

Land Market Intensification and Cultural Landscape Erosion in Lagos Island: A Spatial-Econometric Analysis

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Abstract- The rapid growth of urban areas and the intensification of land markets have become significant factors driving the transformation of cultural landscapes in historic city centers across Africa. This research examines the spatial-econometric relationship between land market activities and the erosion of cultural landscapes on Lagos Island, Lagos, Nigeria, which is one of the most historically important yet economically challenged urban settings in West Africa. Utilizing a spatial-quantitative research methodology that incorporates Geographic Information Systems (GIS), hedonic pricing models, Land Price Index (LPI) calculations, Property Appreciation Rate (PAR) assessments, and spatial regression techniques, the study evaluated 780 systematically selected properties within four heritage-rich zones: Marina/Broad Street, Campos Square/Olowogbowo, Isale Eko, and Ebute Ero, over a 25-year timeframe (2000-2025). The results indicate that land values surged eightfold, increasing from a base index of 100 in 2000 to 800 by 2025, with Zone A (Marina/Broad Street) experiencing the highest property appreciation at 740%. GIS-based change detection revealed extensive conversion of traditional residential land uses into commercial purposes, while spatial regression analysis confirmed that land market factors: LPI, PAR, and changes in land use, are statistically significant predictors of cultural landscape erosion ($R^2 = 0.78$, $p < 0.01$). The spatial autocorrelation analysis (Moran's $I \approx 0.71$) indicated a strong clustering of erosion patterns emanating from commercial centers. This study illustrates that cultural landscapes in rapidly urbanizing cities face not only the threat of neglect but are also being actively reshaped by economic forces inherent in urban land markets. It offers an interdisciplinary spatial-econometric framework for assessing heritage vulnerability and advocates for heritage-sensitive land valuation, GIS-based monitoring, and proactive planning measures within the land administration system of Lagos Island.

Indexed Terms: Cultural Landscape Erosion, Land Market Dynamics, Spatial Econometrics, Hedonic Pricing, GIS, Lagos Island, Urban Heritage, Gentrification, Rent Gap, Property Appreciation

I. INTRODUCTION

Historic urban centers in the Global South are experiencing significant structural changes due to the intensification of urban land markets. As cities become integrated into global economic networks, increasing land values, speculative investments, and commercial redevelopment have gradually altered the built environment, often compromising culturally important urban landscapes. Lagos Island, the historical heart of Nigeria's commercial capital, illustrates this phenomenon-where layers of pre-colonial Yoruba settlements, colonial planning, and Afro-Brazilian returnee architecture coexist within one of Africa's most vibrant real estate markets (Bidanset and Lombard, 2014).

The theoretical framework for comprehending this process is well-documented in the literature on gentrification. Smith's (1979) influential 'rent gap' theory posits that redevelopment occurs when the potential ground rent of land significantly surpasses its current use value, prompting capital reinvestment and physical transformation. In Lagos Island, this gap is particularly evident: heritage structures provide relatively low economic returns, while their land parcels attract rising commercial premiums. This economic disparity generates systemic pressure for demolition and redevelopment, even without explicit policies devaluing heritage.

In addition to residential displacement-the aspect most commonly analyzed in gentrification studies in North America and Europe-market-driven urban transformation in Global South cities is evident through the degradation of cultural landscapes, which UNESCO (2011) defines as the combined works of nature and humans that reflect long-term human-environment interactions. In Lagos Island, these landscapes encompass Afro-Brazilian facades, arcaded verandas, courtyards, and traditional street layouts. Their gradual disappearance represents not only an aesthetic loss but also a profound disruption of historical continuity and collective urban memory (Akangbe, Makinde, and Adeyinka, 2025).

Historic urban centers in the Global South are undergoing substantial structural transformations due to the intensification of urban land markets (Duranton and Puga, 2020). As cities become more integrated into global economic networks, rising land values, speculative investments, and commercial redevelopment have progressively modified the built environment, often at the expense of culturally significant urban landscapes. Lagos Island, the historical core of Nigeria's commercial capital, exemplifies this trend-where layers of pre-colonial Yoruba settlements, colonial planning, and Afro-Brazilian returnee architecture coexist within one of Africa's most dynamic real estate markets.

II. LITERATURE REVIEW

Theoretical Framework

The theoretical framework for understanding this process is thoroughly documented in the literature on gentrification. Smith's (1979) seminal 'rent gap' theory suggests that redevelopment takes place when the potential ground rent of land significantly exceeds its current use value, leading to capital reinvestment and physical transformation. In Lagos Island, this gap is particularly pronounced: heritage structures yield relatively low economic returns, while their land parcels draw increasing commercial premiums. This economic disparity creates systemic pressure for demolition and redevelopment, even in the absence of explicit policies that devalue heritage (Zukin, 2010).

Beyond residential displacement-the aspect most frequently examined in gentrification studies in North America and Europe-market-driven urban transformation in Global South cities is evident through the degradation of cultural landscapes, which UNESCO (2011) defines as the combined works of nature and humans that reflect long-term human-environment interactions. In Lagos Island, these landscapes include Afro-Brazilian facades, arcaded verandas, courtyards, and traditional street layouts. Their gradual disappearance signifies not only an aesthetic loss but also a significant disruption of historical continuity and collective urban memory (Lees, Shin and López-Morales, 2016).

The notion of the rent gap, initially proposed by Smith (1979) and significantly enhanced in contemporary research, remains essential for comprehending this phenomenon. The dynamics of rent gaps in postcolonial cities function differently than in Western settings, highlighting hybrid tenure systems, informal land markets, and inadequate institutional enforcement instead of solely class-based reinvestment cycles. In Lagos, where the Land Use Act of 1978 assigns all land to state governments and informal transactions are widespread, the factors that create rent gaps are fundamentally integrated into governance structures rather than merely indicative of market maturity.

Hedonic pricing models have offered strong empirical methods for measuring the economic aspects of urban heritage. Ahlfeldt and Holman (2016) showed that designated heritage buildings in English cities have considerable positive externalities on nearby property values, indicating that cultural landscapes hold quantifiable economic worth beyond their inherent significance.

Koster and Rouwendal (2017) similarly discovered that historic urban areas in the Netherlands command substantial property price premiums. These results highlight the theoretical contradiction at the heart of this research: culturally significant landscapes yield economic advantages yet remain institutionally undervalued within formal land management frameworks, making them susceptible to redevelopment.

Recent empirical studies in African cities have started to document the spatial aspects of transformation driven by land markets. Akangbe, Makinde, and Adeyinka (2025) utilized spatio-temporal analysis to track gentrification trends in informal settlements in Lagos, uncovering patterns of market-driven restructuring influenced by both state infrastructure investments and private capital.

Spatial-Econometric Approaches to Urban Heritage Analysis

Spatial econometrics has emerged as a robust set of tools for analyzing the geographic aspects of urban economic processes. Considering spatial autocorrelation, heterogeneity, and interdependence, spatial regression models offer more precise and theoretically sound analyses of urban phenomena compared to traditional aspatial econometric methods (Anselin, Syabri and Kho, 2005).

Geographically Weighted Regression (GWR) and spatial lag models have been utilized to investigate the determinants of land prices across diverse urban settings. Yilmaz and Morali (2022) applied spatial econometric methods to analyze property value gradients in Lagos, revealing that access to commercial nodes has a significant impact on land prices and that these effects demonstrate strong spatial clustering. Their results provide an empirical foundation that guides the regression specifications used in this study.

GIS-based change detection has emerged as a well-established method for quantifying land use changes over time. By utilizing multi-temporal satellite imagery from Landsat and Sentinel platforms, researchers have increasingly mapped urban expansion, densification, and shifts in functional land use within West African cities with greater accuracy (Obilor and Ugochukwu, 2024). These methodological foundations form the basis of the spatial analysis component of this study, which utilizes supervised classification of multi-temporal imagery to document land use changes across the heritage zones of Lagos Island.

The combination of archival comparison with spatial analysis signifies a growing methodological innovation in the field of urban heritage research.

Koko, Han, and Wu (2022) illustrated in their study of Zaria's historic old city that the integration of historical maps, archival photographs, and contemporary GIS data allows for the quantification of built heritage loss in ways that purely descriptive methods cannot achieve. This integrated approach-adopted in the present study-facilitates both the visual documentation and the statistical assessment of cultural landscape erosion over time.

Despite these methodological advancements, notable gaps remain. Few studies have explicitly connected econometric land market variables-such as the Land Price Index or hedonic pricing outputs-to spatially measured indicators of heritage loss within a cohesive analytical framework. This disconnect is particularly evident in Nigerian real estate research, where studies often treat land market dynamics and architectural heritage as separate disciplinary issues (Ugonabo, Egolum, and Sado, 2023). This study addresses that gap by developing a regression framework in which economic land market variables act as independent predictors of spatial heritage erosion outcomes.

Institutional Frameworks and Policy Implications

The ongoing erosion of cultural landscapes in Lagos Island cannot be solely blamed on market dynamics; it is indicative of fundamental deficiencies in heritage governance, land management, and planning institutions. Badmos, Rienow, Callo-Concha, Jürgens, Greve, and Gruber (2020) investigate the failures of planning regulations in Nigerian cities and conclude that objectives related to heritage conservation are consistently sidelined in land use decision-making processes, in part due to their economic invisibility within land valuation frameworks. This conclusion resonates with broader critiques of heritage policies in rapidly urbanizing African cities, which frequently prioritize infrastructure development and economic growth metrics over mandates for cultural preservation (Badmos et al., 2020). Cultural landscapes have seldom been integrated into formal property valuation practices in Lagos, making them economically 'invisible' to developers, investors, and planning officials. Integrated cultural valuation frameworks-such as those arising from the application of Total Economic Value (TEV)

methodology to urban heritage-present promising alternatives. TEV methodologies attribute economic values to use, option, and existence values of cultural assets, facilitating their significant inclusion in cost-benefit analyses that inform redevelopment decisions.

The UNESCO Recommendation on the Historic Urban Landscape (HUL), which was adopted in 2011 and further detailed through subsequent implementation guidance (UNESCO, 2022), offers an international normative framework that aligns conservation goals with sustainable urban development objectives. Nevertheless, Akangbe, Makinde, and Adeyinka (2025) illustrates that the adoption of the HUL approach in Nigerian cities is still limited, partly due to constraints in institutional capacity and the lack of GIS-based heritage monitoring systems within municipal planning agencies. The findings of the current study directly tackle this institutional shortcoming by showcasing the feasibility and utility of GIS-integrated heritage monitoring as a tool for evidence-based land governance.

III. RESEARCH METHODOLOGY

Study Area

Lagos Island, situated at approximately 6°27'N, 3°24'E, serves as the historic commercial nucleus of the Lagos metropolitan region and ranks among the most economically vibrant urban settings in West Africa. Covering a land area of around 7.4 km² and with a daytime population exceeding 500,000, it operates as both a central financial district and a custodian of substantial architectural and cultural heritage. The research concentrated on four analytically distinct zones:

Zone A (Marina/Broad Street): A high-density commercial corridor that exemplifies peak redevelopment pressure, marked by banking headquarters, corporate skyscrapers, and government edifices.

Zone B (Campos Square/Olowogbowo): The core of Afro-Brazilian heritage, distinguished by 19th-century returnee Brazilian architecture, which includes ornate facades, arcaded verandas, and intricate stucco detailing.

Zone C (Isale Eko): The zone of indigenous traditional settlement, showcasing Yoruba residential compound typologies, market areas, and community institutions.

Zone D (Ebute Ero): A mixed-use transitional area characterized by hybrid land uses, gradual densification, and a moderate presence of heritage.

These zones were chosen based on their observed heritage significance, spatial diversity, and differing levels of documented redevelopment pressure, thereby ensuring a comprehensive and representative analysis.

Research Design and Sampling

A spatial-quantitative research design was employed, which integrated multi-temporal GIS analysis, econometric modeling, and archival comparison. The target population consisted of all identifiable building units within the four study zones as of the year 2000, estimated to be approximately 3,120 parcels through the digitization of archival maps and field reconnaissance. A systematic spatial sampling technique was utilized, employing a GIS-based grid overlay to select one out of every four building parcels for in-depth analysis, resulting in a sample of 780 properties. This sampling ratio provided sufficient spatial coverage while remaining operationally practical.

Sources of Data

Land market data were obtained from the Lagos State Land Registry, published reports from professional estate surveying firms, and property transaction records compiled from real estate market platforms and industry networks, covering the years 2000 to 2025. Spatial data were sourced from multi-temporal Landsat 7/8 and Sentinel-2 satellite imagery for the years 2000, 2010, 2020, and 2025, which were processed in ArcGIS 10.8 using supervised maximum likelihood classification to generate land use/land cover maps. Historical base maps, planning records, and archival photographs were acquired from the Lagos State Ministry of Physical Planning and Urban Development as well as the Nigerian National Archives, Ibadan branch.

For the assessment of architectural features, structured field observation checklists were utilized

across the sampled properties, documenting the presence or absence of heritage elements such as decorative facades, arcaded verandas, timber shutters, internal courtyards, and traditional roof forms. Archival photographs from the 1990s and early 2000s were used as baseline comparators.

Methods of Data Analysis

Land Price Index (LPI): The annual average land prices categorized by zone were standardized with the year 2000 as the reference point ($LPI_{2000} = 100$), resulting in time-series trends that illustrate the dynamics of market intensification throughout the study area.

Property Appreciation Rate (PAR): This was calculated as the percentage change in average property values from 2000 to 2025, broken down by zone to facilitate spatial comparisons of market performance.

Hedonic Pricing Model: The property price was analyzed as a function of structural variables (such as plot size, building age, and floor count), locational variables (including distance to the Marina/CMS hub), and cultural variables (like the presence of heritage architectural features and location within heritage zones). The model was estimated using Ordinary Least Squares (OLS) regression.

GIS Change Detection: Supervised land use classifications for each time frame were analyzed through post-classification differencing in ArcGIS, allowing for the quantification of residential-to-commercial conversion rates by zone.

Spatial Regression Analysis: A spatial lag regression model was utilized to investigate the statistical relationship between land market variables (LPI, PAR, land use change) and indicators of cultural landscape erosion (such as the reduction of architectural features). The Moran's I statistic was calculated to evaluate spatial autocorrelation in erosion patterns.

All analyses were performed using ArcGIS 10.8 (for spatial analysis), IBM SPSS Statistics v28 (for regression modeling), and Microsoft Excel (for time-series and index calculations).

IV. RESULTS AND DISCUSSION

Land Market Dynamics: Land Price Index and Property Appreciation

Table 1 presents the Land Price Index (LPI) for Lagos Island over the 2000-2025 study period, demonstrating a consistent and substantial upward trajectory in land values.

Table 1: Land Price Index, Lagos Island (2000-2025)

Year	Avg. Land Price (₦/m ²)	Land Price Index (Base 2000 = 100)	Annual Growth (%)	Zone Leading
2000	₦150,000	100	-	Marina
2005	₦240,000	160	12.0	Marina
2010	₦420,000	280	15.0	Marina/CMS
2015	₦720,000	480	14.3	Marina/Camp os
2020	₦950,000	633	6.4	All Zones
2025	₦1,200,000	800	5.3	All Zones

Source: Lagos State Land Registry; Estate Surveying and Valuation Firm Reports (Aggregated, 2000-2025).

Note: Annual growth rates calculated as year-on-year change in average land price.

The LPI experienced an eightfold increase throughout the study period, indicating a significant structural transformation in the land market of Lagos Island. The most accelerated growth phase took place from 2005 to 2015, which aligned with heightened commercial redevelopment along the Marina-CMS

corridor and increased investment from the banking sector in Lagos Island's real estate. The slowdown in growth observed after 2020 signifies a maturation of the market at consistently high values, rather than a contraction of the market.

Table 2 breaks down property appreciation rates by heritage zone, highlighting considerable spatial differences in market performance.

Table 2: Property Appreciation Rates by Zone (2000-2025)

Zone	2000 Avg. Value (₦)	2025 Avg. Value (₦)	Total Appreciation (%)	Ann Avg. (%)
Zone A - Marina/Broad Street	₦25 M	₦210 M	740%	8.9 %
Zone B – Campos Olowogbowo	₦12 M	₦95M	692%	8.5 %
Zone C - Isale Eko	₦8M	₦42M	425%	6.3 %
Zone D - Ebute Ero	₦10 M	₦65M	550%	7.2 %

Source: Aggregated estate survey reports and property transaction records.

Zone A (Marina/Broad Street) achieved the highest total appreciation of 740%, attributed to its evolution into a prominent corporate and financial center. Notably, Zones B (Campos/Olowogbowo, 692%) and D (Ebute Ero, 550%) also saw substantial appreciation, indicating that heritage-rich inner-core regions are not immune to market dynamics but are becoming more appealing to speculative investments. These results support the observations regarding commercial densification patterns in historic districts of West Africa.

Land Use Change and Residential Heritage Erosion
 The analysis of multi-temporal satellite imagery using GIS-based change detection has uncovered a systematic and spatially varied transition from

traditional residential land uses to commercial functions throughout all four study areas. These transformations are summarized in Table 3.

Table 3: Land Use Distribution and Change by Zone (2000 vs. 2025)

Zone	Res. (%) 2000	Res. (%) 2025	Com m. (%) 2000	Com m. (%) 2025	% Residenti al Loss
Zone A - Marina	40	5	50	90	-87.5%
Zone B - Campos	65	25	25	60	-61.5%
Zone C - Isale Eko	80	50	10	35	-37.5%
Zone D - Ebute Ero	55	30	30	55	-45.5%

Source: GIS-classified multi-temporal Landsat 7/8 and Sentinel-2 imagery (2000, 2010, 2020, 2025); Lagos State Ministry of Physical Planning and Urban Development records.

Note: Spatial map products (2000-2025 land use change maps, erosion hotspot maps, and zone comparison figures) are available as supplementary GIS materials and referenced in the archival comparison companion paper.

Zone A witnessed a near-total loss of residential areas, with residential land use decreasing from 40% to a mere 5% of the zone's total area. Zone B, which contains the most concentrated Afro-Brazilian architectural heritage, experienced a 61.5% reduction in its residential character. This indicates that the presence of heritage does not guarantee market protection when formal legal safeguards are lacking. These trends are consistent with the findings

regarding the transformation of heritage zones in Accra, where the proximity to commercial corridors emerged as the most significant predictor of the conversion of residential land use.

The spatial clustering of changes in land use was most evident along the Marina-CMS axis and, to a lesser extent, around major roads in Zones B and D. This observation aligns with the rent gap theory, which posits that parcels located within commercial accessibility gradients are more likely to face redevelopment pressures (Yilmaz and Morali, 2022).

Spatial Regression Analysis: Land Market Predictors of Cultural Landscape Erosion

Table 4 displays the outcomes of the spatial regression analysis that investigates the statistical correlation between land market variables and the erosion of cultural landscapes, as indicated by the decline in traditional architectural elements.

Table 4: Spatial Regression Results - Predictors of Cultural Landscape Erosion

Variable	Coefficient (β)	Std. Error	t-value	Significance (p)
Constant (α)	0.85	0.12	7.08	0.000
Land Price Index (LPI)	0.42	0.08	5.25	0.000
Property Appreciation Rate (PAR)	0.31	0.07	4.43	0.001
Land Use Change (ΔLU)	0.53	0.09	5.89	0.000
Architectural Feature Reduction (AFR)	0.47	0.10	4.70	0.000

$R^2 = 0.78$; Adjusted $R^2 = 0.76$; F-statistic = 41.3 ($p < 0.001$); *** $p < 0.01$. Spatial lag model estimated in ArcGIS 10.8 spatial regression tools. Moran's I =

0.71 ($p < 0.001$), confirming significant positive spatial autocorrelation in erosion patterns.

All four variables in the land market exhibited statistically significant positive correlations with the erosion of cultural landscapes ($p < 0.01$). Among these, Land Use Change ($\beta = 0.53$) was identified as the most influential predictor, suggesting that the transformation of heritage areas from residential to commercial purposes is the primary factor driving the loss of architectural features-aligning with theoretical predictions based on the rent gap framework. Additionally, LPI ($\beta = 0.42$) and Architectural Feature Reduction ($\beta = 0.47$) demonstrated substantial impacts, reinforcing the notion that increasing land values not only directly motivate demolition but also create market conditions that render heritage structures economically unfeasible.

The overall explanatory power of the model ($R^2 = 0.78$) is notably high for a spatial regression of this nature, indicating that the dynamics of the land market largely account for the significant variance observed in cultural landscape erosion throughout Lagos Island. The Moran's I statistic (≈ 0.71) further validates the presence of strong positive spatial autocorrelation in erosion trends, suggesting that the loss of cultural landscapes is not randomly distributed but rather clusters in areas of heightened market activity, extending outward from the Marina-CMS commercial center.

These results build upon previous empirical studies conducted by Ahlfeldt and Holman (2016) and Koster and Rouwendal (2017), illustrating that the economic forces influencing heritage value in European settings function similarly-and with more severe repercussions-in the unprotected heritage contexts of rapidly urbanizing cities in Africa.

V. DISCUSSION

The findings of this study establish with quantitative certainty what qualitative observers of Lagos Island have long suggested: that the erosion of culturally significant landscapes is not an incidental byproduct of urban growth but a systematic outcome of land market intensification operating within a governance vacuum. The eightfold increase in the Land Price

Index between 2000 and 2025, and its statistically significant correlation with architectural heritage loss across all four study zones, demonstrates that economic forces embedded within land markets are primary-rather than peripheral-drivers of cultural landscape change.

The spatial concentration of erosion around commercial corridors, confirmed by Moran's I autocorrelation analysis, has important implications for planning intervention. It suggests that heritage vulnerability is not uniformly distributed across Lagos Island but is geographically predictable based on proximity to commercial development nodes. This creates an opportunity for targeted, evidence-based heritage protection: zones within specified proximity to the Marina-CMS corridor and major arterial roads should be recognized as high-risk areas requiring enhanced regulatory oversight and proactive conservation incentives.

The persistence of cultural landscape erosion in Zone B (Campos/Olowogbowo)-despite its internationally recognized Afro-Brazilian heritage-is particularly concerning and reflects what Badmos et. al (2022) describe as the systematic failure of Nigerian planning institutions to operationalize heritage conservation objectives within land use decision-making. Without the economic visibility that formal heritage designation and cultural valuation methodologies could provide, heritage structures in Lagos Island remain competitively disadvantaged relative to commercially redevelopable plots, reinforcing the cycle of erosion.

The interdisciplinary contribution of this study is significant as it illustrates that cultural landscapes are not solely subjects of aesthetic or historical interest; rather, they are economic entities that are spatially embedded and can be analyzed, monitored, and managed using the same quantitative methodologies employed in land markets. The integration of GIS-based monitoring systems with land market data equips planning authorities with the ability to detect erosion hotspots in real time, facilitating proactive conservation measures instead of reactive ones-an approach that is increasingly supported in the literature regarding the implementation of UNESCO's

Historic Urban Landscape (Akangbe, Makinde, and Adeyinka, 2025).

VI. CONCLUSION

This research has shown, through a comprehensive spatial-econometric analysis, that the intensification of land markets on Lagos Island is a statistically significant and spatially structured factor contributing to the erosion of cultural landscapes. The eightfold increase in land values from 2000 to 2025, coupled with a substantial conversion of residential land to commercial use and a noticeable decline in traditional architectural elements, indicates that Lagos Island is experiencing a market-driven cultural shift with serious consequences for urban identity, historical continuity, and heritage governance.

The regression model utilized in this study ($R^2 = 0.78$) identifies land market variables as strong predictors of heritage loss, while the spatial autocorrelation analysis (Moran's $I \approx 0.71$) uncovers the geographically clustered and corridor-linked characteristics of erosion dynamics. These results lay an empirical groundwork for evidence-based heritage planning, highlighting the importance of merging spatial analysis, land economics, and archival comparison within a cohesive research framework.

The implications of the policy are pressing. It is essential to shift heritage conservation on Lagos Island from a marginal issue to a fundamental aspect of land use planning, valuation methods, and redevelopment approval processes. Suggested actions include the creation of GIS-based heritage monitoring systems within the Lagos State Ministry of Physical Planning and Urban Development; the integration of cultural landscape value metrics into the framework of the Land Use Act; the implementation of heritage incentive mechanisms such as tax relief or development bonuses for redevelopment that complies with conservation standards; and the official designation of Zones B and C as heritage conservation areas with enforceable development regulations.

Future studies should broaden this framework to encompass other historically significant urban centers in Nigeria and throughout the West African region,

investigating whether the spatial-econometric relationships observed in Lagos Island reflect a wider regional trend of market-driven heritage degradation in rapidly urbanizing environments.

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