

Eco-Friendly Alternatives in the Paper Industry: Exploring the Potential of Sustainable Practices in Sanganer's Handmade Paper Production

***Dr. Manoj Kumar Saini**

Abstract:

The global paper industry faces increasing pressure to adopt sustainable practices due to its significant environmental impact, especially concerning deforestation, energy consumption, and pollution. In response, the handmade paper industry, particularly in Sanganer, Rajasthan, offers an eco-friendly alternative that reduces reliance on wood pulp and minimizes chemical use in production. This study explores the environmental benefits and challenges of handmade paper production in Sanganer, focusing on its potential to contribute to sustainable industrial practices. The research examines the materials used in production, such as cotton rags, agricultural residues, and natural fibers, and evaluates their lower environmental impact compared to conventional wood-based paper. Additionally, the study investigates the energy efficiency and waste management practices of the handmade paper industry, highlighting innovative methods employed by local producers to reduce water usage and chemical waste. The paper also addresses the economic sustainability of the industry, analyzing its role in local employment, empowerment of artisans, and preservation of traditional craft techniques. Moreover, the study explores the scalability of sustainable practices within the industry and assesses the potential for integrating modern technologies and practices to enhance productivity while maintaining environmental integrity. This research provides a comprehensive overview of the Sanganer handmade paper industry's role in promoting environmental sustainability and economic resilience, contributing to the broader discourse on green alternatives in industrial production. The findings offer valuable insights for businesses, policymakers, and environmental organizations working towards a more sustainable future in paper production.

Key words: sustainable, eco-friendly, handmade paper, reduce, reuse, and recycle

1. Introduction

Environmental pollution, which is becoming worse every year and seriously harming the planet permanently, is one of the worst issues the world is currently dealing with. Environmental preservation is becoming a survival necessity rather than a problem (Kulshreshtha, Set al., 2011; Timane, R. and Tale, T., 2012). To protect human health as well as the environment—the air, water,

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and land—individuals, groups, and governments must band together. We must protect our farmlands, polar regions, marshes, and rainforests. Additionally, we must protect endangered species.

We can save our planet in several ways. The conservation of nature and ecology is increasingly incorporating practices like organic farming, sustainable forestry, natural landscaping, wild gardening, and precision agriculture, which are occasionally merged into sustainable agriculture. Effective economic growth through more efficient use of resources, such as recycling, reusing, and recovering garbage, and environmentally friendly housing through better building energy efficiency are only the beginning.

One of the best ways to live sustainably is to manage garbage as a resource. Promoting trash reduction, recycling, and repurposing as raw materials for new goods can have a significant impact. Paper is essential to the majority of societal activities. Ninety percent of the approximately 300 million tons of paper produced daily comes from mature pulp. Additionally, the need for paper is growing daily. However, it is shocking to learn that millions of trees are felled every day to produce paper. Paper produced using the traditional process has significant pollution issues.

Making handmade paper is a traditional art form that is essential to this endeavor and has grown to be one of India's major export-oriented industries (Hubbe, M.A., and Bowden, C., 2009, Liebl, M. and Roy, T., 2004). Handmade paper is regarded as eco-friendly because it uses the fewest chemicals and nonwoody raw materials (Agarwal, S., et al, 2016). The raw material needed for this technique is abundant in nature and reasonably priced. Compared to the traditional method of papermaking, handmade papermaking is non-polluting and alkali-free (H. Muraleedharan, 2010). From an economic, natural resource, and social responsibility standpoint, the handmade paper sector is sustainable (Biggs, S. and Messerschmidt, D., 2005).

The paper business depends on forests. One of the main causes for concern is the loss of forest cover. The raw resources used in the handmade paper business are entirely non-forest. Currently, it only makes use of cellulose-rich materials like garbage and cotton rags.

Kraft trash and paper. This could easily be expanded to include the use of agricultural waste and biomass materials, some of which can be cultivated especially for the production of handmade paper (T.N. Subramanian & Dr. Arun Kumar, 1994). The other benefit of non-wood biomass resources is that they can be converted using environmentally beneficial methods. In this regard, some actions have already been taken to make use of grasses, rice husks, and straws. In India, the majority of HMPs employ waste paper or cotton rags that are equally colored and white. The effluent needs to be cooked and bleached when plant fibers are included.

One of the world's greatest problems is the growing population and the loss of forest cover. A climate of rapid development comes at a high cost. Six million square kilometers of forests have been lost in the past 200 years. (N. Rani et al., 2011). One of the main industries and one that is connected to fundamental human needs is paper. Paper is necessary for literacy and education, and its use is a measure of both these fields' progress and of society's general well-being. The need for paper continues to rise despite the growing usage of digital media and information technology. Paper use is

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higher per capita in industrialized nations. The top five countries with the largest per capita consumption of paper are Austria, Finland, Germany, the United States, and Sweden. India still consumes a relatively small amount of paper per person, at 10 kg (9.3 lb), far less than the global average of 55 kg. Because of its negative effects on the environment, paper consumption is frequently discouraged. (Das Sandip, August 1, 2013) Even with the ongoing emphasis on digitalization, India's demand for paper is predicted to expand by 53% by 2020, mostly as a result of a steady rise in the number of school-age children in rural areas. The need for writing and printing paper will continue to grow as a result of increased literacy, contemporary retailing, growing consumerism, and the growing usage of documentation. India's per capita consumption is relatively low when compared to its international counterparts, but things are improving, with demand expected to increase from the current 13 million tons (mt) to an anticipated 20 mt by 2020, according to Harsh Pati Singhanian, vice-chairman and managing director of JK Paper. Business Standard, November 24, 2014, Monday.

1.1. History of Handmade Paper.

Handmade papermaking is an ancient Indian craft. Tsai-Lun is said to have invented paper in 105 AD in China's Lei-Yang area.¹⁷ The handmade paper production process arrived in Tibet approximately 650 AD and was then introduced to India (645 AD).¹⁸ Ongoing explorers find sufficient evidence that paper was being created in India as early as 250 B.C. Unfortunately, this paper was not recognized by Indian culture at the time because writing religious literature was not considered sacred or devout. Papermaking was first documented in this country in the 11th century, following Mahmud Ghaznavi's conquest. The Mughal period saw the peak of success and power in the Indian handmade paper industry.

Later, during British rule, the arrival of mill-made paper dealt a fatal blow to this flourishing profession. Following independence, the Khadi and Village Industries Commission (KVIC) took on the task of reviving this industry, which was still being practiced in abysmal poverty. Individuals, organizations, and governments must work together to protect human health and the natural environment, which includes air, water, and land. This business has experienced consistent improvement thanks to the government's backing during the last four decades. According to research, the production cycle for paper made from non-wood fiber is significantly less expensive than that of wood fiber. According to estimates, there are around 500 handmade paper units spread over India, producing 50,000 large loads of high-quality papers and sheets. The high-quality paper business has previously generated a turnover of Rs 250,000 million for the handcrafted paper industry (Saurabh S. Mahatme et al., 2019). The handmade paper business is another promising small-scale art and craft industry in India, employing roughly 37,000 people across approximately 3000 production units.¹⁹ The handmade paper industry is now spread across the country, with the majority concentrated in Kalpi (Jhansi, Uttar Pradesh), Sanganer (Rajasthan), Kurukshetra (Haryana), Pune (Maharashtra), Mahaboobnagar (Andhra Pradesh), and West Bengal (KVIC, India).²⁰ Kalpi (Jhansi, Uttar Pradesh, India) and Sanganer hamlet near (Jaipur, Rajasthan, India) are among the world's largest high-quality paper production centers.

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Despite rising consumption and demand, it is our societal duty to manage supply and demand sustainably to protect the environment. There are numerous chances to make creative use of scarce resources in the handmade paper sector. The growth of the handmade paper sector has significant potential to meet the growing demand for paper products in an environmentally benign manner for a developing nation like India, which is dealing with a growing shortage of raw materials, energy sources, capital, and raw materials. The manufacture of handmade paper doesn't involve significant financial outlays. In the Indian setting, this is one of its greatest economic advantages. (T.N. Subramanian and A. Kumar, 1994.) Because of these benefits, handmade paper is used all over the world. It lowers waste emissions and energy consumption, saves resources and money overall, and helps the environment by recycling and reusing the material. Making handmade paper from recycled paper is one of the most effective uses. According to the Energy Information Administration, recycled paper uses 40% less energy than paper generated from non-recycled pulp. (T. Kitamura et al., 2014)

Table1: Global Share of Pulp and Paper Imports by Country (2023)

Country	Share of Imports (%)
China	46.03
United States	8.39
Germany	5.59
Italy	4.59
India	3.44
South Korea	2.74
Netherlands	2.38
Turkey	2.26
France	2.01
Rest of World	22.57

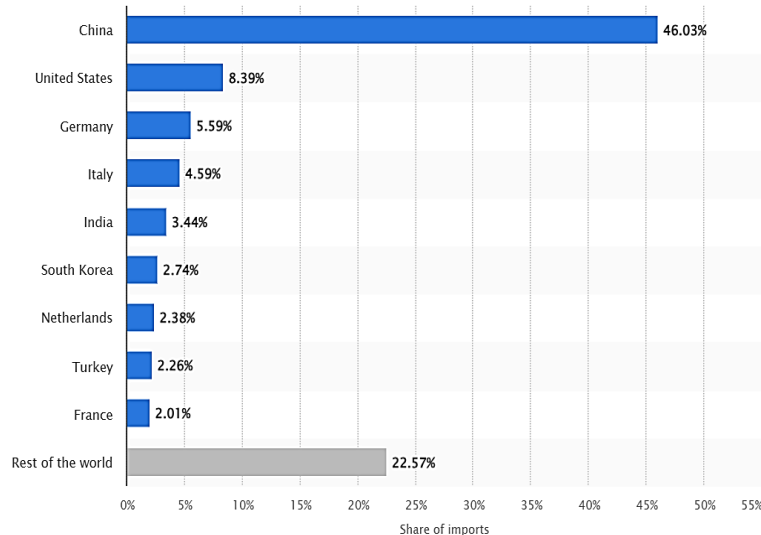
Source: World Economic Survey (2023)

The table presents the global share of pulp and paper imports by country in 2023. China dominates

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the market with **46.03%**, reflecting its high demand for pulp and paper products. The **United States (8.39%)**, **Germany (5.59%)**, and **Italy (4.59%)** follow as significant importers. India contributes **3.44%**, indicating moderate demand. Other countries like **South Korea (2.74%)**, **Netherlands (2.38%)**, **Turkey (2.26%)**, and **France (2.01%)** have relatively lower shares. The **Rest of the World accounts for 22.57%**, encompassing various smaller importers. This data highlights the global distribution of pulp and paper consumption and trade trends.

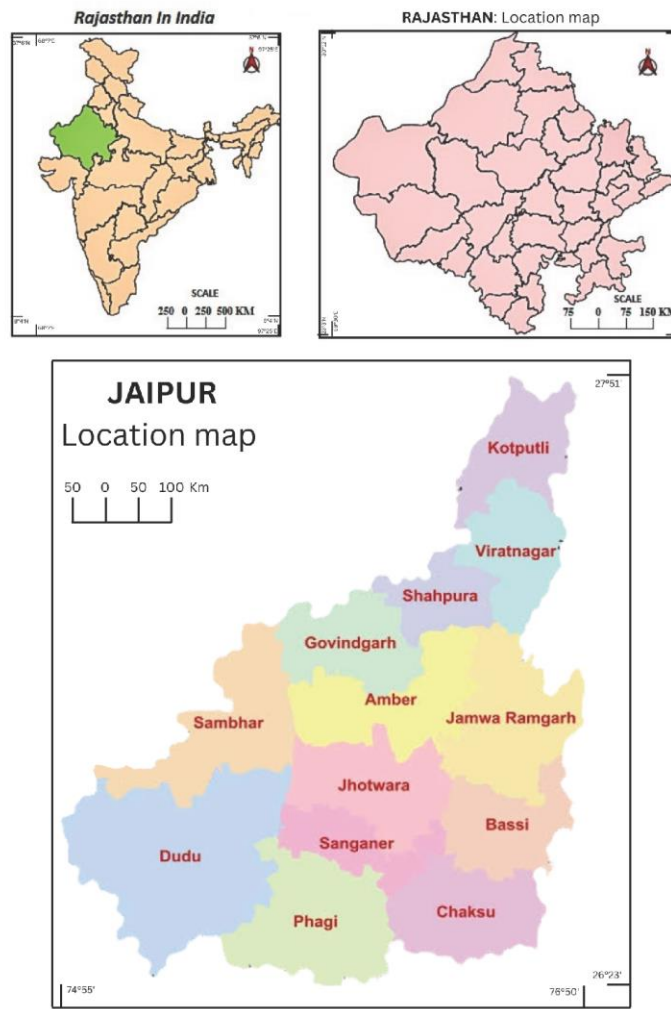


Study Area; Jaipur Rajasthan

Jaipur is the capital of Rajasthan. Jaipur city has got a nick name “Pink City” of India, It is one of UNESCO world historical Heritage Site. Jaipur district is surrounded clockwise Haryana state in the North, District Alwar & Dausa (East), Tonk (South & South-East), Ajmer and Nagaur (West) & Sikar (North-West). The Population of Jaipur District According to 2011 census is 66,26,178 persons. Jaipur is Located between 26°23' North to 27°51' North latitude and 74°55' East to 76°50' East longitude. Its total Geographical area is 11,143 km² In which 52.4% Urban (3471847 persons) and 47.6% Rural (3154331 Persons) rural Male Population is 16,42,924 and Female Population is 15,11,407. In rural area sex ratio is 920 Females per 1000 Males. There are 22 Panchayat Samiti in Jaipur District-Sanganer, Tunga, Kotkhawda, Amber, Bassi, Kishangarh, Renwal, Viratnagar, Andhi, Madhorajpura, Jhotwara, Govindgarh, Shahpura, Dudu, Jobner, Jalsu, Chaksu, Paota, Jamwaramgarh, Phagi, Sambhar Lake and Kotputli. These 22 Panchayats have 600 Gram Panchayats.

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1.2 The Handmade Paper Industry in India:

By reducing, recycling, and reusing materials and resources, the handmade paper industry plays a critical role in protecting the environment. It is crucial to understand the current state of this industry to identify issues and potential future developments. Primary data was gathered through observation and interviews. India's major hub for the production of handcrafted paper is Sanganer. Thirty-one of the 40 units are producing handmade paper. (Village Industries Board of Khadi).

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It has been noted that the handmade paper business is dealing with several issues, such as the high cost of electricity and raw materials, outdated technology, and broken gear. In addition to them, the cheap cost and high-quality items present fierce rivalry in this industry. Due to several issues with funding, training, and technical support, it is challenging to maintain the product's quality. There is very little pollution or adverse environmental effects, and the technologies and raw materials utilized in this sector are safe for both the environment and the workers' health. Writing, packing, decorating, and gifting are all common uses for handmade paper, which is recyclable, biodegradable, and reusable. It also serves as a replacement for paper, which is entirely reliant on forests. Therefore, handmade paper is essential for sustainably managing natural resources. Since it employs a large number of people and manages natural resources sustainably, the handmade paper sector ought to be encouraged. The handmade paper sector benefits both the environment and humanity by giving trained workers, both men and women, jobs. To work in the industry, one must complete a brief and easy training program. The handmade paper is therefore really helpful in a lot of ways.

2. Review of Literature

Handmade paper from Sanganer is a distinctive art form in and of itself, with a strong sense of personality. Despite occasional changes, it remains well-liked both domestically and abroad. The "Kagzis" were taken to Sanganer and settled by Sawai Man Singh, the Amber ruler, in the sixteenth century. Later on, it grew to be the largest handmade paper centre. (Report KVIC, 1997).

Handmade paper is entirely natural. The natural raw materials used to manufacture handmade paper include cotton cloth rags, hosiery bits, silk fiber, and banana tree fibres, among others. This is completely chemical-free and made without the use of acid. The handmade paper's unique strength comes from the natural raw material (Vivek Kumar, 2006).

Forests provide the traditional raw material for handmade paper. Globally, deforestation and environmental imbalance are major issues. Cellulosic (non-woody) alternatives should therefore be utilized as uncooked substances. These alternatives include sugarcane, wheat, maize, and bajara straws, as well as silk fibers used to make handmade paper. Handmade waist material is likewise utilized in addition to these alternatives (Arun Kumar, 2006).

Handmade paper is colored with natural watercolors. These dyes are commonly used under labels like Cam, Azo Free, Atul, Sheeba, and others. Using these natural colors gives handmade papers a really lovely and appealing appearance. (Arango, Maria, 1999). Winser (2003) gathered data regarding the Sanganeri handmade paper's color and texture. Handmade paper from Sanganer is renowned for its exquisite textures and hues. To produce a variety of textures, different flowers and foliage are applied. In response to demand, the hue and texture were also made. Every color utilized is a natural dye. There are both small-scale and large-scale handmade paper industries. This industry uses banana fibers, silk, and soiled hosiery to manufacture paper. Vibrant colors are used to create hand paper.

In 1953, the All India Khadi and Village Industry Board was founded. The handmade paper sector was then included in its growth plans. The owners and employees received information about various

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verities, assistance with the use of accessible raw resources, economic and technological support, and assistance with starting a firm. Promotions such as exemptions from sales taxes and central excise duty have also been offered in certain places where state finances have been relaxed. Kumar Vivek (2006). The handmade paper business is meeting local wants and expectations, according to KVIC (2006-2007). Office supplies are bought by the federal and state governments. Half of the necessary file covers and office supplies are purchased by the Indian government from KVIC/KVIB.

In 2006–07, the Ministry of Agro and Rural Industries employed 10,000 individuals. High levels of education and strenuous physical labor are not necessary for this industry. By working in this sector, many women and illiterate people gained their independence.

By offering bank loans and other forms of assistance, the Indian government and KVIC assisted company owners in establishing their enterprises between 1992 and 1999. Seven years later, the UNDP

worked on development initiatives to boost the handmade paper sector. The government later introduced the REGP program for rural residents. whereby small-scale handmade paper companies received loans. In addition to these initiatives, periodic workshops, seminars, and seller-buyer exhibitions at the national level were held to support the business owners.

Handmade paper products brought in Rs 5,00,000 in 1953. In 1993, it reached 150 million. In 1995, 13,000 tons of handmade paper were produced, generating \$250 million in revenue. The main states that manufacture and export handmade paper are Kerala, Rajasthan, Tamil Nadu, Maharashtra, and Uttar Pradesh (Vivek Kumar, 2006). Before 1991, the handmade paper business was not doing well, according to the Report of the Environment and Coordination Organization (2000). The production increased by 100% this year, which was the highest growth rate. There was an increase in both domestic and export demand. Indian handmade paper is renowned for both its affordability and high quality. 75% of the total demand is exported by India alone.

The study's literature review indicates that the basic material for handmade paper comes from cellulosic sources. Every facility needed by the industry is provided by the government (KVICV/KVIB), including bank loans, minimum price determination, sales tax central excise duty exemptions, etc. The researcher made an effort to find out how well-informed owners were about the government's plan. Along with the existing situation, there will be future product, color, and texture adjustments. Additionally, the researcher sought to understand the socioeconomic position of this industry's owners and workers.

3. Methodology

This study employed a mixed-methods research approach, combining quantitative and qualitative data collection techniques to analyze the challenges, business practices, and government support in the handmade paper industry. Primary data was gathered through structured interviews and surveys conducted with 20 factory owners and their employees in the handmade paper industry. The sample included businesses of varying sizes, ranging from small enterprises with 12–25 workers to larger

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units employing over 100 individuals. Data collection focused on key aspects such as demographic profiles, business establishment motivations, skill acquisition methods, market challenges, workforce composition, and the role of government initiatives. Quantitative data was analyzed using descriptive statistics to identify patterns related to business ownership, workforce participation, and industry growth. Qualitative insights were derived from open-ended responses, allowing for an in-depth understanding of entrepreneurial challenges, skill development, market competition, and sustainability practices. Special attention was given to assessing government support mechanisms such as tax benefits, low-interest loans, and training programs facilitated by KVIC. Furthermore, waste management techniques were examined to evaluate the environmental sustainability of the industry. The findings provide a comprehensive understanding of the socio-economic landscape of the handmade paper sector, highlighting its strengths, challenges, and potential areas for policy intervention.

4. Result and Findings

This section discusses the challenges faced by the company, as well as the evolution of product design, color, technology, and import-export activities over the past 20 years. It also highlights government-provided facilities for the enterprise and addresses waste management practices in production.

Employee Outcomes

The study examined the socioeconomic status of employees, workplace issues, and amenities provided by owners. A total of 20 factories were analyzed, employing 925 workers, of whom 251 (27.13%) were women and 674 (72.86%) were men. The high proportion of female employees indicates that they find comfort and ease in their roles within the handmade paper industry.

Owners' Outcomes

Basic Profile and Demographics

The age distribution of factory owners showed that 45% were between 40 and 50 years old, 25% were aged 30–40, 15% were 20–30 years old, and the remaining 15% were in the 50–60 age group. This data indicates that 70% of owners fall between 30 and 50 years of age. Caste-wise, 55% of the owners belonged to backward (Mali) castes, while 45% were from the general (Muslim) caste. Educational qualifications varied, with 50% being graduates, 25% having completed senior secondary school, 10% completing secondary education, and only 15% holding a postgraduate degree or higher.

Among the 20 factories surveyed, 11 employed 12–25 workers, 4 employed 26–50, 3 employed 51–100, and only 2 employed 101–200 workers. These figures highlight that small-scale factories dominate the sector. Additionally, the study found that 75% of the businesses were family-run, 10% were established due to profitability, and 15% were started by unemployed individuals seeking a

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livelihood. These results indicate that the handmade paper industry is largely a family-driven business, with most owners leveraging familial expertise and traditions.

Experience and Training

A significant 75% of business owners inherited their craft from senior family members, while the remaining 25% acquired their skills from the Kumar Appa Institute. Training durations varied, with 60% of factory owners receiving training for 1–6 months and 40% undergoing training for 6–12 months before starting their businesses. All owners agreed that this craft is easy to learn with minimal effort, and they provide in-house training to new employees.

Business Challenges

Most business owners encountered difficulties at the beginning of their ventures. Among them, 25% faced challenges related to inadequate space and infrastructure, 35% had labor-related issues, and 40% struggled with market-related obstacles. Even among the 75% of family-run businesses, the primary concerns revolved around workforce management and market competition. The 25% of owners who established their businesses independently encountered additional hurdles related to labor, market access, and space constraints.

Market competition emerged as the most significant challenge, affecting 55% of the owners. Additionally, 30% reported issues related to electricity supply, while 15% cited the lack of unity and cooperation within the industry. All 20 business owners expressed concerns over the high cost of equipment, while 75% faced difficulties in maintaining the quality standards of handmade paper. Additionally, 50% found it challenging to introduce new designs that met market demands, and exporters struggled with preserving product quality.

Government-Provided Facilities

All respondents were aware of the tax benefits provided by the government, but only 45% availed themselves of low-interest loans. The Khadi and Village Industries Commission (KVIC) organizes training programs and seminars on relevant topics, which all owners had attended and planned to participate in again. However, 20% of owners demanded lower raw material prices, 50% requested reductions in electricity tariffs, and 30% sought subsidies or reduced costs for machinery.

Waste Management and Environmental Impact

Handmade paper production primarily uses waste materials and natural resources, making it an environmentally sustainable process. All factory owners confirmed that their production methods do not generate harmful residues, as only natural and non-toxic colors are used. Additionally, leftover paper edges and scrap materials from the cutting and finishing stages are recycled as raw materials. These findings highlight that the handmade paper industry in Sanganeer operates with an environmentally friendly approach, ensuring sustainability while maintaining worker and consumer safety.

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Conclusion

Handmade paper is essential to maintaining a clean environment. People who care about the environment take delight in using handcrafted goods and paper. This industry has suffered from several changes during the past few decades. It used to be just made up, devoid of any colors or designs, but now it is. In addition to being well-known in India, Sanganeri handcrafted paper and goods are gaining international recognition due to the growing demand for their exports. It is used to make lampshades, decorative papers, envelopes, pen and mobile stands, cards, flower vases, jewelry boxes, picture frames, and various packing materials in addition to conventional items like diaries, folders, and drawing sheets. The Indian government supports this sector by offering tax breaks, training initiatives, and loans with cheap interest rates. However, this industry needs more focus because it is essential to protecting the environment and giving unskilled workers jobs. The government should support the industry by introducing promotions and promoting handmade paper goods to increase their popularity.

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