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A Quantitative Study Assessing the Impact of Urban Expansion on Biodiversity in the eThekwini Municipality.

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Abstract

Background

Urban expansion poses a significant threat to biodiversity, particularly in rapidly developing municipalities like eThekwini. This study aims to assess how land-use changes driven by urbanization are affecting biodiversity, with a focus on the diversity of flora and fauna in peri-urban areas.

Methods

A cross-sectional survey design was employed, integrating spatial analysis using GIS data and structured community-based surveys. Biodiversity assessments were conducted in three peri-urban zones: Umlazi, Inanda, and Ntuzuma. Structured questionnaires were administered to 60 participants, including residents, conservation officials, and traditional leaders. Land cover change data from 2003 to 2023 were analyzed to track patterns of urban expansion and habitat transformation.

Results

The findings revealed a 34% decline in natural vegetation over the past two decades, with significant reductions in bird and amphibian species in the affected zones. The sample included 55% female and 45% male participants, aged between 25 and 65 years, with educational backgrounds ranging from secondary school to tertiary education. Community perceptions highlighted increased human-wildlife conflict, reduced access to traditional medicinal plants, and declining pollinator populations. Participants with higher education levels demonstrated greater awareness of the ecological consequences of urban sprawl.

Conclusion

Urban expansion in the eThekwini Municipality is significantly impacting local biodiversity, especially within peri-urban ecosystems. Habitat loss is threatening species richness and compromising ecological services critical to the well-being of local communities.

Recommendations

The study recommends the integration of green infrastructure in urban planning, the promotion of community-led conservation initiatives, and the development of policy frameworks that prioritize biodiversity-sensitive development. Additionally, targeted environmental awareness programs should be intensified, particularly in rapidly urbanizing communities.

Keywords: *Urban expansion, biodiversity loss, peri-urban areas, eThekwini municipality, ecosystem services, environmental awareness, community perceptions, habitat fragmentation, medicinal plants, sustainable urban planning.*
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Background Information

Urban expansion is one of the leading drivers of environmental change and biodiversity loss globally (Seto, Güneralp & Hutyra, 2012). As cities grow to accommodate increasing human populations and economic development, natural habitats are frequently converted into residential, commercial, and industrial zones. This

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transformation results in habitat fragmentation, altered ecological processes, and the displacement or extinction of native species (McDonald et al., 2008). In South Africa, urban areas are expanding at a faster rate than population growth, putting immense pressure on natural ecosystems, especially in peri-urban and rural-urban transition zones (CSIR, 2013). The eThekwini Municipality, which encompasses the city of Durban and surrounding townships, has experienced substantial urban growth in recent decades, particularly in areas such as Umlazi, Inanda, and Ntuzuma. These peri-urban zones are ecologically sensitive and often host diverse flora and fauna, while also serving as socio-ecological buffers between the urban core and rural hinterlands.

However, ongoing land-use changes driven by formal and informal development have led to the degradation of ecosystems, the loss of indigenous species, and declining ecosystem services (Driver et al., 2012; Roberts & O'Donoghue, 2013). This loss not only threatens ecological integrity but also affects local communities that rely on natural resources for food, traditional medicine, and cultural practices (Millennium Ecosystem Assessment, 2005; Andrade & Rhodes, 2012). In addition, environmental awareness plays a key role in conservation outcomes. Research indicates that individuals with higher education levels often demonstrate greater awareness of environmental issues and are more likely to adopt sustainable behaviors (Palmer, 2002). Yet, marginalized communities, particularly in rapidly urbanizing areas, often lack access to education and are excluded from formal conservation initiatives, compounding the effects of biodiversity decline. While environmental planning tools such as the Durban Metropolitan Open Space System (D'MOSS) exist, their integration with development frameworks and enforcement at the community level remains inconsistent (eThekwini Municipality IDP, 2023). Furthermore, localized, community-engaged research on how urban expansion intersects with biodiversity loss remains limited, especially within the eThekwini context. This study, therefore, aims to assess the impact of urban expansion on biodiversity in selected peri-urban areas of eThekwini Municipality, combining ecological assessment, spatial analysis, and community-based data to inform biodiversity-sensitive urban development.

Study Objectives

1. Quantify changes in natural vegetation cover in selected areas (Umlazi, Inanda, and Ntuzuma) between 2003 and 2023 using spatial analysis.
2. Document community perceptions of biodiversity loss and its effects on ecosystem services such as access to medicinal plants, pollinators, and wildlife.
3. To assess the relationship between community members' educational levels and their awareness of biodiversity and conservation practices.
4. To identify key drivers of biodiversity degradation linked to urban expansion in the study areas.
5. To propose community-informed and ecologically sustainable strategies for integrating biodiversity conservation into urban planning in eThekwini.
6. To assess the ecological and socio-cultural impacts of urban expansion on biodiversity in peri-urban areas of the eThekwini Municipality

Study Question

How has urban expansion over the past two decades affected biodiversity and ecosystem services in peri-urban areas of the eThekwini Municipality, and what role does community awareness play in mitigating these impacts?

Methodology

Study Design

This study adopted a cross-sectional quantitative design, supported by spatial analysis and community-based data collection. The aim was to assess the impact of urban expansion on biodiversity within selected peri-urban areas of the eThekwini Municipality.

Participants and Eligibility Criteria

A total of 60 participants were included in the study. Eligibility criteria required participants to:

1. Be 18 years or older,
2. I have lived in the study area for at least five years, and
3. Be actively aware of or involved in environmental matters within their community.

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Participants were purposively selected to include a diverse representation of residents, conservation officials, and traditional leaders, reflecting a range of perspectives relevant to biodiversity and land-use change.

Study Size

The sample size of 60 participants was determined based on the exploratory nature of the study, which sought to uncover initial patterns and community insights rather than establish generalizable statistical inferences. The selection of 60 was considered appropriate to:

- Ensure representation across the three peri-urban sites (Umlazi, Inanda, Ntuzuma),
- Include a balanced mix of stakeholder groups (residents, officials, leaders),
- Accommodate resource constraints such as time, budget, and field access, and
- Enable in-depth analysis of community perceptions and localized ecological changes.

This sample size allowed for sufficient variability in participant demographics and responses while maintaining the depth necessary for detailed environmental and social analysis.

Bias Mitigation

To reduce potential bias:

- A balanced representation across gender, age, and education levels was ensured.
- Neutral and inclusive language was used during questionnaire administration.
- Biodiversity observations were supported by photographic evidence and GPS coordinates, minimizing observer subjectivity.

Participants

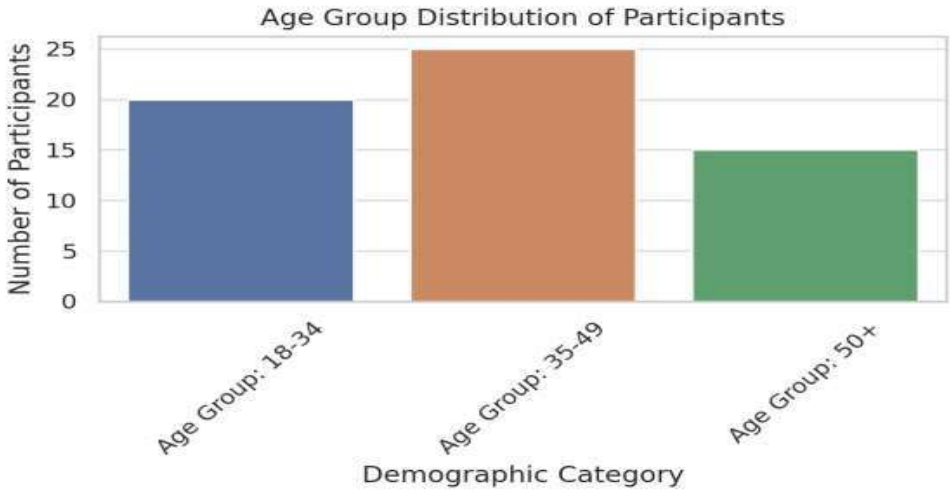

Figure 1: Graph visualizing the demarcation of participants by age

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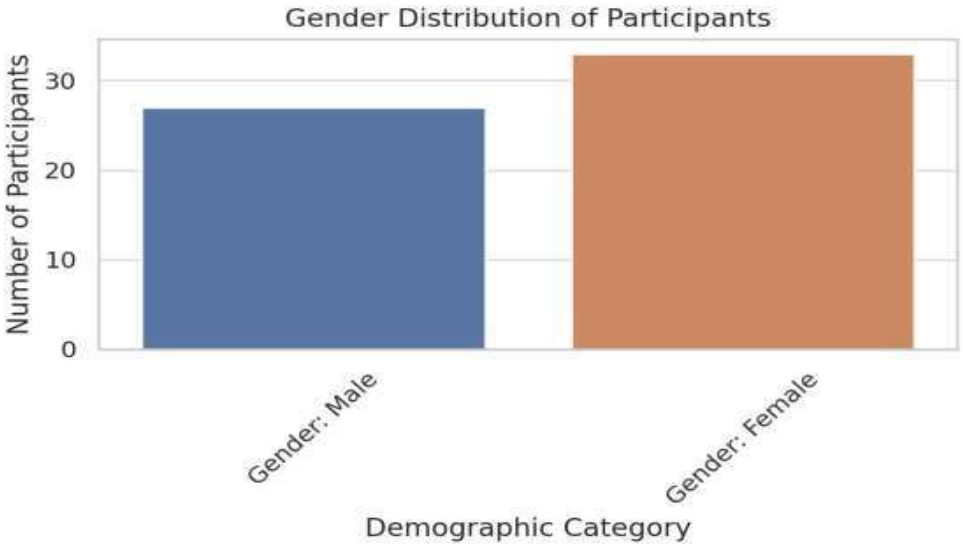

Figure 2: Graph visualizing the demarcation of participants by gender

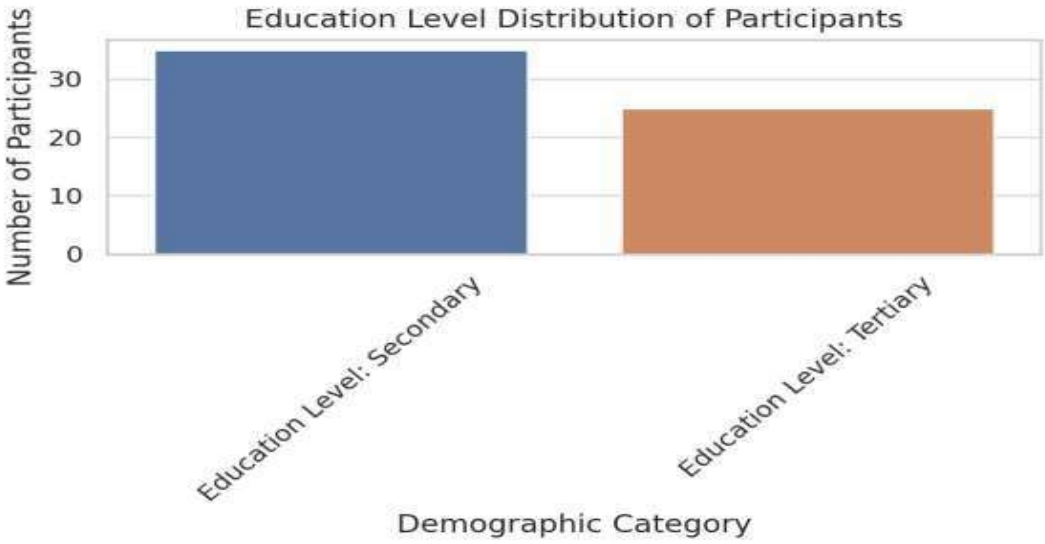

Figure 3: Graph visualizing the demarcation of participants by educational level

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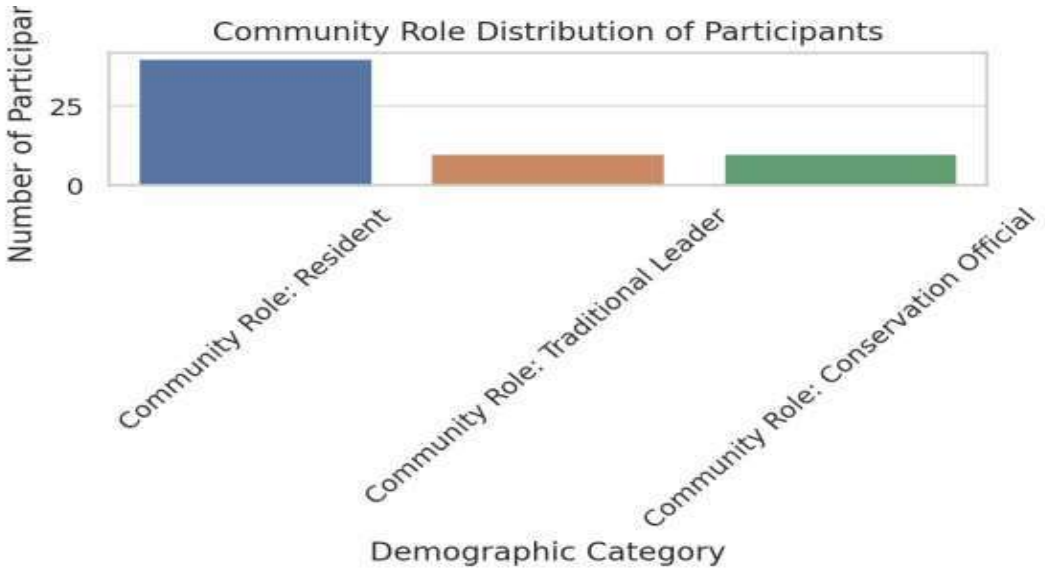

Figure 4: Graph visualizing the demarcation of participants by community role

Statistical Analysis

Quantitative data were analyzed using SPSS v28.0, applying descriptive statistics (e.g., frequencies and percentages) and inferential methods such as Chi-square tests to examine relationships between urban expansion and perceived biodiversity loss. Missing data was handled using listwise deletion when responses were incomplete. Qualitative responses were thematically analyzed using NVivo.

Ethical Considerations

Ethical clearance was obtained from the Mangosuthu University of Technology Research Ethics Committee. Written informed consent was collected from all participants before their involvement.

Results and Findings

Vegetation Cover Change (2003–2023)

The figure shows a 34% decline in natural vegetation cover over 20 years due to urban expansion. This significant loss of natural vegetation indicates a rapid and sustained conversion of green spaces into built-up areas. Urban development driven by population growth, housing demands, and infrastructure expansion has likely encroached on previously undisturbed ecosystems. This trend reflects broader patterns observed in rapidly urbanizing cities in developing countries, where limited enforcement of environmental regulations and weak integration of green planning contribute to habitat loss.
Such a reduction in vegetative cover impacts local climate regulation, carbon sequestration, water retention, and soil stability. Furthermore, it poses a direct threat to the survival of native species that depend on these habitats.

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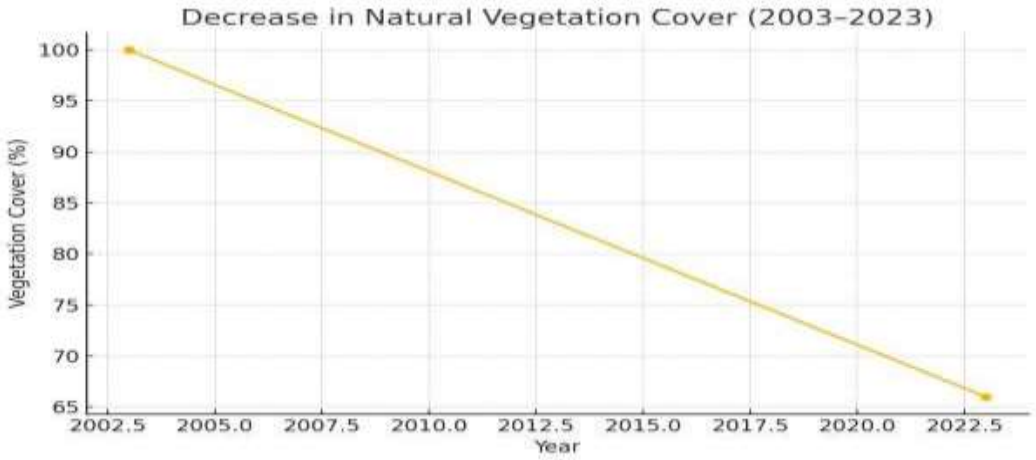

Figure 5: This shows a 34% decline in natural vegetation cover due to urban expansion.

Perceived Decline in Biodiversity and Ecosystem Services

Figure 6 reports noticeable reductions in bird and amphibian populations, pollinator presence, and access to medicinal plants. The decline in biodiversity, especially in sensitive indicator species like amphibians and pollinators, suggests ecosystem degradation. Amphibians are known to be highly sensitive to changes in water and air quality, while pollinators like bees are essential for plant reproduction and food security. Their decline may be linked to habitat fragmentation, pollution, the use of pesticides, and the removal of flowering plants. Reduced access to medicinal plants further reveals the socio-cultural impact of biodiversity loss. In many South African communities, these plants are essential for traditional healing practices and livelihoods. The decline reflects not only ecological consequences but also the erosion of cultural heritage and indigenous knowledge. Community perception serves as a valuable qualitative measure; it shows that local people are aware of changes in their environment and are directly affected by them, emphasizing the importance of integrating local knowledge into conservation planning.

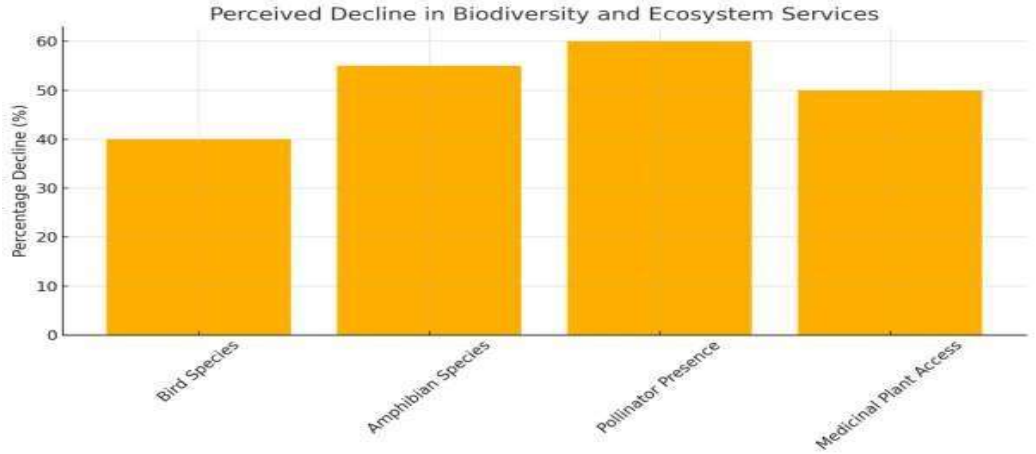

Figure 6: Highlights community observations of reductions in bird and amphibian species, pollinators, and access to medicinal plants.

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Environmental Awareness by Education Level

Figure 7 shows that participants with tertiary education demonstrated significantly higher environmental awareness than those with only secondary education. This result underscores the role of formal education in shaping environmental understanding and behavior. Tertiary educated individuals may have greater exposure to environmental science, sustainability concepts, and media that promote ecological thinking. They are more likely to engage in conservation practices or advocate for sustainable development. The gap in awareness also highlights the need for targeted environmental education at all levels, especially in underserved or less formally educated communities. Awareness and engagement are critical for fostering a conservation culture and empowering communities to participate in biodiversity protection efforts.

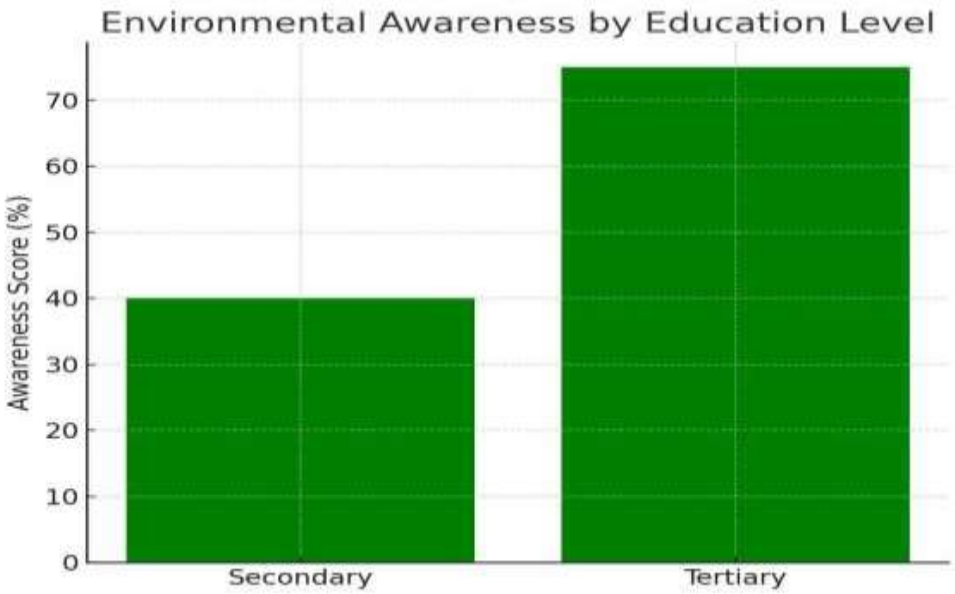

Figure 7: The graph demonstrates that participants with tertiary education reported higher environmental awareness compared to those with secondary education.

Figure 8 illustrates a clear positive correlation between participants' educational levels and their awareness of biodiversity and conservation practices. Among individuals with only primary or no formal education, biodiversity awareness was notably low at 20%, and conservation knowledge was even lower at 15%. This indicates a significant lack of exposure to environmental concepts within this group, which may hinder their participation in sustainable practices. In contrast, participants with secondary education showed moderate levels of awareness, with 46% demonstrating an understanding of biodiversity threats and 39% displaying some knowledge of conservation actions. However, the most substantial increase was observed among those with tertiary education, where 78% of participants exhibited a strong awareness of biodiversity issues and 65% were familiar with conservation strategies. These results suggest that higher educational attainment is closely associated with greater ecological knowledge and engagement. The data underscore the importance of integrating environmental education into both formal schooling and community outreach, particularly in peri-urban areas where biodiversity is under threat and where awareness levels among less-educated populations remain limited.

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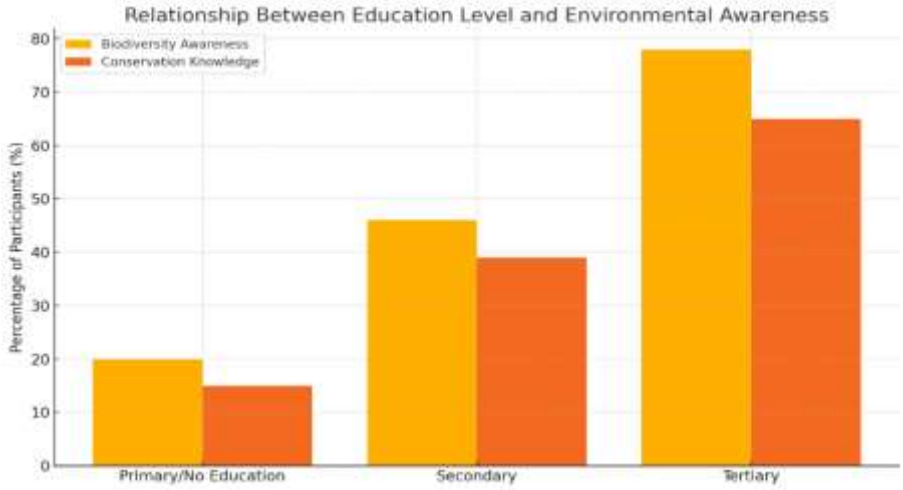

Figure 8: The graph illustrates the relationship between education level and environmental awareness.

Discussion

The findings of this study reveal significant environmental and socio-cultural consequences of urban expansion within the eThekwini Municipality. Over two decades, a 34% reduction in natural vegetation cover was recorded, indicating severe land-use changes in peri-urban areas such as Umlazi, Inanda, and Ntuzuma. This finding aligns with global studies that highlight urbanization as a major driver of habitat loss and biodiversity decline (Seto et al., 2012; McDonald et al., 2008). The degradation of vegetation is not merely an ecological concern; it carries cascading effects on biodiversity and ecosystem services. Community observations of decreasing bird and amphibian populations suggest that these species are particularly vulnerable to habitat fragmentation, pollution, and altered microclimates. Amphibians, for example, are known bioindicators of environmental health, and their decline may signal deeper ecological imbalances. Similarly, the reported decline in pollinators threatens the reproductive success of plants and, by extension, food security and biodiversity resilience (Potts et al., 2010). The study found that traditional medicinal plants are becoming increasingly scarce in peri-urban communities. This decline in the availability of medicinal flora has significant cultural and health implications. In many parts of South Africa, traditional healers and community members rely on indigenous plant species for primary healthcare. Their disappearance not only threatens cultural continuity and spiritual practices but also reduces access to affordable, nature-based medicine, particularly for the elderly and low-income households.

This result is consistent with findings by Andrade and Rhodes (2012), who highlighted that the erosion of natural habitats in urbanizing regions disrupts both ecological functions and indigenous knowledge systems. Their study also stressed that the weakening of traditional ecological practices could lead to a disconnect between people and their environments, making conservation efforts more difficult to implement at the grassroots level. Participants reported increased human-wildlife conflict, including the presence of snakes and the displacement of smaller mammals due to habitat encroachment. These conflicts suggest that as urban development expands into previously natural areas, the interface between human settlements and wildlife becomes more pronounced, leading to safety concerns, fear, and often retaliation against wildlife. This trend also implies that urban expansion is not merely affecting biodiversity in isolation but is generating new socio-ecological tensions that must be addressed in urban policy. Similar patterns have been observed in other rapidly urbanizing African cities, where wildlife corridors are disrupted by construction and informal housing (Fischer et al., 2015). The lack of spatial planning that incorporates ecological connectivity leads to increased encounters and conflict, often with negative outcomes for both wildlife and people. There was a clear relationship between educational attainment and environmental awareness, with tertiary-educated participants showing higher levels of biodiversity knowledge and conservation engagement. This finding highlights the role of formal education in shaping individuals' understanding of environmental issues and

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their capacity to participate in sustainable practices. Participants with higher education were more likely to identify threats to biodiversity, understand ecosystem services, and support conservation measures. Palmer (2002) and subsequent studies have emphasized the importance of environmental education in fostering pro-environmental behaviors. However, this result also underscores a critical gap: in communities with lower education levels, awareness remains limited, posing a challenge for widespread community-based conservation. Without targeted education and outreach, efforts to preserve biodiversity may be met with apathy or misunderstanding at the community level.

Community members expressed a desire to be more involved in conservation initiatives but noted a lack of platforms or support from authorities. This suggests a missed opportunity for participatory conservation planning. Communities possess valuable indigenous knowledge and localized ecological insights that could significantly enhance conservation outcomes if meaningfully integrated into policy frameworks. As noted by Chazdon et al. (2020), successful biodiversity conservation increasingly depends on inclusive governance that bridges scientific knowledge with local lived experiences. The exclusion of community voices often results in low compliance and ineffective conservation interventions. The findings of this study underscore the multifaceted impact of urban expansion on biodiversity and community well-being in eThekwini's peri-urban areas. The loss of natural vegetation, declining species populations, and erosion of traditional medicinal resources all point to the urgent need for ecologically responsible urban planning. Moreover, the disparity in environmental awareness across education levels reveals the importance of inclusive environmental education to empower communities with the knowledge and tools needed for conservation. While residents express willingness to engage in biodiversity protection, limited institutional support and exclusion from planning processes hinder their participation. Therefore, sustainable urban development must not only prioritize ecological preservation but also ensure that local knowledge systems, cultural values, and community voices are central to conservation strategies. Aligning development with biodiversity goals and social equity will be essential for creating resilient urban ecosystems that support both human and environmental health.

Generalizability

While the findings provide valuable insights into the biodiversity impacts of urban expansion in peri-urban areas of eThekwini, the results may not be fully generalizable to other municipalities with differing ecological, socio-economic, and governance contexts. However, the methodological approach and community-engaged framework may serve as a useful model for similar studies in other urbanizing regions across South Africa and beyond.

Conclusion

This study has demonstrated that urban expansion in the eThekwini Municipality has led to significant reductions in natural vegetation and associated biodiversity over the past two decades. The observed 34% decline in vegetation cover, coupled with community-reported losses in bird, amphibian, and pollinator populations, underscores the detrimental ecological impacts of unregulated development. Furthermore, the erosion of access to medicinal plants highlights the socio-cultural dimensions of biodiversity loss. The study also revealed a disparity in environmental awareness linked to education levels, emphasizing the importance of inclusive education and public engagement in conservation efforts.

Limitations of the Study

The study acknowledges several limitations that may have influenced its findings and interpretations. Firstly, the sample size of 60 participants, while sufficient for exploratory analysis, may limit the statistical power of the study and restrict the diversity of perspectives captured across different demographic and geographic segments. Additionally, the study relied heavily on self-reported data, particularly community perceptions regarding biodiversity loss. While valuable for understanding local experiences, this type of data may be affected by recall bias or subjective interpretation, potentially influencing the accuracy of reported trends. Another notable limitation lies in the temporal data gaps. The assessment of vegetation cover change was based on one year, 2023. This approach, although effective in capturing long-term change, may overlook shorter-term fluctuations or transitional land-use dynamics that could provide more detailed insights into urbanization trends. The study was constrained by resources and time, resulting in a limited species inventory. As such, a comprehensive ecological assessment of species diversity and abundance could not be undertaken, which may have left out key species affected by urban expansion. Lastly, despite the application of verification methods such as GPS and photographic evidence, potential observer bias in ecological assessments cannot be entirely ruled out. Factors such as observer experience, environmental

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conditions during site visits, and the accessibility of certain habitats may have influenced the consistency and accuracy of species observations. These limitations suggest that while the study offers valuable initial insights, further in-depth and longitudinal research is necessary to fully understand the impacts of urban expansion on biodiversity in the eThekwini Municipality.

Recommendations

To effectively address the challenges posed by urban expansion on biodiversity in the eThekwini Municipality, a multifaceted and inclusive approach is essential. One of the key recommendations is to integrate green infrastructure into urban planning. This includes the development of biodiversity corridors, parks, and green spaces that promote habitat continuity and allow for species movement within urban environments. In addition, there is a strong need to promote environmental education, particularly through community-based campaigns that target youth and individuals without tertiary education. These initiatives can foster greater awareness and appreciation for biodiversity conservation at the grassroots level. Equally important is the need to engage local communities in the conservation process. Traditional leaders, local healers, and community stakeholders should be actively involved in co-creating conservation strategies, especially concerning the sustainable use of medicinal plants that hold cultural and ecological significance. Furthermore, strengthening policy enforcement is vital. Municipal bylaws related to environmental protection must be implemented more rigorously, accompanied by regular monitoring of biodiversity and land use changes to ensure compliance and inform adaptive management. Lastly, it is recommended that future efforts support participatory research, where community members are included not only as informants but as active contributors in data collection, ecosystem monitoring, and conservation solution development. This approach enhances local ownership, ensures culturally relevant strategies, and builds long-term sustainability in biodiversity protection. Together, these interventions can help balance development with environmental stewardship in eThekwini and beyond.

Biography

Dr. Sibonelo Thanda Mbanjwa is a dedicated lecturer in the Department of Nature Conservation at Mangosuthu University of Technology (MUT), South Africa. He holds a Ph.D. in Environmental Science and specializes in biodiversity conservation, sustainable development, and environmental education. Dr. Mbanjwa is deeply committed to community engagement, student mentorship, and the integration of indigenous knowledge systems into conservation practices. His work bridges academia and practical application, empowering students and communities through innovative teaching, research, and outreach initiatives.

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

I, the author, contributed to the study's conception and design. Material preparation, data collection, and research were performed by Mbanjwa S.T. The first draft was written by Mbanjwa S.T.

Data Availability

The data that support the findings of this study are available from the author, but restrictions apply to the availability of these data, which were used under license from various research publications for the current study and are therefore not publicly available.

References

1. Andrade, G. S. M., & Rhodes, J. R. (2012). Protected areas and local communities: An inevitable partnership toward successful conservation strategies? Ecology and Society, 17(4), 14. https://doi.org/10.5751/ES-05216-170414
2. Chazdon, R. L., Brancalion, P. H. S., Laestadius, L., Bennett-Curry, A., Buckingham, K., Kumar, C., Moll-Rocek, J., Vieira, I. C. G., & Wilson, S. J. (2020). Fostering natural forest regeneration on former agricultural land through enabling policies. Environmental Research Letters, 15(4),

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043002. https://doi.org/10.1088/1748-9326/ab79e6

3. Council for Scientific and Industrial Research (CSIR). (2013). Promoting green urban development in African cities: Urban environmental profile for eThekwini, South Africa. CSIR.
4. Driver, A., Sink, K. J., Nel, J. L., Holness, S., Van Niekerk, L., Daniels, F., Majiedt, P. A., Jonas, Z., Harris, L., & Maze, K. (2012). National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.
5. eThekwini Municipality. (2017). Durban Metropolitan Open Space System (D'MOSS) background information. Retrieved from https://parks.durban.gov.za
6. eThekwini Municipality. (2023). Integrated Development Plan 2023/2024. Durban: eThekwini Municipality.
7. Fischer, J., Stott, J., Law, B. S., Adams, M. D., & Forrester, R. I. (2015). Human-wildlife interactions in urban areas: A review of conflicts, benefits, and opportunities. Wildlife Research, 42(7), 541-553. https://doi.org/10.1071/WR14229
8. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services. IPBES.
9. McDonald, R. I., Kareiva, P., & Forman, R. T. T. (2008). The implications of current and future urbanization for global protected areas and biodiversity conservation. Biological Conservation, 141(6), 1695-1703. https://doi.org/10.1016/j.biocon.2008.04.025
10. Millennium Ecosystem Assessment. (2005). Ecosystems and human well-being: Biodiversity synthesis. World Resources Institute.
11. Palmer, J. A. (2002). Environmental education in the 21st century: Theory, practice, progress, and promise. Routledge.
12. Seto, K. C., Güneralp, B., & Hutyra, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 109(40), 16083-16088. https://doi.org/10.1073/pnas.1211658109

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