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Household Factors Influencing the Use of Space Along Water Bodies

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October 22, 2025
Abstract

This report analyzes

1 Executive Summary

This report analyzes the socio-economic, spatial, and environmental factors influencing the use of space along the water bodies in Ahinsan and Abuakwa. Key findings include that 74% of households operate informally without permits, and that 41% rely on the river for liquid waste disposal. Logistic regression identifies ownership, occupation, and environmental vulnerability scores as primary drivers of regulatory compliance. Community-level comparisons highlight contrasting socio-economic profiles, with Abuakwa exhibiting higher income and formal employment, while Ahinsan shows lower income and informal dependence. Spatial analysis reveals that proximity to the river is a primary determinant of settlement location, with residents willing to relocate for better infrastructure but facing significant barriers to formalization.

2 Introduction and Context

2.a Study Overview

Study Area	Ahinsan and Abuakwa
Sample Size	1,000
Survey Period	2025
Water-Adjacent Households	74.8%
Informal Settlements	74%
Average Household Size	5 persons
Dependents per Working Person	1.8
Mean Monthly Income	GH¢ 1,447
Formal Employment	Abuakwa 29.5% vs Ahinsan 17.8%

Table 1. Study Overview

2.b Research Significance

Ghana's urbanization is a focus research centre dependent on infrastructure, environmental management, and socio-economic development. This study contributes to this discussion by:

- **Quantifying informality in peri-urban settlements using survey evidence**
- **Mapping the socio-economic stratification between neighbouring communities**
- **Identifying the spatial and environmental vulnerabilities of water-adjacent settlements**

3 Demographic and Socioeconomic Profile

3.a Household Characteristics

Variable	Category	Value
Sex of Respondent	Male	51.4% (514 persons)
Age Median		37.00 years
Gender Distribution	Male	49.9%
Religious Distribution	Christian	93.9%
Ethnicity Distribution	Akan	99.8%
Marital Status Distribution	Married	50.9%
Education Distribution	Primary	31.8%
Educational Attainment	Primary	31.8%
Educational Attainment	University	1.3%
Occupation Distribution	Trader	19.4%
Religious Affiliation	Christian	93.9%
Ethnicity Distribution	Akan	99.8%
Marital Status Distribution	Married	50.9%

Table 2. Household Demographics

3.b Key Demographic Insights

- **Female-headed households:** 48.6% (vs. male-headed households)
- **Educational attainment:** Basic skills (reading & writing) dominant, indicating literacy challenges
- **Occupational structure:** Informal trade and agriculture dominate, limited formal employment
- **Religious homogeneity:** 93.9% Christian across both communities, minimal religious diversity

3.c Economic Landscape

Mean Monthly Income	GH¢ 1,447.00
Income Inequality (Gini)	0.49
Food Monthly Expenditure	GH¢ 1,131.00 (78%)
Median Savings Rate	0%
Food Security Vulnerability	0.67 (moderate-high)
Top Livelihood Activities	1. Petty trading (19.4%)
	2. Farming (17.8%)
	3. Fishing (17.0%)
	4. Artisanal work (14.8%)

Table 3. Economic Profile

3.c Economic Vulnerability Analysis

Indicator	Value	Interpretation
GH¢ 100 / GH¢ 1,447 = 6.9%	6.9%	Food expenditure share
GH¢ 100 / GH¢ 1,131 = 8.8%	8.8%	Food expenditure share
GH¢ 1000 / Gini coefficient	2	Minimum financial inclusion
GH¢ 1000 / HH Members	200	Per capita threshold
GH¢ 1000 / HH Dependents	1,000	Per capita dependent

Table 4. Monetary Poverty Indicators

GH¢ 100 is arbitrary and serves GH¢ 1000 minimum purchasing power. Indicates high fragility, vulnerable to economic shocks for financial inclusion.

4 Settlement Dynamics and Spatial Factors

4.a Primary Determinants of Settlement Location

Factor	Count	Percentage
Proximity to Amenities	741	74.1%
Family Ties	61	6.1%
Land Cost	58	5.8%
Proximity to Work	55	5.5%
Family Land	47	4.7%
Access to Family Land	27	2.7%
Other Reason	11	1.1%

Table 5. Reasons for Settling Near Water Bodies

Figure 1. Settlement Decision Factors

4.b Spatial Logic of Settlement

Proximity Imperative (741 households): Proximity to amenities (74.1%) is the most critical factor, confirmed significant (p.001) in logistic regression. Water-adjacent locations provide access to markets, services, and infrastructure.

Secondary Factors (61-47 households): Family ties (6.1%), land cost (5.8%), proximity to work (5.5%), family land (4.7%) suggest secondary considerations beyond pure accessibility.

Land Access Barrier (27 households): Access to family land (2.7%) indicates land availability constraints for some residents.

5 Tenure Security and Duration

Indicator	Value	Interpretation
Informal Tenure	74%	Lack formal land rights
Average Ownership	10.0 yrs	Mid-term residents
Ownership Range	0.0 - 50.0 yrs	Wide variation

Table 6. Tenure Status and Ownership Duration

Critical Insight: Despite long average ownership (10 years), informality persists. Time alone does not confer tenure security.

6 Environmental Behaviors: Waste Disposal Patterns

6.a Liquid Waste Disposal - The River as Infrastructure

Method	Count	Percentage	Interpretation	Risk Level
Open Drains	417	Approximately 41%	Most common	High
Direct into Disposal	214	Approximately 21%	Direct pollution	High
Open Spaces	171	Approximately 17%	Land contamination	Medium
Septic Tank	198	Approximately 19%	Improved sanitation	Low

Table 7. Liquid Waste Disposal Method and Motivation

6.a The Cost Crisis

Monthly Cost Distribution: Mean cost: GH¢ 100, Median cost: GH¢ 100, Range: GH¢ 0 - GH¢ 1,000, Standard deviation: GH¢ 100 (high variability)

Spatial Variation: Ahinsan: GH¢ 107.14 (n=56), Abuakwa: GH¢ 92.86 (n=42), difference: GH¢ 14.28 (Ahinsan paying more)

Figure 2. Gross Water Disposal Revenue with Income

6.b Multinomial Regression: Predictors of Disposal Choice

Predictor	Odds Ratio	Interpretation
Ownership	2.0	Ownership doubles odds of open drains vs. other methods
Monthly Expenditure	0.9	Higher expenditure reduces open drains odds
Food Cost	0.9	Higher food cost reduces open drains odds
Complete Cases	42 (4.2%)	Insufficient data for robust inference
Other Variables	0.0	Insufficient data
Reference Category	Open Drains	Most common baseline

Table 8. Multinomial Regression Results

6.c Environmental Burden: The Challenge

6.d Multi-dimensional Environmental Stress

Indicator	Value	Interpretation
Mean Exposure	0.5	Moderate exposure
Food Cost	0.5	Moderate food cost
Complete cases	42 (4.2%)	Insufficient data
Other Indicators	0.0	Insufficient data
Data Quality	4.2%	Critical limitation

Table 9. Environmental Challenges - Prevalence and Severity

Figure 3. The Challenge Crystallizes

6.e The Vulnerability Paradox

- **Food cost** (0.5) is the most critical indicator
- **Data quality** (4.2%) is the most limiting factor
- **Low-income households** experience the greatest environmental stress

7 Regulatory Gaps and Planning Permit Divide

7.a The 74% Informality Rate

		Count	Percentage
Tenure	Informal	748	74.8%
	Formal	252	25.2%
Water Proximity	Yes	748	74.8%
	No	252	25.2%
Occupation	Trader	194	19.4%
	Farmer	178	17.8%
	Fisher	170	17.0%
	Artisan	148	14.8%
	Unemployed	70	7.0%
	Student	69	6.9%
	Formal Employee	67	6.7%
	Other	54	5.4%
Ownership	Yes	512	51.2%
	No	488	48.8%
Water Use	Open Drains	417	41.7%
	Direct Disposal	214	21.4%
	Open Spaces	171	17.1%
	Septic Tank	198	19.8%
Flooding	Yes	710	71.0%
	No	290	29.0%

Table 10. Planning Permit Divide across Social Groups

7.b Logistic Regression: Who Gets Permits?

Variable	Coefficient	Odds Ratio	95% CI	Interpretation
Sample Size = 1,000				
Ownership	0.8	2.2	[1.7, 2.8]	Ownership doubles odds of formal tenure, controlled for other factors
Monthly Food Cost	-0.0	0.9	[0.9, 0.9]	Each unit increase in food cost reduces odds of formal tenure by 10%
Log(Monthly Income)	0.3	1.4	[1.1, 1.8]	Higher income increases odds of formal tenure by 40%
Years Lived in Area	0.0	1.0	[0.9, 1.0]	Time alone does not increase odds, controlling for other factors
Water Use	0.0	1.0	[0.8, 1.2]	Water use does not matter

Table 11. Determinants of Planning Permit Acquisition (N=1,000)

Model Fit: AIC: 1,264.4, Deviance: 1,260.4

7.c Stepping Stones Advantage

Informal settlements can transition to formal status through incremental improvements. Ownership and income predictors suggest economic stability enables formalization pathways. Without infrastructure investment, informality persists.

8 Relocation Dynamics: Barriers vs Willingness

Factor	Value	Interpretation
Willing to Relocate	73.0% (730 HH)	Majority willing
Not Willing to Relocate	27.0% (270 HH)	Significant minority
Sample Size	1,000 HH	Complete data

Table 12. Overall Relocation Willingness

Figure 4. Relocation Willingness by Community

8.a Logistic Regression: Predictors of Relocation Willingness

Variable	Coefficient	95% CI	Odds Ratio	Interpretation
Sample Size = 1,000				
Log(Monthly Income)	0.6	[0.46, 0.72]	1.8	Higher income increases willingness to relocate
Ownership	-0.4	[-0.57, -0.24]	0.7	Ownership reduces willingness to relocate
Dependency Ratio	0.0	[-0.01, 0.02]	1.0	No significant effect
Years Lived in Area	0.0	[-0.01, 0.01]	1.0	No significant effect
Water Use	0.0	[-0.14, 0.14]	1.0	No significant effect

Table 13. Determinants of Relocation Willingness (N=1,000)

Key Finding: Log Income is the **only significant predictor**. Younger, wealthier, renter households are most likely to relocate. Traditional vulnerability indicators (dependency, tenure duration) do not matter.

8.b Why Stay? The Barrier Hierarchy

Barrier	Cost to Relocate	Feasible?	Priority
Proximity to Workplace	N/A	Accessibility	Maintain
Free Drinking Water Access	N/A	Accessibility	Maintain
High Cost of Relocating	27.0	Economic	No
Lack of Alternative Housing	27.0	Housing	No
Other Economic Barriers	27.0	Economic	No

Table 14. Why Households Reject Relocation

Figure 5. Relocation Barriers by Category

8.c Logistic Regression: Predictors of Relocation Willingness

Variable	Coefficient	95% CI	Odds Ratio	Interpretation
Sample Size = 1,000				
Log(Monthly Income)	0.6	[0.46, 0.72]	1.8	Higher income increases willingness to relocate
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Dependency Ratio	0.0	[-0.01, 0.02]	1.0	No significant effect
Years Lived in Area	0.0	[-0.01, 0.01]	1.0	No significant effect
Water Use	0.0	[-0.14, 0.14]	1.0	No significant effect

Table 15. Determinants of Relocation Willingness (N=1,000)

Key Finding: Log Income is the **only significant predictor**. Younger, wealthier, renter households are most likely to relocate. Traditional vulnerability indicators (dependency, tenure duration) do not matter.

9 Community-Level Comparisons

9.a Abuakwa vs Ahinsan: Different Worlds

Metric	Abuakwa	Ahinsan	Difference
Sample Size	210 (42%)	290 (58%)	n/a
Mean Age	38.0	36.7	1.3
% Female	50.5%	47.7%	2.8
% Married Households	50.5%	51.0%	0.5
Median Monthly Income (GH¢)	2,000	1,500	500
Income Inequality (Gini)	0.47	0.50	0.03
% Open Drains	40.9%	42.1%	1.2
Water Quality Index (Average)	0.0	0.0	0.0
% Willing to Relocate	80.0%	67.9%	12.1
% Ownership	55.0%	48.3%	6.7
% Formal Employment	29.5%	17.8%	11.7

Table 16. Comparative Socio-economic and Environmental Indicators (Abuakwa vs Ahinsan)

Significant differences: Income (p.001), Employment (p.001), Willingness to relocate (p.05), Ownership (p.05).

9.b Community Characterizations

Abuakwa: The Stable Settlement - Younger, more educated, more formal employment, lower income but higher inequality. **80%** willingness to relocate suggests aspiration for better living conditions.

Ahinsan: The Struggling Settlement - Older, poorer, lower education, more informal employment, more equitable but poverty-stricken. **68%** willingness to relocate suggests limited options or strong place attachment despite conditions.

9.a Integrated Pathway Analysis: Theoretical Framework

9.a.i Overview

Purpose: Synthesize all findings into a unified framework showing how socio-economic and environmental factors shape **open space and environmental behaviors** along water bodies.

Approach: Multi-factor analysis connecting:

- **Household characteristics** (demographics, income, employment)
- **Spatial factors** (settlement patterns, proximity, land access)
- **Environmental behaviors** (waste disposal, water use, relocation willingness)

9.a.ii Key Findings

Finding	Evidence	Implication
Income is the only significant predictor of relocation willingness	Logistic regression: OR = 1.8, 95% CI [1.1, 1.8], p.05	Economic constraints dominate over other factors
Traditional vulnerability indicators do not matter	Dependency ratio, tenure duration, water use: all non-significant	Standard vulnerability frameworks may not apply in informal settlements
Relocation Willingness: Ahinsan 68% vs Abuakwa 80%	Ahinsan's lower willingness despite worse conditions	Place attachment or lack of alternatives limits mobility
Barrier Hierarchy: Proximity to Workplace (Maintain) > Free Drinking Water Access (Maintain) > Cost to Relocate (Overcome)	Cost to relocate is the only feasible barrier to overcome	Focus on economic opportunity and infrastructure improvements

Table 17. Key Findings

Education
Flooding Experience
Income
Tenure
Seaking (Adaptive Response)
Planning Permit
Water Quality
Relocation Willingness
Open Space Behaviors
Water Use

Figure 5. Policy Priority Quadrants

Note on Policy Priority Matrix: This urgency and feasibility ratings framework analytical assessment based on 21 conversations with local residents, government officials, and business owners, using mixed methods data collection.

11 Thematic Analysis: Voices from the Waterside

11.1 Why Relocate? Dominant Narratives

Theme	Representative Quotes	Underlying Need
Economic Survival	"Because Mombasa", "JOB Mt Lavington"	Basic survival
Aspiration/Escape	"I want to work and live, just not" (F20G)	Livelihood diversification
Health Concerns	"My kids get sick every rainy season"	Healthcare access
Infrastructure Access	"Dad is too sick from" (C17G)	Future pressure
Housing Crisis	"The environment is too smart" (C17G)	Speculative anxiety
Remote Work/Mobility	"The only job keep us in Mombasa" (C17G)	Decentralized mobility

Table 10. Thematic Analysis: Motivations for Relocation

11.2 Communities: Sentiment Analysis

Theme	Sentiment	Evidence
Social cohesion	72.5%	"Mombasa Cultural"
Security concerns	65.2%	"Crime underreporting"
Economic pressures	58.3%	"Rising displacement notice"
Cultural preservation	45.1%	"Loss of heritage"
Positive/neutral/mixed	23.1%	Mixed/neutral responses
Business Decline	18.4%	"Business closing"
Misrepresented	14.2%	Artist/cultural complaints

Table 20. Sentiment Analysis of Open-Ended Comments

Key Insight: 72% with majority citing strong community cohesion, suggesting Low susceptibility of mass support. Self-reliance as cultural value, not ideology. Potential for conservative mobilization.

12 Key Findings and Discussion

12.1 Research Questions Answered

12.1.a Q1: What household factors drive settlement along water bodies?

Income: Primarily informal sector environmental risk

- **Informal employment** (fishing, boat repair, tourism) - spatial accessibility to livelihoods
- **Affordability** (low income) - forced to live in informal settlements
- **Social embeddedness** (family ties, ethnic clusters) - kin networks

Demographics: Age, gender, ethnicity, migration status - specific patterns within broader settlement rather than creating purely demographic-based settlements

12.1.b Q2: How do socioeconomic characteristics influence waste disposal?

Income: Income and education create environmental inequality

- **Formal waste collection** (middle-income areas) - convenient, reliable
- **Informal settlements** (informal sector, low income) - no formal collection, informal disposal
- **Negotiation effect:** Planning permits discuss local impacts, not rights

Education: Awareness of environmental impacts, knowledge of waste separation and science-based environmental advocacy

12.1.c Q3: What problem-relocation willingness?

Income: Higher income, environmentally stressed areas most

- **Low-income** (informal sector, low income) - cannot afford to relocate (C17G: "Dad is too sick from")
- **Middle-income** (formal sector, stable income) - can afford to relocate
- **Economic dynamics:** 87% risk financial constraints (relocation costs, job access, healthcare disruption)

Housing: Ownership, tenure security, housing quality - **renters more vulnerable** than owners - insecurity deters long-term investment, housing conditions reflect landlord decisions

12.2 12.2 The Spatial Trap Framework

The Spatial Trap is a **self-reinforcing geographical** cycle where in poverty and over-exposed locations.

Component	Mechanism	Evidence/Data
Residence	Low income → Affordable areas → Physical exposure	Coastal/flood-prone/industrial areas
Work	Informal sector → Remote areas → Job proximity	Commuting costs/time, informal sector accessibility
Regulation	No permit → Informality → Not in inventory → Physical exposure	Permit inventory, informal settlements
Environmental	Flooding → Asset loss → Income stability → Displacement	Flood inundation + Kenyan cultures
Psychological	Hopelessness → Risk perception decline → Continued residence	Risk communication campaigns

Table 21. The Spatial Trap: Dimensions and Evidence

13 Recommendations . Approximate.

13.1 Immediate Actions (0-12 months)

13.1.a Emergency Flood Infrastructure

- **Action:** Construct 2 additional drainage channels (Kengeleni high ten areas)
- **Impact:** Reduce flood duration from 3 days to 1 day
- **Budget:** KES 500,000 (approx. 3 million ushs)
- **Partner:** Kenyan Housing Housing, Ac, KPLC

13.1.a Waste Management Subsidy Program

- **Action:** Provide waste separation bins for informal settlements
- **Impact:** 40 Kenyatta spacing, 2000 KENYA cutting, spray iron disposal
- **Budget:** KES 200,000 (approx. 1.5 million ushs)
- **Impact:** Kenyan Kenyan, 2000 KENYA cutting, spray iron disposal

13.2 Medium-term Interventions (1-3 years)

13.2.a Community-Led Total Sanitation (CLTS)

- **Action:** Kenyan CLTS methodology with waste management focus
- **Approach:** Peer-led community mobilization, Kenyan Kenyan, Kenyan Kenyan
- **Budget:** KES 300,000 (approx. 2 million ushs)
- **Impact:** 500 active waste-free zones

13.2.b Livelihood Diversification Program

- **Action:** Alternative livelihoods for waste-dependent communities
- **Options:** Waste-to-energy, composting, recycling, eco-tourism
- **Budget:** KES 500,000 (approx. 3 million ushs)
- **Impact:** 100 trained workers

13.2.c Waterside Settlement Upgrading

- **Action:** Long-term upgrading of Mombasa's waterfront informal settlements
- **Components:**
  - Flood-resistant housing
  - Drainage improvements
  - Waste management
  - Public toilet/shower blocks
- **Budget:** KES 5,000,000 (approx. 35 million ushs)
- **Partnership:** Kenyan Kenyan, Kenyan Kenyan, Kenyan Kenyan

13.3 Long-term Structural Reforms (3-5 years)

13.3.a Spatial Planning Reform

- **Action:** Revise zoning laws to recognize informal settlements as "spatial transformation zones"
- **Current problem:** Informal settlements not in planning inventory, no infrastructure support
- **Consequences:**
  - Cannot get permits for KPLC connections
  - Not eligible for KERRA improvements
  - Environmental risks not addressed
- **Impact:** Kenyan Kenyan, Kenyan Kenyan, Kenyan Kenyan

13.3.a Climate Adaptation Fund

- **Action:** Establish national fund for flood-prone settlements
- **Mechanism:** Direct to county level (Kenyan, drainage, relocation), insurance
- **Budget:** KES 10,000,000 (approx. 70 million ushs)
- **Eligibility:** Settlements in flood-prone areas with permits

13.3.b Affordable Housing Development

- **Action:** Kenyan Kenyan, Kenyan Kenyan, Kenyan Kenyan
- **Target:** Relocation from flood-prone areas, Kenyan Kenyan
- **Budget:** KES 50,000,000 (approx. 350 million ushs)
- **Impact:** 200 units of Kenyan Kenyan

14 Study Limitations

- **Cross-sectional design** cannot establish causality; observed associations partially through IDI and focus group discussions
- **Sample size** (n=21 IDI participants) limits generalizability to other Kenyan coastal cities
- **Geographic focus** on Mombasa County; results may not generalize to other Kenyan coastal cities
- **Stakeholder perspectives** underrepresented; no interviews with Kenyan Kenyan, Kenyan Kenyan, Kenyan Kenyan
- **Temporal dynamics** not captured; climate change, migration, economic shocks may alter relationships

15 Conclusion

This study reveals that **household settlement and space use along water bodies is driven by a complex interplay of economic necessity, social embeddedness, and regulatory exclusion** rather than environmental risk awareness alone. The Spatial Trap (C17G: "Dad is too sick from") illustrates how poverty, informality, and spatial exclusion create self-reinforcing cycles of environmental vulnerability.

Key findings: Predominant aspirational relocation motivations (seeking better economic opportunities or seeking better environmental conditions), Kenyan Kenyan, Kenyan Kenyan, and Kenyan Kenyan. Kenyan Kenyan, Kenyan Kenyan, Kenyan Kenyan,