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The Impact of Open Spaces on Residential Property Values

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Abstract: The increasing population density in urban areas leads to further construction of houses, and less land is being distributed to open spaces. Thus, there are preservation efforts in many cities to preserve open spaces and maintain the benefits. Ultimately, people desire to live near open spaces to enjoy their benefits, impacting the residential property values. This study attempts to explore the relationship between open spaces and the effects on the values of its neighboring residential properties, specifically in the city of Shanghai, using the hedonic model. The study analyzed the impact through several aspects, including open space type, size, and proximity to residential properties. Results suggest that open spaces, in general, do have the impact of increasing residential property values, and the effect could vary according to the size, type, and distance to residential property. This study helps decision-makers better implement future housing policies and city planning models.

Keywords: Residential property values, Open space, Hedonic model.

1. Introduction

In the current society, over 50% of the population lives in cities [1], causing the population density in cities to rapidly increase. In particular, the city of Shanghai in China is one of the most populated megacities and has experienced rapid growth. From the year 2000 to 2023, Shanghai experienced an increase in the population of over 10 million, resulting in a population of over 29 million in 2023 [2]. Under these circumstances, housing and infrastructures are continuously being built while progressively more proportions of the land are being occupied. Consequently, open spaces in cities often shrink and are replaced by buildings. However, open space still serves as a crucial amenity that offers social and economic values such as aesthetic values, health benefits, and far more; therefore, it is often preserved even in urbanized places.

There were many different preservation policies attempted by governments to preserve open spaces in urban cities. For instance, there was a tax abatement system proposed in Massachusetts where landowners could enjoy the deferral of real estate taxes as long as they kept the land open and undeveloped [3]. This incentivizes landowners to refrain from development and, therefore, preserve open spaces. Additionally, the Dutch government has also employed spatial planning, where they set restrictive zones on parts of the country to limit the number of buildings [4]. This controls the rate of urban expansion while also preserving the open spaces.

Open spaces possess great social and economic significance to society, causing governments to often preserve them, and people also often desire to live near them. Hence, it is important to study and learn the values provided by open spaces and how they may impact surrounding property values.

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This essay utilizes a case study and has chosen to investigate the city of Shanghai, China, specifically the open space Xujiahui Park. The hedonic model can be utilized to analyze the market value of nearby properties of this park and, therefore discover the effect of the proximity to open space on residential property values. Thus allowing reference for future open space construction. Other literature was reviewed to explore the relationship between the type of open space and the property value, as well as the relationship between the size of the open space and the property value.

2. Literature Review

Open space is generally considered essential for providing various social values and benefits to the residents and society. Open space refers to areas of land that have no buildings constructed on it, and they are namely utilized for parks and green belts within cities [5]. Open space provides benefits, including aesthetic enhancements, preserving biodiversity, as well as many health benefits, like reducing heat and noise levels and offering opportunities for physical exercise and social interaction [6]. Hence, open spaces stand as an important amenity, and many people often desire to live near open spaces because of the numerous benefits they provide. Consequently, in a competitive housing market, prices of homes near open spaces may be increased to compromise the benefits and the positive externalities generated by the open space.

2.1. Impact of the Proximity to Open Space on Residential Property Values

There is a lot of literature evaluating the effects of open space on residential property values. One of the aspects researched is how the property value may vary at different distances to the open space, and these studies discovered that home values increase as they get closer to the open space. In past studies [7], their regression analysis in Philadelphia illustrates that 33% of land value was accounted from the park at 40 feet distance away from the park, then decreased to 9% at 1000 feet and 4.2% at 2,500 feet. Additionally, this can be further reinforced by another study in the city of Portland, which demonstrates that residential properties can sell up to US$2105 more for houses within 1500 feet of any open space than houses that are located more than 1500 feet from an open space [8].

More recent studies suggest that governments have been implementing housing policies to increase residents' accessibility to open space and reduce their distance to the nearest open space. For example, UK guidelines emphasizes that urban residents should be accessible to at least 2 hectares of urban green space within a proximity of 400 meters from their homes [9]. Similar policies to increase accessibility to open space can also be seen in many other more economically developed countries, such as Germany and some other European countries. Alongside, recent studies also established that urban areas in China experienced an increase in the marginal willingness to pay from proximity to blue spaces [10]; larger blue spaces attract more rich people, who are owners of more expensive properties, while smaller blue spaces attract purchasers of cheaper housing.

2.2. Impact of Different Types of Open Space on Residential Property Values

In addition, it is also crucial to distinguish between different types of open spaces, namely protected and developable open spaces. Protected open spaces are under conservation policies and will be preserved. Conversely, developable open spaces are privately owned and could be used in the future for the development and construction of buildings. It is significant to differentiate between them because they would have different expected future values and, therefore, affect property values differently. Past findings suggested that protected open space has a greater effect on increasing property values, while developable open space has less effect or possibly even degenerate property values [6].

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Recent studies investigated several specific open space types, such as gardens, neighborhood parks, playgrounds, and cemeteries. Results suggested that residents are more willing to purchase properties near a park or open spaces that generally have more recreational functions or provide a larger space for enjoyment and relaxation [11]. This is also reinforced by another recent study that concludes that there were greater property value effects near passive rather than active parks [12].

2.3. Impact of the Size of Open Space on Residential Property Values

Many studies utilize hedonic analysis to approximate how the amenity value for open space varies according to the size of the open space. A past study investigated how the effect of open spaces on property values differs by the size in Portland, looked at open spaces with different sizes and included a natural park (258 acres), golf courses (169 acres), urban parks (148 acres) and specialty parks (112 acres) [13]. Empirical results, on average, indicated that natural parks have the greatest statistical impact on a residential property's price, while golf courses, urban parks, and specialty parks also show less but great positive effects on a residential property's sale price.

Recent studies also demonstrate similar results, where larger-sized open spaces offer a greater effect on property values. For instance, a study stated that parks below 250 acres provide less effect than those larger than 250 acres [12].

3. Methodology

This essay will utilize the hedonic model and a specific case to practically investigate one particular aspect: the effect of the proximity of open space on residential property values. The city chosen was Shanghai, China, and Shanghai was chosen because the city has undergone significant urban development, which makes open spaces more limited, so they are possible to have greater impacts on property values, and it will be clearer to see the relationship. Then, discussion and comparison could be made between the literature works and the case study to evaluate the differences and overall analyze the effect of open spaces on residential property values.

3.1. Theoretical Model

Property values can be determined through hedonic pricing analysis, which includes analyzing the internal and external features of a property [14]. Internal features are the features of the property, such as the area of the house, the material used, or the age of the house. External features are the features of the surroundings, such as air pollution level, infrastructure, amenities, and cleanliness. These factors work together to create the overall value of the property.

The hedonic model is utilized to understand and calculate how open spaces affect residential property values. In the hedonic model, property value is determined by the internal and external features of the property, therefore suggests the equation.

$$Final\ Price = Base\ Cost + Land\ Cost \tag{1}$$

Base Costs are the sum of the internal features of the property, such as the area and the number of rooms, while the Land Costs are the sum of the external features of the property, including nearby amenities and distance to open space. To find the effect on the property value imposed by the open space, the value of the Land Cost should be calculated to determine the proportion of the property value that is given by the open space. The Final Price is the selling price of the property, while the Base Cost requires separating into smaller portions of internal features and adding the values together. A dummy variable is implemented to state the number of internal features this property includes, and the dummy variable will be any whole number. Hence, the equation is denoted as:

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$$P(i) = \alpha + \sum_{j=1}^{n} \beta(j)\, V(ij) \quad (2)$$

"$P(i)$" is the price of the house, "α" is the land cost, and it is a constant, "n" is the number of types of internal features, and "j" corresponds to the different features. "β" are the different values of the internal features and "V" is the dummy variable. This equation will be employed in the case study to compute the land value of the property that is given from the open space.

3.2. Case Study

The case study was conducted in the city of Shanghai, China, and it was done by collecting data from three residential properties that are at different distances away from the Xujiahui Park and finding the land value that this park gives to the property. The park chosen for investigation is the Xujiahui Park in the Xujiahui district, and three properties were chosen next to the park shown in Figure 1. The properties were chosen near each other in the same direction to keep the other external features constant.

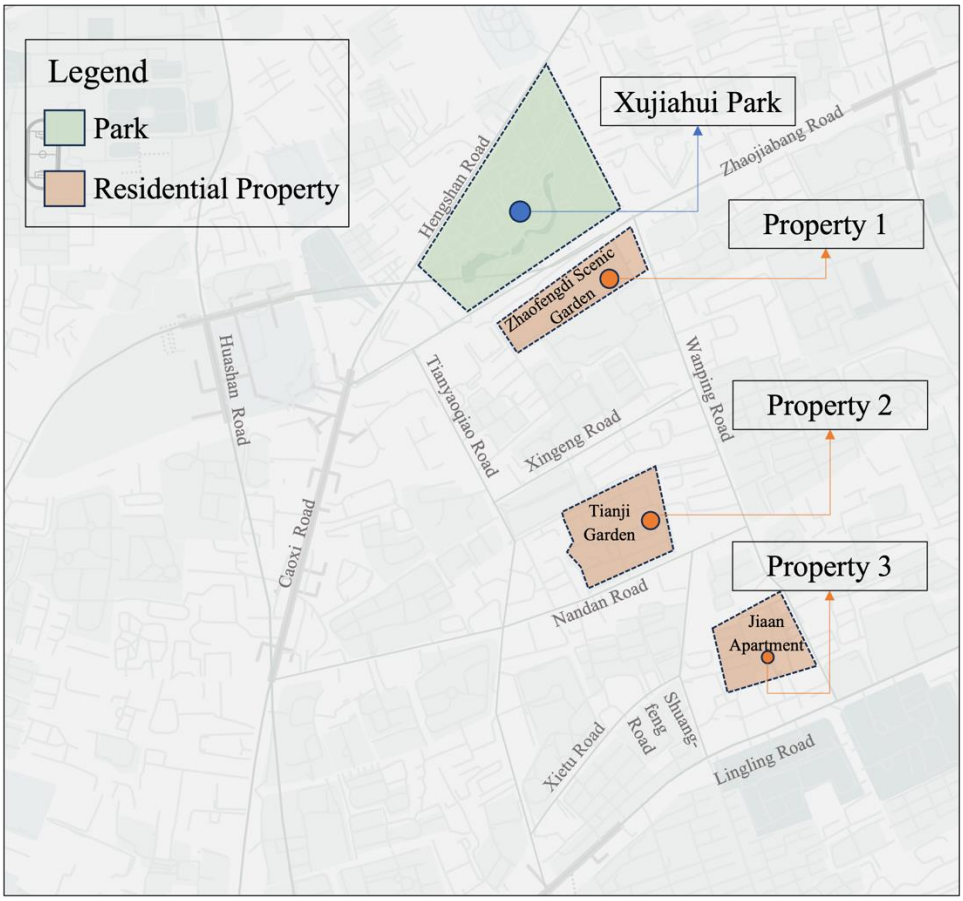


Figure 1: Xujiahui District Map

To find the basic cost of the house, four internal features are chosen, including the age of the property, the number of bathrooms, the number of bedrooms, and the area of the property. Table 1 illustrates the data collected for three properties in the Xujiahui district that are at different distances to the Xujiahui Park. The hedonic model can be employed to calculate the land cost of each property.

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Table 1: Residential Property Data

	Distance from Xujiahui Park (m)	Internal Features				Sale Price (US$)
		Age (years)	Number of Bathrooms	Number of Bedrooms	Area (m^2)	
Property 1	72	20	2	3	158	2466475
Property 2	536	20	2	3	180	2743607
Property 3	889	23	1	2	117	1718496

According to the UBC [15], the marginal implicit cost for a bathroom is approximately $22000, while for a bedroom is $15000. For each year after the property is built, the value degrades by $314 per year, and the average price of land in the Xujiahui district is ¥96429 per m^2, which converts to $13366 per m^2 [16]. Using this, input the values into this equation:

At property 1, there are four types of internal features examined; therefore, "n" is four, and "j" corresponds to each of the internal features. For instance, when "j" is 1, the first feature is examined, and it is the age of the house; therefore, the "β" and "V" values would change corresponding to the value for the age of the house, such that "β" would be $-314 and "$V$" would be 20. Now, substitute the values:

$$2466475 = \alpha + \sum_{j=1}^{4} \beta(j)\, V(ij) \tag{3}$$

Expand:

$$2466475 = \alpha + [(-314 * 20) + (22000 * 2) + (15000 * 3) + (13366 * 158)] \tag{4}$$

Compute:

$$\alpha = 271927 \tag{5}$$

Do the same and calculate for property 2:

$$2743607 = \alpha + [(-314 * 20) + (22000 * 2) + (15000 * 3) + (13366 * 180)] \tag{6}$$

$$\alpha = 255007 \tag{7}$$

For property 3:

$$1718496 = \alpha + [(-314 * 23) + (22000 * 1) + (15000 * 2) + (13366 * 117)] \tag{8}$$

$$\alpha = 109896 \tag{9}$$

3.3. Results

Table 2 illustrates the data calculated, and a graph can be constructed from the data to illustrate the relationship between the land cost and the proximity to the park. Figure 2 illustrates the relationship between land cost and the distance from the park, illustrating the percentage of the land cost of the property price on the y-axis and the distance to the park on the x-axis.

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Table 2: Land Cost Data

	Distance from Xujiahui Park (m)	Land Cost ($)	Percentage of Sale Price (%)
Property 1	72	271927	11.0
Property 2	536	255007	9.29
Property 3	889	109896	6.39

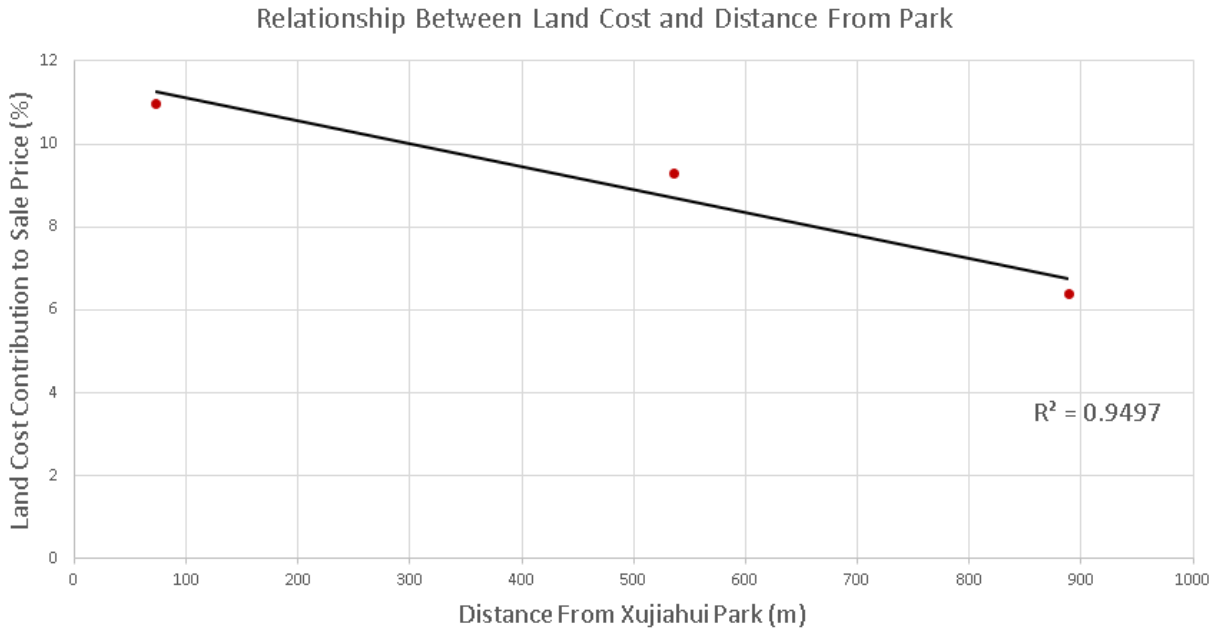


Figure 2: Graph of Land Cost and Distance from Park

3.4. Data Analysis

According to Figure 2, the relationship between land cost and the distance from the park illustrates a strong inverse correlation reflected by the R2 value of around 0.95 for the least squares regression line. Hence, suggests that the closer a property is to an open space, the larger the effect on the sale price of the property. However, the linear relationship is not perfect, as the points are not closely connected in a straight line. From 72 to 536 meters, there was only a slight drop in land cost even though it experienced a greater change in distance, while there was a greater decrease from 536 to 889 meters despite a smaller change in distance.

Property 1, was only 72 meters away from the park and it could be seen across the street, therefore it provides the residents with great aesthetic views from their homes while also being very convenient to walk directly to the park, hence contributing to its high land cost.

Property 2, which was 536 meters away, experienced a decrease in land cost possibly because it no longer provides the aesthetic views and is less convenient to walk there, but many people would still accept walking this much of a distance to reach the park therefore it remains with a relatively high land cost.

However, at property 3, which was 889 meters from the park, there was a greater drop in land cost, possibly because the park is no longer convenient to reach by walking, and it also does not provide aesthetic views. At this distance from the park, most people are unwilling to walk to the park, as

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research suggests that most people are only willing to walk a distance of approximately a quarter mile to half a mile [17]. Consequently, the cheap and simple transport method of walking is not likely an option for the residents here, making the land cost lower.

4. Discussion

Both the literature review and the case study support the central idea that open spaces can increase nearby residential property values, but there are also many different aspects explored for a more specific extent of which open spaces impact residential property values.

Previously, several types of open spaces were explored, such as protected open spaces and developable open spaces. Results reflected that protected open space had a greater impact on residential property values, while developable open space can have little or even negative effects on property values [6]. This is possibly due to the long-term benefits that protected open spaces enjoy, as they are under conservation policies so that they will always be there, and the residents nearby can, for a long term, enjoy the benefits provided by the open space in turn significantly increasing nearby residential property values. Conversely, developable open space might be used in the future for the construction of other buildings; therefore, it can also cause noise pollution and dust, creating negative externalities for nearby residents. Furthermore, developable open spaces might not be supervised and monitored as they are possibly not under policies. Therefore, the tragedy of the commons could be a problem since people are not responsible for the maintenance of the open space. Consequently, developable open space may have less or negative effects on nearby residential property values. Furthermore, passive parks were also said to have greater impacts than active parks [12]. Passive parks are more relaxing and less intense, focusing on nature landscapes and offering less sporty activities such as picnic areas and trails. Conversely, active parks offer more intense active sports, such as playgrounds and skateparks. Passive parks provide more green spaces and are more beneficial to the environment, improving the air quality while also reducing noise pollution. Therefore, they could be considered more valuable to residents and hence have a larger impact on residential property values.

Additionally, research has suggested that there is a positive correlation between the size of the open space and the effects on residential property values [12-13]. This is possibly due to the increasing benefits that go along with the increasing size of the open space. A larger park may provide cleaner air quality from the presence of more plants, and also, the increase in capacity for the number of people allows it to be less crowded and offers better chances for social interaction. Furthermore, more amenities and infrastructure may be provided, such as callisthenic areas, restaurants, or bike roads, therefore offering more opportunities and benefits to the residents, and this benefit may be reflected in the higher price of the residential property value. Furthermore, smaller open spaces or parks, such as playgrounds or fields, are generally noisier, while larger parks offer less noise pollution, making larger open spaces more desirable to nearby residents and causing a larger effect on the residential property value.

Another aspect investigated is the relationship between the distance of the open space and the residential property. Past studies [7-8], recent studies [10], and my case study all reflected an inverse relationship between the distance from the park and property value, that the greater the distance from the park, the less effect on the residential property value. However, the case study also explores another aspect of convenience. At a distance that is convenient for the residents and that allows them to walk there, a greater value of the open space can still be capitalized into the residential property value. In contrast, at a distance that is no longer convenient for the residents to walk to the park, there may be far less value of the open space capitalized into the residential property value. This is possible because most people travel to the park to take a walk there and relax; fewer people may ride a bike there due to their laziness, while other types of transport, such as cars or buses, may be too costly for

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such a short distance. Hence, if people lose the option of walking there, there will be less demand for people to go to the park, and people will enjoy fewer benefits provided by the open space.

4.1. New Findings

Summarizing all the different aspects investigated, a new conclusion could be made that in a position where the more benefits can enjoy from the open space, the higher the value of the open space is accounted inside the property value. Hence, Figure 3 is constructed to illustrate the effects of open spaces on property values. The x-axis is the quantity of the open space, and the y-axis is the land cost, which shows the effect of the open space on the property value. “S” stands for the supply of open space, and “Qo” is the quantity of open spaces, which is fixed as the number of open spaces does not change in the short run. “D” stands for the demand curve, and “MPB” stands for marginal private benefit, which shows the amount of benefit enjoyed by the residents. Conversely, “MSB” is the marginal social benefit, which in this case is the total benefits provided by the open space.

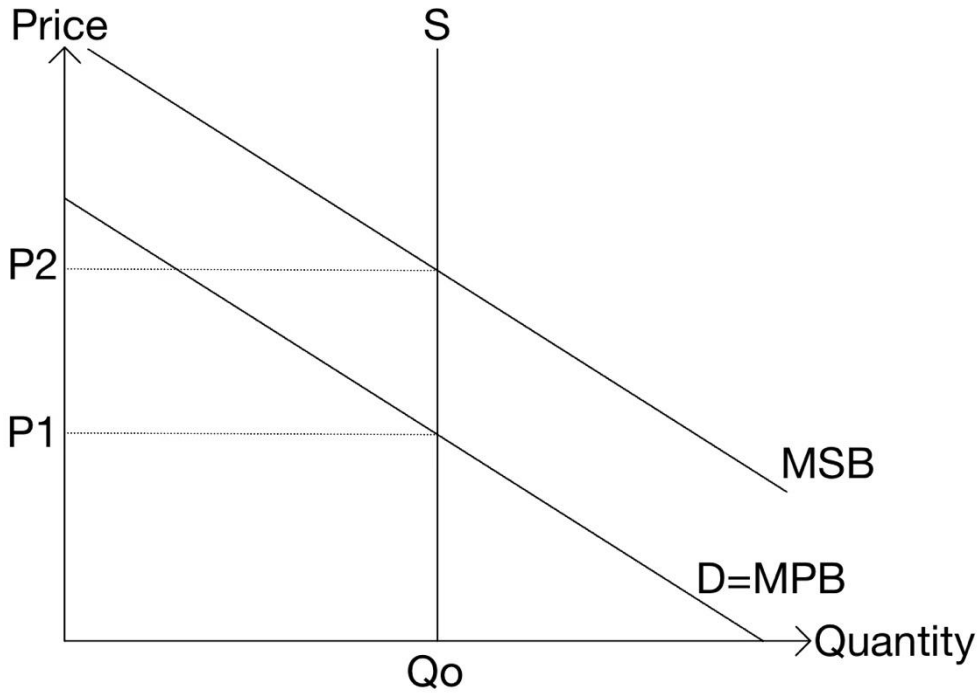


Figure 3: Open Space Diagram

When the resident enjoys fewer benefits from the open space, the demand curve (marginal private benefit) shifts downwards, and less value is capitalized to the property value, and vice versa. Now, consider the three factors: if the proximity to the open space from the property increases, the residents will not enjoy the aesthetic view and will have to spend more time in transport to the open space, therefore creating additional costs and decreasing the marginal private benefit. Open spaces with larger sizes may include extra infrastructure and activities as well as offer cleaner air quality, therefore providing more benefits and increasing the marginal private benefit. Additionally, protected open space may also provide more benefits than developable open space to the resident and thus impact the property value more.

In the future, urban planning may focus more on environmental aspects, such as dealing with climate change along with promoting sustainability. Therefore, more green open spaces could be preserved or constructed. This could allow more people to enjoy the benefits of open spaces and make

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open spaces more accessible to residents by having them settled across the city. Hence, the number of open spaces may increase, causing there to be smaller effects of open spaces on residential property values in the future.

5. Conclusion

In conclusion, this essay provided holistic insights into finding the impact of open spaces on residential property values by investigating multiple aspects such as the size, type of open space, and the property's proximity to open space. Through these aspects, a new idea was introduced: Generally, the more benefits you can obtain from the open space, the more the value of open space is capitalized into the property value. Through understanding these relationships explored in the essay, policy-makers can introduce more spatially effective and equitable policies and housing arrangements.

However, some limitations in this study could be explored further for a more comprehensive understanding. In the case study, data from only three residential properties were collected, which may reflect less information and, therefore, lack evidence for stronger support for the point. Furthermore, there were many exclusions in the features considered for the calculation, such as other external features that contribute to the land cost, like malls or small shops. To compensate for this, the properties chosen were near each other in the same direction so that the external features would remain relatively constant for them. Similarly, other internal features, such as materials used, are not included in the base cost. Consequently, calculations and results may be slightly inaccurate, and in the future, more variables could be accounted for to conduct a more accurate case study.

In the future, as the pressure for housing and infrastructure in urban areas continues to rise, the integration of open spaces into residential developments is likely to become more vital. As urban areas generally become more economically developed, people may seek higher standards of living and realize the advantages of open spaces, such as improving their mental and physical health, therefore desiring more for them. Consequently, it should become more crucial for policymakers to incorporate parks and open spaces into city planning and zoning, possibly through government regulation or incentivizing developers to include open areas in their projects. Ultimately, it fosters a balance between built constructions and nature to meet the residents' requirements for open spaces and enrich the living standards for the residents.

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