

Fostering Inclusive Green Economies: Women's Role in Entrepreneurship and Environmental Innovation

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ABSTRACT

The shift towards a green economy represents a critical challenge of the 21st century, driven by the urgent need to mitigate climate change, combat environmental degradation, and reduce unsustainable resource use. Integral to this transition is the active participation of women, whose entrepreneurial initiatives and innovative approaches are increasingly recognized as key drivers of sustainable development. Globally, women are emerging as influential agents of change in green sectors such as renewable energy, sustainable agriculture, and waste management, leading enterprises that enhance ecological sustainability and resilience. Despite their substantial contributions to advancing green economies, women often encounter systemic obstacles—including gender-based social norms, restricted financial access, and limited representation in leadership and policy-making arenas. This paper investigates the intersection of gender, entrepreneurship, and environmental sustainability, with a particular focus on the pivotal role women play in driving innovation within green sectors. By presenting case studies of women-led ventures, the paper illustrates how female entrepreneurs are not only addressing pressing environmental challenges but also catalysing economic development, generating employment, and reducing poverty. The discussion further highlights the need for supportive policies and gender-responsive strategies that enhance women's access to resources and decision-making roles within the green economy. Ultimately, this analysis emphasizes the broader socio-economic value of empowering women in environmentally sustainable fields—advancing social equity, promoting environmental justice, and ensuring an inclusive transition to a green economy. The paper concludes by advocating for coordinated global efforts to foster environments where women's contributions to sustainable innovation are acknowledged and supported, positioning gender empowerment as a cornerstone of long-term ecological and economic progress.

Keywords: Green Economy, Women Entrepreneurs, Environmental Innovation, Gender and Sustainability, Renewable Energy

INTRODUCTION

Amidst the growing challenges of climate change, environmental degradation and dwindling natural resources, the transition to green economies has become increasingly critical. At the heart of this shift lies the significant role of women, whose engagement in green entrepreneurship presents opportunities to advance both environmental sustainability and social equity (Guerrero and Stock, 2012). Across various regions, women are establishing enterprises centered on sustainable practices—efforts that simultaneously address ecological

concerns and promote economic independence and gender empowerment. As the global focus intensifies on sustainable development, it becomes clear that women's active involvement is vital for realizing long-term environmental objectives (ENERGIA, 2019). This paper examines the diverse ways in which women contribute to the green economy, with an emphasis on their entrepreneurial activities in sectors such as renewable energy, sustainable agriculture and waste management. It further evaluates the policy landscape influencing women's participation in these fields and provides strategic recommendations for creating a more inclusive

and equitable green economy.

Literature Review:

Women in Green Entrepreneurship:

Green entrepreneurship involves the creation of enterprises that prioritize environmental sustainability alongside economic viability (Karalam *et al.*, 2024). Women entrepreneurs are increasingly engaging in green sectors such as renewable energy, sustainable agriculture, waste management, and eco-tourism. These ventures not only support environmental protection by reducing carbon emissions and promoting sustainable practices but also foster employment and improve community livelihoods. The World Bank (2020) highlights that women, particularly in rural settings, tend to adopt environmentally sustainable practices due to their close relationship with natural resources and their roles in managing household well-being. Studies have shown that women-led enterprises often emphasize social equity, environmental responsibility, and community empowerment (Ergün *et al.*, 2024).

Nevertheless, women remain underrepresented in green entrepreneurship relative to men. This gender gap can be largely attributed to systemic barriers, including restricted access to education, financial resources, and technological tools (Guerrero and Stock, 2012). Addressing these structural challenges is essential to enhancing women's participation and leadership in green economic sectors.

Barriers to Women's Participation in Green Economies:

Although women in developing countries are increasingly participating in green entrepreneurship, they continue to encounter considerable obstacles. A key challenge is limited access to finance, as women-led ventures often struggle to attract investment. Research indicates that female entrepreneurs in green sectors receive less funding compared to their male counterparts, a disparity driven by investor bias and the absence of gender-responsive investment mechanisms (IFC, 2021). Furthermore, many women lack access to mentorship and professional networks, which are crucial for business growth and sustainability (Hande, 2016).

Cultural and societal norms also act as significant barriers, restricting women's full engagement in entrepreneurial activities. In various regions, traditional gender roles confine women to domestic responsibilities,

thereby limiting their participation in formal employment or entrepreneurial ventures (Galudra *et al.*, 2024). Additionally, prevailing gender stereotypes contribute to women's under representation in technical domains of the green economy, such as renewable energy and engineering.

Policy Frameworks for Inclusive Green Economies:

Gender-responsive policy frameworks play a pivotal role in enhancing women's involvement in green economic development. These frameworks must address gender-specific barriers by improving women's access to education, vocational training, and financial services. Policies that support microfinance programs for women and offer subsidies to women-led green businesses have demonstrated positive outcomes in several regions (UN Women, 2020). Incorporating gender-focused strategies into national development agendas can help ensure women are both contributors to and beneficiaries of green economic transformation.

The United Nations Environment Programme (UNEP, 2019) underscores the importance of policies that tackle structural inequalities, such as the unequal division of labour and the under representation of women in leadership and decision-making roles. Enhancing women's access to resources and supporting their active participation in green sectors is critical for fostering a truly inclusive and sustainable green economy.

Women in Key Green Sectors:

Renewable Energy:

The renewable energy sector is witnessing rapid expansion, with women increasingly assuming leadership roles and driving transformative change. Their involvement spans from the design and deployment of clean energy technologies to grassroots advocacy for improved energy access, particularly in underserved rural regions. In Sub-Saharan Africa, for instance, women have been instrumental in launching solar energy enterprises that deliver off-grid electricity solutions to remote communities, fostering local economic development and reducing dependence on fossil fuels (ENERGIA, 2019).

A notable example is the Barefoot College in India, a non-governmental organization that trains women—especially elderly women or grandmothers—to become solar engineers. Through this initiative, women acquire hands-on skills in installing and maintaining solar energy systems in rural areas, thus addressing energy poverty

and advancing gender equality (Hande, 2016). The program not only empowers women through technical education but also contributes significantly to the sustainable development of marginalized communities.

Sustainable Agriculture:

Women play a pivotal role in advancing sustainable agriculture, contributing significantly to both environmental stewardship and social well-being. In numerous developing regions, women are at the forefront of promoting organic farming, agroecological methods, and climate-resilient agricultural practices (FAO, 2018). These approaches emphasize soil conservation, reduced reliance on chemical inputs, and enhanced biodiversity—crucial elements for ensuring long-term food security and ecological balance.

In rural settings, where women frequently serve as the primary stewards of agricultural activities, their intimate understanding of local ecosystems and traditional knowledge makes them invaluable in the shift toward sustainable farming systems (Galudra *et al.*, 2024). A compelling example comes from East Africa, where women-led agricultural cooperatives have pioneered the adoption of agroforestry and organic cultivation. These initiatives not only combat the adverse effects of climate change but also strengthen food systems and enhance community resilience.

Waste Management and Recycling:

Waste management and recycling have emerged as critical sectors where women are increasingly engaging in entrepreneurial activities. In urban centres across the Global South—particularly in countries such as India, Brazil, and Kenya—women are spearheading innovative efforts to manage and reduce waste. A notable example is the Self-Employed Women's Association (SEWA) in India, which has enabled women to establish

enterprises that focus on recycling materials such as plastic, paper, and metal (Karalam *et al.*, 2024). These initiatives not only address environmental concerns by mitigating pollution but also generate employment and economic opportunities within marginalized communities.

Women-led efforts in waste management play a vital role in tackling the growing challenges associated with urban waste while advancing sustainable environmental practices. Moreover, these initiatives exemplify the convergence of gender equity and environmental justice, as they promote ecological sustainability and contribute to public health improvements in underserved areas (Table 1).

Case Studies of Women in Green Entrepreneurship: SELCO India:

SELCO India, a pioneering social enterprise, delivers solar energy solutions to marginalized communities, with a strong focus on empowering women in rural areas. A central aspect of its model involves training women to become solar technicians, enabling them to assume leadership roles in renewable energy initiatives (Cheah and Parwez, 2019). These women entrepreneurs are equipped with the technical expertise to install and maintain solar systems, thereby expanding access to off-grid energy for rural households. Beyond addressing energy poverty, SELCO's approach promotes gender equality by actively involving women in the clean energy sector.

The Barefoot College:

The Barefoot College, headquartered in India, adopts a grassroots approach by training women—particularly grandmothers—from rural areas to become solar engineers. This initiative has significantly contributed to the electrification of remote communities while simultaneously equipping women with technical

Table 1 : Women's Contributions Across Green Sectors and Their Socio-Environmental Impact

Green Sector	Women's Role	Impact
Renewable Energy	Solar engineering, clean cookstove innovation	Access to energy, reduced emissions, improved public health
Sustainable Agriculture	Organic farming, seed preservation, agroforestry	Food security, biodiversity conservation, economic independence
Waste Management	Recycling initiatives, composting, e-waste processing	Urban cleanliness, circular economy, job creation
Eco-Tourism	Community-based tourism, conservation education	Local livelihood development, cultural preservation, sustainability
Green Textiles	Natural dyes, upcycled fabrics, low-impact production	Reduced water pollution, ethical fashion, employment for rural women

Source: Adapted from FAO (2018), Karalam *et al.*, 2024, UN Women (2020)

competencies and leadership skills (Hande, 2016). Graduates of the program not only install solar energy systems but also act as educators and advocates for renewable energy within their communities, thereby amplifying the reach and impact of the initiative.

The Socio-Economic Benefits of Women in Green Entrepreneurship:

The inclusion of women in green entrepreneurship yields substantial socio-economic benefits. It fosters employment generation in emerging sustainable industries, thus supporting economic growth and poverty alleviation. According to the World Bank (2020), women-led green enterprises often emphasize social equity, with many reinvesting earnings into their households and local communities. This reinvestment contributes to broader improvements in healthcare, education, and infrastructure.

Moreover, women entrepreneurs typically adopt business models grounded in inclusivity and environmental sustainability, enhancing community resilience and ecological balance. Their success can serve as a powerful catalyst, inspiring future generations of women to engage in entrepreneurial ventures within green sectors and thereby reinforcing the foundations of inclusive and sustainable economies.

Challenges and Opportunities for Women Entrepreneurs in Green Sectors:

Despite the promising potential of women's participation in green industries, several structural barriers persist. These include limited access to financial resources, entrenched gender biases, and socio-cultural norms that constrain women's entrepreneurial engagement (IFC, 2021; UN Women, 2020). Women often face challenges in securing land ownership, patents,

and technological tools—factors that are essential for launching and scaling green enterprises (Guerrero and Stock, 2012).

In addition, the under representation of women in science, technology, engineering, and mathematics (STEM) fields restricts their participation in high-growth green sectors such as renewable energy, climate-smart agriculture, and environmental engineering (UNEP, 2019). Domestic responsibilities and caregiving roles, often unequally distributed, further reduce the time and mobility women have to engage in formal entrepreneurship (Ergün *et al.*, 2024).

Nonetheless, these challenges also offer strategic opportunities. The growing global momentum around sustainability and inclusive development creates favourable conditions for transformative change. Emerging sectors such as the circular economy, sustainable textiles, and eco-tourism are opening new doors for women-led enterprises (Karalam *et al.*, 2024). Moreover, digital platforms, climate innovation hubs, and women-led cooperatives present scalable models that combine environmental solutions with social empowerment (Galudra *et al.*, 2024).

To fully leverage these opportunities, gender-sensitive strategies that enhance access to finance, technical training, mentorship, and market linkages are essential. Building an enabling ecosystem where women entrepreneurs can thrive in green sectors is not only a matter of social justice but a critical step toward achieving inclusive and sustainable economic growth (World Bank, 2020).

Policy Recommendations for Advancing Inclusive Green Economies:

To ensure women's equitable participation in the green economy, the following strategies are suggested

Table 2 : Identifying Gaps and Policy Actions to Promote Women in Green Economies	
Existing Policy Gaps	Recommended Policy Actions
Inadequate access to gender-sensitive funding mechanisms	Establish dedicated green credit lines and grants for women-led enterprises
Limited technical and vocational training programs for women	Develop inclusive curricula in renewable energy, sustainable agriculture, and waste recycling
Underrepresentation in climate leadership and decision-making	Quotas and incentives for female leadership in environmental boards and government agencies
Lack of integration of gender in environmental policies	Mainstream gender in climate policy planning, budgeting, and monitoring
Weak support for women's cooperatives in green sectors	Legal recognition, funding access, and market linkages for women-led cooperatives

Source: UNEP (2019), UN Women (2020), Guerrero and Stock (2012).

(Table 2).

1. **Inclusive Financial Support:** Create financing options specifically aimed at supporting women-led ventures in green industries, including microloans and gender-focused investment programs.
2. **Skill Development and Training:** Introduce educational initiatives that offer women hands-on training in eco-friendly technologies and sustainable business operations, empowering them with practical skills and knowledge.
3. **Gender-Inclusive Policy Reforms:** Adopt and enforce policies that tackle gender-related obstacles, such as disparities in access to resources, leadership roles, and decision-making platforms within green sectors.

Supportive Networks and Mentorship:

Build professional networks and mentorship systems that connect women entrepreneurs with experts and peers in green sectors to encourage collaboration, learning, and long-term growth (Guerrero and Stock, 2012).

Gender and Climate Finance: Bridging the Gap for Women Entrepreneurs:

Access to climate finance remains one of the most significant barriers to the growth of women-led green enterprises. Climate finance—sourced from public, private, and multilateral channels—supports climate mitigation and adaptation strategies. Yet, women entrepreneurs are often excluded due to institutional bias, lower credit scores, and limited participation in formal financial systems (IFC, 2021).

Integrating gender equality into climate finance mechanisms is essential. While international frameworks like the Green Climate Fund (GCF) have initiated gender action plans, their effective implementation at local levels remains inconsistent. To close this gap, targeted initiatives must promote transparency, apply gender-sensitive risk assessments, and offer technical assistance. Bridging the gender gap in climate finance is crucial not only for advancing environmental goals but also for achieving inclusive economic development and social equity.

Conclusion:

Women play a pivotal role in shaping the future of green economies through their entrepreneurial efforts and

environmental innovations. Their contributions in areas such as clean energy, sustainable agriculture, and waste management drive both ecological sustainability and social justice. Yet, systemic challenges—including limited funding, restricted access to training, and socio-cultural constraints—continue to hinder their full potential.

Addressing these issues requires inclusive policy reforms, strategic investments, and capacity-building initiatives that empower women to lead in green sectors. By strengthening women's roles in the green economy, societies can foster sustainable, inclusive, and resilient pathways that support both environmental progress and equitable economic growth.

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