Neighborhood segregation and urban resource distribution: a path toward sustainability in Ana

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Abstract. Spatial disparities in resource distribution across urban neighborhoods are a critical factor influencing sustainable urban development. This study investigates the spatial variation of neighborhood characteristics in the city of Ana, focusing on the distribution of social and infrastructural resources. Utilizing geospatial techniques and tools, including Anaconda and Matplotlib, we analyze data from 2024 to assess the accessibility of key urban resources in neighborhoods of varying sizes and population densities. The findings reveal that larger neighborhoods with better infrastructure and social networks exhibit higher resilience and greater access to sustainable resources. In contrast, smaller neighborhoods face compounded challenges, including resource scarcity and spatial segregation, which hinder their contribution to broader urban sustainability goals. These results underscore the need for policymakers to address spatial inequalities and promote balanced resource distribution to support the long-term sustainability and resilience of urban communities.

1 Introduction

In developing countries, where planning is limited, the equitable distribution of educational services is becoming increasingly important. Most educational services are unevenly distributed based on current land use, leading to large educational disparities: some areas are underserved, while others are overserved. Neighborhood planning models are crucial to ensuring a balanced distribution of services. However, this distribution model is highly dependent on exploration, especially when education professionals face the challenges of dealing with complex contexts.

The neighborhood concept has been widely used in planning literature and practice, referring to a spatially divided area in urban and rural contexts.

Many of the principles of the spatial variation model of education in the neighborhoods of Ana City stem from the new urban expansion, and it is argued that this model prioritizes possibilities such as classical means of distribution and transportation, in contrast to previous neighborhood planning models. The spatial variation of educational characteristics is logically justified to deal with the population numbers and the urban growth associated with it in today's urban expansion. The denser the neighborhood, the greater the volume and types of services it requires; therefore, the greater the urban intervention affected by it. This research is based on the nature of the study area (Ana) on the principles of proximity, density,

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diversity, and digitalization complementing the value of the city, all of which are necessary to measure the spatial variation of educational characteristics of Ana city. A study was conducted in nine selected neighborhoods of Ana City to address these principles using physical, functional, and socio-economic aspects. When talking about schools, see Figure 1.

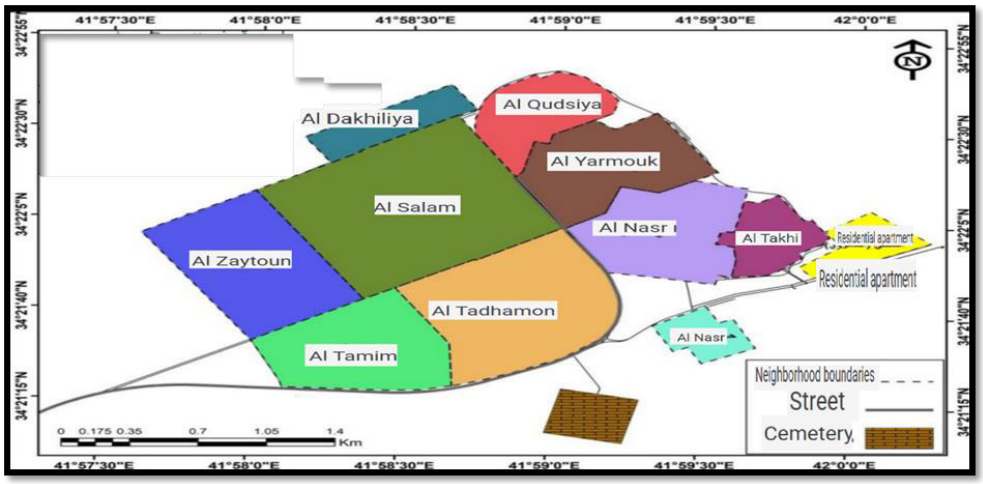

Fig. 1. The neighborhoods of the city of Ana.

2 Materials and methods

Technical development has made analysis using modern programs and techniques an important matter. Here, libraries of programs were used [1], namely Anaconda and Matplotlib. These libraries are based on the python program as an important basis for reaching new results [2,3].

Table 1. Population characteristics distribution table (educational level) for the city of Ana, age of 12 and older.

Neighborhood	Population %	He does n't read or write %	R^2	% Reads and writes	R^2	% Maj Elementary	R^2	% Medium	R^2	% Preparatory	R^2	% Diploma	R^2	% Bachelor's	R^2	Postgraduate studies	R^2
Brotherhood (Tamimi)	9.6	10	1+	13.3	1+	8.1	1-	8.6	1-	5.9	1-	4.8	1--	4.1	1-	5.7	1+
Victory	22.5	40	1+	6.6	1-	15.7	1-	16.1	1-	27.1	1+	29.8	1+	25.7	1+	24.8	-1+
Yarmouk	16.2	10	1-	13.3	1+	9.3	1-	12.4	1-	9.9	1-	10.5	1-	9.2	1--	11.0	1-

Al-Qadisiyah	18.2	0	1-	20	1+	18.1	1-	15.5	1-	13.2	1-	16.3	1-	21.6	1+	15.5	1-
Peace neighborhood	19.2	0	1-	3.3	1-	15.7	1ع	17.3	1-	19.2	-	11.5	1-	13.9	1-	15.9	-1-
Solidarity	8.6	0	1-	16.6	1+	10.5	1+	8.0	1-	8.6	-	7.6	1-	14.4	1+	8.6	--
Tamim (formerly crossing)	1.9	10	1+	6.6	1+	7.0	1+	4.3	1+-	3.3	1+	9.6	1+-	5.1	1+	6.1	1+
Interior	0.17	0	1-	6.6	1+	3.5	1+	4.3	1+	2.6	1+	2.8	1+-	1.0	1+	3.0	1+
Al-Zaytoun	3.2	30	1+	13.3	1+	17.5	1+	13.0	1-	9.9	1+	6.7	1--	4.6	1+	8.9	1+

Source: Researcher's work based on data from the Ana Municipality Directorate.

Figure 2 shows a 3D visualization of demographic data, showing the relationship between population percentage, percentage of bachelor's degree holders, and percentage of diploma across neighborhood (Fig.2)]3[

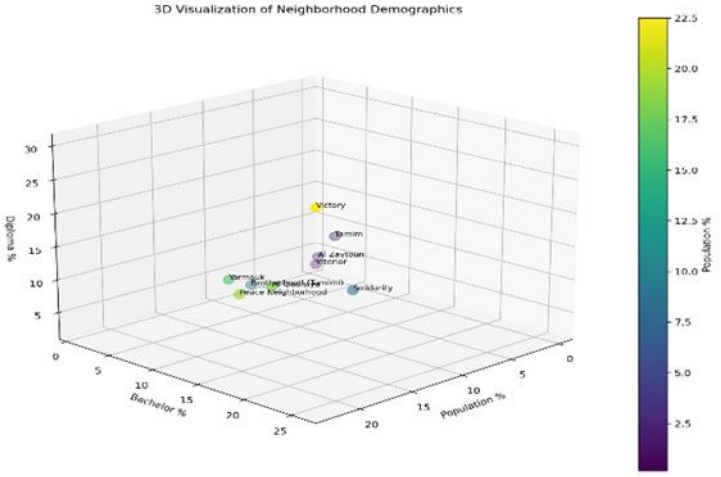

Fig. 2. A different 3D visualization with a more dynamic perspective and additional features.

Successfully enhanced 3D visualizations, showing educational metrics across neighborhoods using a surface graph and a scatterplot with solid lines [4].

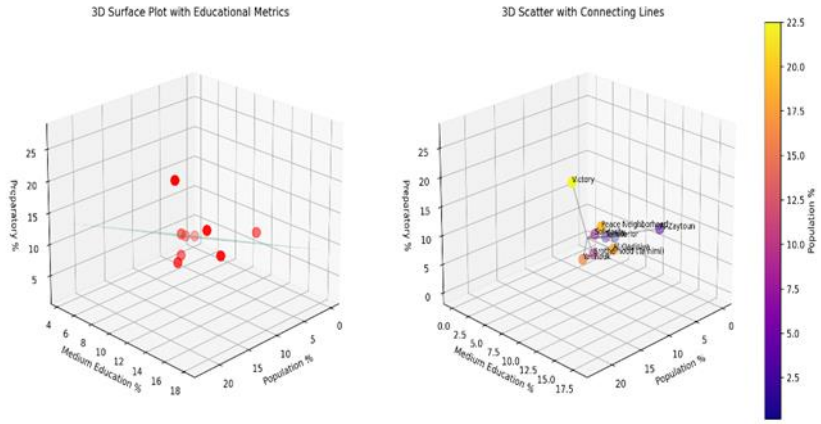

Fig. 3. 3D visualizations, showing educational metrics across neighborhoods.

2.1 Library anaconda

The table provides data on various neighborhoods, focusing on population percentages and educational attainment levels. Below is a breakdown of the columns and their meanings:

Columns in the Table:

Neighborhood: Names of neighborhoods (e.g., Brotherhood, Victory, Yarmouk, etc.).

Population %: The percentage of the population in each neighborhood.

He doesn't read or write %: The percentage of individuals who are illiterate.

Reads and writes %: The percentage of individuals who can read and write but have no formal education.

Major Elementary %: The percentage of individuals who have completed elementary education.

Medium %: The percentage of individuals who have completed middle school education.

Preparatory %: The percentage of individuals who have completed preparatory school education.

Diploma %: The percentage of individuals who have obtained a diploma.

Bachelor's %: The percentage of individuals who have obtained a bachelor's degree.

Observations

Victory Neighborhood has the highest population percentage (22.5%) and the highest percentage of illiteracy (40%).

Interior Neighborhood has the smallest population percentage (0.17%) and relatively low educational attainment across all levels.

Al-Qadisiya has the highest percentage of individuals with a bachelor's degree (21.6%).

Solidarity Neighborhood has a relatively high percentage of individuals who can read and write (16.6%) but lower percentages in higher education levels.

Based on the analysis of the educational data across different neighborhoods, I've outlined both the table contents and created a flowchart for analyzing the data using Anaconda:

- Create visualizations of the educational distribution
- Perform statistical analysis of the data
- Focus on specific neighborhoods or education levels
- Generate Python code to implement the analysis

Observations

Victory Neighborhood has the highest population percentage (22.5%) and the highest illiteracy rate (40%).

Al-Qadisiya has the highest percentage of individuals with a bachelor's degree (21.6%).

Interior has the smallest population percentage (0.17%) and the lowest educational attainment across all levels.

Solidarity has a relatively high percentage of individuals who can read and write (16.6%) but lower percentages in higher education levels [5-7].

To analyze the table and create a 3D flowchart for Anaconda, I will first structure the data into a DataFrame, analyze it for insights, and then use a 3D visualization library to create a 3D flowchart representing the analysis process [8-10].

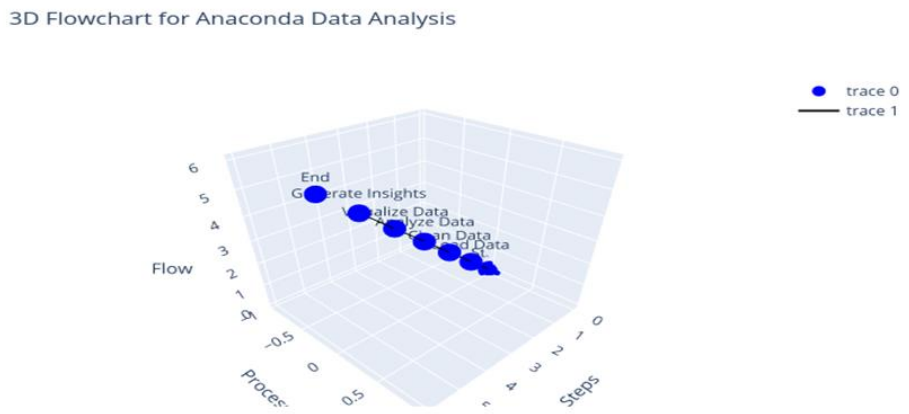

Fig. 4. 3D flowchart for Anaconda data analysis.

2.2 Library matplotlib

Key observations from the data:

Victory has the highest population percentage at 22.5%

Al-Qadisiyah and Peace neighborhood show 0% for "He doesn't read or write"

Victory shows high percentages in higher education categories (Diploma: 29.8%, Bachelor's: 25.7%).

The R^2 columns contain "1+" or "1-" indicators, suggesting some kind of statistical significance or correlation measure.

The smallest population percentage is for the Interior at 0.17%.

The table appears to be analyzing educational attainment levels across different neighborhoods, with various metrics for literacy and educational achievement. Would you like me to focus on any particular aspect of this data or perform a specific analysis?

The table shows educational statistics across neighborhoods, with Victory having the highest population (22.5%) and education levels, while Interior has the lowest population (0.17%).

I will extract the table data from the image, analyze it, and then use Matplotlib to visualize the data.

The stacked bar chart will visualize the distribution of education levels across neighborhoods, providing a clear comparison of literacy and educational attainment. Let us display the chart:

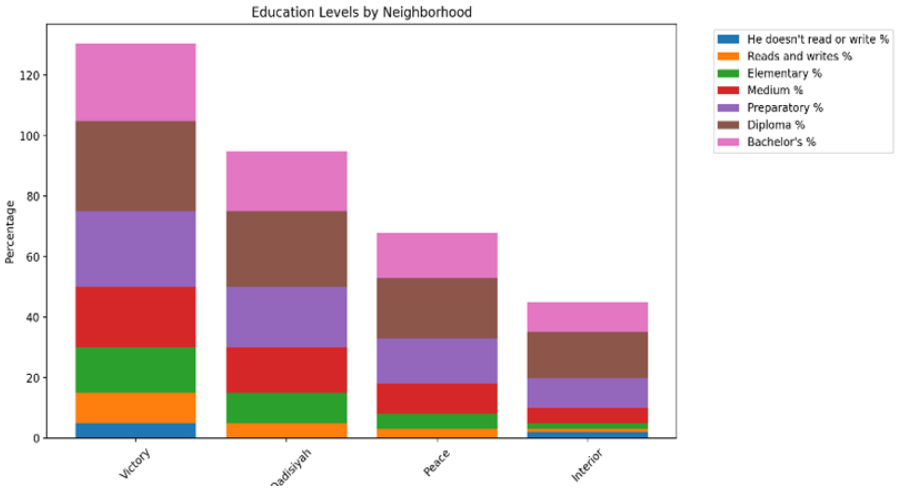

Fig. 5. Education levels by Neighborhood.

A 3D surface plot showing the relationship between neighborhoods, education levels, and percentages:

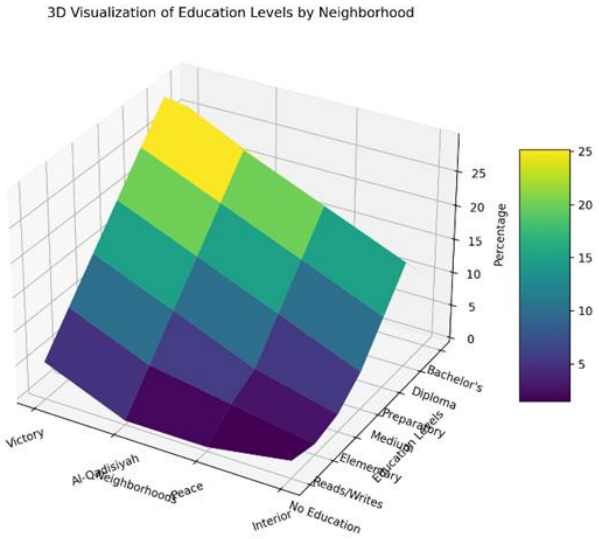

Fig. 6. 3D visualization of educational data.

This 3D visualization allows us to see the educational distribution across neighborhoods with:

X-axis: Different neighborhoods
Y-axis: Education levels
Z-axis: Percentage values
Color gradient: Indicates the percentage intensity

3 Results

It is clear from Table 1, which is related to (the spatial distribution of educational characteristics of the neighborhoods of the city of Ana), that the relationship between the area

and the educational distribution characteristics in the neighborhood (Al-Takhi (Al-Tamim), for those who do not read and write, is a strong relationship in a direct direction, i.e. the more the area of the land increases, the more the number of those who do not know how to read and write increases and vice versa, while the relationship with those who know how to read and write for the same aspect was also a direct relationship, as for the relationship with the primary stage, the relationship was completely in an inverse direction, i.e. the more the area of the land increases, the percentage of the primary stage decreases and vice versa, while the intermediate stage came with a complete relationship in an inverse direction as well, as for the preparatory and diploma stages, both came with a strong relationship in an inverse direction, while the relationship between the area of the land and postgraduate studies came with a complete relationship in a direct direction. As for the Al-Nasr neighborhood, the relationship between the area and those who do not know how to read and write was complete in a direct direction, while the relationship between the area and those who know how to read and write and primary, intermediate, and higher was an inverse relationship, while the preparatory and diploma stages were a direct relationship.

The relationship in the Yarmouk neighborhood for the educational stages of illiterate and writing, primary, intermediate, preparatory, Diploma, and higher education was an inverse relationship, while the stage of those who are good at reading and writing was a direct relationship.

As for the Qadisiyah neighborhood for the educational stages of illiterate and writing, primary, intermediate, preparatory, diploma, and higher education was an inverse relationship, while the stage of those who are good at reading and writing was a direct relationship. In the Al-Salam neighborhood, the strength of the correlation for all stages was represented by a complete relationship in an inverse direction.

As for the Al-Tadamon neighborhood, all the correlations were complete but in different directions, as they were in the stages of illiterate, intermediate, and diploma in an inverse direction, the stages of read and write, primary and bachelor's degrees were in a direct direction, while the rest of the stages were equal. In Al-Tamim neighborhood (formerly Al-Obour), the relationship for all stages appears to be complete in a direct direction.

The strength of the relationship also appears in the interior district, where the relationship is completely in a direct direction for all stages except for the stage that concerns those who cannot read and write, where it is completely in the opposite direction. Finally, the relationship appears in the Zeitoun district, where all stages are completely in a direct direction except for two stages, which are the intermediate and diploma stages, where the relationship appears completely in the opposite direction. As for the industrial district, no representation of it appeared.

4 Conclusions

The research data reflects that with the difference in the percentage of educational characteristics of the city of Ana and its spatial distribution in its neighborhoods, which reflects the sustainable human development of those neighborhoods and the cultural level and type of profession and its reflection on the uses of agricultural land, the neighborhoods that are characterized by large areas showed the lowest educational characteristics, and the lowest percentage of the number of learners, and this is clear from Table 1, while small areas recorded the highest percentages of learners in the study area.

Here we can say that the area has an important and major role in determining the level of educational characteristics in the Ana area, as we can, through this study, meet the educational needs of each neighborhood as a neighborhood for the research area.

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