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Analyzing High School Accessibility within the Zoning-Based Admission System: A Case Study of Cakung Sub-District

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ABSTRACT
The zoning policy within the New Student Admission system (PPDB) was implemented as a governmental strategy to promote equitable access to education. In Cakung Sub-district, three urban villages were identified as lacking public senior high schools (SMAN), thereby potentially creating disparities in access for students residing in those areas. This study aims to analyze the spatial accessibility of SMAN regardless of administrative boundaries, using spatial analysis through buffering techniques in ArcGIS software. The results show that 85.23% of residential areas (36.03 km²) fall within the optimal accessibility radius of 1,600 meters from existing SMAN locations, whereas 14.76% (6.24 km²) remain outside the service area. These findings indicate that gaps in access to education still exist in areas not covered by the buffer zones. The study recommends a revision of the current zoning policy through the integration of geospatial and demographic data to ensure a more equitable distribution of educational facilities.

ABSTRAK
Kebijakan zonasi dalam Penerimaan Peserta Didik Baru (PPDB) merupakan salah satu upaya pemerintah dalam mewujudkan pemerataan akses pendidikan. Di Kecamatan Cakung ditemukan tiga kelurahan yang tidak memiliki Sekolah Menengah Atas Negeri (SMAN), sehingga berpotensi menimbulkan ketidakadilan bagi siswa yang berdomisili di wilayah tersebut. Penelitian ini bertujuan untuk menganalisis keterjangkauan SMAN tanpa dibatasi oleh wilayah administrasi menggunakan metode analisis spasial melalui buffering dengan perangkat lunak ArcGIS. Hasil menunjukkan bahwa 85,23% wilayah permukiman (36,03 km²) berada dalam radius jangkauan optimal 1.600 meter dari lokasi SMAN, sementara 14,76% wilayah permukiman (6,24 km²) tidak terjangkau. Temuan ini mengindikasikan masih adanya kesenjangan akses pendidikan di wilayah yang tidak tercakup dalam zona pelayanan. Penelitian ini merekomendasikan pembenahan kebijakan zonasi melalui integrasi data geospasial dan kependudukan untuk memastikan distribusi fasilitas pendidikan yang lebih merata.

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KEYWORDS
Educational Zoning, Spatial Accessibility, Spatial Analysis

INTRODUCTION

Education constitutes one of the fundamental sectors sustaining the development of a nation. The higher the quality of a country's education system, the more rapidly the nation is likely to advance, thereby attaining the status of a developed country (Wahyudi et al., 2022). According to Law Number 20 of 2003 concerning the national education system, the government is mandated to guarantee equal access to education, enhance quality and relevance, and improve the efficiency of educational management in order to respond effectively to future challenges. Nevertheless, disparities in the distribution of educational facilities remain prevalent. This issue requires particular attention from the government to ensure that schools are accessible to all segments of society.

Regulation of the Minister of Education and Culture (Permendikbud) Number 51 of 2018 stipulates that schools administered by local governments (public schools) must admit prospective students through three admission pathways: the zoning system, academic achievement, and parental transfer. The regulation aims to ensure that new student admissions are conducted objectively, transparently, accountably, non-discriminatorily, and equitably, while simultaneously promoting broader access to educational services. Furthermore, Jakarta Governor Regulation (Pergub) Number 21 of 2022, Article 12, specifies three priority zoning categories for new student admissions: Zone 1 applies to students residing in the same neighborhood unit (RT) as the school; Zone applies to

students residing in adjacent RTs surrounding the school location based on spatial mapping; and Zone 2 applies to students residing within the same or neighboring urban village (kelurahan) as the school.

Although the zoning system is designed with the noble intention of expanding equitable access to education and equalizing educational quality, the absence of evenly distributed school facilities undermines its fairness, particularly for students residing outside the designated zones. Even though the system has been subject to recurring challenges each year, Indonesia's former Minister of Education and Culture, Nadiem Anwar Makarim, affirmed that the zoning system will continue to be implemented in 2024 (Tempo, 2023).

Cakung Sub-district, one of the ten sub-districts within East Jakarta Administrative City, comprises seven urban villages: Jatinegara, Penggilingan, Rawa Terate, Cakung Barat, Cakung Timur, Ujung Menteng, and Pulo Gebang. Data from Statistics Indonesia (BPS, 2024) indicate that at least two urban villages in Cakung Sub-district do not have public senior high schools. In light of these circumstances, this research is deemed significant for examining issues of equity in the admission of senior high school students through the zoning system, with a particular focus on Cakung Sub-district. Accordingly, the study is entitled "Analyzing High School Accessibility within the Zoning- Based Admission System: A Case Study of Cakung Sub-District."

METHODS

Data collection in this study was conducted through observation and literature review to obtain both primary and secondary data. Secondary data were gathered from literature studies involving theories, references, and official sources. This method allowed the researchers to capture real conditions, thereby producing more accurate and contextual data (Joesyiana, 2018). In this study, observation was carried out to obtain the geographical coordinates of each public senior high school within Cakung Sub-district.

This research employed a descriptive method with a quantitative approach. These methods were applied to identify and describe the level of accessibility of public senior high schools in relation to the PPDB zoning policy. Spatial analysis was carried out using buffering techniques in ArcGIS software. The collected spatial data were processed in ArcGIS to generate buffer zones, which delineate the service coverage areas of each school. The results of the buffering analysis were then interpreted using descriptive analysis, in which the data and facts obtained were systematically organized and examined to provide information related to zoning-based student admissions.

Buffering is commonly applied in various spatial analyses such as environmental regulation studies (Prahasta, 2002). As a form of proximity analysis, buffering aims to identify spatial relationships between a point and the surrounding area. These buffer zones graphically illustrate areas within a specified distance of the buffered object, thereby enabling researchers to evaluate spatial proximity between objects within a geographic space (Prahasta, 2002). In this study, the buffering analysis produced spatial zones representing the coverage areas of SMA/MA in relation to residential settlements. This allowed the researchers to determine the accessibility of schools from residential areas based on geographical location. The buffer radius applied was 1,200–1,600 meters, following the standard service range for senior high schools (Lianita, 2022).

Table 1. Standards for Educational Service Coverage

School Level	Service Coverage Area	Design Characteristics	Location Description
Elementary School (SD)	400–800 meters	Must be accessible on foot from residential areas without crossing major roads. If crossing is required, the road should be a local road.	Close to residential areas and other public facilities
Junior High School (SMP)	800–1200 meters	Must be located away from arterial and primary roads, and pedestrian pathways from other areas should be available.	Close to concentrations of residential areas
Senior High School (SMA)	1200–1600 meters	Must be located near green/open spaces and away from sources of noise.	Situated in central areas to facilitate access to other public facilities

Source: N, L. L., Sutomo, S., & Bramasta, D., 2022

RESULTS AND DISCUSSIONS

Cakung Sub-district, located in East Jakarta, is one of the regions with the highest population growth in DKI Jakarta. According to Statistics Indonesia (BPS, 2024), Cakung covers an area of approximately 42.28 km² and consists of seven urban villages: Cakung Barat, Cakung Timur, Jatinegara, Penggilingan, Pulo Gebang, Ujung Menteng, and Rawa Terate. In 2024, Cakung recorded the largest population in East Jakarta, with more than 565,310 residents. The distribution of population density by urban village in Cakung Sub-district is presented in Table 2.

Table 2. Cakung Population Density Data

Sub-district	Area (Km²)	Number of Residents	Population Density
Jatinegara	6,6	107.979	16.567,64
Penggilingan	4,49	133.739	30.292,87
Pulo Gebang	6,92	120.172	18.132,19
Ujung Menteng	5,04	40.466	9.243,00
Cakung Timur	9,81	78.521	8.659,16
Cakung Barat	6,12	75.433	12.285,93
Rawa Terate	3,3	30.903	7.503,60

Source: BPS, 2024

Despite being the most populous sub-district in East Jakarta, Cakung currently has only five public senior high schools (SMA Negeri) spread across its seven urban villages. This number is disproportionate to the needs of the school-age population, particularly given the rapid population growth and socio-economic heterogeneity of the area. The limited availability of public senior high schools has led to intense competition among students seeking access to government-provided formal education.

To regulate access, the Ministry of Education and Culture (Kemdikbud) formally introduced the school zoning system (zonasi sekolah) through Ministerial Regulation (Permendikbud) Number 14 of 2018. The school zoning system refers to the designation of geographic areas for placing school-age children into public schools located near their place of residence (Pusbuk, 2020). The regulation mandated that at least 90% of new students admitted to public schools must come from the closest zoning radius, ensuring admissions are conducted objectively, transparently, accountably, non-discriminatorily, and equitably.

In 2019, the policy was refined through Permendikbud Number 51 of 2018, which stipulated in Article 20(1) that local governments hold the authority to determine zoning boundaries based on regional characteristics. The aim of this provision was to align student residences with nearby schools, taking into account factors such as school distribution and population density. The following year, in response to public demands for greater recognition of student achievement, Permendikbud Number 20 of 2019 revised the quota allocations to 80% for zoning, 15% for achievement, and 5% for parental transfer. This adjustment provided greater flexibility for high- achieving students to select schools of their preference while maintaining the core objectives of equitable access (Kemdikbud, 2020). Within this zoning context, it is notable that two urban villages in Cakung, Rawa Terate and Ujung Menteng, lack public senior high schools, effectively excluding them from competing as part of "Zone 1" or "Zone 2" in the PPDB admission process.

According to SIAP PPDB archives (2022), Rawa Terate, with a population of 40,466, falls only into Zone 3 for SMA Negeri 107, 89, 45, and 36. Similarly, Ujung Menteng, with a population of 30,903, also has access solely within Zone 3 for SMA Negeri 11, 76, 89, 102, and 115. Since Zone 3 constitutes the lowest admission priority, students from these urban villages face substantially lower chances of acceptance compared to students residing in Zones 1 and 2. This inequality is exacerbated by the limited quota available for zoning admissions in each school. On average, the quota for the zoning pathway accommodates only about 105 students per school. With merely five public senior high schools operating in Cakung, the total capacity for zoning-based admissions is severely inadequate relative to the number of school-age students requiring access to secondary education.

Table 3. Data on Public High Schools in Cakung District

School	Location	Zoning Quota	Zone 1	Zone 2	Zone 3
SMAN 11 Jakarta	Jl. Pendidikan, Rt. 9, Rw. 5, Kel. Pulo Gebang	105	Penggilingan (RW5), Pulo Gebang (RW5)	Penggilingan (RW4, RW5), Pulo Gebang (RW5, RW15)	Penggilingan, Pulo Gebang, Ujung Menteng
SMAN 89 Jakarta	Jl. Kayu Tinggi, Rt. 6, Rw. 9, Kel. Cakung Timur	105	Cakung Timur (RW9, RW12)	Cakung Timur (RW5, RW9, RW12, RW14)	Cakung Barat, Cakung Timur, Penggilingan, Pulogebang, Rawaterate, Ujung Menteng
SMAN 102 Jakarta	Jl. Kayutinggi, Rt. 9, Rw. 6, Kel. Cakung Timur	122	Cakung Timur (RW6)	Cakung Timur (RW6, RW10, RW14)	Cakung Barat, Cakung Timur, Rawaterate, Ujung Menteng
SMAN 76 Jakarta	Jl. Tipar Cakung, Rt. 10, Rw. 7, Kel. Cakung Barat	105	Cakung Barat (RW7)	Cakung Barat (RW4, RW5, RW7)	Cakung Barat, Cakung Timur, Sukapura, Rorotam, Ujung Menteng
SMAN 107 Jakarta	Jl. Kamp. Rawa Badung Timur, Rt. 8, Rw. 7, Kel. Jatinegara	107	Jatinegara (RW6, RW7)	Jatinegara (RW6, RW7, RW9), Penggilingan (RW10)	Jatinegara, Penggilingan, Rawaterate

Source: Arsip SIAP PPDB, 2022

To further analyze the accessibility of public senior high schools in Cakung, a spatial analysis was conducted using the buffering method in ArcGIS software. This analysis generated spatial data in the form of buffer zones surrounding each school location. These buffer zones were used to visualize the extent to which SMA/MA facilities are accessible from residential settlements (Figure 1). The buffer zones were further processed using an intersect operation between the five school buffer areas and the residential zones of Cakung Sub-district, followed by a clipping procedure to restrict the results solely to settlement areas.

The findings revealed that 85.23% of residential areas in Cakung (covering 36.03 km²) fall within the buffer radius of SMA/MA, while the remaining areas lie outside the service coverage. These results indicate that the spatial distribution of public senior high schools in Cakung remains suboptimal in serving the entirety of its residential areas.

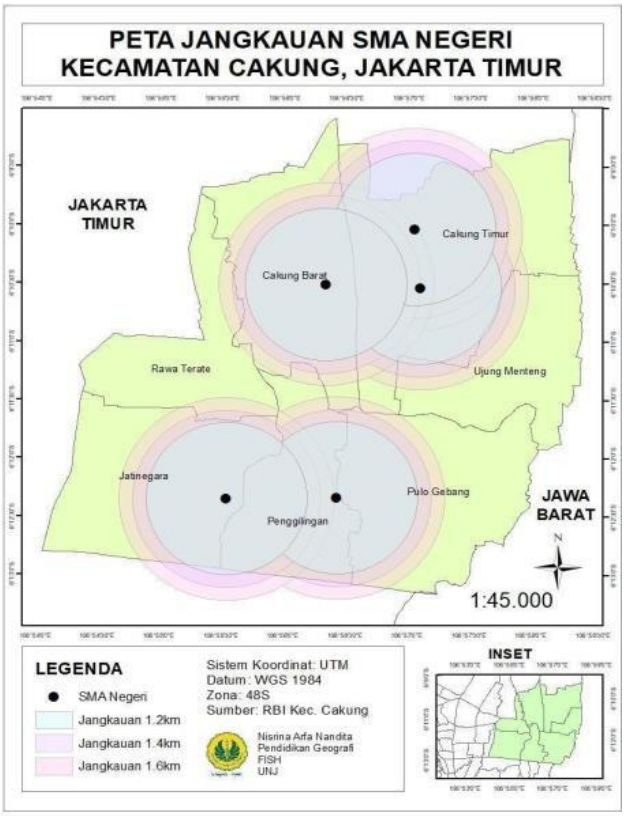

Figure 1. Cakung District Public High School Coverage Map Source: Processed Data Results, 2024

Accessibility refers to the ease or difficulty with which a location can be reached from another, and it is determined by physical distance, cost, time, and various geographical constraints (Marhadi, 2019). Spatial analysis using the buffering method further revealed that 14.76% of residential areas in Cakung (covering 6.24 km²) fall outside the optimal service radius of existing public senior high schools. Most of these underserved areas are located in Rawaterate and Ujung Menteng, highlighting the geographical limitations in access to public secondary education.

Table 4. Buffer Analysis Results

Area	Area Size (km²)	Urban Village	Percentage	
Area Within Reach of Public High School Facilities	36.03 km²	Cakung Timur	51.01%	85.23%
		Cakung Barat	12.37%	
		Ujung Menteng	0.38%	
		Rawa Terate	0.58%	
		Jatinegara	4.60%	
		Penggilingan	13.14%	
		Pulo Gebang	3.16%	
Area Outside the Reach	6.24 km²	Cakung Timur	1.82%	14.76%
		Cakung Barat	1.05%	
		Ujung Menteng	3.07%	
		Rawa Terate	3.26%	
		Jatinegara	2.30%	
		Penggilingan	0.19%	
		Pulo Gebang	3.07%	
Total	42.27 km²		100%	

Source: Processed Data Results, 2024

Furthermore, based on the Indonesian National Standard (SNI) 03-1733-2004 concerning Guidelines for Urban Housing Planning, ideally one senior high school should serve a population of 4,800 residents. With Cakung's population exceeding 550,000, at least 115 public senior high schools would be required to meet this standard. However, only five such schools are currently available, far below the necessary provision. This disparity underscores the structural shortcomings of the zoning policy, which, despite its intention to promote fairness, has not yet addressed the fundamental problem of unequal distribution of educational facilities.

The implications of these conditions highlight the necessity of revising the zoning policy by taking into account both geographical aspects and population density. Reforming the zoning pathway in Cakung Sub-district constitutes a strategic step toward achieving more equitable access to education, particularly for Rawaterate and Ujung Menteng. A redesigned zoning framework should integrate spatial analysis of the distance between residential areas and schools, while also incorporating demographic data to ensure that highly populated areas receive greater priority. Moreover, increasing the admission quota through the expansion of classroom capacity, either by constructing new facilities or optimizing existing infrastructure is essential to accommodate growing demand. A flexible zoning approach may also be applied to grant priority access to students in areas with limited educational facilities, even if they fall outside the standard service radius, as is the case for Rawaterate and Ujung Menteng.

CONCLUSIONS

The findings of this study indicate that Cakung Sub-district faces significant challenges in providing equitable access to senior high school education. With a population of more than 565,310 residents in 2024, Cakung is served by only five public senior high schools, a number that is insufficient to meet the educational needs of its school- age population. Spatial analysis using buffering further revealed that 14.76% of residential areas in Cakung most notably in Rawa terate and Ujung Menteng urban villages, lie outside the optimal service radius of existing public senior high schools. When assessed against spatial planning and demographic standards as outlined in SNI 03- 1733-2004, the current provision of public senior high schools in Cakung is far below the ideal benchmark, which should reach approximately 115 units.

To address these challenges, strategic measures are required, including revising the zoning policy to incorporate geographical distance and population density, increasing the quota for zoning-based admissions, and developing new educational facilities in accordance with national standards. In addition, a flexible zoning approach may be implemented to grant priority access to students from areas with limited educational facilities. Through these efforts, Cakung Sub-district can move toward establishing a more equitable, inclusive, and balanced education system that aligns with the fundamental principles of the national school zoning policy.

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