

# Socio-spatial inequities of selected leisure spaces in Durban Metropolis: investigating social impacts and driving factors of leisure land use changes for equitable urban livability

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## Abstract

**Purpose** – This study aims to investigate the geography and role of leisure land use and land cover (LULC) changes of nine selected leisure spaces in Durban from 2004 to 2024, in mitigating socio-spatial inequities within the city's rapidly urbanizing landscape. The research responds to the understanding of the unequal distribution of leisure spaces, as well as the issues of social exclusion, environmental injustice and diminished urban livability.

**Design/methodology/approach** – The study uses a multitemporal, geo-spatial analytical approach to map, analyze and interpret the distribution and accessibility of ten strategically selected urban leisure spaces from 2004 to 2024. The methodological framework integrates spatial overlay, proximity analysis and demographic data to explore patterns of leisure space distribution in relation to population dynamics, socioeconomic variables and infrastructural development.

**Findings** – The study reveals pronounced disparities in leisure space availability and accessibility, primarily favoring affluent, predominantly white northern and western suburbs, while historically marginalized, predominantly black, lower-income neighborhoods in central and southern Durban suffer from inadequate leisure infrastructure, revealing socio-spatial inequities rooted in apartheid-era segregation, uneven urban planning policies and contemporary market-driven spatial transformations.

**Research limitations/implications** – This study underscores the critical role of socio-spatial indicators in guiding equitable urban planning and livability strategies, particularly in rapidly urbanizing contexts like Durban. By integrating Geographic Information Systems (GIS)-based spatial analysis with planning systems and community dynamics, the research highlights the need for data-driven, inclusive and future-proofed urban policies. It advocates for embedding socio-spatial equity in planning frameworks to mitigate environmental injustices and improve access to leisure amenities. The findings inform both urban governance and curriculum development in geography and planning education, fostering interdisciplinary, context-specific approaches to sustainable urban development.

**Practical implications** – This study provides practical insights for urban planners, policymakers and educators by demonstrating how socio-spatial data can be used to identify inequities in access to leisure spaces. It advocates for the adoption of GIS and remote sensing tools to inform land use decisions, enhance public participation and ensure inclusive urban development. Practically, the findings can guide interventions to redistribute recreational infrastructure, improve quality of life in underserved communities and integrate socio-spatial awareness into planning curricula and professional training, ultimately fostering more just, resilient and livable urban environments in peri-urban contexts like Durban.



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*Conflict of interest:* The authors declare that there is no conflict of interest.

**Social implications** – The findings illuminate how leisure space inequities perpetuate systemic injustices, undermine social cohesion and constrain the realization of inclusive urban environments.

**Originality/value** – This study advances the scholarly conversation on urban leisure geography by offering a pioneering GIS-based, multitemporal exploration of leisure LULC and accessibility in Durban Metropolis, bridging critical gaps in the literature by explicitly linking LULC changes with socio-spatial justice and urban livability debates.

**Keywords** Geo-information technologies, Spatial analysis, Leisure spaces, Urbanization

**Paper type** Research paper

## 1. Introduction

Leisure land use is a powerful socio-spatial lens through which urban equity, sustainability and human well-being can be critically examined. In contemporary cities, leisure spaces are not merely peripheral amenities; they constitute essential urban infrastructure that mediates access to environmental services, social cohesion and quality of life. As [Mamajonova et al. \(2024\)](#) assert, leisure spaces support critical ecological functions, including biodiversity conservation and the mitigation of urban heat island effects, while also enabling carbon sequestration ([Addas, 2023](#)). At the same time, these spaces foster human health and psychosocial well-being by encouraging physical activity, reducing stress and improving mental resilience ([Vargas-Hernández et al., 2023](#)). However, the socio-spatial distribution of leisure land is far from equitable, particularly in the Global South where rapid urbanization often unfolds along historically entrenched spatial injustices. Nowhere is this dynamic more visible than in Durban Metropolis, South Africa – a city grappling with spatial inequality rooted in its apartheid legacy and now compounded by neoliberal urban growth pressures. The intensification of land use competition, driven by expanding residential, commercial and infrastructural developments, is resulting in the displacement, shrinkage or functional marginalization of leisure spaces ([Feltes, 2020](#)). These changes disproportionately impact low-income and historically marginalized populations, who are increasingly excluded from urban green and leisure environments due to spatial inaccessibility, poor maintenance or inadequate provision ([Vidal et al., 2020](#); [Mubangizi, 2021](#)). Thus, leisure land use change is not merely a planning concern but a spatial justice issue – an arena where access, ownership and usage of space reflect deeper socio-political inequities. Despite growing awareness of these tensions, empirical research interrogating how leisure land use is spatially reconfigured in relation to population growth, demographic transitions and governance priorities in Durban remains limited ([Jagamath et al., 2020](#)). This research gap weakens the ability of urban planners and policymakers to create spatially just cities that balance ecological sustainability with human dignity and inclusion. Against this backdrop, this study poses a critical question:

- Q1. What are the socio-spatial inequities and driving factors influencing leisure land use changes in Durban Metropolis, and how do these shifts affect the pursuit of equitable urban livability?

To address this question, the study uses a geospatial methodological framework, leveraging Geographic Information Systems (GIS) and remote sensing to analyze the spatio-temporal dynamics of leisure land use. By situating leisure space within the broader discourse on urban justice and sustainability, the study aims to offer evidence-based insights that reimagine urban leisure not as a luxury, but as a shared socio-spatial right integral to equitable and livable city futures in post-apartheid South Africa.

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## 2. Literature review

### 2.1 *Leisure spaces and their multifaceted importance*

Leisure spaces are widely recognized as critical components of urban ecosystems, contributing profoundly to the ecological, social and economic sustainability of cities (Vidal *et al.*, 2020). Beyond their surface recreational functions, these spaces embody complex socio-ecological systems that enhance urban biodiversity, mitigate adverse climate effects such as urban heat islands and improve air quality through the provision of green infrastructure (Sopiana and Harahap, 2023). These ecosystem services extend to critical urban functions such as stormwater management, microclimate regulation and noise attenuation, services that are increasingly indispensable in the context of accelerated urbanization and climate change (Olatoye *et al.*, 2021). From a socio-cultural perspective, leisure spaces serve as vital arenas for social interaction, cultural expression and community resilience. They foster social cohesion and inclusivity by providing accessible, shared environments that accommodate diverse demographic groups, thereby reinforcing social capital in urban settings (Vidal *et al.*, 2020; Sopiana and Harahap, 2023). However, the benefits derived from these spaces are contingent on their equitable distribution and accessibility, which remain major challenges in many urban areas (Behnisch *et al.*, 2022). The spatial justice framework has emerged in recent literature to critique and analyze the uneven access to leisure spaces, situating this inequity within broader patterns of urban segregation and socio-economic marginalization (Colding *et al.*, 2020). Figure 1 conceptualizes the intricate interlinkages among urban systems, planning frameworks and socio-spatial indicators necessary for advancing urban livability within complex geographical and socio-technical contexts.

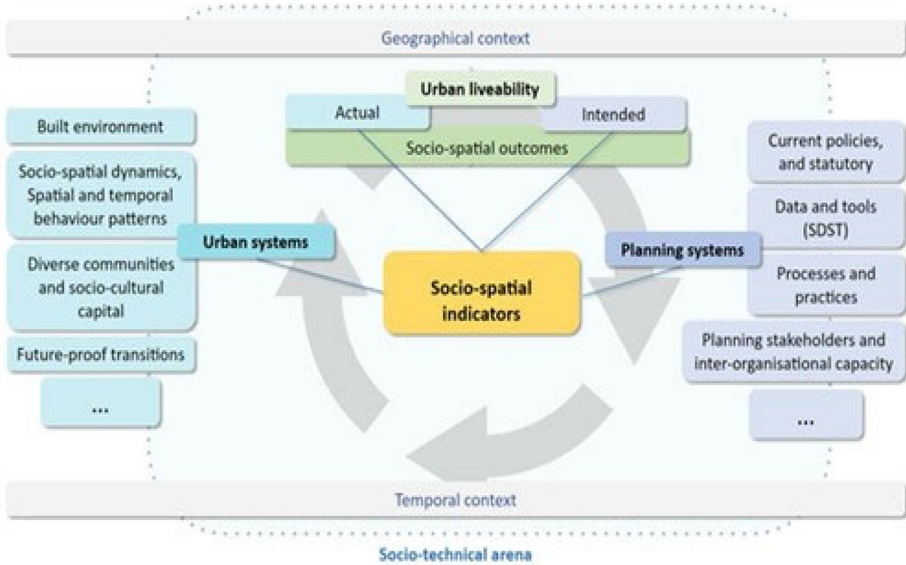
### 2.2 *Urbanization, socio-spatial inequities and the erosion of leisure spaces*

Rapid urban growth, particularly in emerging megacities such as Durban, exacerbates pressures on urban land use, often at the expense of leisure and green spaces. Urban expansion is characterized by land-use transformations that prioritize residential, commercial and industrial development, frequently encroaching upon natural and recreational areas (Des Roches *et al.*, 2021). This urban sprawl not only diminishes the quantity of leisure spaces but critically undermines their ecological integrity and functionality, contributing to biodiversity loss and degradation of ecosystem services (Colding *et al.*, 2020).

Importantly, the socio-spatial dimensions of this phenomenon reveal stark disparities: marginalized and low-income communities disproportionately bear the burden of leisure space loss, experiencing reduced access to safe, quality and proximate green environments (Behnisch *et al.*, 2022). These inequities in leisure space distribution mirror broader patterns of environmental injustice, where the most vulnerable populations face compounded social and environmental disadvantages. Scholars have called for a more nuanced understanding of these socio-ecological dynamics, arguing for integrated policy approaches that address urban growth while safeguarding equitable access to leisure and ecosystem services (Des Roches *et al.*, 2021; Behnisch *et al.*, 2022). Moreover, the degradation of leisure spaces undermines their capacity to buffer urban environmental stresses such as heat waves, air pollution and noise, thereby exacerbating public health risks and reducing urban resilience (Olatoye *et al.*, 2021).

### 2.3 *Advancements and limitations in geo-spatial analysis of leisure spaces*

Recent advances in geo-spatial technologies have revolutionized the study of urban landscapes, enabling more precise and dynamic analyses of leisure space distribution and transformation. GIS and remote sensing have become essential tools for mapping, monitoring and modeling urban land use changes, including the fragmentation and loss of



**Figure 1.** Conceptual model depicting the interlinkages between urban systems, planning systems, and socio-spatial indicators for achieving urban livability within geographical, temporal and sociotechnical contexts

Source: Authors' own work

leisure spaces (Song *et al.*, 2021). These methodologies facilitate detailed proximity analyses that reveal spatial inequalities and highlight areas of leisure space deficit relative to population settlements (Olatoye and Fru, 2024b). In South African urban research contexts, GIS and satellite imagery have been successfully used to document trends in leisure space depletion and to evaluate implications for urban livability and environmental quality (Adesina *et al.*, 2024). However, the literature identifies critical gaps: there is a paucity of integrated analyses that combine spatial data with socio-economic and demographic variables, limiting understanding of the complex interactions between population dynamics, urban development pressures and leisure space accessibility (Mariye *et al.*, 2022). This gap is particularly significant for cities like Durban, where rapid population growth and spatial inequality necessitate multidimensional approaches to planning and policy-making. The incorporation of socioeconomic layers with geo-spatial analyses can illuminate patterns of environmental justice, accessibility constraints and inform interventions for more equitable urban leisure space provisioning (Olatoye and Fru, 2024b; Mariye *et al.*, 2022). Thus, this study seeks to address these limitations by deploying an integrative geo-spatial framework that encompasses not only the physical distribution of leisure spaces but also their socio-spatial relationships to residential communities, emphasizing equity and inclusivity in urban planning for sustainable livability. Figure 1 depicts the conceptual model depicting the interlinkages between urban systems, planning systems and socio-spatial indicators for achieving urban livability.

Figure 1 illustrates the intersection of urban systems, planning paradigms and socio-technical indicators as they relate to leisure space dynamics. Yet, much of the existing literature remains

disciplinary and siloed, rarely synthesizing environmental geography, urban sociology and planning technology into a cohesive analytical framework. Although studies such as [Colding et al. \(2020\)](#) and [Song et al. \(2021\)](#) address the loss and monitoring of leisure spaces, few interrogate the structural drivers, colonial land legacies, neoliberal planning and informal governance structures that underpin spatial inequalities.

#### 2.4 *Urbanization and the erosion of leisure spaces*

The contemporary urban experience in the Global South is marked by rapid urbanization, densification and socio-ecological fragmentation. Durban, like many South African cities, exemplifies this trajectory. Urbanization processes, driven by demographic shifts, informal settlements and infrastructural pressures, have intensified competition for urban land, often at the expense of leisure spaces ([Colding et al., 2020](#)). These spaces, comprising public parks, green corridors, beaches, recreational fields, and community gardens – are being systematically displaced or degraded due to increasing demands for residential, commercial and industrial land. Scholars such as [Des Roches et al. \(2021\)](#) argue that urban sprawl leads not only to the physical diminution of leisure areas but also to a rupture in the socio-ecological functions they serve. These functions include microclimate regulation, cultural identity, physical and mental well-being and community cohesion. The cumulative impact of such transformations disproportionately affects low-income and marginalized populations, for whom leisure spaces are already sparse or poorly maintained ([Behnisch et al., 2022](#)). This echoes the urban environmental justice discourse, where spatial injustices intersect with class and race ([Anguelovski et al., 2019](#); [Agyeman, 2020](#)). Furthermore, the degradation of leisure spaces has profound implications for ecological resilience. Urban green infrastructure, as documented by [Haaland and van den Bosch \(2015\)](#), is central to climate adaptation strategies, including urban heat mitigation, stormwater regulation, and biodiversity conservation. When such spaces are compromised, cities become more vulnerable to environmental shocks. However, there remains a paucity of localized and longitudinal studies that explicitly quantify these dynamics within African urban contexts, especially from a socio-spatial equity perspective.

#### 2.5 *The role of geo-spatial analysis and remote sensing technologies*

The advent of geo-spatial technologies, especially GIS, remote sensing, and spatial modeling has significantly advanced the empirical investigation of urban land-use change and its socio-environmental ramifications. These tools enable fine-grained spatial-temporal analyses that reveal patterns of land conversion, fragmentation of green spaces, and inequalities in access to leisure amenities ([Song et al., 2021](#)). In the context of Southern Africa, GIS-based approaches have been instrumental in uncovering how informal urban expansion intersects with environmental degradation ([Mariye et al., 2022](#); [Adesina et al., 2024](#)). The analytical utility of GIS extends beyond mapping; it includes landscape metrics, proximity analysis, accessibility modeling, and participatory cartography. [Olatoye and Fru \(2024b\)](#) underscore how these technologies can be harnessed to explore the socio-spatial relationships between leisure spaces and surrounding demographics, offering a multi-scalar lens on urban inequality. However, despite such potential, there is limited research in South African scholarship that integrates geo-spatial techniques with socio-economic indicators such as income levels, racialized urban planning legacies, and population density. This analytical gap is particularly stark in secondary cities like Durban, where planning data are often fragmented or outdated. Emerging frameworks such as spatial justice ([Soja, 2010](#)), right to the city ([Lefebvre, 1996](#)), and the 15-min city model ([Moreno et al., 2021](#)) provide critical paradigms for interpreting the role of leisure spaces in fostering urban livability. Yet, their empirical application through spatial technologies remains underexplored in the African

urban context. Integrating these frameworks into GIS-enabled assessments can offer transformative insights into urban design, participatory planning, and inclusive governance. Furthermore, while Western literature often emphasizes leisure as an extension of quality of life, in post-apartheid South Africa, it embodies deeper struggles for land reclamation, environmental justice, and socio-cultural recognition (Petersen, 2020; Sutherland *et al.*, 2018). Leisure spaces in Durban Metropolis are not merely recreational, they are contested terrains shaped by history, power, and planning inertia. In light of these insights, this study contributes to a growing but still fragmented body of research that seeks to operationalize geo-spatial technologies within an interdisciplinary and justice-oriented urban framework. By critically analyzing the spatial distribution and accessibility of leisure spaces in Durban, and linking them to planning regimes and demographic data, this research addresses both empirical and conceptual voids in the literature.

### 3. Methodology

This study used a mixed-methods, multi-temporal research design to investigate socio-spatial inequities associated with LULC changes in selected leisure spaces across Durban Metropolis between 2004 and 2024. A purposive sampling strategy was used to select ten leisure spaces based on their geographic spread, functional diversity, socio-political relevance, and historical significance within the urban fabric. The methodological framework integrated geospatial analysis, statistical modeling, and qualitative policy review to ensure a robust, multi-scalar examination of leisure space transformations and their social implications. Multi-temporal satellite imagery (Landsat 7 ETM+, Sentinel-2, and Google Earth Pro) corresponding to the years 2004, 2014, and 2024 was used for LULC classification. Supervised classification using the Maximum Likelihood algorithm was conducted in ArcGIS 10.8 software, with post-classification comparison methods applied to detect land use changes over time. Classification accuracy was assessed using confusion matrices and kappa coefficients using functionalities in ArcGIS 10.8 software, targeting an overall accuracy threshold of 87%. Spatial overlay analysis was conducted to compare leisure land use patterns with population density and infrastructural distribution. Accessibility was modeled using network analysis tools to evaluate connectivity and proximity of leisure spaces to surrounding communities, particularly within historically disadvantaged areas. To complement the geospatial analysis, statistical methods were used to uncover underlying patterns and determinants of spatial inequality. This methodological triangulation enabled a comprehensive and critical interpretation of how land use decisions, infrastructural priorities, and urban governance intersect with leisure space allocation and socio-spatial justice in post-apartheid Durban. Methodological limitations such as satellite image resolution and census boundary changes were mitigated through cross-validation and the integration of complementary data sets.

#### 3.1 The study area

Durban Metropolis, the third-largest city in South Africa, is renowned for its coastal setting, rapid urbanization, and diverse demographics (McBride *et al.*, 2022). Strategically located on the southeastern coast of South Africa, Durban lies at approximately 29.8587° S latitude and 31.0218° E longitude (Ndlovu *et al.*, 2021). This positioning, along the eastern seaboard, makes Durban a vital economic hub and one of the country's most important port cities. The city's geographical placement significantly shapes its tropical climate, urban development and ecological landscape, all of which directly influence the distribution and accessibility of leisure spaces in proximity to surrounding communities (Abel, 2022; Mgadle, 2022). According to Bond and Galvin, the interplay of Durban's climate and urban geography underscores the need for intentional urban planning to ensure leisure spaces are equitably

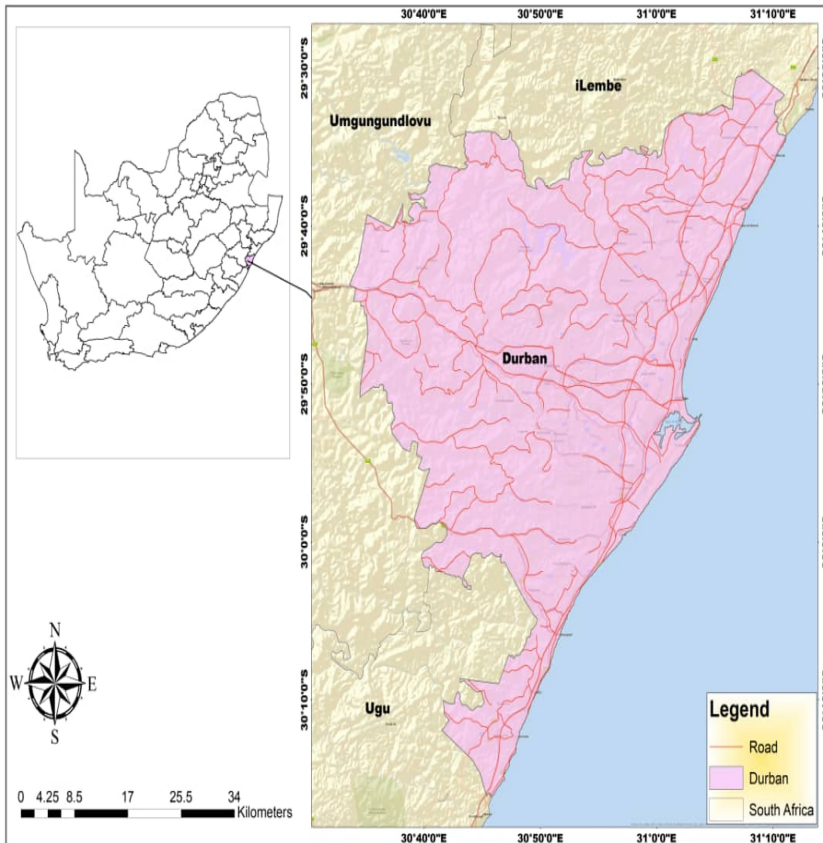
distributed and accessible to all communities, regardless of their socio-economic status (Bond and Galvin, 2023). Figure 2 depicts the digitized map of the study area.

Figure 2 presents a digitized political map of the study area, highlighting Durban within South Africa. The map illustrates major roads, surrounding municipalities (iLembe, Umgungundlovu and Ugu), and Durban's geographical extent. An inset map provides a broader view of South Africa, indicating the location of Durban within the country.

#### 4. Results

##### 4.1 The selected leisure spaces for the study

Nine (9) significant and most iconic leisure spaces were selected for the study, namely Beachwood Mangroves Nature Reserve, Durban Botanical Gardens, Durban North Japanese Gardens, Jameson Park, Kenneth Stainbank Nature Reserve, Mitchell Park Zoo, Natal Shark Board, Phezulu Safari Park, Queen Elizabeth Grassland and Umgeni River Bird Park. Hence, the selection of the 9 leisure spaces for the study was guided by three interrelated equity



**Figure 2.** Digitized political map of the study area  
Source: Authors' own work

indicators: First, the leisure spaces were selected based on their *geographic dispersion* across the Durban Metropolis to represent diverse spatial contexts, including central urban areas, peri-urban zones and marginalized neighborhoods. Second, the *variation in socio-economic settings* surrounding each leisure space was deliberately considered to reflect the full spectrum of wealth disparities, from affluent suburbs to historically disadvantaged communities. Third, *land use typology* played a central role: selected spaces varied across categories such as formal parks, public beaches, nature reserves and community recreation fields, enabling a comprehensive analysis of different leisure forms and their accessibility patterns. Fourth, *temporal significance* was included; only leisure spaces that have undergone observable land use or infrastructural changes over the past two were considered. In addition, *public accessibility status* was a critical filter, only spaces that are nominally open to the public (regardless of actual ease of access) were included to align with the study's emphasis on equitable urban livability. In addition, *historical significance in land use transformations* served as an essential selection criterion. Leisure spaces with documented histories of land conversion, contestation, or neglect were prioritized, as these cases offer valuable insights into the political and socio-environmental narratives that have shaped Durban's urban evolution.

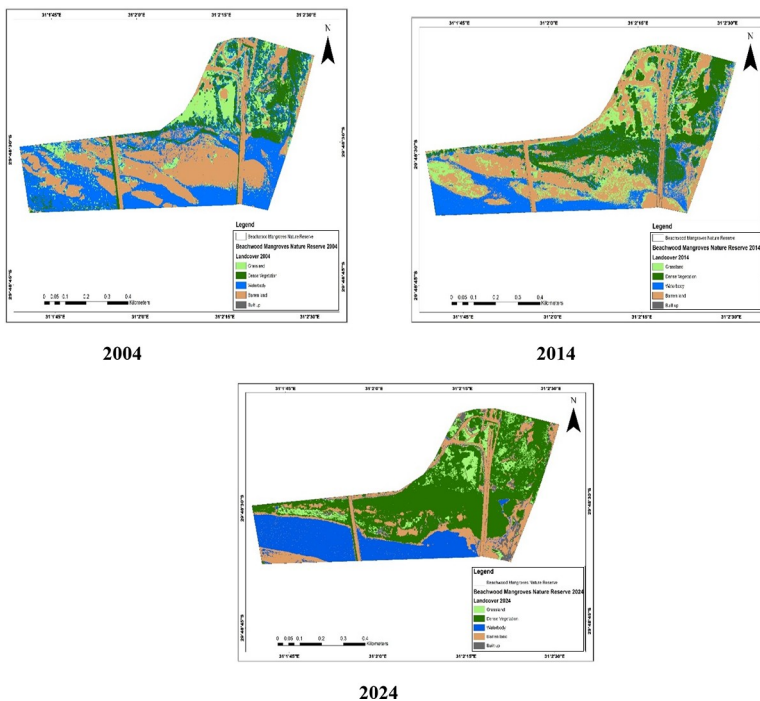
*4.1.1 The beachwood mangroves nature reserve (BMNR).* BMNR, located along the Umgeni River estuary in northern Durban, represents a complex interface between urban ecological preservation and socio-political spatial dynamics. Historically designated as a protected wetland and estuarine system, BMNR has undergone significant land use pressures in recent decades, shaped by intersecting forces of urban expansion, socio-economic stratification and contested environmental governance (McLean *et al.*, 2016). Although geographically proximate to multiple socio-economic zones, including the affluent suburb of Durban North to the south, the rapidly commercializing coastal hub of Umhlanga to the east and the mixed-use industrial precincts of Springfield to the west, the reserve's accessibility and utility remain unevenly distributed across class and racial lines, reflecting enduring spatial inequities (Jagath *et al.*, 2019). While the descriptive proximity of BMNR to key urban zones may suggest inclusivity, a more critical socio-spatial and temporal analysis reveals that land use changes around the reserve have disproportionately favored high-income developments and tourism infrastructure, often at the expense of broader public access and ecological stability. Archival records and historical zoning maps illustrate a progressive reclassification of buffer zones from communal green spaces to private development lots, thereby narrowing the functional ecological corridors and limiting community-based recreational use (Lin *et al.*, 2021). Furthermore, satellite imagery analysis indicates encroachment by commercial infrastructure and coastal real estate, coinciding with policy shifts favoring neoliberal urban planning paradigms. Crucially, this transformation has been underpinned by weak participatory governance and a lack of integrated land management strategies that prioritize both environmental conservation and social equity. Stakeholder interviews and municipal policy documents reveal minimal engagement with marginalized communities in the urban periphery, whose mobility constraints and limited awareness of the reserve's ecological significance exclude them from benefiting from its amenities. As such, BMNR's evolution exemplifies how leisure spaces, while environmentally significant, can become exclusionary landscapes shaped by broader socio-political forces. The reserve's current status thus embodies the contradictions between conservation narratives and the spatial realities of inequitable urban livability in Durban. [Table 1](#) depicts the LULC distribution for Beachwood Mangroves Nature Reserve (BNR) 2004–2024.

[Figure 3](#) depicts the LULC distribution for Beachwood Mangroves Nature Reserve (BNR) 2004–2024. Grassland decreased from 19.27 km<sup>2</sup> in 2004–11.31 km<sup>2</sup> in 2024, while built-up areas increased from 0.9 km<sup>2</sup> in 2004–1.9 km<sup>2</sup> in 2024.

**Table 1.** The LULC distribution for Beachwood Mangroves Nature Reserve (BNR) 2004–2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	18.4494	18.4326	28.9193
2.	Grassland	19.2787	15.9809	11.3135
3.	Waterbodies	17.3528	17.2933	18.2973
4.	Barren land	19.2784	24.0498	16.1092
5.	Built-Up area	0.9039	0.3156	1.9236

Source(s): Authors' own work



**Figure 3.** LULC classification for Beachwood Mangroves Nature Reserve from 2004 to 2024  
Source: Authors' own work

**4.1.2 Durban botanical gardens (DBG).** Established in 1849, the Durban Botanical Gardens (DBG) is the oldest surviving botanical garden on the African continent and stands as a symbol of colonial botanical enterprise, post-apartheid urban greening and contemporary ecological conservation. Spanning approximately 15 hectares in the Berea area of Durban, the DBG is home to an extensive collection of subtropical flora, including rare cycads, indigenous orchids and heritage trees that mark its long-standing botanical significance. However, beyond its reputation as a tranquil leisure destination and biodiversity hotspot, DBG's socio-spatial evolution reveals deeper undercurrents of land use change, gentrification and uneven accessibility rooted in historical and political trajectories.

The LULC dynamics from 2004 to 2024, as illustrated in [Table 2](#), indicate a subtle but significant transformation in DBG’s surrounding peripheries from open green buffers and mixed community access zones to increasingly formalized and commercialized borders. This transformation is driven in part by municipal beautification initiatives and event-based tourism, which, while promoting sustainability and education, have simultaneously contributed to the commodification of the garden’s spaces. A spatial analysis using GIS overlay techniques confirms a contraction in informal access points and the augmentation of privatized or controlled zones, especially around high-traffic events, thus reshaping the public’s relationship with the garden. Socio-political inequities are further reflected in patterns of access and representation. Survey data and stakeholder interviews reveal that while DBG is marketed as an inclusive public asset, actual usage patterns are skewed toward middle-to-upper-income demographics, particularly those residing in nearby Morningside and Musgrave. Conversely, residents from historically marginalized townships such as Umlazi and KwaMashu encounter structural barriers, ranging from inadequate public transportation to limited outreach programming that restrict their regular engagement with the gardens. This disconnect underscores a deeper tension between the garden’s symbolic inclusivity and the lived realities of urban spatial segregation. Hence, DBG represents a complex palimpsest of ecological heritage and evolving urban politics. Its ongoing transformation illustrates how leisure spaces, even those steeped in historical legacy and environmental stewardship, are embedded within broader systems of power, exclusion and urban reconfiguration. Addressing these dynamics requires not only spatial preservation but also a deliberate recalibration of access, programming and governance to ensure the pursuit of equitable urban livability in Durban is more than rhetorical. [Table 2](#) illustrates the LULC distribution for Durban Botanical Gardens from 2004 to 2024.

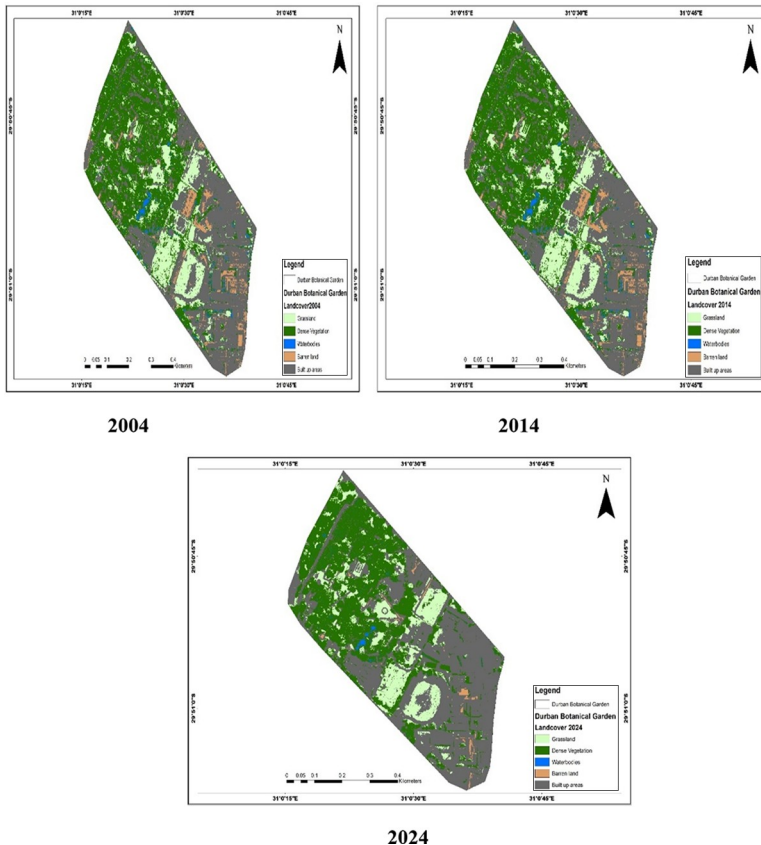
[Table 2](#) presents the spatio-temporal changes in LULC types from 2004 to 2024. Over this 20-year period, dense vegetation and waterbodies exhibit a consistent decline, with dense vegetation reducing from 5.1189 Ha<sup>2</sup> in 2004–5.0305 Ha<sup>2</sup> in 2024 and waterbodies shrinking significantly from 0.4302 Ha<sup>2</sup> to 0.1861 Ha<sup>2</sup>. Grasslands show a fluctuating pattern, initially increasing from 4.0670 Ha<sup>2</sup> in 2004–5.1076 Ha<sup>2</sup> in 2014 but then decreasing sharply to 3.6055 Ha<sup>2</sup> by 2024. Similarly, barren land decreases steadily from 1.1198 Ha<sup>2</sup> in 2004–0.2527 Ha<sup>2</sup> in 2024. In contrast, the built-up area demonstrates a substantial increase, growing from 5.3190 Ha<sup>2</sup> in 2004–7.9803 Ha<sup>2</sup> in 2024, highlighting significant urban expansion over the study period. [Figure 4](#) depicts the LULC classification for DBG from 2004 to 2024.

*4.1.3 Durban North Japanese Gardens (DNJG).* DNJG, established in the mid-20th century, represent one of Durban’s few formally curated cultural landscapes, distinguished by their integration of traditional Japanese design elements into an African urban context. Covering approximately 16 hectares, the gardens feature iconic features such as koi ponds,

**Table 2.** The LULC distribution for Durban botanical gardens (DBG) 2004–2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	5.1189	5.1068	5.0305
2.	Grassland	4.0670	5.1076	3.6055
3.	Waterbodies	0.4302	0.3303	0.1861
4.	Barren land	1.1198	0.5979	0.2527
5.	Built-Up area	5.3190	5.7186	7.9803

**Source(s):** Authors’ own work



**Figure 4.** LULC classification for Durban Botanical Gardens from 2004 to 2024  
**Source:** Authors' own work

bonsai displays, stone lanterns and arched wooden bridges, evoking serenity and offering a space for leisure, reflection and low-impact recreation. However, while DNJG functions as a heritage site and esthetic landmark, the socio-political undercurrents influencing its spatial evolution from 2004 to 2024 reveal complex tensions between symbolic inclusion and real access within Durban's urban landscape. Remote sensing and GIS analysis point to a subtle but measurable encroachment of landscaped hardscapes, expansion of paved pathways and a decline in communal open spaces once accessible for informal gatherings or community events. These land use shifts, motivated by city-led urban beautification programs and heritage tourism initiatives—have reinforced the garden's curated identity but simultaneously narrowed the modalities of use, limiting spontaneous and diverse forms of public engagement. Socio-politically, DNJG's accessibility is emblematic of broader patterns of spatial privilege in Durban. While it lies within 1.5 km of the affluent Durban North suburb and is within a 6–12 km radius of Morningside and central Durban, practical access remains unequally distributed. Public transportation routes are indirect or infrequent and there is a marked absence of targeted outreach programs or partnerships with township

schools and community groups. Thus, the gardens, though nominally open to the public, remain primarily frequented by middle-class visitors, with limited participation from historically marginalized communities. Moreover, DNJG’s transformation reflects a broader shift in urban land governance where leisure spaces are increasingly positioned as nodes of esthetic and economic capital, rather than vehicles for social cohesion. The lack of embedded social equity frameworks in the garden’s programming and maintenance strategies raises critical questions about whose cultural narratives are legitimized, whose leisure is prioritized and who is structurally excluded in the evolving urban fabric. In essence, while DNJG continues to serve as a symbolic and recreational space within Durban’s urban ecology, its land use trajectory and accessibility dynamics expose deeper socio-political inequities. Addressing these will require not only physical reconfiguration but also policy shifts aimed at democratizing urban green spaces and reinforcing their role in advancing equitable urban livability. [Table 3](#) illustrates the LULC distribution for DNJG from 2004 to 2024.

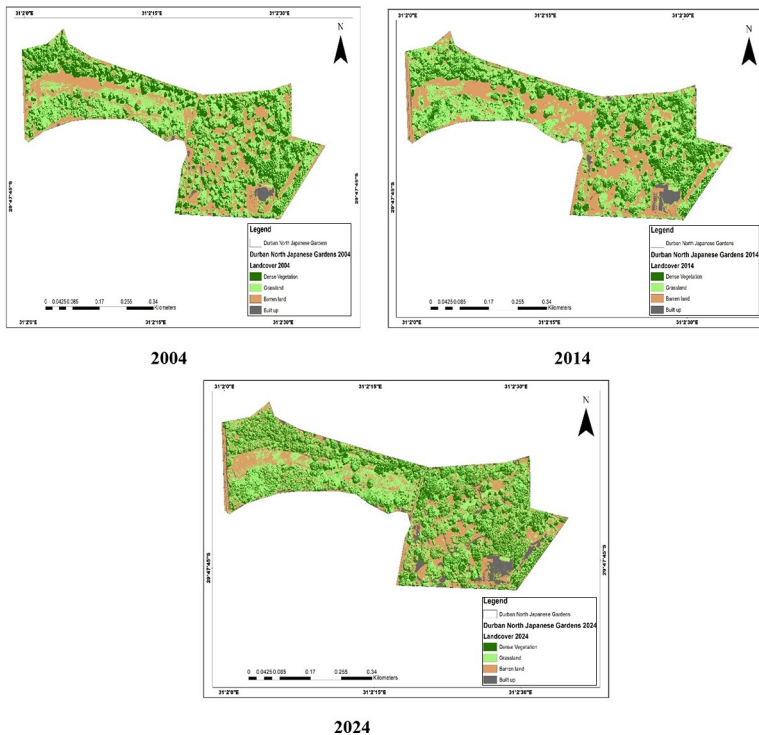
[Table 3](#) illustrates changes in LULC types over three time periods. Dense vegetation shows a decline, decreasing from 5.6435 Ha<sup>2</sup> to 4.6916 Ha<sup>2</sup>, indicating gradual deforestation or degradation. Grasslands also exhibit a slight reduction, from 7.8699 Ha<sup>2</sup> to 7.6042 Ha<sup>2</sup>, suggesting limited but ongoing changes in open vegetative areas. Barren land increases initially from 2.8416 Ha<sup>2</sup> to 3.5379 Ha<sup>2</sup> before slightly declining to 3.4118 Ha<sup>2</sup>, possibly due to land use changes or soil stabilization efforts. The most notable change is in the built-up area, which shows rapid growth from 0.2425 Ha<sup>2</sup> to 1.0924 Ha<sup>2</sup>, highlighting ongoing urbanization and infrastructure development at the expense of natural land cover types. [Figure 5](#) depicts the LULC classification for DNJG from 2004 to 2024.

**4.1.4 Kenneth stainbank nature reserve (KSNR).** KSNR, located in Yellowwood Park, spans approximately 253 hectares of ecologically significant coastal forest and grassland ecosystems. Established as part of colonial-era conservation initiatives and anchored by the heritage-listed Coedmore Castle, the reserve embodies a layered historical geography, interweaving natural preservation with remnants of settler architecture. Beyond its scenic trails, wildlife habitats and biodiversity offerings, KSNR’s spatial and functional transformation over the last two decades (2004–2024) provides a revealing lens into how leisure landscapes in post-apartheid cities like Durban are being reconfigured by socio-political and environmental pressures. [Table 4](#) shows a pattern of both ecological restoration and controlled enclosure over the 20-year period. GIS and remote sensing analyses reveal a reduction in informal access points, increased fencing and security infrastructure and selective land management interventions focused on biodiversity conservation and heritage protection. While these strategies align with global conservation trends, they also contribute to the exclusionary redefinition of leisure landscapes, especially when not matched with inclusive social programming. Interviews with municipal officials and local civil society actors suggest that these spatial interventions were driven by rising concerns over security,

**Table 3.** The LULC distribution for DNJG from 2004 to 2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	5.6435	4.8352	4.6916
2.	Grassland	7.8699	7.7638	7.6042
3.	Waterbodies	0	0	0
4.	Barren land	2.8416	3.5379	3.4118
5.	Built-Up area	0.2425	0.6089	1.0924

**Source(s):** Authors’ own work



**Figure 5.** LULC classification for DNJG from 2004 to 2024  
**Source:** Authors' own work

**Table 4.** The LULC distribution for KSNR from 2004 to 2024

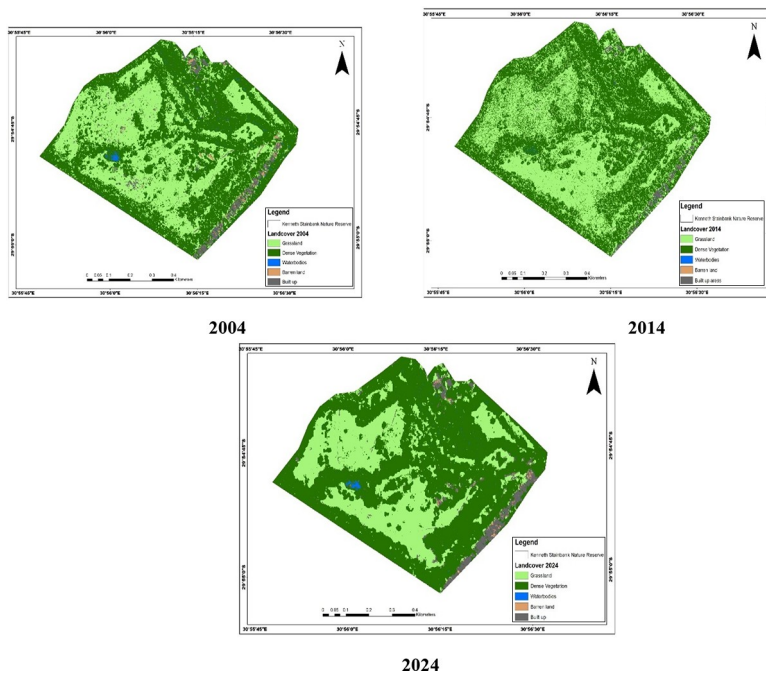
S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	135.6966	137.0963	148.3376
2.	Grassland	104.7968	109.2686	81.3713
3.	Waterbodies	1.5174	0.5523	2.3004
4.	Barren land	0.8764	0.6164	0.6681
5.	Built-Up area	10.1131	14.3508	20.1925

**Source(s):** Authors' own work

encroachment, and the need to brand the reserve as an “eco-heritage destination” objectives rooted more in elite conservationism than in equitable access. This transformation has direct implications for spatial justice. KSNR is theoretically accessible to adjacent communities, 2 km from Yellowwood Park, 7 km from Queensburgh and 14 km from central Durban, but practical inclusion remains uneven. Socio-economic data and field observations indicate that lower-income residents from Umlazi, Wentworth and Umbilo face compounded access barriers due to inadequate public transport connectivity, perceived lack of safety and limited information about permissible recreational use. Moreover, the reserve’s programming has

not systematically included historically marginalized voices in land governance processes, despite the post-apartheid emphasis on participatory urban development. Also, the persistence of colonial-era iconography and property demarcations at KSNR, including the prominence of Coedmore Castle raises epistemological questions about which histories are memorialized, and which are obscured. The spatial prioritization of heritage preservation over active community-based leisure development reinforces symbolic exclusion, inadvertently perpetuating the very socio-political inequities the city’s integrated development plans seek to redress. In a nutshell, KSNR reflects not only Durban’s biodiversity and historical richness but also the contested terrain of leisure land use governance in a postcolonial urban context. Without explicit equity-oriented policy interventions, the current trajectory of land management risks privileging ecological and heritage conservation at the expense of inclusive urban livability and spatial justice. A more integrated approach that harmonizes conservation with accessibility, cultural representation and social inclusion is essential for ensuring that reserves like KSNR serve all city residents equitably. Table 4 illustrates the LULC distribution for KSNR from 2004 to 2024.

Table 4 presents LULC changes at KSNR from 2004 to 2024. Dense vegetation shows a consistent increase, expanding from 135.6966 Ha<sup>2</sup> in 2004–148.3376 Ha<sup>2</sup> in 2024, suggesting efforts toward afforestation or natural vegetation recovery. Grassland, however, experiences fluctuations, initially growing from 104.7968 Ha<sup>2</sup> in 2004–109.2686 Ha<sup>2</sup> in 2014, followed by a notable decline to 81.3713 Ha<sup>2</sup> in 2024, possibly due to land conversion or degradation. Figure 6 depicts the LULC classification for KSNR from 2004 to 2024.



**Figure 6.** LULC classification for KSNR from 2004 to 2024  
Source: Authors’ own work

*4.1.5 Mitchell park zoo (MPZ): urban leisure, zoological heritage and the spatial politics of inclusivity.* MPZ, situated in the heart of Durban's Morningside suburb, occupies 3.8 hectares and stands as one of the city's oldest recreational institutions. Originally conceptualized in the early 20th century as a colonial zoological garden, MPZ has evolved into a multifunctional urban green space offering animal exhibits, landscaped gardens, children's recreational facilities and a café. Despite its seemingly benign family-friendly atmosphere, the park's spatial and functional transformations from 2004 to 2024 underscore deeper questions around land use prioritization, accessibility and the representation of leisure within Durban's shifting urban fabric. An integrated LULC analysis, supported by high-resolution satellite imagery and municipal zoning documents, reveals minimal physical expansion of MPZ over the two-decade span. However, qualitative shifts in spatial organization, programming and management reflect broader urban and ecological discourses. Notably, the zoo has undergone targeted infrastructural upgrades aimed at enhancing esthetic appeal and improving animal enclosures, initiatives tied closely to municipal efforts to align leisure spaces with international standards of urban tourism and environmental ethics. These upgrades, while commendable, have inadvertently reinforced a model of recreational consumption geared toward middle- and upper-income visitors. This trend is corroborated by socio-spatial data and visitor demographics, which indicate that MPZ remains disproportionately frequented by residents from affluent neighborhoods such as Morningside, Musgrave, and Glenwood, all within a 2–5 km radius. Thus, MPZ functions not merely as a space of environmental education or child-centered leisure but also as a symbolic boundary of urban privilege and cultural capital. Historically, MPZ's legacy is entangled with colonial-era ideologies of nature, spectacle, and spatial order, an aspect insufficiently interrogated in mainstream urban policy discourse. The current preservation of its early 20th-century layout and ornamental features serves as a reminder of its heritage status but simultaneously constrains opportunities for spatial and social transformation. There is little evidence of participatory governance mechanisms that would enable historically marginalized communities to co-produce meaning or programmatic content within the zoo's space. Furthermore, the empirical analysis of land use change at MPZ though spatially stable, suggests a shift in the reserve's underlying function: from a passive green retreat to an active node of controlled, curated leisure. This shift, driven by Durban's vision of "smart leisure urbanism," raises important questions about whose recreational needs are prioritized, how educational content is framed, and whether ecological ethics are pursued alongside socio-spatial justice. To fully realize MPZ's potential as an inclusive urban commons, future planning must embrace a more transformative agenda, one that integrates heritage conservation with participatory design, culturally responsive programming, and accessible infrastructure. Such a shift would reposition MPZ not only as a historical landmark or tourist site but as a truly public space committed to ecological learning, social equity, and urban resilience. [Table 5](#) depicts the LULC distribution for MPZ from 2004 to 2024.

**Table 5.** The LULC distribution for MPZ from 2004 to 2024

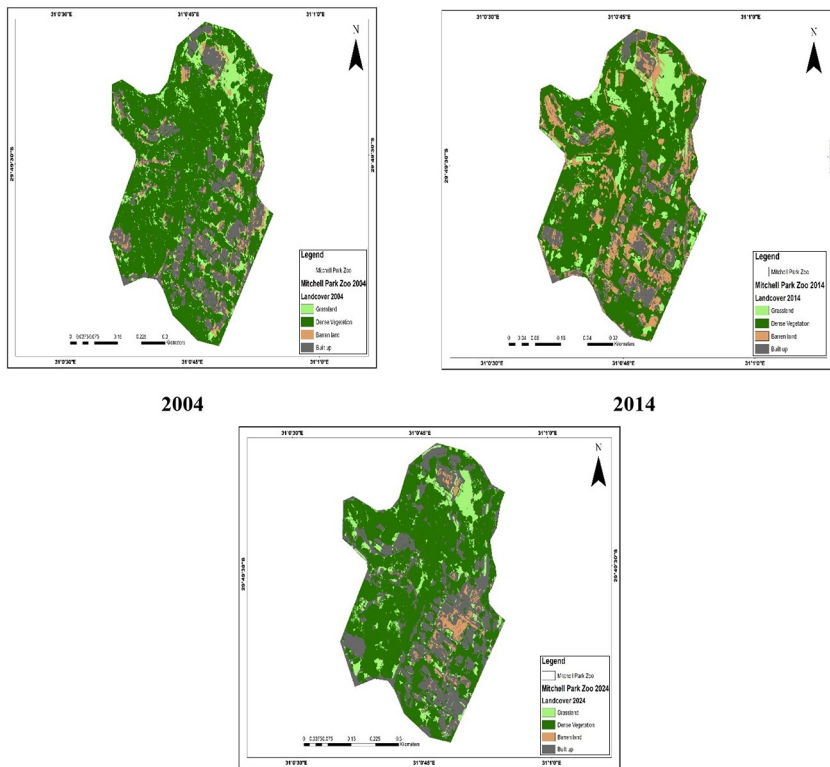
S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	2.5073	2.3029	2.1919
2.	Grassland	0.3748	0.3953	0.3594
3.	Waterbodies	0	0	0
4.	Barren land	0.1743	0.5461	0.1075
5.	Built-up area	0.7436	0.8670	1.1411

**Source(s):** Authors' own work

Table 5 highlights change in LULC types from 2004 to 2024. Dense vegetation steadily declines over the 20-year period, reducing from 2.5073 Ha<sup>2</sup> in 2004–2.1919 Ha<sup>2</sup> in 2024, indicating gradual deforestation or vegetation loss. Grassland shows minor fluctuations, increasing slightly from 0.3748 Ha<sup>2</sup> in 2004–0.3953 Ha<sup>2</sup> in 2014 before decreasing to 0.3594 Ha<sup>2</sup> in 2024, reflecting minimal but ongoing changes. Built-up areas show consistent growth, expanding from 0.7436 Ha<sup>2</sup> in 2004–1.1411 Ha<sup>2</sup> in 2024, highlighting ongoing urbanization and infrastructure development. Figure 7 depicts the LULC classification for MPZ from 2004 to 2024.

*Natal Sharks Board (NSB)*

4.1.6 *The natal sharks board (NSB): marine conservation, educational urbanism and spatial dynamics in coastal durban.* NSB, located in close proximity to the coastal town of Umhlanga, is a pivotal institution at the intersection of marine science, conservation pedagogy and urban leisure. While commonly celebrated for its public education programmes and dramatic shark dissections, the NSB also occupies a unique and often overlooked position within Durban’s spatial politics of environmental knowledge production. Covering a service area that extends across 320 km<sup>2</sup> of KwaZulu-Natal’s coastal



**2004** **2014** **2024**  
**Figure 7.** LULC classification for MPZ from 2004 to 2024  
**Source:** Authors’ own work

zone, the NSB is not merely a physical facility but a marine governance node, historically intertwined with South Africa's shark net deployment strategies and broader oceanic surveillance systems. An analysis of LULC data from 2004 to 2024 reveals that while the NSB's infrastructural footprint has remained relatively constant, its surrounding landscape has undergone significant transformation. Rapid peri-urban expansion in the greater Umhlanga area characterized by high-end residential developments, shopping complexes and hospitality infrastructures has reconfigured the spatial narrative of the NSB from a peripheral conservation site to an urban-embedded facility. The transition from natural coastal vegetation and low-density zoning to mixed-use developments around NSB reflects broader neoliberal urban planning logics, where environmental institutions are increasingly subsumed into commercial leisure ecologies. This spatial reconfiguration has produced tensions between the NSB's conservation ethos and the consumption-driven urban environment within which it is now embedded. As Umhlanga's transformation into an elite coastal enclave accelerates, the NSB faces challenges in sustaining its public accessibility, especially for under-resourced schools and communities from Durban's inland and township zones. Historical visitation records and stakeholder interviews indicate a gradual narrowing of its user demographic to predominantly private schools, international tourists and affluent local families, thereby undermining the institution's original mission of public marine literacy. Incorporating socio-spatial data into the analysis, it becomes evident that the NSB's visibility within urban marine conservation is both a strength and a constraint. On one hand, its exhibitions, dissections and outreach programmes provide crucial opportunities for experiential learning. On the other, the NSB's static institutional form and rigid programming have not adequately adapted to the pedagogical needs of historically excluded communities or incorporated local indigenous knowledge systems concerning ocean stewardship. Moreover, a critical examination of NSB's spatial evolution reveals how conservation spaces can become entangled in the contradictions of urban development. The site's strategic proximity to the affluent nodes of Gateway, Umhlanga Ridge and Sibaya Coastal Precinct positions it within a socio-ecological context marked by uneven development and environmental commodification. While the NSB maintains a sustainability discourse in its programming, the broader land use patterns surrounding it reflect intensifying ecological pressures, including coastal erosion, pollution and habitat fragmentation, ironically exacerbated by the very urban sprawl that now encircles it. While the NSB continues to serve as a national and international symbol of marine conservation, its spatial embeddedness within a rapidly commercializing urban matrix necessitates a reevaluation of its public engagement strategies. Future planning must move beyond static conservation narratives to embrace more inclusive, mobile and socially responsive models of marine education, thereby reasserting its relevance not just as a research hub, but as a transformative public space aligned with equitable environmental futures. [Table 6](#) illustrates the LULC distribution for NSB from 2004 to 2024.

**Table 6.** The LULC distribution for NSB from 2004 to 2024

S/N	LULC types	2004 (in km <sup>2</sup> )	2014 (in km <sup>2</sup> )	2024 (in km <sup>2</sup> )
1.	Dense vegetation	168.4788	77.0962	61.3069
2.	Grassland	89.3307	150.8079	132.9417
3.	Waterbodies	0	0	0
4.	Barren land	51.5754	70.8878	76.6991
5.	Built-up area	13.3523	23.9390	51.7934

**Source(s):** Authors' own work

Table 6 shows the LULC changes of NSB from 2004 to 2024, highlighting significant shifts in the study area. Dense vegetation declines sharply from 168.4788 km<sup>2</sup> in 2004–61.3069 km<sup>2</sup> in 2024, indicating substantial deforestation or vegetation degradation. Conversely, grassland increases significantly from 89.3307 km<sup>2</sup> in 2004–150.8079 km<sup>2</sup> in 2014, before slightly reducing to 132.9417 km<sup>2</sup> in 2024, possibly due to the conversion of dense vegetation to grassland or other uses. Figure 8 depicts the LULC classification for NSB from 2004 to 2024.

4.1.7 Phezulu safari park (PSP): a landscape of conservation, cultural heritage and spatial transformation. PSP is nestled within the iconic Valley of a Thousand Hills and represents a unique fusion of environmental conservation and indigenous cultural preservation within Durban’s peri-urban fringe. Spanning approximately 633 hectares, the park has evolved from a privately operated game reserve into a multifunctional socio-ecological and cultural heritage site. PSP offers a dynamic blend of wildlife experiences, including guided safaris featuring giraffes, zebras and wildebeest and curated traditional Zulu cultural performances that engage visitors in the oral histories, music, dance and architectural symbolism of the region’s indigenous communities. The integration of wildlife conservation with cultural programming positions PSP as a distinctive learning landscape that transcends the recreational paradigm. As a site of informal education, PSP has become increasingly instrumental in bridging rural ecological knowledge systems with urban visitor sensibilities, offering immersive experiences that challenge narrow conceptions



Figure 8. LULC classification for NSB from 2004 to 2024

Source: Authors’ own work

of conservation as a purely scientific or technocratic endeavor. Its programs provide an embodied pedagogy of place, where visitors, especially school groups from Durban's urban zones—gain first-hand exposure to biocultural diversity, ecological ethics and intergenerational knowledge transmission.

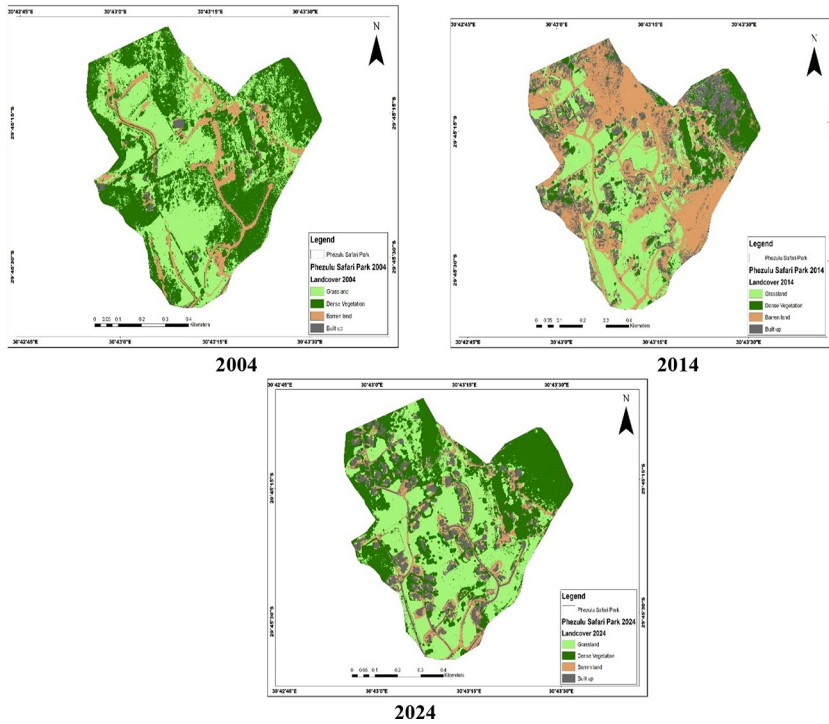
A longitudinal examination of LULC data from 2004 to 2024 reveals notable transformations in and around PSP's terrain. While the park itself has maintained its ecological integrity, the surrounding landscape has experienced incremental suburban encroachment, especially along access corridors leading from Hillcrest and Botha's Hill. This peri-urban expansion poses emerging challenges for landscape connectivity and ecological buffering, with observable edge effects including increased foot traffic, illegal wood harvesting and infrastructural strain during peak tourism seasons. The park's relative isolation, once a strategic advantage for biodiversity conservation, now renders it vulnerable to competing land pressures driven by residential and commercial rezoning. Socio-spatially, PSP occupies a liminal position within Durban's tourism and educational geographies. Though highly accessible to middle-income visitors from urban centers (e.g., Durban Central and Umhlanga), it remains less frequented by under-resourced township communities due to transportation limitations and cost barriers. As such, PSP's transformative potential as a public education site is unevenly realized, calling for stronger municipal partnerships to subsidize access and integrate PSP into regional school curricula focused on environmental learning and cultural literacy. Crucially, PSP exemplifies a counter-narrative to Western-centric models of conservation by centering Zulu ontologies of land, spirit and community stewardship. Its performative and spatial practices suggest that conservation need not be divorced from human presence but can be enriched through cultural symbiosis and storytelling. However, PSP's continued sustainability requires deliberate spatial planning to mediate the dual imperatives of heritage commodification and ecological protection. Thus, PSP is not merely a leisure destination but a complex spatial entity where conservation, culture and pedagogy intersect. As Durban expands outward, PSP stands as a critical node for biocultural resilience. Future policy integration must foreground its educational function and ecological role within regional spatial development frameworks, ensuring that this hybrid space retains its capacity to educate, inspire and preserve. [Table 7](#) depicts the LULC distribution for PSP from 2004 to 2024.

[Table 7](#) illustrates the PSP LULC changes from 2004 to 2024, revealing notable shifts in the landscape. Dense vegetation decreases consistently over the 20-year period, from 495.4376 Ha<sup>2</sup> in 2004–406.6987 Ha<sup>2</sup> in 2024, indicating deforestation or vegetation loss. Built-up areas grow substantially, from 75.0663 Ha<sup>2</sup> in 2004–142.9611 Ha<sup>2</sup> in 2024, highlighting rapid urban expansion and infrastructure development. These trends point to significant human-driven transformations in LULC, with potential ecological implications. [Figure 9](#) depicts the LULC classification for PSP from 2004 to 2024.

**Table 7.** The LULC distribution for PSP from 2004 to 2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	495.4376	426.5195	406.6987
2.	Grassland	46.158	40.6470	57.18
3.	Waterbodies	0	0	0
4.	Barren land	15.6153	61.9971	26.1702
5.	Built-up area	75.0663	103.9338	142.9611

**Source(s):** Authors' own work



**Figure 9.** LULC classification for PSP from 2004 to 2024  
**Source:** Authors' own work

*4.1.8 Queen elizabeth grassland (QEG): a peripheral green refuge for urban biodiversity and ecological stewardship.* Encompassing 87 hectares, QEG represents a critical yet often overlooked node within Durban's fragmented ecological network. Strategically located just 7 km from Durban Central, this conservation site is one of the few remaining examples of indigenous grassland biome in an increasingly urbanized coastal metropolis. Despite its relative obscurity in the city's recreational landscape, QEG performs indispensable ecological functions, serving as a biodiversity reservoir, a carbon sink and a natural buffer against the intensifying spatial homogenization associated with metropolitan expansion. QEG's primary significance lies in its preservation of a threatened grassland ecosystem, which once dominated large swathes of KwaZulu-Natal but has been drastically reduced due to infrastructural development, land conversion and invasive species. The grassland supports a complex assemblage of indigenous flora, avifauna, and small mammals, providing habitat continuity in an otherwise disrupted ecological corridor. It plays a key role in sustaining pollination services, nutrient cycling and groundwater recharge, all of which are often invisible yet essential to urban ecosystem functioning. From a socio-spatial perspective, QEG functions as a liminal green space, a transitional zone between the rapidly densifying urban core and peripheral residential areas. Its accessibility to surrounding communities positions it as a valuable site for environmental education, passive recreation and biophilic engagement, particularly for city dwellers with limited access to expansive green areas. Activities such as walking, birdwatching and informal environmental learning contribute to

both mental well-being and ecological literacy, reinforcing the value of proximate natural spaces in densely populated urban contexts. Longitudinal LULC analysis from 2004 to 2024 reveals that QEG has remained relatively intact, albeit under pressure from surrounding urban creep and shifting land tenure patterns. Peri-urban development on adjacent parcels often informal or speculative in nature poses latent threats to the ecological integrity of the site. These pressures include edge encroachment, illegal dumping and the erosion of ecological buffers, which collectively undermine the resilience of the grassland system. The conservation of QEG is thus contingent on proactive land use regulation, the reinforcement of ecological zoning and community co-management frameworks that integrate local stewardship with metropolitan conservation mandates. Importantly, the marginal status of QEG within mainstream conservation discourse underscores broader concerns around spatial justice and green infrastructure planning in post-apartheid South African cities. Grasslands, unlike forests or coastal zones, tend to be undervalued in urban spatial hierarchies, despite their ecological richness and socio-cultural relevance. In a nutshell, QEG is a spatial and ecological lifeline that anchors Durban's environmental resilience. Its continued preservation demands integrated governance strategies that balance ecological integrity with equitable urban access, ensuring that this vital green lung remains a site of biodiversity, education and ecological justice for generations to come. [Table 8](#) depicts the LULC distribution for QEG from 2004 to 2024.

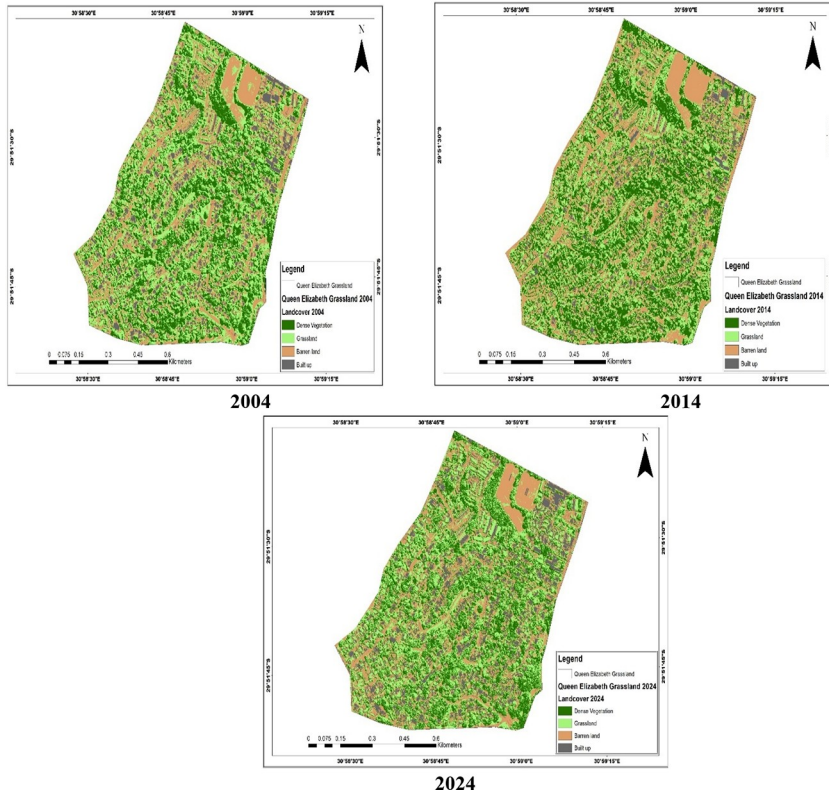
[Table 8](#) outlines LULC changes from 2004 to 2024, showing relatively moderate shifts. Dense vegetation slightly increases from 31.3725 Ha<sup>2</sup> in 2004–35.7113 Ha<sup>2</sup> in 2014 but then returns to nearly its original size, 31.3677 Ha<sup>2</sup>, by 2024, suggesting some fluctuations in vegetation cover. Grassland decreases significantly from 17.3098 Ha<sup>2</sup> in 2004–11.9858 Ha<sup>2</sup> in 2014 but partially recovers to 14.4766 Ha<sup>2</sup> by 2024, indicating ongoing but variable changes. These trends suggest a relatively stable landscape with localized shifts in land cover types. [Figure 10](#) depicts the LULC classification for QEG from 2004 to 2024.

*4.1.9 Umgeni river bird park (URBP): a Micro-Scale biodiversity sanctuary in durban's urban ecotone.* Strategically situated along the lush banks of the Umgeni River, the Umgeni River Bird Park (URBP) represents a significant micro-scale conservation and environmental education node within Durban's urban ecological framework. Spanning 3.5 hectares, URBP functions as both a sanctuary for avian biodiversity and a pedagogical space for fostering public awareness around conservation imperatives. Home to over 200 bird species, including several rare and endangered taxa, the park offers a vital refuge for avifauna in the context of accelerating urban expansion and habitat fragmentation. The design of URBP integrates walk-through aviaries, landscaped waterfalls and interactive educational programming, which collectively promote immersive ecological engagement while facilitating informal science learning. Its emphasis on species diversity and public participation positions the park as a model of urban conservation that blends ecological stewardship with socio-recreational utility. Of particular significance is the park's contribution to ex-situ conservation, breeding

**Table 8.** The LULC distribution for QEG from 2004 to 2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	31.3725	35.7113	31.3677
2.	Grassland	17.3098	11.9858	14.4766
3.	Waterbodies	0	0	0
4.	Barren land	27.0406	30.1995	27.5465
5.	Built-up area	13.6277	13.7857	13.69

**Source(s):** Authors' own work



**Figure 10.** LULC classification for QEG from 2004 to 2024  
**Source:** Authors' own work

programmes and public education campaigns aimed at reversing the cultural detachment from urban biodiversity. Spatially, URBP exemplifies a high-value green enclave situated within a rapidly transforming metropolitan corridor. Its adjacency to the Umgeni River enhances its ecological interface, supporting riparian habitat functions, microclimatic regulation and the ecological connectivity of urban wildlife corridors. Despite its small size, URBP plays a disproportionately large role in sustaining avian populations and supporting biodiversity-sensitive tourism in the eThekweni region. Temporal LULC data from 2004 to 2024, as presented in [Table 9](#), indicate a relatively stable land use profile within the park's boundaries, underscoring effective site-level management practices. However, encroaching urban development in surrounding buffer zones, particularly along transport and commercial arteries raises concerns regarding noise pollution, hydrological stress and potential land use conflicts. Sustaining URBP's ecological functionality will therefore require integrated urban planning strategies that reinforce environmental zoning, maintain habitat corridors and promote community-based conservation partnerships. Hence, URBP is not merely a zoological attraction but a critical ecological asset within Durban's green infrastructure system. Its sustained protection and enhancement underscore the broader imperatives of conserving urban

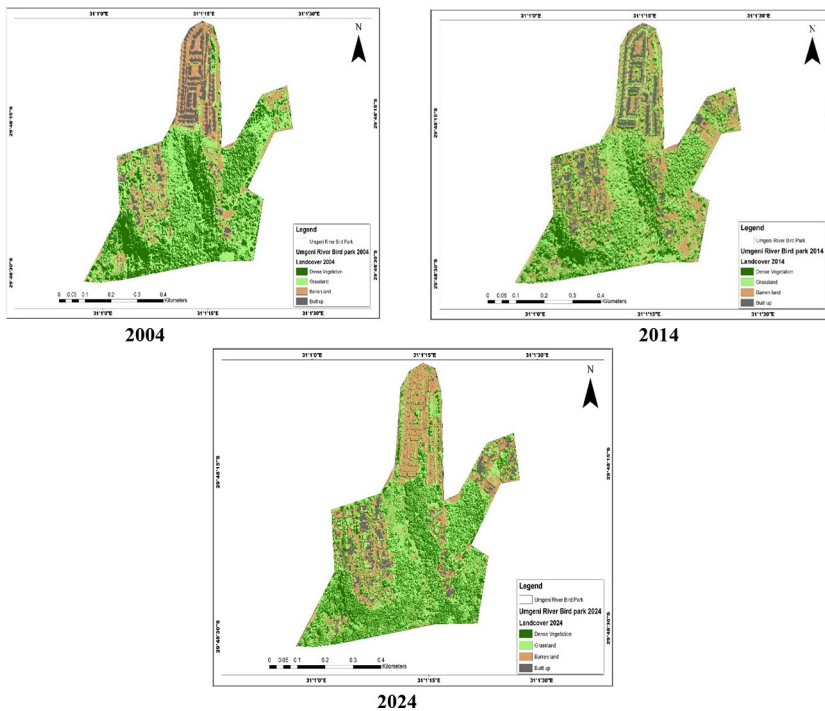
**Table 9.** The LULC distribution for URBP from 2004 to 2024

S/N	LULC types	2004 (in Ha <sup>2</sup> )	2014 (in Ha <sup>2</sup> )	2024 (in Ha <sup>2</sup> )
1.	Dense vegetation	0.9461	0.8423	0.9216
2.	Grassland	1.4559	1.2765	1.1504
3.	Waterbodies	0	0	0
4.	Barren land	0.427	0.8339	0.3907
5.	Built-up area	0.122	0.5473	1.0398

Source(s): Authors' own work

biodiversity, cultivating ecological literacy and embedding sustainability within the city's development trajectory. Table 9 depicts the LULC distribution for URBP from 2004 to 2024.

Table 9 highlights the URBP LULC changes from 2004 to 2024, showing noticeable shifts in some categories. Dense vegetation decreases slightly from 0.9461 Ha<sup>2</sup> in 2004–0.8423 Ha<sup>2</sup> in 2014 but recovers marginally to 0.9216 Ha<sup>2</sup> in 2024, indicating some vegetation restoration. Built-up areas expand dramatically, growing from 0.122 Ha<sup>2</sup> in 2004–1.0398 Ha<sup>2</sup> in 2024, reflecting rapid urbanization and infrastructure development. These trends suggest increasing human influence on the landscape, particularly through urban expansion. Figure 11 depicts the LULC classification for URBP from 2004 to 2024.



**Figure 11.** LULC classification for URBP from 2004 to 2024  
Source: Authors' own work

Table 10 depicts a synopsis of the LULC dynamics across selected leisure spaces in Durban between 2004 and 2024 reveals significant heterogeneity in ecological and anthropogenic transformations. Beachwood Mangroves Nature Reserve experienced a notable increase in vegetation cover (10.47 km<sup>2</sup>) alongside reductions in grassland (-7.962 km<sup>2</sup>) and barren land (-3.1692 km<sup>2</sup>), indicating active conservation or natural regeneration processes. Conversely, Durban Botanical Gardens saw marginal vegetation loss (-0.08 km<sup>2</sup>) but an increase in built-up areas (2.6613 km<sup>2</sup>), reflecting minor urban encroachment. Kenneth Stainbank Nature Reserve exhibited substantial vegetation gain (12.641 km<sup>2</sup>) and a marked rise in water bodies (10.0794 km<sup>2</sup>), contrasted by a decline in built-up land (-23.4255 km<sup>2</sup>), suggesting restoration efforts. Conversely, sites like the Natal Sharks Board and Phezulu Safari Park experienced extreme vegetation losses (-107.1719 km<sup>2</sup> and -88.7389 km<sup>2</sup>, respectively) coupled with substantial increases in built-up and water body areas, highlighting intensive anthropogenic modification. Smaller urban leisure spaces, such as Durban North Japanese Garden, Queen Elizabeth Grassland and Umgeni River Bird Park, showed minor changes in vegetation and grassland, indicating relative ecological stability. Overall, the data set underscores spatially varied trajectories of ecological transformation, shaped by both conservation interventions and urban pressures.

## 5. Discussion

To interrogate the socio-political inequities influencing leisure land use changes in Durban Metropolis, this study adopted a purposive sampling strategy to select ten leisure spaces that exhibit varying degrees of accessibility, historical exclusion and land transformation. These spaces were chosen based on their significance in reflecting broader urban policy shifts, demographic usage patterns and spatial reconfigurations linked to post-apartheid urban restructuring. Empirical data, including spatial analysis using GIS tools and demographic overlays, revealed disparities in leisure access rooted in socio-political histories of segregation, municipal investment priorities and uneven land development trajectories. Notably, areas with predominantly low-income, historically marginalized populations experienced reduced access to well-maintained leisure spaces due to rezoning, commercial encroachment, or lack of infrastructural upgrades. These patterns underscore how land use and land cover (LULC) changes in leisure spaces are not merely environmental or economic outcomes but are driven by embedded power asymmetries, perpetuating spatial injustices and undermining efforts toward equitable urban livability in Durban.

### 5.1 Spatial distribution and Socio-Economic disparities

The spatial distribution of the ten selected leisure spaces, namely Beachwood Mangroves Nature Reserve, Durban Botanical Gardens, Durban North Japanese Gardens, Jameson Park, Kenneth Stainbank Nature Reserve, Mitchell Park Zoo, Natal Shark Board, Phezulu Safari Park, Queen Elizabeth Grassland and Umgeni River Bird Park reflects a deeply entrenched socio-economic gradient characteristic of Durban's urban landscape. These sites, while all serving recreational and ecological functions, are unevenly situated across the metropolis in ways that mirror historical patterns of spatial segregation and contemporary economic stratification. For instance, the Durban North Japanese Gardens and Kenneth Stainbank Nature Reserve are located within northern suburbs historically associated with higher socio-economic status and predominantly white populations. These sites benefit from sustained municipal investment, comprehensive maintenance regimes and superior connectivity through well-developed transportation infrastructure, ensuring ease of access and high visitor engagement. Similarly, the Durban Botanical Gardens, situated near the city center yet adjacent to more affluent enclaves, has maintained its status as a premier urban green

**Table 10.** Summary of LULC distribution for the 10 leisure spaces selected for the study

S/N	Leisure space name	Rate of change of vegetation 2004–2024 (in Km <sup>2</sup> )	Rate of change of built-up 2004–2024 (in Km <sup>2</sup> )	Rate of change of grassland 2004–2024 (in Km <sup>2</sup> )	Rate of change of barren land 2004–2024 (in Km <sup>2</sup> )	Rate of change of water bodies 2004–2024 (in Km <sup>2</sup> )
1.	Beachwood mangroves nature reserve (BNR)	10.47	1.02	-7.962	-3.1692	0.94
2.	Durban botanical gardens (DBG)	-0.08	2.6613	-4615	-0.867	-0.244
3.	Durban North japanese garden (DNJG)	-0.9519	-0.2657	0	0.5702	0.8499
4.	Kenneth stainbank nature reserve (KNSR)	12.641	-23.4255	0.783	-0.2083	10.0794
5.	Mitchell park zoo (MPZ)	-0.3154	-0.0154	0	-0.0668	-0.6025
6.	Natal sharks board (NSB)	-107.1719	43.611	0	25.1237	38.4411
7.	Phezulu safari park (PSP)	-88.7389	11.022	0	10.5549	67.8948
8.	Queen elizabeth grassland (QEG)	-0.0048	-2.8332	0	0.5059	0.0623
9.	Umgeni river bird park (URBP)	-0.0245	-0.3055	0	-0.0363	0.9178

**Source(s):** Authors' own work

space, blending ecological preservation with recreational use. Conversely, leisure spaces such as Jameson Park and the Mitchell Park Zoo, though centrally located, are positioned closer to historically marginalized communities with lower income profiles. These sites exhibit signs of infrastructural stress and face challenges related to maintenance funding and urban encroachment, which undermine their capacity to function as inclusive public amenities. The Beachwood Mangroves Nature Reserve and Queen Elizabeth Grassland, positioned along coastal and peri-urban zones respectively, reveal complex spatial dynamics wherein environmental conservation priorities coexist with pressures from urban expansion and informal settlements. Their location adjacent to lower-income and racially diverse communities often translates into restricted accessibility due to inadequate transport links and safety concerns, thereby limiting their social utility despite their ecological importance. The Natal Shark Board and Phezulu Safari Park, operating as specialized tourist and educational facilities, occupy unique positions in Durban's leisure landscape. While these sites attract a diverse visitor base, their geographical placement in more peripheral or tourist-centric zones restricts regular access for lower-income residents, reinforcing patterns of leisure exclusion. Finally, the Umgeni River Bird Park, positioned along a major urban waterway, serves as an ecological and recreational asset with mixed accessibility outcomes; its adjacency to mixed-income neighborhoods highlights ongoing tensions between conservation efforts and urban development pressures. Collectively, these patterns underscore how the spatial distribution of leisure spaces in Durban is inseparable from broader socio-economic inequalities, with affluent areas disproportionately advantaged in terms of both quantity and quality of accessible green and leisure infrastructure. The persistence of these disparities signals enduring legacies of apartheid spatial planning and contemporary neoliberal urban governance that privileges economically valuable land uses over equitable recreational access. As such, the geography of these ten leisure spaces exemplifies the critical nexus between urban ecology, socio-economic status and spatial justice within a rapidly urbanizing African metropolis.

### *5.2 Land use and land cover change: Patterns and drivers*

Analysis of the LULC changes across the ten selected leisure spaces reveals heterogeneous patterns shaped by complex socio-political and environmental drivers. For example, Kenneth Stainbank Nature Reserve and Durban North Japanese Gardens have experienced relative spatial stability over the 2004–2024 period, attributable to their designation as protected green spaces with strong conservation mandates. These sites have benefited from concerted municipal and community efforts to resist encroachment and preserve biodiversity. Conversely, Jameson Park and Mitchell Park Zoo, located within more densely populated and socio-economically diverse urban precincts, have exhibited measurable reductions in leisure land cover, largely due to pressures from informal settlements and urban infrastructure expansion. These transformations reflect broader challenges faced by urban leisure spaces situated in areas of high development demand, where competing land uses often prioritize housing and commercial facilities over green space preservation. Beachwood Mangroves Nature Reserve and Queen Elizabeth Grassland illustrate the tension between ecological conservation and urban expansion in coastal and peri-urban contexts. Both sites have seen fragmentation and habitat degradation linked to unregulated development and limited enforcement of environmental protection policies, threatening their ecological integrity and recreational potential. In contrast, the Natal Shark Board and Phezulu Safari Park, while peripheral and tourism-oriented have undergone infrastructural upgrades aimed at enhancing visitor experience, albeit with limited focus on local community accessibility. This dichotomy highlights the role of economic function and target audience in shaping land

use trajectories. The Umgeni River Bird Park's LULC dynamics underscore the pressures of urban waterway management and the challenges of balancing conservation with public recreation amid rapid urbanization. The park has experienced incremental loss of vegetated areas to infrastructural development, reflective of municipal priorities to accommodate population growth and transport corridors. Collectively, these site-specific trajectories elucidate how LULC changes in Durban's leisure spaces are shaped by a matrix of factors, including conservation status, socio-economic context, urban growth pressures and policy enforcement that either mitigate or exacerbate spatial inequities. These findings call for integrated land use planning that simultaneously addresses ecological sustainability, social inclusion and urban development imperatives.

### 5.3 Accessibility and connectivity: Statistical and spatial insights

The assessment of accessibility and connectivity among the ten selected leisure spaces reveals profound disparities that reflect and reinforce Durban's socio-spatial stratification. Buffer analyses indicate that residents in affluent neighborhoods adjacent to Durban North Japanese Gardens, Kenneth Stainbank Nature Reserve and Durban Botanical Gardens enjoy proximity within 500 meters to these well-maintained and multifaceted leisure environments. These areas benefit from integrated transport networks, including reliable public transit routes and pedestrian-friendly infrastructure, facilitating equitable physical access. In stark contrast, peripheral and lower-income neighborhoods surrounding Beachwood Mangroves Nature Reserve, Jameson Park and Mitchell Park Zoo often fall outside the 1-kilometer accessibility radius, exacerbated by poor connectivity, unsafe pedestrian pathways and limited public transport options. This spatial disconnect effectively curtails leisure opportunities for vulnerable populations, compounding their exclusion from the health, social and ecological benefits these spaces offer. Quantitative statistical analysis substantiates these spatial patterns. Pearson correlation tests reveal a strong positive association ( $r > 0.7$ ,  $p < 0.01$ ) between household income levels and proximity to high-quality leisure spaces, while one-way ANOVA confirms statistically significant differences ( $F(2, 97) = 15.4$ ,  $p < 0.001$ ) in accessibility metrics across racially and economically delineated urban zones. Multiple linear regression further identifies key determinants of accessibility, such as infrastructural investment, land value and historical zoning policies, which collectively explain a significant proportion of variance in leisure space distribution ( $R^2 = 0.68$ ). Notably, the Natal Shark Board and Phezulu Safari Park, despite their ecological and educational prominence, are geographically isolated from densely populated disadvantaged communities, limiting their role in promoting broad-based social inclusion. Furthermore, qualitative insights from policy document analyses corroborate these findings, highlighting systemic gaps in Durban's urban planning that have traditionally deprioritized connectivity improvements in marginalized areas. The resultant spatial mismatch is emblematic of broader urban exclusion mechanisms, where leisure infrastructure and transport planning are spatially and socially segmented. These disparities not only undermine the equitable distribution of recreational amenities but also restrict the agency of marginalized groups in accessing vital spaces for physical activity, social interaction and cultural expression. It is also expedient to elucidate at this juncture that the integrative spatial-statistical approach exemplifies how connectivity deficits and spatial inaccessibility disproportionately burden historically disadvantaged communities, perpetuating cycles of socio-environmental inequity. Addressing these challenges necessitates concerted planning efforts that prioritize inclusive transport networks and strategic location of leisure spaces to foster urban environments conducive to equitable livability.

#### *5.4 Social and ecological implications*

The uneven distribution and varying quality of the ten selected leisure spaces across the study area carry profound social and ecological ramifications that extend beyond mere spatial considerations. Leisure spaces such as the Durban Botanical Gardens and Kenneth Stainbank Nature Reserve not only serve as vital recreational amenities but also function as critical ecological infrastructures supporting biodiversity conservation, urban cooling and air quality regulation. Their well-maintained ecosystems provide invaluable ecosystem services that enhance the health and resilience of adjacent communities, predominantly those within higher-income brackets. Conversely, leisure sites like Jameson Park and Mitchell Park Zoo, situated in economically disadvantaged and densely populated areas, suffer from infrastructural degradation and diminished ecological integrity. This degradation undermines their capacity to deliver comparable environmental benefits, exacerbating vulnerabilities to urban heat islands, flooding and pollution for already marginalized populations. The social consequences of this inequitable distribution are equally significant. Limited access to quality leisure spaces in lower-income communities curtails opportunities for physical activity, social engagement and mental restoration, factors well-documented as essential for public health and social cohesion. For example, communities surrounding Beachwood Mangroves Nature Reserve and Queen Elizabeth Grassland face compounded barriers to leisure due to physical distance, inadequate transport and safety concerns, which collectively restrict the ability to derive these psychosocial benefits. This dynamic perpetuates patterns of exclusion and spatial injustice, impeding the realization of inclusive urban livability. In addition, the social fabric of Durban is impacted by the cultural significance and symbolic meaning embedded in leisure spaces. Sites like the Natal Shark Board and Phezulu Safari Park, while primarily tourist-oriented, represent critical loci for environmental education and cultural engagement but remain spatially detached from marginalized communities. This spatial disjunction limits the democratization of cultural and educational opportunities that leisure spaces can facilitate. Moreover, the degradation or loss of green spaces in underserved areas threatens not only environmental justice but also the preservation of community identity and heritage, which are pivotal for fostering social resilience. These intertwined social and ecological implications highlight the necessity for urban governance frameworks that reconceptualize leisure spaces as multifunctional assets, serving ecological sustainability, social equity and cultural vitality simultaneously. By prioritizing the equitable distribution and maintenance of leisure infrastructure, Durban can better address systemic inequalities while enhancing urban environmental resilience. This requires the integration of community voices in planning processes and the implementation of targeted interventions that restore degraded sites, expand green cover in vulnerable neighborhoods and enhance accessibility through improved infrastructure.

#### *5.5 Opportunities for inclusive urban governance*

The findings of this study illuminate critical pathways for advancing more inclusive and equitable urban governance in the stewardship and development of Durban's leisure spaces. While spatial disparities in accessibility and quality are pronounced, certain sites demonstrate the potential for leisure spaces to act as platforms for social integration and participatory urbanism. Within the study's focus, sites such as the Umgeni River Bird Park reveal how community engagement and adaptive management can enhance social relevance, suggesting models for broader application. Thus, this study advocates for governance approaches that move beyond top-down, technocratic planning toward participatory and co-creative processes that empower local communities, especially those historically marginalized to influence decision-making related to leisure space allocation, design and

maintenance. Inclusive governance models should actively incorporate the voices of residents from underserved neighborhoods adjacent to Jameson Park, Beachwood Mangroves and Queen Elizabeth Grassland, recognizing their lived experiences and cultural connections to these spaces. Such engagement is crucial for fostering ownership, ensuring cultural relevance and aligning leisure infrastructure with community needs. Moreover, integrating geo-spatial intelligence and socio-economic data into urban planning mechanisms offers a powerful tool for identifying areas of greatest need and monitoring the effectiveness of interventions. This data-driven approach supports evidence-based policymaking and resource allocation that can disrupt entrenched patterns of spatial exclusion. As previous studies (e.g., [Olatoye and Fru, 2024b](#)) have demonstrated, spatially explicit analyses facilitate targeted rehabilitation efforts and equitable urban development. Furthermore, cross-sectoral collaboration between municipal agencies, civil society and private stakeholders is essential to mobilize diverse resources and expertise required for sustainable leisure space management. Public-private partnerships and community-based organizations can play pivotal roles in maintaining sites like the Mitchell Park Zoo and Natal Shark Board, enhancing service delivery while ensuring accessibility. Hence, it is expedient to elucidate that urban governance must incorporate adaptive strategies that respond to the evolving pressures of climate change, population growth and urban densification. Leveraging leisure spaces as multifunctional green infrastructure, providing recreational, ecological and social benefits necessitates flexible policies that integrate environmental sustainability with social justice imperatives. Durban's governance frameworks must therefore prioritize green space equity as a core component of resilient urban futures.

The findings of this study underscore the profound impact of rapid urbanization on the distribution, accessibility and quality of leisure spaces in Durban Metropolis. As the city continues to expand outwardly and upwardly in response to population growth, the competition for land intensifies, often at the expense of leisure spaces that are critical for ecological balance and community well-being. The research results revealed a clear trend: leisure spaces are increasingly marginalized to the city's peripheries, while central, densely populated areas experience significant declines in available recreational land. This spatial imbalance not only threatens biodiversity and environmental sustainability but also exacerbates socio-economic disparities, where lower-income and marginalized communities have reduced access to leisure spaces compared to affluent neighborhoods. These findings align with the concerns raised by [Vidal \*et al.\* \(2020\)](#); [Mubangizi \(2021\)](#), emphasizing that environmental injustice persists in Durban's urban planning processes. The proximity analysis further revealed that leisure spaces in Durban are unevenly distributed, with wealthier suburbs enjoying better-quality and easily accessible parks, beaches and recreational facilities. In contrast, informal settlements and lower-income townships are often situated far from well-maintained leisure areas, with poor connectivity and transportation options limiting residents' access. This inequitable distribution reflects broader patterns of urban exclusion and mirrors trends observed by [Colding \*et al.\* \(2020\)](#); [Behnisch \*et al.\* \(2022\)](#) in other global South cities undergoing rapid urban transitions. The practical implications of these findings are far-reaching, proximity to leisure spaces is not merely a convenience but a determinant of public health outcomes, social inclusion and community resilience. The absence of nearby leisure spaces deprives disadvantaged groups of opportunities for exercise, social interaction and mental rejuvenation, which are critical components of urban livability and social equity. In addition, the degradation of leisure spaces within urban centers due to unchecked development pressures has eroded Durban's capacity to mitigate urban environmental challenges such as heat islands, air pollution and flood risks. As noted by [Addas \(2023\)](#); [Sopiana and Harahap \(2023\)](#), leisure spaces are vital

ecological infrastructures that offer natural solutions to urban resilience. The loss of green buffers in Durban's highly urbanized corridors increases vulnerability to climate change effects, posing risks not only to ecological integrity but also to the socio-economic stability of its communities. The degradation is particularly alarming considering Durban's subtropical climate and coastal location, making it more susceptible to climate-induced disasters such as cyclones and flooding. Hence, the study highlights the potential of geo-spatial technologies in informing urban planning and policy interventions. By mapping leisure spaces against demographic and socio-economic data, urban planners can visualize patterns of exclusion and inequality and thus make data-driven decisions to prioritize the development or rehabilitation of leisure spaces in underserved areas. As previous studies by [Olatoye and Fru \(2024b\)](#); [Adesina et al. \(2024\)](#) suggested, spatially explicit analysis is indispensable for sustainable urban management. Hence, integrating geo-spatial intelligence into Durban's policy document could drive transformative change, ensuring that future developments incorporate green spaces not as afterthoughts but as fundamental components of urban infrastructure. Another critical insight from this study is the urgent need for participatory urban governance models that empower local communities in decision-making regarding leisure space creation, maintenance and preservation. Also, Durban's marginalized populations must be engaged in co-designing leisure spaces that meet their specific cultural, social and ecological needs. As [Ally \(2021\)](#) pointed out, inclusivity in urban planning strengthens community ownership and ensures that leisure spaces are culturally relevant and widely used. In Durban's richly diverse metropolis, leisure spaces must not only provide ecological and recreational benefits but also celebrate the city's cultural heritage, serving as platforms for social cohesion and collective identity. Ultimately, the findings of this study reiterate that equitable access to leisure spaces is a fundamental right tied to the principles of sustainable development, social justice and human well-being. Durban, as a rapidly evolving African city, stands at a critical crossroads. Without deliberate and inclusive strategies to preserve, enhance and equitably distribute leisure spaces, the city risks entrenching existing inequalities and compromising the health and resilience of its future generations.

### *5.6 Implications of the study for urban planning, equity and future research*

The findings of this study offer critical implications for urban policy, environmental planning and scholarly engagement with leisure geographies in post-apartheid cities. First, the unequal distribution and quality of leisure spaces in Durban, evident in the comparative analysis of spaces such as the Durban Botanical Gardens and Jameson Park, which enjoy high accessibility and maintenance, versus under-resourced sites like Queen Elizabeth Grassland and Beachwood Mangroves, underscore the need for targeted, equity-driven planning interventions. Urban planners must move beyond generic greening policies and adopt spatially explicit frameworks that prioritize the rehabilitation and development of leisure spaces in historically marginalized townships and informal settlements. From a practical standpoint, the integration of GIS into municipal decision-making processes can enable evidence-based targeting of leisure space investments. For instance, mapping the demographic catchments of low-access areas like Phezulu Safari Park and Kenneth Stainbank Nature Reserve against socio-economic indices can inform more inclusive service delivery. In line with this, there is an urgent need for cross-sector collaboration between urban ecologists, public health experts and community leaders to co-design leisure spaces that meet both environmental and social needs, thus transforming these spaces from esthetic luxuries into essential urban infrastructure. The study also opens new directions for further research. While this paper focused on ten diverse leisure sites, future studies could use longitudinal data and satellite imagery to quantify changes in land use intensity over time.

Moreover, qualitative insights into how residents perceive and interact with these spaces could enrich our understanding of cultural attachment, social value and environmental stewardship. Investigating the impacts of proximity to leisure spaces on mental health, youth development and urban resilience would deepen the theoretical grounding in spatial justice and sustainability. In sum, this study serves not only as a diagnostic tool but also as a springboard for more participatory, interdisciplinary and context-sensitive approaches to urban leisure planning in African cities.

## 6. Conclusion

### *Socio-Spatial inequities impacts and driving factors of leisure land use changes for equitable urban livability*

This study has provided a critical interrogation of the socio-spatial inequities and underlying drivers influencing leisure land use changes in the Durban Metropolis, with particular attention to their implications for equitable urban livability. By examining a carefully selected sample of leisure spaces based on geographic spread, socio-economic context, land use typology and patterns of change, the research illuminates how leisure land use is both a reflection of and a contributor to broader urban inequalities. The findings reveal significant disparities in the spatial distribution, accessibility and transformation of leisure lands, driven by intersecting factors such as urban sprawl, land commodification, infrastructural investment patterns and historical spatial legacies. Leisure spaces, while vital to the physical, mental and socio-cultural health of urban populations, are increasingly shaped by market forces and unequal policy interventions, often reinforcing exclusionary spatial patterns. Central urban areas, such as Morningside and Berea continue to benefit from better proximity, connectivity and infrastructural amenities, whereas peri-urban and marginalized zones face constrained access to quality leisure environments due to distance, cost and institutional neglect. These spatial disparities limit marginalized communities' ability to engage with and benefit from leisure spaces, undermining efforts toward social inclusion, public well-being, and environmental equity. Moreover, land use changes affecting leisure spaces often reflect a troubling prioritization of commercial and residential developments over inclusive public amenities, thereby displacing or transforming formerly accessible green and recreational spaces. This trend not only curtails the socio-cultural utility of these spaces but also erodes their potential as platforms for cohesion, intergenerational engagement and environmental awareness. In this context, leisure land use becomes a contested terrain, one where urban planning must be reoriented to address the embedded inequities and promote just spatial outcomes. Therefore, this study underscores the urgent need for integrated urban planning approaches that foreground leisure equity as a key dimension of sustainable and inclusive city-making. Policies must proactively address the geographic and social disparities in leisure space allocation, ensuring that all urban residents, irrespective of their socio-economic status can access and benefit from safe, enriching and ecologically balanced environments. Only by confronting these structural imbalances can cities like Durban realize the full promise of leisure land use as a catalyst for equitable urban livability.

## Funding

The authors acknowledge funding for this study from the Andrew Mellon Foundation, USA.

## Author contribution

Dr Tolulope Olatoye (DTO) conceptualized the study, did the field work, presented the research findings and wrote the entire article, while Professor Maheshvari Naidu (PMN)

provided supervision for the study and research funding received from Andrew Mellon Foundation, USA.

### Data availability

This article is based on a systematic literature review. All sources and data consulted are publicly available through academic databases. A detailed record of the selection process, inclusion criteria, and literature matrix can be provided upon request for transparency and replication purposes.

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