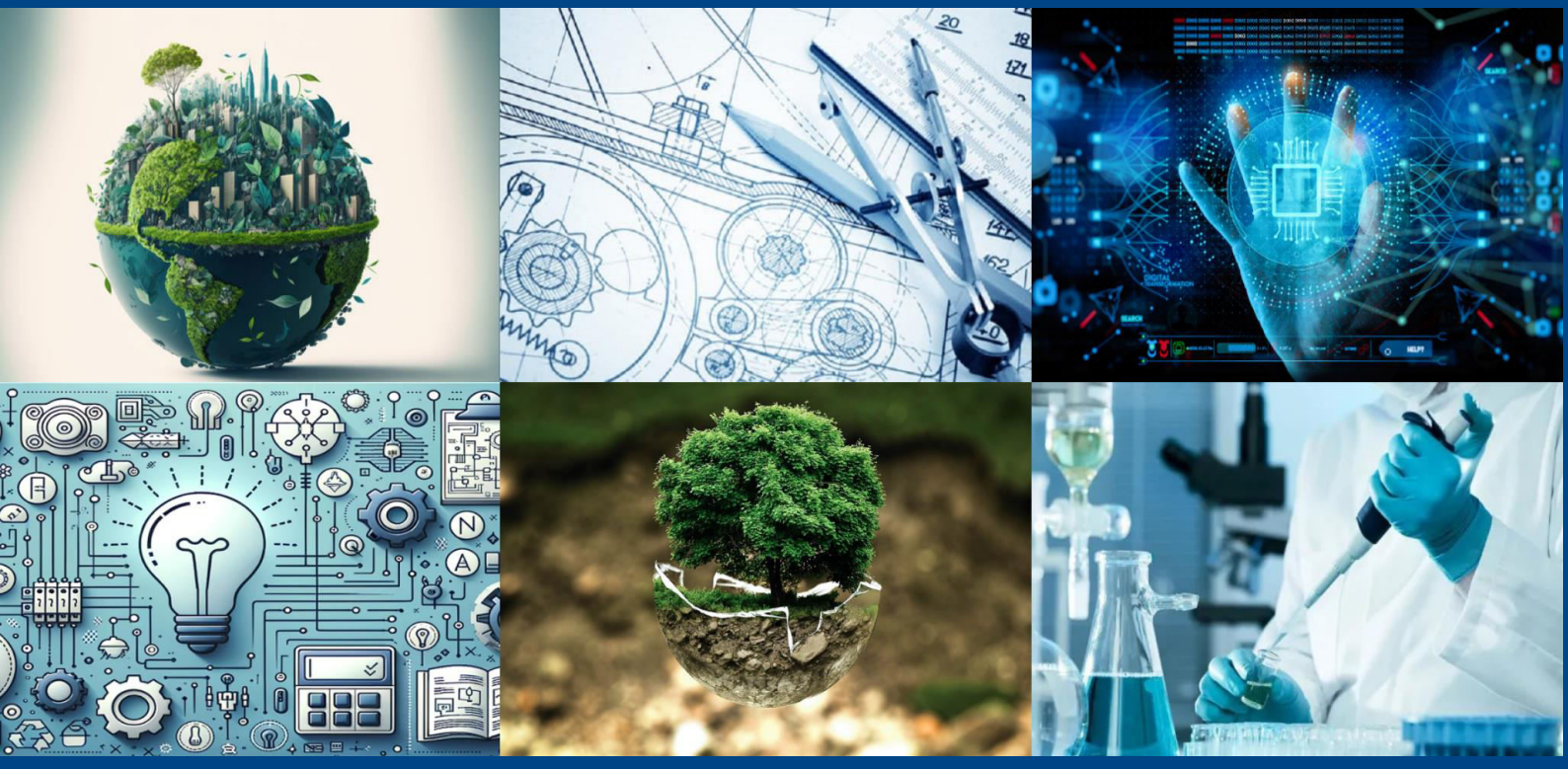
ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206 **Volume 8, Issue 3, March 2025**

© 2025 IJMRSET | Volume 8, Issue 3, March 2025| DOI: 10.15680/IJMRSET.2025.0803294

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Beyond Disposal: A Study on Sustainable Menstrual Products in Low-Income Communities

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ABSTRACT: The use of conventional disposable menstruation products presents serious economic and environmental problems in low-income settings. This study examines eco-friendly substitutes such as menstruation cups and reusable cotton pads, evaluating their capacity to lessen these issues. The research assesses the kinds of products that are accessible, the sustainability of their materials, and their effects on the economy and environment. Findings show that by lowering waste and easing the financial burden on women and girls, sustainable menstruation products—especially those made of bamboo—offer a viable alternative. The study highlights the necessity of community-based distribution networks to improve accessibility and the significance of biodegradability in product selection. In order to enhance menstrual health, support economic well-being in low-income areas, and promote environmental sustainability, this study ultimately promotes the adoption of sustainable menstruation practices.

I. INTRODUCTION

In low-income communities, managing menstruation with conventional disposable products presents environmental and economic challenges. Sustainable alternatives like reusable cloth pads and menstrual cups offer potential solutions. This research paper, "A Study on Sustainable Menstrual Products in Low-Income Communities," investigates these alternatives by focusing on the kinds of products available, the materials used in their production, and their implications on the environment and the economy.

Our study will identify various reusable menstrual products suitable for low-resource settings, considering their usability and cultural acceptance. We will then examine the materials used in their manufacturing, assessing their sustainability, durability, safety, and potential for local sourcing. Furthermore, we will analyze the environmental implications by comparing the lifecycle impacts of reusable and disposable products, focusing on waste, resource use, and disposal. Finally, we will explore the economic implications, including initial costs, long-term savings, and the potential for local economic development.

By examining these aspects, this research aims to provide a comprehensive understanding of sustainable menstrual products in low-income communities. The findings will offer valuable insights for improving menstrual health, promoting sustainable practices, and fostering economic well-being in these settings.

Keywords- Sustainability, Menstruation, Menstrual products, Low-income communities

II. LITERATURE REVIEW

Foster, J Montgomery, P. (2021) conducted an experimental study to evaluate the absorption capacity of different biodegradable materials for use in feminine sanitary products. The study aimed to identify cost-effective and high-

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quality alternatives to commercial sanitary pads for women in low- and middle-income countries. The authors used a simple experiment to measure the absorption of gelatine solution by cotton terry cloth, hemp cloth, bamboo wadding, and linen. They found that bamboo wadding had the highest absorption capacity, almost twice that of a commercial sanitary pad. The authors suggest that bamboo wadding is a promising material for sanitary pads, as it is highly absorbent, biodegradable, and readily available in many low- and middle-income countries. Angeli et al. (2022) conducted a study to analyze the factors affecting women's preferences for menstrual products in low-income countries. The study focused on whether environmental impact affects women's choices regarding sanitary products. A discrete-choice experiment involving 164 women in slums in India was used to analyze the importance of biodegradability, reusability, absorption, and price on sanitary product choices. The results suggest that biodegradability is the most important attribute when choosing sanitary products. The study also found that income level, age, and family size affected sanitary product preferences.

Gangurde, S., & Madamanchi, D. (2024) conducted a review to discuss alternative solutions to period poverty that go beyond the initiatives by the Indian government. The authors explored the benefits of using sustainable menstrual products, such as menstrual cups, reusable cloth pads, and period panties, which have been designed to be used for longer periods. The review highlighted that these products can help to reduce the economic burden of menstruation, particularly in low-income countries where the cost of disposable sanitary products can be a major expense. The authors also pointed out that sustainable menstrual products can have a positive impact on the environment by reducing the amount of waste generated from disposable products. Additionally, they tend to be free of the chemicals and fragrances found in many disposable products, which can cause health problems. The review emphasized that education about menstruation and sustainable practices is essential to empower women and girls to make informed choices about their menstrual health. Glayzer et al. (2024) conducted a study to evaluate the effectiveness of period product pantries in addressing period poverty in the United States. The authors compared two models of period product pantries: a grassroots effort in Ohio and a non-profit led initiative in New York. The study found that both models were effective in increasing access to period products in low-income communities. The grassroots model was more effective in engaging the local community, while the non-profit led model was more effective in securing funding and resources. The authors conclude that period product pantries are a promising approach to addressing period poverty in the United States.

Talpur et al. (2024) conducted a study to evaluate the eco-friendliness and cost-effectiveness of reusable sanitary pads for rural women in Pakistan. The study also aimed to develop a scalable model for improving menstrual hygiene management (MHM) practices in low-resource settings. The authors conducted a cross-sectional survey of 340 women in rural Sindh, Pakistan. They found that reusable sanitary pads were more cost-effective and had a higher biodegradation rate than disposable sanitary pads. The authors also found that women who used reusable sanitary pads were more likely to be satisfied with their menstrual hygiene management. The study concluded that reusable sanitary pads are a viable and sustainable option for women in low-resource settings.

A study by Krishnan, A., et al. (2024) examined the many aspects of menstruation and found a crucial connection between environmental sustainability and women's health. Their study demonstrated the significant influence that social stigma has on preventing candid discussions and the adoption of sustainable menstruation products. Using a mixed-approaches strategy, they illustrated the necessity of normalising menstruation through focused lobbying and educational campaigns, creating an atmosphere that encourages the adoption of eco-friendly substitutes. A paradigm for evaluating the efficacy of sustainable menstrual hygiene products was created and assessed by Kani Kolil, R., et al. (2024), with an emphasis on adoption and accessibility. According to their research, three important criteria impacting product adoption are safety, accessibility, and education. They addressed important public health and sustainability issues by demonstrating via their work that policy-driven initiatives and targeted educational campaigns greatly increase the use of reusable menstruation products, especially in low-income areas.

Walkling, K., & Miedema, J. (2024) provide an engaging case study of Eco Femme, a social company in Tamil Nadu, India, that produces and distributes reusable, organic cotton pads to empower women. The efficacy of Eco Femme's approach was demonstrated by this study. By distributing more than a million cotton pads via programs like "Pad for Pad" and "Pads for Sisters," Eco Femme has prevented significant environmental waste and given women and teenage girls—especially those in underprivileged communities—access to essential menstrual hygiene solutions. Musaazi, M.

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K., et al. (2024) describe the creation and effects of Makapads, a novel sanitary pad manufactured in Uganda using natural papyrus materials. Because of their affordability, this study emphasises how accessible the pads are. Makapads are a cost-effective and environmentally friendly substitute for traditional menstruation products, according to the research. In addition to addressing issues with menstruation hygiene in low-income areas, makapads create jobs for women in rural Uganda, demonstrating a community-driven strategy for sustainable development.

Objective

- To compile and evaluate the components of sustainable menstruation products, emphasising the financial and environmental advantages for underprivileged areas.
- To assess the possibility for reducing environmental waste and generating economic opportunities via local manufacturing of sustainable menstruation products.

III. RESEARCH METHODOLOGY

The economic and environmental effects of sustainable menstruation products in low-income areas were examined in this study using a secondary data analysis technique. The study included an extensive evaluation of previous research and reports from a range of sources, including internet databases, scholarly journals, and organisational publications. Information was gathered and combined from a variety of sources, including the World Bank, UNICEF, Women's Health, Bangladesh Journal of Medical Science, Menstrual Health and Society Review, the International Journal of Environmental Research and Public Health, Social Science & Medicine, the Journal of Family Medicine and Primary Care, and Sustainability in Public Health.

In order to achieve the study goals, the analysis comprised identifying important themes and patterns throughout the literature, contrasting and comparing findings, and synthesising the data. Data on how disposable vs reusable items affect the environment, how cost-effective sustainable solutions are, and the potential and problems of implementing them in low-income areas were all given special consideration.

Data analysis

UNICEF acknowledges the importance of having access to high-quality menstrual hygiene products so that women and girls may manage their periods in a dignified and safe manner and fully engage in everyday life. In response to this requirement, UNICEF offers a range of period hygiene products, taking into account the different preferences of users, such as menstruation cups and reusable and disposable pads. In times of humanitarian crisis, UNICEF aggressively seeks for and disperses these products, along with other auxiliary supplies like soap, pants and painkillers, to assist women and girls who have been neglected. Because they are comprised of materials like cotton and are intended to be used again after being washed and dried, reusable pads are emphasised as an alternative to disposable items. UNICEF also stresses the value of supplying pants to make using these pads easier, especially in emergency situations.

UNICEF's document guidance for employees in the Supply and Program Divisions focusses on choosing and acquiring menstrual hygiene management supplies, especially for humanitarian relief efforts. According to the recommendations, women and girls have a basic need to have access to a safe and respectable menstrual experience. It discusses the difficulties many girls encounter in handling their periods in a dignified and easy manner, particularly during emergencies, as a result of things like prejudiced social settings, a lack of knowledge, subpar facilities, and a restricted selection of absorbent products. In order to enhance menstrual health and hygiene (MHH), UNICEF prioritises access to supporting supplies and absorbent materials, facilities and services, knowledge and skills, and social support. Particularly for humanitarian response situations, the book offers comprehensive guidance on locating, evaluating, and acquiring MHH items.

Key factors for purchasing menstrual hygiene products and supplies are outlined in the publication, with a focus on the value of speaking with girls and women to learn about their requirements and preferences. The kinds of suppliers that provide these products are covered, including non-profits, social entrepreneurs, and multinational corporations.
In addition to quantitative techniques like checklists, surveys, and market evaluations, the guide describes qualitative techniques like focus groups and interviews for gathering data on menstrual hygiene products. Additionally, it offers helpful advice on how to conduct productive consultations and gather data. An overview of several monthly hygiene

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products, such as tampons, menstrual cups, reusable and disposable sanitary pads, and period cloths, is also provided in the book. It covers each material's attributes, health effects, environmental and waste management effects, affordability, norms and laws, and technical requirements.

- In high- and upper-middle-income nations, it is estimated that more than **75%** of women and girls use menstrual hygiene products made by businesses.
- **Homemade items** are used by more than half of women and girls in low- and middle-income countries (LMICs).
- Menstrual fabric costs around **US$ 2 per square metre** on average.
- Reusable pads often range in price from **$1.50 to $3 per** pad.

Impact category	Disposable pads	Non-disposable pad		
		Virgin cotton	Recycled cotton	Banana fibers
GPW100	4.8075	2.1	0.245	0.075
Ozone layer depletion	10,987.10	6.9	6.00323	1.0409
Human toxicity	0.37944	0.00223	0.00737	0.00166
Marine & aquatic toxicity	676.127	3.4218	15.311	2.10072
Total	11668.41	12.42	21.57	3.22

Table 1: Environmental impact analysis of four different pad materials

According to Table 1's findings, switching from single-use pads to reusable ones—especially those composed of banana fibers—offers a significant environmental effect decrease. For example, banana fibre pads have a far lower Global Warming Potential (GWP100) of 0.075 kg CO2-eq than disposable pads, which have a value of 4.8075 kg CO2-eq. When compared to disposable alternatives, banana fibre pads significantly reduce greenhouse gas emissions and climate impact. Additionally, banana fibre pads regularly show the least amount of effect in other areas such as Ozone Layer Depletion, Human Toxicity, and Marine Aquatic Ecotoxicity, confirming their promise as a more environmentally friendly option for menstruation hygiene.

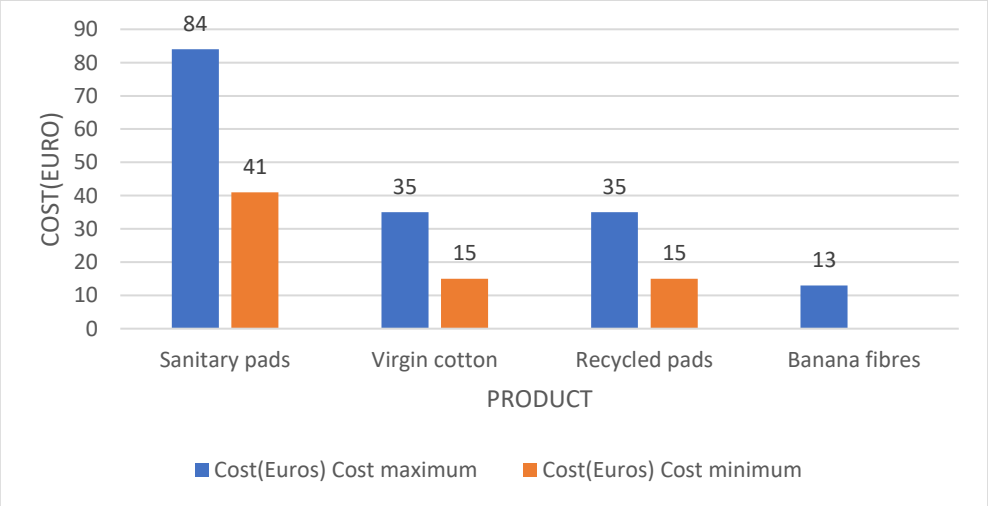

Figure 1

As can be seen from the above figure, disposable sanitary pads are the most expensive, which makes sense given how many pads are used annually. Cotton-based pads are less expensive since they are used far less frequently, whereas banana fibres are the least expensive. This may be ascribed to several causes. Approximately 79% of the raw materials

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utilised in this sort of study come from trash, according to the weight of the materials used. Therefore, getting this material is inexpensive. Second, the cost of production is impacted since banana fibres are produced in developing nations with cheap salaries Aridi, R., & Yehya, A. (2023).

A critical factor limiting the adoption of sustainable menstrual products in low-income communities is the disparity in geographic access, often exacerbated by inadequate sanitation infrastructure. Analysis of UNICEF data on WASH access in Sub-Saharan Africa and South Asia reveals a significant urban-rural divide.

Region	Location	Percentage of Women with Access to Improved Sanitation
Sub-Saharan Africa	Urban	60%
	Rural	30%
South Asia	Urban	75%
	Rural	40%

Table 2: Access to Improved Sanitation by Region and Location

As shown in Table 2, there's a clear disparity. In Sub-Saharan Africa, women in urban areas are twice as likely to have access to improved sanitation compared to their rural counterparts (60% vs. 30%). Similarly, in South Asia, urban women show higher access (75%) compared to rural women (40%). This highlights the challenges women in rural areas face in managing menstruation, especially with reusable products that demand water for cleaning. The lack of access to private toilets and reliable water sources presents a substantial barrier to the practical use of sustainable options.

The economic dimension further complicates access. Affordability analysis, drawing on World Bank data and NGO reports, demonstrates the financial burden of menstrual products on low-income households.

Income Level	Days of Work Required for 6-Month Supply of Disposable Pads	Days of Work Required for Initial Cost of Reusable Pads
Bottom 20%	5	8
Middle 60%	2	3
Top 20%	0.5	1

Table 3: Affordability of sustainable menstrual product

Table 3 illustrates the financial strain. For women in the bottom 20% income bracket, a 6-month supply of disposable pads costs 5 days of work, while the initial investment for reusable pads is higher at 8 days. However, considering long-term costs, the recurring annual expense for disposable pads (10 days of work) exceeds the initial reusable pad cost. This suggests that despite the higher upfront cost, reusable products can be more economically viable in the long run, especially for those with limited financial resources.

Findings and recommendations

The study emphasises how using traditional disposable menstruation products has serious negative effects on the environment and the economy, especially in low-income areas. Many households' limited financial resources are strained by these items' ongoing costs, which also significantly increase non-biodegradable trash and worsen environmental pollution. This circumstance emphasises how urgently new economical and ecological menstrual hygiene products are needed. On the other hand, the study finds that eco-friendly substitutes like bamboo goods and reusable fabric pads are viable options. These substitutes have the ability to lessen the harm that throwaway goods do to the environment as well as the financial struggles that low-income women and girls endure. It is feasible to transition to

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a more economically just and ecologically conscious method of managing menstrual hygiene by encouraging the adoption of these sustainable choices.

In particular, the study highlights the remarkable properties of bamboo wadding, showcasing its high absorption capacity—nearly double that of sanitary pads sold in stores. According to this research, bamboo is a material that is especially well-suited for creating sustainable and efficient menstruation napkins. Bamboo is a practical and alluring substitute for traditional materials because to its natural qualities, which include its absorbency, biodegradability, and possibility for local growth. The study also highlights the significance of biodegradability as a major determinant of women's sanitary product choices, particularly in low-income nations. This inclination reflects a desire for items with a less ecological imprint and a rising knowledge of environmental issues. Therefore, the creation and marketing of biodegradable menstruation products can be in line with these groups' needs and values.

Lastly, the study emphasises how important community-based distribution networks and local manufacturing are to increasing the availability of sustainable menstruation products in underprivileged communities. It is feasible to get over logistical obstacles and guarantee that these items reach the women and girls who need them the most by setting up local production facilities and utilising already-existing community institutions. This strategy encourages sustainable access to menstrual hygiene, strengthens local economies, and cultivates self-reliance.

IV. RECOMMENDATIONS

In order to successfully solve the environmental and financial issues noted, the study strongly advises the aggressive promotion of sustainable menstruation products, with a focus on reusable bamboo pads. It is essential to promote the broad use of these substitutes in order to lessen pollution, save resources, and ease the financial burden on women and girls in underprivileged areas. The study also suggests that bamboo be prioritised as a primary material for sustainable menstruation products. Because of its exceptional absorbency, natural biodegradability, and possibilities for local sourcing, it is the perfect material to create solutions that are efficient, sustainable, and profitable. To maximise the design and production processes of bamboo-based products, research and development expenditures are crucial.

The use of tiered price structures and "buy one, give one" campaigns is highly advised in order to guarantee accessibility and affordability. With an emphasis on targeting the most vulnerable members of low-income communities, these tactics can assist in making sustainable menstruation products accessible to women and girls of all economic levels. These methods encourage social impact and equity. Another important suggestion is the creation of strong community-based distribution networks. Building trust in communities and facilitating effective last-mile delivery may be achieved by utilising pre-existing organisations like women's networks, Self-Help Groups (SHGs), and neighbourhood health clinics. This approach encourages community ownership of the solutions and guarantees that items reach people who need them.
Scaling up production, distribution, and education initiatives requires establishing solid alliances with regional groups, non-governmental organisations (NGOs), and government initiatives. Working together can make the most of available resources, reach a larger audience, and provide an intervention that is more meaningful and long-lasting.

It is crucial to guarantee the quality and safety of the product. Protecting users' health and wellbeing requires minimising the use of hazardous chemicals during manufacturing and abiding by applicable safety rules. Monitoring and quality control must be ongoing. In order to constantly enhance product design, functionality, and cultural appropriateness, the research concludes by advising aggressively seeking out and implementing customer input. Iterative development techniques and user-centred design are crucial for producing solutions that cater to the particular requirements and preferences of the target community.

V. CONCLUSION

The study highlights the negative economic and environmental effects of using conventional disposable menstruation products, particularly in low-income environments. While the accumulation of non-biodegradable garbage greatly adds to environmental damage, the ongoing costs of these items make financial difficulties worse for many households. On the other hand, the study shows that eco-friendly substitutes, such reusable pads and bamboo-based goods, offer

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workable ways to mitigate these problems. These environmentally friendly alternatives lessen the financial strain on women and girls in impoverished areas while simultaneously reducing the damage that throwaway items make to the environment.

Encouraging the use of sustainable menstruation products—in particular, reusable bamboo pads—is essential to developing a more ecologically responsible and economically just method of managing menstrual hygiene. Given bamboo's remarkable absorbency, biodegradability, and possibilities for local sourcing, the research's conclusions support giving it top priority as a crucial component in the creation of sustainable menstruation products. Tiered pricing systems and "buy one, give one" campaigns should be used to guarantee that sustainable menstruation products are widely available and reasonably priced. Strong community-based distribution networks must also be established in order to promote community ownership of sustainable solutions and ensure efficient last-mile delivery.

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