

Women 5.0 and the Future of Sustainable Innovation: A Case Study of Telangana's Inclusive Entrepreneurship Ecosystem

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Abstract

The transition from Industry 4.0 to Industry 5.0 represents a paradigm shift from automation-driven industrial progress toward a **human-centric, sustainable, and inclusive** model of development (European Commission, 2021). Within this emerging framework, the concept of Women 5.0 encapsulates the empowerment of women as pivotal agents of innovation, sustainability, and entrepreneurship. This paper examines how **Telangana**, a leading Indian state in innovation and enterprise policy, has become a hub for women-led sustainable ventures through initiatives such as **WE Hub**, the **Women Entrepreneurship Platform (WEP) – Telangana Chapter**, and collaborations with **NITI Aayog** and the **National Stock Exchange (NSE)**. Drawing on case-based illustrations, the study explores women entrepreneurs driving sustainable innovation across sectors including environmental technology, circular economy, and health tech. The analysis concludes that Women 5.0 exemplifies the intersection of gender empowerment, inclusive innovation, and sustainable development—positioning Telangana as a replicable model for regional and national advancement.

Keywords

Industry 5.0; Women Entrepreneurship; Sustainable Innovation; Telangana; WE Hub; Inclusive Development; Circular Economy

1. Introduction

The emergence of *Industry 5.0* reflects an evolution in global development thinking—from prioritizing automation and productivity to fostering **human-centric innovation** that integrates sustainability, social inclusion, and resilience (Demirkan & Spohrer, 2023). Unlike *Industry 4.0*, which centered on digital efficiency, *Industry 5.0* highlights **collaboration between technology and humanity** to achieve ethical and sustainable growth (Breque et al., 2021).

Within this conceptual transformation, *Women 5.0* situates women not merely as participants but as **leaders of innovation ecosystems** who shape sustainable solutions addressing both environmental and economic challenges.

In India, the state of **Telangana** provides a compelling case study. Through strategic policies, government-led incubators, and ecosystem partnerships, Telangana has emerged as one of the country's leading regions for women's entrepreneurship (WE Hub, 2024). Initiatives such as **WE Hub**, **WEP Telangana Chapter**, and linkages with **NITI Aayog** and **NSE** reflect the state's commitment to advancing **inclusive, sustainability-oriented innovation**.

2. The Women 5.0 Framework

The *Women 5.0* framework is aligned with the guiding principles of *Industry 5.0*, emphasizing human values, sustainability, and inclusivity. It integrates three foundational pillars:

1. **Human-Centric Development:** Recognizing women as central to innovation, community resilience, and social progress.
2. **Sustainability Orientation:** Promoting eco-conscious design, circular economy practices, and responsible production.
3. **Inclusive Growth:** Expanding women's participation across technology, entrepreneurship, and emerging green sectors.

By uniting **gender empowerment** with **sustainable innovation**, *Women 5.0* reinforces the notion that social equity and environmental responsibility are mutually reinforcing elements of long-term economic vitality (OECD, 2022).

3. Telangana: A Fertile Ecosystem for Women-Led Sustainable Innovation

3.1 Policy and Institutional Support

Telangana's innovation ecosystem is anchored by **WE Hub**, India's first state-run incubator dedicated to women entrepreneurs. WE Hub offers structured incubation, capacity building, and funding access to women-led MSMEs, with an explicit focus on sustainability-oriented enterprises (WE Hub, 2024). The **Women Entrepreneurship Platform (WEP) – Telangana Chapter**, established in collaboration with **NITI Aayog**, extends this ecosystem by integrating mentorship and state-national level support systems (NITI Aayog, 2023).

3.2 Financial Inclusion and Capital Access

Financial innovation has been further strengthened through the **WE Hub–National Stock Exchange (NSE)** collaboration. This initiative promotes **financial literacy**, **IPO awareness**, and access to equity markets for women-led MSMEs via the *NSE Emerge* platform. Such programs expand women's participation in formal financial ecosystems, reducing dependency on short-term credit or grants (The Times of India, 2024).

3.3 Innovation Hubs and Entrepreneurial Networks

T-Hub, Telangana's flagship innovation center, and networks such as **TiE Women Hyderabad** play a critical role in integrating women founders into mainstream innovation ecosystems. These platforms facilitate mentorship, investor linkages, and knowledge exchange through events and accelerators, ensuring that women innovators in sustainability and technology gain visibility and strategic partnerships (The Times of India, 2024).

4. Case Studies of Women-Led Sustainable Innovation in Telangana

4.1 Pratibha Bharathi – Bio-Compostable Packaging¹

- **Innovation:** Development of starch-based, bio-compostable alternatives to single-use plastic bags.
- **Sustainability Impact:** Reduces plastic waste, supports compostable material use, and contributes to circular waste management.

4.2 Arunjyothi Lokhande – Compostable Seed Paper²

- **Innovation:** Creation of seed paper that decomposes naturally and germinates into saplings, enriching soil and promoting reforestation.
- **Sustainability Impact:** Integrates waste reduction, circular design, and urban greening.

4.3 Women Innovators in the TiE Women / Hyderabad Ecosystem³

- **Examples:**
 - *Avinya NeuroTech* – Affordable AI-based brain monitoring for accessible healthcare.
 - *Prasinos Tech* – Nanobubble and ozone-based water purification technology.
 - *Rare & Authentic Extracts* – Seaweed-based edible and biodegradable packaging materials.
- **Sustainability Impact:** Demonstrates technological diversity among women-led startups advancing sustainability in health, environment, and materials innovation.

4.4 Sustain-Her-Ability Cohort⁴

- **Focus:** Women-led enterprises in sustainable fashion, circular crafts, and waste-to-product innovation.
- **Sustainability Impact:** Promotes social inclusion, local employment, and low-carbon production models.

4.5 Grassroots Eco-Enterprises⁵

- **Scope:** Community enterprises and women-led self-help groups (SHGs) engaged in upcycling, millet-based food products, herbal remedies, and sustainable crafts.
- **Support:** Supported by WE Hub, T-Hub, and local development programs.

¹ *The Hans India* (2024).

² *The Hans India* (2024).

³ *The Times of India* (2024).

⁴ *The New Indian Express* (2024).

⁵ *Enterprise IT World* (2024).

- **Impact:** Builds inclusive local economies and reduces ecological footprints.

5. Lessons and Insights

Key Driver	Impact
Targeted incubators (e.g., WE Hub)	Accelerate growth of women founders in sustainability sectors ⁶
Visibility through events and demo days	Increases investor access and pilot customer opportunities ⁷
Financial literacy and IPO readiness	Opens non-traditional capital pathways for women-led MSMEs ⁸
Cross-sector partnerships	Combine traditional skills with circular and technological innovation ⁹
Policy-backed inclusion	Integrates women entrepreneurs into state and national innovation agendas ¹⁰

6. Conclusion

Telangana's *Women 5.0* ecosystem exemplifies the productive convergence of **gender equity, innovation, and sustainability**. Supported by robust policy instruments and institutional frameworks, women entrepreneurs are driving progress across environmental, social, and economic dimensions.

Initiatives such as **WE Hub**, **WEP**, and **T-Hub** demonstrate how targeted state-level interventions can transform the entrepreneurial landscape and accelerate the transition toward a **sustainable innovation economy**. The *Women 5.0* model, therefore, offers a **replicable policy blueprint** for other regions aspiring to align *Industry 5.0* principles with gender empowerment and inclusive, sustainable growth.

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⁶ WE Hub, 2024

⁷ TIE Hyderabad, 2024

⁸ NSE-WE Hub, 2024

⁹ The New Indian Express, 2024

¹⁰ NITI Aayog, 2023

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