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Eco-Entrepreneurship through Handmade Papermaking: A Waste-To-Wealth Model for a Green Economy and Inclusive Development

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Abstract

Green economy is a sustainable system where eco-friendly industries create jobs by protecting natural resources and stimulating sustainable development. It enables an improvement of human well-being along with the social equity besides reducing carbon emissions/footprints. This may also lead to the adoption of cleaner technologies through waste management and use of renewable energy alternatives. Handmade paper making is one such enterprise that creates a pathway to the inclusive green entrepreneurship by way of converting local waste into valuable goods in ecofriendly manner with an avenue of mass employment opportunities.

Since ancient time, handmade paper industry has been flourishing deeply in association with the major pillars of sustainability i.e. environmental, economic, and social. Therefore, it is highly relevant for the present era of sustainable development. The present study explores how this “waste-to-wealth” model can support inclusive development and eco-entrepreneurship for women, youth, and transgender communities.

Kumarappa National Handmade Paper Institute (KNHPI), Jaipur, showcases the generation of high-quality non-wood, eco-friendly paper production aiding in resource conservation, and reducing pollution while creating labor-intensive employment. By educating women, youth, and transgender entrepreneurs in pulp preparation, handmade papermaking, natural dyeing, product designing and screen printing, the sector can build resilient micro-enterprises that transform municipal, agricultural, and ritual temple offerings into useful amenities.

Also, the steps to increase eco-entrepreneurship include short modular training programs, women-friendly work environment, seeding micro-finance, incubation support for product development and exposure to online and export markets. Value-addition through aesthetic designs and quality standards will increase incomes and also attract youth and marginalized community persons.

Such interventions at large scale will lead to strengthening of local circular economies, reducing pressure on forests and lowering the landfill burdens, contributing directly to sustainability and greener economy with a secured future.

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Introduction

As the world is moving towards green economy and low carbon footprint livelihoods, there is renewal and development of interest in traditional industries which convert local waste into valuable products. In this context, handmade paper is one of the heritage arts of India with huge potential of creating something novel using very few resources (*Bhodiwal S, et al., 2022*).

Handmade papermaking has long cultural roots in India and it re-emerged in late 20th century due to struggle of freedom. Remarkable efforts by Mahatma Gandhi, re-rooted the handmade paper industry nationwide under Swadeshi movement. Handmade paper industry uses 100% non-wood resources such as cotton rags (textile industry waste/tailor cuttings/denim waste etc.) or waste papers or lignocellulosic waste materials to generate high quality handmade papers which can be converted into marketable goods. It plays pivotal role in protection of environment by reducing, reusing, recycling and re-purposing of resources and materials. The process of making handmade paper requires minimum machinery and equipments, and it is very simple to understand. It is a drive towards mass employment and an important tool of women empowerment. Thus, handmade paper industry is a green and sustainable enterprise (*Chauhan, S., et al., 2022*).

A green economy is defined as low carbon, resource efficient and socially inclusive (*UNEP*). Green economy focuses on development strategies that reduce ecological degradation while supporting human well-being, income, and social justice. Eco-entrepreneurship, an enterprise based on ecological responsibility, has emerged as a crucial approach to handle resource depletion and unemployment on a large scale. Besides creating employment opportunities for the society, eco-entrepreneurship provides pathways of dignified work, skill development, and community leadership for women, rural youth, and transgender individuals who often face societal barriers.

The handmade paper industry becomes an entry point for communities with limited formal education, low capital access and historically restricted participation. This sector depends heavily on manual skills than the expensive machinery. It becomes an opportunity for women, rural youth, and transgender communities who are often excluded from society due to discrimination or lack of exposure. This aligns perfectly with Skill India Mission, National MSME policies, and Sustainable Development Goals (SDGs) particularly SDG 1 (no poverty), SDG 2 (zero hunger) SDG 3 (good health and well being) SDG 6 (clean water and sanitation) SDG 5 (gender equality), SDG 8 (decent work and economic growth), SDG 9 (industry innovation and infrastructure) SDG 11 (sustainable cities and communities) SDG 12 (responsible consumption and production) (*KVIC, 2016*).

The handmade paper industry is not only an eco-friendly green enterprise but it also helps in the shift towards development of smart cities through minimizing deforestation, effluent generation and global warming concerns of conventional paper mills.

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Handmade Paper Industry

The post-independence era saw significant efforts led by environmentalists like J.C. Kumarappa, also known as 'Green Gandhi' who founded institutions promoting non-wood papermaking as a Gandhian model of village industry and focused heavily on environmentalism and sustainable development. This history frames handmade paper not only as a craft but also as a sustainable livelihood practice deeply embedded in Indian socio environmental ethics, now revitalized by institutions such as KNHPI and HMPFI, KVIC (*Kumarappa, 1950; Chauhan & Agarwal, 2018*).

Kumarappa National Handmade Paper Institute (KNHPI) Jaipur, an R&D and training institute under KVIC, Ministry of MSME, roots to 1990s UNIDO (*United Nations Industrial Development Organization*) project to boost India's handmade paper industry by establishing a research center and becoming an autonomous body in 1997.

KNHPI focuses on modernizing the sector with eco-friendly products like Khadi Prakritik Paint from cow dung, handmade paper making from paper waste, plant waste and fibre or textile waste and providing training to students, young professionals and various groups to promote rural industrialization and employment, making it a key player in reviving traditional resources and art with sustainable innovation (*pib.gov.in*).

This research positions the handmade paper sector as a cornerstone of India's inclusive green transition and development. (*UNEP 2021; Chauhan et al., 2020*)

Barriers Faced by Women, Youth and Transgender Communities

Women and youth in India face various barriers that limit their participation and entrepreneurial opportunities. Despite significant increase and boost in female education and enrolment, female participation remains extremely low and uneven. Large fractions of educated women remain out of paid work because of social norms, safety and mobility constraints, and limited access to formal jobs (*DGE female labour utilization review; PIB summary on workforce trends*).

These constraints are prevalent in rural areas where social and household responsibilities substantially reduce women's time availability for paid work, many women therefore engage primarily in unpaid family chores or "helpers" roles rather than formal salaried employment. The result is a paradox of rising human capital but limited labour market leverage for women a core social backlash that green micro-enterprise models must explicitly address if they are to be genuinely inclusive.

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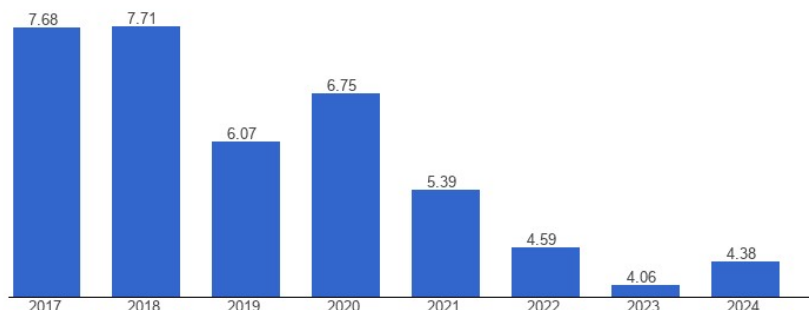


Figure 1: India's Women Unemployment rates(www.theglobaleconomy.com)

Youth defined broadly as age group of 15–29 years old face a distinct overlapping setbacks. India has the largest youth population in the world, with about 65% of its people under the age of 35. India's youth unemployment rate while improving in recent years still registers substantial low levels (*Periodic Labour Force Survey; government estimates youth UR (unemployment rate) around 10.2% in 2023-24 (www.pib.gov.in)*, and many working young people are trapped in low-productivity, informal, or seasonal work without social protection, reliable income source or pathways for upgrading skills (*India Employment Report 2024; World Bank youth unemployment data*). Lack of relevant vocational training, and rural unemployment push youth to migrate to cities where competition is intense and formal sector entry is very limited. For both young women and men, entrepreneurship is often constrained by limited or negligible access to startup capital, weak business networks, and limitations in skills needed to scale products beyond local sales. (*Press Information Bureau, www.pib.gov.in*)

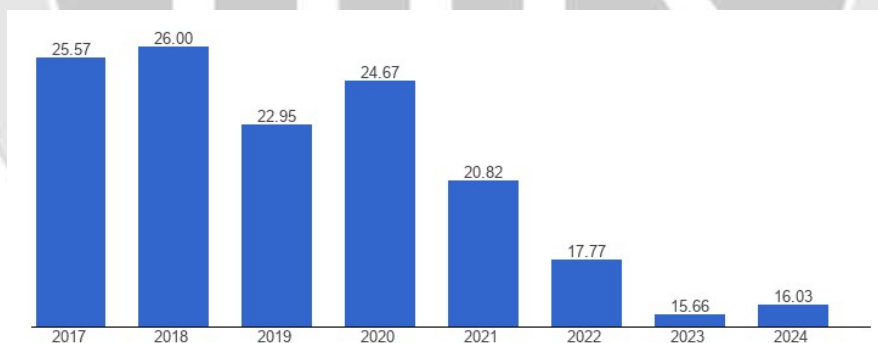


Figure 2: India's Youth Unemployment Rates (www.theglobaleconomy.com)

Transgender people and other gender minorities face lots of discrimination in hiring and training that further reduces their opportunities. As per India's 2011 Census, the official transgender (third gender) population was about 4.88 lakh (~0.04%) (www.socialjustice.gov.in). Although India has taken policy steps (national portals, equal-opportunity guidelines, and welfare schemes) to

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promote inclusion, implementation remains uneven and social stigma still blocks their complete participation in many training, livelihood and financial programs.

This exclusion increase vulnerability and often forces transgender individuals into survival economies with precarious incomes; conversely, targeted skill programs that ensure safe spaces, identity-sensitive documentation support, and linkages to social protection show encouraging outcomes in pilot settings. Any inclusive eco-entrepreneurship model must combine technical training with anti-discrimination and targeted financial inclusion measures. (www.transgender.dosje.gov.in)

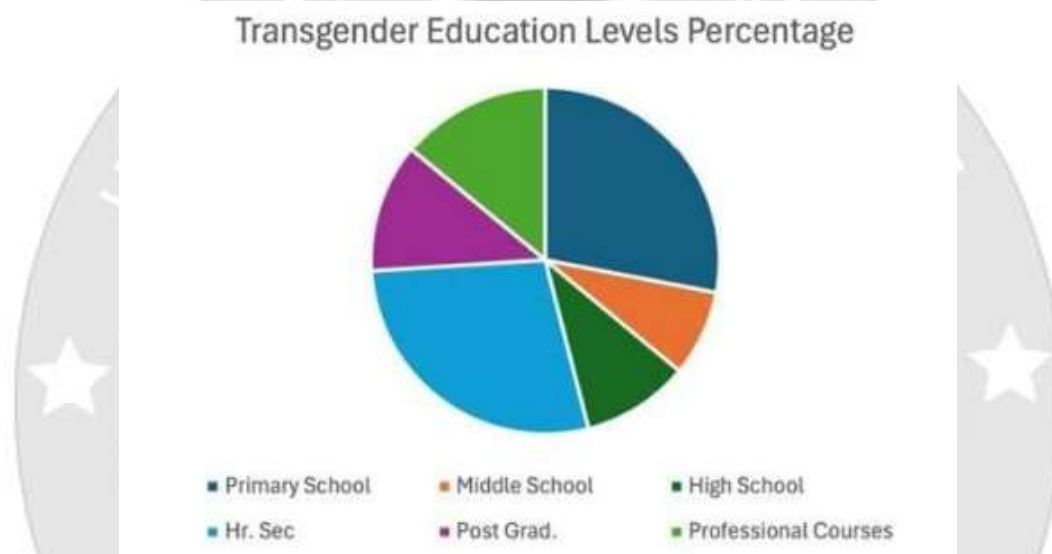


Figure 3: Transgender educational levels percentage (Singh.I 2024)

This data shows that only 28% trans individuals are able to complete primary school, . Participation percentage drops sharply as education level progresses, with only 8% passing middle school and 10% completing high school. These low numbers reflect the challenges and discrimination faced by transgender individuals. However 30% have passed higher secondary education, and 12% have completed postgraduate studies, indicating the severe challenges in pursuing higher education. Lastly, 14% have undertaken professional courses, possibly due to alternative career paths or vocational training being more accessible than formal academic progression (Singh.I 2024).

The handmade-paper sector by virtue of its low capital intensity, decentralized production, and strong scope for value-addition through design and craft is particularly well suited to absorb women, youth and transgender into productive, dignified livelihoods. KNHPI's training batches, pilot projects and outreach (batch details and pilot-plant records) demonstrate how short, modular skill courses (pulpung, sheet formation, natural dyeing, screen printing, product design) can convert

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local raw-material streams into saleable products while offering flexibility for participants with domestic duties.

Evidence from KNHPI and allied case studies suggests that women and youth who complete modular training are more likely to undertake own account activities, join self help groups, or set up micro-units pathways that increase household incomes while retaining caregiving flexibility. For transgender inclusion, KNHPI's interventions should combine community partnerships with NGOs to run dedicated cohorts and safe workspaces. (knhpi.org.in).

Socio-Economic Opportunities from Handmade Paper Industry

Labour intensive, low capital entry

Handmade papermaking does not require any heavy machinery or high capital investment but requires basic equipment and workspace. This makes it ideally suitable for small micro-enterprises or SHGs (self-help groups) (Brody, C., et.al. 2017) motivating individuals from low-income backgrounds to start production with minimal financial risk. KNHPI's democratized training and technical consultancy lower knowledge and entry barriers further.

Flexibility and inclusivity for marginalized groups

Handmade paper making is a skill-based industry rather than capital oriented and can be operated flexibly (home-based, community-based, modular), it offers suitable livelihood options for women including homemakers, single mothers, or women with restrictions as well as for youth seeking employment, and transgender or otherwise marginalized groups who often face exclusion from formal markets. Literature on sustainable handicrafts shows that women artisans benefit socially and economically from such models, combining environmental responsibility with empowerment.

Potential for Value Addition and Higher Earnings

Artisanal paper products, notebooks, cards, gift-boxes, custom stationery, eco-packaging have higher margins than plain paper because of their craftsmanship and artistic value. Goods from handmade paper of waste or recycled sources are considered as eco-premium goods.

Framework for Inclusive Eco-entrepreneurship via KNHPI

Modular Training Programs

KNHPI offers **modular curriculum** tailored for learners (women, youth, transgenders and especially abled people) to inculcate technical skills, design, enterprise management and social inclusion considerations. Conduction of workshops, hands-on training, and R&D support can be expanded to create multi-level skill development programmes. It may include:

1. **Beginner level training** for marginalized group.
2. **Advanced technical internships and trainings** for youth in production, design, and quality control.
3. **Entrepreneurship incubator modules** promoting self-employment in paper making and eco-product manufacturing.

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Initial training includes fibre preparation (rags, agro-waste), pulping, sheet formation, pressing/drying, basic quality testing, eco-friendly bleaching. Value addition includes product design (cards, stationery items, and packaging), screen printing, natural dyeing, texturing, marbling, packaging and finishing. Product conversion includes making marketable goods such as paper bags, lamps, gifting boxes, etc from the handmade paper. Marketing and costing these goods includes pricing, packaging, branding, simple digital literacy (photography, listing online), marketing strategies. (Setiorini, A., et al., (2025)

Incubation support: After completion of training, successful trainees can access shared pilot-plant/workshop facilities basic equipment, business advisory, and linkages with micro-finance or government schemes. Also universities can make paper recycling units inside their campus to reuse the papers used by students and faculty themselves. This will inculcate awareness among the students, youth and also faculty to reduce use of paper and reuse the ones produced by them.

Social-inclusion and sustainability module includes gender-sensitization, safe workplace norms, waste-management & environmental impact awareness, group formation & SHG/micro-enterprise models.

Financial Support: To provide financial support to these communities, connecting micro-enterprises with existing MSME or KVIC schemes to provide working capital and subsidy without collateral charges could be a measurable step. Providing of group based loans via SHGs to reduce financial risk and build peer support among women or marginalized entrepreneurs (SFURTI scheme of KVIC). Offering low cost subsidy through institutions, universities or government support may ensure equal access for the economically weaker sections.

Introduction of trainees to **digital marketplaces** (e.g., artisanal e-commerce platforms, handicraft portals, import export portals) with training in photography, product description, order fulfilment, customer service. Alignment of production with market or seasonal demands (wedding seasons, festivals, corporate gifting, academic sessions) for maximum sales potential. Also supply chains and market could be expanded to corporate offices, academic institutions etc.

Gender responsive learning environment- Creating safe, accessible, and gender-neutral training spaces encourages the participation of women and transgender individuals. Key actions for gender inclusivity includes women led training groups and machine handling, zero harassment policies, safe and sound working environment, flexible working hours.

Employment Generation across the Handmade Paper Industry

Raw material collection and waste management- Local waste collectors, especially unemployed youth and rural women, can be trained in systematic collection, segregation, and pre-processing of waste fibers. This creates entrepreneurial micro-units supplying raw materials to KNHPI and Handmade paper manufacturing units.

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Production and processing jobs- Handmade papermaking involves batch processes such as pulping, sheet formation, pressing, calendaring, and finishing. These areas can absorb large numbers of workers with minimal formal education. Employment expands significantly when paper is converted into value-added eco-products viz. journals, bags, gift items, seed paper, office stationery, and biodegradable packaging. Women artisans especially excel in designing, precision, finishing and embellishing. (Simi S., et.al, (2024).

People can be motivated to join the KNHPI and be self dependent and empowered by increasing paid internships or apprenticeships, introducing shift based timings according to women's schedule, offering certificates and scholarships to the participants.

Women and youth led cooperatives - Cooperatives help marginalized groups that operate collectively. Women can lead seed paper enterprises and pilot plants whereas youth can lead collection startups or waste collection committee and transgender communities can take over product and design studios.

Digital and e-commerce capacity building - Training could be provided in branding, product photography, online selling, and logistics helps rural groups access national markets. KNHPI can help in promoting the sustainable products by collaborating with handicraft e-commerce platforms, social media marketing trainers and various portals to promote eco-products and spread awareness among people about this sustainable approach.

Conclusion

Handmade paper production, is a remarkable waste-to-wealth eco-entrepreneurship model and has the potential to deliver sustainable environmental benefits, promote circular economies, and provide inclusive livelihoods for socially and economically marginalized groups. Institutions like KNHPI, with their R&D facilities, training infrastructure, and pilot-plant, can help achieve inclusive and greener development. By adopting a comprehensive framework like modular training, micro-enterprise incubation, market linkages, eco-certification, and monitoring; the handmade paper sector can scale beyond expectations and act as significant contributor to India's green economy, rural livelihood enhancement, and social empowerment of the communities.

Green economy not only promotes sustainable development but also contributes heavily towards achieving all the sustainable development goals. If implemented with commitment and social sensitivity, this model could become a national benchmark for inclusive, sustainable, and equitable green entrepreneurship in the 21st century.

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