

# Bibliometric analysis highlighting the role of women in addressing climate change challenges and achieving sustainable development goals for greener future

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## ABSTRACT

Fossil fuel consumption increased quickly, contributing to climate change that is evident in unusual flooding and draughts, and global warming. Over the past ten years, women's involvement in society has grown dramatically, and they succeeded in playing a noticeable role in reducing climate change. A bibliometric analysis of data from the last ten years has been carried out to examine the role of women in addressing the climate change. The analysis's findings discussed the relevant to the sustainable development goals (SDGs), particularly SDG 7 and SDG 13. The results considered contributions made by women in the various sectors while taking geographic dispersion into account. The bibliometric analysis delves into topics including women's leadership in environmental groups, their involvement in policymaking, their contributions to sustainable development projects, and the influence of gender diversity on attempts to mitigate climate change. This study's results highlight how women have influenced policies and actions related to climate change, point out areas of research deficiency and recommendations on how to increase role of the women in addressing the climate change and achieving sustainability. To achieve more successful results, this initiative aims to highlight the significance of gender equality and encourage inclusivity in climate change decision-making processes.

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## 1. INTRODUCTION

Climate change has significant risks to public health, safety, and the environment. It is imperative that the rise in global temperatures brought on by climate change should stay below 1.5 °C in order to prevent millions of deaths and disastrous health effects [1]. Because of the ecosystem and climate change, zoonotic diseases, diseases spread from animals to humans, are appearing at an alarming rate [2]. In addition to its direct effects on health, climate change also has indirect effects on health through disruptions in food sources and lower economic productivity, as well as changes in infectious diseases and environmental hazards [3]. Further research and interventions are required to mitigate the risks associated with climate change, as outdoor workers are especially susceptible to these hazards [4]. For instance, the public health system in the United States is not equipped to guard against the health risks posed by climate change, which emphasizes the need for more funding and legislative authority [5]. Indeed, one of the biggest threats to

humanity in the modern era and future generations is climate change. According to specific accounts, it is an artificial calamity that poses severe risks to public health, safety, and the environment [6], [7]. Widespread, swift, and decisive, the effects of climate change are felt in many facets of society, such as infrastructure, livelihoods, culture, economy, and physical health. Furthermore, there is a possibility that climate change will intensify conflicts and has been connected to effects on mental health, which is a new development in assessments that have been conducted recently. Governments must act appropriately and create policies to reduce the risks and safeguard the Earth and its people.

Despite being disproportionately affected by the health issues raised by the climate change; women have historically been underrepresented in climate science and governance leadership. In addition to being a question of justice, increasing the representation of women in climate leadership produces more equitable results. Comprehensive, creative, and quick environmental solutions require inclusive leadership with a foundation in gender justice [8]. Discrimination and inequality in many forms, stemming from factors such as gender, class, race, and other characteristics, make it more difficult for people to adjust to and deal with climate change. To increase women's resilience, policies and programs must emphasize their protection, health needs, capacity building, livelihoods, and leadership [9], [10]. The United Nations Framework Convention on Climate Change (UNFCCC) has underlined the importance of gender balance and equity, and gender integration in climate action is critical. Future gender disparities are being addressed through gender-sensitive strategies, such as gender-responsive climate finance [10]. Women are more vulnerable to climate change because of their higher sensitivity and lower levels of adaptive capacity. Plans for climate adaptation can incorporate targeted action and identify and address differential vulnerability with the aid of gender-based climate risk assessments [11].

Women are crucial in addressing issues related to the environment and climate change. They have aided in risk identification, emergency preparedness and response, and mitigating the negative consequences of environmental calamities [12]. Furthermore, it has been recognized that women are capable and gifted leaders who are crucial to the battle against climate change [13]. A correlation has been observed between their participation in environmental decision-making and more ambitious climate goals and policies [14], [15]. However, the contributions that women make to environmental management and protection are often disregarded [16]. Women's emancipation and the recognition of the other gender are necessary to address environmental challenges [17]. It will take significant legislative actions, funding sources, and gender-focused mentoring program to empower women to properly take care of the environment and advocate for environmental issues. Further research and data collection are needed to determine how women's environmental leadership affects environmental outcomes. Mukurazhizha and Matanga [18] discussed how women respond to, prepare for, and mitigate the negative effects of environmental disasters. The authors emphasize how important it is to recognize women as vital leaders when addressing environmental issues [18]. The study also focused on the case of Cyclone Idai in Chipinge, Zimbabwe, and employed a qualitative research methodology. The study's findings highlight three critical roles: reproductive, social, and productive, that women play in the environmental crisis as wage workers. Women are employed in the domains of child protection, disaster response, mitigation strategies, and climate change interpretation. They also establish informal social protection networks and social groupings within communities [18]. Gan *et al.* [13] discussed how women are addressing environmental and climate-related issues in the Asia-Pacific region. They highlighted the importance of women's leadership in environmental movements, their participation in disaster management, and the inclusion of women in climate change research and action. Oktarina and Yulianti [14] discussed the concept of ecofeminism, a movement that supports Indonesian women's involvement in environmental protection. It highlights the equal part that women play in environmental management and protection, as well as the importance of their involvement in gender-responsive climate policies [14]. It also demonstrates how frequently women's contributions to environmental protection are disregarded at the local and national levels in Indonesia [14], [15]. The importance of women's participation in environmental decision-making and their impact on environmental outcomes are covered in [16]. In addressing women's responsibilities in the fight against climate change, Sertyesilisik [19] argues that empowering women and encouraging their participation in decision-making can help mitigate the adverse impacts of climate change. In his analysis of women's roles in the fight against climate change, Charbit [20] argues that while women are vital to this effort, their contributions are usually overlooked and undervalued. It is important to highlight the role of the women in controlling the climate change. Therefore, the aim of the paper is highlighting the role of women in controlling the climate change and achieving the sustainable development goal. Firstly, collecting the data of the related recent publications during the last 10 years from 2013 to 2023 based on Scopus database. Second, using the professional software's search as VOSviewer software and Publish or Perish software, bibliometric analysis has been carried out. The results of the bibliometric analysis were used to highlight the role of the women in controlling the climate change and highlighting the strong and weak points for the policy makers.

The rest of the paper is organized as follows. Section 2 illustrated the methods used in the paper. The results and discussion are explained in detail in section 3. Finally, the main findings are outlined in the conclusions.

## 2. METHOD

As part of the research methodology, a comprehensive review of the body of literature on women's contributions to climate change mitigation was conducted. The VOSviewer analysis tool was utilized to perform a bibliometric analysis aimed at identifying research trends concerning women and climate change, strong and weak points that could help the policy makers in taking the proper decision to increase the participation and the effectiveness of the women's role in controlling climate change. The analysis discusses the change in viewpoint regarding the contribution of women to mitigating climate change and accomplishing sustainable development objectives. As shown in Figure 1, the preferred reporting items for systematic reviews and meta-analyses (PRISMA) method was used to find, filter, and examine the publications in preparation for a bibliometric analysis. Over the course of the 10 years chosen for the study, relevant publications related to role of women in controlling the climate change that were published and indexed in the Elsevier Scopus database were included. After that, a suitable search string was created and implemented in Scopus to find relevant literature on the subject. The PRISMA analysis and data recovery approach flowchart utilized in this study is displayed in Figure 1. The search string *TITLE-ABS-KEY* criteria ("women" AND ("climate change" OR "sustainable development goals") AND *PUBYEAR* > 2012 AND *PUBYEAR* < 2024 was run in Scopus on December 8, 2023. Many duplicate entries, unrelated documents, non-English, non-peer reviewed, and unconventional document types were among the many documents that the search turned up. As a result, screening was done to remove all of the publications that were duplicates as well as document kinds like editorials, data documents, notes, and letters. A total of 1,346 documents were published exclusively in the English language between 2013 and 2023 as a result of the study. The CSV version of the publication data was exported to VOSviewer and Publish or Perish software for bibliometric analysis, while the publication data was exported to Microsoft Excel for publication trends analysis. The purpose of the percentage total (PT) analysis was to look at the publications' growth pattern as well as the leading authors and researchers, their affiliations, the countries where they are actively conducting research on the subject, and funding organizations. However, using VOSviewer software, the analysis was carried out to look at the co-authorship, keyword co-occurrences, and citation networks on the subject. Using the software, visualization maps of the networks were created in order to assess the influence of hotspots, collaborations, and the research impact of the subject in the literature.

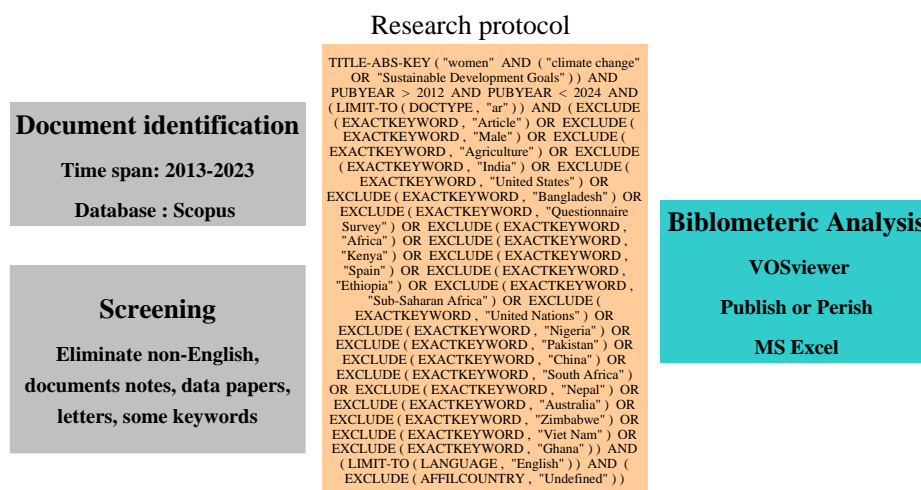


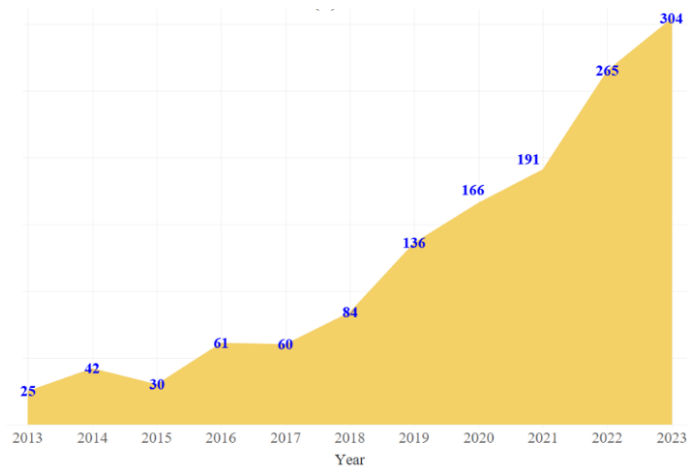
Figure 1. Research methodology

## 3. RESULTS AND DISCUSSION

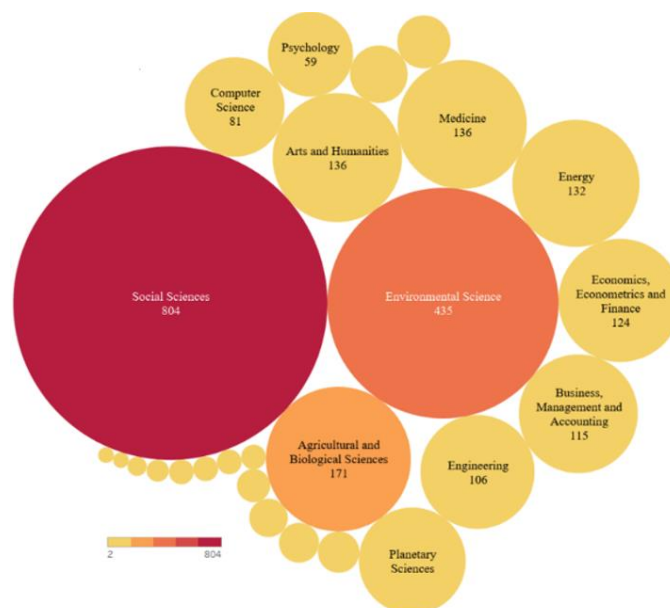
### 3.1. Number of documents

Figure 2 presents the growing rate of published documents related to the role of women in controlling climate change over the last ten years (2013-2023). The total number of documents is 1,364. The

number of published documents increased from 23 documents in 2013 to 304 documents in 2023. The rate of published documents increased by 15%, 38.7% and 14.7% for 2021, 2022 and 2023 respectively. Figure 2(a) and Figure 2(b) show the published documents related to the research topic according to growth trajectory and subject categories respectively. It is worth mentioning that the increase seen in Figure 2(a) is comparable to the growth in researchers' attention to examining the role of women in controlling climate change and achieving sustainable development goals. Because of this, many analyses, decision-makers, and scientists worldwide have made it a priority to find methods, resources, and frameworks that will improve our understanding of the immediate and long-term global challenges that climate change and global warming present. Due to the multifaceted character of climate change, studies involving multiple subject areas have been conducted across disciplines. The top topic areas in which research studies on women and climate change are categorized in the Scopus database are displayed in Figure 2(b). The research topic is indexed in multiple categories, including earth and planetary sciences, engineering, social sciences, environmental science, agricultural and biological sciences, arts and humanities, medicine, energy, economics, econometrics and finance, business, management and accounting, and others. The results show that the topic is a wide, complex, and interdisciplinary field of study, supporting the earlier submission about its effects on society, the economy, and the environment. additional investigation reveals that the social sciences and environmental science are the two most popular subject areas, making up 804 and 435 published papers, or 31.9 % and 17.3% of the total percentage, respectively.



(a)



(b)

Figure 2. Published documents related to the research topic (a) growth trajectory and (b) subject categories

### 3.2. Impact of the women’s research

The impact of the research work done by the women can be monitored through following the trend of the citation of such work. The number of citations for published papers about women's contributions related to mitigating climate change is shown in Figure 3, while Table 1 lists the top 10 highly cited works from 2013 to 2023 based on data from the Scopus database. As is evident, there were 4,180 citations in 2023 compared to 1,442 in 2020 (three times), for a total of 13,422 citations, indicating the increase impact of the women’s research. In 2021, 2022, and 2023, the citation growth rate increases by 61.7%, 33.37%, and 35%, respectively.

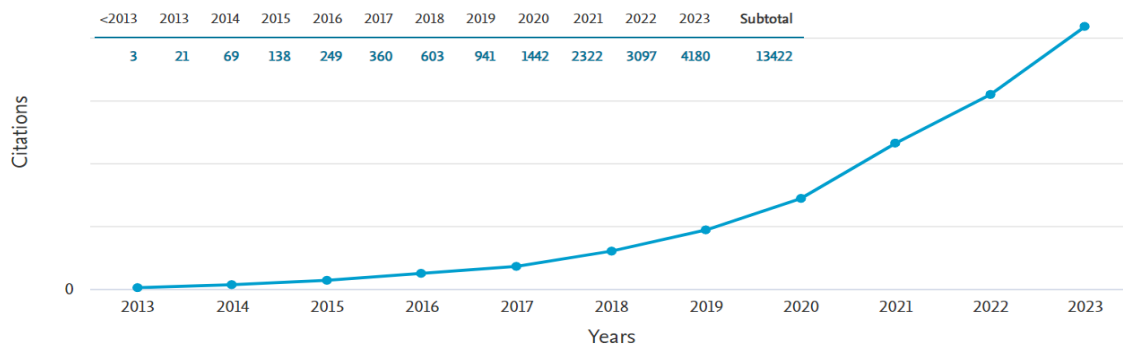


Figure 3. Number of citations per year

Table 1. Top ten highly cited published documents

No	Author	DOI	Year	Journal	Citations	%	FWCI
1	Ben-Amar <i>et al.</i> [21]	10.1007/s10551-015-2759-1	2017	Business Ethics	490	3.65	20.77
2	Carr and Thompson [22]	10.1111/gec3.12121	2014	Geography Compass	178	1.33	4.35
3	Djoudi <i>et al.</i> [23]	10.1007/s13280-016-0825-2	2016	Ambio	173	1.29	3.5
4	Sultana [24]	10.1080/00330124.2013.821730	2014	Professional Geographer	166	1.24	4
5	Alston [25]	10.1016/j.wsif.2013.01.016	2014	Women's Studies	147	1.1	4.92
6	Pasut <i>et al.</i> [26]	10.1016/j.buildenv.2014.10.026	2015	Building and Environment	145	1.08	6.01
7	Gaard [27]	10.1016/j.wsif.2015.02.004	2015	Women's Studies	141	1.05	5.36
8	Reckien <i>et al.</i> [28]	10.1177/0956247816677778	2017	Environment and Urbanization	126	0.94	5.89
9	Resurrección [29]	10.1016/j.wsif.2013.03.011	2013	Women's Studies	126	0.94	5.75
10	Monteiro <i>et al.</i> [30]	10.1016/j.jclepro.2019.04.332	2019	Cleaner Production	117	0.87	4.58

The most cited published document, as indicated in Table 1, has received 490 citations in total, or 3.65% of all citations, and has the highest rate of field weighted citation impact (FWCI) (20.77). Ben-Amar *et al.* [21] work is the most frequently cited. The paper's main conclusion showed that women bring unique qualities to boards, including a more democratic, collaborative, and participatory leadership style as well as the capacity to help boards make better decisions. In addition, they are believed to be more aware of environmental and corporate social responsibility issues, which can enhance corporate efficiency and ensure better corporate disclosure addressing climate change issues with the company reducing carbon footprint. The first step in measuring greenhouse gas emissions in their emissions for investors and can be seen in disclosure. This enables stakeholders to hold the company accountable for its actions and provide transparency and accountability for its emissions. This may serve as motivation for the business to cut emissions and build a more sustainable future [21]. Carr and Thompson's work [22], which has received 178 citations to date at a rate of FWCI (4.35), is the second most cited publication. The paper's key finding showed how the women are creating their own adaptations by developing locally relevant methods and plans to deal with the effects of climate change in their daily lives. Some of the activities that women are involved in include cultivating unique crops that differ from those grown by men in terms of their biophysical properties, making use of their special roles in their homes and communities to devise innovative solutions for coping with drought, flooding, uncertainty, and other stressors associated with climate change, and having limited access to resources necessary for their livelihoods, such as land and inputs [22]. In order to better understand the difficulties facing the community in question and the likely effects of any intervention package on these various vulnerabilities, the work argues that gender analysis must be incorporated into the design of any program or project that aims to address the vulnerabilities related to climate variability and

change that those living in agrarian settings face [22]. The high citations of the documents as presented Table 1 demonstrate the significance of climate change studies (done by the women) from a socioeconomic and environmental perspective in addition to their research impact. The role of women in limiting climate change has grown significantly over time, as the publication trends analysis shows. This has led to a high total number of citations (13,422) over the last ten years. The co-authorships among researchers worldwide can also be linked to high citation counts.

### 3.3. Source title

Based on information from Scopus, Figure 4 displays the common international journals where women published their research related to controlling the climate change between 2013 and 2023. sustainability Switzerland, agenda, climate and development, frontiers in sustainable food systems, and international journal of disaster risk reduction are the most popular journals on the subject, as can be observed. Over the past ten years, 143 documents, or 10.5% of all publications (1,364) on the subject, have been published in the top 5 source journals. With 69 publications published, or 5.05% of all documents, sustainability Switzerland is the leading journal on the subject. Sustainability is an open access international journal, cross-disciplinary, scholarly, of technical, environmental, cultural, economic, and social sustainability of human beings. It offers an advanced forum for studies related to sustainability and sustainable development, according to its description as an open-access publication. Its high impact factor and open access feature; which, based on numerous studies in the literature, strongly correlate with productivity and citations; may be the cause of its high output. The inclusion of other MDPI journals, like Sustainability, in the top 5 journals related to the research topic may be partially explained by this observation. Consequently, one may fairly infer that the open-access format and reputable source titles account for a significant portion of the top journals' productivity in this field. The open access features of the sustainability journal also indicate the interest in the research through financial support of this work. Figure 5 displays the total number of published documents for each journal about women's role in mitigating climate change (2013–2023).

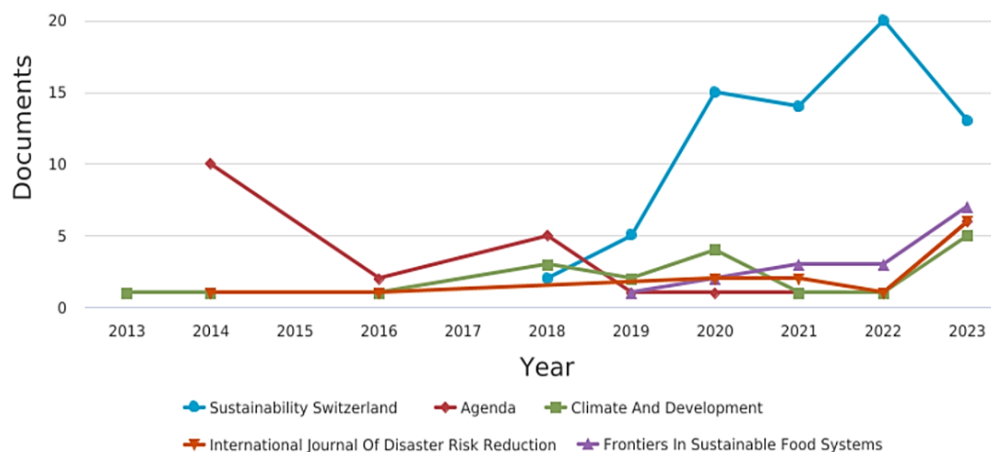


Figure 4. Top international journals for publications on the role of women in controlling the climate change (2013–2023)

### 3.4. Top authors

Based on data from Scopus, the top ten most prolific researchers who have contributed to the discussion of women's role in limiting climate change between 2013 and 2023 are displayed in Table 2. As can be seen, during the study's examined timeframe, the top 10 authors published a total of 39 documents. Subsequent investigation reveals that Table 2 lists the top 5 most prolific researchers along with the nation in which they are affiliated: Seema Arora-Jonsson (Sweden), Azhar Abbas (Pakistan), Margaret Alston (Australia), and Salvador Baena-Morales (Spain). With five publications on women and climate change, Margaret Alston, an Australian Academic at the University of Newcastle in Callaghan, is the most prolific researcher on the subjects. The most recent work, titled "Women and climate change in Vanuatu, Pacific Islands Region," was published in the Journal of Gender, Place, and Culture (Taylor & Francis) in 2023 [31]. The paper's primary conclusions are that, according to focus group discussions with women in five Vanuatuan communities, women are facing a number of challenges, including poor fishing, rising sea levels, declining resources, and damage from wild pigs to their gardens and food crops [31].

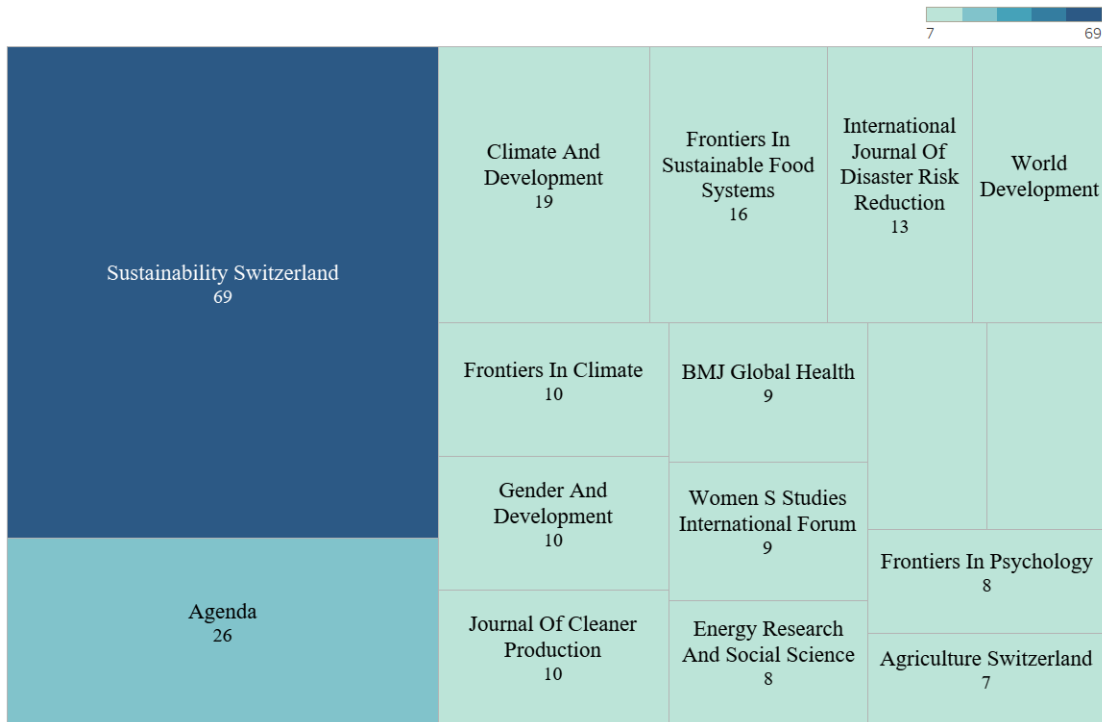


Figure 5. Number of published documents for every source title for publications on the role of women in controlling the climate change (2013–2023)

Table 2. Top researchers with affiliations and h-index

Name	No of papers	Affiliation	h-index
1 Alston, Margaret	5	The University of Newcastle, Australia, Callaghan, Australia	30
2 Baena-Morales, Salvador	5	Universitat d'Alacant, Alicante, Spain	10
3 Abbas, Azhar	4	Pakistan University of Sargodha, Institute of Chemistry, Sargodha, Pakistan	21
4 Arora-Jonsson, Seema	4	Sveriges Lantbruks Universitet, Department of Urban and Rural Development, Uppsala, Sweden	17
5 McNamara, Karen E.	4	The University of Queensland, Brisbane, Australia	38
6 Merma-Molina, Gladys	4	Universitat d'Alacant, Department of General and Specific Didactics, Alicante, Spain	7
7 Udas, Pranita Bhushan	4	Wageningen University and Research, Wageningen, Netherlands	8
8 Azadi, Hossein	3	Université de Liège, Liege, Belgium	38
9 Azuh, Dominic	3	Covenant University, Ota, Nigeria	8
10 Butler, James R.A.	3	Cawthron, Nelson, New Zealand	36

### 3.5. Top researching countries and institutions

The leading organizations actively involved in promoting women's participation in climate change research worldwide are displayed in Figure 6. In order to effectively conduct research on a variety of topics of interest, host institutions typically supply researchers and scientists with resources in the form of infrastructure, funding, and other qualified staff members. Based on Scopus data, the top five research institutions are Australian National University, University of KwaZulu-Natal (South Africa), Universitat d'Alacant (Spain), Covenant University (Nigeria), and Stellenbosch University (South Africa). Based on Scopus data from 2013 to 2023, Figure 7 displays the top countries actively engaged in global research on women and climate change. As can be seen, the top five countries are South Africa, Australia, India, the United States, and the United Kingdom. Out of 1,346 documents, 746 (or roughly 56%) have been published by these top 5 countries. This constitutes a substantial academic and scientific addition to the field of study on women and climate change. According to Figure 7, which shows 300 publications, or 22% of all documents on the subject, the United States is the highest contributed country. The number of documents increased from 7 in 2013 to 56 in 2023, representing a 9.8% annual growth rate in comparison to 2022. The universities with the highest rates of published documents related to Women and climate change are

University of Florida and University of California, with 10 and 9 documents, respectively. The annual number of citations for documents published in the United States was a 28.8% increase in citations from 2022 to 2023, with 6 citations in 2013 and 1,100 documents in 2023. The most frequently cited section is titled “gender and climate change adaptation in agrarian settings: current thinking, new directions, and research frontiers” and was published by Carr and Thompson [22]. The article appeared in the 2014 issue of Geography Compass Journal. With an FWCI of 4.35, the paper has 111 total citations. The paper's primary conclusion is that binary approaches to gender analysis are likely to ignore the unique difficulties that large segments of agrarian populations face, which could result in maladaptive interventions that increase vulnerability rather than lessen it. In order to better understand and address the variety of vulnerabilities and adaptation strategies within agrarian communities facing the impacts of climate change, the paper advocates for the adoption of intersectional gender analyses [22].

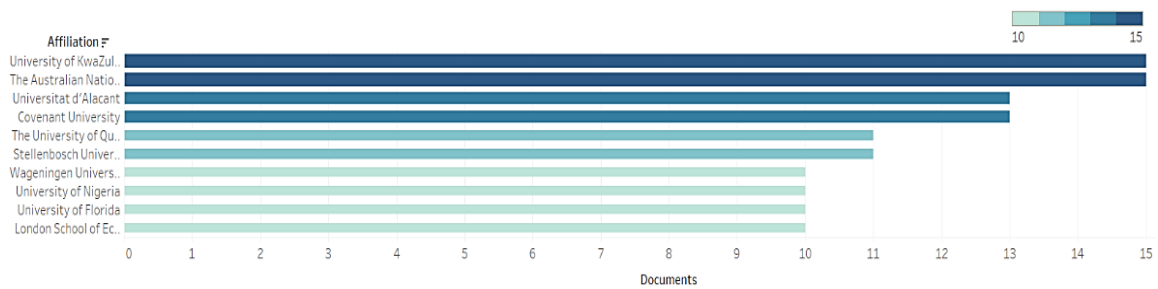


Figure 6. Top institutions for publications on the role of women in controlling the climate change

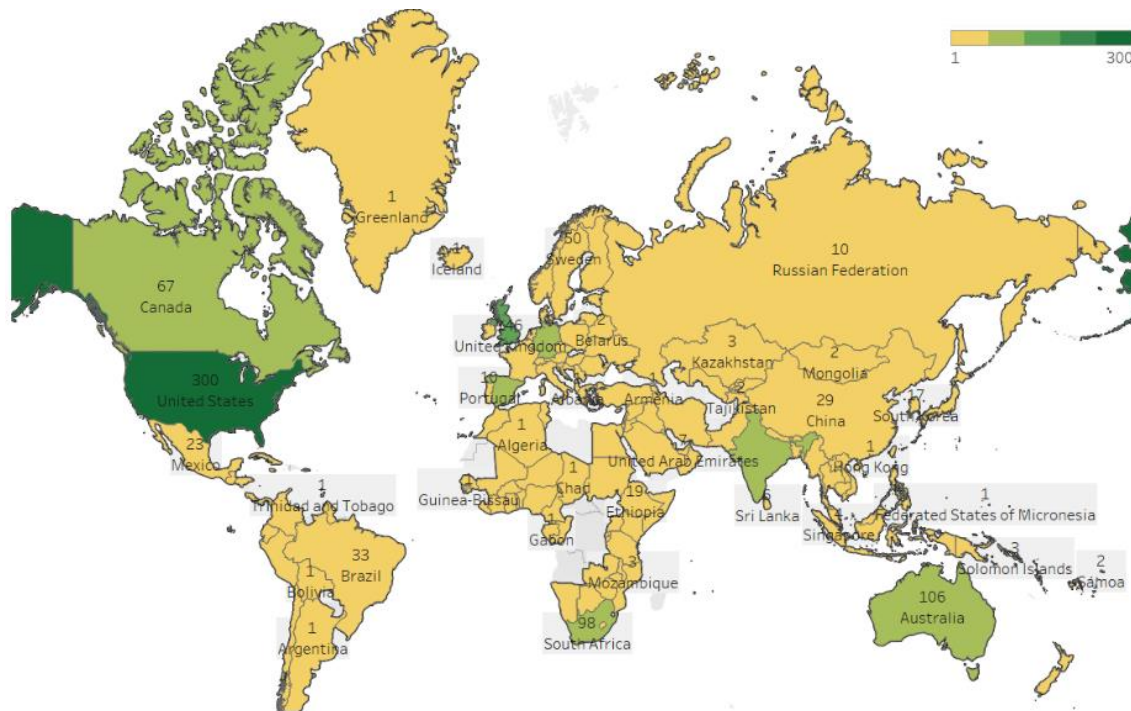


Figure 7. Top countries for publications on the role of women in controlling the climate change

### 3.6. Keywords co-occurrence analysis

The network visualization maps of co-occurring keywords in studies on women and climate change are displayed in Figure 8. An essential tool for understanding the development of clusters, hotspots, and themes in any field of study is the analysis of keyword co-occurrence. Using VOSviewer software, the co-occurrence of keywords was analyzed in this study. As a result, the keywords on the research topic's network visualization map were mapped as indicated in Figure 8. According to the map, of the 5,564








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**REFERENCES**

- [1] A. M. V. Jayaraj and A. F. A. Ibrahim, "Climate change and health," *Haya: The Saudi Journal of Life Sciences*, vol. 8, no. 05, pp. 58–60, May 2023, doi: 10.36348/sjls.2023.v08i05.002.
- [2] The Lancet Infectious Diseases, "Twin threats: climate change and zoonoses," *The Lancet Infectious Diseases*, vol. 23, no. 1, Jan. 2023, doi: 10.1016/S1473-3099(22)00817-9.
- [3] J. Rocha, S. Oliveira, C. M. Viana, and A. I. Ribeiro, "Climate change and its impacts on health, environment and economy," in *One Health: Integrated Approach to 21st Century Challenges to Health*, Elsevier, 2022, pp. 253–279.
- [4] P. A. Schulte *et al.*, "Updated assessment of occupational safety and health hazards of climate change," *Journal of Occupational and Environmental Hygiene*, vol. 20, no. 5–6, pp. 183–206, Jun. 2023, doi: 10.1080/15459624.2023.2205468.
- [5] A. D. Moulton, "Needed: new authority to build public health system capacity for climate change health threats," *Journal of Public Health Policy*, vol. 41, no. 1, pp. 14–23, Jan. 2020, doi: 10.1057/s41271-019-00210-4.
- [6] J. Wang, J. Hsu, Y. Li, and V. C. Gu, "Confronting current crises and critical challenges of climate change," *International Journal of Sociotechnology and Knowledge Development*, vol. 15, no. 1, pp. 1–17, Mar. 2023, doi: 10.4018/IJSKD.318695.
- [7] P. Wagner, "The triple problem displacement: climate change and the politics of the Great Acceleration," *European Journal of Social Theory*, vol. 26, no. 1, pp. 24–47, Nov. 2022, doi: 10.1177/13684310221136083.
- [8] B. Wray, E. M. Veidis, E. C. Flores, A. A. Phillips, O. Alani, and M. Barry, "A call to action for gender equity in climate leadership," *American Journal of Tropical Medicine and Hygiene*, vol. 108, no. 6, pp. 1088–1092, Jun. 2023, doi: 10.4269/ajtmh.22-0674.
- [9] D. Haider and R. Sultana, "Gender, inclusion, climate change and disasters," *Handbook on Climate Change and Disasters*, pp. 231–248, 2022, doi: 10.4337/9781800371613.00030.
- [10] C. Secretariat, *Gender integration for climate action*. Commonwealth Secretariat, 2022.
- [11] M. E. O. Oragwa, "Climate change: inclusion of gender and cultural diversity in climate change actions," in *Encyclopedia of Information Science and Technology, Fifth Edition*, IGI Global, 2020, pp. 1398–1407.
- [12] P. Singh, T. Tabe, and T. Martin, "The role of women in community resilience to climate change: a case study of an Indigenous Fijian community," *Women's Studies International Forum*, vol. 90, Jan. 2022, doi: 10.1016/j.wsif.2021.102550.
- [13] C. C. R. Gan, C. McNamara, H. Gunasiri, P. Oliva, and B. Sebar, "Women and planetary health in Asia-Pacific," *Frontiers in Climate*, vol. 5, Mar. 2023, doi: 10.3389/fclim.2023.1058432.
- [14] T. N. Oktarina and A. Yulianti, "The role of women in sustainable development and environmental protection: a discourse of ecofeminism in Indonesia," *Indonesian Journal of Environmental Law and Sustainable Development*, vol. 1, no. 2, pp. 107–138, Jul. 2022, doi: 10.15294/ijel.v1i2.58137.
- [15] V. Papavasileiou, E. Nikolaou, N. Andreadakis, Y. Xanthacou, D. Matzanos, and M. Kaila, "The contribution of women in environmental protection within the context of local sustainable development," *IJASOS- International E-journal of Advances in Social Sciences*, vol. 5, no. 15, pp. 1327–1332, Dec. 2019, doi: 10.18769/ijasos.592100.
- [16] S. Strumskyte, S. Ramos Magaña, and H. Bendig, "Women's leadership in environmental action," *OECD Environment*, 2022.
- [17] V. Belleli, S. Ramos Magaña, and D. Xynou, "Gender mainstreaming in environmental policies," in *Joining Forces for Gender Equality*, OECD, 2023.
- [18] R. M. Mukurazhizha and S. Y. Matanga, "The role of women in managing the environmental crisis: a case study of Cyclone Idai in Chipinge, Zimbabwe," *HTS Teologiese Studies / Theological Studies*, vol. 79, no. 3, Apr. 2023, doi: 10.4102/hts.v79i3.8042.
- [19] E. Sertyesilisik, "Gender equity and politics for the enhancement of environmental sustainability: empowerment of women for the fight against climate change," in *Environmental Sustainability, Growth Trajectory and Gender: Contemporary Issues of Developing Economies*, Emerald Publishing Limited, 2022, pp. 233–242.
- [20] Y. Charbit, "Women as actors in addressing climate change," in *International Handbooks of Population*, Springer Netherlands, 2018, pp. 317–328.
- [21] W. Ben-Amar, M. Chang, and P. McIlkenny, "Board gender diversity and corporate response to sustainability initiatives: evidence from the carbon disclosure project," *Journal of Business Ethics*, vol. 142, no. 2, pp. 369–383, Jul. 2017, doi: 10.1007/s10551-015-2759-1.
- [22] E. R. Carr and M. C. Thompson, "Gender and climate change adaptation in agrarian settings: current thinking, new directions, and research frontiers," *Geography Compass*, vol. 8, no. 3, pp. 182–197, Mar. 2014, doi: 10.1111/gec3.12121.
- [23] H. Djoudi, B. Locatelli, C. Vaast, K. Asher, M. Brockhaus, and B. Basnett Sijapati, "Beyond dichotomies: gender and intersecting inequalities in climate change studies," *Ambio*, vol. 45, no. S3, pp. 248–262, Nov. 2016, doi: 10.1007/s13280-016-0825-2.
- [24] F. Sultana, "Gendering climate change: geographical insights," *Professional Geographer*, vol. 66, no. 3, pp. 372–381, Aug. 2014, doi: 10.1080/00330124.2013.821730.
- [25] M. Alston, "Gender mainstreaming and climate change," *Women's Studies International Forum*, vol. 47, pp. 287–294, Nov. 2014, doi: 10.1016/j.wsif.2013.01.016.
- [26] W. Pasut, H. Zhang, E. Arens, and Y. Zhai, "Energy-efficient comfort with a heated/cooled chair: Results from human subject tests," *Building and Environment*, vol. 84, pp. 10–21, Jan. 2015, doi: 10.1016/j.buildenv.2014.10.026.
- [27] G. Gaard, "Ecofeminism and climate change," *Women's Studies International Forum*, vol. 49, pp. 20–33, Mar. 2015, doi: 10.1016/j.wsif.2015.02.004.
- [28] D. Reckien *et al.*, "Climate change, equity and the sustainable development goals: an urban perspective," *Environment and Urbanization*, vol. 29, no. 1, pp. 159–182, Jan. 2017, doi: 10.1177/0956247816677778.
- [29] B. P. Resurrección, "Persistent women and environment linkages in climate change and sustainable development agendas," *Women's Studies International Forum*, vol. 40, pp. 33–43, Sep. 2013, doi: 10.1016/j.wsif.2013.03.011.
- [30] N. B. R. Monteiro, E. A. da Silva, and J. M. Moita Neto, "Sustainable development goals in mining," *Journal of Cleaner Production*, vol. 228, pp. 509–520, Aug. 2019, doi: 10.1016/j.jclepro.2019.04.332.
- [31] M. Alston, S. Fuller, and N. Kwarney, "Women and climate change in Vanuatu, Pacific Islands Region," *Gender, Place and Culture*, pp. 1–22, Jul. 2023, doi: 10.1080/0966369X.2023.2229530.

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