



Production Of Cost-Effective Recycled Plastic Interlock As A Solution To Plastic Waste Generated In Sri Lanka.

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Abstract

This research examines the potential of producing recycled plastic interlocking bricks as a sustainable alternative to conventional concrete interlocks, with a focus on addressing the rising plastic waste problem in Sri Lanka, particularly within the Ampara District. While the study is geographically concentrated in Ampara, its findings are expected to provide valuable insights applicable across the country. The district presents appropriate research setting due to its rich biodiversity, fragile ecosystems, and expanding tourism sector, all of which are increasingly threatened by unmanaged plastic waste. Furthermore, the availability of data and the ability to collaborate with local communities enhance the practicality of conducting the study in this region. As Ampara reflects many of the national challenges such as inadequate waste management and rapid development, the solutions proposed recycling initiatives and the production of plastic interlocks can be scaled and adapted nationwide. Although regionally based, the outcomes of this study carry wider significance for advancing sustainable waste management practices throughout Sri Lanka.

In the Ampara District of Sri Lanka, the accumulation of plastic waste continues to rise, while existing disposal practices remain limited and unsustainable. This situation threatens local biodiversity, fragile ecosystems, and the tourism industry that depends on a clean environment. At the same time, the construction sector is experiencing increasing costs for conventional materials such as concrete interlocks. These challenges create a demand for

alternative solutions that address both environmental and economic concerns. The research problem, therefore, lies in the absence of an effective method to recycle plastic waste into durable and affordable interlocking bricks, along with the lack of sufficient evidence on how their performance and cost compare with standard concrete interlocks.

A thorough assessment of plastic waste volume and composition was conducted using data from local authorities, including the Urban Council and Pradeshiya Sabha. High-density polyethylene (HDPE), polyethylene terephthalate (PET), and sand were selected as the primary materials, with a heating process used for manufacturing. Various compositions were tested to identify the most effective mix, followed by laboratory evaluations measuring compressive strength and water absorption. The study also included a detailed cost analysis, comparing the selected plastic interlock with traditional concrete interlocks. Results confirmed that recycled plastic interlocks are a viable and cost-effective solution, offering environmental benefits by reducing plastic pollution while promoting sustainable construction materials in the Ampara region

Keywords: Plastic Pollution ; Recycled Plastic Interlocks ; Eco-friendly Bricks ; Waste management ; Cost analysis ; Environmental Sustainability .

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1. Introduction

Plastics, synthetic organic materials derived from petrochemicals, possess high plasticity, allowing them to be moulded under heat and pressure. Their low cost, density, transparency, and excellent insulation properties make them indispensable in sectors such as packaging, electronics, transportation, and medical equipment. However, their widespread use has led to significant environmental challenges. Improper disposal methods, including open dumping and incineration, contribute to pollution, with plastic particles entering ecosystems and food chains. Furthermore, plastic production relies on nonrenewable resources and emits greenhouse gases, exacerbating climate change. Recycling presents a viable solution for managing plastic waste effectively. (Arachhi N., 2020).

Ampara District, located in Sri Lanka's Eastern Province, spans 4,495 square kilometers and features diverse ecosystems, including coastal, marine, terrestrial, and aquatic habitats (Prof. Devaka K. Weerakoon et al., 2022). Historically part of the ancient Rohana Kingdom, it has significant cultural heritage and biodiversity, hosting 760 plant and 453 animal species, including many endemic and SLIIT International Conference on Engineering and Technology 130-2 threatened ones. The district experiences a tropical climate with average temperatures between 25-27°C and annual rainfall of approximately 1,750 mm, primarily from the northeastern monsoon. However, conservation challenges such as deforestation, illegal activities, and invasive species threaten its ecosystems. Additionally, waste management has become a major issue, with Sri Lanka generating around 7,000 megatons of solid waste daily, of which the Eastern Province contributes 8.5% (Subhane S. L., 2022). Kalmunai Municipal Council, the district's main urban center, produces 65 metric tons of waste daily, but only 60-80% is collected. Waste sources include residential, industrial, commercial, agricultural, and construction waste. Despite 20 local authorities being responsible for waste collection, improper disposal methods such as open dumping and burning are common, posing risks to public health and the environment. These challenges are worsened by financial constraints and a lack of technical expertise in implementing sustainable waste management strategies (S. A. G. L. Subasinghe et al., 2012).

A research initiative by the Faculty of Engineering at SLIIT aims to address Ampara's plastic pollution by developing cost-effective recycled plastic paving interlocks. These interlocks are positioned as sustainable alternatives to traditional concrete interlocks, which have a higher carbon footprint and cost. The project seeks to evaluate the properties and sustainability of these plastic interlocks, offering a dual solution to plastic waste and the environmental impact of concrete production. By repurposing waste plastics into functional products, the research underscores the potential of innovative recycling methods to mitigate environmental issues in the region.

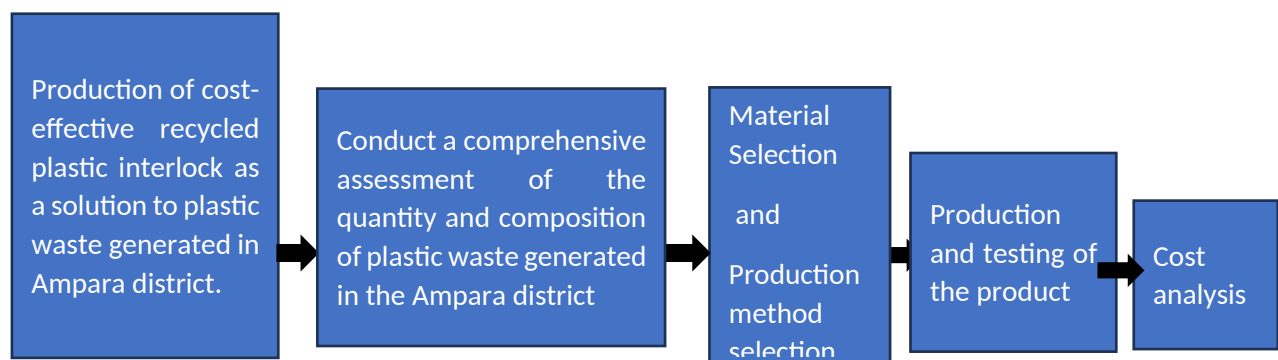
This study focuses on addressing the plastic waste generated in the Ampara area by exploring its potential use in producing recycled plastic interlocks as a sustainable alternative to traditional concrete interlocks.

This study focuses on Ampara District due to its biodiversity, tourism, and ease of data collection, but its findings are relevant nationwide. The plastic recycling methods and solutions developed here can be applied across Sri Lanka, making the research valuable beyond its local scope. It involves identifying current plastic waste disposal methods and evaluating recycling options to manufacture construction-related products such as paving interlocks. The research includes laboratory testing to analyze the mechanical properties of recycled plastic interlocks such as compressive strength and durability and compares these with existing interlock products to ensure performance standards are met. Additionally, the study examines the production cost of recycled plastic interlocks, contrasting it with the current market price of concrete interlocks to assess cost-effectiveness. Furthermore, the environmental impacts of utilizing recycled plastic as a paving material are analyzed, considering both positive and negative outcomes. The expected outcome is to determine the feasibility of using recycled plastic interlocks as a durable, cost-effective, and environmentally friendly solution for managing plastic waste while meeting construction demands.

2. Methodology

This study focuses on addressing the plastic waste issue in the Ampara district through the development of cost-effective plastic interlock bricks. The project aims to utilize plastic waste materials to create sustainable construction materials.

The initial phase involves a comprehensive assessment of plastic waste generation in the region. This includes analyzing the types and rates of plastic waste produced, their composition, and current disposal methods. Using this data, plastic interlock bricks with different material compositions will be produced and tested for strength, durability, and overall performance. A thorough cost analysis will also be conducted to ensure the economic viability of large-scale production.



2.1 Conduct A Comprehensive Assessment Of The Quantity And Composition Of Plastic Waste Generated In The Ampara District.

The study utilized a data collection approach involving direct engagement with government authorities, including urban councils and Pradeshiya Sabhas, which are primarily responsible for collecting and categorizing plastic waste. A Google Form was distributed by the Ampara ACLG office to all local authorities within its jurisdiction to streamline data acquisition. While the collected data were reliable, some gaps were identified due to insufficient record-keeping practices in certain authorities. This method ensured a structured and practical approach to obtaining relevant information for the study.

Table 1: Data collected about Non-Degradable Waste collected in Ampara district

S.N	Name of the LA	Collection of degradable waste (MT per month)	Collection of non-degradable waste			Total Collection of Nondegradable waste (MT per Month)
			PET Bottles (MT per Month)	Tetra Packs (MT per Month) (eg- Fresh milk packs)	Other burnable items(MT per Month) eg- Yoghurt cups etc)	
1	Pottuvil PS	375	69	120	10	199
2	Ampara U C	6000	2400	2000	150	3000
3	Nintavur PS	420	50	140	50	240
4	Dehiattakandiya PS	4	0.6	1	2	3.6
5	Namaloya PS	3.05	0.07			3.12
6	Uhana PS	95	25	10	30	60
7	Irakkamam Ps	42	0.5	0.5	3	4
8	Karaitivu PS	100	0.2	0.1	0.1	1
9	Navithanveli PS	1.6	0.3	0.1	0.5	0.9
10	Padiyathalawa PS	3	2	1	1	6
11	Tirukkivil PS	77	0.025			0.025
12	AKKARAIPATTU - PS	27	1	0.5	0.75	11
13	Mahaoya Ps					
14	Alayadivembu PS	40	2	1	2	5
15	Lahugala PS	1	0.1	0.1	0.1	0.3
16	Damana PS	2.55	0.05	0.01	-	0.45
17	Sammanthurai PS	145	0.05	0.05	0.01 mt	125

Table 2: Categorized data collected about plastic waste collected in Ampara district by local authorities in given months.

The analysis of waste data in the Ampara district highlights a significant accumulation of PET and PP plastics

Waste Collecting Authority -Urban council / Pradeshiya Sabha							
S.N	Name of the LA	Month	Total Plastic Collected (Kg)	PP Plastic category (Kg)	Pet plastic category (Kg)	Other(Kg)	Total Area of the weight collected (Km ²)
1	Dehiaththakandiya PS	2024 May	1150	550	600	2000	30
		2024 June	1466	870	596	2100	30
		2024 July	1210	610	600	1890	30
2	Namaloya PS	2024 May	170	50	50	500	17
		2024 June	150	50	50	750	17
		2024 July	150	50	50	600	17
3	Sammanthurai PS	2024 May	250	50	50	150	132.8
		2024 June	240	50	40	140	132.8
		2024 July	250	50	50	150	132.8
4	Ninthavur PS	2024 May	350	25	25	500	2.5
		2024 June	150	28	40	750	2.5

, particularly in areas like Ampara UC and Pothuvil PS. Despite being collected in large volumes, these plastics currently lack a systematic recycling process. This initiative proposes utilizing PET and PP plastics as core materials for producing durable building bricks, providing an eco-friendly solution to manage non-degradable plastic waste. Transforming plastic waste into construction materials can reduce the environmental impact of plastic disposal while supporting the local construction industry.

2.1 Material Selection

Based on the analyzed data and the performance requirements of interlock bricks, sand, PP, and PET plastic waste were identified as the primary materials. The plastic waste was shredded into fine fragments to improve melting efficiency, while the sand was sieved through a one-millimeter mesh to remove larger particles. This meticulous preparation ensures a uniform mixture, contributing to the quality and durability of the interlock bricks.



Figure 1: Sieved sand**Figure 2:** Shredded PP Plastic**Figure 3:** Shredded PET plastic

2.2 Production method selection.

The heating method was chosen for producing plastic bricks due to its low energy requirements and minimal reliance on advanced machinery. The process involves heating the prepared plastic mixture, pouring it into moulds, and manually compressing it to achieve the desired shape and density. This approach simplifies the manufacturing process, reduces operational costs, and enhances accessibility. By efficiently processing plastic waste, this method supports resource conservation and aligns with sustainable and environmentally friendly practices.

2.3 Sample preparation

Five sample types were prepared, each with varying compositions of PET and PP plastics and sand, to determine the optimal mix design. The different mix designs were selected to systematically study how varying proportions of PET, PP, and sand influence the overall performance and practicality of recycled interlocks. Since the aim of the research is to produce a cost-effective and sustainable product, it was necessary to test a wide range of combinations, from high-plastic to high-sand ratios, and to also include mixes where PET and PP were blended together.

Table 2: Material content of different samples

Sample	Plastic percentage%		Sand percentage %
	PET	pp	
Sample 01		80	20
Sample 02		60	40
Sample 03		50	50
Sample 04	10	40	50
Sample 05	25	25	50

Sample size = 200mm × 100mm

Thickness = 50mm

2.4 Production procedure

2.4.1 Apparatus

- Plastic Shredder Machine
- Domestic cooker
- Gas cylinder
- Pan for heating

- Steel steering rode
- Scale
- Mold – two models were crafted one for initial design and the other one for cylindrical design to conduct a tensile strength test cylindrical



Figure 4: Mold crafted for plastic interlocks closed



Figure 5: Mold for tensile strength test specimen

2.4.2 Production set-up

The plastic brick production was designed as a domestic operation utilizing simplified equipment, making it feasible outside an industrial setting. Most apparatus were household items, with the exception of a shredding machine. Shredded plastic materials were initially processed at an external facility before being transported to the production site for further processing.

A weighing scale was placed to accurately measure plastic quantities for various sample designs. The heating and mixing process was conducted using a pan and steel rod near a cooker connected to a domestic gas cylinder, ensuring a consistent heat source. The steel rod facilitated continuous and thorough stirring of the plastic mixture, ensuring an even distribution of materials for uniform and high-quality bricks.



Figure 6: Production setup

2.4.3 Production of interlocks

The production of interlocking bricks employed a heat-based method involving precise material measurements and mixing. Materials were combined in predetermined ratios and heated until achieving a viscous, paste-like consistency, signaling readiness for molding. The heated mixture was then poured into pre-prepared molds and manually compressed to ensure uniformity, high density, and proper shaping.

Following compression, the molds underwent a controlled cooling process in a water bath. This step solidified the bricks while enhancing their structural integrity and durability. The careful cooling ensured the interlocks met the necessary strength and efficiency standards, resulting in a high-quality, reliable final product.



Figure 7: Heating mixture



Figure 8: The mixture pastes after heating just before pouring into the mould.

2.4.4 Final Production

Five distinct sample types were prepared using the outlined production process, each featuring unique material compositions. These variations were designed to assess how different combinations impact the strength, durability, and cost-effectiveness of the interlock bricks.

Comprehensive testing was conducted on each sample to evaluate structural properties, including strength, density, and overall performance. The results provided critical insights into the material configurations, highlighting variations in quality and economic feasibility. This analysis enabled the identification of optimal material combinations, balancing performance requirements and cost considerations to refine the production process for desired outcomes



Figure10: Final plastic interlock product

2.5 Cost analysis

The total production cost per brick was evaluated by categorizing costs into key components, with each expense assigned a value based on its contribution to the overall process. This method provides a detailed understanding of the cost structure, enabling the identification of the most cost-effective mix design. The analysis was based on the assumption of mass production, in line with industry standards, to allow a fair comparison with traditional concrete interlock production methods. Cost data was gathered through interviews with the NEUF Plastic Recycling Center, a local facility specializing in large-scale production of fully plastic bricks and other recycled products. Insights from NEUF's production processes helped determine accurate cost values for each stage of the plastic brick manufacturing process.

2.5.1 Key Cost Categories

1. Raw material cost (per 1Kg according to the data obtained from NEUF plastic centre).

- PP Plastic-Rs.80
- PET Plastic-Rs.20
- Sand-Rs.5

2. Cost of energy per brick (according to the data obtained from NEUF plastic centre) •

- Shredding -Rs.0.5
- Production (Heating, compressing moulding etc)-Rs 5 •
- Cooling-Rs.5

3. labor cost per brick (according to the data obtained from NEUF plastic centre)

- Manual laboring-RS 2 per brick

Table 3: Cost analysis for each sample

Sample	Weight	Cost for	Cost of	Cost for	Cost of plastic (LKR)	Total cost
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	(material+waste		Labor	Energy	sand				(LKR)
Specimen	kg)	Weight (g)	(LKR)	(LKR)	(LKR)	PET	PP	Percentage of	
	Sand: PP:			Weight of Paver block		Weight of water		Water	
	PET Ratio			after 24 hrs in water		observed by Paver		observation	
				(g)		Block (g)		(%)	
Sample 01	950		2	5	1		61	69	
Sample 02	1150	950	2	5955	2	0 5	55	0.526	64
Sample 03	1230		2	5	2.5	0 5	49		58.5
Sample 02	4:6	1150		1155		5		0.435	
Sample 04	1290		2	5	2.5	2.5	41		52
Sample 03	5:5	1230	2	51235	2.5	6.5 5	26	0.406	42
Sample 05	1245								
Sample 04	5:4:1	1290		1295		5		0.387	
Sample 05	5:2.5:2.5	1245		1250		5		0.401	

Cost of a traditional interlock of this size is typically 58 rupees colored ones. Sample 3, sample 4 and sample 5 are taken as cost-effective samples and then checked for further tests to understand the characteristics of strength and other properties such as water absorption.

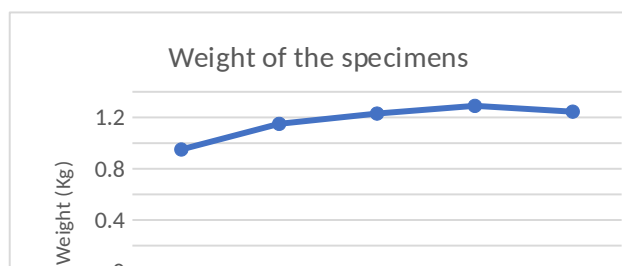
3 Results and Discussion

This research aims to evaluate the production of cost-effective interlock paving bricks and improve their strength to determine if plastic-based interlocks can be a viable alternative to traditional concrete interlocks. To assess the characteristics of these plastic interlocks, three tests were conducted: one to measure water absorption, and the others to evaluate compressive and tensile strength. The tests were performed following established methods from previous studies, ensuring the reliability and comparability of the results.

3.1 Weight of the specimens. (Typical concrete interlock weight 2.5Kg)

Table 3: Weight of the samples

Figure 11: Graphed weight of the different samples



The analysis of various samples demonstrates how different proportions of sand, polypropylene (PP), and polyethylene terephthalate (PET) affect the weight and density of plastic-based interlocking blocks. Sample 01, with a 2:8 sand-to-PP ratio, has the lightest weight at 0.95 kg due to the higher PP content, which lowers density. Sample 02, with a 4:6 sand-to-PP ratio, weighs 1.15 kg as the increased sand proportion raises the block's density. Sample 03, with equal sand and PP content, weighs 1.23 kg, reflecting a balanced composition. Sample 04, incorporating PET in a 5:4:1 sand-to-PP-to-PET ratio, weighs 1.29 kg, with PET enhancing structural integrity while maintaining balance. Lastly, Sample 05, with a 5:2.5:2.5 sand-to-PP-to-PET ratio, weighs 1.245 kg, offering a strong, stable mix with moderate density.

3.2 Water absorption test. (Typical concrete water absorption is (4-6) %).

Table 6: Water absorption result table

Specimen	Sand: PP: PET Ratio	Weight (Kg)
Sample 01	2: 8:0	0.95
Sample 02	4:6 :0	1.15
Sample 03	5:5 :0	1.23
Sample 04	5:4:1	1.29
Sample 05	5:2.5:2.5	1.245

Method: Dry the specimen in an oven, weigh it, immerse in water for 24 hrs, then reweigh. Absorption % = $(\text{Wet} - \text{Dry}) / \text{Dry} \times 100$

Apparatus: Oven, water tank, electronic balance.

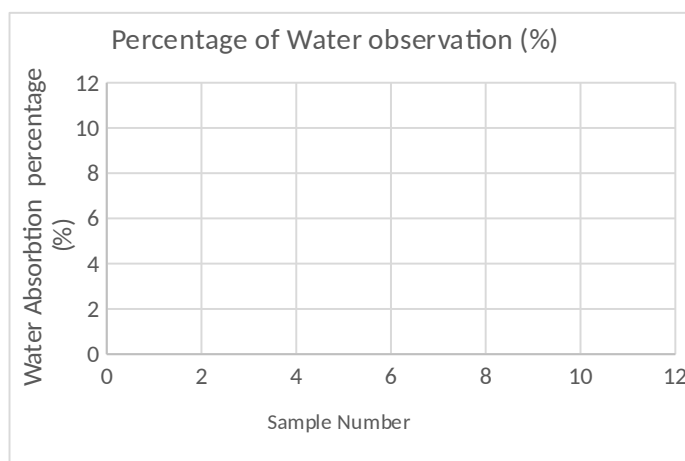


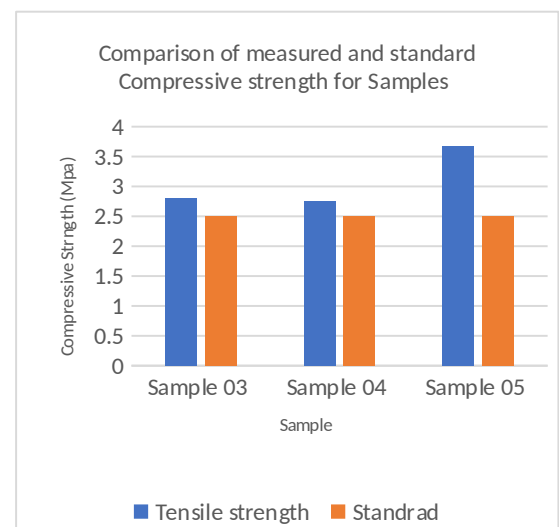
Figure 12: Graphed water absorption result

The analysis of water absorption rates in plastic interlock blocks reveals that varying proportions of sand, polypropylene (PP), and polyethylene terephthalate (PET) significantly affect the material's porosity and moisture resistance. As sand content increases and PET is introduced, the water absorption rate decreases, with Sample 01 exhibiting the highest absorption at 0.526%, and Sample 04 showing the lowest at 0.387%. This suggests that higher sand content and the addition of PET improve the block's density, reducing porosity and moisture penetration. Compared to traditional concrete interlocks, plastic interlocks demonstrate much lower water absorption, enhancing their durability and making them more resilient to extreme weather conditions, such as freeze-thaw cycles, heavy rainfall, and temperature fluctuations. The superior water resistance of plastic interlocks makes them a more durable and reliable alternative to concrete interlocks, particularly in climates with harsh weather conditions. But due to this lower water absorption can be lead into poor drainage and water infiltration issues

3.3 Compressive strength test. (According to the ASTM(American Society for Testing and Materials) standards, 21mpa is the minimum compressive strength needed for light vehicular traffic.

Table 4: Compressive strength test results

Sample	Sand:PP: PET content	Sample weight (kg)	Load at failure (kN)	Compressive strength (Mpa)
Sample 03	5:5 0	1.23	483.9	21.195
Sample 04	5:4:1	1.29	545.68	27.284
Sample 05	5:2.5:2.5	1.245	575.4	28.77

**Figure 13:** Bar chart of compressive strength and standard compressive

Method: Place cube/cylinder specimen in a compression testing machine and apply load until failure. Strength = Load / Area.

Apparatus: Compression testing machine (CTM), calipers.

The bar chart compares the compressive strength of various plastic interlock samples against the ASTM standard of 21 MPa, highlighting the impact of different material compositions. Sample 03, with a 5:5 sand-to-PP ratio and no PET, achieves a compressive strength of 21.195 MPa, meeting the ASTM benchmark but offering the lowest strength among the samples due to the absence of PET. Sample 02, incorporating PET in a 5:4:1 sand-to-PP-to-PET ratio, achieves a higher compressive strength of 27.284 MPa, benefiting from PET's ability to enhance cohesion and structural resilience. Sample 04 demonstrates the highest compressive strength at 28.77 MPa,

attributed to its balanced composition of 5:2.5:2.5 sand, PP, and PET, which optimizes density and cohesion. The analysis underscores the significant role of PET in improving compressive strength, with the strongest samples featuring a balanced use of PP and PET supported by a high sand content, resulting in durable and load-resistant blocks.

3.4 Tensile strength test. (According to the ASTM standards, 2.5 Mpa is the minimum tensile strength needed for light vehicular traffic).

Table 5: Tensile strength test results

Sample	Sand:PP: PET content	Sample weight (Kg)	Tensile strength (Mpa)
Sample 03	5:5	1.23	2.811
Sample 04	5:4:1	1.29	2.75
Sample 05	5:2.5:2.5	1.245	

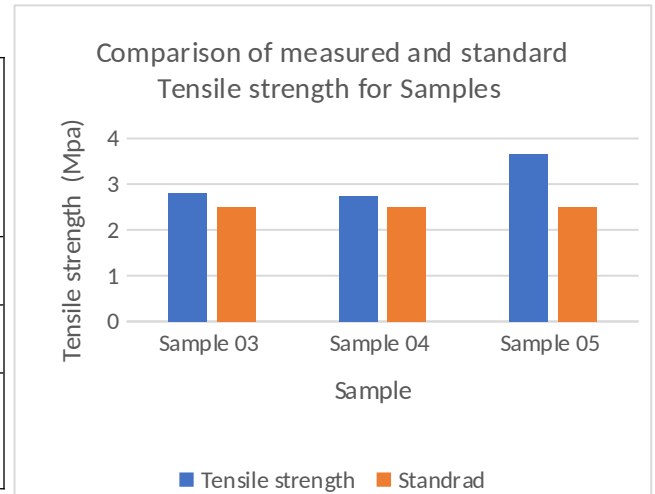


Figure 14: Bar chart of the tensile strength for each sample with standard value

Method Indirect (splitting): Apply load on cylinder's diameter until it splits.

Apparatus: UTM or CTM, loading strips.

The analysis of tensile strength in plastic paving blocks highlights the influence of varying sand, polypropylene (PP), and polyethylene terephthalate (PET) compositions on performance under tension. Sample 03, with a balanced 5:5 sand-to-PP ratio and no PET, exhibits the highest tensile strength of 2.811 MPa, benefiting from strong material bonding. Sample 04, incorporating PET in a 5:4:1 ratio, shows a slightly reduced tensile strength of 2.75 MPa, while Sample 05, with a 5:2.5:2.5 composition, records the lowest tensile strength at 2.67 MPa, indicating that excess PET may compromise tensile performance. The findings suggest that higher PP content enhances tensile strength, as PP contributes to flexibility and resistance to tensile forces. Compared to traditional concrete interlocks, plastic interlocks demonstrate superior tensile strength, improving their durability and resistance to cracking or deformation under stress. This advantage makes plastic interlocks a more reliable and long-lasting alternative for applications requiring resilience to mechanical stresses and environmental changes.

4 Conclusion

The comparison between plastic and concrete interlocks reveals a clear advantage for plastic interlocks in terms of performance, cost-efficiency, and sustainability. Plastic interlocks demonstrate superior compressive and tensile strength, reduced water absorption, and lighter weight while being more cost-effective than traditional concrete options. Manufactured primarily from waste plastics, they offer an eco-friendly alternative by repurposing materials that would otherwise contribute to environmental pollution. This approach significantly lowers the carbon footprint of interlock production and aligns with global efforts to adopt sustainable building practices.

Among the designs tested, Sample 05 emerged as the most suitable, offering the highest compressive strength, balanced performance across all metrics, and a sustainable use of PET and polypropylene (PP), addressing plastic waste reduction comprehensively.

The adoption of plastic interlocks provides a cost-effective and environmentally sustainable solution. By transforming plastic waste into durable construction materials, this innovation addresses environmental challenges while meeting the needs of the growing construction industry. The findings of this research not only validate the viability of plastic interlocks as an alternative to concrete but also establish a foundation for further development of recycled plastic materials in construction. This integration of waste management and material innovation supports a circular economy, enhancing sustainability and reducing reliance on non-renewable resources in the construction sector.

Plastic interlocks do face challenges like lower strength, slipperiness in rain, poor drainage, and the risk of microplastic release. However, despite these issues, they offer significant environmental and economic benefits compared to traditional concrete blocks. They're made from recycled plastic, reducing waste and lowering carbon emissions. With continued research and development, most of these drawbacks can be overcome through better design, materials, and manufacturing methods—making plastic interlocks a more sustainable and cost-effective solution in the long run.

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References

- [1] N. Arachchi, S. Thathsarani, A. Kaluarachchi, and A. Nilmini, "Current Plastic Wastage and Introducing New Innovations to Minimize Plastic Wastage in Sri Lanka," *vol. 1, p. 2*, 2020. [Online]. Available: https://www.researchgate.net/publication/348558475_Current_Plastic_Wastage_and_Introducing_New_Innovations_to_Minimize_Plastic_Wastage_in_Sri_Lanka.
- [2] S. Sinnalebbe, "Solid Waste Management in Kalmunai Municipal Council," *Journal of Research on Technology in Education*, *vol. 3, no. 4, pp. 2*, 2022. [Online]. Available: https://www.researchgate.net/publication/364383502_Solid_Waste_Management_in_Kalmunai_Municipal_Council.
- [3] D. Weerakoon, N. C. Jayawardana, R. de Mel, T. Ranasinghe, and A. P. Sumanapala, "Biodiversity Profile of the Ampara District," *Nov. 26*, 2022. [Online]. Available: https://www.researchgate.net/publication/368815875_Biodiversity_Profile_of_the_Ampara_District.

- [4] "Solid Waste Management in Kalmunai Municipal Council," *Journal of Research on Technology in Engineering*, vol. 3, no. 4, pp. 2, 2022. [Online]. Available: <https://www.jrte.org/wp-content/uploads/2022/10/Solid-Waste-Management-in-Kalmunai-Municipal-Council.pdf> [Accessed: Aug. 27, 2025].
- [5] P. O. Dawodu, A. Akindele, and U. Imoh, "Recycling of Waste Plastic for the Production of Road Interlocking Paving Stone in Nigeria," *Journal of Engineering Research and Reports*, pp. 296–301, 2022. doi: 10.9734/jerr/2022/v23i12785.
- [6] R. Kumar, K. Sadeghi, J. Jang, and J. Seo, "Mechanical, chemical, and bio-recycling of biodegradable plastics: A review," *The Science of the Total Environment*, vol. 882, p. 163446, 2023. doi: 10.1016/j.scitotenv.2023.163446.
- [7] F. Tahir, S. Sbahieh, and S. G. Al-Ghamdi, "Environmental impacts of using recycled plastics in concrete," *Materials Today: Proceedings*, vol. 62, pp. 4013–4017, 2022. doi: 10.1016/j.matpr.2022.04.593.
- [8] A. Genc, O. Zeydan, and S. Sarac, "Cost analysis of plastic solid waste recycling in an urban district in Turkey," *Waste Management & Research*, vol. 37, no. 9, pp. 906–913, 2019. doi: 10.1177/0734242x19858665.
- [9] L. Gungat, F. Anthony, A. K. Mirasa, H. Asrah, N. Bolong, N. A. Ispal, and S. J. Matlan, "Development of Paver Block Containing Recycled Plastic," in *IOP Conference Series: Materials Science and Engineering*, vol. 1144, no. 1, p. 012094, 2021. doi: 10.1088/1757-899X/1144/1/012094.
- [10] S. Nandi and G. D. R. N. Ransinchung, "A Review on the Use of Alternative Materials as a Sustainable Approach in the Manufacture of Concrete Paver Blocks," in *Lecture Notes in Civil Engineering*, pp. 93–108, 2022. doi: 10.1007/978-981-16-9921-4_6.
- [11] P. G. C. N. T. Pilapitiya and A. S. Ratnayake, "The world of plastic waste: A review," *Cleaner Materials*, vol. 11, p. 100220, 2024. doi: 10.1016/j.clema.2024.100220.
- [12] S. Sable, M. Ikar, and P. Dudheinamdar, "Exploring the Complexities and Challenges of Plastic Recycling: A Comprehensive Research Review," in *Advances in Science, Technology & Innovation*, pp. 189–202, 2024. doi: 10.1007/978-3-031-49826-8_22.
- [13] N. Shahla Al Balushi, N. Al Siyabi, M. A. Hasani, A. Monther, and S. Kuckian, "Plastic Based Cost-Effective Interlock Paver Blocks," *Journal of Student Research*, Sep. 16, 2024. [Online]. Available: <https://www.jsr.org/index.php/path/article/view/2122>.
- [14] M. N. Shrestha, J. Kandel, P. KC, A. Bhatta, S. Paudyal, and B. P. Adhikari, "A Review of Plastic Bricks as a Construction Material," *Zenodo*, 2023. doi: 10.5281/zenodo.7578846.