TOPICAL REVIEW

How is adaptation, resilience, and vulnerability research engaging with gender?

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Abstract

The gendered dimensions of climate change have received increasing interest in climate change adaptation, resilience, and vulnerability (ARV) research. Yet concerns have been expressed that engagement with ‘gender’ in this work has been tokenistic. In this context, we ask: how is climate change ARV research engaging with gender? To answer this question, we develop an assessment framework capturing key attributes of engagement and use it to evaluate peer reviewed ARV articles with a focus on gender published since 2006 (n = 123). Results indicate an increase in ARV studies with a gender focus over this period, with the level of gender engagement also increasing. There are a relatively equal numbers of studies categorized as engaging gender at a high, medium, and low level, with studies from Sub-Saharan Africa consistently exhibiting high levels of gender engagement. Gender focused ARV has a strong focus on examining female experiences, with few studies explicitly focusing on men, and no work accounting for those identifying outside the gender binary.

1. Introduction

The last decade has experienced a significant expansion in climate change adaptation, resilience, and vulnerability (ARV) research that seeks to identify the risks posed by climate change and inform decision making on risk reduction [1]. The field is diverse, with studies utilizing a variety of conceptual and methodological approaches, and focusing on different sectors, scales, and populations. A number of targeted reviews have sought to characterize research domains and publishing trends in this rapidly emerging field [1–6]. These studies document how the ARV field is evolving and in some instances have critically examined the concepts, assumptions, and blind-spots in research conducted.

One area of increasing interest in the ARV field has been on the gendered dimensions of climate change [7, 8]. This work highlights that climate change is not gender neutral, with structural and social inequalities, and socially constructed roles and expectations, differentiating vulnerability by gender, influencing the types and nature of adaptations recommended in research.

While increasing emphasis on the gender dimensions of climate change in ARV studies is welcome in this regard, concerns have been expressed about the extent of engagement. Some have argued that the incorporation of ‘gender’ has been tokenistic, with studies simply documenting that climate change will have differential impacts by gender, but contributing little to our understanding of the processes creating vulnerability or stimulating real change to reduce inequalities [9, 10]. Adaptations based on tokenistic engagement of gender risk reinforcing and entrenching pre-existing gender inequalities and vulnerabilities, and may result in interventions which are maladaptive or adaptations that are more effective for one gender than another [11, 12].

Reflecting these concerns, we examine how gender is incorporated into ARV studies published in the peer reviewed literature, asking the question: How is gender being engaged in climate change ARV research? In doing so, the work addresses an important gap in understanding, with few studies systematically examining how gender is being framed within this scholarship [7, 9, 13].
2. Methodology

In this section we develop an assessment framework for examining how gender is being engaged in ARV research. ‘Research’ is defined as the systematic inquiry or investigation on climate change adaptation, resilience, or vulnerability, capturing studies which seek to identify and characterize how climate change affects human systems, along with work which identifies, evaluates, and prioritizes interventions to reduce vulnerability and enhance resilience. Our approach recognizes that the ultimate aim of much ARV research is to inform decision making on risk reduction at a range of scales from the household to regional to national level, with a variety of approaches to achieving this [14, 15]. At one extreme, studies seek to achieve this by developing scientific understanding on causality of vulnerability, describe conditions, and characterize future trajectories, with the hope that this information will end up being useful to knowledge users. In this so-called ‘linear model’ or the ‘science supply paradigm’, the aim of research is to supply information for knowledge users to act on [16]. Increasingly, however, this approach to knowledge creation has been critiqued, particularly in the context of wicked problems like climate change [17, 18], with many ARV studies now explicitly seeking to create usable or actionable knowledge [19, 20]. In this research, community engagement and emphasis on local empowerment figure strongly, in which researchers often take a normative stance, seeking not only to understand but also catalyze change. We recognize the importance of both approaches to research, yet differentiate both in our model of engagement to capture those explicitly seeking to move research to action.

2.1. Conceptual model

To determine the ways in which ARV research is engaging with gender, we developed a conceptual model capturing attributes of ‘engagement’. Building upon the gender studies scholarship, and the climate and gender literature, the model recognizes that engagement occurs on a spectrum. Research that engages with gender at a low level simply acknowledges that gender exists and in some way interacts with the issue being examined. Conversely, studies that engage with gender at a high level acknowledge different gender experiences, consider gender throughout the research process, recognize and highlight the underlying power structures behind gendered experiences, and advance the cause of greater gender equality [21–23]. The conceptual model has three attributes, each of which has key components, which capture how gender is incorporated in a study.

2.1.1. Gender-mainstreaming

Gender-mainstreaming refers to the promotion of gender equality by ensuring the different needs, experiences and capabilities of all genders are considered when conducting research projects and in making policy recommendations [24, 25], and can be considered a function of gender-sensitivity, gender-responsiveness, and gender-transformativeness. These three components capture how thoroughly gender is being addressed in research. Gender-sensitivity is evidenced by explicit acknowledgement of the different experiences and needs as they differ by gender, having ‘clear, specific objectives, actions and indicators that will lead to reductions in gender disparities’ [13, p 3] and by using gender sensitive language [24, 27]. Gender-responsiveness is in evidence when research findings are presented in a gender-disaggregated manner, and/or when progress indicators measure the different impacts of a policy intervention on both men and women, and, ideally, those elsewhere on the gender spectrum [24, 26]. Finally, gender-transformativeness involves the rethinking of social values, organizational practices, policies, and goals of different sectors to include gender [9, 13, 25]. For example, this may involve evaluating how resources are distributed following a climate related disaster such as flooding to ensure equal access, or focusing on integrating women’s local knowledge in adaptation planning.

2.1.2. The experience of gender

Engaging with concepts of gender at a high level goes beyond describing the practical needs of particular genders to discuss and advance the strategic needs of gender [23, 28]. Practical gender needs are those that address practical interests of a gender within their socially accepted societal role in response to an immediate perceived necessity. These needs may stem from gender divisions of labour and subordinate positions in society, but do not seek to challenge fundamental inequality [23, 28]. Such needs can be addressed by promoting the improvement of living conditions through a focus on issues such as access to health care, food and water distribution, employment, and housing [28]. By addressing practical needs, research aims to improve the differentiated access, roles and rights as they play out within gender norms and parameters. Strategic needs are those related to gendered divisions of labour distribution, power, and control which aim to challenge existing gender roles as a means to greater equality [28]. Addressing strategic needs in research often involves a transformation of roles, redistribution of power, and re-evaluation of legal rights and social responsibilities. This may involve the requirement for equal gender participation and consultation for climate change projects or actively working to transform gender roles through ARV research. In this way, researchers can examine
the root causes of gender inequality that create differential vulnerability.

In the context of ARV research, practical and strategic needs are woven throughout. Recognizing the differential nature of climatic change impacts is at the core of much ARV literature, although focusing on strategic needs through a gendered lens is less common. Recognizing how one’s gender impacts strategic needs and how the strategic needs of one’s gender may change due to environmental stressors is important if ARV research is to engage with gender at a high level. While addressing practical needs of different genders is necessary, failing to move beyond this and acknowledge the underlying causes that have led to differentiated climate change experiences may perpetuate uneven climate change impacts between genders. In this way, acknowledging strategic needs indicates greater engagement with concepts of gender [28].

2.1.3. Degree of action

The final attribute of engagement concerns the level of action being taken. While gender mainstreaming and the experience of gender addresses the depth of understanding and engagement with gender issues in research, engaging with gender at a high level results in moving beyond understanding and acknowledgement towards promoting inequality reduction [25]. While it is unreasonable to expect research to be the sole driving force in overcoming systemic gender inequality, research does have a role to play documenting gender inequity and promoting efforts to overcome it, both within the region or sector of focus, and in academia more broadly [29]. Building on Lesnikowski et al [30], the degree of action attribute helps categorize how much change may be enacted as a result of the research.

The lowest level of actions are statements of recognition which acknowledge that a relationship between gender and ARV exists. This indicates awareness of the potential gendered dimensions of climate change impacts and adaptations, but does not indicate that action has been taken or proposed to reduce inequality. Statements of recognition indicate a lower level of engagement. Groundwork statements not only recognize a relationship between gender and ARV, but also outline recommendations for how gender inequality can be reduced through the research process or policy intervention. Such statements take preliminary steps towards greater gender equity by informing ARV practices, but do not themselves constitute change in policies, programs or the delivery of services. Finally, statements of action are considered as to be highly engaging as they capture cases where concrete actions have been taken as part of the research process to increase gender equality within ARV research or through ARV processes. Statements of action are informed by and build from statements of recognition and groundwork statements to promote or instigate changes in programming, policy and delivery of services.

2.2. Assessment rubric

An assessment rubric was designed to operationalize the conceptual model to examine the level of gender engagement in ARV research. The rubric is based on a series of standardized indicators (i.e. questions) organized around the three attributes of engagement and their associated components, as illustrated in table 1.

Peer reviewed articles were used as the data source from which to examine how gender is being considered in ARV research. To identify relevant articles and ensure comprehensiveness in the review, we conducted a systematic literature review [31]. Search terms were first developed to capture research focusing on gender, and were applied within Scopus and Web of Knowledge focusing on studies published between 2006 and 2014 (table 2). To be included, studies had to have a substantive focus on gender. The initial review returned 1284 articles which were screened based on inclusion/exclusion criteria and reading of the title and abstract, with 232 relevant documents remaining for full reading. After this final screening, 123 documents were retained as reporting on studies examining gender in the context of climate change ARV (see supplementary data for a complete list of included documents). The majority of excluded articles did not substantially focus on adaptation, resilience, or vulnerability, focused exclusively on natural systems, or did not focus on gender.

2.3. Coding scheme

Each peer reviewed article was coded using the assessment rubric. First articles were coded to capture the region, sectoral focus, and type of study (adaptation, vulnerability, and/or resilience). Indices for each component of engagement were then calculated, capturing the extent to which indicators of each component were evident in the study (table 1):

- **Gender mainstreaming**: the presence or absence of gender-sensitivity, gender-responsiveness, and gender-transformativeness in the sector(s) of focus was used to determine the extent to which each study engaged with gender. Articles that showed evidence of each of these components was considered to be engaging with gender at a higher level than those that address two or fewer. Each component of gender mainstreaming received equal weighting and was scored out of 1, for a maximum score of 3.

- **Experience of gender**: articles that examined the gender experience purely by focusing on practical needs received a score of 1, while articles that explored the power dynamics and strategic needs of genders in relation to each received a score of 2. Three points were awarded to studies that
Table 1. The conceptual model for examining the level to which climate change ARV studies are engaging with gender (note: for each indicator, ‘presence’ reflects an affirmative answer to one of the indicators).

| Attributes and components of engagement | Questions/indicators | Scoring system |
|----------------------------------------|-----------------------|----------------|
| **1. Gender mainstreaming: extent to which gender concepts are being applied in the ARV research process** | **Total possible score: 3** |
| Gender-sensitivity | Is there explicit recognition of the different needs and experiences by gender? Presence: score of 1 | |
| | Are there objectives, actions, and/or indicators that aim to reduce gender disparities? Absence: score of 0 | |
| | Is gender sensitive language used? | |
| Gender-responsiveness | Are the research findings presented in a gender-disaggregated manner? Presence: score of 1 | |
| | Do progress indicators measure the different impacts experienced by each gender? Absence: score of 0 | |
| | Are there recommendations or evidence of equal participation in decision making processes by all genders? | |
| Gender-transformativeness | Does the research critically analyze social values, organizational practices, and goals? Presence: score of 1 | |
| | Does the research promote the rethinking of societal structures of power as they relate to gender? Absence: score of 0 | |

| **2. Experience of gender: extent to which the specific needs of different genders are acknowledged and addressed throughout ARV research processes.** | **Total possible score: 3** |
| Practical needs | Does the research focus on improving the practical and differentiated needs each gender experiences within current gender norms? Presence: score of 1 | |
| | Absence: score of 0 | |
| Strategic needs | Does the research aim to reduce gender inequality through a re-evaluation of power distribution, societal roles and responsibilities, legal rights? Presence: score of 2 | |
| | Absence: score of 0 | |

| **3. Degree of action: extent of action being taken to reduce gender inequality in ARV research processes** | **Total possible score: 3** |
| Statements of recognition | Does the paper acknowledge that a relationship exists between gender and ARV? Presence: score of 1 | |
| | Absence: score of 0 | |
| Groundwork | Are recommendations made that would reduce gender inequality in ARV work? Presence: score of 1 | |
| | Absence: score of 0 | |
| Action | Does the paper describe concrete actions that have been taken or are being taken to reduce gender inequality through ARV processes? Presence: score of 1 | |
| | Absence: score of 0 | |

Table 2. Review parameters.

| Inclusion | Exclusion |
|-----------|-----------|
| Published from Jan 1st 2006-February 18 2014 | Anything published prior to January 1st 2006 |
| Discusses adaptation, vulnerability and resilience in relation to humans or that are human driven | Discussions of adaptation, vulnerability or resilience that are not human driven |
| Discusses gender in some capacity (either focused on male and/or female and/or other genders) | Fails to discuss gender in any way |
| Focuses on contemporary climate change issues | Papers focused on prehistoric climate change |
| Focuses on adaptation, vulnerability or resilience (or a combination of the three) | Focuses exclusively on mitigation |

| Search Term Focus | Boolean Search Terms |
|-------------------|----------------------|
| Gender based search terms | Gender” OR women OR men OR feminine OR masculine |
| Climate Change search terms | ‘climat’ change” OR ‘global warming’ |
| Adaptation, vulnerability and resilience search terms | Adapt” OR cope OR coping OR plan” OR manage” OR interven” OR adjust OR modif” OR action” OR groundwork OR innovation” OR participatory OR plans OR planning |
| Resilience search terms | Resilien” |
| Vulnerability search terms | Vulnerabl” |
Table 3. Examples of the scoring system.

| Article title                                                                 | Low level of engagement                                                                 | Moderate level engagement                                                                 | High level engagement                                                                 |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Understanding the vulnerability, resilience and adaptive capacity of households in rural Victorian towns in the context of long-term water insecurity | Women’s rights in climate change: using video as a tool for empowerment in Nepal         | Farm income, gender differentials and climate risk in Cameroon: typology of male and female adaptation options across agroecologies. |
| Paper looks at how individuals and households in a rural Australian region are adapting to long-term water insecurity and aims to identify risk factors for vulnerability. Considers health and well-being impacts of climate change. Found clear gender differences in the way men and women identified, communicated and dealt with climate change. Paper stated that men had a tendency to prefer hard adaptations, while women preferred soft adaptations | Research project aimed to understand how the use of participatory video could help women secure rights in the face of the effects of climate change. Women in Nepalese communities were interviewed about changes they have experienced, how they are coping and what could be done to adapt and then chose which adaptation option they would make a video about. | This paper focused on analyzing and identifying the effect of climate risk on farm production and management options for both male and female farmers. |

Reasons behind engagement score
- Did not consider either strategic or practical needs.
- Showed evidence of gender responsiveness but no evidence of gender-sensitivity or gender-transformativeness.
- Only made statements of recognition.

- Only looked at practical gender needs.
- Showed evidence of all three areas of gender mainstreaming: gender-sensitivity, gender-responsiveness, and gender-transformativeness.
- Made groundwork statements.

examined both the practical needs of gender and strategic gender interests. To evaluate this, the gender(s) of focus in each article were examined to determine whether the research was aiming to address either the practical needs, strategic needs, or both of the gender(s) of focus. In instances where it was unclear as to what kind of gender experience the paper was focusing on, papers received a zero. The differential weighting reflects the fact that gender equality is a human right recognized by the UN and a well-established means to increasing health outcomes, poverty reduction, and increased education of women and children [32–34]. Studies that focus on the strategic needs and relative position of genders to each other, are consequently viewed as taking greater strides towards gender equality as they focus on the power structures that shape gender roles.

- **Degree of action**: studies that made statements of recognition were considered to have taken the smallest degree of action towards reconciling gender and ARV work and were scored as a 1. Articles that lay groundwork by making recommendations as to how to reconcile gender and ARV research, moved beyond statements of recognition and received a score of two, receiving one point for making a statement of recognition and a second point for building upon this with groundwork statements. Studies which detailed actual actions being taken to reconcile ARV work with concepts of gender were awarded a score of three as these studies exhibited statements of recognition, made recommendations, and detailed actions being taken. As with the experience of gender category, papers where the degree of action taken by the paper was unclear received a zero.

An engagement index was then calculated by summing scores for component indices using equal weighting, calculated on a nine point scale, building on similar evaluation methodologies developed in the climate change field [19, 34, 35]. Based on this nine point scale, articles were then categorized as having high, moderate, or low levels of engagement with gender. To be classified as having a high level of engagement, articles had to score between seven to nine points; moderate levels of engagement scored between four to six points; low levels of engagement were
categorized as those articles scoring between zero and three points (see table 3 for examples of how the index was operationalized). Results were entered into Excel for analysis. Descriptive statistics were used to examine trends in gender engagement across studies, and chi-squared tests were used to examine the significance of relationships between performance and article characteristics (e.g. geographic region, academic sector, article type), with significance set at 95%.

While the review is comprehensive and systematic, limitations of the study include a focus solely on peer-reviewed articles, and we acknowledge a substantial body of work in the 'grey literature' on gender and climate change. Articles were evaluated based on the information presented in each peer-reviewed article. As a result, each document was evaluated based just on what was described in the paper. We note that articles themselves may not fully substantiate the extent to which gender concepts are integrated into a particular research project; key components of engagement may not have been documented, or conversely, may be overstated. Notwithstanding these caveats, the use of peer reviewed articles as a basis for systematically examining the extent to which research engages in a particular subject is widely accepted [19, 36, 37], and develops a baseline and exploratory characterization of how gender is being incorporated into ARV research.

3. Results

3.1. Focus on gender in ARV studies has increased over time, accompanied by an increase in studies that engage with gender at a high level.

Of the 123 articles examined, 41% (n = 50) were classified as having a high level of engagement with gender, scoring a 7 or 8 out of a possible 9 points, with no studies receiving a maximum score. 28% (n = 34) had moderate engagement, and 31% (n = 38) a low level of engagement. The number of papers examining gender in ARV research increased over the observation period. The average level of engagement also increased from 3.5/9 in 2006 to 5.6/9 in 2013, although varying by year with a maximum level of 5.75/9 in 2010 (figure 1).

The literature reviewed provides insight into how gender is framed within ARV work. Of all the work reviewed, 48% (n = 59) had gender as the main focus of the article: the average engagement score for these articles was 6.83, indicating a high level of gender engagement. For those articles where gender was not the main focus, the average score was 3.44. In terms of genders being addressed, most examine the female experience. Only one article explicitly focused on men and no articles focused on those who identify elsewhere on the gender spectrum. Rather, papers either explicitly spoke about women (42% of all articles) or spoke about both men and women (57%).

3.2. Studies perform highest on gender mainstreaming and integrating the experience of gender

Performance of reviewed studies differs between attributes of the conceptual model of engagement, with studies scoring highest on gender mainstreaming and experience of gender (see supplemental data). In both cases, studies either fully engage with the attribute in question or not, with the least number of studies categorized as having moderate performance. With gender mainstreaming, for example, 44% (n = 54) of articles had a high level of engagement, compared to 33% (n = 41) with a low engagement; for the
experience of gender, the results were 36% \((n=44)\) and 52% \((n=64)\) respectively. With regards the extent of action being taken to reduce gender inequality (i.e. degree of action), the majority of reviewed articles were classified as groundwork (51%, \(n=63\)). Such studies make recommendations on how to reduce gender inequality in ARV work, and are indicative of the literature moving beyond simply recognizing that gender is important to consider. Only a small number of articles, however, were classified as ‘actions,’ describing concrete actions that have been taken or proposed to reduce gender inequality in the research process or through proposed/developed adaptation strategies [38, 39].

3.3. Adaptation focused research has higher levels of engagement than vulnerability work, with resilience studies having a limited gender focus

The reviewed articles were almost equally split between having an adaptation or a vulnerability focus (61%, \(n=75\) and 63%, \(n=77\) respectively), while only 6% \((n=8)\) had a resilience focus. Articles taking a resilience approach also had the lowest average engagement score at 4.5 compared to adaptation and vulnerability approaches that scored 5.69 and 4.87, respectively.

Articles with a primary emphasis on adaptation—including studies examining or proposing adaptations—were more likely \((p<0.05)\) to have a higher level of engagement than studies examining vulnerability, scoring higher on all three attributes of the conceptual model (see supplementary data). Fifty-seven percent \((n=43)\) of adaptation articles exhibited evidence of gender-transformativeness, while 46% of vulnerability \((n=35)\) focused studies did. Adaptation work also scored higher on gender-sensitivity and gender-responsiveness (see supplementary data).

In relation to the experience of gender, adaptation focused work was more likely \((p<0.005)\) than vulnerability studies to move beyond practical needs to discuss the strategic needs of a specific gender. Vulnerability focused articles trailed adaptation work largely because of the high proportion that did not look at either practical or strategic needs of the gender experience.

When examining the degree of action taken, both adaptation and vulnerability literature generally did not score the highest level of engagement, with 3% \((n=1)\) respectively classed as actions (see supplementary data). Adaptation focused papers however, were more likely to move beyond statements of recognition and provide recommendations than those taking a vulnerability approach, which is unsurprising given the more action-oriented nature of adaptation research.

3.4. Significant geographic disparities exist in gender engagement, with studies from Sub-Saharan Africa scoring the highest

Sub-Saharan Africa (SSA) is the region where most of the reviewed articles examining gender in the ARV research focus on \((n=49, 40\%)\). Studies from this region also have the highest performance, with an average engagement score of 5.2/9 (figure 2). There is strong evidence of gender-sensitivity, gender-responsiveness, and gender-transformativeness in research from SSA, with level of engagement increasing over the observation period.

In other regions, few ARV studies are integrating gender considerations, with no studies documented from North Africa, and one study in the Middle East [40] and among the Small Island Developing States [41]. In North, South and Central America combined, twelve studies were identified (4 from Canada, 5 from Mexico, 2 from the US, and 1 focused on Brazil and Chile), with work from this region calculated as having the lowest engagement (4.16/9). Europe had a similarly low number of articles \((n=8)\), with an average engagement score of 4.62.

Twenty percent \((n=24)\) of all articles focused on Asia, although this primarily reflects the high number of articles focusing on Bangladesh \((n=11)\). Vulnerability studies were most common in Asia, in which gender was rarely the main focus of an article, rather being considered as a factor that impacts vulnerability.

At a national level, Bangladesh \((n=11)\) and Australia \((n=11)\) have the most articles examining gender in an ARV context, although studies from these nations generally scored low on the engagement index. In Bangladesh, this reflects poor performance across studies on the experience of gender component of the assessment framework: over half the articles focused just on practical gender needs or failed to examine either component of gender experience. In Australia, the reviewed studies scored low across the all three components of the assessment framework, an exception being a study examining the destabilizing impact of climate change on the mental health of rural Australian men [40]. Not only did this article receive an overall engagement score of 8, but it was the only article in the entire dataset which examined exclusively male experiences. The majority of studies from Bangladesh \((8/11)\) and Australia \((8/11)\) focused on vulnerability.

3.5. Levels of engagement differ by sectoral focus

Gender was addressed in ARV studies taking place primarily in three sectors. Health was the focus of 23% \((n=28)\) of articles, with a strong emphasis on examining gender in the context of determinants and experience of vulnerability (particularly temperature related). Eight health articles had gender as a main focus of the paper [13, 42–48]. Health focused research as a whole scored low on the engagement index,
however, averaging 3.57 (the lowest documented), and was constrained by the limited examination of the specific needs of different genders in this work (i.e. experience of gender). Health studies largely made statements of recognition with just 32% ($n = 9$) providing gender groundwork.

A considerable amount of gender and ARV research was also documented in environmental management ($n = 25$). Gender was the main focus in this work in just over one third of these cases ($n = 9$), and was primarily examined as a determinant of vulnerability. Studies here received an average of 4.24 in the engagement index, with relatively high scores in the experience of gender and degree of action (see supplementary data). Articles focusing on hazards research comprised 13% ($n = 16$) of included papers, and primarily focused on vulnerability. Studies here performed low on engagement in general, scoring 3.69, with few going beyond recognizing a relationship between gender and ARV to consider higher levels of action needed to address gender inequality.

While health, environmental management, and hazards research were well represented in this review, other prominent sectors were notably absent. Research looking at gender and ARV within the context of agriculture yielded only six articles, while food security focused articles numbered four. Studies examining ARV and gender in relation to livelihoods returned only three results, which was the same for migration focused research within this body of literature.

### 3.6. Performance in regards to strategic needs and gender-transformativeness highlights the difficulty of overcoming societal norms.

Few papers focused exclusively on the strategic gender needs, with most papers focusing either on practical gender needs or both practical and strategic gender needs. While 36% of articles discussed either practical or strategic gender needs in relation to climate change, 25% of papers failed to discuss either. No clear trend over time could be distinguished to suggest that a general movement away from practical needs towards strategic gender needs is occurring.

Similarly, gender-transformativeness emerged as a strong indicator of engagement. If an article exhibited gender-transformativeness, it almost always had evidence of gender-sensitivity and gender-responsiveness as well. This indicates that research which is critically analyzing underlying social and organizational structures and advocating for changes to these structures as they relate to gender, is likely already aware of the varied life experiences mediated by gender, presenting disaggregating data, and using progress indicators to measure the different experiences of each gender. Yet,
overall levels of gender-transformativeness were low, reflecting larger societal norms.

4. Discussion

This paper systematically examines how climate change adaptation, resilience, and vulnerability (ARV) research is engaging with gender. While gender is being engaged with at a high level in some ARV studies in the peer reviewed literature, significant variations in the level of engagement occur depending on article type, geographic region, and sectoral focus. These geographical variations highlight potential areas for future research. Similarly the varying levels of engagement across sectors illustrates the ways in which the methodologies, conceptual frameworks, and research structures applied to particular sectors differentially engage with concepts of gender. Gaps also point to larger systemic struggles in relation to gender equity and power distribution. Across all articles, consideration of gender-transformativeness was limited, which is indicative of the difficulty in overcoming societal and institutionalized norms. Similarly, the negligible number of resilience focused studies integrating gender issues examined in this review, may be related to these systemic issues. Resilience literature has been critiqued as lacking a focus on power and marginalization, which are implicitly aligned with gender based research [30].

We find that while gender is an increasing focus in ARV studies, it remains marginal: we documented only 123 ARV studies published in the peer reviewed literature between 2006 and early 2014 as having a gender angle, a small fraction of a much larger body of scholarship on adaptation, resilience, and vulnerability [e.g. see 1]. Further, gender research is rooted in the female experience with one article explicitly focusing on men, no studies focusing on those outside the gender binary, and studies focusing on both genders still predominantly highlighting the experiences of women. This predominant focus on women in articles with a gender focus is a response to broader concerns about the privileging of the male voice in research in general, including climate change research. As such, many of the papers examined focus on women as the understudied gender. Notwithstanding, the dearth of studies explicitly focusing on men or those outside the gender binary is concerning.

In the literature focusing on women, two framings were generally discernible, with women either being described in a passive manner as a vulnerable sub-population or viewed as active participants in responding to climate change impacts. Studies that viewed women as a vulnerable sub-population primarily focused on health and natural hazards in a changing climate. The majority of these articles assigned women to a list of vulnerable members of society along with children and the elderly, yet rarely examined the causal processes making women more vulnerable, overlooked the agency of women in responding to climate impacts, and failed to examine the barriers that need to be overcome to reduce vulnerability. This failure to explicitly state or examine the root causes of vulnerability, coupled with a tendency to frame gender only in terms of sex-disaggregated data, contributed significantly to the lower levels of engagement across vulnerability and health focused articles. The reductionist tendency of climate change discourse has also been noted in the political ecology literature; Bee et al [49], for example, warns that the tokenistic inclusion of uncritical gender-sensitive language fails to challenge the underlying roots of gender inequality. Such work risks perpetuating vulnerability stereotypes that may not be accurate in all circumstances.

Alternatively, women were depicted as possessing specific knowledge and skills necessary for understanding the risks posed by climate change and for developing effective, equitable, and sustainable response options. This work described explicitly targeting women to help ensure their experiences are engaged in the research process and help define recommended adaptations. Yet, as Arora-Jonsson [29] warns, inviting women to participate in discussions that are ruled by hierarchical patriarchal systems may not result in highly inclusive outcomes. Women being brought into these contexts may struggle to express themselves due to the social confines and expectations of their gender. While some of the studies reviewed here sought to challenge existing power relations through ARV research (i.e. through their engagement with gender transformativeness), these were the exception, with most studies not exhibiting evidence of gender engagement at this level.

These two general framings of how women are depicted in ARV studies, generated through a systematic examination of the literature, are broadly consistent with other work commenting on the field. Yet there also key differences. While Arora-Jonsson [29] argues that women in the climate change literature as a whole are often described as ’environmental saviors’, the peer reviewed articles we reviewed exhibited a more nuanced understanding of the role women play and have the potential to play in relation to ARV. Similar, MacGregor’s [9] argument that women are frequently depicted as ‘the problem’ was not borne out here, with only two of the 123 articles taking this stance.

The treatment of gender in ARV studies is important given the role of research in generating understanding on the experience of climate change, identifying factors determining vulnerability and resilience, identifying and evaluating adaptation opportunities, ultimately framing the nature of the problem and response options. A failure to fully engage gender in this work may compromise vulnerability reduction
activities, and could result in maladaptation or adaptation which has uneven impacts across the gender spectrum [49]. Particularly given the action orientated nature of much work in the ARV field, and outreach and advocacy role researchers are increasingly playing, the impacts of such neglect stem well beyond academic understanding. Yet equally we need to caution that research agendas often exist independently of local policy mandates and processes, so that even research which is highly engaged with concepts of gender may have limited impact on the gender norms of everyday life or policy processes.

5. Conclusion

In this paper we systematically examine the extent to which gender is being engaged with in climate change adaptation, resilience, and vulnerability (ARV) research. We find that while gender is an increasing focus in this literature, it remains in its infancy. Although there is recognition of the links between gender and climate change, outside of Sub Saharan Africa, few of the studies we review have a high level of gender engagement. If gender is to be engaged with at a high level, studies need to move beyond just recognizing that climate change impacts are often gendered, to critically examine the underlying social-cultural-political processes that determine differential vulnerability along gender lines, and influence the effectiveness and gender implications of adaptation.

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References

[1] Wang B, Pan S-Y, Ke R-Y, Wang K and Wei Y-M 2014 An overview of climate change vulnerability: a bibliometric analysis based on web of science database Nat. Hazards 74 1649–66
[2] Ford J D and Pearce T 2010 What we know, do not know, and need to know about climate change vulnerability in the western Canadian Arctic: a systematic literature review Environ. Res. Lett. 5 014008
[3] Ford J D, Bolton K, Shirley J, Pearce T, Tremblay M and Westlake M 2012 Mapping human dimensions of climate change research in the Canadian Arctic Ambio. 41 808–22
[4] Bassett T J and Fogelman C 2013 Déjà vu or something new? The adaptation concept in the climate change literature Geoforum. 48 42–53
[5] Chapman S et al 2014 Publishing trends on climate change vulnerability in the conservation literature reveal a predominant focus on direct impacts and long time-scales. Diversity Distrib. 20 1221–8
[6] Preston B L, Mustelin J and Maloney M C 2013 Climate adaptation heuristics and the science/policy divide. Mitig Adapt Strateg. Glob. Change 20 467–97
[7] Lambrou Y and Piana G 2006 Gender: The Missing Component of the Response to Climate Change (http://eldis.org/vfile/upload/1/document/0708/DOC20105.pdf)
[8] Patt A G, Daze A and Suarez P 2009 Gender and climate change vulnerability: what’s the problem, what’s the solution? Distributional Impacts of Climate Change and Disasters: Concepts and Cases (Cheltenham: Edward Elgar)
[9] MacGregor S 2010 Gender and climate change: from impacts to discourses J. Indian Ocean Region 6 223–38
[10] Alston M 2014 Gender mainstreaming and climate change Women’s Studies International Forum B 47 287–94
[11] Edvardsson Björnberg K and Hansson S O 2013 Gendering local climate adaptation Local Environment. 18 217–32
[12] Faezy J, Pettorrelli N, Kenter J, Wagatoda D and Schuett D 2011 Maladaptive trajectories of change in Makira, Solomon Islands. Glob. Environ. Change. 21 1275–89
[13] Preet R, Nilsson M, Schumann B and Evengard B 2010 The gender perspective in climate change and global health Glob. Health Action 3 5720
[14] Ford J D, Keskitalo E C H, Smith T, Berrang-Ford L, Duerrden F and Smit B 2010 Case study and analogue methodologies in climate change vulnerability research WIREs: Clim. Change 1 374–92
[15] Schröter D, Polsky C and Patt A G 2005 Assessing vulnerabilities to the effects of global change: an eight step approach Mitigation and Adaptation Strategies for Global Change 10 573–95
[16] Sarewitz D and Pielke R 2007 The neglected heart of science policy: reconciling supply of and demand for science Environ. Sci. Policy 10 5–16
[17] Dilling L and Lemos M C 2011 Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy Glob. Environ. Change 21 680–9
[18] Sarewitz D 2011 Does climate change knowledge really matter? WIREs: Clim. Change 2 475–81
[19] Ford J D, Knight M and Pearce T 2013 Assessing the ‘usability’ of climate change research for decision-making: a case study of the Canadian international polar year Glob. Environ. Change 23 1317–26
[20] Lemos M C, Kirchoff C J and Ramprasad V 2012 Narrowing the climate information usability gap Nat. Clim. Change 2 789–94
[21] Department for International Development 2008 The Gender Manual, A Practical Guide (http://webarchive.nationalarchives.gov.uk/+/http://dfid.gov.uk/0/Documents/publications/dfid-gender-manual-2008.pdf)
[22] Derbyshire H 2002 Gender Manual: A Practical Guide for Development Policy Makers and Practitioners Department of International Development (http://bvsde.paho.org/bvsacd/cd27/gendermanual.pdf)
[23] March C, Smith I and Mukhopadhyay M 1999 A Guide to Gender Analysis Frameworks Oxfam (http://ndi.org/files/Guide%20to%20Gender%20Analysis%20Frameworks.pdf)
[24] Haddad Z and Villalobos Prats E 2012 Mainstreaming Gender in Health Adaptation to Climate Change Programmes World Health Organization (http://who.int/globalchange/publications/Mainstreaming_Gender_Climate.pdf)
[25] Walby S 2005 Gender mainstreaming: productive tensions in theory and practice Soc Pol. 12 321–43
[26] WHO 2015 MDG 3: promote gender equality and empower women (http://who.int/topics/millennium_development_goals/gender/en/)
[27] Vincent K et al 2010 Gender, Climate Change and Community-Based Adaptation (New York: United Nations Development Programme) (http://undp.org/content/undp/en/home/librarypage/environment-energy/climate_change/gender/community-change-and-community-based-adaptation-guidebook-.html)
[28] Moser CON 1989 Gender planning in the third world: meeting practical and strategic gender needs World Development 17 1799–825
[29] Arora-Jonsson S 2011 Virtue and vulnerability: discourses on women, gender and climate change Glob. Environ. Change. 21 744–51
[30] Lesnikowski A C, Ford J D, Barrera M and Heymann S J 2011 Adapting to health impacts of climate change: a study of UNFCCC Annex I parties Environ. Res. Lett. 6 044009
[31] Berrang-Ford L, Pearce T and Ford J D Systematic review approaches for climate change adaptation research Reg. Environ. Change in press (doi:10.1007/s10113-014-0708-7)
[32] The United Nations 1948 Universal Declaration of Human Rights
[33] The Universal Declaration of Human Rights 2015 http://un.org/en/documents/udhr/
[34] Preston B L, Westaway R M and Yuen E J 2010 Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations Mitig. Adapt. Strateg. Glob. Change 16 407–38
[35] Sherman M H and Ford J 2014 Stakeholder engagement in adaptation interventions: an evaluation of projects in developing nations Climate Policy. 14 417–41
[36] Ahmed S and Fajber E 2009 Engendering adaptation to climate variability in Gujarat, India Gender & Development 17 33–50
[37] Smyth I 2009 Gender in climate change and disaster risk reduction, Manila, october 2008 Develop. Practice 19 799–802
[38] Spring U O 2006 Hydro-diplomacy: Opportunities for Learning from an Intergovernmental Process p 165 (http://scopus.com/inward/record.url?eid=2-s2.0-34249003732&partnerID=40&md5=e831335c0b7a83d-d86761646e6ba97cc)
[39] Lane R and McNaught R 2009 Building gendered approaches to adaptation in the Pacific Gender & Development 17 67–80
[40] Alston M 2011 Gender and climate change in Australia J. Socil. 47 53–70
[41] Carter A 2011 Climate of collaboration Planet Earth (http://planetearth.nerc.ac.uk/features/story.aspx?id=937)
[42] Dominelli L 2013 Mind the gap: built infrastructures, sustainable caring relations, and resilient communities in extreme weather events Australian Social Work 66 204–17
[43] McDowell G, Stephenson E and Ford J D 2014 Adaptation to climate change in glaciated mountain regions Clim. Change 126 77–91
[44] Porter J J, Dessai S and Tompkins E L 2014 What do we know about UK household adaptation to climate change? A systematic review Clim Change 127 371–9
[45] Jerneck A and Olsson L 2013 A smoke-free kitchen: initiating community based co-production for cleaner cooking and cuts in carbon emissions J. Cleaner Prod. 60 208–15
[46] Natalia K 2011 Climate change effects on human health in a gender perspective: some trends in Arctic research Global Health Action (http://ncbi.nlm.nih.gov/pmc/articles/PMC3179263/)
[47] Rich J L, Wright S L and Loxton D 2012 'Patience, hormone replacement therapy and rain': women, ageing and drought in Australia: narratives from the mid-age cohort of the Australian longitudinal study on women’s health Aust. J. Rural Health 20 324–8
[48] Van Zutphen A R, Hsu W-H and Lin S 2014 Extreme winter temperature and birth defects: a population-based case-control study Environ Res. 128 1–8
[49] Bee B, Maureen B and Petra T 2012 Gender, development, and rights-based approaches: lessons for climate change adaptation and adaptive social protection Research, Action and Policy: Addressing the Gendered Impacts of Climate Change (Dordrecht: Springer) pp 95–108
[50] Whyte K P 2014 Indigenous women, climate change impacts, and collective action Hypatia. 29 599–616