# ADAPTATION STRATEGIES AMONG WOMEN IN THE FACE OF CLIMATE CHANGE

*Nor Aliya Ayub, Fathiah Jabir, Shahrul Azhar Md Hanif, Siti Najiha Md Asari, Idayu Badilla Idris & Rozita Hod**

*Department of Public Health Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Wilayah Persekutuan Kuala Lumpur, Malaysia*

*Corresponding author: rozita.hod@hctm.ukm.edu.my*

**ABSTRACT**

**Introduction:** Globally, climate change brings significant threats to health, especially towards women. This is due to women's unique biological characteristics and their diverse social role within the community. This scoping review examines women's adaptation strategies across individual, community, and organizational levels.

**Method:** This scoping review employed the Population, Exposure and Outcome (PEO) framework to review literature from Scopus, PubMed, and Web of Science databases, focusing on studies published from 2014 to 2024. A total of 19 out of 1079 articles were included. The included studies used qualitative, quantitative, and mixed-methods study design.

**Results:** At the individual level, women employed socioeconomic adaptations, primarily in agriculture and finance, using crop diversification, savings groups, and micro-credit to enhance resilience. Traditional knowledge also supported health adaptations. Integration of traditional knowledge, including medicinal plant use and indigenous weather prediction, fosters intergenerational knowledge exchange as well as resilience. Community-level strategies focused on social networks for resource sharing, disaster preparedness, and collective health initiatives. Organizational strategies emphasized economic empowerment through financial aid, training, and climate-smart agriculture, with women's leadership and advocacy promoting gender-inclusive climate responses.

**Conclusion:** Women's adaptation strategies are diverse, integrating economic, social, and traditional methods to mitigate climate impacts. This review highlights the need for gender-sensitive policies that address women's unique adaptation needs. Acknowledging the methodological limitations, including the focus on low and middle-income countries (LMICs) and the lack of long-term analysis.

**Keywords:** women, adaptation, climate change, resilience

## INTRODUCTION

Climate change refers to the long-term variation of the mean weather patterns globally, which includes variations in temperature, precipitation, and other climatic factors. Global warming, or the rise in Earth's average surface temperature, is one of the main causes of contemporary climate change, largely contributed by anthropogenic activities including deforestation, use of fossil fuels, excessive agricultural activities, burning of agricultural leftovers, and transportation (Afriyie et al., 2018; Akinbami, 2021; Valavanidis, 2022; Watts et al., 2015). Due to climate change, extreme weather and climate hazard have become more severe and frequent, which cause significant consequences to human rights, including health, livelihoods, inequality, diminishing food and water security, political and economic instability (Watts et al., 2015). These impacts disproportionately affect vulnerable populations, including the impoverished, youth, and future generations.

Climate change and disasters affect men and women differently. Women and girls often face greater risks, burdens, and repercussions (Kibria, 2016). For example, effects on women sexual and reproductive health, mental health due to relocation and displacement caused by climate-related disasters may make it difficult for people to access family planning and other reproductive health services and economic security (Ashraf et al., 2024; Rylander et al., 2013). Although the psychological effects of climate change are sometimes disregarded, they can have detrimental effects on women's mental health, including anxiety, depression, and other mental health issues (Cianconi et al., 2020). Crises exacerbate existing gender disparities and intersecting forms of discrimination against marginalized groups of women (Rao et al., 2019).

This review focuses on low- and middle-income countries (LMICs) because these regions often experience higher vulnerability to climate change impacts due to limited resources, weaker health systems, and inadequate infrastructure. Additionally, systemic barriers such as patriarchal norms, restricted access to education and financial resources, limit decision-making power among women in LMICs, impeding their ability to adapt effectively. These barriers highlight the urgency of examining adaptation strategies in these contexts to inform gender-sensitive and equitable responses to climate change.

Human adaptation strategies refer to the process of adjusting to or coping with changes in the environment or working conditions to reduce vulnerability and enhance resilience. Adaptation includes behavioural changes, technological interventions, social support, and other coping mechanisms aimed at safeguarding health and wellbeing (Spencer et al., 2022). Human adaptability focuses on the flexibility with which humans, both as individuals and as populations, cope with environmental challenges through both biological and behavioural/cultural means (Moran, 2022). Thus, this review aims to explore adaptations made to mitigate climate change impacts from the perspective of women's health.

## METHODS

This scoping review consists of five steps: scoping, searching, screening, data extraction, and data analysis. This scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The research question was developed using the PEO framework (P: Population; E: Exposure and O: Outcome), focusing on the adaptations made by women aged 18 years above to mitigate the impacts of climate change on their health.

A comprehensive literature search was conducted across Scopus, PubMed, and Web of Science databases from 25th March to 8th May 2024, using the keywords outlined in Table 1. After screening 1,079 downloaded articles for eligibility based on the criteria in Table 2, the final set of studies were selected (see Figure 1). Two independent reviewers extracted key data from the included studies using a standardized Excel matrix. This captured details such as author, publication year, country, population, research design, article type, and adaptation strategies at the individual, community, and organizational levels.

**Table 1: Keywords Search Used in The Screening Process**

| Database | Search strings |
|---|---|
| Pubmed | ((((health OR wellbeing OR wellness OR "quality of life")) AND (("climate change" OR "global warming" OR "greenhouse effect*" OR "sea level rise" OR "climat* variability" OR "extreme weather" OR "climate crisis" OR "climate disaster"))) AND ((adaptation* OR adjustment OR strateg*))) AND ((women OR woman OR lady OR ladies OR maternal)) |
| Scopus | TITLE-ABS-KEY ((health OR wellbeing OR wellness OR "quality of life") AND ("climate change" OR "global warming" OR "greenhouse effect*" OR "sea level rise" OR "climat* variability" OR "extreme weather" OR "climate crisis" OR "climate disaster") AND (adaptation* OR adjustment OR strateg*) AND (women OR woman OR lady OR ladies OR maternal)) |
| Web of Science (WOS) | TS=((health OR wellbeing OR wellness OR quality of life) AND (climate change OR global warming OR greenhouse effect* OR sea level rise OR climat* variability OR extreme weather OR climate crisis OR climate disaster) AND (adaptation* OR adjustment OR strateg*) AND (wom?n OR lady OR ladies OR maternal)) |

The extracted data underwent thematic analysis, organizing the adaptations according to the socio-ecological framework of individual, community, and organizational levels. This approach enabled the identification of common themes, similarities, and differences across the literature. The frequency of articles was determined based on priority and research design, focusing on the attributes associated with identifying women's adaptation towards climate change.

**Table 2: Eligibility criteria for inclusion of studies in the framework synthesis**

| No. | Criteria | Inclusion | Exclusion |
|---|---|---|---|
| 1 | Research types | -Original article: Qualitative or Quantitative<br>-Organisation report | Meta-analysis, systematic literature review |
| 2 | Article types | Original research published in a peer-reviewed academic journal | Opinion, perspective paper, reviews, bulletin |
| 3 | Study setting | Women aged 18 years old and above | |
| 4 | Context | Adaptation strategies towards climate change | |
| 5 | Study period | From year 2014 onwards (Past 10 years) | |

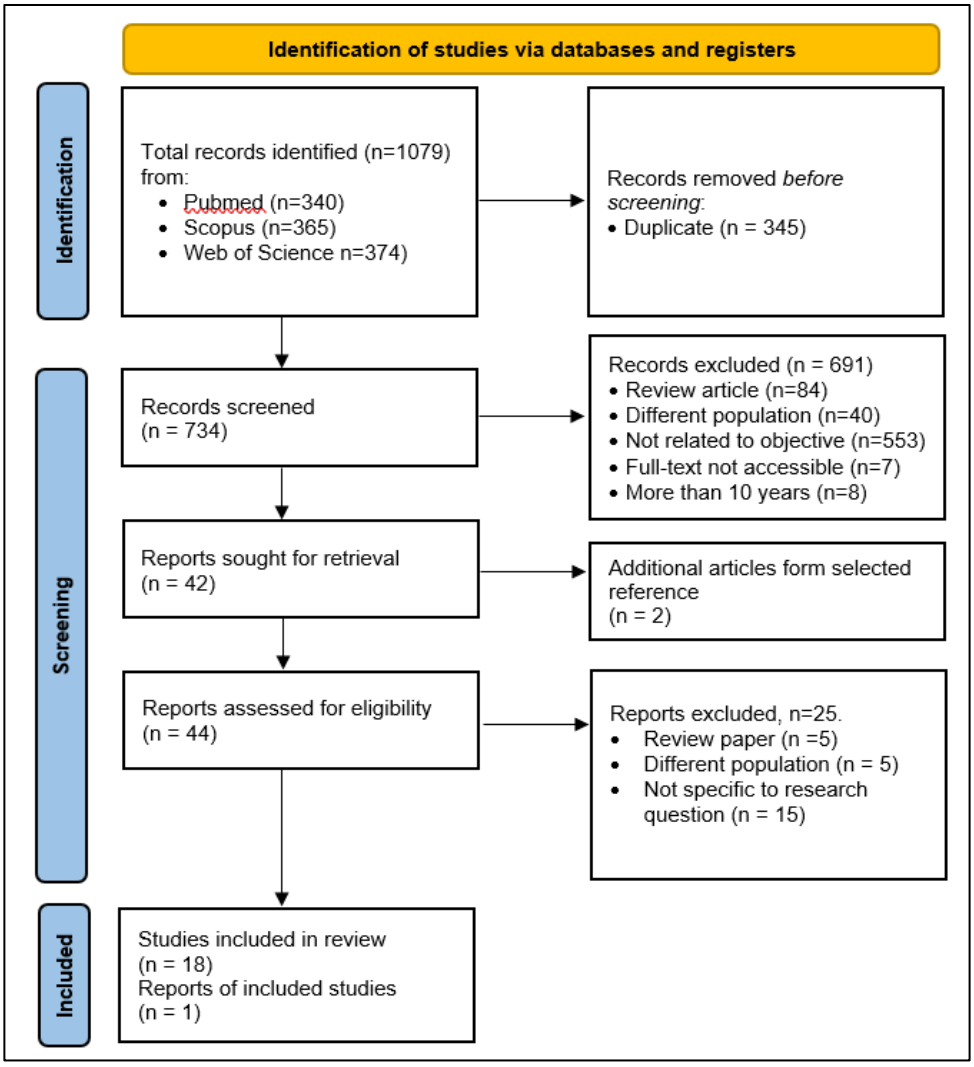


**Figure1: PRISMA Flow for article search, screening for duplication and eligibility.**

## RESULTS

This review included 19 articles, 18 of which were original research studies and one organizational report, spanning 2016–2024 (as shown in Table 3). Most of the studies utilized qualitative design (n=9), four adopted mixed methods study design (Cáceres-Arteaga et al., 2020; Pratiwi et al., 2017; Ramirez, 2016; Rao et al., 2020), quantitative modelling (Brooks et al., 2023), SWOT analysis (Shanthi et al., 2017), quasi experiment study design (Webb, 2020) and case study approaches (Moulton & Carey, 2023; Vasseur et al., 2018). Ten articles focused specifically on women (Akinbami, 2021; Brooks et al., 2023; Clissold et al., 2020; Md et al., 2022; Michael, 2024; Moulton & Carey, 2023; Nyahunda et al., 2021; Shanthi et al., 2017; Spencer et al., 2022; Tanjeela, 2023), while the remaining articles targeted general adult population. Studies included populations across diverse income levels from lower middle income (LMI) countries, upper middle income (UMI), low-income countries (LI), and high-income (HI) countries. Table 4 summarises findings on women's adaptation towards climate change. Women's adaptation was described at three levels: individual, community and organisation.

### Individual Adaptation

Individual adaptations, discussed in 17 articles, largely revolved around socioeconomic strategies, with a focus on financial management (n=9), agriculture (n=8), and social networks (n=6). There were 17 articles that described the adaptation of women towards climate change at the individual level. Women in agriculture implemented crop rotation and diversified crops to ensure constant production (Afriyie et al., 2018; Clissold et al., 2020; Nyahunda et al., 2021), growing drought-resistant crops and shorter life span crops (Afriyie et al., 2018; Akinbami, 2021; Moulton & Carey, 2023), livestock relocation to higher ground to avoid flooding (Afriyie et al., 2018) and even stop rearing cattle due to the uncertain weather patterns to cope with climate variability (Moulton & Carey, 2023).

Financial adaptations include reliance on loans from non-governmental organisations (NGOs), governmental, or private financial institutions (Md et al., 2022; Tanjeela, 2023), diversifying income sources through small trades, including the trading of minor household necessities (Afriyie et al., 2018; Clissold et al., 2020; Nyahunda et al., 2021; Pratiwi et al., 2017; Rao et al., 2020) and engaging in non-agricultural pursuits (Akinbami, 2021). Migration was also commonly found as adaptation strategy, in pursuit of better employment opportunities or the desire to reside in locations less susceptible to extreme weather events (Afriyie et al., 2018; Michael, 2024; Rao et al., 2020). Social capital supports women by facilitating shared resources (exchange food, sharing crops or even money), early warning information, and resilience-building within communities (Afriyie et al., 2018; Clissold et al., 2020; Moulton & Carey, 2023; Nyahunda et al., 2021; Rao et al., 2020; Vasseur et al., 2018).

Health-related adaptations, mentioned in six studies, particularly addressed climate change's impacts on women's well-being. Women joined national health schemes and utilize traditional health practices to address climate-induced health risks (Afriyie et al., 2018; Md et al., 2022). For example, access to maternal health services was improved

through community health programs supported by NGOs and health partnerships (Rao et al., 2020). Reproductive health adaptations included seeking mobile health services and community-based family planning programs during disaster displacement, ensuring continued access to contraception and maternal care despite challenges posed by extreme weather (Ashrafuzzaman et al., 2023). Other adaptations taken by working women exposed to extreme heat include taking additional rest time, reducing workload and wearing lighter clothes (Spencer et al., 2022). In mental health, women engaged in religious faith and community prayer groups to cope with the anxiety and uncertainty caused by climate variability (Moulton & Carey, 2023). Counselling services and peer-support groups were reported as valuable in building psychological resilience, although these services were often limited in availability.

Disaster preparedness strategies found in five articles encompassed preventive practices such as resource stockpiling and adopting household safety measures. Married women have carried out early harvesting of their crops despite being discouraged by their husband (Webb, 2020). They were also aware of signs of extreme weather (Md et al., 2022), installed their house with water tank or storage systems for drought preparation, and in certain areas where the salinity of the water was too high, these tanks were also used to harvest rainwater (Ashrafuzzaman et al., 2023; Tanjeela, 2023).

Additionally, traditional knowledge and leadership roles are essential individual strategies. The utilisation of traditional knowledge about traditional plant treatments for minor ailments, predicts droughts or insufficient rainfall, enabling them to take necessary precautions in advance to mitigate potential climate disasters (Afriyie et al., 2018; Nyahunda et al., 2021; Ramirez, 2016)(Afriyie et al., 2018; Ramirez, 2016). They also started taking active roles in climate-related advocacy within households and communities (Pratiwi et al., 2017; Rao et al., 2020). For example, they led organisations and programs aimed at raising funds while simultaneously lobbying for the needs and rights of the government (Clissold et al., 2020; Ramirez, 2016; Webb, 2020).

**Table** Error! No text of specified style in document.**: Characteristics of original articles included (n=19).**

| No. | Author | Year | Country | Study design | Study population | Income status* |
|---|---|---|---|---|---|---|
| 1 | Ramirez (2016) | 2016 | Peru | Mixed method | Social actors in the human settlement Nuevo Punchana Peruvian Amazon | UMI |
| 2 | Pratiwi et al. (2017) | 2017 | Cirebon, Indonesia | Mixed method | Men and women in the productive age range of 20 to 64 years old | UMI |
| 3 | Shanti et al. (2017) | 2017 | India | SWOT analysis | Coastal woman in Tamil Nadu India | LMI |
| 4 | Internal Human Rights Law Review (2018)** | 2018 | International/State parties | Report | Convention on the Elimination of All Forms of Discrimination against Women | Not Applicable |
| 5 | Afriyie et al. (2018) | 2018 | Ghana | Qualitative method | Households who have been directly affected by at least one of the flood events | LMI |
| 6 | Vasseur et al. (2018) | 2018 | Canada | Case study | Residents from 10 small rural coastal communities in Atlantic Canada, specifically in the provinces of Quebec, New Brunswick, and Prince Edward Island | HI |
| 7 | Rao et al. (2019) | 2019 | Ghana, Ethiopia, mali, Kenya, Namibia, India | Mixed method | Population in semi-arid Africa and India | LMI |
| 8 | Caceres-Arteaga & Lane (2020) | 2020 | Ecuador | Mixed method | Stakeholders from Pedro Moncayo | UMI |
| 9 | Clissold et al. (2020) | 2020 | Vanuatu | Qualitative method | Women marketplace vendor | LMI |
| 10 | Akinbami (2021) | 2021 | Nigeria | Qualitative method | Rural Women in Nigeria | LMI |
| 11 | Md et al. (2022) | 2022 | Bangladesh | Qualitative method | Women in 12 unions in Shyamnagar upazila in the Satkhira district in the Southwestern Coastal Region of Bangladesh | LMI |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | Spencer et al. (2022) | 2022 | West Kiang, The Gambia | Qualitative method | Women who were engaged in subsistence farming, pregnant or had delivery within the past months | LMI |
| 13 | Tanjeela (2022) | 2022 | Bangladesh | Qualitative method | Women directly involved in adaptation programs, community members participating in focus group discussions, and key informants such as policymakers, government officials, gender and environment activists, practitioners, and academics | LMI |
| 14 | Webb (2022) | 2022 | Aniwa, Erromango, and Tanna | Quasi-experiment | Communities in the Tafea Province of Vanuatu, specifically on the islands of Aniwa, Erromango, and Tanna. | LMI |
| 15 | Nyahunda et al. (2022) | 2022 | Vhembe, South Africa | Qualitative method | Rural women practised subsistence farming and resided in the same village for a minimum period of 10 years. | UMI |
| 16 | Md et al. (2023) | 2023 | Bangladesh | Qualitative method | Individuals living in three specific unions within the Shyamnagar Upazila | LMI |
| 17 | Brooks et al. (2023) | 2023 | Burkina Faso, Kenya, and Uganda | Quantitative modelling | Married women at reproductive age and able to conceive in rainfed agricultural communities in Sub-Saharan Africa | LI |
| 18 | Moulton & Carey (2023) | 2023 | Peru | Case study | Quechua woman in Andes | UMI |
| 19 | Michael (2024) | 2024 | Nigeria | Qualitative method | Female in riverine area of Bayelsa State | LMI |

*HI: High income, UMI: Upper -middle income, LMI: Lower-middle income, LI: Lower-income. ** Organisational report

**Community Adaptation**

Community adaptations were found in 14 articles, which emphasized the importance of social networks (n=12) and financial strategies (n=2) in supporting climate resilience. Social networks provide foundation for resource and information sharing, mutual support through advice, and shared understanding on resilience (Afriyie et al., 2018; Clissold et al., 2020; Moulton & Carey, 2023; Spencer et al., 2022; Vasseur et al., 2018).

Financial mechanism adaptation including group savings, and micro-credit schemes tailored the needs of vulnerable women (Afriyie et al., 2018; Rao et al., 2019; Shanthi et al., 2017). Woman community also organised social events to raise funds for those affected by floods (Pratiwi et al., 2017; Ramirez, 2016). Coastal Women's Self-Help Groups adopted brackish water aquaculture technologies to enhance their income diversification and strengthen their resilience in disaster risk reduction communities by taking proactive measures such as harvesting and preparing food before disasters, ensuring a two-week food supply and protecting water resources (Shanthi et al., 2017). In response to water shortages, community members employ strategies such as larger ponds with sand filters and increased rainwater harvesting options (Ashrafuzzaman et al., 2023). These adaptations ensured food and water security, and livelihoods, and demonstrate the resilience and ingenuity of women in addressing environmental challenges (Webb, 2020).

Traditional knowledge systems further aid community adaptation, as women used medicinal plants and indigenous knowledge to inform climate-related decisions, fostering intergenerational knowledge exchange. Women utilised and share their extensive knowledge of medicinal plants such as sacha garlic, toe, chuchuhuasi, and mallow through community networks (Ramirez, 2016). In rural areas, women use indigenous knowledge systems for weather-related decision-making, essential for climate adaptation (Nyahunda et al., 2021). Additionally, women-led advocacy was integral, with examples of groups actively lobbying for inclusion in formal response and recovery activities post-climate disaster (Clissold et al., 2020).

**Organisational Adaptation**

Six articles addressed organisational adaptation, focusing on socioeconomic empowerment and institutional support. Financial adaptations at this level, documented in two articles, include governmental and non-governmental assistance through micro-loans and credit (Akinbami, 2021; Md et al., 2022). Promoting entrepreneurship and green entrepreneurship for the economic empowerment of rural women were among the method in diversifying business operations (Akinbami, 2021). This protection included credit, facility availability, employment prospects, education, and training (Cáceres-Arteaga et al., 2020; Md et al., 2022).

In health and disaster preparedness, organizations play a key role by promoting national health insurance and disaster-resilient infrastructure (Cáceres-Arteaga et al., 2020; Pratiwi et al., 2017). The National Health Insurance Scheme's provision of health care services will lessen concerns following climate change, particularly in cases where illness and injury outbreaks develop (Afriyie et al., 2018). In addition, the involvement of social organisations in education and awareness of environmental issues and disaster preparedness is also important as part of the sustainable and resilient strategy against climate change (Pratiwi et al., 2017). Law and policy adaptations emphasized gender-sensitive initiatives that support equitable adaptation, underscoring the need for women's active participation and access to resources ("General Recommendation No. 37 (2018) on the Gender-Related Dimensions of Disaster Risk Reduction in the Context of Climate Change," 2018).

**Table 4: Summary of the articles included in the scoping review**

| Adaptation | 1) | 2) | 3) | 4) | 5) | 6) | 7) | 8) | 9) | 10) | 11) | 12) | 13) | 14) | 15) | 16) | 17) | 18) | 19) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Individual** | | | | | | | | | | | | | | | | | | | | |
| Socioeconomic | | | | | | | | | | | | | | | | | | | | |
| ▪ Agriculture | | | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | | 18 |
| ▪ Financial | | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | | | 9 |
| ▪ Housing | | | | | ✓ | | ✓ | | | | | | | | | | | | ✓ | 3 |
| ▪ Social network/capital | | | | | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | | | | | ✓ | | 6 |
| Health | | | | | ✓ | | | | | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | 6 |
| Disaster preparedness | | | | | | | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | 5 |
| Traditional knowledge | ✓ | | | ✓ | ✓ | | | | | | | | | | | | | | | 3 |
| Leadership | ✓ | ✓ | | | | | ✓ | | ✓ | | | | | ✓ | | | | | | 5 |
| **Community** | | | | | | | | | | | | | | | | | | | | |
| Socioeconomic | | | | | | | | | | | | | | | | | | | | |
| ▪ Agriculture | | | ✓ | | | | | | | | | | | | | | | | | 1 |
| ▪ Financial | | | ✓ | | ✓ | | | | | | | | | | | | | | | 2 |
| ▪ Housing | | | | | | | | | | | | | | | | | | | | 0 |
| ▪ Social network/capital | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | 12 |
| Health | ✓ | | | | | | | | | | | | | | | | | | | 1 |
| Disaster preparedness | | | | | | | | | | | | | | ✓ | | | | | | 1 |
| Leadership | | | | ✓ | | | | | ✓ | | ✓ | | | | | | | | | 3 |
| **Organisation** | | | | | | | | | | | | | | | | | | | | |
| Socioeconomic | | | | | | | | | | | | | | | | | | | | |
| ▪ Agriculture | | | | | | | | ✓ | | | | | | | | | | | | 1 |
| ▪ Financial | | | | | | | | | ✓ | | | | | | | ✓ | | | | 2 |
| Health | | | | | ✓ | | | | | | | | | | | | | | | 1 |
| Disaster preparedness | | ✓ | | | | | | | | | | | | | | | | | | 1 |
| Law & Policy | | | | ✓ | | | | | | | | | | | | | | | | 1 |

9) Ramirez (2016)
10) Pratiwi et al. (2017)
11) Shanti et al. (2017)
12) Internal Human Rights Law Review (2018)
13) Afriyie et al. (2018)
14) Vasseur et al. (2018)
15) Rao et al. (2019)
16) Caceres-Arteaga & Lane (2020)
17) Clissold et al. (2020)
18) Akinbami (2021)
19) Md et al. (2022)
1) Spencer et al. (2022)
2) Tanjeela (2022)
3) Webb (2022)
4) Nyahunda et al. (2022)
5) Md et al. (2023)
6) Brooks et al. (2023)
7) Moulton & Carey (2023)
8) Michael (2024)

## DISCUSSION

This scoping review investigates climate change adaptation strategies focusing on women's responses across different socioeconomic contexts. The findings align with the Socio-Ecological Model (SEM), illustrating how women's adaptation strategies to climate change occur at multiple, interconnected levels (Yin et al., 2024). This model emphasizes the dynamic interplay between individuals and their environments, recognizing that adaptation is influenced by broader structural and institutional factors.

Women's personal resources, knowledge, and attitudes shape their capacity to respond to climate challenges. The relationship level highlights the role of family and social networks in facilitating adaptation by providing emotional and financial support. At the community level, organizations and local networks promote collective adaptation efforts, while the societal level considers the influence of policies, laws, and cultural norms that either enable or restrict women's adaptive capacity. By applying SEM model, this review highlights not only women's strategies in climate adaptation but also the systemic barriers that shape their responses.

At the individual level, socioeconomic approaches, particularly in agriculture and finance. Agriculture, one of the most climate-sensitive sectors, is vital to women's livelihoods yet is disproportionately affected by temperature and rainfall variability, reducing crop yields and, consequently, economic stability (Malhi et al., 2021). Despite facing resource disparities, women farmers adopt adaptive practices, such as traditional irrigation and mixed cropping, showcasing their resilience and capability (Afriyie et al., 2018; Ramirez, 2016). Financial adaptations, including savings groups, micro-credit schemes, and income diversification, emerged as crucial strategies for economic resilience and facilitating post-disaster recovery (Afriyie et al., 2018; Béné et al., 2014; Fletschner & Kenney, 2014; Rao et al., 2019; Shanthi et al., 2017).

Adaptations addressing health impacts were limited in scope, with most studies addressing general gender differences in climate vulnerability rather than specific strategies for women (Desai & Zhang, 2021; McCall et al., 2019; World Health Organization, 2014). However, traditional knowledge emerged as a unique and valuable tool, enabling women to leverage indigenous knowledge for medicinal and agricultural resilience, reflecting their expertise in local ecologies. This knowledge was shared across generations through community networks. This intergenerational wisdom contributed significantly to effective climate change management (Berkes et al., 2000; Nyahunda & Tirivangasi, 2022; Nyong et al., 2007; Ramirez, 2016; Voeks, 2007). Furthermore, women's social capital facilitated knowledge exchange and mutual support, fostering community resilience (MacGregor, 2010; Paavola, 2008).

At the community level, collective strategies enhanced women's resilience through resource mobilization, knowledge sharing, and alleviating financial pressures from climate events. Initiatives like sand-filtered ponds and rainwater harvesting showcase women's leadership in securing clean water and improving public health (Ashrafuzzaman et al., 2023). Their involvement in community health programs further bolsters resilience against climate-related health risks (Kovats & Hajat, 2008; Watts et al., 2015). Similarly, adaptive agricultural practices, such as brackish water aquaculture in Women's Self-Help Groups (WSHGs), highlighted women's innovation in addressing climate challenges (Lipper et al., 2014; Shanthi et al., 2017; Webb, 2020) which were crucial for food security.

At the organizational level, economic empowerment initiatives such as entrepreneurship and green entrepreneurship diversify women's livelihoods and reduce dependence on climate-sensitive sectors(Akinbami, 2021; Md et al., 2022). Additionally, socioeconomic mechanisms, including grants and training, support climate-resilient agriculture, thereby enabling women participation in community decision-making (Moral et al., 2023). These program also bolster climate-resilient infrastructure, enhancing healthcare, water, and sanitation systems to reduce disaster impacts (Liu, 2023).

At the societal level, systemic barriers arising from legal, economic, sociocultural, and political inequalities hinder women's full participation in climate resilience. Legal and institutional barriers such as lack of land rights, restrict women's access to productive resources, limiting their ability to invest in sustainable agriculture (Nahar & Tajuddin, 2022). Sociocultural norms further restrict women's mobility and decision-making power within households and communities, reducing their ability to fully engage in climate adaptation activities (Hossen et al., 2021; Nahar & Tajuddin, 2022).

Furthermore, political inequalities exacerbate these challenges by limiting women's representation in governance structures, resulting in gender-blind climate policies that fail to address their specific vulnerabilities and adaptation needs (Afriyie et al., 2018). Therefore, empowering women politically can lead to more inclusive climate strategies that consider gender-specific impacts and promote sustainable development (Mavisakalyan & Tarverdi, 2019). Capacity-building initiatives led by social organizations enhance adaptive capacity and promote disaster preparedness (Cáceres-Arteaga et al., 2020; Pratiwi et al., 2017), while women in leadership roles can advocate for their inclusion in climate adaptation policies (Clissold et al., 2020). However, limited access to agricultural technology further restricts women's economic advancement, reinforcing existing inequalities.

Access to healthcare is vital for addressing climate-related health issues like heat stress and waterborne diseases, particularly in underserved areas (Spencer et al., 2022). Initiatives like National Health Insurance (NHI) are critical for mitigating health impacts on women (Afriyie et al., 2018) by addressing threats exacerbated by climate events. The provision of health care services through NHI scheme can alleviate worries associated with illness and injury outbreaks due to climate change.

Most studies reviewed focused on LMIC, where climate vulnerability is often more pronounced due to limited infrastructure, economic constraints and high dependence on climate-sensitive livelihoods. While high-income countries also implement adaptation strategies, there often rely on institutional (policy and regulation) and technological interventions rather than community-driven approaches (Stephane et al., 2020).

Addressing systemic barriers is essential for achieving gender-equitable climate adaptation. Integrating gender-sensitive policies that enhance women's land rights, access to finance, and participation in decision-making can strengthen their adaptive capacity (Mavisakalyan & Tarverdi, 2019; Nahar & Tajuddin, 2022). Moreover, recognizing and formalizing traditional knowledge systems can bridge the gap between indigenous practices and scientific adaptation strategies. Investing in women-led community initiatives can further enhance resilience by fostering collective action and sustainable resource management.

**Strength and Limitations**

This review was able to recognise the importance of traditional knowledge systems, such as the use of medicinal plants and indigenous weather prediction methods, in women's adaptation strategies. This acknowledgement promotes the integration of local and indigenous knowledge into climate change adaptation efforts. Besides, this review highlights the crucial role of women's social capital and networks in fostering community resilience, knowledge sharing, and mutual support, underscoring the value of collective approaches in climate change adaptation.

The focus on women's adaptation strategies brings to light the distinct challenges and needs that women confront in the face of climate change impacts. This focus is vital for informing the formulation of gender-sensitive policies and programs tailored to these specific challenges. The review also encompasses various domains of adaptation, including agriculture, finance, health, disaster preparedness, and policy, thus offering a multidisciplinary perspective on the complex effects of climate change on women's health and well-being.

However, this review has notable limitations. The majority of studies included were conducted in LMICs, potentially limiting the generalizability of the findings to women in high-income nations, who may face different socioeconomic and cultural contexts. This review does not adequately address the systemic barriers and adaptation strategies relevant to women in high-income countries, which could provide valuable insights into broader global adaptation efforts.

Additionally, the review is also limited by the exclusion of non-English studies, which may have restricted the breadth of evidence considered. This limitation could result in the underrepresentation of adaptation strategies and perspectives from non-English-speaking regions, particularly in LMICs where valuable localised knowledge might be documented in native languages. Future research should address these gaps by incorporating studies from a broader

geographic scope, including high-income countries, and non-English studies to capture a more comprehensive understanding of global adaptation strategies.

Lastly, while this review identified various adaptation strategies, there is limited information on their long-term effectiveness and sustainability in mitigating climate change impacts on women's health. Future studies should assess the durability of these strategies under evolving climatic and social conditions to ensure they remain effective over time.

## CONCLUSION

This scoping review highlights women's diverse strategies to adapt to climate change, particularly in low- and middle-income countries. Women's roles in agriculture, financial management, social networks, and leadership are essential to community resilience and sustainable adaptation practices. Key adaptations include socioeconomic adjustments, traditional knowledge, and health strategies. However, significant gaps remain in understanding the long-term effectiveness and sustainability of these approaches, particularly regarding health-specific adaptations. Future research should prioritize evaluating the long-term impacts of these adaptation strategies and exploring health-related adaptations in greater depth. Addressing these gaps will provide a more comprehensive understanding of how gender-responsive adaptation measures can enhance resilience over time. To support effective adaptation, this review recommends prioritizing gender-sensitive policies that integrate women as agents of change in climate initiatives, with particular attention to the needs of marginalized and vulnerable groups. Culturally appropriate, interdisciplinary approaches supported by robust monitoring and evaluation frameworks will ensure that adaptation strategies are inclusive and responsive to women's unique challenges and contributions. Advancing gender equity through climate change policies can foster resilience for women and communities alike, creating a foundation for more comprehensive and equitable climate adaptation efforts. By recognizing and addressing the distinct needs and strengths of women, this review underscores the importance of inclusive, evidence-based strategies that empower women to thrive in the face of climate change.

**Conflicts of Interest**

The authors declare no conflicts of interest.

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