Assessing the Challenges of Polythene Pollution Control Despite Innovations in Jute-Based Biodegradable Alternatives: A Case Study in Urban Bangladesh

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Research Aims: This research examines those barriers that have prevented the reduction of polythene pollution in urban Bangladesh even though jute-based biodegradable alternatives are available. This study will particularly analyze the following key issues: (1) Barriers to the adoption and implementation of jute-based biodegradable alternatives, (2) Potential environmental benefits from their use, and (3) Propose strategies to support their widespread use as sustainable options.

Research Questions:

1. What are the key obstacles to using jute-based biodegradable alternatives of polythene in Bangladesh's urban areas?

2. How effective are the policies/regulations in stimulating Jute-based product consumption as an alternative to conventional polythene?

3. What are the potential economic, social, and environmental challenges that restrict Bangladesh's consumers' and industries' acceptability of jute-based alternatives?

4. What strategies could improve the production, accessibility, and acceptance of jute-based biodegradable options as a replacement for polythene?

Introduction:

The environmental consequences of polythene*:* Polythene, which is so important for packaging today, has turned out to be one of the biggest environmental hazards threatening plant life, animals, and even human health. Petrochemical products such as PET, PVC, or polyethylene [1] leak into grasslands and the ocean where they threaten thousands of species.

Alternatives to jute-based ones of Bangladesh: Bangladesh, which is a major jute producer has jute-based biodegradable alternatives and implemented a polythene ban in 2002. However, the actual use of these innovations is low; policy failings continue and pollution in cities is unabated. To drive jute-based solutions further, to make on-ground solutions to the ever-evolving environmental hazards, we must investigate the barriers.

Importance of the Research*:* Understanding the reasons behind the lack of acceptance will give pointers on how to mitigate urban pollution. This study evaluates the environmental impact of polythene, reviews recent developments, and identifies key prerequisites for the sustainability of jute-based replacements.

Research Goals*:* However, no existing study has ever specifically analyzed polythene pollution and biodegradable solutions in Bangladesh. There is a gap between these facts and the improved jute product availability which this case study will address by gatekeeping possible challenges with reducing polythene use with cheaper jute products to center sustainable practices within urban Bangladesh.

Literature Review:

Recent Research on Polythene Pollution and Environmental Impact: Extensive research indicated that polythene pollution is an environmental hazard since it persists in ecosystems and degrades soil, water quality, and biodiversity. Plastic materials, including polyethylene and polypropylene, have been noted to form a big part of urban waste due to wide usage and the nonbiodegradable nature of the materials, which presents long-term ecological risks. [2][3]. The poor infrastructure for waste management and landfilling in most developing countries contributes to an increase in plastic waste burdens in all water bodies, from rivers to marine systems [4]. The predominance of polythene in Bangladesh has made many people greatly concerned with its very likely effects on both aquatic and terrestrial environments, finding an alternative to it has thus been strongly recommended [5].

Research on Jute-Based Biodegradable Alternatives: Being a major jute producer, much development to produce degradable jute-based substitutes for polythene has been carried out in Bangladesh. Economic and environmental beneficiaries of jute products that take less time in decomposition and hence less harm to the environment have been analyzed by the researchers [6]. Most of the recent innovations in jute and jute cellulose-based bioplastic give an excellent outlook for their application. Studies cite production costs, limited scalability, and consumer awareness as barriers that hinder the replacement of conventional plastics with jute-based products [7][8]. Despite government policies promoting these alternatives, including a polythene ban enacted in 2002, the implementation and public acceptance remain limited [9].

Gaps in Prior Research: While studies are valuable in terms of insight into the environmental benefits of using alternatives to jute and polythene pollution challenges, there is an evident lack of in-depth research on the barriers that prevent the adoption of jute-based alternatives in urban Bangladesh. Most research broadly discusses the environmental impact of plastics or the benefit of jute without indicating why biodegradable alternatives are struggling to penetrate the urban market. Additionally, existing studies often overlook socio-economic factors, such as consumer preferences, cost implications for manufacturers, and policy enforcement challenges. This research gap indicates the need for a case study approach that examines the specific barriers to jute-based alternative adoption within Bangladesh's urban context, providing a nuanced understanding of both environmental and socio-economic dynamics.

Implications for Research Design and Focus: Current literature gaps inform the focus of the study into a detailed analysis of why jute-based biodegradable products, despite their environmental comparative advantages and supporting policies, have not been widely adopted in urban areas. Examining these barriers from an urban-specific perspective, the study hopes to provide actionable insights into the practical and economic reasons that will address environmental benefits and consumer, and industry behavioral functions in Bangladesh. The approach is necessary to provide interventions that may help drive sustainable alternatives while informing policy adjustments in pursuit of environmental goals.

Research Methodologies:

This research shall therefore adopt a mixed-method approach to judge the issues of control of polythene pollution in urban areas of Bangladesh despite the availability of jute-based

biodegradable alternatives.

Quantitative Phase: A structured survey will be conducted on a representative sample of urban residents (N = 500) targeting individuals from different demographics using polythene products in their daily lives. The survey shall cover the awareness level, usage pattern, and attitude toward jute-based alternatives. In this, the perceived level of convenience, cost, and environmental impact associated with using polythene and jute products will be gauged by having participants respond to statements on a Likert scale. In this manner, stratified random sampling should be utilized to represent a wide array of socioeconomic groups within the sample.

Qualitative Phase: Semi-structured interviews with subsamples of the respondents will be conducted, comprising (n=30), on issues related to motivations toward the choice of polythene over jute-based products, perceived challenges, and views on environmental sustainability. The interviews will further prove how cultural, economic, and social factors dictate material choice. Interviews shall be thematically analyzed with due attention being paid to recurring themes and patterns concerning environmental awareness, economic apprehensions, and behavior about polythene use.

Data Analysis: Quantitative data from the survey will be analyzed using descriptive and inferential statistical methods. Regression analysis will be included to provide explanations of the relationship between demographic variables and preference for polythene alternatives to jute. From this, an idea of how different groups within the population think of and use the materials will be obtained. Data from interviews will be analyzed qualitatively for themes and coded to identify the principal challenges, beliefs, and behaviors related to polythene use and receptiveness to jute alternatives, adding depth to the quantitative context.

Project Practicalities: Data collection will last for a timeline of 12 weeks. Major tasks include survey design and distribution (Weeks 1–3), interviews (Weeks 4–6), data collection, and initial analysis (Weeks 7–9), followed by final analysis, synthesis, and reporting (Weeks 10–12). This research will be subjected strictly to the rules of ethics, which will protect confidentiality on the part of the participants and ensure the security of data. Data from this research will be anonymized and well-kept; participants will be informed of their rights to withdraw at any time.

Conclusion: This research, in short, tackles the chronic problem of polythene pollution in urban Bangladesh and the resultant poor adoption of jute-based biodegradable alternatives. While jute brings with it environmental benefits, and Bangladesh has large-scale production of jute, the economic and awareness barriers are huge to the widespread use of such alternatives. This study strongly indicates the necessity of policy interventions, economic incentives, and public awareness in the direction of sustainable packaging solutions. With strategic support, jute can provide a viable, eco-friendly replacement for single-use plastics contributing to a cleaner urban environment and ensuring a sustainable future.

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