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Women Empowerment as a Mediator Between Environmental Conservation and Climate Intervention

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ABSTRACT

The study investigated the influence of environmental conservation on climate intervention and explored how women empowerment mediates between the both. Using survey questionnaire, 246 responses were collected from Saudi women. To understand these associations, Smart PLS-SEM version 4 was employed for data analysis. This study significantly supported all the hypotheses; environmental conservation has a positive significant impact on climate intervention ($\beta = 0.552$; $p = 0.003$). The research verified that women empowerment plays a mediating role, with statistical significance ($\beta = 0.267$; $p = 0.015$), highlighting their crucial function as key drivers in advancing sustainable development. The study's conclusion highlighted the value of women's empowerment as a link between combating climate change and environmental preservation. Saudi women are found to have sufficient knowledge on environment and have mobility in resources, and be good decision-makers. By identifying and leveraging the unique talents of women, policymakers and practitioners may develop more inclusive and effective strategies for decreasing environmental challenges and building climate resilient communities, thereby helping to realize the goals of Saudi Vision 2030. This study contributes to the ongoing discourse regarding the interplay between gender, climate resilience, and environmental sustainability by endorsing all-encompassing approaches that empower women to be agents of change.

1. INTRODUCTION

The complex relationship among climate intervention, environmental protection, and women's empowerment is a critical point of convergence for the goal of sustainable development. The transformative role that women's empowerment plays as a mediator in developing environmental resilience and executing effective climate solutions has been highlighted by a growing body of research and practical actions in recent years. Women are in a unique position to promote change at the nexus of environmental preservation and climate action since they are important stakeholders and stewards of ecosystems. In addition to its economic and social aspects, women's empowerment extends to environmental leadership, where they function as custodians of biodiversity and accelerators for sustainable practices. Acknowledging women as change agents in environmental stewardship releases their capacity to develop, adjust, and use tactics that balance human activity with the natural world. This strategy is in line with the knowledge that finding comprehensive and long-lasting solutions to environmental problems requires a more inclusive and gender-responsive strategy.

Women's empowerment also serves as a link between communities and climate solutions, encouraging cooperation and guaranteeing that the latter is socially just and pertinent to the region. Building a resilient and sustainable future requires a strategic imperative: comprehending and utilizing the power of women's empowerment as we manage the complexity of a changing climate and growing environmental challenges. This paper investigates the complex mechanisms through which women's empowerment acts as an important intermediary, creating links between successful climate intervention and environmental preservation.

The interconnectedness of addressing climate change, environmental preservation, and women empowerment forms a vital triangle that requires careful consideration. Women, who are frequently disproportionately impacted by the negative effects of climate change, have the ability to effectively influence change and lessen the destruction of the environment. The urgency of identifying and utilizing women's potential as intermediaries between environmental preservation and climate change action is emphasized by this problem statement. Due to the disruption of ecosystems and the intensification of natural disasters brought about by climate change, women are disproportionately responsible for taking on more caregiving and resource management roles.

Furthermore, women who have achieved political, social, and economic empowerment are better equipped to significantly contribute to environmental sustainability. Research indicates that gender neutral policies and initiatives result in more successful mitigation and adaptation plans for climate change. Nonetheless, obstacles such as discrimination based on gender and restricted resource availability continue to exist, impeding women's complete involvement in environmental projects. In order to address these issues, a multifaceted strategy that emphasizes women empowerment as a critical tactic for building resilience and sustainability is needed. By understanding and addressing the intricate relationships that exist between environmental preservation, climate change intervention, and women's empowerment, one can develop more comprehensive and equitable solutions for a sustainable future.

Saudi Arabia's Vision 2030 depends on women's empowerment since it serves as a link between preserving the environment and reducing climate change. Women empowerment increases the nation's overall resilience to environmental concerns as they actively participate in numerous areas. Through encouraging women to engage in sustainable practices, Saudi Arabia may leverage a range of viewpoints and creative resolutions for environmental problems. Strong, independent women encourage environmentally conscious behavior by teaching the public about climate change. Furthermore, having more women in decision-making processes guarantees a balanced approach to policy creation that places a strong emphasis on sustainability. In addition to bolstering Saudi Arabia's dedication to global environmental stewardship and climate change mitigation, this comprehensive participation of women in environmental programs aligns with Vision 2030's objectives of economic diversification.

Therefore, the study suggests a wide range of goals.

1. To investigate the various viewpoints that guarantee empowered women to act as mediators between the mitigation of environment conservation and climate change.

2. To comprehend the significant role that women play in conservation efforts, helping to achieve a harmonious balance between environmental degradation and human activity.

3. To demonstrate how empowered women’s efforts substantiate to combat climate change.

The study is well organized with its sections in a logical structure. The initial two sections offer a brief summary and a comprehensive literature review. Moving on, the third section details the research methodology, outlining the statistical techniques and data collection procedures used. The fourth section presents the study results, while the fifth section thoroughly discusses the findings and their implications. Subsequently, the study limitations and research parameters are outlined. The research concludes in the final section.

2. LITERATURE REVIEW AND HYPOTHESES FORMULATION

Governments today place a high priority on enhancing the lives of their constituents, particularly those who reside in rural areas [1, 2]. Research on the evolution of development perspectives reveals that in the 1950s and 1960s, the focus was solely on advancing economic growth, viewing people merely as tools for increased productivity [3, 4]. Despite economic growth, international development organizations like UNIRSD, 2005 [5] argue that the overall quality of human existence has suffered. Additionally, women's roles have been largely neglected, leading to increased exploitation and humiliation [5, 6]. It was only in the early 1970s that national and international development organizations began addressing women's participation in development initiatives [7]. The 1980s marked a significant shift with the introduction of the sustainable development perspective, altering the understanding of women's role in human development [8, 9]. This critique also gave rise to the "Gender and Development (GAD)" perspective, which scrutinizes women's role in development [9]. Women empowerment serves as a powerful mediator by fostering inclusive decision-making processes and amplifying diverse perspectives. Unlike conventional interventions that often prescribe fixed solutions, empowerment enables women to actively participate in shaping policies and initiatives, ensuring relevance and sustainability. Its distinctiveness lies in its emphasis on systemic change and the cultivation of agency, enabling women to drive their own progress within their communities and beyond [7-9].

The imperative inclusion of women, constituting half of the population, in human development initiatives has gained significance since the 1990s, prompting the initiation of efforts to enhance gender sensitive indicators. Reflecting this commitment, one of the seventeen sustainable development goals is dedicated to "achieving gender equality and empowering all women and girls" (United Nations 2015). Despite global efforts towards sustainable development, numerous challenges persist. Over 736 million individuals still endure extreme poverty, defined as living on less than US$1.9 per person per day, with income inequality predominantly prevalent in developing nations [10-13]. Women empowerment encompasses the multifaceted improvement of their economic [14, 15], social [16, 17], and political [18-20] status, addressing the systemic disadvantages faced by women in society [21]. Acknowledged as a pivotal challenge of the 21st century [22-26], true empowerment necessitates the creation of a societal and political climate where women can live free from the pervasive threats of abuse, prejudice, mistreatment, enslavement, and general harassment inherent in historical male dominated systems [21, 27-31]. A prerequisite for achieving sustainable development involves empowering rural women to assume leadership roles in their community's active development and participate in decision-making processes [32, 33].

2.1 Role of women in environment conservation

According to Pillai et al. [34], there is a growing emphasis on policy initiatives and development discussions on empowering women. Alongside this development, there has been a noticeable and consistent change in the perception of women, shifting from being seen as helpless objects and victims to being recognized as powerful agents [35, 36]. The contemporary focus revolves around women empowerment and active participation in development, extending beyond mere ownership of material resources. Challenges related to gender and the environment have arisen as this concept broadens to include ideology and control over non-material resources [36, 37]. Principle 20 of the Rio Declaration on Environment and Development emphasizes the critical roles that women play in environmental management and sustainable development. Consequently, women's engagement

in environmental issues is vital for achieving environment conservation [38]. Women are more closely connected to environmental matters, climate change, and sustainable consumption habits than men, owing to their knowledge, experience, and domestic responsibilities [39-42]. Moreover, research indicates that women exhibit greater conscientiousness than men in areas such as recycling, purchasing eco-friendly items, and opting for organic food. Women, particularly those in disadvantaged rural households, actively contribute to the protection and restoration of the environment as their livelihoods depend on natural resources. However, they also bear the brunt of any environmental degradation [43]. Therefore, empowering Saudi women is equally crucial element in initiatives aimed at environment conservation.

2.2 Environment conservation and climate intervention

In this framework, empowerment is seen as a pathway to environmental preservation. Individual empowerment is characterized by success across various programs. Conversely, on a personal level, empowerment is seen as a strategy for attaining objectives [44-46]. According to this perspective, environment conservation is influenced by behavioral intention, attitude, and knowledge about the environment.

Environmental knowledge (EK) relates to how an individual perceives environmental phenomena [47]. Knowledge about the environment serves to enhance one's understanding of environmental aspects. This education is categorized into thirteen groups, covering environmental management, environmental management techniques, environmental issues, geo-ecology, economics, social and cultural environment, adaptation and evolution, natural resources, culture, politics, family, individual, and mentality [48]. All information related to this subject falls under the umbrella of environmental knowledge. Environmental attitude (EA) as outlined by Pillai [49], refers to an individual's personal beliefs, motivations, and objectives regarding environmental matters and actions. Furthermore, this attitude serves as a benchmark in the environment, shaping how individuals perceive, think about, and observe the world. It also influences how the environment is perceived and how its values impact individuals [50]. The comprehension of the environment is expected to change people's perceptions of it, subsequently influencing policy decisions [51]. Behavioral intention (BI) states that all human actions fall within the scope of behavior, categorized as a broad term [52]. The response of an individual or a group to a specific environmental issue is termed environmental behavior [53, 54]. People can exhibit pro-ecological behavior by fulfilling their moral obligation to take action and consciously working to reduce the adverse impacts caused by humans [55]. Therefore, it is hypothesized as below.

H1: Environmental conversation has a positive relationship with climate intervention.

2.3 Women empowerment (WE) and climate intervention (CI)

This section is dedicated to environment conservation, and discusses the capacity of women to identify their own objectives and take intentional actions. As outlined by Alsop and Heinsohn [44] and Kleine [56], this capacity serves both structural and individual purposes. Positioned as the framework's dependent variable, agency establishes connections between social causes and outcomes. According to the notion of women's agency, women play a pivotal role in driving change, especially in defining significant life choices and exercising control over resources and decisions that significantly impact their lives. UN women [57], advocated this concept for viewing women not merely as recipients of services but as the primary agents in the process of change. Within this framework, women's agency encompasses elements such as knowledge (KNW), mobility (MOB), and decision-making (DM).

DM power in a family is gauged through an amalgamation of various criteria, which signifies the influence exerted by women over choices made within the household. This influence extends to women's decision-making regarding employment, marriage, child-rearing, and other aspects, as well as their capacity to determine the household budget and make purchases without seeking permission. Ghuman [58], has highlighted the importance of women's decision-making authority concerning financial and domestic matters. However, the emphasis is placed on women's involvement in decision-making beyond the domestic sphere, such as their freedom to choose whether to buy jewelry or clothing for themselves or to express their opinions in significant household purchases. Grabe [59], asserts that agency is intertwined with decision-making processes. Mobility as per Bhagowalia et al. [60], and Wiklander [61], the MOB factor signifies the extent of a woman's movement. This pertains to whether women have the freedom to travel to diverse locations, such as markets, healthcare facilities, areas outside their village, neighboring towns, and visiting friends and family, without requiring permission from family members or traveling independently [61]. Formal or informal education, in addition to on-the-job training, can help women improve their knowledge, abilities (including life skills and other competencies), and capacity to use these in pertinent contexts. Eerdewijk et al. [62] defined life skills as the knowledge, attitude, and ability to engage in consistent, constructive behavior that helps people deal with the difficulties of daily life. Therefore, it is hypothesized as below.

H2: Women empowerment has a positive influence on climate intervention

2.4 Women empowerment as a mediator between environment conservation and climate intervention

Women who are empowered take on an active role as change agents and make important contributions to sustainable practices. Women are frequently the principal guardians of natural resources in many countries, which makes their participation essential in environmental activities. Women who are empowered are more likely to participate in environmentally beneficial activities like resource management and sustainable farming. Their improved access to economic and educational possibilities enables individuals to put creative solutions to environmental problems into practice. Additionally, research suggests that women value community well-being, which puts more emphasis on conservation activities. Within the framework of climate intervention, strong women play a crucial role in promoting and carrying out adaptation measures. They play key roles in community-based initiatives that address the impacts of climate change, fostering resilience among vulnerable populations [63]. Therefore, by empowering women, we

unlock a powerful force for environment conservation and climate intervention. Their leadership and participation in decision-making processes contribute to a more sustainable and resilient future for both communities and the planet. Therefore, it is hypothesized as below.

H3: Environmental awareness has a positive significant relationship with women empowerment.

Despite its potential, climate intervention cannot replace lower carbon dioxide emissions and adaptation strategies meant to lessen the negative effects of climate change. But as we approach an unprecedented era of climate change, there's a growing interest in intentionally tampering with the climate system to deal with these issues. Climate interventions can be divided into two categories: (1) Carbon dioxide or greenhouse gases removal (CDR) and (2) Solar radiation modification (SRM). Carbon dioxide removal strategies aim to address one of the main contributors to climate change, but further research is needed to assess if these technologies are suitable for broad use. While SRM modification strategies have the potential to rapidly cool the earth's surface, they also pose unknown environmental and other risks, warranting caution in their implementation on a scale that could alter the climate. SMR approach also includes earth's surface albedo (like brightening urban roofs, planting on the roofs, crop, and other land-use changes [64, 65].

Empowering women is integral to environment conservation. Empowered women actively participate in resource management, community stewardship, and sustainable practices. Relationship harmony is fostered by this link, which benefits women's health and environmental preservation. Empowering women is vital for effective climate intervention. Women, when empowered, play key roles in implementing climate adaptation strategies and community resilience initiatives. Their leadership enhances the capacity to address climate challenges, promoting sustainable practices and contributing to a more resilient and climate conscious society. Since 2017, UN Women, in collaboration with its partners, has been dedicated to advancing the economic empowerment of women and enhancing climate resilience in West and Central Africa. This commitment is manifested through the implementation of its key initiative, the Women Empowerment through Climate-Resilient Agriculture Value Chains' program [63]. The worldwide challenge of climate change necessitates a combination of risk- and effectiveness-tolerant methods. The fundamental strategy for reducing the negative consequences of climate change continues to be strengthening human and natural systems to better withstand it in conjunction with significant cuts in greenhouse gas emissions. The organizations do, however, strongly advise that any actions taken by society to alter the planet's climate be founded on a significantly larger body of scientific knowledge than what is already available. This research should encompass not only climate science but also economic, political, ethical, and other considerations [66]. Therefore, it is hypothesized as below.

H4: Women empowerment mediates the association between environmental conversation and climate intervention.

Based on the illustration from the theoretical aspects of the variables, the study has formulated the following proposed theoretical framework as shown in Figure 1.

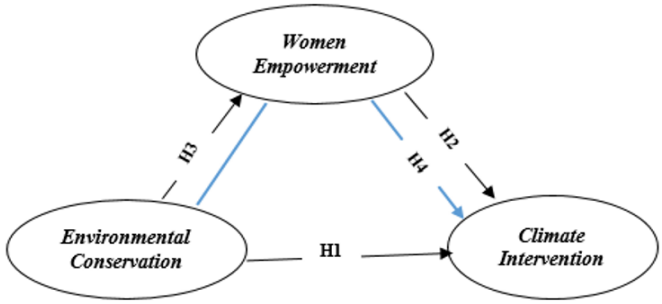

Figure 1. Theoretical framework

3. METHODOLOGY

3.1 Sample size and data collection procedure

A survey questionnaire was used in this research to examine the function of women empowerment as a mediator between environment conservation and climate change intervention. The study utilized a quantitative survey from women in the Saudi communities who are pursuing university studies, employed and homemakers and collected 246 responses. Community involvement was given top priority in the research to guarantee that Saudi women's viewpoints are fairly represented. The sample selection involved purposive sampling, targeting women aged 18-60 from diverse socio-economic backgrounds like females pursuing education, working and housewives in the Riyadh region. Exclusion criteria included individuals not identifying as women and those unable to provide informed consent. Inclusion criteria encompassed participants with varied educational levels, occupations, and geographic locations, ensuring a comprehensive representation of perspectives on empowerment. Data were collected via a structured survey questionnaire based on the measurement items comprising closed-ended questions and Likert-scale items on a scale of 1-5 assessing empowerment dimensions. Open-ended questions allowed for qualitative insights. Pre-testing ensured clarity and relevance. Researchers conducted online survey, adhering to ethical guidelines in order to ensure transparency and reproducibility of research findings. Statistical analyses, such as smart PLS, were used to assess the mediating effect of women empowerment. Overall, this methodological framework aimed to provide a nuanced understanding of the interconnected dynamics, offering practical insights for policymakers and practitioners. The respondents' profile of the respondents was presented in Table 1.

3.2 Development of measurement items

Environmental knowledge, environment attitude and behavioral intention are the three items of environmental awareness [47-49, 52] respectively. Women empowerment is the second independent variable in the study. Knowledge (KNW), mobility (MOB), and decision-making (DM) are the three measurement items of women empowerment employed from UN women [57]. Climate intervention (CI) is the dependent variable and its two approaches carbon dioxide or greenhouse gases removal (CDR) and solar radiation modification (SRM) are the measurement items used in the study which were employed [66].

4. RESULTS OF DATA ANALYSIS

4.1 Respondents profile

Table 1 presents the demographic characteristics of the respondents. The majority of respondents fall under the age group of 18-25, constituting about 30.9%, with many of them were undergraduates (48.8%), majority of them are unmarried (44.3%). 54.5% of total respondents are non-Saudi and 41.8% are working women.

Table 1. Demographic characteristics (n=246)

Variable	Categories	Frequency	Percentage (%)
Age	18 - 25 years	76	30.9
	26 - 30 years	62	25.2
	31 - 35 years	45	18.3
	36 - 40 years	41	16.7
	More than 40 and less than 60 years	22	8.9
Education	Schooling	33	13.4
	Bachelors	120	48.8
	Masters	76	30.9
	Ph.D.	17	6.9
Civil Status	Spinster	109	44.3
	Married	90	36.6
	Divorced	47	19.1
Nationality	Saudi	112	45.5
	Non-Saudi	134	54.5
Occupational Status	Pursuing University studies	56	22.8
	Working women	103	41.8
	Housewife	87	35.4

Source: Data analysis

4.2 Assessment of measurement model

The examination of the study's measurement and structural model employed Smart PLS-SEM version 4, because of its suitability in analyzing complex relationships within structural equation models, accommodating non-normal data and small sample sizes in fields such as social science [67]. Assumptions include the necessity of reflective measurement models and the requirement of sufficient sample size for robust results.

To address potential Common Method Bias, following the recommendations of Agbonifoh and Ogbeide [68] and Hair et al. [69], the authors initially scrutinized the overall interdependence among study variables to mitigate issues related to interdependence or collinearity inherent in single-source data. This involved subjecting each variable to regression on an established variable, and a VIF value below 3.3 indicated an absence of bias arising from the use of a singular data source, as evidenced in Table 2. The assessment of common method variance involved a comprehensive collinearity test utilizing the PLS-SEM methodology, deemed superior to the Harmon Single Factor method [69]. Furthermore, in accordance with Kock and Lynn, [70], an examination of Web power Multivariate Kurtosis, along with the computation of Univariate and Multivariate skewness and kurtosis, was performed to ascertain data normalcy. The results demonstrated that single-source bias and common method variance were not significant concerns, substantiating the robustness of the data, as outlined in Table 2.

The findings indicate that individual variables exhibited univariate normality, as evidenced by skewness and kurtosis values falling within the range of 1. However, when considering multivariate normality, the application of Kock [71] rule of thumb revealed a multivariate skewness surpassing 3, and the multivariate kurtosis exceeded 20. Mardia's multivariate skewness ($\beta = 66.152$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 124.153$, $p < 0.01$) further affirmed this deviation from normality. Consequently, the data is deemed abnormal, justifying the adoption of the PLS bootstrapping method.

Table 2. Testing for full collinearity

EC	WE	CI
3.341	2.136	3.241

Source: Data analysis

4.3 Validity and reliability

As there were potential bias in the data, study was proceeded with additional investigation to assess the validity and reliability conditions. The factor loadings of individual items for each study variable were consistent with the requirements outlined by Leclercq-Machado et al. [67] ensuring that items exhibited loadings above the acceptable threshold of 0.5. To gauge the reliability of the variables, a composite reliability (CR) value was computed, ranging from 0.820 to 0.922, surpassing the minimum threshold of 0.70 recommended by Leclercq-Machado et al. [67]. Furthermore, the study delved into the convergent validity of the measuring items, defined as the average variance extracted (AVE) value exceeding 0.50, as indicated in Table 3. The AVE values, ranging from 0.774 to 0.884, demonstrated an excellent AVE rating, affirming that each construct accounted for more than fifty percent of the variation among its indicators. This comprehensive examination confirms the study's success in establishing reliability, validity, and convergent validity.

Table 3. Reliabilities of study variables

Construct	Items	Factor Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
Environmental Awareness	EK	0.931	0.922	0.884
	EA	0.901		
	BI	0.848		
Women Empowerment	DM	0.878	0.820	0.824
	MOB	0.774		
	KNW	0.882		
Climate Intervention	CDR	0.783	0.866	0.774
	SRM	0.907		

Source: Data analysis

4.4 Discriminant validity

To ensure the validity and reliability of the study variables, we conducted an investigation into the discriminant validity of the assessment items. Utilizing the Heterotrait-Monotrait (HTMT) criterion, the values for discriminant validity of the research variables were found to be reasonable, as depicted in Table 4 below. Recognizing criticisms of the Cain et al. [72] reliability criterion, the MTMT matrix approach was employed to assess discriminant validity using the HTMT ratio of correlations [73]. As outlined in the research, concerns about discriminant validity arise when the HTMT value exceeds 0.85 or 0.90 [73, 74]. In line with this criterion, all values in Table 2 met the HTMT 0.90 threshold, and no

variables exhibited an HTMT value of 1, indicating the presence of discriminant validity in the constructs Kock [71]. Consequently, both vertically and horizontally, the row and column values surpassed the AVE values, providing statistical evidence of the study's assessments' significance.

Table 4. Discriminant validity using HTMT ratio

Constructs	EC	WE	CI
Environmental Conservation (EC)	0.857		
Women Empowerment (WE)	0.737	0.796	
Climate Intervention (CI)	0.791	0.782	0.785

Source: Data analysis

4.5 Structural model of the tested hypotheses

After the measurement process, which assessed the validity and reliability of the constructs and addressed issues related to data normality, the study model was deemed satisfactory. Subsequently, the model yielded pertinent findings, enabling the evaluation of the structural model through a bootstrapping approach on the 246 respondents. The hypotheses tested are detailed in Table 5 and Table 6, while the structural model is depicted in Figure 2. Furthermore, bootstrapping approach was used with 5,000-resample supporting the suggestions of Leclercq-Machado et al. [67]. Table 5 illustrates the tested direct hypotheses, adhering to the current research standards for hypothesis presentation.

Table 5. Direct effect of tested relationships

Hypotheses	Effect	β	SE	T-Stat	P Value	Decision
H1	EC → CI	0.552	0.026	6.745	0.003	Supported
H2	WE → CI	0.348	0.036	2.509	0.006	Supported
H3	EC → WE	0.481	0.011	9.489	0.000	Supported

Source: Data analysis

Table 6. Indirect effect

Hypothesis	Effect	β	SE	T Stat	P Value	Decision
H4	EC → WE → CI	0.267	0.065	3.274	0.015	Accepted

Source: Data analysis

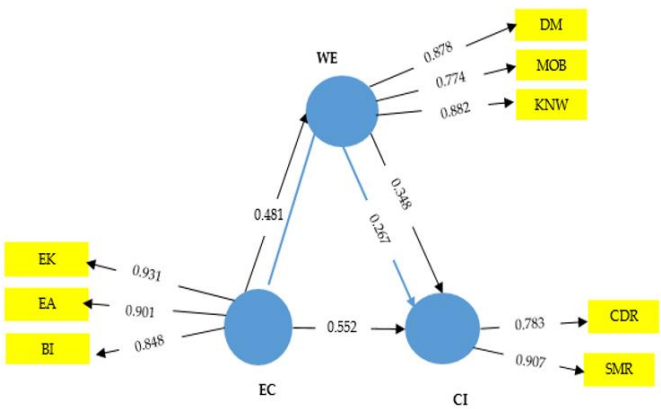

Figure 2. PLS-SEM hypothesized structural model

Table 5 indicates the path coefficients, t-values and significant values are presented and Environmental Conservation (EC) exhibited a noteworthy impact on both Climate Intervention (CI) and Women Empowerment (WE). The path coefficient for EC → CI was 0.552; p = 0.003 and t = 6.745. Similarly, the effect of Women Empowerment on Climate Intervention (WE → CI) was significant, with a coefficient of 0.348, p = 0.006, and t = 2.509. Additionally, the association between Environmental Conservation and Women Empowerment (EC → WE) was highly significant, with a coefficient of 0.481, p < 0.000, and t = 9.489. To summarize, the statistical analysis, as presented in Table 5, confirms the significance of the relationships EC → CI, WE → CI, and EC → WE. Hence, the hypotheses H1, H2 and H3 are supported by the research data.

Table 6 outlines the examined indirect or mediating impact of women empowerment on the connection between environmental conservation and climate intervention. As depicted, there is indeed a mediating influence of women empowerment (WE) between environmental conservation (EC) and climate intervention (CI). The results indicate a notable mediating effect, supporting the fourth hypothesis (H4, EC → WE → CI) with a coefficient of 0.267, a t-value of 3.274, and a p-value of 0.015. Hence, the hypothesis H4 is supported by the research data.

5. DISCUSSIONS

The results confirmed the positive association among EC, WE and CI. The study demonstrated positive mediation of WE between EC and CI. Results found there exists a positive impact of EC on CI. The results of this study shed light on how environmental conservation can reinforcing the climate interventions, which are immensely needed during these decades of environment deterioration due to huge business operations and their adverse impact on the society and communities. The intersection of environmental conservation, women empowerment, and climate intervention forms a critical nexus in fostering sustainable development. Through promoting knowledge, mobility, and decision-making, Saudi women empowerment plays a critical role in bridging the gap between environmental protection and climate intervention. The statistical data β = 0.267; p = 0.015 showed that empowered women are capable of gaining knowledge, coming up with original ideas, and spreading environmental consciousness. Their greater mobility allows them to take advantage of resources, conduct fieldwork, and encourage community involvement. Women's representation in decision-making is evident; it guarantees a diversity of interests and points of view, enhancing strategies and policies. While statistical significance indicates reliable relationships, practical significance considers their real-world impact. For instance, a statistically significant correlation between education and empowerment may highlight the importance of education policies. However, its practical significance lies in how effectively these policies translate into tangible improvements in women's lives, such as increased economic opportunities and decision-making autonomy. The research suggests that by providing education, opportunities for leadership, and access to opportunities, Saudi women can be empowered and the country can successfully utilize their potential to address environmental concerns. By increasing resilience to climate change and advancing a more inclusive and equitable environmental agenda, their participation catalyzes sustainable development specifically in the realms of carbon dioxide reduction and solar radiation modification.

Environmental knowledge, comprising an understanding of ecological principles and conservation practices, is a foundational aspect of promoting environmentally conscious

behaviors. The positive correlation between environmental knowledge and attitudes is well-established, influencing individuals' intentions to engage in environmentally friendly actions. This study scrutinizes how these components collectively contribute to shaping behavioral intentions of women in support of environmental conservation. At the same time, women empowerment becomes apparent as a key component of sustainable development. Beyond conventional gender roles, women empowerment can be illustrated by improved knowledge, increased mobility, and decision making skills. Empowered women are better equipped to contribute to environmental conservation efforts, acting as influential agents of change within their communities in the Saudi Arabia region. The study findings are also consistent with research findings of UN region [57].

Crucially, this research introduces women empowerment as a mediator, elucidating its pivotal role in bridging the gap between environmental conservation and climate intervention. By examining decision-making, mobility, and knowledge as mediating factors, the study assesses how empowered women can channel their influence towards climate interventions such as carbon dioxide reduction and solar radiation modification. The findings show the women ecological knowledge, attitude and intention are boosted with their empowerment in mitigating many climate related issues. The majority of women are dedicated to playing a small yet impactful role in sustainable initiatives, such as implementing rooftop gardens, harnessing solar radiation as an alternative energy source, and cooling their immediate living areas. The study explores their participation in community-based projects, natural resource management, and the adoption of sustainable farming methods as ways to combat environmental degradation. The report emphasizes how crucial it is to include gender viewpoints in mitigation and adaptation plans for climate change. It highlights the flexibility and ingenuity demonstrated by empowered women in supporting these projects. Integrating the women in decision-making procedures can improve the efficacy of environmental policies by guaranteeing a range of viewpoints and creative solutions. Furthermore, encouraging women to participate in sustainable activities can increase community environmental stewardship and build resilience to climate change. This strategy supports gender equality and Saudi Arabia's socioeconomic development in addition to the environment.

Understanding the nuanced relationships within this triad environmental conservation, women empowerment, and climate intervention provides valuable insights for crafting comprehensive and effective sustainability strategies. The findings of this study not only underscore the interconnectedness of these elements but also emphasize the catalytic role of women empowerment in steering societies towards a more ecologically resilient and climate-friendly future.

6. LIMITATIONS AND SCOPE OF FUTURE RESEARCH

Though this study offers significant insights into the complex interrelationships between women empowerment, environmental protection, and climate intervention, it is imperative to recognize key limitations that may affect the applicability and interpretation of the study findings. As majority of the findings are self-reported, there could be a chance of social desirability bias, in which participants give answers that they believe to be socially acceptable rather than ones that accurately reflect their views or actions. The accuracy of stated environmental knowledge, attitudes, and behavioral intentions may be impacted by this possible bias. Second, the unique cultural and contextual characteristics of the study population may limit the generalizability of the findings. Cultural variations in attitudes towards environmental conservation and women empowerment might affect the applicability of our results to diverse settings.

Moreover, the study predominantly focuses on a set of predefined variables, overlooking other potential influencers and mediators. The complexity of environmental issues and empowerment dynamics may entail additional variables that were not considered in our research. Few unexpected results, such as disparities in empowerment levels among demographic groups are suggested as underlying social inequalities. Exploring these anomalies could unveil systemic barriers to empowerment. Addressing such disparities by future researchers is vital for devising targeted interventions to ensure equitable opportunities for all women, mitigating the risk of perpetuating existing inequalities. Additionally, the cross-sectional nature of our study limits our ability to establish causality definitively. A more thorough understanding of the periodic links between climate action, women empowerment, and environmental conservation may be obtained through longitudinal study. Notwithstanding these drawbacks, this study provides insightful information about how these categories are related to one another and lays the groundwork for future studies that will examine these connections more thoroughly and among a wider range of people.

7. CONCLUSIONS

Empowering women is a critical mediator between environmental protection and climate change action, according to research. Improvements to the environment and the reduction of climate change have been associated with the empowerment of women in a variety of domains, such as economic possibilities, decision-making, and education. Women emphasize sustainable actions more frequently and have distinct perspectives on environmental challenges. Research indicates that when women participate actively in conservation initiatives, resource management, biodiversity preservation, and community resilience all significantly increase. Women with greater leverage are more likely to embrace environmentally beneficial behaviors, support sustainable growth, and help lower greenhouse gas emissions. Moreover, women empowerment improves their ability to adjust to the effects of climate change. Women who possess education and economic clout are more equipped to adapt to shifting environmental conditions and foster the creation of novel solutions. Community-based adaptation measures, sustainable agriculture, and renewable energy have all been successfully promoted by women-led efforts in several instances. The study concludes by highlighting the important role that women empowerment plays as a mediator, creating a positive feedback loop between successful climate change response and environmental preservation. In addition to being a question of gender equality, empowering women is also a calculated move toward addressing the interrelated problems of environmental sustainability and climate change.

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REFERENCES

[1] Fukuda-Parr, S. (2004). Millennium development goals: Why they matter. Global Governance, 10(4): 395-402.

[2] Howard-Hassmann, R.E. (2018). Human rights and the search for community. Abingdon: Routledge.

[3] Garavan, T.N., McCarthy, A.M., Morley, M.J. (2016). Global Human Resource Development: Regional and Country Perspectives. Abingdon: Routledge.

[4] McGovern, S. (2013). Education, Modern Development, and Indigenous Knowledge: An Analysis of Academic Knowledge Production. Abingdon: Routledge. https://doi.org/10.4324/9781315052236

[5] United Nations Research Institute for Social Development. (2005). Gender equality: Striving for justice in an unequal world: Geneva. Switzerland: United Nations Research Institute for Social Development.

[6] Lamb, V.M. (2011). The 1950's and the 1960's and the American Woman: The transition from the "housewife" to the feminist. (Master civilisations contemporaines et comparées), Université du Sud Toulon-Var. https://dumas.ccsd.cnrs.fr/dumas-00680821/document.

[7] Upali, P. (2013). Role of Women in Rural Development. Colombo: Gamana (Guarantee) Ltd.

[8] Nussbaum, M.C. (2001). Women and Human Development: The Capabilities Approach. Cambridge: Cambridge University Press.

[9] Stotsky, M.J.G. (2016). Trends in Gender Equality and Women'S Advancement. Washington, D.C.: International Monetary Fund.

[10] Carley, M., Christie, I. (2017). Managing Sustainable Development. Abingdon: Routledge. https://doi.org/10.4324/9781315091525

[11] Clark, R., Reed, J., Sunderland, T. (2018). Bridging funding gaps for climate and sustainable development: Pitfalls, progress and potential of private fnance. Land Use Policy, 71: 335-346. https://doi.org/10.1016/j.landusepol.2017.12.013

[12] United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. Resolution adopted by the General Assembly, New York: United Nations, Department of Economic and Social Affairs.

[13] Sansaniwal, S., Rosen, M., Tyagi, S. (2017). Global challenges in the sustainable development of biomass gasification: An overview. Renewable and Sustainable Energy Reviews, 80: 23-43. https://doi.org/10.1016/j.rser.2017.05.215

[14] Dufo, E. (2012). Women empowerment and economic development. Journal of Economic Literature, 50(4): 1051-1079. https://doi.org/10.1257/jel.50.4.1051

[15] Sinha, M., Mahapatra, S.S., Dutta, A., Sengupta, P.P. (2019). Microfnance and women empowerment: An empirical analysis. In Handbook of Research on Micro Financial Impacts on Women Empowerment, Poverty, and Inequality, India, pp. 52-64. https://doi.org/10.4018/978-1- 5225-5240-6.CH003

[16] Haghighat, E. (2013). Social status and change: The question of access to resources and women's empowerment in the Middle East and North Africa. Journal of International Women's Studies, 14(1): 273-299.

[17] Mukhopadhyay, P., Sinha, M., Chaudhury, A.R., Sengupta, P.P. (2019). Microfnance, micro-entrepreneurial activities through self-help groups, and socio-economic empowerment of women: A study of Burdwan district of West Bengal. Gender Economics Breakthroughs in Research and Practice, IGI Global, pp. 319-336 https://doi.org/10.4018/978-1-5225-5213-0.ch005

[18] Atisa, G., Zemrani, A., Weiss, M. (2021). Decentralized governments: Local empowerment and sustainable development challenges in Africa. Environment, Development and Sustainability, 23: 3349-3367. https://doi.org/10.1007/s10668-020-00722-0

[19] Mwatha, R., Mbugua, G., Murunga, G. (2013). Young women's political participation in Kenya. Women's Empowerment Link, 7: 1505-1530.

[20] Ritchie, M., Rogers, T.A., Sauer, L. (2014). Women's empowerment in the political processes in the Maldives (p. 16). Washington, DC: IFES.

[21] Dandona, A. (2015). Empowerment of women: A conceptual framework. The International Journal of Indian Psychology, 2(3): 2348-5396.

[22] Adinarayana, G. (2016). Women empowerment: A challenge of 21st century. International Journal of Research in Social Sciences, 6(1): 8-22.

[23] Deepa, B., Sakshi, R. (2014). Women empowerment: A challenge of 21st century. International Journal of Management, IT and Engineering, 4(2): 68-72. https://doi.org/10.5958/2348-7534.2014.01291.4

[24] Shettar, D., Rajeshwari, M. (2015). A study on issues and challenges of women empowerment in India. IOSR Journal of Business and Management, 17(4): 13-19.

[25] Slaughter, A.M. (2015). Why women still can't have it all. Bloomsbury: OneWorld.

[26] Undiyaundeye, F. (2013). The challenges of women empowerment for sustainable development in Nigeria. Academic Journal of Interdisciplinary Studies, 2(11): 9. https://doi.org/10.5901/ajis.2013.v2n11p9

[27] Jinia, N.J. (2016). Microcredit and women's empowerment. Does microcredit promote the borrowers to participate in the household decision-making process in Bangladesh? Ph.D Thesis, University of Tampere.

[28] Kumar, D., Hossain, A., Gope, M.C. (2015). Role of micro credit program in empowering rural women in Bangladesh: A study on Grameen Bank Bangladesh Limited. Asian Business Review, 3(4): 114-120.

[29] Rani, S. (2017). Women empowerment: Need of modern era. International Journal of Advanced Education and Research, 2(3): 143-144.

[30] Rifkin, S.B. (2003). A framework linking community empowerment and health equity: It is a matter of choice. Journal of Health, Population and Nutrition, 21: 168-180.

[31] Ugbomeh, G.M. (2001). Empowering women in agricultural education for sustainable rural development. Community Development Journal, 36(4): 289-302. https://doi.org/10.1093/cdj/36.4

[32] Kabeer, N. (2005). Is microfnance a'magic bullet'for women's empowerment? Analysis of fndings from South

Asia. Economic and Political Weekly, 40(44): 4709-4718.
[33] Kumari, M. (2018). Constraints in empowerment of rural women in Sahibganj district of Jharkhand. Journal of Krishi Vigyan, 6(2): 197-200.
[34] Pillai, Asalatha, B., Ponnuswamy, B. (2009). Women in development: Dissecting the discourse. http://mpra.ub.uni-muenchen.de/13119/.
[35] Bradshaw, S. (2013). Women's decision-making in rural and urban households in Nicaragua: The influence of income and ideology. Environment and Urbanization, 25(1): 81-94. https://doi.org/10.1177/0956247813477361
[36] Niaghi, O. (2019). The role of women and their empowerment in environmentally sustainable development. Journal of Environmental Science Studies, 4(2): 1328-1339.
[37] Osirim, M.J. (2001). Making good on commitments to grassroots women: Ngos and empowerment for women in contemporary Zimbabwe. Women's Studie International Forum, 24(2): 167-180. https://doi.org/10.1016/S0277-5395(01)00154-6
[38] Alvarez, M.L. (2013). From unheard screams to powerful voices: A case study of women's political empowerment in the Philippines. Seoul, Korea: Thesis.
[39] Bayeh, E. (2016). The role of empowering women and achieving gender equality to the sustainable development of Ethiopia. Pacifc Science Review B: Humanities and Social Sciences, 2(1): 37-42. https://doi.org/10.1016/j.psrb.2016.09.013
[40] Shobeiri, S.M., Meiboudi, H. (2014). Women's participation in environmental management and development promotion culture. International Journal of Resistive Economics, 2(2): 49-61.
[41] Naganag, E.M. (2014). The role of indigenous women in forest conservation in upland Kalinga province, Northern Philippines. International Journal of Advanced Research in Management and Social Sciences, 3(6): 75-89.
[42] Heinzle, S., Kanzig, J., Nentwich, J., Ofenberger, U. (2010). Moving beyond gender diferences in research on sustainable consumption: Evidence from a discrete choice experiment, University of St.Gallen, pp. 1-52.
[43] Karamidehkordi, E. (2012). Sustainable natural resource management, a global challenge of this century. Sustainable Natural Resources Management, 8: 105-114.
[44] Alsop, R., Heinsohn, N. (2005). Measuring empowerment in practice: Structuring analysis and framing indicators. Washington, D.C.: The World Bank.
[45] Kabeer, N. (1999). Resources, agency, achievements: Refections on the measurement of women's empowerment. Development and Change, 30(3): 435-464. https://doi.org/10.1111/1467-7660.00125
[46] Schwerin, E.W. (1995). Mediation, citizen empowerment, and transformational politics. United States: Praeger Publishers.
[47] Lee, K. (2010). The green purchase behavior of Hong Kong young consumers: The role of peer influence, local environmental involvement, and concrete environmental knowledge. Journal of International Consumer Marketing, 23(1): 21-44. https://doi.org/10.1080/08961530.2011.524575
[48] Davison, L., Littleford, C., Ryley, T. (2014). Air travel attitudes and behaviours: The development of environment-based segments. Journal of Air Transport Management, 36: 13-22. https://doi.org/10.1016/j.jairtraman.2013.12.007
[49] Pillai, S.K.P. (2012). A study of environmental awareness of higher secondary school students in Cuddalore district. Research Expo International Multidisciplinary Research Journal, 2(2): 44-48.
[50] Tuna, M. (2004). Public environmental attitudes in Turkey. Environmental justice and global citizenship. Oxford: The Interdisciplinary Press. Eco-Audit.
[51] Arcury, T.A. (1990). Environmental attitude and environmental knowledge. Human Organization, 49(4): 300-304. https://doi.org/10.17730/humo.49.4.y6135676n433r880
[52] Lee, E.B. (2008). Environmental attitudes and information sources among African American college students. The Journal of Environmental Education, 40(1): 29-42. https://doi.org/10.3200/JOEE.40.1.29-42
[53] Alatawi, F., Dwivedi, Y.K., Williams, M.D., Rana, N.P. (2012). Conceptual model for examining knowledge management system (KMS) adoption in public sector organizations in Saudi Arabia. In paper presented at the tGOV workshop, 12 (tGOV12): Brunel University, West London.
[54] Chen, F.Y. (2013). The intention and determining factors for airline passengers' participation in carbon offset schemes. Journal of Air Transport Management, 29: 17-22. https://doi.org/10.1016/j.jairtraman.2013.01.001
[55] Harland, P., Staats, H., Wilke, H.A. (2007). Situational and personality factors as direct or personal norm mediated predictors of pro-environmental behavior: Questions derived from norm-activation theory. Basic and Applied Social Psychology, 29(4): 323-334. https://doi.org/10.1080/01973530701665058
[56] Kleine, D. (2009). ICT4WHAT?-Using the choice framework to operationalise the capability approach to development. In 2009 International Conference on Information and Communication Technologies and Development (ICTD), Doha, Qatar, pp. 108-117. https://doi.org/10.1109/ICTD.2009.5426717
[57] UN Women. (2009). Women, gender equality and climate change, 11 pages, accessed 2 September 2018 at http://www.un.org/womenwatch/feature/climate_change/downloads/Women_and_Climate_Change_Factsheet.pdf.
[58] Ghuman, S.J. (2003). Women's autonomy and child survival: A comparison of Muslims and non-Muslims in four Asian countries. Demography, 40(3): 419-436. https://doi.org/10.1353/dem.2003.0021
[59] Grabe, S. (2012). An empirical examination of women's empowerment and transformative change in the context of international development. American Journal of Community Psychology, 49(1-2): 233-245. https://doi.org/10.1007/s10464-011-9453-y
[60] Bhagowalia, P., Menon, P., Quisumbing, A.R., Soundararajan, V. (2015). What dimensions of women's empowerment matter most for child nutrition? Evidence using nationally representative data from Bangladesh. http://ebrary.ifpri.org/utils/getfle/collection/p15738coll2/id/127005/flename/12721 6.pdf. Accessed 12 March 2020.
[61] Wiklander, J. (2010). Determinants of women's empowerment in rural India: An intra-household study. Master's Thesis, Department of Economics, Lunds University.

[62] Eerdewijk, A., Wong, F., Vaast, C., Newton, J., Tyszler, M., Pennington, A. (2017). White paper: A conceptual model on women and girls' empowerment. Amsterdam: Royal Tropical Institute (KIT).
[63] United Nations Entity for Gender Equality and the Empowerment of Women (UNEGEEW). (2021). Women in climate resilient agriculture in West and Central Africa: Key results of UN Women's flagship programme. UN Women Office Publishing: West and Central Africa Regional Office.
[64] Shepherd, J.G. (2019). Geoengineering the Climate: Science, Governance and Uncertainty (Royal Society, London, 2009): https://royalsociety.org/topics-policy/publications/2009/geoengineering-climate/.
[65] Hirsch, A.L., Wilhelm, M., Davin, E.L., Thiery, W., Seneviratne, S.I. (2017). Can climate-effective land management reduce regional warming? Journal of Geophysical Research: Atmospheres, 122(4): 2269-2288. https://doi.org/10.1002/2016JD026125
[66] Board, O.S., National Research Council. (2015). Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration. National Academies Press.
[67] Leclercq-Machado, L., Alvarez-Risco, A., Esquerre-Botton, S., Almanza-Cruz, C., de las Mercedes Anderson-Seminario, M., Del-Aguila-Arcentales, S., Yáñez, J.A. (2022). Effect of corporate social responsibility on consumer satisfaction and consumer loyalty of private banking companies in Peru. Sustainability, 14: 9078. https://doi.org/10.3390/su14159078
[68] Agbonifoh, C.I., Ogbeide, D.O. (2022). Determinants of customer loyalty during the COVID-19 pandemic: Evidence from the Nigerian telecommunication industry. Nigerian Academy of Management Journal, 17(1): 32-45.
[69] Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1): 2-24. https://doi.org/10.1108/EBR-11-2018-0203
[70] Kock, N., Lynn, G. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. Journal of the Association for Information Systems, 13(7): 1-40.
[71] Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. International Journal of e-Collaboration, 11(4): 1-10. https://doi.org/10.4018/ijec.2015100101
[72] Cain, M.K., Zhang, Z., Yuan, K.H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. Behavior Research Methods, 49: 1716-1735. https://doi.org/10.3758/s13428-016-0814-1
[73] Kline, R.B. (2016). Methodology in the social sciences. In Principles and Practices of Structural Equation Modelling (4th ed.). Guilford Press.
[74] Fornell, C.G., Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1): 39-50. https://doi.org/10.1177/002224378101800104