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EXPLORING THE DIMENSIONS OF LAND USE CHANGES IN DAVAO CITY

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ABSTRACT

Davao City, Philippines' urban landscape has witnessed substantial changes in land use patterns driven by population growth, economic development, and infrastructure improvements. These changes offer both opportunities for progress and sustainability and social equity challenges. Understanding residents' perceptions of these changes is essential for informed decision-making. This research utilized a quantitative survey that explored residents' awareness, concerns, and preferences regarding land use changes. Data analysis employing SPSS software includes factor analysis to identify underlying constructs. The findings highlighted residents' concerns about the negative environmental and social impacts of land use changes and their support for sustainable development practices, public participation, and government regulation. These insights provide valuable guidance for future urban development planning in Davao City.

Keywords: Davao City, Land use, Residents' perceptions, Sustainable development practices, Urban development planning

1. INTRODUCTION

The Philippines has undergone significant transformations in the past few years due to changing land utilization patterns. The alteration of the natural landscape through human activities, known as land use change, is primarily focused on the land's economic functions (Paul & Rashid, 2017). These changes were driven by various factors, including population growth, economic development, transportation infrastructure improvement, and institutional and policy change (Buladaco, 2016). These factors interact with each other to shape the patterns and dynamics of land use changes in the city. Davao City, a central economic hub in the Philippines, has undergone significant land-use changes recently. While such changes offer opportunities for progress, they also raise concerns about environmental sustainability and social equity (Hasan et al., 2020). Uncontrolled and unplanned land use changes can have numerous negative impacts on the environment, economy, and society (Pandey et al., 2017). These include loss of natural habitats, destruction of ecosystems, depletion of natural resources, increased pollution, decreased water availability, reduced agricultural productivity, and social displacement of communities (Izakovičová et al., 2018) Understanding how residents perceive land-use changes in Davao City is crucial for informed development decisions. This research employed a survey to capture residents' awareness, concerns, and preferences regarding these changes. The survey explored the residents' knowledge of land use and its environmental impacts, their opinions on government involvement, public participation in planning, and their desires for sustainable future development. Additionally, the survey gauged residents' willingness to adopt sustainable practices and support environmentally responsible initiatives. This comprehensive approach, analyzed using SPSS software, will provide valuable insights to guide future development plans for Davao City.

2. METHODOLOGY

In this study, the researcher utilized a quantitative research methodology. The researcher collected the data through a physical survey instrument containing 30 items to capture information on the respondents' perceptions and experiences of land-use changes in Davao City. The target population for this study was Non-Governmental Organizations (NGOs) working on urban development issues, Government employees involved in planning and development, and residents of Davao City from various socio-economic backgrounds—a sample of 150 respondents. The data collected from the survey was analyzed using the Statistical Package for the Social Sciences (SPSS) software. This software allows for statistical analysis to identify patterns, trends, and relationships between variables related to land use changes and their impacts.

3. RESULTS AND DISCUSSIONS

This section presents the results of KMO and Bartlett's Test and Principal Component Analysis. The derivation of the number of factor structures and the rotated matrix of the model was also presented using Varimax with Kaiser Normalization. The Kaiser Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's test of sphericity were performed to ensure that the construct can be tested for factor analysis. It can be gleaned from Table 1 that the KMO value is .790, which is above the recommended value of .5, indicating that the sample is meritorious and adequate for factor analysis. Meanwhile, Bartlett's test was performed to check if there is a certain redundancy between the variables

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that can be summarized with a few numbers of factors. The results revealed that the p-value is significant (p<.05), indicating that the data have patterned relationships, and factorability is assumed.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.790
Bartlett's Test of Sphericity	Approx. Chi-Square	1521.081
	Df	300
	Sig.	.000

As shown in the preliminary analysis, it can be generalized that the items in the tool are suitable and adequate for the extraction of factors and, thus, ready for factor analysis. The derivation of factor structure was determined through the eigenvalues of the components. As a rule of thumb, components whose Eigenvalue is at least one are selected. Table 2 presents the number of constructs extracted, initial Eigenvalues associated with the specified constructs, the percentage of total variance, and the cumulative percentage of each construct. After utilizing the criterion for Eigenvalue, the 30 items of the scale measure even underlying factors because the first seven components have an Eigenvalue of at least 1.

Table 2. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.775	27.102	27.102	6.775	27.102	27.102	4.580	18.318	18.318
2	2.737	10.950	38.052	2.737	10.950	38.052	2.245	8.979	27.297
3	1.817	7.269	45.321	1.817	7.269	45.321	2.205	8.818	36.115
4	1.593	6.372	51.692	1.593	6.372	51.692	2.059	8.238	44.353
5	1.235	4.942	56.634	1.235	4.942	56.634	2.037	8.146	52.499
6	1.138	4.553	61.187	1.138	4.553	61.187	1.692	6.767	59.267
7	1.021	4.083	65.270	1.021	4.083	65.270	1.501	6.003	65.270
8	.912	3.649	68.919						
9	.846	3.382	72.302						

Extraction Method: Principal Component Analysis.

To strengthen the results of the previous table, Figure 1 illustrates the scree plot, displaying the number of the factor versus its corresponding Eigenvalue. The scree plot indicates that the initial seven factors explain most of the data's variability, as evidenced by their Eigenvalues exceeding 1. On the other hand, the remaining factors contribute minimally to the variability, suggesting they are less significant.

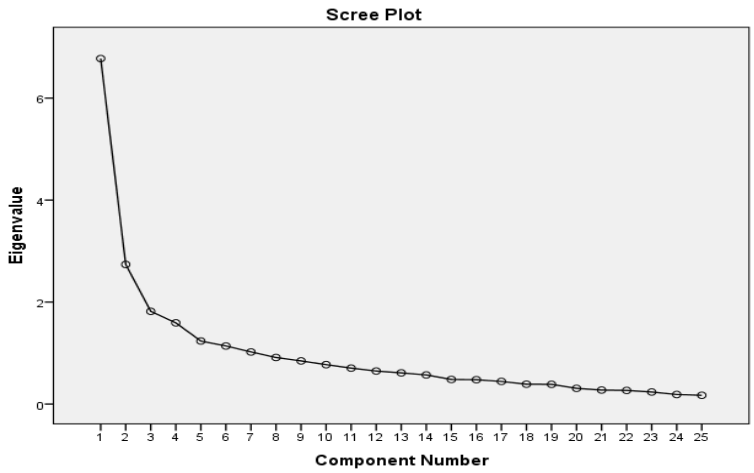

Figure 1. Scree Plot

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Based on the criterion, 25 items were categorized into six constructs: Environmental Impact of Urban Development, Land Use Transformation, Sustainable Urban Development, Negative Impacts of Urban Development, and Land Regulation and Environmental Awareness.

In Table 3, the residents' responses to a set of survey questions (items 6, 13, 9, 7, 14, 10, 8, 12, 15) all point towards a shared concern about the negative consequences of land-use changes in Davao City. These concerns encompass environmental issues like declining air quality, environmental degradation, increased risk of flooding, and threats to wildlife habitats. Social impacts are also a worry, with residents expressing concerns about rising food prices due to land conversion and declining quality of life due to the loss of green spaces and a feeling of disconnect from nature. Significantly, the survey also suggests that some residents believe a lack of public participation in land-use decisions might be a contributing factor to these negative effects.

Table 3. Rotated Component Matrix with Items Grouped Under Environmental Impact of Urban Development.

Item No.	Items	Factor Coefficient	Construct
i6	Land-use changes have negatively impacted air quality in the city.	.786	**Environmental Impact of Urban Development**
i13	Traffic congestion has worsened due to new developments.	.713	
i9	The changes have had a negative impact on the overall health of the environment.	.710	
i7	These changes have increased the risk of flooding in some areas.	.700	
i14	The loss of green spaces has negatively impacted my quality of life.	.647	
i10	I am concerned about the long-term environmental consequences of these changes.	.581	
i8	The loss of natural habitats is a threat to wildlife in Davao City.	.577	
i12	The conversion of agricultural land has led to increased food prices.	.570	
i15	I feel less connected to nature due to the changes in land use.	.492	
i19	Public participation is important in making decisions about land use in the city.	.474	

The responses to the survey (items 1, 3, 5, and 2) in Table 4 show a clear understanding of the ongoing land-use transformation in Davao City. This table highlighted the concept in which the respondents have noticed changes in land use (item 1, with the highest factor of .717). The survey responses also point to specific types of transformation. Item 3 (factor coefficient .518) highlighted the conversion of agricultural land for commercial purposes, suggesting a shift in land use priorities. Similarly, item 5 (factor coefficient .441) indicates a decline in green spaces, and item i2 (factor coefficient .435) reflects the expansion of residential areas. These findings paint a picture of a city undergoing significant changes in land use patterns, a trend consistent with rapid urbanization in many developing countries (Dawson et al., 2020).

Table 4. Rotated Component Matrix with Items Grouped Under Land Use Transformation.

Item No.	Items	Factor Coefficient	Construct
i1	I have noticed changes in how land is being used in Davao City in recent years.	.717	**Land Use Transformation**
i3	The conversion of agricultural land to commercial areas is a major concern.	.518	
i5	There has been a loss of green spaces within Davao City.	.441	
i2	There has been an increase in residential areas in the city.	.435	

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Table 5 shows that items i23, i24, and i25 describe that the respondents' preferences in Davao City lean towards sustainable development practices. The highest factor coefficient (.747) for item i23 indicates strong support for combining residential and commercial areas. This approach can contribute to sustainability by reducing car reliance and promoting neighborhood walkability. Similarly, item i24 (factor coefficient .628) highlighted resident belief in the benefits of urban agriculture, a practice that fosters a more sustainable food system through local production. Finally, item i25 (factor coefficient .545) reflects residents' desire for new developments to prioritize walkable areas and readily available public transportation options. These preferences for mixed-use development, urban agriculture, and walkable neighborhoods (Brookfield, 2016) with public solid transportation (Loo et al., 2016) all point toward a shared interest in sustainable urban planning for Davao City.

Table 5. Rotated Component Matrix with Items Grouped Under Sustainable Urban Development.

Item No.	Items	Factor Coefficient	Construct
i23	I support the development of mixed-use projects that combine residential and commercial areas.	.747	**Sustainable Urban Development**
i24	I believe that promoting urban agriculture can be beneficial for the city.	.628	
i25	New developments should prioritize walkability and public transportation options.	.545	

Table 6 shows items i11 and i4, where respondents recognized the negative impacts of land use changes in urban development. The first item (i11) addresses the challenge of finding affordable housing due to land use changes, showing a strong association with the construct (factor coefficient of .755). The second item (i4) highlighted the issue of deforestation resulting from new infrastructure projects, also strongly associated with the "Negative Impacts of Urban Development" construct (factor coefficient of .640). These findings highlighted the consequences of urban development, such as housing affordability challenges and environmental degradation, emphasizing the critical importance of balanced decision-making to address these negative impacts and promote sustainable development effectively.

Table 6. Rotated Component Matrix with Items Grouped Under Negative Impacts of Urban Development

Item No.	Items	Factor Coefficient	Construct
i11	Land-use changes have made it more difficult to find affordable housing in the city.	.755	**Negative Impacts of Urban Development**
i4	The development of new infrastructure projects has led to deforestation	.640	

The factor coefficient values in Table 7 indicate the strength of association between each item and the construct. Item i18 (factor coefficient of .760) expresses a belief in the need for increased governmental regulation of land development, which suggests a strong correlation with the construct. Similarly, item i17 (factor coefficient of .743), indicating personal awareness of the environmental impacts of land-use changes, significantly correlates with the construct. These findings suggest that respondents who support greater government regulation of land development are often well-informed about the environmental effects of land-use changes, highlighting the interconnectedness of land regulation and environmental awareness.

Table 7. Rotated Component Matrix with Items Grouped Under Land Regulation & Environmental Awareness.

Item No.	Items	Factor Coefficient	Construct
i18	I believe that the government should do more to regulate land development.	.760	**Land Regulation & Environmental Awareness**
i17	I am informed about the environmental impacts of land-use changes.	.743	

4. CONCLUSION

Based on the findings, the researcher concluded that the factors influencing land-use dynamics in Davao City, Philippines, are multifaceted. Preliminary analyses, such as KMO and Bartlett's Test and Principal Component Analysis, affirmed the suitability of survey items for factor extraction and analysis. The derived factor structures delineated five distinct constructs: Environmental Impact of Urban Development, Land Use Transformation, Sustainable Urban Development, Negative Impacts of Urban Development, and Land Regulation and Environmental Awareness. These

constructs offer insights into various facets of land-use dynamics and community perceptions. Further examination through rotated component matrices underscored respondents' concerns about negative environmental and social impacts, their comprehension of ongoing land-use changes, preferences for sustainable development practices, and awareness of specific negative impacts. These findings underscore the complexity of decision-making regarding land use and emphasize the significance of community engagement and informed participation in crafting sustainable urban development strategies for Davao City.

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