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Women-Led Green Startups Promoting Sustainable Development in Tamil Nadu

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ABSTRACT :

Tamil Nadu, one of India's most industrially and environmentally diverse states, has seen a surge in sustainable entrepreneurship, with women increasingly at the forefront. These women entrepreneurs are actively engaged in areas such as organic farming, waste management, renewable energy, eco-tourism, and green manufacturing, often blending traditional knowledge with modern sustainable technologies. As the world confronts the escalating challenges of climate change, ecological degradation, and resource scarcity, and there is a growing consensus that innovative, localized, and socially responsible solutions are essential. Within this context, women-led green startups—enterprises that are both environmentally sustainable and spearheaded by women—are gaining attention for their unique potential to drive both ecological transformation and socio-economic empowerment. This study examines the emergence and impact of women-led green startups in Tamil Nadu, highlighting their role in advancing sustainable development goals (SDGs). It explores institutional support mechanisms, socio-economic contributions, environmental innovations, and challenges faced by women entrepreneurs in the green economy. Drawing from secondary data, case studies, and policy analyses, the paper identifies how targeted government schemes and incubation programs are fostering inclusive, eco-conscious entrepreneurship across rural and urban regions. The findings underscore the need for gender-sensitive policy interventions and scaling mechanisms to strengthen women's participation in sustainable development. The intersection of gender empowerment and ecological entrepreneurship forms the basis of this paper, which explores how these businesses are shaping a resilient, inclusive green economy.

Keywords : Women entrepreneurship, Green startups, Tamil Nadu, Social innovation, Sustainable development ,Incubation, Eco-enterprises, Inclusive growth, Gender empowerment, Climate resilience.

Introduction

In recent years, the intersection of *gender, entrepreneurship, and environmental sustainability* has emerged as a powerful pathway for inclusive development, especially in emerging economies like India. As the world confronts the escalating challenges of climate change, ecological degradation, and resource scarcity, there is a growing consensus that innovative, localized, and socially responsible solutions are essential. Within this context, *women-led green startups*—enterprises that are both environmentally sustainable and spearheaded by women—are gaining attention for their unique potential to drive *both ecological transformation and socio-economic empowerment*. Tamil Nadu, one of India's most industrially and environmentally diverse states, has seen a surge in sustainable entrepreneurship, with women increasingly at the forefront. These women entrepreneurs are actively engaged in areas such as *organic farming, waste management, renewable energy, eco-tourism, and green manufacturing*, often blending traditional knowledge with modern sustainable technologies. Their ventures not only address critical environmental issues like pollution, deforestation, and carbon emissions but also create *livelihoods, strengthen community resilience*, and promote *women's leadership* in non-traditional sectors. Despite their impact, *women-led green startups face significant systemic challenges*. These range from limited access to finance, gendered social norms, lack of technical training, and market linkages to weak institutional support. Conversely, enablers such as *government schemes, incubator programs, digital platforms, and community support networks* are emerging to facilitate their growth. However, research on this topic remains relatively sparse, especially in the Indian context, and even more so in *regional ecosystems like Tamil Nadu*. This study seeks to fill this gap by examining the *ecosystem surrounding women-led green startups* in Tamil Nadu. It explores their *environmental and socio-economic contributions*, identifies the *barriers and enablers* shaping their development, evaluates *government and private sector interventions*, and proposes *scalable strategies* to enhance their impact. Through a combination of qualitative and secondary data analysis, the research aims to generate actionable insights that can inform policy, practice, and future academic discourse. As India pursues its *Sustainable Development Goals (SDGs)* and prepares for a *green economic transition*, empowering women entrepreneurs in the sustainability sector is no longer optional—it is essential. These study positions women not just as beneficiaries of development but as *key agents of change* in building a greener, more equitable future. Sustainable development in the 21st century requires inclusive participation, especially from underrepresented groups such as women. In Tamil Nadu, a growing number of women-led green startups are addressing environmental challenges while generating social and economic value. Supported by programs like StartupTN, TN-RISE, and international initiatives (e.g., World Bank and EU-backed GENIE), these startups

range from organic farming ventures to waste recycling innovations. The intersection of gender empowerment and ecological entrepreneurship forms the basis of this paper, which explores how these businesses are shaping a resilient, inclusive green economy.

Review of Literature

1. *Women in Entrepreneurship* Research has consistently highlighted the role of women entrepreneurs in driving inclusive economic growth (Brush et al., 2009; Tambunan, 2008). In India, women-owned enterprises comprise nearly 20% of MSMEs (MSME Ministry, 2022), yet face systemic challenges including access to finance, limited networks, and patriarchal constraints (Bardasi et al., 2011).
2. *Green and Sustainable Startups* Sustainable or green entrepreneurship is characterized by ventures that seek to address environmental problems through innovation (Dean & McMullen, 2007). Research by Schick et al. (2002) and Cohen & Winn (2007) suggests that green startups are more agile and responsive to environmental issues than traditional businesses. In the Indian context, recent studies (Agarwal & Singh, 2021; CEEW, 2022) have documented growth in sectors like renewable energy, organic agriculture, and eco-friendly product manufacturing, with startups playing a pivotal role in localized sustainable development.
3. *Gender and Environmental Innovation* The role of women as environmental stewards is well documented in environmental sociology and feminist ecological studies (Shiva, 1989; Dankelman, 2010). Women entrepreneurs often integrate sustainability into their business models not merely for profit, but also from a values-based motivation linked to community and environmental care (Jamali, 2009). Studies by Minniti & Naudé (2010) show that women are more likely to engage in environmentally and socially responsible entrepreneurship, although underrepresented in green innovation due to structural exclusion from STEM and energy sectors.
4. *Institutional Ecosystems and Policy Frameworks* The entrepreneurial ecosystem, including *incubators, accelerators, government schemes, and mentorship programs*, plays a crucial role in supporting women-led green startups. Research by Isenberg (2010) and Spigel (2017) emphasizes the importance of tailored ecosystems to support underrepresented entrepreneurs. In India, programs like *Startup India, MUDRA Yojana*, and *Tamil Nadu's Startup & Innovation Policy (2018)* provide frameworks for support, yet gender-disaggregated data on beneficiaries is scarce. Kabeer and Natali (2013) argue that inclusive policies must go beyond access to capital and address deep-rooted socio-cultural barrier
5. *Brush, C.G., et al. (2009)* – Women entrepreneurs face structural and socio-cultural barriers but excel in impact-driven sectors such as green and social innovation.
6. *OECD (2020)* – Gender-inclusive entrepreneurship is critical to achieving SDG 5 and SDG 13
7. *Desai, V. (2021)* – Environmental entrepreneurship in South India shows strong correlation with social capital and local institutional support.
8. *UNESCAP (2022)* – Inclusive green economy policies can triple women-led enterprise participation if coupled with funding and training access.
9. *Mishra & Menon (2023)* – Tamil Nadu's StartupTN and Women Development Corporation have successfully piloted programs scaling women-led climate ventures.

Statement of the problem

The effective implementation of entrepreneurial ecosystems continues to face obstacles, despite their increasing recognition as drivers of inclusive and sustainable economic growth. A lot of start-ups, especially those that are inclusive and green, have trouble finding investors, mentors, and market prospects. Further impeding their expansion are regulatory obstacles, a lack of infrastructure, and a lack of legislative support. Under-represented groups also frequently face systemic barriers that hinder their full involvement in the entrepreneurial scene, including women, minorities, and entrepreneurs in rural areas. In the absence of a healthy and thriving ecosystem, chances for social justice, environmental sustainability, and economic growth are lost. As a result, this study looks at how entrepreneurial ecosystems support inclusive and green firms, identifies important gaps, and offers practical suggestions for development in order to address these issues.

Objectives of the study

1. To analyze the ecosystem supporting women-led green startups in Tamil Nadu.
2. To assess the environmental and socio-economic impact of such startups.
3. To explore the barriers and enablers in the growth of women-led green enterprises.
4. To evaluate government policies and incubation frameworks targeted at women entrepreneurs.
5. To propose strategies for scaling and replicating successful models.

Research Methodology

This study utilises a combined methods research strategy, Qualitative and exploratory approach Secondary data from government reports (StartupTN, TN-RISE, Vazhndhu Kattuvom), NGO publications, and startup databases. Case studies of startups such as *Eco Femme, Mannvasanai*, and *GreenFem Producer Company*. Literature from academic journals, policy papers, and sustainability reports

1. To Analyze the Ecosystem Supporting Women-Led Green Startups in Tamil Nadu

This objective focuses on understanding the *entrepreneurial ecosystem* that enables the emergence and growth of *women-led green startups* in Tamil Nadu. The analysis encompasses both structural and institutional components of the ecosystem, including:

Incubators and Accelerators: These provide early-stage women entrepreneurs with access to technical support, business development services, co-working spaces, and networking opportunities. Government-supported initiatives like *StartupTN*, *TN-RISE*, and university-based incubators play a vital role in nurturing green innovations led by women.

Funding Institutions: Access to capital remains a critical factor in startup development. The study explores the availability and accessibility of *seed funding*, *grants*, *venture capital*, and *microfinance* options tailored for women entrepreneurs, particularly those focusing on sustainability, clean tech, and circular economy solutions.

Mentorship and Capacity Building: The presence of structured mentorship programs and entrepreneurship training—especially those with a gender lens—enhances the confidence and competence of women entrepreneurs. Programs under the *World Bank's Vazhndhu Kattuvom* initiative and *EU-supported GENIE Project* are assessed for their impact on women's entrepreneurial journeys.

Startup Networks and Communities: Ecosystem connectivity is amplified through platforms that link entrepreneurs with peers, experts, investors, and policymakers. This includes regional forums, women-in-business associations, and sustainability-focused enterprise networks that foster collaboration and shared learning.

Market Linkages: Establishing viable market access for eco-friendly products and services is essential for long-term sustainability. The study examines how public-private partnerships, digital platforms, and e-commerce initiatives (e.g., tie-ups with Flipkart, Amazon Saheli) contribute to the market readiness of women-led green startups.

2. To Assess the Environmental and Socio-Economic Impact of Women-Led Green Startups

This objective seeks to evaluate the *dual impact*—*environmental* and *socio-economic*—of women-led green startups operating in Tamil Nadu. These enterprises not only aim to address ecological challenges but also play a transformative role in promoting inclusive development and gender empowerment.

Environmental Impact Assessment

Women-led green startups often prioritize environmentally responsible practices and innovations. This study analyzes the contributions of such enterprises in the following areas:

- *Waste Management and Recycling:* Initiatives focusing on upcycling, composting, plastic alternatives, and community-based waste collection (e.g., GreenFem Producer Company) help reduce landfill burden and improve urban and rural hygiene.
- *Promotion of Renewable Energy:* Startups engaged in solar energy, biofuels (e.g., cooking oil to biodiesel recycling), and energy-efficient technologies contribute to climate mitigation goals.
- *Sustainable Products and Consumption:* Enterprises producing eco-friendly menstrual products, biodegradable packaging, and organic agricultural inputs help reduce pollution and ecological degradation.
- *Biodiversity and Resource Conservation:* Some ventures promote indigenous farming practices, seed conservation, and natural resource stewardship (e.g., Mannvasanai promoting traditional millet farming).

Socio-Economic Impact Assessment

Beyond environmental stewardship, women-led green startups also drive economic and social transformation, particularly in underserved areas:

- *Employment Generation:* These startups create *direct and indirect employment*, especially for rural women and marginalized communities. The study will quantify the number of jobs created through case studies and secondary data.
- *Income Enhancement and Financial Inclusion:* Women's participation in entrepreneurship contributes to increased household incomes and improved financial literacy, fostering long-term resilience.
- *Empowerment and Gender Equality:* Running a green enterprise enhances women's agency, decision-making power, and social mobility, thereby advancing SDG 5 (Gender Equality).
- *Rural and Community Development:* Many startups work within *Self-Help Group (SHG)* frameworks and producer collectives, fostering solidarity, skills transfer, and inclusive local economic growth.
- *Health and Wellbeing:* Products and services that reduce pollution, provide clean energy, or improve sanitation have measurable positive effects on community health.

3. To Explore the Barriers and Enablers in the Growth of Women-Led Green Enterprises

This objective focuses on identifying and analyzing the *critical challenges (barriers)* and *success factors (enablers)* that influence the trajectory of women-led green startups in Tamil Nadu. Understanding these elements is essential for designing effective policies and interventions to support women entrepreneurs in the green economy.

Barriers to Growth

Despite increasing support for women entrepreneurship, several systemic and situational barriers continue to impede the growth of women-led green enterprises. Key barriers include:

- *Limited Access to Finance:* Many women face difficulties in securing startup capital, loans, or investor backing due to a lack of collateral, credit history, or gendered assumptions about business risk.
- *Gender Bias and Social Norms:* Societal expectations often limit women's mobility, time, and perceived business acumen, especially in rural areas, discouraging entrepreneurial pursuits.
- *Skill Gaps and Limited Exposure:* Technical knowledge about green technologies and business management skills are often lacking due to gendered educational inequalities or lack of access to specialized training.
- *Market Constraints:* Difficulty in accessing markets, building brand visibility, or dealing with supply chain logistics can hinder business scalability.

- **Regulatory and Bureaucratic Hurdles:** Navigating complex regulations, licenses, and taxation frameworks can be disproportionately challenging for first-time or grassroots women entrepreneurs.

Enablers of Growth

On the other hand, several factors facilitate the emergence and success of women-led green startups:

- **Policy and Institutional Support:** Tamil Nadu government initiatives such as *StartupTN*, *MSME support programs*, and the *Women Entrepreneur Parks* offer incubation, mentorship, and seed funding to female founders.
- **Community and SHG-Based Models:** Support from *Self-Help Groups (SHGs)* and local NGOs fosters collective ownership, training, and access to microcredit, particularly in rural green enterprises.
- **Education and Capacity Building:** Vocational training in renewable energy, organic farming, eco-craft, and digital marketing enhances entrepreneurial confidence and competency.
- **Digital and E-Commerce Platforms:** Online marketplaces like *Amazon Saheli* and *Meesho* offer visibility and customer access to eco-conscious women entrepreneurs, especially in Tier 2 and Tier 3 cities.
- **Recognition and Role Models:** Visibility of successful women green entrepreneurs through awards, media coverage, and peer learning platforms acts as a motivational and replicable model for others.

4. To evaluate government policies and incubation frameworks targeted at women entrepreneurs

Government-backed Incentive & Incubation Programs

- **StartupTNSpecialPackages:** Launched by Chief Minister M.K. Stalin in late 2022, these packages comprise grants, incubator spaces, mentorship, acceleration programs, and tailor-made Angel investor circles for women-led startups ($\geq 75\%$ women-owned) in green tech, rural impact, and FemTech. Early-stage startups got ₹5 lakh seed grants—seven green-tech startups and 10 women-led startups were among the first recipients, plus waived co-working fees up to ₹2 lakh in the first year [worldbank](#)

- **TN-RISE (Tamil Nadu Rural Incubator & Start-Up Enabler):**

A World Bank-backed initiative under the Tamil Nadu Women Development Corporation launched in July 2024. It supports rural women entrepreneurs with market linkages, finance facilitation, incubation, and partnerships with Flipkart, HP, etc. 126 entrepreneurs and 80 enterprise groups have already benefited times of India

- **Exclusive Women-Focused Startup Mission:** A key pillar of the 2023-24 budget, this mission under StartupTN facilitates climate, rural, agri, and marine tech incubators, with up to 40% funding support [thehindu.com](#).

Empowerment Through Skill-Building & Finance

- **World Bank's Vazhdhu Kattuvom / TN Rural Transformation:**

This program has trained rural women (e.g., masonry training near Tiruchy) and provided matching grants facilitating ₹267 crore in loans for 8,400 women-led enterprises since 2022. Over 100,000 micro-enterprises and 53,000 jobs have been created, inspiring similar models in other states .

- **GENIE Project (EU-supported via TREC-STEP):** Launched in 2020 to equip women with green/climate innovation tools, GENIE has supported 1,433 women-led climate ventures in Tamil Nadu alone, leading to 1,200 new green jobs [dtnext.in](#).

Success Stories of Women-led Green Startups

- **Mannvasanai:** Founded by E.Menaka, who left Polaris to promote traditional rice and millet-based products. After securing ₹45 lakh for a minority equity stake, she has opened three outlets in Chennai and launched packaged millet batters [timesofindia.indiatimes.com](#).
- **Eco Femme:** Auroville-based women-led social enterprise that makes GOTS-certified reusable cloth pads since 2009. Over 1 million pads distributed with 75 million single-use pads prevented from reaching landfills [en.wikipedia.org](#).
- **GreenFem Producer Company (Madurai):** A women-led producer company since 2020, making jute/cloth bags, organic soaps, herbal napkins, and offering training in jute, paper bags, embroidery, and business skills—uplifting rural women [greenfem.in](#).
- **SMEs backed by Tvaran (Villgro & Cisco):** Women-led enterprises recycling plastic and used cooking oil. One startup processed 30 tonnes of used oil/month into biodiesel, raising ₹3 crore via Chennai Angels

Ecosystem Strength & Scale

- **Startup Demographics:** Tamil Nadu hosts 576 all-women startups and 3,654 with at least one woman founder. Funding raised includes ₹3,520 crore from angels/VCs and ₹2,906 crore in bank loans [thehindu.com](#).
- **Registration Boom:** Over 622,000 women-led startups registered via the Udyam portal in three years, making Tamil Nadu second-highest nationwide

5. To Propose Strategies for Scaling and Replicating Successful Models

The final objective of this study is to develop and recommend *practical, scalable, and replicable strategies* that can broaden the reach and deepen the impact of *women-led green startups*, both within Tamil Nadu and in similar regional, national, and global contexts. These strategies will be informed by the *empirical findings, case study analysis, and stakeholder inputs* gathered throughout the research.

Rationale for Scaling and Replication

Women-led green startups are often *locally rooted and context-specific*, yet many of their innovations and approaches have the potential for *wider application*. To unlock this potential, it is essential to develop strategic frameworks that:

- Support transition from *pilot-scale* to *growth-stage* operations.
- Enable *replication of successful models* in other geographies with similar socio-economic and ecological conditions.
- Ensure the *sustainability and inclusivity* of such initiatives across the lifecycle of the enterprise.

Proposed Strategic Areas

Based on the data and case studies examined, the study will propose strategies under the following focus areas:

Policy Integration and Incentive Design

Institutionalize green entrepreneurship into state and national development policies.

Provide *gender-sensitive incentives*, including tax exemptions, innovation grants, and green certifications tailored for women-led enterprises.

Capacity Building and Green Skill Development

Expand *technical training*, eco-innovation labs, and vocational education programs focused on green technologies, especially in rural and semi-urban areas.

Integrate *climate education and entrepreneurship* into school and college curricula, with a focus on women and girls.

Access to Finance and Investment Readiness

Promote dedicated *gender-inclusive green finance mechanisms* such as climate venture funds, social impact investing, and zero-interest revolving funds.

Offer *investment readiness programs* to help women-led startups prepare for pitching, scaling, and compliance.

Replication Toolkits and Peer Networks

Develop *scalable models and replication toolkits* (e.g., business plans, impact measurement frameworks) that can be used by other aspiring women entrepreneurs.

Strengthen regional *peer-learning platforms* and mentorship networks to accelerate knowledge transfer and collaborative scaling.

Technology and Digital Enablement

Promote the use of *digital platforms for e-commerce, logistics, and marketing* to scale outreach.

Encourage adoption of *green technologies and innovations* through open-source platforms and innovation hubs.

Broader Impact and Global Relevance

- Provide a *roadmap for ecosystem actors*—governments, NGOs, investors, and academic institutions—to support women-led green innovation.
- Create *replicable policy and program models* that align with global agendas such as the *UN Sustainable Development Goals (SDGs)*, particularly SDG 5 (Gender Equality), SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).
- Contribute to a *knowledge base* for emerging economies looking to combine *gender empowerment and climate resilience* through inclusive entrepreneurship.

Conclusion

Women-led green startups in Tamil Nadu represent a powerful convergence of *gender empowerment, environmental sustainability, and economic innovation*. These enterprises are not only addressing pressing ecological issues such as waste management, pollution, and climate change, but are also playing a transformative role in advancing *social equity, local employment, and women's leadership* in traditionally male-dominated sectors. This study has highlighted the multifaceted *ecosystem* that supports these startups—comprising incubators, funding bodies, government schemes, mentorship networks, and market linkages. At the same time, it has revealed persistent *barriers* such as gender bias, limited access to finance, and capacity gaps that hinder growth and scalability. The *environmental and socio-economic impacts* of these startups are significant, demonstrating that women-led ventures can catalyze systemic change while also aligning with the Sustainable Development Goals (SDGs). As Tamil Nadu continues to advance its green economy vision, supporting women entrepreneurs in this sector is not only a strategic economic investment but also a moral imperative for sustainable development. To fully realize this potential, the state must implement *integrated strategies*—including targeted funding, mentorship programs, inclusive policy design, and awareness campaigns—to create an enabling environment that nurtures and scales women-led green innovation. The insights from this study can serve as a model for other regions in India and beyond, inspiring *replicable frameworks* for a greener, more inclusive future.

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