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INTEGRATING TRADITIONAL INDIAN SUSTAINABLE PACKAGING MATERIALS, REGIONAL STARTUPS, AND DESIGN THINKING FOR A SUSTAINABLE FUTURE: A REVIEW

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ABSTRACT

The growing environmental threat posed by plastic waste—particularly from the packaging sector—necessitates a shift toward sustainable, scalable, and culturally integrated alternatives. India, with its deep reservoir of traditional knowledge and biodiversity, offers a rich foundation for reimagining packaging through indigenous materials such as pigol leaves, jute, sal leaves, clay, and palm fronds. This study explores the potential of these region-specific materials across North, South, East, and West of India, analyzing their ecological advantages, practical limitations, and revival through contemporary design thinking methodologies. Using the Double Diamond Model as a design framework, the study evaluates how startups like LeafyPack, Jutify, MittiCool, and EcoRoots apply iterative, user-centered innovation to transform traditional materials into commercially viable packaging solutions. A comparative analysis of these ventures reveals both the promise and challenges—ranging from scalability and durability to policy gaps and consumer awareness—that currently limit widespread adoption.

The study also provides a forward-looking strategy emphasizing design-policy integration, smart packaging technologies, decentralized rural production hubs, and university-led incubation for craft-tech startups. These recommendations aim to bridge the rural-urban divide and position India as a global leader in packaging. By synthesizing traditional material wisdom with modern innovation tools, this research contributes to the discourse on environmentally conscious design and inclusive entrepreneurship. It underscores that India's sustainable packaging revolution lies not in reinventing, but in redesigning and rediscovering its own heritage to meet contemporary ecological and economic needs.

KEYWORDS: Packaging, Traditional Indian Materials, Design Thinking, Regional Startups, Sustainability

I. INTRODUCTION

The exponential rise in global plastic consumption, particularly in the packaging industry, has catalyzed an urgent need for innovative, sustainable alternatives. According to the India Plastics Pact (2021), the country generates more than 3.4 million tonnes of plastic waste annually, with a significant portion stemming from single-use packaging. Amidst this environmental crisis, India's rich cultural and ecological heritage offers unique potential to reframe packaging through the integration of traditional, biodegradable materials and modern design thinking principles. Sustainable packaging refers to the development and use of packaging solutions that have minimal

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environmental impact and footprint. This includes the use of renewable materials, reducing energy consumption, and enhancing recyclability or biodegradability (Mudgal et al., 2024). While developed countries have turned to high-tech bioplastics or circular manufacturing systems, India's advantage lies in its legacy of material wisdom and decentralized, region-specific crafts. The reuse of cloth bags, banana leaves, jute wraps, and clay containers has historically served both functional and aesthetic purposes in Indian societies, demonstrating sustainability long before it became a global concern (Versino et al., 2023). Scholars have highlighted that eco-packaging must not only fulfill environmental metrics but also align with socio-economic and cultural dimensions, especially in a diverse nation like India (Das & Das, 2021). Traditional Indian materials such as pigol (areca) leaves in the South, jute and sal leaves in the East, cotton and terracotta in the North, and palm fronds in the West, are biodegradable, cost-effective, and culturally embedded. However, these materials face limitations in terms of food safety regulations, shelf-life, scalability, and consumer perception (Bijitkar & Moule, 2024).





in Modern Packaging

Fig 1 The Mounting Crisis of Plastic Waste Fig 2 Eco-Friendly Traditional Food Packaging Using Banana Leaves

Design thinking—a human-centered approach to innovation—has emerged as a promising framework to navigate these challenges. It allows designers and entrepreneurs to engage deeply with stakeholders, prototype iterative solutions, and balance environmental and user-centric needs. The Double Diamond Model—comprising Discover, Define, Develop, and Deliver phases—is particularly suited for reimagining sustainable packaging as it encourages the synthesis of traditional knowledge and modern functionality (Singh & Singari, 2024). Indian startups such as LeafyPack, Jutify, and MittiCool are increasingly adopting this method to turn indigenous wisdom into viable commercial products, though many still face hurdles related to financing, logistics, and mainstream adoption (Kurian & James, 2021). India's packaging market is forecasted to reach USD 204.81 billion by 2025, offering vast scope for innovation (Pant et al., 2024). However, sustainable packaging solutions remain a niche due to fragmented efforts, limited policy incentives, and consumer preferences that often prioritize aesthetics and affordability over ecoconsciousness (Tang & Pashkevich, 2024). This context necessitates a cohesive strategy that merges design, policy, education, and entrepreneurship.



Biodegradable Indian Packaging Solution



Fig 3 Traditional Sal Leaf Plate – A Fig 4 Modern Eco-Friendly Food Packaging Using Kraft Paper Boxes

The broader sustainability movement in India-aligned with the Swachh Bharat Abhiyan and the UN Sustainable Development Goals (SDGs)-provides fertile ground for fostering such change. Programs encouraging startups and self-help groups (SHGs), especially in rural areas, have started to bridge traditional craftsmanship with contemporary design through skill-building and microfinancing. These grassroots innovations often exemplify circular economy principles, including reuse, repurposing, and zero-waste production (Singh, 2020; Jagoda et al., 2023). Despite these efforts, a critical gap remains in connecting traditional material usage with global standards of performance and scalability. Many biodegradable alternatives lack industrial standardization, certifications, or compatibility with automated packaging systems. Additionally, fragmented supply chains and lack of investment hinder rural producers from accessing larger urban markets (Parashar & Chaurasia, 2024). Thus, this study seeks to critically explore the evolving ecosystem of sustainable packaging in India by integrating three pivotal dimensions:

Regional Traditional Materials: A comparative analysis of biodegradable, region-specific packaging options, their strengths and limitations, and cultural relevance.

Design Thinking: Application of iterative design methodologies to enhance viability, user acceptance, and innovation in packaging.

Startups and Case Studies: Real-world examples from Indian states showcasing successes and failures, to understand the broader entrepreneurial landscape.

By examining the confluence of these factors, the study intends to propose pathways for combining ecological responsibility with cultural authenticity. Evaluate policy frameworks and funding mechanisms required to support these initiatives. Identify strategies for scaling rural innovation into urban markets through technological and logistical enablement. In doing so, the study contributes to the growing literature on sustainable development in the Global South, offering insights not just for India but also for other regions seeking culturally integrated environmental solutions. Ultimately, the integration of traditional knowledge systems with modern innovation tools can provide India with a distinctive and scalable blueprint for sustainable packaging, aligned with both environmental stewardship and socio-economic empowerment.

II.TRADITIONAL PACKAGING MATERIALS ACROSS INDIA

India's extensive cultural history and ecological wealth have led to the natural evolution of sustainable materials deeply embedded in the country's way of life. Traditional packaging methods have not only reflected regional resource availability but also upheld environmental values long before the contemporary discourse around sustainability emerged (Tang & Pashkevich, 2024). This section explores the diversity, utility, and potential of traditional packaging materials across four key regions of India—South, East, North, and West—emphasizing their inherent properties, use-cases, and limitations in the context of modern industrial demands.

South India: Areca and Pigol Leaves: The southern region of India, particularly the states of Tamil Nadu, Kerala, and Karnataka, has historically utilized areca palm (pigol) leaves for packaging and serving food. These leaves are abundant, biodegradable, heat-resistant, and require minimal processing. They are often molded into plates, bowls, and trays for serving meals during traditional feasts, weddings, and religious ceremonies. Today, these same qualities are being leveraged by startups for biodegradable tableware and food delivery containers (Kurian & James, 2021).



Fig 5 Product Lifecycle of Areca Leaf Sheath in Sustainable Packaging Applications

What sets areca leaf packaging apart is its combination of functionality and minimal environmental footprint. The leaves are collected after naturally falling from trees, cleaned, and pressed into shape using heat—making them a zero-waste product that avoids tree felling or chemical use. Furthermore, areca-based products can degrade within 60 days in composting environments,

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making them an effective replacement for plastic plates and Styrofoam packaging (Das & Das, 2021). However, despite these advantages, several challenges hinder the widespread commercialization of areca packaging. Manual production processes limit scalability and increase labor costs. The absence of standardized testing and certification for food safety further constrains its global acceptability. Seasonal availability and moisture sensitivity during storage also present practical issues in high-volume operations (Versino et al., 2023). Nevertheless, these materials continue to be at the heart of several successful pilot projects and have gained popularity in the export markets, particularly in Europe and the U.S., where consumers are increasingly drawn to eco-conscious lifestyle products (Bijitkar & Moule, 2024).

East India: Jute and Sal Leaves: The eastern region of India, especially West Bengal, Assam, and Odisha, is rich in jute cultivation and sal tree forests. These resources have long served as the backbone of rural packaging practices. Jute is spun into threads and woven into sacks, bags, and shopping totes. Sal leaves are stitched together to form plates or wraps, especially used by local street vendors and in religious offerings (Mudgal et al., 2024). Jute's key attributes— biodegradability, tensile strength, and renewability—make it a frontrunner in the sustainable packaging discourse. In addition to its robustness, jute is resistant to UV radiation, can be easily dyed or printed, and is reusable over long periods. Sal leaves, on the other hand, are light, biodegradable, and capable of being molded with heat to create compartmentalized food packaging (Pant et al., 2024). These materials also support a vibrant informal economy, particularly for tribal women and cooperatives who harvest, process, and sell them in local markets. From an environmental standpoint, jute absorbs significant amounts of CO_2 during its growth cycle and enriches the soil post-harvest, making it highly sustainable (Singh & Singari, 2024).

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Fig 6 Handcrafted Jute and Natural Fiber Products by Rural Artisan in India

Yet, the challenges are notable. Jute products are often more expensive than plastic alternatives, and the production lacks integration with modern logistics and branding. Sal leaves degrade quickly under moisture and cannot meet the shelf-life expectations required for commercial packaging. In urban settings, jute is often seen more as a fashion accessory than a packaging material, thus limiting its mainstream retail adoption (Kurian & James, 2021). In recent years, initiatives like Jutify have attempted to position jute packaging for grocery chains and ecommerce by creating composite blends (jute with cotton or polyester). However, hybrid materials raise questions of recyclability and cost-efficiency, especially if they reintroduce synthetic polymers (Versino et al., 2023).

North India: Cotton Fabric and Clay: Northern India, comprising regions such as Rajasthan, Uttar Pradesh, and Himachal Pradesh, has traditionally employed cotton fabrics and clay or terracotta containers for packaging. Cotton pouches, embroidered bags, and muslin cloths have

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been used for wrapping dry grains, sweets, and gifts. Terracotta jars and clay pots have long served as storage units for liquids, dairy, and perishables like curd and pickles (Singh, 2020).



Fig 7 Harvesting Raw Cotton: The First Step in Sustainable Natural Fiber Production



Fig 8 Weaving Cotton Yarn into Fabric: Integrating Tradition with Modern Textile Technology

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The cultural significance of these materials is profound. Cotton, being breathable and reusable, aligns with contemporary sustainability principles. Clay is a thermally stable, porous, and non-toxic material that not only preserves food but also regulates its temperature. Notably, startups like MittiCool have modernized clay into urban-friendly packaging formats like fridge-free water bottles, lunch boxes, and coolers (Das & Das, 2021). These materials also possess strong aesthetic appeal, which lends them to luxury or artisanal branding. Furthermore, they promote circular economy practices, as both clay and cotton can be returned to the environment without adverse effects (Tang & Pashkevich, 2024). However, their durability and fragility under urban logistical systems are major concerns. Clay can break during transport, and cotton lacks moisture-proofing—making it unsuitable for items that require long-distance shipping or water resistance. Additionally, the production of clay pots is energy-intensive if modern kilns are used, and improper disposal can result in dust pollution (Mudgal et al., 2024). Nonetheless, North India has witnessed a revival of traditional crafts for packaging through designer collaborations and NGO-led initiatives, often focused on niche urban consumers who value heritage and sustainability (Pant et al., 2024).

West India: Palm Leaves and Khali Patta: In western India, particularly Maharashtra, Gujarat, and Rajasthan, traditional packaging makes extensive use of palm leaves and khali patta (dried leaves of the palmyra tree). These are primarily used in rural and tribal belts for wrapping snacks, flowers, or perishable items like fish or paan (Parashar & Chaurasia, 2024). Palm-based packaging is abundant, culturally embedded, and biodegradable. In coastal Maharashtra and Goa, palm leaves are used to bundle fresh produce, often stitched into small cones or boxes. These forms are not only compostable but also integrate seamlessly with local diets and religious customs (Tang & Pashkevich, 2024).

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Fig 9 Traditional Palm Leaf Packaging Boxes for Food and Storage

What distinguishes these materials is their cultural symbolism—used in rituals, offerings, and festivals—which ensures their continuous relevance in daily life. Palm frond packaging is also extremely affordable and low-tech, requiring only manual skill and binding (Das & Das, 2021). However, their market reach remains limited. Urban consumers often perceive such packaging as primitive or fragile. Food safety regulations, certification barriers, and packaging standardization are mostly absent. Moreover, these materials degrade quickly when exposed to moisture, limiting their shelf-life for commercial use (Kurian & James, 2021).

Projects like EcoRoots have begun introducing palm-based packaging into luxury gift segments, leveraging the organic, hand-made nature of the material. Yet these often serve aesthetic rather than functional packaging needs and struggle with consumer reuse behavior, which affects their overall sustainability (Bijitkar & Moule, 2024).

Common Advantages and Shared Challenges: Across all regions, traditional materials share certain environmental strengths:

i. Low carbon footprint due to minimal processing (Jagoda et al., 2023).

- ii. Biodegradability, often decomposing within weeks (Versino et al., 2023).
- iii. Cultural resonance, making adoption more natural in rural and semi-urban India (Tang & Pashkevich, 2024).
- iv. Employment generation for artisans, tribal workers, and women cooperatives (Singh, 2020).
- v. However, these benefits are countered by systemic limitations:
- vi. Durability and scalability issues, especially under industrial standards (Mudgal et al., 2024).
- vii. Inadequate policy support for certification and subsidies (Pant et al., 2024).
- viii. Limited consumer awareness and misaligned perceptions regarding aesthetics and hygiene (Kurian & James, 2021).
- ix. Technological limitations, especially lack of automation or mechanization for mass production (Das & Das, 2021).

To scale traditional packaging systems, there is a pressing need for material innovation, integration with hybrid systems, and alignment with design thinking frameworks. Solutions like moisture-resistant coatings for jute, biopolymer integration with palm, and modular packaging design using clay or cotton could unlock new markets (Singh & Singari, 2024). India's traditional packaging materials provide a rich, underutilized resource base that can lead the global sustainability movement. When combined with policy innovation, design tools, and startup ecosystems, these materials can form the bedrock of an economically viable, culturally rooted, and environmentally sound packaging future (Tang & Pashkevich, 2024).

III.DESIGN THINKING FOR SUSTAINABLE PACKAGING

Design thinking is an iterative, user-centered approach to innovation that addresses complex challenges by integrating human needs, technological feasibility, and business viability (Bijitkar & Moule, 2024). It has emerged as a powerful tool in the development of sustainable packaging by enabling designers and entrepreneurs to balance ecological concerns with practical functionality. One of the most widely adopted frameworks within design thinking is the **Double Diamond Model**, introduced by the UK Design Council. This four-phase process—**Discover**, **Define**, **Develop**, **and Deliver**—is especially effective in the context of sustainability because it encourages exploration of local contexts and inclusive engagement with stakeholders (Pant et al., 2024).

In India, where cultural diversity and regional crafts offer a wide material base, design thinking has been used to:

Discover region-specific resources (e.g., pigol leaves in Tamil Nadu, jute in West Bengal).

Define diverse consumer needs (e.g., urban preference for aesthetics vs. rural demand for affordability).

Develop packaging prototypes that fuse traditional materials with modern form and functionality.

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Deliver solutions that are scalable and market-ready while promoting low environmental impact (Tang & Pashkevich, 2024; Singh & Singari, 2024).

Startups like **LeafyPack** in Tamil Nadu and **Jutify** in West Bengal demonstrate this model in action. LeafyPack uses areca leaves to produce heat-pressed, biodegradable food containers primarily for events and exports, while Jutify experiments with urban retail packaging made from jute and textile composites, targeting eco-conscious urban buyers (Kurian & James, 2021). However, challenges remain—such as limited automation, consumer perception, and the lack of robust policy incentives—that prevent many such innovations from scaling beyond niche markets (Mudgal et al., 2024).



Fig 10 The Circular Model of Sustainable Packaging Solutions: Reduce, Reuse, Recycle, Renew, Return

Table 1 Application of the Double Diamond Model in Indian Sustainable Packaging Startups

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Phase	Key Activity	Example Application	Startup
			Example
Discover	Identify indigenous	Mapping pigol leaf	LeafyPack
	materials and crafts	availability in southern India	
Define	Analyze consumer needs	Urban vs. rural usage	Jutify
	and packaging pain points	preferences for packaging	
Develop	Design and prototype	Biodegradable, heat-resistant	LeafyPack
	culturally rooted	trays using pigol leaves	
	packaging		
Deliver	Launch at scale, optimize	Jute-based grocery wraps with	Jutify
	production and logistics	hybrid materials	

IV.Studies of Sustainable Packaging Startups in India (Region-Wise)

Region	Startup	Material Used	Key Innovation /	Outcome / Challenge	
			Application		
South	LeafyPack	Areca & pigol	Biodegradable	Export demand	
India	(Tamil Nadu)	leaves	tableware for food	achieved; however,	
			delivery and events	manual production	
				created scalability issues	
North	MittiCool	Clay & ceramic	Eco-fridges and natural	Gained interest for rural	
India	(Gujarat)		water bottles	use; urban packaging	
				adoption remains limited	
East	Jutify	Jute & textile	Jute-based urban	Effective eco-	
India	(Kolkata)	blends	packaging for grocery	alternative; but high	
			and retail chains	costs and lack of major	
				brand partnerships	
West	EcoRoots	Bamboo &	Sustainable luxury gift	Eco-friendly appeal	
India	(Maharashtra)	palm	boxes and wrapping	noted; consumer reuse is	
			solutions	low, limiting	
				sustainability impact	

Table 2 Indian Regional Startups in Sustainable Packaging: Materials, Innovations & Challenges

Explanatory Notes & Citations:

1. **LeafyPack**: According to industry reports (Das & Das, 2021; Tang & Pashkevich, 2024), traditional materials like areca leaves are gaining traction for event-based use but suffer from production bottlenecks when scaling.

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2. **MittiCool**: Highlighted by Mudgal et al. (2024), this Gujarat-based startup illustrates the intersection of craftsmanship and eco-utility, though it lacks adaptability to modern packaging trends.

3. **Jutify**: As seen in Kurian & James (2021), jute remains a sustainable material choice, but startups face marketing and cost challenges despite consumer demand in urban retail.

4. **EcoRoots**: As reviewed in Versino et al. (2023), high-end sustainable packaging solutions such as bamboo gift boxes have a niche market, though post-use consumer behavior limits their full circular potential.

Challenges in Scaling Sustainable Packaging Startups

Category	Key Challenges		
Category	Key chancinges		
Material	Natural materials like pigol leaves and jute are prone to degradation from		
Durability	moisture or weight, limiting their reliability for broader logistics use (Pant		
	et al., 2024).		
Policy Gaps	s There's limited government recognition or subsidies for packagi		
	innovations using traditional or biodegradable materials, stalling growth		
	(Das & Das, 2021).		
Technological	Many rural or craft-based startups lack automation and scalable		
Limitations	manufacturing, increasing labor costs and reducing competitiveness		
	(Mudgal et al., 2024).		
Awareness &	Urban consumers often prioritize pricing, convenience, and aesthetics		
Adoption	over sustainability, limiting widespread adoption (Kurian & James, 2021).		
Startup	Startups in this sector often struggle with funding, scalability, and		
Ecosystem	market linkages, leading to premature closure despite good intent (Singh		
	& Singari, 2024).		

Table 3 Key Challenges in Scaling Sustainable Packaging Startups in India

Integration with Modern Materials: Pros & Cons

Material	Pros				Cons			
Metal-based	Highly	durable,	reusable,	and	High	production	energy	cost,
Wraps	recyclable over long lifespans		expensive for mass-scale packaging					
					(Versin	no et al., 2023)		

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Fabric	Washable, biodegradable, easy to	Often not waterproof or food-safe,		
Packaging	customize and reuse	making it impractical for perishables		
		(Das & Das, 2021).		
Hybrid	Blends jute, banana fiber, or	Risks introducing microplastic		
Packaging	bamboo with biodegradable plastics	residues, increased cost, and		
	to achieve form and function	unclear recyclability (Tang &		
		Pashkevich, 2024).		
Carton-	Using jute coatings, clay linings, or	Still emerging, with unclear		
Traditional	eco-laminates over cardboard helps	regulations, limited reuse, and cost		
Mix	balance strength with sustainability	hurdles (Pant et al., 2024).		

V.CONCLUSION

For centuries, Indian society has embraced materials like banana leaves, clay pots, jute sacks, and palm wraps—not just as packaging, but as embodiments of respect for nature, craft, and community. The modern packaging sector needs is a **design-led ecosystem that honors this traditional wisdom while addressing contemporary demands** of scalability, hygiene, brand storytelling, and durability.

The study reveals that across India's four major regions, local startups are attempting to revive these materials using design thinking frameworks like the Double Diamond Model. From LeafyPack's pigol leaf containers in the South to Jutify's jute hybrids in the East, each startup showcases the power of **contextual innovation**. However, gaps remain in market readiness, automation, and consumer education.

Challenges such as material degradation, lack of industrial compatibility, fragmented policies, and the urban bias toward aesthetics can be systematically addressed through:

- Material science interventions to enhance durability
- Smart tech for transparency and traceability
- **Policy harmonization** at state and central levels
- **Community storytelling** to shape cultural acceptance

India stands at a crossroads—where it can either follow the global race toward expensive bioengineered alternatives or **lead by rooting sustainability in its own soil**. By aligning startup culture with grassroots ingenuity, India can create packaging solutions that are **ecologically smart**, **economically inclusive**, and globally relevant.

As packaging becomes the new frontier of sustainable innovation, India has the opportunity not just to reduce its plastic burden—but to export its **heritage-informed**, **eco-positive packaging systems** to the world.

VI. FUTURE SCOPE AND RECOMMENDATIONS

The path toward a resilient and scalable sustainable packaging ecosystem in India is anchored in a holistic blend of cultural intelligence, design innovation, and strategic policymaking. Drawing from the insights presented in the regional case studies and material evaluations, the following

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recommendations and future directions are proposed to strengthen the national sustainable packaging agenda.

1. Design-Policy Integration: To foster innovation in traditional material-based packaging, government intervention must go beyond bans and plastic penalties. Policymakers should create **certification and quality assurance frameworks** specifically tailored to indigenous biodegradable materials. This would enhance trust and marketability for startups using jute, areca, clay, and palm leaves.

Incentivizing local packaging enterprises through **Make in India** and **Startup India** initiatives can create a national-level push. Schemes similar to the FPO (Farmer Producer Organization) model can be introduced to empower community-based packaging producers. For example, SHGs in Odisha producing sal leaf packaging can benefit from micro-loans, R&D grants, and integration into supply chains of government-run procurement systems such as TRIFED or e-NAM.

Sustainability-specific tax benefits for packaging companies using certified biodegradable materials could act as a market equalizer against cheaper, non-biodegradable alternatives.

2. Educational Campaigns and Visual Storytelling: Despite the rich material traditions, a gap in **consumer awareness** is a major bottleneck. Many urban consumers remain unaware of the sustainability and cultural value embedded in traditional packaging.

Nationwide **visual storytelling campaigns**—via short films, design exhibitions, and social media reels—can highlight the lifecycle and benefits of pigol plates or jute bags. Educational institutions can integrate **design for sustainability modules** into design, architecture, and business curricula to sensitize the next generation of professionals.

Additionally, QR codes embedded in packaging (see Smart Packaging) can offer consumers insights into the story of the product—who made it, how it degrades, and why it matters. Emotional branding can convert buyers into advocates.

3. Smart Packaging and Technology Integration: To make traditional packaging viable for **urban logistics, traceability, and e-commerce**, a fusion with smart technologies is essential.

- **QR code integration** on biodegradable packs can provide origin tracking, composting instructions, or even artisan backstories.
- **Moisture-resistant coatings** from natural waxes or nano-biopolymers can significantly enhance the shelf life of jute and palm-based packaging.
- **IoT-based temperature and humidity monitoring** can be introduced in clay containers used for perishables to enable smart cold-chain packaging.

Collaboration between **design schools**, **rural cooperatives**, **and tech startups** can drive this innovation pipeline.

4. Bridging the Rural-Urban Divide: Decentralized production in rural areas must be coupled with **centralized logistics hubs**, especially near metro cities. Rural units can continue to produce traditional packaging at scale with handcraft or semi-automated means, while **urban logistics centers can handle quality checks, branding, and bulk dispatching**.

This "hub-and-spoke" model can boost employment in rural India and reduce transportation emissions by ensuring that bulk material doesn't have to travel across long distances unrefined.

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Case in Point: LeafyPack (Tamil Nadu) and EcoRoots (Maharashtra) could benefit from shared logistics services and climate-controlled warehouses that preserve material quality during monsoon seasons.

5. Strengthening Startup Ecosystems: Most sustainable packaging startups in India remain small-scale due to lack of mentorship, funding access, and market connections. Universities, design schools, and IITs can set up dedicated incubation cells focusing on the fusion of craft and technology.

These centers can offer:

- Design mentorship from academic experts
- Prototyping labs for sustainable material exploration
- Pitching platforms to connect with government buyers and green e-commerce ventures
- Business modeling guidance for SHGs and cooperatives transitioning to startup mode

Successful case studies from LeafyPack, Jutify, and MittiCool can form the curriculum for such incubators, which must also support **multilingual communication** to ensure inclusivity of non-English-speaking rural artisans.

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