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A SOCIAL APPROACH TO ASSESSING THE IMPACT OF URBANIZATION ON NATURAL RESOURCES: A CASE STUDY OF MAKURDI-BENUE STATE, NIGERIA

Data paper

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Abstract

The environment is under more stress due to urbanization in Makurdi Metropolis, which raises questions regarding sustainable growth. Based on a survey of 185 locals, this study investigates how environmental deterioration and population increase are influenced by factors like high birth rates and rural-to-urban migration. The research indicates that the suggested remedies and the perceived problems associated with urbanization are highly aligned. Although rural development and tree planting are viewed as successful strategies, the community makes it apparent that better urban planning and enforcement are required. The results highlight how crucial it is to improve urban planning procedures, boost community involvement, and put workable solutions into place in order to mitigate the adverse effects of urbanization. In conclusion, Makurdi's urbanization is linked to serious environmental and social problems, such as pollution, habitat degradation, and biodiversity loss. Particularly, 84.6% of respondents are worried about rising pollution, and 80% of respondents consider high population density to be a big problem. Two other significant difficulties mentioned by 82% and 87% of respondents, respectively, are habitat loss and deforestation. The method used for this research involves a mixed-methods approach, using both quantitative and qualitative data to examine the relationships between urbanization, socio-economic factors, and natural resource depletion. The analysis is underscored by urbanization and sustainability theories and intends to identify the impacts of urbanization, understand socio-economic influences, and provide recommendations for sustainable development. The expected outcomes include quantification of urbanization impacts, analysis of socio-economic influences, and policy recommendations for mitigating negative impacts and promoting sustainable development.

Keywords: assessment, urbanization, impacts, natural resources, Makurdi, Benue.

СОЦИАЛЬНЫЙ ПОДХОД К ОЦЕНКЕ ВОЗДЕЙСТВИЯ УРБАНИЗАЦИИ НА ПРИРОДНЫЕ РЕСУРСЫ: КЕЙС-СТАДИ ШТАТА МАКУРДИ-БЕНУЭ, НИГЕРИЯ

Статья с данными

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Аннотация

Из-за урбанизации в мегаполисе Макурди окружающая среда подвергается всё большей нагрузке, что ставит под вопрос устойчивый рост. На основе опроса 185 местных жителей в данном исследовании рассматривается, как на ухудшение состояния окружающей среды и рост численности населения влияют такие факторы, как высокая рождаемость и миграция из сельской местности в города. Результаты исследования показывают, что предлагаемые способы решения проблем и предполагаемые проблемы, связанные с урбанизацией, в значительной степени совпадают. Хотя развитие сельских районов и посадка деревьев рассматриваются как успешные стратегии, сообщество считает, что необходимо улучшить городское планирование и обеспечить соблюдение законов. Полученные результаты подчеркивают, насколько важно усовершенствовать процедуры городского планирования, активизировать участие общины и внедрить действенные решения, чтобы смягчить негативные последствия урбанизации. В заключение следует отметить, что урбанизация Макурди связана с серьезными экологическими и социальными проблемами, такими как загрязнение, деградация среды обитания и утрата биоразнообразия. В частности, 84,6% респондентов обеспокоены ростом загрязнения окружающей среды, а 80% опрошенных считают большой проблемой высокую плотность населения. Две другие значительные проблемы, о которых упомянули 82 и 87% респондентов, соответственно, — это потеря среды обитания и вырубка лесов. В данном исследовании использован смешанный

метод с применением количественных и качественных данных для изучения взаимосвязи между урбанизацией, социально-экономическими факторами и истощением природных ресурсов. Анализ опирается на теории урбанизации и устойчивого развития и призван выявить последствия урбанизации, понять социально-экономические факторы и дать рекомендации по устойчивому развитию. Ожидаемые результаты включают количественную оценку воздействия урбанизации, анализ социально-экономических влияний и политические рекомендации по смягчению негативных последствий и обеспечению устойчивого развития.

Ключевые слова: оценка, урбанизация, воздействие, природные ресурсы, Макурди, Бенуэ.

Introduction

The environment is under more stress due to urbanization in Nigeria's Makurdi Metropolis, which raises questions regarding sustainable growth [1]. The world is increasingly becoming more urbanized, which damages plant biodiversity and alters plant habitat [2]. Population shift from urban areas to suburban fringes, decline in food supply, destruction of biodiversity, destruction or loss of environmentally sensitive areas. In urban settlement and management, biodiversity conservation is essential, and it is also a crucial aspect of greening. Problems like a lack of plant species and urban green space have become obstacles to the establishment of biologically appealing zones. But people are seeking ways to balance modernization and the environment, as well as ways to balance biodiversity with economic growth [3]. The rapid urbanization in Benue State, Nigeria, has precipitated profound transformations in land use and land cover patterns, characterized by the widespread conversion of natural habitats into urban areas, agricultural land, and other human-dominated landscapes. Urban growth has led to so many environmental problems,such as, pollution, deforestation, and loss of natural habitats [4]. This phenomenon has far-reaching consequences, including the loss of fertile farmland, decreased agricultural productivity, and compromised food security, as the most productive agricultural land is diverted to accommodate urban development [5] furthermore, the burgeoning urban population in Benue State has led to an escalation in social and economic activities, placing immense pressure on existing infrastructure and services. The impact of urbanization on biodiversity in African cities presents unique challenges and opportunities [6]. Noted that awareness of the benefits of urban green spaces is low among stakeholders in sub-Saharan Africa. population shift from urban areas to suburban fringes, decline in food supply, destruction of biodiversity, destruction or loss of environmentally sensitive areas.Notably, the criteria used to define an urban Centre vary significantly across countries, encompassing factors such as population size, density, and economic activities. Moreover, [7] provide a review of urbanization in tropical regions and its relationship with deforestation. The study notes that as urban areas grow, they encroach on forests that once served as biodiversity hotspots, reducing the number of plant species and ecosystem resilience. In emerging nations like Nigeria, where urbanization puts strain on ecosystems and changes social, economic, and environmental dynamics, this trend is especially noticeable. In addition to rearranging economies and locations, urbanization increases the demand on natural resources, causing previously unheard-of environmental stress. These adverse environmental impacts are best illustrated by Makurdi Metropolis in Benue State, where growing urban populations put a great deal of strain on the environment and disturb regional ecosystems. Urbanization play major roles in the loss of the world’s biodiversity and the homogenization of its biota. Nevertheless, comparatives studies of urban biodiversity leading to robust generalities of the status and drivers of biodiversity in cities at the global scale are not enough [4]. The issues with biodiversity fragmentation in Makurdi metropolis are not influenced by anthropogenic activities alone. Factors such as natural disasters from flooding contributed to the continual habitat alteration, most especially in the aquatic body. By evaluating the environmental implications of urban growth and suggesting ways for reducing the negative effects on Benue State's natural ecosystem, this study aims to investigate these dynamics inside Makurdi. This study offers a thorough understanding of the effects of urbanization on Makurdi's environmental health by combining survey data with previously published works, emphasizing the consequences for sustainable development and policy.

Scientific novelty of the research

The dynamics within the city of Makurdi are examined in this study. By combining survey data with previously released research, it also provides a comprehensive understanding of the effects of urbanization on Makurdi's environmental health, highlighting the implications for sustainable development and policy while evaluating the ecological implications of urban growth and offering solutions to lessen the detrimental effects on natural ecosystems.

The goal: to assess the social impacts of urbanization on natural resources in Makurdi and identify strategies for sustainable development.

The objectives

To conduct a thorough assessment of the current environmental situation in Makurdi, focusing on natural resource degradation and urbanization impacts, and identify the social factors influencing the relationship between urbanization and natural resource degradation, while examining existing policies and practices related to urban planning and natural resource management, developing and proposing strategies for promoting sustainable urban development and environmental conservation, and engaging with local stakeholders to raise awareness and build support for sustainable urban development and environmental conservation in Makurdi.

Relevance: this study is pertinent due to its investigation of the nexus between urbanization and natural resource degradation in Makurdi, providing valuable insights for sustainable urban planning, environmental management, and policy development.

Research methodology

4.1. Description of The Study Area

The Makurdi Local Government Area lies between lat.70 00l N and 70 45l N and long 80 00l and 80 32l E in the northeastern part of Benue State. It is situated within a physiographic zone called the Benue trough with a mean elevation of 92 meters above sea level. Makurdi shared boundary with Gwer West Local Government Area to the west, Gwer East Local

Government Area to the south, Guma to the North East and Doma to the North West. Politically, it falls within the Middle Belt region of Nigeria and has a radius of 16 kilometres from its centre. It is the capital of Benue State and headquarters of Makurdi Local Government Area. It serves as a major link between the Northern and Southern parts of Nigeria. The town has several drainage channels. These channels include river Benue, which bisects the town into South and north banks, and its tributaries including Urudu, Demepe, Kereke and Mu and the smaller ones include Idye and Kpege [8].

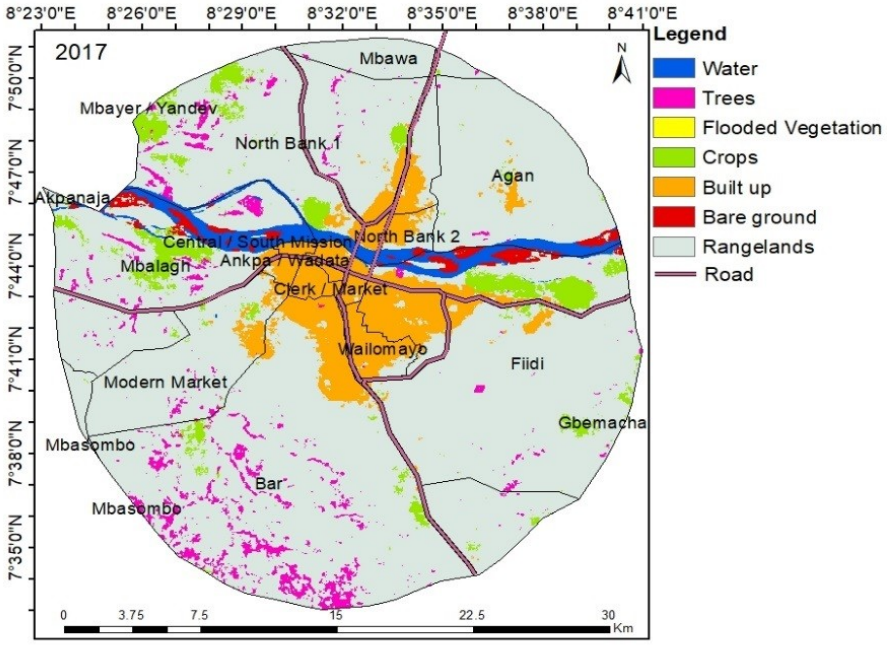

Figure 1 - Map of Makurdi showing wards and vegetation 2017
DOI: https://doi.org/10.60797/IRJ.2025.156.82.1

Note: based on [9]

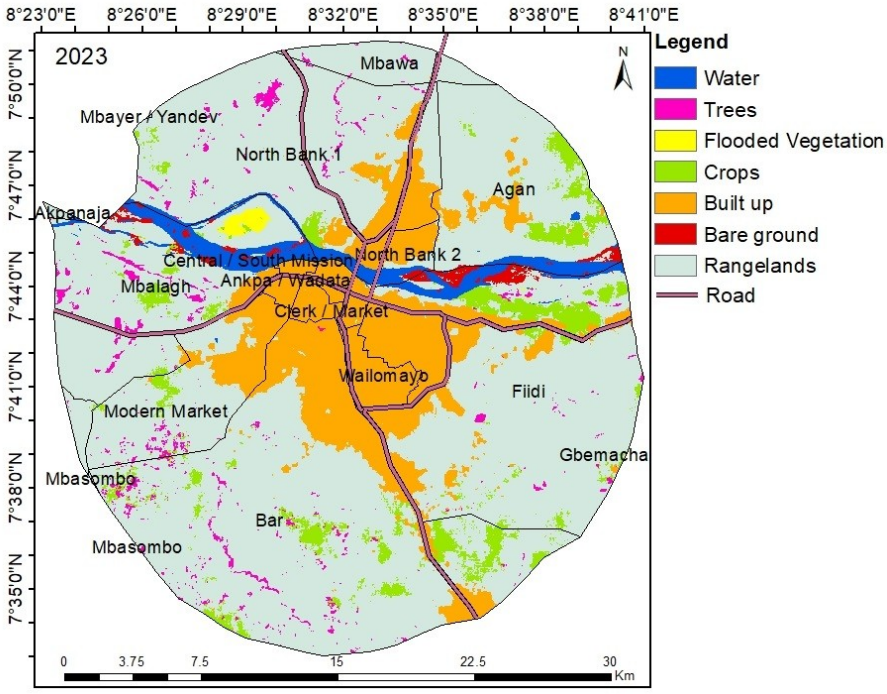

Figure 2 - Map of makurdi showing wards and vegetation 2023
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Note: based on [9]

Table 1 - Percentage of land cover showing by year

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Land Cover Type	2017 (sq.km)	2023 (sq.km)	2017 (%)	2023 (%)
Water	24.84	27.33	3.00	3.28
Trees	26.41	14.47	3.19	1.74
Flooded Vegetation	0.00	2.70	0.00	0.32
Crops	33.72	42.15	4.07	5.06
Built up	81.50	146.72	9.83	17.60
Bare ground	9.75	7.32	1.18	0.88
Rangelands	652.48	593.02	78.73	71.13

Note: Data is obtained from Sentinel-2 10m Land Use/Land Cover Time series : source, [9]

4.2. Study Design

The research employed a quantitative methodology, using structured surveys to gather data from 185 respondents in Makurdi. Stratified sampling ensured proportional representation across demographic variables such as gender, age, and occupation. Data collection focused on assessing demographic characteristics, urbanization drivers, environmental issues, and public opinions on sustainable urban management. Findings were tabulated to illustrate trends and population sentiments regarding urbanization's environmental impact. A descriptive design was selected to understand the extent of urbanization's impact within the area. Python R was used to analyze the data for an effective and clear presentation of the information gathered. The design made it easier to record demographic information and investigate the connections between environmental effects and urban growth drivers. As shown in frequency and percentage statistics, the study examined the reasons behind urbanization, environmental issues associated with urbanization, and public perception of possible remedies. These tables were crucial for understanding how urbanization affected the environment. Alternative approaches to assessing urbanization's impact on natural resources include physical/environmental methods like remote sensing, ecological footprint analysis, and life cycle assessment; economic approaches such as cost-benefit analysis, economic valuation, and green accounting; integrated approaches like sustainability assessment, urban metabolism analysis, and resilience-based approaches; and participatory and collaborative methods involving stakeholder engagement, participatory rural appraisal, and collaborative governance.

Results

Table 2 - Demographic Data

DOI: https://doi.org/10.60797/IRJ.2025.156.82.4

Demographic Data		
Distribution of Gender		
Sex of Respondent	Frequency	Percentage %
Male	105	56.8
Female	80	43.2
Total	185	100
Age of the Respondents		
Age of Respondents	Frequency	Percentage %
18-24	46	24.9
25-31	58	31.4
32-38	24	12.9
39-45	32	17.3
46 above	25	13.5
Total	185	100
Education Level of the Respondent		
Education Level of the Respondents	Frequency	Percentage %

Demographic Data		
Non-formal education	10	5.4
Primary	1	0.5
Secondary	49	26.5
Tertiary	100	54.1
Postgraduate	25	13.5
Total	185	100
Occupation of Respondents		
Occupation of Respondents	Frequency	Percentage %
Farming	46	24.7
Nursery Manager	4	2.2
Fishing	2	1.2
Trading	59	31.9
Civil Servant	49	26.5
Others	25	13.5
Total	185	100
Marital Status of Respondents		
Marital Status of Respondent	Frequency	Percentage %
Widowed	17	9.2
Divorced	7	3.8
Single	85	45.9
Married	76	41.1
Total	185	100

Note: Field Survey, 2024

Table 3 - Causes of Urbanization with Makurdi

DOI: https://doi.org/10.60797/IRJ.2025.156.82.5

Causes of Urbanization with Makurdi		
Increase in Birthrate		
Birthrate Increase	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	15	8
Agree	68	36.8
Strongly Agree	100	54.1
Total	185	100
Rural Urban Migration		
Rural Urban Migration	Frequency	Percentage %
Strongly Disagree	7	3.7
Disagree	19	10.3
Agree	73	39.5
Strongly Agree	86	46.5
Total	185	100
Employment Opportunities and Higher wage		
Employment Opportunities & Higher wage	Frequency	Percentage %
Strongly Disagree	13	7.0
Disagree	35	18.8

Causes of Urbanization with Makurdi		
Agree	76	41.3
Strongly Agree	61	32.9
Total	185	100
Migration due to Conflict and Environmental Disaster		
Migration due to Conflict & Environmental Disaster	Frequency	Percentage%
Strongly Disagree	12.7	6.9
Disagree	26.0	14.1
Agree	60.0	32.3
Strongly Agree	86.3	46.7
Total	185	100
Availability of Social Amenities		
Availability of Social Amenities	Frequency	Percentage %
Strongly Disagree	11	5.9
Disagree	25	13.5
Agree	89	48.1
Strongly Agree	60	32.4
Total	185	100

Note: Field Survey, 2024

Table 4 - Problems of Urbanization within Makurdi

DOI: https://doi.org/10.60797/IRJ.2025.156.82.6

Problems of Urbanization within Makurdi		
High Population		
High Population	Frequency	Percentage %
Strongly Disagree	5	2.7
Disagree	9	4.9
Agree	100	54.1
Strongly Agree	71	38.1
Total	185	100
Pollution		
Pollution	Frequency	Percentage %
Strongly Disagree	19	10.3
Disagree	24	13
Agree	91	49.1
Strongly Agree	51	27.6
Total	185	100
Deforestation		
Deforestation	Frequency	Percentage %
Strongly Disagree	1	0.5
Disagree	26	14.1
Agree	75	40.5
Strongly Agree	83	44.9
Total	185	100
Climate Change		
Climate Change	Frequency	Percentage%
Strongly Disagree	0	0
Disagree	29	15.7

Problems of Urbanization within Makurdi		
Agree	105	56.7
Strongly Agree	51	27.6
Total	185	100
Habitat Loss		
Habitat Loss	Frequency	Percentage %
Strongly Disagree	5	2.1
Disagree	30	16.2
Agree	105	56.7
Strongly Agree	45	25
Total	185	100
Soil Erosion		
Soil Erosion	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	25	13.5
Agree	97	52.4
Strongly Agree	61	33
Total	185	100
Lack of Law Enforcement		
Lack of Law Enforcement	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	17	9.2
Agree	72	38.9
Strongly Agree	94	50.8
Total	185	100

Note: Field Survey, 2024

Table 5 - Impacts of Urbanization within Makurdi

DOI: https://doi.org/10.60797/IRJ.2025.156.82.7

Over-Exploitation of Resources		
Over-Exploitation of Resources	Frequency	Percentage %
Strongly Agree	3	1.6
Agree	23	12.4
Disagree	81	43.8
Strongly Disagree	78	42.2
Total	185	100
Infrastructural Development of Cities withUrban Plan		
Development of Cities without Urban Planning	Frequency	Percentage %
Strongly Disagree	5	2.7
Disagree	26	14.1
Agree	96	51.9
Strongly Agree	58	31.3
Total	185	100
Indiscriminate Waste Disposal		
Strongly Disagree	1	0.5
Disagree	20	10.8
Agree	91	49.2
Strongly Agree	73	39.5

Over-Exploitation of Resources		
Total	185	100
Extinction of Species		
Extinction of Species	Frequency	Percentage %
Strongly Disagree	6	3.2
Disagree	34	18.4
Agree	87	47
Strongly Agree	58	31.4
Total	185	100
Degradation of Habitat		
Degradation of Habitat	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	27	14.6
Agree	97	52.4
Strongly Agree	59	31.9
Total	185	100
Changes in Species Distribution		
Changes in Species Distribution	Frequency	Percentage %
Strongly Disagree	3	1.6
Disagree	44	23.8
Agree	91	49.2
Strongly Agree	47	25.4
Total	185	100
Introduction of Invasive Species		
Introduction of Invasive Species	Frequency	Percentage %
Strongly Disagree	7	3.7
Disagree	29	15.7
Agree	81	43.8
Strongly Agree	68	36.8
Total	185	100

Note: Field Survey, 2024

Table 6 - Solution to Problem of Urbanization within Makurdi

DOI: https://doi.org/10.60797/IRJ.2025.156.82.8

Solution to Problem of Urbanization within Makurdi		
Tree Planting		
Tree Planting	Frequency	Percentage %
Strongly Disagree	0	0
Disagree	25	13.5
Agree	60	32.4
Strongly Agree	100	54.1
Total	185	100
Development of Rural Area		
Development of Rural Area	Frequency	Percentage %
Strongly Disagree	5	2.7
Disagree	22	11.9
Agreed	60	32.4
Strongly Agree	98	53
Total	185	100

Solution to Problem of Urbanization within Makurdi		
Proper Disposal of Waste		
Proper Disposal of Waste	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	19	10.3
Agree	70	37.8
Strongly Agree	94	50.8
Total	185	100
Proper Urban Planning		
Proper Urban Planning	Frequency	Percentage %
Strongly Disagree	69	37.3
Disagree	16	8.7
Agree	87	47.0
Strongly Agree	13	7.0
Total	185	100
Green Infrastructure		
Green Infrastructure	Frequency	Percentage %
Strongly Disagree	8	4.2
Disagree	14	7.7
Agree	77	41.6
Strongly Agree	86	46.5
Total	185	100
Renewable Energy Integration		
Renewable Energy Integration	Frequency	Percentage %
Strongly Disagree	1	0.5
Disagree	18	9.7
Agree	100	54.1
Strongly Agree	66	35.7
Total	185	100
Climate Resilient Design		
Climate Resilient Design	Frequency	Percentage %
Strongly Disagree	3	1.6
Disagree	17	9.2
Agree	105	56.8
Strongly Agree	60	32.4
Total	185	100
Community Engagement		
Community Engagement	Frequency	Percentage %
Strongly Disagree	2	1.1
Disagree	17	9.2
Agree	89	48.1
Strongly Agree	77	41.6
Total	185	100

Note: Field Survey, 2024

Discussion

6.1. Cross-tabulation of Data

Cross-tabulating demographic factors with perceptions of urbanization impacts is essential for understanding how different segments of the population view and are affected by urban growth. This analysis offers valuable insights into the variability of perceptions based on age, gender, and occupation, which can aid in designing targeted interventions and policies. First, it is crucial to structure the data to include both demographic details — such as age, gender, and occupation — as shown in Table 2

and responses to questions about urbanization. By analyzing how these demographic factors influence perceptions of urbanization's impacts, we can uncover patterns that reveal how different groups experience urban growth.

For instance, examining perceptions across various age groups can highlight whether younger or older respondents perceive urbanization differently. Table 2 Age of the Respondents illustrates these differences, showing how younger respondents might report higher levels of agreement with concerns about urbanization's impacts, such as increased pollution or habitat loss. This suggests that younger individuals may be more affected by or more aware of these issues compared to older groups. Gender-based analysis can uncover if there are notable differences in how males and females perceive the effects of urbanization. If, for example, female respondents express greater concerns about pollution, this could indicate a need for gender-specific environmental policies that address these unique concerns. Understanding these gender-specific perceptions can help tailor more effective and inclusive policies. Occupation-based perceptions further reveal how different professional groups view urbanization's impacts. Individuals in "Trading" might experience and report economic impacts differently than those in "Civil Service". This differentiation highlights the need for targeted interventions that address the specific needs of various occupational groups, such as improving trade-related infrastructure or enhancing public services for civil employees. Overall, cross-tabulating demographic factors with perceptions of urbanization impacts provides a nuanced understanding of how urban growth affects different groups. Table 2 Age of the Respondents alongside the statistical analysis, presents a comprehensive view of these varying perceptions, which can guide more effective and inclusive urban planning and policy-making. This approach helps identify specific concerns of diverse demographic segments and informs targeted strategies to mitigate the negative impacts of urbanization.

6.2. Correlation of Data

To explore the correlations between perceived causes of urbanization and its effects on biodiversity, it is essential to analyze how different urbanization drivers are related to changes in biodiversity as show in (figure 3) below. This involves examining survey data that includes responses on both perceived causes of urbanization and observed effects on biodiversity. The data should be organized so that each respondent's perceptions and observations are captured in separate columns, with responses rated on a Likert scale or numerical scale. The analysis begins with calculating the Pearson correlation coefficient between perceived causes of urbanization and their effects on biodiversity. This coefficient, which ranges from -1 to 1, helps quantify the strength and direction of the relationship between these variables. A correlation of 1 indicates a perfect positive relationship, -1 signifies a perfect negative relationship, and 0 indicates no correlation. For instance, if there is a high positive correlation, such as 0.8, between the perception of natural increase as a driver of urbanization and its effect on biodiversity, it implies that respondents who view natural increase as a major factor also perceive it as significantly impacting biodiversity. Such a correlation suggests that these respondents believe the natural increase in population is closely linked to adverse effects on biodiversity.

```
Correlation Matrix:
                        Natural_Increase  Rural_Urban_Migration  \
Natural_Increase                1.000000              -0.800000
Rural_Urban_Migration          -0.800000               1.000000
Employment_Opportunities        0.867722              -0.433861
Migration_Conflict              0.273861               0.000000
Social_Amenities                0.400000               0.100000
Biodiversity_Effect             0.700000              -0.500000

                        Employment_Opportunities  Migration_Conflict  \
Natural_Increase                        0.867722        2.738613e-01
Rural_Urban_Migration                  -0.433861        0.000000e+00
Employment_Opportunities                1.000000        2.970443e-01
Migration_Conflict                      0.297044        1.000000e+00
Social_Amenities                        0.542326        8.215838e-01
Biodiversity_Effect                     0.542326       -6.080942e-17

                        Social_Amenities  Biodiversity_Effect
Natural_Increase                0.400000         7.000000e-01
Rural_Urban_Migration           0.100000        -5.000000e-01
Employment_Opportunities        0.542326         5.423261e-01
Migration_Conflict              0.821584        -6.080942e-17
Social_Amenities                1.000000         4.000000e-01
Biodiversity_Effect             0.400000         1.000000e+00

Correlation between Natural Increase and Biodiversity Effect:
0.6999999999999998

Correlation between Rural-Urban Migration and Biodiversity Effect:
-0.5000000000000001
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Figure 3 - Correlation Matrix showing the respondents views

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6.3. Overall Analysis of Urbanization in Makurdi Metropolis

The analysis of urbanization in Makurdi, based on responses from data collected, offers a comprehensive view of the causes, problems, and effects of urban growth in the area. The data reveals significant insights into how urbanization impacts the environment and community, and highlights potential solutions. Natural increase and rural-urban migration are identified as the primary drivers of urbanization, with 92% and 92.7% of respondents, respectively, recognizing these factors as significant

contributors to urban expansion. Additionally, 68% attribute urban growth to employment opportunities, 71.3% to migration due to conflict and environmental disasters, and 79.3% to the availability of social amenities. This consensus underscores the multifaceted nature of urban growth in Makurdi, driven by both demographic factors and the pursuit of better living conditions. A significant 80% of respondents view high population density as a major issue, while 84.6% are concerned about increased pollution. Deforestation and habitat loss are also prominent issues, with 82% and 87% of respondents, respectively, citing these as major problems. This agreed with [10] that, "deforestation is the most relevant and complex challenge in the debate on reconciling conservation and regional development". Climate change and soil erosion are similarly viewed as adverse effects of urban growth, affecting 81% and 73% of respondents. Furthermore, inadequate law enforcement (74%) exacerbates these issues by failing to regulate urban expansion effectively. The effects of urbanization on biodiversity and other factors are equally concerning. Respondents perceive increased disease outbreaks (79.4%), overexploitation of resources (79.3%), and improper waste disposal (74%) as significant consequences. Extinction of species (80%) and habitat degradation (87.4%) are particularly alarming, with 81% noting changes in species distribution and 71% observing the introduction of invasive species.

In terms of solutions, tree planting is widely supported, with 80% of respondents strongly agreeing on its effectiveness. Rural area development (78%), proper waste disposal (79%), and green infrastructure (61%) also receive strong backing. However, there is notable dissatisfaction with current urban planning, with only 3% of respondents strongly agreeing on its effectiveness, indicating a significant gap in urban management strategies. Renewable energy integration (56%) and climate-resilient design (50%) are also endorsed, although community engagement (44.7%) is less emphasized. The data suggests a strong alignment between the perceived problems of urbanization and the proposed solutions. While tree planting and rural development are seen as effective measures, the community expresses a clear need for improved urban planning and enforcement. The findings underscore the importance of enhancing urban planning processes, increasing community engagement, and implementing practical solutions to address the negative impacts of urbanization. In summary, urbanization in Makurdi is associated with significant environmental and social challenges, including biodiversity loss, pollution, and habitat degradation. Addressing these issues requires a comprehensive approach involving better urban planning, effective policy enforcement, and active community involvement to mitigate the adverse effects and promote sustainable urban development.

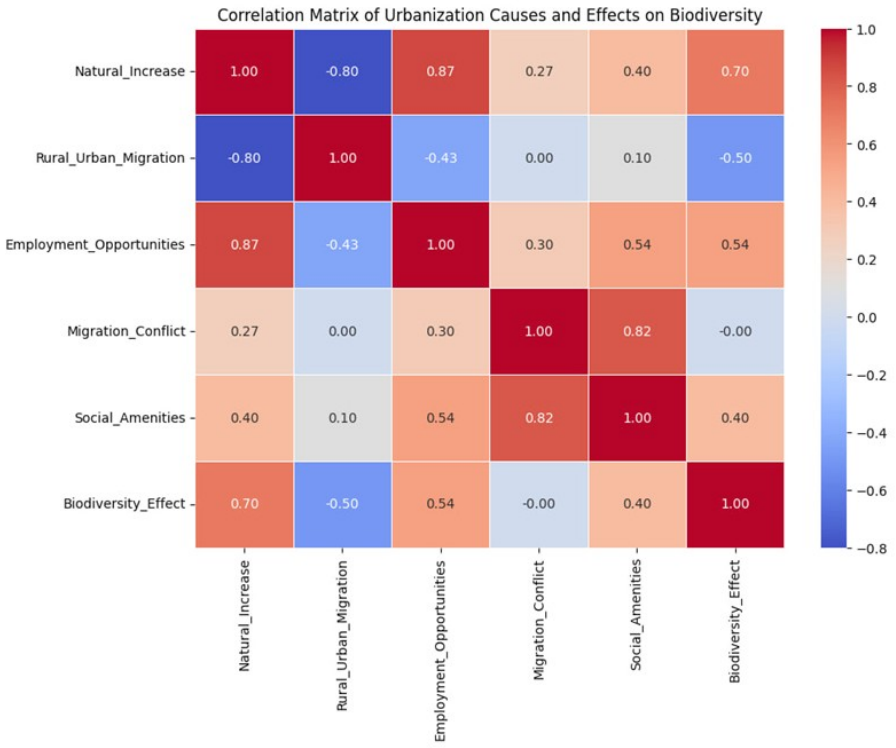

Figure 4 - Correlation Matrix of Urbanization Causes Effects on Biodiversity
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Conclusion

Urbanization in Makurdi has led to several pressing environmental issues, from resource overuse to pollution and habitat degradation. The city's population growth, spurred by both natural increase and rural migration, is stretching Makurdi's ecosystem to its limits. The data from this study reveal that pollution, deforestation, and soil erosion are significant concerns for residents, driven largely by unregulated urban expansion. Reforestation, improved waste management, climate resilience design, community involvement, and alternative energy solutions are all strongly favored by the community in spite of these obstacles. Together with thorough urban planning, these tactics can help Makurdi achieve sustainable growth that benefits the city's people and the environment. This strategy calls for legislative action that protects community ecosystems while attending to the particular requirements of urban centers, serving as a model for other expanding cities in comparable environmental circumstances.

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Не указан.

Рецензия

Все статьи проходят рецензирование. Но рецензент или автор статьи предпочли не публиковать рецензию к этой статье в открытом доступе. Рецензия может быть предоставлена компетентным органам по запросу.

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Conflict of Interest

None declared.

Review

All articles are peer-reviewed. But the reviewer or the author of the article chose not to publish a review of this article in the public domain. The review can be provided to the competent authorities upon request.

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