Where the City Ends: Morphology of Urban Sprawl in Metro Iloilo (1999-2019)

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Abstract

Urban expansion in the Philippines has accelerated in recent decades and has exerted pressure on agricultural land, communities, and peri-urban governance. This study analyzes land use and land cover (LULC) change in Metro Iloilo using multi-temporal Landsat imagery (1999, 2009, 2019) processed in Google Earth Engine and classified with a Random Forest algorithm. Built-up areas increased from 1,919 ha (4.6%) in 1999 to 4,149 ha (9.9%) in 2019, largely replacing agricultural land, which declined from 64.5% to 55.0%. Intensity Analysis (IA) revealed that (i) urban growth accelerated most rapidly between 2009 and 2019; (ii) agriculture was consistently the most targeted class for conversion; and (iii) built-up expansion was highly systematic, with gains in Pavia and Oton exceeding expectations under uniform change. Morphological analysis further showed dual sprawl dynamics: contiguous growth radiating from Iloilo City's core and leapfrogging clusters emerging in Santa Barbara and San Miguel. These findings highlight the urgency of integrating remote sensing-based monitoring with regional planning to manage sprawl, safeguard agricultural land, and guide more sustainable urban transitions in Metro Iloilo.

1. Introduction

1.1 Urbanization and Urban Sprawl

Cities have expanded rapidly and endlessly over the past two centuries, with more than half of the global population now urban and projections nearing 70 percent by 2050 (Bhattacharya, 2010; United Nations [UN], 2024). Urbanization entails more than demographic growth. It produces new spatial forms and relations. Brenner and Schmid (2011) describe an era of planetary urbanization marked by polynucleated metropolitan regions and blurred urban boundaries, where even "non-urban" spaces are drawn into urban processes. Urban sprawl is a contested but widely recognized spatial manifestation of urbanization. Scholars variously frame it as a pattern, process, cause, or consequence of land-use change (Ewing, 1994; Galster et al., 2001). Some highlight its forms, such as scattered development (Wilson et al., 2003) while others stress its pace, occurring when land conversion exceeds population growth (Barnes et al., 2001). Though sometimes explained as a market-driven outcome (Brueckner, 2000), a broad consensus describes sprawl as unplanned, uneven, and excessive growth involving the irreversible conversion of agricultural and natural lands (Bhatta, 2010).

1.2 Morphology of Sprawl

Typologies help clarify sprawl's spatial expression. Wilson et al. (2003) distinguished infill, expansion, and outlying growth (isolated, linear, clustered), while Harvey and Clark (1965) outlined low-density continuous, ribbon, and leapfrog development. These correspond closely and are illustrated in Figure 1. The patterns themselves are not inherently problematic: low-density growth may support transport corridors, and leapfrog development may reflect terrain constraints. What defines sprawl is not the type of growth but its consequences. As Ewing (1994) notes, the distinction lies in whether expansion generates negative impacts rather than in the form itself.

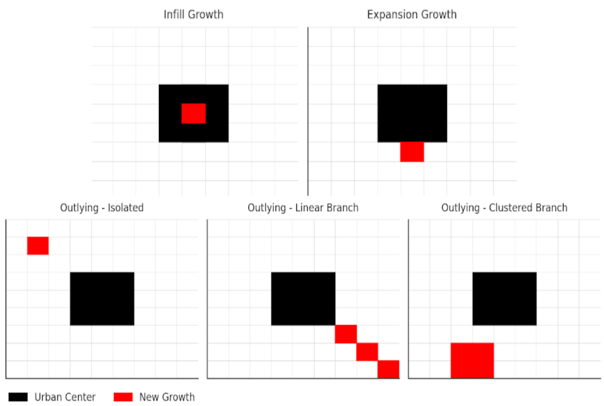

Figure 1. Diagram of urban growth patterns.

1.3 Sprawl in the Peri-Urban Philippines

In the Global South, sprawl often manifests through peri-urbanization, where urban and rural functions overlap in fluid and contested landscapes (McGee, 1991). In the Philippines, the rapid conversion of agricultural land to built-up use illustrates this dynamic. Between 1988 and 2016, nearly 100,000 hectares of agricultural land were officially reclassified for non-agricultural use, and estimates from the National Irrigation Administration indicate that as much as 165,000 hectares of irrigated prime farmland may be lost to conversion each year (Senate of the Philippines, 2019; IBON Foundation, 2017). For a country where agriculture remains central to livelihoods, these transformations have deep economic and social implications. Metro Iloilo provides a critical case for examining these processes. As Western Visayas' regional hub and the core of the Metro Iloilo–Guimaras Economic Development Council (MIGEDC), its growth has been shaped by both local dynamics and national development policies. Yet despite its rapid expansion, scholarship on Iloilo's peri-urban transitions remains sparse.

1.4 Remote Sensing for Urban Sprawl Analysis

In the Philippines, urban sprawl is often examined through Land Use/Land Cover (LULC) analysis using Geographic Information Systems (GIS) and remote sensing. The multi-temporal Landsat archive enables consistent detection of land cover changes at regional scales (Bhatta, 2010). Supervised classification methods such as Maximum Likelihood (Abino, 2015; Olfato-Parojinog et al., 2023) remain standard, while more recent efforts have turned toward machine learning algorithms like Random Forest and Multilayer Perceptron (MLP) neural networks (Iizuka et al., 2017; Johnson & Iizuka, 2016). In the Laguna de Bay region, for instance, Iizuka and colleagues (2017) combined past land cover change trajectories with neural-network calibration to model future scenarios of "business-as-usual", "compact development," and "high sprawl." Their results show continued conversion of cropland and tree cover into built-up areas, demonstrating the value of sprawl-oriented simulation for policy and planning.

Other scholars have complemented classification with landscape metrics and entropy models to capture the form of urban expansion. Gonzales (2016) applied Shannon entropy to quantify Baguio City's steep terrain, highlighting highly discontinuous and fragmented growth. Soriano et al. (2019) assessed sprawl in the Mount Makiling Forest Reserve buffer zones, finding that built-up areas more than doubled from 1992 and 2015 despite protective regulations. Entropy analysis revealed initially dispersed growth, followed by a partial compacting trend as settlement pressures mounted. Several studies have also sought to situate sprawl in relation to ecological and infrastructural pressures. Andong and Sajor (2015) linked sprawl in Metro Manila to transport emissions, showing that unlike in developed contexts where sprawl is tied to private cars, Manila's sprawl exacerbates public mass transit dependence, raising CO_2 emissions. Murakami and Palijon (2005), meanwhile, described the mixed and fragmented land uses of Metro Manila's fringe, where informal settlements along highways coexist with subdivisions built on reclaimed marshlands. Collectively, these studies highlight the utility of remote sensing in capturing both the magnitude and spatial patterns of urban sprawl, while also revealing how such approaches can inform planning and policy

1.5 Research Objectives

Tracing urban expansion in Metro Iloilo from 1999 to 2019, this study examines how land cover changes reveal the speed, pattern, and intensity of sprawl across the city-region's peri-urban zones. Two contributions guide this work. First, this focuses on Metro Iloilo, a fast-growing but understudied secondary city-region where growth pressures outpace planning capacities. Second, this applies Landsat-based classification with Intensity Analysis to capture not only the magnitude but also the pace and unevenness of land conversions, distinguishing whether changes are active, dormant, or reversible. By producing spatially explicit evidence of peri-urban growth, this also contributes to the United Nations' Sustainable Development Goal 11, which calls for sustainable, inclusive, and well-coordinated cities.

Specifically, this study aims to: (1) Map and quantify land cover changes over two decades; (2) Analyze the intensity, speed, and spatial patterns of urban expansion; and (3) Assess how these trends reflect peri-urban transitions and governance challenges. These findings serve as geospatial evidences to guide peri-urban growth and support city-region planning in Metro Iloilo.

2. Materials and Methods

2.1 Study Area

The study focuses on the Metro Iloilo area, a prominent regional center in Western Visayas. This area encompasses Iloilo City, which serves as the regional capital and administrative hub, along with its six adjacent municipalities: Oton, Pavia, Leganes, San Miguel, Santa Barbara, and Cabatuan (See Table 1 and Figure 2). According to the Philippine Statistics Authority (PSA) (2025), the Province of Iloilo accounts for 47 percent of total regional palay (rice) production and contributes roughly one-fourth of the region's vegetable and root crop output. Agriculture remains significant, representing 22.7 percent of the province's gross domestic product. Amid this agrarian base, the province faces mounting urban pressures: Iloilo is the most densely populated in the region, averaging 387 persons per square kilometer, while Iloilo City, as the highly urbanized core, reaches 5,719 persons per square kilometer; and has been recognized as the second fastest-growing economy among Highly Urbanized Cities outside Metro Manila (National Economic and Development Authority [NEDA] Region VI, 2023; Herrera, 2024).

Municipality /City	Area (ha)	Density 2020 (per ha)	Growth Rate (1995-2020)
Cabatuan	11,290	5.41	1.49%
Iloilo City	5,600	58.42	1.26%
Leganes	3,220	10.78	2.39%
Oton	8,460	11.40	2.23%
Pavia	3,500	25.93	3.94%
Santa Barbara	13,196	5.13	2.16%
San Miguel	3,197	9.42	1.86%

Table 1. Area statistics per municipality/city (PSA, 2020).

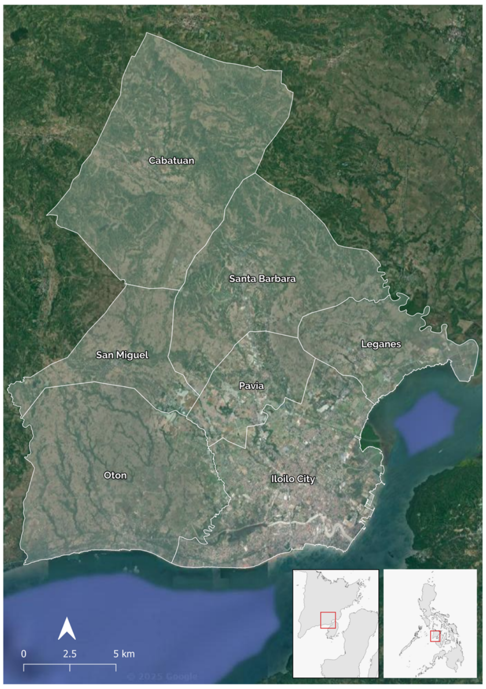

Figure 2. Study Area – Metro Iloilo.

2.2 Data Collection

Remotely sensed data were obtained from Landsat 5 TM, Landsat 7 ETM+, and Landsat 8 OLI to capture land cover in 1999, 2009, and 2019, covering a 20-year interval. All datasets were sourced from Collection 2 Level 2 products, eliminating the need for atmospheric correction. These sensors offer 30-meter spatial resolution, suitable for regional-scale urban monitoring.

2.3 Preprocessing and Land Cover Classification

Google Earth Engine (GEE) was used for data preprocessing, primarily due to its integrated access to the Landsat archive. Annual median composites were generated from images with less than 20% cloud cover to reduce cloud contamination, and gap-filling was applied to account for missing pixels. Supervised land cover classification was performed on each composite using the Random Forest algorithm in GEE. Training polygons were distributed evenly across the study area to ensure representative sampling of all land cover types. These were cross-validated with higher-resolution satellite images and verified zoning maps. The study focused on five dominant land cover classes which were derived from the classification utilized by Baqa et al. (2021) (see Table 2).

During classification, barren soil and agricultural land were merged into a single category because their spectral signatures are often similar, particularly in fallow or recently plowed fields. This consolidation minimized misclassification while still allowing analysis of transition to built-up areas. Classification accuracy was assessed by splitting the training dataset into an 80:20 ratio, with 80% used for training and 20% for validation.

LULC Class	Description
Water Body	Open water features such as rivers, lakes, ponds, reservoirs, etc.
Vegetation	Areas dominated by natural vegetation, primarily forest cover.
Agriculture	Land designated for both organized and unorganized farming systems.
Built-up Area	Human-modified surfaces including residential neighborhoods, roads, etc.
Mangroves	Coastal intertidal zones dominated by mangrove vegetation.

Table 2. Schema for LULC class (Baqa et al., 2021).

The resulting classified maps were also visually inspected, and growth types were categorized according to Wilson et al.'s (2003) typologies which provides a descriptive overview of Metro Iloilo's urban morphology.

2.4 Change Detection Analysis

In this stage of analysis, the agricultural/barren soil and vegetation classes were merged into a single non-built-up category, contrasted against built-up areas. Change detection was conducted using a post-classification, pixel-based comparison across two intervals: 1999–2009 and 2009–2019. Change matrices were computed to quantify transitions between the two land cover classes. Additionally, a change map was generated to spatially visualize the locations of urban growth.

2.5 Intensity Analysis

This study examines the extent of Metro Iloilo's spatial growth using the framework of Intensity Analysis (IA), which organizes land cover change into three hierarchical levels: (1) the interval level, indicating the rate of overall change; (2) the category level, showing gains and losses in specific land classes; and (3) the transition level, identifying source-to-target conversions, such as agricultural land to built-up areas (Gandharum et al., 2022) (see Table 3).

Level	Description	Key Question
Category Level	Compares gains or losses per land class	*Which classes change more or less than expected?*
Interval Level	Measures overall change of speed	*Is change accelerating or slowing?*
Transition Level	Examines source-to-target conversions	*From which class is land gained or lost?*

Table 3. Matrix of IA Framework (Gandharum et al., 2022)

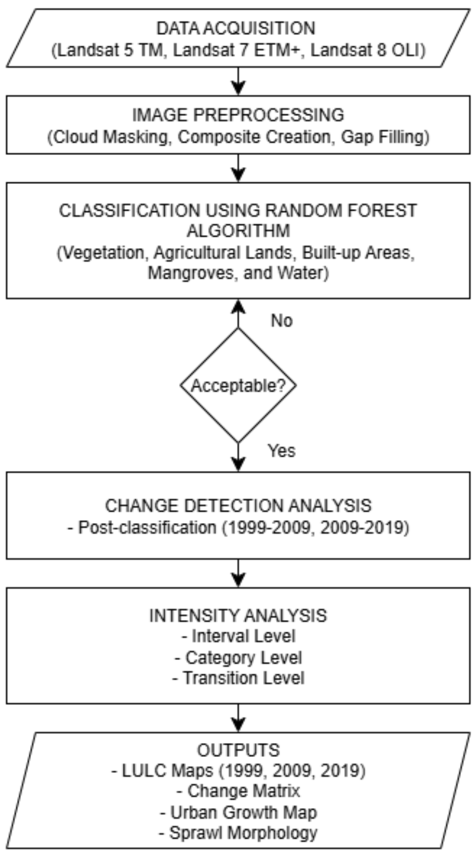

Figure 3. Methodological workflow of the study.

The overall methodological workflow showing preprocessing, classification, accuracy assessment, change detection analysis and intensity analysis is summarized in Figure 3.

3. Results

3.1 Land Cover Classification

Land cover statistics (see Table 4 and Figure 4) reveal clear shifts in Metro Iloilo's spatial composition between 1999 and 2019. Built-up areas more than doubled, reflecting sustained urban expansion into the metropolitan periphery. This growth occurred largely at the expense of agricultural land which registered the most consistent decline, losing nearly 4,000 hectares during the study period. Vegetation cover expanded significantly in the first decade before stabilizing, while mangrove ecosystems showed a sharp contraction followed by partial recovery. Water bodies, by contrast, remained largely unchanged, fluctuating only slightly across the three time-steps.

Class	1999	2009	2019
Built-up	1,919.08 ha (4.59%)	2,735.55 ha (6.52%)	4,148.66 ha (9.87%)
Agricultural	27,026.76 ha (64.54%)	24,687.33 ha (58.87%)	23,092.08 ha (54.96%)
Vegetation	11,087.50 ha (26.48%)	13,502.02 ha (32.20%)	13,532.89 ha (32.21%)
Mangrove	776.37 ha (1.85%)	156.29 ha (0.37%)	221.71 ha (0.53%)
Water	1,066.41 ha (2.55%)	850.88 ha (2.03%)	1,019.85 ha (2.43%)

Table 4. Area statistics (in hectares) per land cover class for 1999, 2009, and 2019

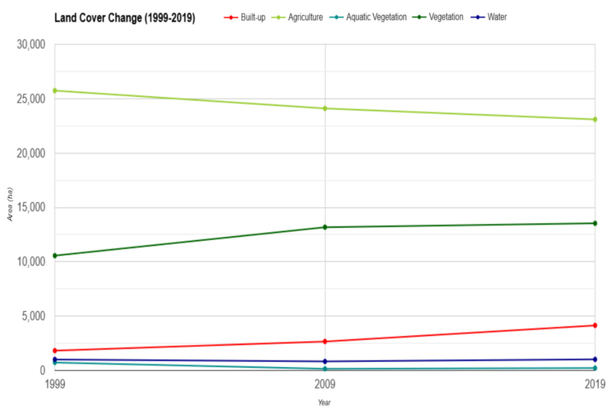

Figure 4. Area statistics (in hectares) per land cover class for 1999, 2009, and 2019.

3.2 Metro Iloilo Growth Morphology

The classified land cover maps (Figure 5) for 1999, 2009, and 2019 illustrate the core-to-periphery expansion in Metro Iloilo. In 1999, built-up areas were primarily concentrated within the city proper forming a compact urban core. By 2009, radial expansion had emerged as a development extending outward along major road networks from Iloilo City into Pavia, Oton, Santa Barbara, and Leganes, carving into agricultural land. By 2019, sprawl intensified further, with built-up footprints extending beyond urban boundaries and into surrounding towns.

The morphology of urban growth in Metro Iloilo's municipalities aligns closely with Wilson et al.'s (2003) typologies. Iloilo City demonstrates both infill and expansion type that consolidates its compact core while further extending outward. Neighboring municipalities reflect more complex processes. Oton and Leganes follow linear growth along coastal corridors and highways. Pavia and Cabatuan illustrate clustered branch expansions. Santa Barbara combines infill with contiguous expansion, whereas San Miguel exhibits isolated patches of new development marking the outermost reach of metropolitan influence. The typology of urban growth and key observations in each municipality of Metro Iloilo are synthesized in Table 5.

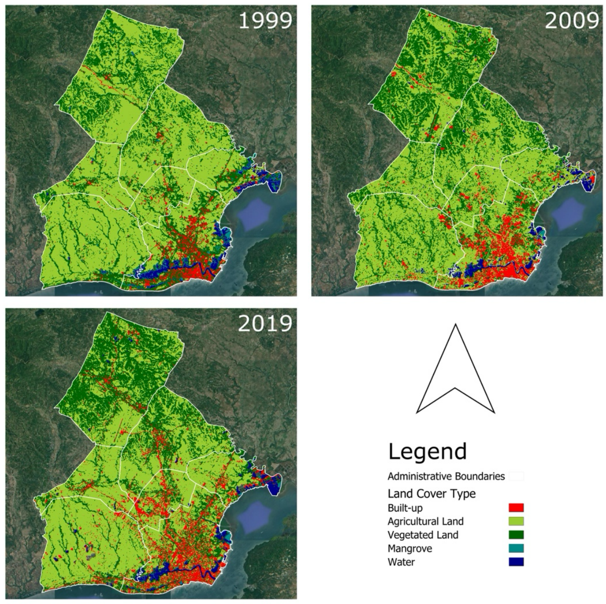

Figure 5. Classified Land Cover Map (1999, 2009, and 2019).

Municity	Growth Types	Key Observations
Iloilo City	Infill; Edge Expansion	Compact core with infill and outward growth along borders.
Oton	Contiguous; Linear sprawl	Linear sprawl along coast and inland roads.
Pavia	Contiguous; Clustered outlying	Rapid expansion and farmland conversion; clustered growth beyond borders.
Leganes	Linear outlying; Contiguous	Growth along coast and highways; inland agriculture partly retained.
Cabatuan	Clustered & linear outlying	New clusters near airport; linear growth along transport links.
Santa Barbara	Infill; Contiguous	Clusters merged; forming a strong secondary growth pole.

San Miguel	Isolated outlying	Small dispersed developments showing metro reach.

Table 5. Typology and key observations of urban growth in Metro Iloilo (1999–2019).

3.3 Accuracy Assessment

Overall Accuracy (OA), User's Accuracy (UA), and Producer's Accuracy (PA) confirm overall reliability while clarifying class-level limitations for interpreting LULC transitions (Table 6). Land cover classification accuracy varied across years, with overall accuracies of 86.5% (1999), 80.4% (2009), and 92.0% (2019). Built-up areas and water were consistently well-detected, while agricultural (UA = 78–91%) and vegetated (UA = 68–82%) areas showed moderate confusion in cropland zones. Mangrove remained highly reliable with minor boundary errors. The 2009 dataset was weakest, likely due to gap-filled pixels, while 2019 performed best, particularly for built-up land (UA = 97%), benefitting from improved sensor resolution and classifier performance. User's and Producer's Accuracies highlight class-specific trends. Built-up land improved steadily (UA = 83–98%; PA = 77–93%), agricultural land was balanced but underrepresented in 2009 (PA = 0.774), and vegetation showed the lowest accuracy though improving by 2019 (UA = 0.818). Mangrove and water retained high accuracies (UA and PA >0.84) across all years.

Land Cover	**1999**		**2009**		**2019**	
	UA	PA	UA	PA	UA	PA
Built-up	0.833	0.769	0.867	0.839	0.975	0.929
Agri	0.908	0.908	0.788	0.774	0.912	0.949
Veg	0.682	0.789	0.700	0.778	0.818	0.844
Mangrove	0.842	0.842	0.864	0.826	0.912	0.886
Water	0.957	0.882	0.929	0.867	0.926	0.926
OA (%)	**86.5**		**80.4**		**92.0**	
Kappa	**0.813**		**0.744**		**0.892**	

Table 6. Accuracy assessment of land cover classifications for 1999, 2009, and 2019.

3.4 Change Matrix

The land cover change matrix (Table 7) quantifies both persistence and conversion over two decades. In both periods, the most significant change was the conversion of Non-built to Built land, occurring at more than three times the scale of the reverse transition. From 1999 and 2009, 2,716.93 hectares of Non-built land were developed, a figure that rose by 26.8% in the following decade to 3,444.85 hectares. The land cover change map (see Figure 6) illustrates this in red, highlighting scattered and uneven conversions, ranging from contiguous expansion towards the peripheries. By contrast, conversion from Built to Non-built, was smaller, with 712.54 hectares from 1999-2009 and 980.55 hectares from 2009-2019, indicating potential de-densification or land rehabilitation. Net change calculations (the difference between gain and loss) show a significant net gain in the Built class. At the same time, persistence remains the dominant pattern: most Built land stayed as Built (green in Figure 6) while most Non-built land also retained its class (white spaces).

Class - From/To	**1999 – 2009**		**2009 - 2019**	
	Non-built	**Built**	**Non-built**	**Built**
Non-built	37 525.95	712.54	36 066.42	980.55
Built	2 716.93	1 200.87	3 444.85	1 745.01

Table 7. LULC Class Change Matrix (1999–2019). In hectares.

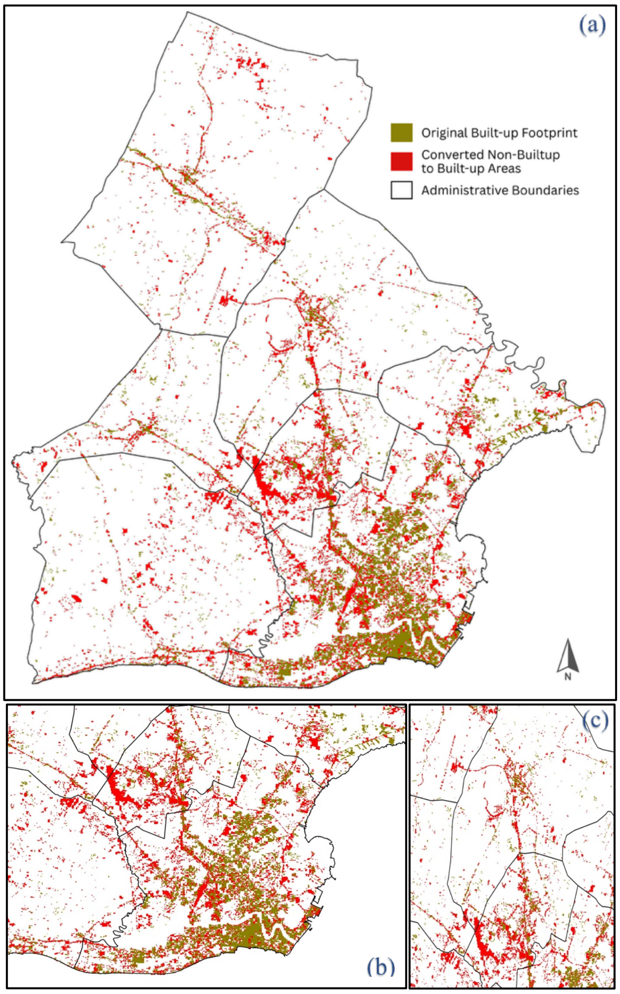

Figure 6. (a) Land cover change in Metro Iloilo, 1999–2019. (b) Infill growth in Iloilo City and (c) Linear expansion from Pavia–Santa Barbara to Cabatuan Airport.

3.5 Intensity Analysis

3.5.1 Category: The Built-up class is the most dynamic land cover, as it exhibited an active status for both loss and gain in both observed time intervals (see Figure 7). Built-up areas were converted to and from other classes at rates well above the landscape average. From 1999 to 2009, the loss intensity was 0.0372 and the gain intensity was 0.0693. Similar rates continued from 2009 to 2019, with a loss intensity of 0.0360 and a gain intensity of 0.0664. This confirms that the Built-up class is constantly restructured by concurrent processes of expansion and contraction. In contrast, the Non-built class showed a dormant status for both loss and gain across both periods, with change rates at which slower than the uniform change intensity. From 1999–2009, the loss intensity was 0.0068 and the gain intensity was 0.0019; similar low rates were observed from 2009–2019 (loss 0.0087; gain 0.0026). These findings suggest that while the Built class drives most landscape change, the Non-built class remains a relatively stable and less-impacted component of the system.

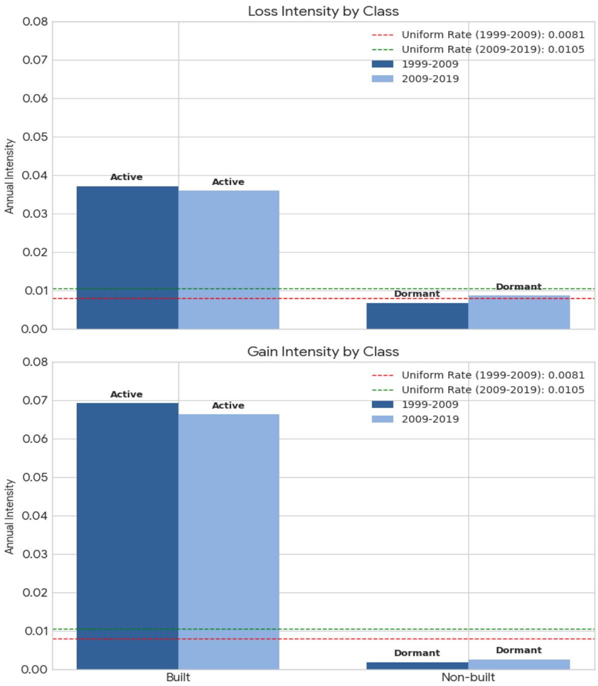

Figure 7 Category-level Loss and Gain intensity analysis by class (1999–2009 and 2009–2019).

3.5.2 Interval: The interval-level analysis shows that the pace of LULC change varied significantly between the two decades (Figure 8). From 1999-2009, land transitions averaged 640.60 hectares per year, well above the uniform 20-year rate of 460.54 hectares per year. The first decade was thus a period of rapid change, marked by built-up expansion and major losses in agricultural land. The pattern reflects the strong urbanization pressures, as Iloilo City and its neighboring municipalities faced rising demand for residential, commercial, and infrastructural development. On the other hand, the period from 2009 to 2019 slowed considerably, with an annual change intensity of only 327.36 hectares per year, placing it below the uniform rate and thus in the slow change category. This suggests that the wave of rapid land conversion that characterized the earlier decade had moderated, even though urban growth continued. The slower pace points to a deceleration in the overall restructuring of Metro Iloilo's landscape, as agricultural loss stabilized somewhat and vegetation areas remained relatively constant. Overall, the results indicate that land change in Metro Iloilo is decelerating, moving from a phase of accelerated urban expansion in the 2000s toward a more gradual reconfiguration of land uses in the 2010s.

3.5.3 Transition: The transition-level analysis shows that in both intervals, the observed transition intensities exceeded uniform benchmarks, indicating active transitions (see Figure 9). The transition from non-built to built registered intensities of approximately 0.007 (1999–2009) and 0.009 (2009–2019), both exceeding the uniform values of 0.0064 and 0.0082, respectively. This confirms that conversion to built-up areas occurred at disproportionately higher rates than would be expected under uniform change, suggesting intensified urban expansion during both decades. Conversely, the Built to Non-built transition displayed much higher intensities with around 0.037 and 0.036 for the two intervals that are far above the uniform benchmarks. While technically classified as "active," this largely reflects the systematic category exchange in the classification process, rather than a substantive reversal of built-up development.

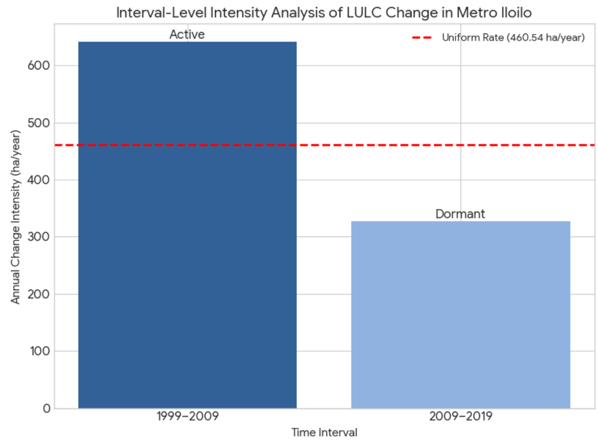

Figure 8. Interval-level analysis of LULC change in Metro Iloilo, 1999–2009 and 2009–2019.

4. Discussion

4.1 Intensity Analysis

IA provides a lens to interpret not only how much change occurred in Metro Iloilo, but also how fast and in what direction is the sprawl is moving. At the category level, the Built-up class was consistently the most active, with high gain and loss intensities across both decades. This indicates expansion into peri-urban zones alongside densification and reconfiguration within existing built-up areas. By contrast, Non-built classes (agriculture, vegetation, mangroves, water) remained largely dormant, with slower rates suggesting a more stable landscape backdrop despite gradual decline. At the interval level, the first decade (1999–2009) was one of accelerated change, with annual rates surpassing uniform benchmarks which is an era of rapid agricultural conversion tied to Iloilo's rise as a regional hub.

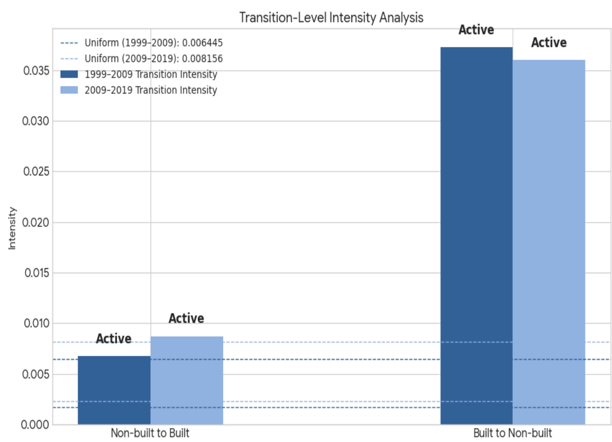

Figure 9. Transition-level analysis of LULC change in Metro Iloilo, 1999–2009 and 2009–2019.

The following decade (2009–2019) slowed, falling below uniform levels. This deceleration points less to an end of sprawl than to its moderation, reflecting both regulatory influences of local and regional scales of governance. At the transition level, Non-built to built conversions consistently exceeded uniform expectations, confirming farmland loss central to the sprawl. Yet high built-to-non-built transitions reveal that not all urban land is permanently sealed. It suggests the reversibility, it may be through vacant lots, abandoned projects, or active land use change, highlights the possibility of cyclical urban expansion.

4.2 Drivers of Metro Iloilo Sprawl

The demographic patterns of Metro Iloilo strongly coincide with the spatial patterns of urban sprawl over the past two decades. Census data from 1995 to 2020 show steady but uneven population growth in Metro-Iloilo (PSA, 2020). Iloilo City showed a modest growth of about 1.21% annually, while peri-urban municipalities like Pavia more than doubled its population from 26,756 to 74,594, growing at 3.60% annually, followed by Leganes (2.24%), Oton (1.97%), and Santa Barbara (1.90%).

These demographic shifts correspond with the morphological shifts in the land cover. By 2009, for instance, when Pavia, Oton, and Santa Barbara were experiencing rapid population growth, maps reveal radial expansion outward from Iloilo City. The decline in agricultural land likewise corresponds directly to the municipalities experiencing the highest population growth rates, particularly Pavia and Oton. Meanwhile, the slower demographic gains of Cabatuan and San Miguel are mirrored in their more fragmented and isolated urban footprints.

If population redistribution generates demand for land, infrastructure and economic development lay down the corridors along which sprawl accelerates. The *Western Visayas Regional Development Plan 2017–2022* notes that the opening of the Iloilo International Airport in Sta. Barbara–Cabatuan in 2007, together with the ongoing expansion of the Iloilo City seaport, reinforced the city's role as a regional gateway. Metro Iloilo has since positioned itself as the principal growth pole for Panay and Guimaras, while also emerging as the hub for meetings, incentives, conferences, and exhibitions (MICE). It hosts major health facilities and sustains a thriving ICT–BPM sector, including seventeen (17) PEZA-accredited IT Parks and Centers (Ortega et al., 2015). The updated *Regional Development Plan 2023–2028* underscores continued investments in port upgrades, circumferential road networks, roll-on/roll-off (RORO) water transport connectivity, and the logistics infrastructure (NEDA, 2023). The most ambitious initiative to date is the ₱50-billion, 200-hectare Iloilo City Reclamation Project, which is expected to intensify in-migration and drive both peripheral sprawl and urban core densification (Dalipe IV, 2024).

The drivers of sprawl in Metro Iloilo cannot be disentangled from these national and regional policy frameworks. Since the 1990s, the Philippine state has promoted "metropolitan arrangements" as vehicles of competitiveness in a liberalizing economy (Manasan & Mercado, 1998; Ortega et al., 2015). The establishment of MIGEDC follows this trajectory which draws on the template of Metro Manila while aligning with the Mega-Region Economic Development Strategy and the decentralization thrust of the 1991 Local Government Code. These frameworks facilitated the agglomeration of municipalities around Iloilo City and by extension, institutionalized the peri-urban expansion patterns in the metro.

5. Conclusion and Recommendations

5.1 Summary of Findings

Metro Iloilo has experienced sustained yet uneven sprawl over the past two decades, with built-up expansion largely replacing agricultural land. Change analysis shows non-built areas converted to built-up land, accelerating by nearly 27% in the second decade. Not all urbanized land was permanent. Some reversals from built to non-built occurred. Yet, intensity analysis confirms built-up land as the most dynamic category, with gains and losses well above uniform benchmarks. Whereas, agricultural and vegetated lands remained relatively dormant. At the interval level, sprawl exceeded long-term averages between 1999–2009, but slowed after 2009 as conversion rates fell below the uniform pace. Morphologically, growth is polycentric and fragmented. Iloilo City expanded through infill and outward growth; Oton and Leganes developed linearly along transport corridors; Pavia and Cabatuan clustered around branches; Santa Barbara combined infill and expansion; while San Miguel showed dispersed patches at the metropolitan edge. These shifts were driven by demographic pressures, infrastructure investments, and regional development policies.

5.2 Informing (Peri) Urban Governance

Findings underscore the need to strengthen governance in managing peri-urban transitions. Advancing compact and connected urban form aligns with national efforts to curb indiscriminate agricultural land conversion and protect food security. Three policy measures are central: (1) Establish clear urban growth boundaries through Planned City Extensions (PCEs) embedded in CLUPs to anchor expansion while safeguarding strategic farmland; (2) Shift away from low-density, subdivision-led development toward compact blocks, mixed-use housing, and accessible public spaces to reduce land consumption; and (3) Institutionalize remote sensing–based monitoring within LGU planning units to support evidence-driven regulation.

This study mapped and quantified two decades of land cover change, examined the speed and intensity of expansion, and situated these patterns within broader peri-urban transitions. While effective in demonstrating the value of coupling remote sensing with Intensity Analysis in secondary Philippine cities, limitations remain. Landsat's spatial resolution constrains detection of fine-grained change; limited ground verification reduces sensitivity to incremental cover change processes; and the analysis did not explicitly correlate how population growth or infrastructure shape conversion. Conducting municipality-level IA would further clarify variation across local jurisdictions. Nonetheless, making sprawl spatially legible is a critical first step. The study contributes to debates on peri-urbanization in the Global South and offers grounded insights for more coordinated and sustainable regional planning in the Philippines.

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