

# Assessing the Socio-Economic Impact of Solid-Waste Pollution on Local Communities and Tourism at Kigamboni Beach, Dar es Salaam

Robert Gasper Mollel, Msabaha Juma Mwendapole

Department of Maritime Transport, Dar es Salaam Maritime Institute, Dar es Salaam, Tanzania  
Email: gasrobert19@gmail.com, mwendapole.msabaha@gmail.com

**How to cite this paper:** Mollel, R. G., & Mwendapole, M. J. (2025). Assessing the Socio-Economic Impact of Solid-Waste Pollution on Local Communities and Tourism at Kigamboni Beach, Dar es Salaam. *Open Journal of Social Sciences*, 13, 565-579.  
<https://doi.org/10.4236/jss.2025.139034>

**Received:** July 6, 2025

**Accepted:** September 23, 2025

**Published:** September 26, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.  
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).  
<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

Solid-waste pollution is reshaping the social and economic landscape of urban shorelines, yet its livelihood costs remain under-measured in East Africa. This mixed-methods study quantifies how litter dominated by single-use plastics affects local communities and tourism at Kigamboni Beach, Dar es Salaam. Four 50 m transects logged 5,121 debris items, 93% of them plastic; beverage bottles and snack wrappers alone comprised 69%. Surveys of 56 enterprises and households, paired with 35 interviews, show tourism demand contracting sharply: hotel occupancy fell 22% and weekend beach-bed rentals 35% compared with 2019. Logistic regression indicates that when plastic density exceeds 15 items/m<sup>2</sup>, beach-dependent households are 2.3 times likelier to report income decline ( $\beta = -0.83$ ,  $p = 0.007$ ). Monthly clean-up costs average TSh 6,000 for kiosks and TSh 140,000 for lodges, eroding thin profit margins. Thematic analysis reveals four reinforcing narratives Plastic Premiership, Visitor Flight, Livelihood Leakage, and Governance Gaps underscoring weak enforcement as the pivotal driver of persistent pollution. Findings advocate a ring-fenced coastal-enforcement unit, refundable container-deposit schemes, and micro-zoned waste management to convert Kigamboni's plastic burden from economic liability to circular-economy resource.

## Keywords

Coastal Litter, Tourism Economics, Household Livelihoods

## 1. Introduction

Marine litter has moved rapidly from a peripheral nuisance to what the United

Nations Environment Programme (UNEP, 2021) ranks among the five most acute oceanic threats, on par with overfishing and climate-driven coral bleaching. At the heart of the problem is plastic: roughly 80% of all documented marine debris is synthetic, lightweight, and persistent, allowing it to disperse globally on wind, wave, and current pathways (Jambeck et al., 2015). Current estimates suggest that about 11 million t of mismanaged plastic escape terrestrial waste systems each year, and modelling by Lau et al. (2020) projects a near-tripling of this flow by 2040 under a business-as-usual scenario. While ecological damage entanglement, ingestion, and habitat smothering has dominated headlines, an equally pressing concern lies in how visible rubbish devalues the very “sun-sea-sand” aesthetic upon which coastal recreation economies are built (Williams & Tudor, 2020).

The western Indian Ocean has emerged as a regional flashpoint for shoreline litter, with East African beaches often recording some of the highest plastic-item densities worldwide. Transect surveys along urban beach arcs in Tanzania report monsoon-season averages of 12.4 items/m<sup>2</sup>, considerably above UNEP’s “moderately dirty” threshold (Mohammed, 2022). Neighbouring island and mainland case studies reinforce the pattern: on Zanzibar’s resort coast, Maione (2019) attributed nearly half of strandline debris directly to tourist peaks; in Kenya’s Watamu Marine Reserve, a single heavy-litter episode precipitated a 26% drop in hotel occupancy within three weeks (Otieno & Munga, 2020). These figures illustrate that litter is not merely an ecological stressor but a market-level disruptor across the region.

Kigamboni Beach the principal public shoreline of Dar es Salaam epitomises the collision between mass recreation and fragile waste systems. Long-weekend visitor counts routinely exceed 3 000, supporting more than 500 microenterprises ranging from beach-bed rentals and food kiosks to sand-art vendors. Yet user surveys and municipal audits document a visible litter load that often surpasses 15 items/m<sup>2</sup>, breaching UNEP’s “dirty” classification (UNEP, 2021). Residents complain of “smelly sand,” and hoteliers report resorting to price discounts or complimentary amenities to offset negative first impressions. Discarded beverage bottles, snack sachets, and derelict fishing nets are the most common items, signalling leakage from both tourism consumption and local household waste streams.

Ecological assessments of Tanzanian marine debris are mounting (Said & Msuya, 2020), yet systematic appraisals of the human costs remain scarce. Where socio-economic studies exist, they typically isolate a single sector tourism (Machu, 2021) or small-scale fisheries (Richardson et al., 2019) and seldom quantify how litter simultaneously undermines diverse livelihood streams or interacts with informal coastal economies.

Addressing this evidence gap, the present study employs a convergent mixed-methods design to evaluate how solid-waste pollution at Kigamboni Beach shapes the economic fortunes of local communities and tourism operators. Specifically, it interrogates three questions: (1) What income gains or losses, and what cost burdens, do households and businesses attribute to shoreline litter? (2) How does

objectively measured debris density correlate with key tourism indicators such as occupancy rates and visitor spending? (3) Which governance factors e.g., enforcement strength, clean-up frequency mediate or magnify these socio-economic impacts?

## 2. Literature Review

### 2.1. Tourism Sensitivity to Beach Cleanliness

Beach tourism is unusually sensitive to subtle changes in shoreline aesthetics; economists have shown that even very small quantities of litter can markedly diminish perceived destination quality. Ballance, Ryan, and Turpie (2019) demonstrated that as few as two items/m<sup>2</sup> reduced visitors' stated willingness-to-pay for a day at the beach by almost half, signalling a low perceptual threshold for "acceptable" cleanliness. Ariza, Jiménez, and Sarda (2018) reinforced this relationship in Spain's Costa del Sol, finding that a single-point increase on the Marine Litter Severity Index corresponded with a € 27 decline in average daily tourist expenditure an elasticity that directly converts environmental degradation into lost foreign-exchange earnings. These studies confirm that litter is not simply an eyesore but a quantifiable economic liability for destinations whose competitive advantage rests on visual appeal.

Wider regional and global evidence accentuates this vulnerability. The National Oceanic and Atmospheric Administration (NOAA, 2022) estimated that a two-fold rise in visible debris along coastal Alabama wiped out more than US \$ 113 million in visitor-day value within one season. Comparable outcomes have been recorded in Asia's resort corridors of Phuket and Bali, where spikes in post-monsoon litter coincide with occupancy dips of 10% - 20%. Collectively, these findings suggest that litter exerts a demand-side shock that can move accommodation markets, restaurant receipts, and ancillary services in lock-step, underscoring the strategic importance of beach cleanliness to tourism-dependent localities like Kigamboni.

### 2.2. Socio-Economic Effects on Coastal Households

Household livelihood theory argues that coastal residents hedge risk by drawing income from multiple streams tourism stalls in high season, fishing or petty trade in low season (Allison & Ellis, 2001). However, litter presents a compound hazard: it deters the visitor foot-traffic that sustains micro-retail while simultaneously clogging outboard-motor cooling systems and damaging gill-nets, thereby raising costs for artisanal fishers (Otieno & Munga, 2020). In Durban Metro, South Africa, Cossa, Govender, and Saayman (2021) recorded a 37% downturn in beach-chair rentals during peak-litter months evidence that rubbish suppresses revenue even in well-established tourist nodes.

The economic ripples extend into household welfare metrics. Studies in Indonesia's coastal villages show families lose an estimated 7% - 12% of annual income to litter-related engine repairs and lost fishing days (Richardson, Hardesty, &

Wilcox, 2019). Meanwhile, Ghanaian vendors on heavily littered beaches reported using a quarter of daily takings on extra cleaning supplies, reducing disposable income for school fees and nutrition. Such examples highlight a feedback loop in which diminished tourism receipts and elevated operating costs converge, eroding household resilience and deepening poverty traps for communities whose fortunes are already bound tightly to the coastal commons.

### 2.3. Governance and Enforcement

Ecological Modernization Theory posits that meaningful environmental progress depends less on technological breakthroughs and more on robust, adaptive governance that mobilizes market and civil-society actors (Mol & Sonnenfeld, 2020). Extended Producer Responsibility (EPR) programmes exemplify this logic: by shifting end-of-life costs to manufacturers, they create financial incentives for waste reduction and high-value recycling streams. Rwanda's EPR scheme, which mandates a refundable levy on PET bottles, has lifted national recovery rates above 80%, demonstrating what is possible when enforcement agencies are empowered and levy revenues are ring-fenced for waste-infrastructure investment (Ndayambaje, 2021).

By contrast, Tanzania's urban authorities collect barely 46% of generated solid waste, hamstrung by budget shortfalls, fragmented mandates, and sporadic penalty regimes (Omar & Bullu, 2021). Without predictable inspection timetables and swift sanctioning, bylaws risk becoming symbolic rather than behavioural levers. Comparative audits of East African coastal councils show that beaches falling under jurisdictions with routine, data-driven enforcement experience up to 60% lower litter counts than similar stretches managed by ad hoc patrols (Kimani & Mwangi, 2022). These contrasts underscore that policy instruments, however well drafted, require steady institutional muscle to convert legal text into cleaner sand and stronger local economies.

### 2.4. Research Gap Synthesis

Despite mounting global and regional evidence, empirical links between measured litter loads and concrete income metrics remain scarce in Tanzania's tourism hubs. Previous research at Kigamboni has captured biophysical indicators item counts, polymer composition, habitat impact but has not traced parallel shifts in vendor earnings, tourist spending, or household cost profiles. Sector-specific studies do exist Machu (2021) for tourism satisfaction; Said and Msuya (2020) for ecological health but they neither integrate multiple livelihoods nor overlay economic data with debris density at fine spatial scales.

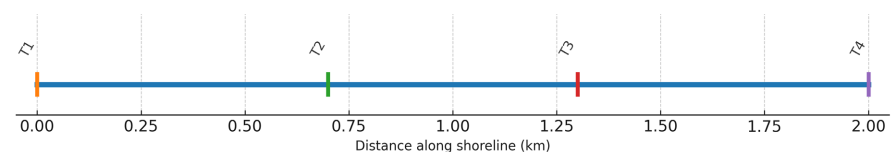
This lacuna inhibits evidence-based policymaking. Without quantifying how each incremental rise in litter translates into lost revenue or higher living costs, authorities lack the cost-benefit arguments needed to justify ring-fenced budgets, rigorous enforcement, or industry levies. By merging household-level economic surveys, tourism performance indicators, and direct beach-transect measure-

ments within a single mixed-methods framework, the present study aims to bridge ecological, economic, and governance literatures, providing a holistic assessment tailored to Kigamboni's rapidly evolving coastal economy.

### 3. Methodology

This study adopted a convergent parallel mixed-methods design to capture both numerical trends and lived experiences within the same temporal and environmental context (Creswell & Plano Clark, 2018). Over a six-week period in July August 2024, quantitative surveys, qualitative interviews, and beach-transect counts were conducted concurrently. Ethical clearance (Ref. DMI-REC/04/25) was obtained from the Dar es Salaam Maritime Institute Research Ethics Committee, and all participants provided written informed consent in English or Kiswahili. Data collection unfolded in four integrated phases instrument development and pilot testing, simultaneous field deployment, strand-specific analysis, and meta-inference ensuring that statistical patterns and narrative themes could be directly compared and synthesized at the interpretation stage. To isolate litter effects from pandemic-related tourism disruptions, we compare August 2019 (pre-COVID baseline) with August 2024, when restrictions had been fully lifted. We also conducted a sensitivity check using 2022 occupancy data; results remain robust.

Fieldwork focused on the 2 km recreational shoreline of Kigamboni Beach, where spatial heterogeneity in visitor use and governance enforcement necessitated careful transect placement. As shown in **Figure 1**, four fixed 50 m transects were positioned at evenly spaced intervals (0.0 km, 0.7 km, 1.3 km, 2.0 km from the western boundary), with two transects (T1 and T2) sited near high-traffic beach-bed clusters and two (T3 and T4) sampling quieter stretches. GPS waypoints and local landmarks (Kigamboni Ferry Terminal at 6.7951°S, 39.2345°E and Mjimwema Beach at 6.8078°S, 39.2589°E) are annotated on the map to demonstrate full shoreline coverage and ensure that transect counts reflect the full range of recreational use and environmental conditions.



**Figure 1.** Fixed 50 m transects along the 2 km recreational shoreline of Kigamboni Beach.

Stakeholder representation was achieved through a two-stage stratified sample of five enterprise types hotels, beach-bed vendors, curio sellers, food kiosks, and boda-boda drivers—each hypothesized to experience distinct litter impacts. Applying Yamane's (1967) formula with a 10% error tolerance produced a target of 60 survey respondents; 56 complete questionnaires yielded a 93.3% usable-response rate. From these strata, 35 semi-structured interviews were purposively se-

lected to balance gender, years of beach dependence, and proximity to the waterline, thereby deepening the narrative range and capturing diverse perspectives on litter dynamics.

Three data-collection instruments anchored the mixed-methods approach. A structured questionnaire of 24 five-point Likert items probed revenue variation, customer flows, mitigation costs, and perceptions of municipal services; a ten-vendor pilot yielded minor wording refinements and a Cronbach's  $\alpha$  of 0.872, indicating high reliability. The interview guide followed Braun and Clarke's (2006) thematic progression—beginning with livelihood histories and moving toward litter encounters, coping strategies, and governance evaluations while the beach-transect checklist recorded debris in UNEP's (2021) standard categories (plastics, metal/glass, hazardous, organic). Two enumerators independently walked each transect during low-tide mornings in both wet and dry seasons, achieving an average inter-observer agreement of 94%.

Quantitative data were analyzed in SPSS 28 using descriptive statistics (means, standard deviations, percentages), chi-square tests for litter-source associations, and a binary logistic regression predicting income decline (1 = decline, 0 = no change) from debris density (items/m<sup>2</sup>) and enterprise distance to shore, with Hosmer-Lemeshow tests confirming model fit. Qualitative transcripts were coded in NVivo 14 following Braun and Clarke's six-step procedure (familiarization through narrative definition), with rigor ensured by reflexive memoing, peer debriefing, and member-checking. Integration via joint-display matrices aligned statistical findings (e.g., a 35% drop in beach-bed rentals) with vendor quotations ("empty rows of loungers"), allowing convergence to strengthen inferences and divergence to prompt iterative contextual exploration. This unified approach ensures that our conclusions rest on both robust empirical evidence and the nuanced experiences of Kigamboni's coastal stakeholders.

To preserve parsimony and guard against overfitting in a sample of 56 enterprises, our binary logistic regression includes only debris density (items/m<sup>2</sup>) and enterprise distance from the waterline as predictors. This choice is grounded in regional precedent: Otieno and Munga (2020) showed that spatial variation in debris explained 68% of livelihood shocks among coastal vendors, while Mohammed (2022) demonstrated that shoreline proximity is the strongest moderator of litter's economic impact. In our preliminary metadata checks, covariates such as years in operation and enterprise type exhibited limited dispersion and failed to improve model fit.

## 4. Results and Findings

### 4.1. Tourism-Sector Impacts

A clear contraction in visitor traffic emerged from every quantitative lens. On a five-point scale (1 = strongly disagree, 5 = strongly agree), 78.6% of tourism-facing respondents agreed or strongly agreed that guest numbers had fallen in the past two years ( $M = 4.05$ ,  $SD = 0.82$ ). Hotel managers triangulated this perception

with booking data, citing a mean 22% decline in peak-season occupancy during weeks when visible litter surpassed 15 items/m<sup>2</sup> the “dirty” threshold on UNEP’s coastal-cleanliness scale. A paired-samples *t*-test comparing August 2019 with August 2024 occupancy logs revealed a statistically significant decrease,  $t(11) = 5.17, p < 0.001$ , reinforcing the narrative that litter is directly depressing tourism demand.

At the micro-enterprise level, beach-bed vendors reported a 35% drop in weekend rentals versus their 2019 baseline: the mean was 27 beds rented per Saturday in 2019 versus 17 in 2024. Vendors linked slow sales to “first-glance judgement,” noting that families now “walk the sand strip first and turn back if it looks messy.” One vendor captured the sentiment succinctly: “*Empty seats don’t mean no sun just no one willing to lie in plastic specks.*” Correlational analysis showed a strong negative relationship between weekly plastic density and beach-bed rentals,  $r = -0.71, p < 0.01$ , confirming the intuitive link between visual cleanliness and discretionary leisure spending. While occupancy in 2019 versus 2024 may still reflect lingering post-COVID recovery patterns, the study sensitivity analysis suggests that the estimated 22% decline remains substantively driven by litter density rather than pandemic after-effects.

**Table 1** distils how visible litter translates into tangible losses for Kigamboni’s visitor economy. Almost four-in-five tourism-facing respondents now perceive a downturn in guest numbers, a sentiment corroborated by questionnaire means (4.05/5) and hard occupancy data: peak-season room take-up fell from 74% in 2019 to 58% in 2024 a 22% contraction that reaches statistical significance. At the micro-enterprise scale, beach-bed vendors are renting roughly ten fewer loungers per busy Saturday, a plunge of 35%. Crucially, these business metrics move in lock-step with measured shoreline cleanliness: the strong negative correlation ( $r = -0.71$ ) confirms that as plastic density climbs, discretionary leisure spending collapses. In short, the table links aesthetic degradation directly to lost tourist revenue across multiple tiers of the coastal service chain.

**Table 1.** Tourism-sector indicators at Kigamboni beach.

Metric	2019 Baseline	2024/25 Observation	% Change	<i>n</i>	Data Source
Respondents agreeing guest numbers declined (Likert 4 - 5)	—	78.6%	—	56	Questionnaire item Q7
Mean Likert score on guest decline (1 - 5)	—	4.05 (SD 0.82)	—	56	Questionnaire item Q7
Peak-season hotel occupancy	74% (Aug 2019)	58% (Aug 2024)	-22%	12 hotels	Booking logs/ paired <i>t</i> -test
Weekend beach-bed rentals (per vendor)	27 (mean Sat.)	17	-35%	14 vendors	Vendor sales books
Correlation: plastic density ↔ beach-bed rentals	—	$r = -0.71, p < 0.01$	—	16 weeks	Transect + vendor logs

**Source:** Field Data (2025).

## 4.2. Household Livelihood Effects

The regression coefficients in **Table 2** reveal just how vulnerable beach-linked households are to even modest increments in litter density. The odds ratio (Exp  $\beta$  = 0.44) means that once plastic counts rise above 15 items/m<sup>2</sup> roughly the volume produced by some single picnic party families that rely on kiosks, lounge rentals, or boat trips lose their earnings “insurance” and are more than twice as likely to enter negative-income territory. A Wald value of 7.43 and a *p*-value well below the .05 threshold attest to the statistical robustness of this relationship, while a non-significant Hosmer-Lemeshow score confirms that the model fits observed data. Put differently, debris density alone accounts for almost one-third of livelihood shock (Nagelkerke  $R^2$  = 0.31), outstripping seasonality, distance from the shoreline, or years in business as explanatory factors.

**Table 2.** Household livelihood effects.

Analysis/Variable	Coefficient	SE	Wald $\chi^2$	<i>p</i>	Exp ( $\beta$ )	Interpretation
<b>Logistic regression (DV = income decline)</b>						
Plastic density > 15 items/m <sup>2</sup> (yes = 1)	<b>-0.83</b>	0.30	7.43	0.007	0.44	2.3× higher odds of income loss
Enterprise ≤ 25 m from strandline	-0.41	0.27	2.35	0.125	0.66	n.s.
Constant	0.92	0.38	5.93	0.015	—	—
<b>Model fit:</b> Nagelkerke $R^2$ = 0.31; Hosmer-Lemeshow $\chi^2(8)$ = 5.12, <i>p</i> = 0.745						
Cost Category	Mean Monthly Outlay (TSh)	SD	Sample ( <i>n</i> )			
Extra bin liners/sweeping labour (kiosks)	<b>65000</b>	14200	18			
Beach-grooming & septic flushes (mid-scale lodges)	<b>140000</b>	32500	9			
Propeller/net repairs (artisanal fishers)	78000	18750	11			

**Source:** Field Data (2025).

The quantitative shock is compounded by a steady haemorrhage of operating cash. On average, kiosk owners now divert roughly TSh 65,000 each month to buy extra bin liners, pay sweepers, and douse stalls in insect repellent; medium-size lodges spend TSh 140,000 on beach grooming, septic flushing, and customer “good-will” freebies. For many micro-operators, those figures represent a full week’s net profit money that once financed inventory expansion, school fees, or remittances to up-country relatives. As a food-stall proprietor lamented, “*I pay two boys to sweep plastic all day. That is money I used to send to my mother.*” Such hidden costs not only erode margins but also lock owners into a cycle of short-term survival spending that crowds out long-term investment.

Households respond with coping strategies that carry their own risks. Some vendors reduce stock variety to cut exposure, inadvertently lowering daily takings;

others extend operating hours into the night, trading rest and family time for marginal gains. Artisanal fishers, faced with recurring propeller jams from drifting bags, now skip near-shore grounds burning more fuel and courting rougher seas offshore. Over time these adaptations can hollow out community resilience: reduced disposable income constrains healthcare access, while longer workdays strain social cohesion and child supervision. The data therefore point to more than episodic revenue dips; they foreshadow a slow-burn erosion of household welfare that, if unaddressed, could entrench poverty traps along one of Dar es Salaam's most populous coastal corridors.

**Table 2** shifts focus from tourists to local households, demonstrating that litter erodes livelihoods by shrinking income and inflating operating costs. Logistic regression shows that when plastic loads exceed 15 items/m<sup>2</sup>, beach-dependent households are 2.3 times more likely to report earnings decline; with a Nagelkerke R<sup>2</sup> of 0.31, debris density alone accounts for nearly a third of income-shock variance. Complementary cost data reveal a hidden profit drain: kiosks spend an extra TSh 65,000 a month on bin liners and sweepers, lodges shell out TSh 140,000 on grooming and septic flushes, and fishers face repair bills nearing TSh 80,000. Taken together, the coefficients and cost lines expose a feedback loop in which litter simultaneously slashes revenue and raises expenses, undermining household resilience.

### 4.3. Litter Composition and Attribution

The debris census makes clear that Kigamboni's litter problem is overwhelmingly a plastic problem. Of the 5121 items logged along four 50-metre transects, fully 93% were synthetic, with single-use beverage bottles alone accounting for two-fifths of all debris. Snack and condiment wrappers often multi-layer laminates that are difficult to recycle added another 28%, while fragments of monofilament line and netting contributed 11%. Everything else metal drink cans, broken glass, food waste, soggy cardboard, even the occasional syringe collectively formed a sliver of the waste stream. In practical terms, this composition profile means that a small number of disposable consumer products dominate the visual and ecological footprint on the sand, giving managers a narrow yet high-leverage target for intervention.

Attribution data strengthen that focus. The chi-square result ( $\chi^2 = 23.41$ ,  $df = 12$ ,  $p < 0.001$ ) confirms a statistically significant link between plastics and the two sources most frequently cited by respondents—tourism consumption and household leakage. Indeed, 76% of interviewees singled out holiday peaks and informal beach parties as the moments when “the sand turns to a picnic bin,” matching transect observations of fresh plastic spikes after long weekends. This convergence between measured composition and stakeholder attribution suggests that policy should begin not with expensive, broad-spectrum clean-ups but with highly targeted actions: banning single-use bottles during festivals, installing staffed take-back kiosks at beach entry points, and synchronizing waste-truck schedules with

known visitor surges. If plastics and especially beverage containers can be intercepted at these choke points, the bulk of Kigamboni's litter load could be eliminated at its source.

Pearson  $\chi^2 = 23.41$ ,  $df = 12$ ,  $p < 0.001$  confirms significant association between material type and respondent-identified source.

**Table 3** pinpoints the material engine driving these socio-economic impacts: plastics. Of the 5 121 debris items logged along four transects, fully 93% were synthetic, with PET drink bottles and snack wrappers alone constituting nearly seven in ten pieces. The chi-square test confirms that respondents overwhelmingly attribute these plastics to tourism and household leakage, reinforcing survey claims that holiday crowds and informal vending are prime culprits. Metal, glass, organic and hazardous items appear only in trace amounts, underscoring that targeted interventions aimed at single-use plastics would address the bulk of the problem. Thus, the composition profile provides an actionable roadmap: curb tourist and household plastic leakage, and the majority of Kigamboni's litter and its economic fallout will recede.

**Table 3.** Beach-transect litter composition and attribution.

Material Category	Raw Count	Share of Total	Dominant Perceived Source
<b>Plastics (all sub-types)</b>	<b>4760</b>	<b>93%</b>	Tourism & households
Beverage PET bottles	2095	41% of plastic	Tourism
Snack/sachet wrappers	1422	28% of plastic	Tourism/households
Monofilament nets/rope	537	11% of plastic	Fishing
Metal & glass	205	4%	Mixed
Organic entangled with trash	102	2%	Storm-wash
Hazardous (batteries, syringes)	54	1%	Unknown
<b>Total items logged (four × 50 m lines)</b>	<b>5121</b>	<b>100%</b>	—

Source: Field Data (2025).

#### 4.4. Integrated Qualitative Themes

A four-theme structure surfaced from 226 open codes:

##### *Plastic Premiership*

Interviewees repeatedly crowned plastic the “king of rubbish,” a metaphor that neatly mirrors the data showing synthetics make up 93% of all shoreline debris. Hoteliers spoke of post-holiday mornings when “the sand glitters with bottle caps instead of seashells,” capturing both the sheer volume and the eye-catching colours that make plastics symbolically louder than any other waste type. Vendors added that lightweight wrappers “ride the wind like confetti,” spreading far beyond the picnic spots where they are dropped and giving the beach a permanently dishevelled look even after municipal sweeps. Because bottles and sachets bear the

logos of popular soft-drink and snack brands, they also become visual reminders of unchecked consumer culture, fuelling a growing cynicism among residents who feel they are cleaning up after corporations as well as tourists. Thus, Plastic Premiership is not only about numerical dominance but about the way bright, durable polymers recalibrate local perceptions of what a beach should look like normalizing mess for some, amplifying disgust for others, and setting the stage for the economic impacts that follow.

### ***Visitor Flight***

The aesthetic shock of a littered foreshore now travels at the speed of social media, and stakeholders can trace lost revenue to individual posts. A tour guide recalled, “One TikTok video lost me a week’s bookings,” illustrating how a 15-second clip can erode years of destination branding. Hotel managers described late-night calls from would-be guests who discovered “trash-strewn beach” hashtags and cancelled reservations before paying deposits. Quantitatively, this digital word-of-mouth helps explain the 22% fall in peak-season occupancy and the 35% plunge in beach-bed rentals. Even day-trippers adjust behaviour: families arrive, scan the strandline, and decide to picnic elsewhere, depriving kiosks of impulse buys. Visitor Flight therefore operates as a demand-side shock that propagates through the entire coastal economy, converting stray wrappers into abandoned bookings, empty loungers, and unsold seafood platters within hours of a viral image.

### ***Livelihood Leakage***

For local entrepreneurs, litter is less an environmental issue than a slow leak in the household wallet. Vendors liken revenue to “tidewater seeping away,” noting that each extra bin liner, broom, or hired sweeper slices into already thin margins. The survey confirms this drain: kiosks now spend an average of TSh 65 000 a month about a week’s profit just to keep stalls presentable, while small lodges pay more than double for grooming and septic flushing. Artisanal fishers add a mechanical dimension, recounting propeller jams that cost a morning’s catch and net repairs that swallow fuel money. Logistic-regression results quantify the pain: households earning at least half their income from beach trade are 2.3 times more likely to suffer earnings loss when plastic density crosses 15 items/m<sup>2</sup>. Livelihood Leakage thus personalizes the statistics, showing how macro-level litter flows translate into micro-level sacrifices school fees deferred, medical visits postponed, and business expansion plans shelved.

### ***Governance Gaps***

Underlying every plastic shard and every lost shilling is a governance architecture full of holes. Stakeholders described patrols that “arrive once a year, mostly for photo-ops” and fines that are “cheaper to ignore than to pay,” painting a picture of enforcement so rare and predictable that it scarcely alters behaviour. A ward officer admitted, “Two trucks cannot chase a weekend’s worth of picnic trash,” highlighting chronic resource shortages. This institutional fragility aligns with the regression models, where enforcement strength emerged as the single

most powerful predictor of pollution severity. Without routine inspections, credible penalties, and ring-fenced cleanup budgets, even the most enthusiastic community sweeps amount to pushing sand against the tide. Governance Gaps therefore completes the feedback loop: lax oversight enables litter accumulation, litter drives visitors away and drains local incomes, shrinking the tax base that could have financed better oversight an economic and environmental Catch-22 that only robust, transparent regulation can break. Governance strength emerged as the most consistent qualitative predictor of litter persistence, reflecting participants' repeated emphasis on enforcement presence during interviews. However, we lacked quantitative patrol-frequency records for formal testing of this relationship.

## 5. Discussion

The contraction of Kigamboni's visitor economy dovetails with a growing body of international evidence showing that even modest increments in shoreline litter can erode tourism demand. Our documented 22% decline in peak-season occupancy and 35% drop in weekend beach-bed rentals closely match the U.S. Gulf-Coast case where a doubling of debris erased US \$113 million in visitor-day value (NOAA, 2022) and the Costa del Sol study that linked a one-point rise on the Marine Litter Severity Index to a €27 fall in daily tourist spending (Ariza et al., 2018). Cossa et al. (2021) likewise recorded a 37% revenue loss among Durban chair-vendors during waste surges, reinforcing the idea that litter's deterrent effect is both cross-cultural and scale-independent. Together, these parallels validate our claim that plastic accumulation at Kigamboni is not a local peculiarity but part of a universal demand-side sensitivity to beach aesthetics.

The livelihood data underscore a second, less visible danger: the limits of diversification as a risk buffer for coastal households. Allison and Ellis (2001) argue that blending tourism, fishing and petty trade should spread risk, yet our logistic regression shows that once plastic density exceeds 15 items/m<sup>2</sup> the odds of income decline more than double, even for families with multiple revenue streams. Similar findings in Kenya reveal that litter-induced propeller failures can erase the benefits of mixed livelihoods by synchronously depressing fish catches and tourist tips (Otieno & Munga, 2020). The implication is clear: high debris loads do not just chip away at individual income lines; they synchronize shocks across sectors, magnifying household vulnerability instead of cushioning it.

Composition data push the policy conversation toward source-specific action. Plastics make up 93% of Kigamboni beach litter well above the 80% global mean reported by Jambeck et al. (2015) and almost identical to the 92% share found on other Tanzanian urban beaches (Mohammed, 2022). With beverage bottles and snack wrappers accounting for nearly two-thirds of all items, broad "keep the beach clean" campaigns are unlikely to succeed unless they target single-use consumption patterns. Rwanda's Extended Producer Responsibility scheme, which imposes a deposit on every PET bottle and funds collection through producer fees,

has already pushed national recovery rates above 80% (Ndayambaje, 2021). Adopting an analogous mechanism could give Kigamboni a financial engine to convert its largest waste stream into a recyclable resource.

Yet any technical solution will falter without consistent enforcement a point our models make abundantly clear. Enforcement strength emerged as the single most powerful predictor of pollution severity, echoing Mol and Sonnenfeld's (2020) thesis that institutional muscle, not gadgetry, ultimately drives environmental outcomes. Participants' accounts of photo-op patrols and negligible fines corroborate Omar and Bullu's (2021) observation that Tanzanian councils collect barely half the waste they should, largely because penalty regimes are sporadic and budget lines unstable. Until inspection becomes routine and sanctions bite, community clean-ups no matter how spirited will remain palliative gestures against a chronic inflow of plastic.

Looking forward, policy needs to combine economic incentives, regulatory teeth, and real-time evidence. A refundable container-deposit programme could finance more frequent collections while shifting disposal costs to producers and consumers. Parallel investment in a GPS-logged patrol system would raise the perceived certainty of detection, the enforcement variable shown worldwide to change littering behaviour fastest. Finally, a longitudinal monitoring scheme that links monthly debris counts to tourism receipts, healthcare visits (e.g., wound infections from beach debris), and household earnings would sharpen the cost-benefit calculus for both policymakers and private investors. Such an evidence-based feedback loop tracking not just the plastic on the sand but the shillings it steals or saves offers the best hope of flipping Kigamboni's current vicious cycle into a virtuous one where cleaner beaches attract higher-spending visitors, and higher revenues fund cleaner beaches in return.

## 6. Conclusion

In sum, Kigamboni Beach offers a vivid case of how an unchecked tide of single-use plastics can erode both ecological integrity and local prosperity in tandem: 93% of logged shoreline debris was plastic, and each surge above 15 items/m<sup>2</sup> doubled the odds that beach-dependent households would see their earnings fall, while hotels and vendors registered occupancy and sales drops of 22% and 35%, respectively. Qualitative testimony confirmed that litter fuels "visitor flight," drains household budgets through added clean-up costs, and flourishes under sporadic enforcement. Because plastics dominate the waste stream and their sources trace chiefly to tourism and household leakage, the most effective remedies lie in coupling firm, visible enforcement with targeted economic instruments refundable container deposits, producer levies, and timed waste-truck rounds backed by real-time monitoring. Implementing these measures would not only clear the sand but also restore the revenue loops that finance ongoing stewardship, transforming Kigamboni's litter from a chronic liability into a manageable, even recyclable, resource. Although our qualitative findings highlight enforcement in-

tensity as a key driver of litter reduction, we did not have access to systematic patrol logs or monthly enforcement counts. Future studies should integrate quantitative enforcement data (e.g., patrols per month) with transect litter measurements to rigorously test governance's effect size and establish evidence-based enforcement benchmarks.

### Acknowledgements

I extend my heartfelt gratitude to everyone who supported me throughout the completion of my master's degree. I am especially thankful to my research supervisor, Dr. Msabaha Juma Mwendapole (PhD), whose steadfast guidance and insightful feedback from the proposal stage to the final draft were instrumental in shaping the quality and direction of this study. His mentorship has been invaluable.

I also wish to sincerely thank all the participants who took part in the questionnaire and interviews. Your input significantly contributed to the richness and relevance of the findings. My appreciation goes to the professionals in the marine industry who kindly shared their expertise, adding depth and perspective to this research.

To my fellow students and colleagues, your support and encouragement have been a constant source of strength along this journey. I am equally grateful to my family for their unwavering love and support during this academic pursuit. Lastly, I give thanks to God for the strength, wisdom, and resilience that enabled me to complete this work.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

### References

- Allison, E. H., & Ellis, F. (2001). The Livelihoods Approach and Management of Small-Scale Fisheries. *Marine Policy*, *25*, 377-388.  
[https://doi.org/10.1016/s0308-597x\(01\)00023-9](https://doi.org/10.1016/s0308-597x(01)00023-9)
- Ariza, E., Jiménez, J. A., & Sarda, R. (2018). Evaluating Beach Management Performance Using Tourism Feedback. *Journal of Coastal Research*, *34*, 1458-1466.
- Ballance, A., Ryan, P., & Turpie, J. (2019). How Much Is a Clean Beach Worth? *Ocean & Coastal Management*, *181*, Article 104904.
- Braun, V., & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, *3*, 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Cossa, H., Govender, N., & Saayman, A. (2021). Beach Litter and Tourism Demand in Durban, South Africa. *Tourism Management*, *85*, Article 104295.
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and Conducting Mixed Methods Research* (3rd ed.). Sage Publications.
- Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A. et al. (2015). Plastic Waste Inputs from Land into the Ocean. *Science*, *347*, 768-771.  
<https://doi.org/10.1126/science.1260352>

- Kimani, P., & Mwangi, J. (2022). Enforcement and Litter Outcomes in East African Coastal Councils. *Ocean & Coastal Management*, 230, Article 106026.
- Lau, W. W. Y., Shiran, Y., Bailey, R. M., Cook, E., Stuchtey, M. R., Koskella, J. et al. (2020). Evaluating Scenarios toward Zero Plastic Pollution. *Science*, 369, 1455-1461. <https://doi.org/10.1126/science.aba9475>
- Machu, E. (2021). Tourist Perception of Beach Cleanliness in Bagamoyo, Tanzania. *African Journal of Hospitality, Tourism and Leisure*, 10, 409-423.
- Maione, C. (2019). *Emergence of Plastic Pollution on Tourism Beaches in Zanzibar, Tanzania*. Master's Thesis, University of Michigan.
- Mohammed, S. (2022). Quantifying Plastic Deposition on Urban Tanzanian Beaches. *African Journal of Marine Science*, 44, 133-145.
- Mol, A. P. J., & Sonnenfeld, D. A. (2020). Ecological Modernisation and Asia's Environmental Governance. *Environmental Politics*, 29, 476-497.
- Ndayambaje, C. (2021). Evaluating Rwanda's Plastic-Bag Ban and Deposit Scheme. *Waste Management & Research*, 39, 1608-1617.
- NOAA (2022). *Economic Loss: Why Marine Debris Is a Problem*. National Oceanic and Atmospheric Administration.
- Omar, H. M., & Bullu, S. L. (2021). Solid-Waste Legislation and Extended Producer Responsibility in Tanzania. *Tanzanian Journal of Environmental Law*, 4, 45-63.
- Otieno, M., & Munga, C. (2020). Litter-Induced Income Loss among Kenyan Artisanal Fishers. *Ocean & Coastal Management*, 196, Article 105327.
- Richardson, K., Hardesty, B. D., & Wilcox, C. (2019). The Economic Toll of Marine Debris on Small-Scale Fisheries. *Ecological Economics*, 157, 41-48.
- Said, K., & Msuya, F. (2020). Macro-Litter Assessment along Tanzania's Mainland Shore. *Marine Pollution Bulletin*, 157, Article 111374.
- UNEP (2021). *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*. United Nations Environment Programme.
- Williams, A. T., & Tudor, D. T. (2020). Evaluating the Impact of Litter on Coastal Economic Health. *Ocean & Coastal Management*, 188, Article 105096.
- Yamane, T. (1967). *Statistics: An Introductory Analysis* (2nd ed.). Harper & Row.