



## Analysis of Availability and Spatial Distribution Patterns and Accessibility of Health Facilities in Regional Development

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### Abstract

This study aims to analyze the availability, spatial distribution patterns, and accessibility of health facilities in Batam Kota District in order to support regional development. The availability of health facilities in Batam Kota District consists of hospitals, health centers, sub-health centers, clinics, and pharmacies spread across various sub-districts. Spatial analysis methods are used to identify the distribution patterns of health facilities, while accessibility analysis is carried out by taking into account the distance and travel time from the center of the settlement. The results of the study indicate that health facilities in Batam Kota District have a clustered distribution pattern in hospitals and a random pattern in health centers, clinics, and pharmacies. Accessibility to health facilities is quite good, but there is an imbalance in the distribution of facilities, especially in sub-districts with high population density. SWOT analysis identifies the strengths, weaknesses, opportunities, and threats related to the development of health facilities in this area. In conclusion, there needs to be more equitable development of health facilities, additional medical personnel, and utilization of infrastructure to improve access and quality of health services, in order to support sustainable regional development in Batam Kota District.

## Introduction

Health is a basic human right. Everyone has the same right to obtain access to safe, quality and affordable health services (Health Law No. 36/2009). The purpose of health development is to increase awareness, willingness, and ability to live healthily for everyone so that the highest level of public health can be realized (Salim et al., 2021; Andriansyah, 2013; Damopolii, 2016; Nopiani, 2019).

The government has an obligation to improve the welfare of its people in the health sector as stated in the 1945 Constitution, Article 28 H paragraph 1, which states "Everyone has the right to live in prosperity physically and mentally, to have a place to live, and to have a good and healthy living environment and has the right to receive health services". Not only in the health sector to improve the quality of human resources, but the role in the education sector also has a great influence

Health facilities are one type of public facilities needed by the community that function to improve the health of the community (Molyneux et al., 2012). Health service factors, the availability of service facilities and quality health workers will affect the quality of health status and the status of health problems that occur in the area even though the problem is located far from health facilities (Azwar, 1996; Milah 2022; Coombs et al., 2021; Yeruva et al., 2022).

The provision of health service facilities is the responsibility of the central government and regional governments in accordance with the provisions of Law Number 36 of 2009 concerning Health, which states that the government is responsible for the availability of health service facilities for the community to achieve the highest level of health.

Health infrastructure is one of the key factors in achieving health development in Indonesia. The Indonesian Ministry of Health's health welfare budget allocated to districts/cities amounting to 5% of the APBN plays a role in helping to improve health infrastructure and superstructure for the community. The role of the government through the health budget focuses on the budget for health workers' salaries, and related to health infrastructure, the government plays a role in increasing the number of health facilities such as hospitals, assistant health centers, mobile health centers, integrated health posts provided through the budget in the village scope, including the availability of medicines, beds, rooms that can provide services to the community in increasing maximum assistance so that they feel the health performance program initiated by the district/city government in the village (Reza & Safitri, 2022; Wulandari et al., 2024; Saragih, 2024; Udjiyanto et al., 2021).

The construction of health facility buildings is one of the keys to efforts to improve overall public health (Berniak-Woźny & Rataj, 2023; DeSalvo et al., 2021). Adequate health facilities can improve the accessibility and quality of health services, which in turn can improve the level of health and welfare of the community. The construction of health facilities is closely related to the increase in population (Bidarti, 2020; Ahdoot et al., 2024; Alderwick et al., 2021).

If the population in an area increases, the need for adequate and quality health facilities will also increase. Increasing accessibility to improve the quality of health services is also important, because health facilities will be the main destination for people who experience health problems (Kaihlanen et al., 2022; Johnson et al., 2022; Saeed & Masters, 2021).

Cities in Indonesia are experiencing faster growth than cities in other Asian countries, the average growth of cities in Indonesia is 4.1% (World Bank, 2016). The Director General of Health Services of the Indonesian Ministry of Health stated that the number of hospitals continues to increase. In 2015, the number of hospitals was 2,490 units and increased in 2016 to 2,601 units.

The average growth of public hospitals is 0.4%, while private hospitals are 3%. The growth of private hospitals is more aggressive than other types of hospitals. The average growth is 17.3%. The increase in growth indicates that hospitals have a high level of demand, especially in urban areas that have various activities and high population concentrations compared to non-urban areas.

### **Overview of Research Area: Batam City District**

Batam Kota District as the Capital of Batam City, has a population of 185,633 people in 2021, with a population density of 4,766 people/km<sup>2</sup>. The high population and density in Batam Kota District indicates a significant need for adequate and easily accessible health facilities.

### **List of Village Areas**

By the people of Batam, Batam Kota sub-district is better known as Batam Center. In this sub-district is located the center of Batam City government, so because of its strategic location in the middle of Batam Island, Batam Kota sub-district has developed rapidly into a busy and dense industrial and residential area. Batam Kota sub-district has 7 sub-districts, namely Sungai Panas sub-district, Baloi Permai sub-district, Taman Baloi sub-district, Sukajadi sub-district, Belian sub-district and Teluk Tering sub-district.

The population of Batam Kota sub-district in 2021 was 185,633 people, with a population density of 4,766 people/km<sup>2</sup>. Islam is the majority religion in Batam Kota sub-district, with

65.50% of adherents, followed by Christians at 21.07%, with Protestants at 16.92% and Catholics at 4.15%. Some others adhere to Buddhism at 13.12%, then Confucianism at 0.16%, Hinduism at 0.14% and believers at 0.01%.

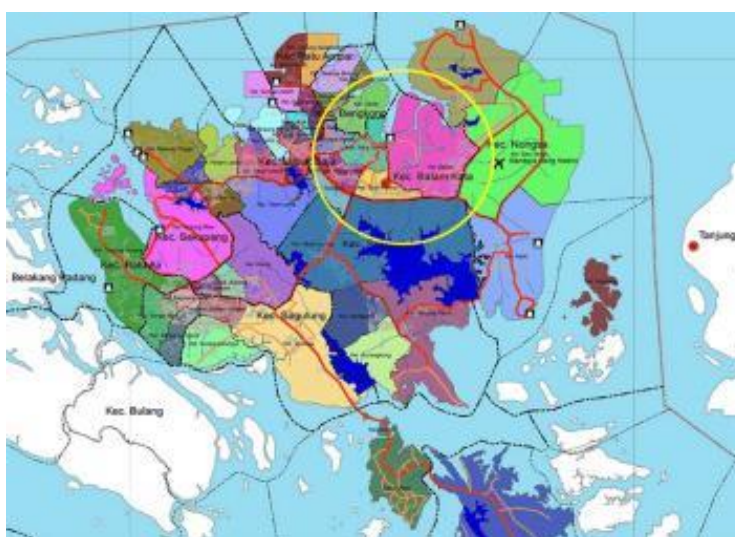


Figure 1. Map of Batam City District

Table 1. Area by Village/Sub-district in Batam Kota District in 2021

Village/Sub-district	Area (km <sup>2</sup> )	Percentage of District Area (%)
Taman Baloi	4.065	8,68
Baloi Permai	4.960	10,60
Belian	24.931	53,26
Teluk Tering	6.487	13,86
Sungai Panas	2.991	6,39
Sukajadi	3.374	7,61

Source: Batam City District in Figures 2022

Table 2. Population Sex Ratio by Village/Sub-district in Batam Kota District in 2021

Village/Sub-district	Resident		
	Man	Woman	Amount
Taman Baloi	10.955	11.576	22.531
Baloi Permai	17.771	18.103	35.874
Belian	40.572	40.772	81.344
Teluk Tering	9.009	9.329	18.338
Sungai Panas	13.888	13.667	27.555
Sukajadi	2.907	3.006	5.913
<b>Batam City District</b>	<b>95.102</b>	<b>96.453</b>	<b>191.555</b>

Source: Batam City District in Figures 2022

Table 3. Percentage, Population Density and Sex Ratio by Village/Sub-district in Batam Kota District in 2021

Village/Sub-district	Population Percentage (%)	Population Density (per Km <sup>2</sup> )	Sex Ratio
Taman Baloi	11.76	5.54	94.64
Baloi Permai	18.73	7.23	98.17
Belian	42.47	3.26	99.51

Teluk Tering	9.57	2.83	96.57
Sungai Panas	14.38	9.21	101.62
Sukajadi	3.09	1.75	96.71
<b>Batam Kota District</b>	<b>15.87</b>	<b>4.09</b>	<b>98.60</b>

Source: Batam City District in Figures 2022

Table 4. Number of Health Facilities in Batam Kota District

Year	Hospital	Special Hospital	Maternity Hospital	Polyclinic	Inpatient Health Center	Outpatient Health Center	Auxiliary Health Center	Primary Clinic	Posyandu	Pharmacy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2019	1	-	2	6	-	2	3	-	-	6
2020	1	-	-	6	-	2	3	-	-	6
2021	-	-	-	6	-	2	3	-	-	6
2022	5	2	-	6	-	2	3	49	61	6
2023	5	2	-	6	-	2	3	55	61	6

Source: Batam City in Figures 20224

Table 5. Number of Health Workers in Batam City District

Doctor	Dentist	Nurse	Midwife	Pharmacist	Public Health Worker	Nutritionist	Medical Laboratory Technologist
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
14	5	2	26	-	1	-	-

Source: Batam City in Figures 2024

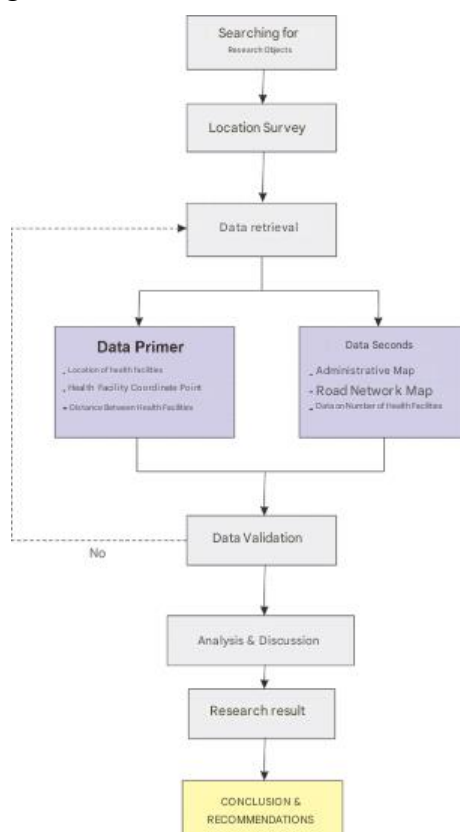


Figure 2. Flowchart of Research Methodology for Health Facility Data Collection and Analysis

### Purpose and objectives

Assess the physical conditions, equipment, and services available at health facilities in Batam Kota District. Assess the competence and number of medical personnel available at the health

facility. Measuring distance and travel time from dense settlements to health facilities. Assess the availability and accessibility of public transportation to health facilities.

### **Formulation of the problem**

How to identify technical characteristics using the parameters of the Indonesian National Standardization (SNI 3-1733-2004 ) on Procedures for Planning Housing Environments in Urban Areas, health facilities in Batam City District are in accordance with the requirements? What influences the distribution pattern and number of health facilities in Batam Kota District?

### **Theoretical basis**

#### ***Definition of Health***

The World Health Organization (WHO) defines health as a state of physical, mental and social well-being, and not merely the absence of disease and physical infirmity. In practice, the measurement of health levels used includes life expectancy. This measure is one of three components in calculating the Human Development Index (HDI). Health development is an integral part of national development because the health sector touches almost all aspects of human life in a sustainable manner, which is a series of comprehensive, integrated and directed developments (Kasinathan et al., 2022; Mensah et al., 2024). This development is an effort to achieve awareness, willingness and ability to live healthily for every resident in order to realize an optimal level of health. Through health development, it is hoped that every resident has the ability to live healthily so that in the future a quality next generation will be created as an important capital in national development (Kalalinggi et al., 2023; Robertson, 1990). The objectives of health development as stated in the Health Development Strategy Plan are the implementation of health development programs or activities that guarantee the achievement of the highest level of public health.

The direction of health development policy according to the Ministry of Health (2004) is: 1) Improving the quality of human resources and a mutually supportive environment, with a healthy paradigm approach that prioritizes efforts to improve health, prevention, healing, recovery and rehabilitation from conception to old age; 2) Improving and maintaining the quality of health institutions and services through sustainable empowerment of human resources and medical infrastructure, including the availability of medicines that are accessible to the community.

#### **Provision of Health Facilities**

According to Adisasmito (2007), health efforts are a system that brings together various public health efforts and individual health efforts in an integrated and mutually supportive manner to ensure the achievement of the highest level of public health. Provision of health offices Health administration is an obligation of the central government and regional governments in accordance with the regulations of Law Number 36 of 2009 concerning Health which states that public authorities are responsible for the accessibility of health administration offices for regions to organize the most important welfare status.

Law Number 36 of 2009 states that the Regional Government can determine the number and type of health service facilities and grant operating permits in its area by considering the area, health needs, number and distribution of population, disease patterns, utilization, social function, and ability to utilize technology.

#### **Accessibility of Health Facilities**

Accessibility of Health Facilities According to Winardi (2002) the quality of health services has various dimensions, one of which is access. Health services are the convenience of a guarantee program or coverage of services provided both geographically, where access is related to transportation, distance and duration of travel.

In this way, health services can be reached by people who need them.

### National Standardization (SNI 3-1733-2004) Regarding Procedures for Planning Urban Housing Environments

National Standard establishes a planning system that facilitates the process of building housing and settlements in built-up areas and developing planning both at the central level and especially at the provincial and regional (city/district) levels.

Health facilities function to provide health services to the community, have a very strategic role in accelerating the improvement of public health as well as to control population growth. The basis for providing these facilities is based on the number of residents served by the facilities.

The basis for this provision will also consider the spatial design approach of existing environmental units or groups. Of course, this can be related to the formation of building groups/blocks that will later be formed according to the context of their environment. While the placement of the provision of these facilities will consider the reach of the service area radius related to the basic needs of facilities that must be met to serve a particular area.

### Types of Health Facilities

Some types of facilities needed are: 1) Posyandu which functions to provide health services for toddlers; 2) certain times also for vaccination; 3) Mother and Child Welfare Center (BKIA) / Maternity Clinic), which serves to serve mothers before, during and after giving birth and serves children up to 6 years of age; 4) Health centers and treatment centers, which function as first-level health service facilities that provide services to the population in curing diseases, in addition to implementing health maintenance and disease prevention programs in their working areas; 5) Auxiliary health centers and treatment centers, which function as simple health service units that provide limited health services and assist in implementing health center activities within a smaller area; 6) Pharmacies function to serve the population in procuring medicines, both for healing and prevention.

Table 6. Procedures for Planning Housing Areas

Type of Facility	Supporting Population (people)	Space Requirements per Unit		Standard (m <sup>2</sup> /person)	Criteria		Notes
		Floor Area Min. (m <sup>2</sup> )	Land Area Min. (m <sup>2</sup> )		Coverage Radius	Location & Implementation	
Posyandu (Integrated Health Post)	1,250	36	60	0.048	500 m	In the middle of neighborhood groups not hindered by roads, rivers, etc.	Can be combined with residents' homes or neighborhood meeting halls
Village Health Post	2,500	150	300	0.12	1,000 m	In the center of community groups not hindered by roads, rivers, etc.	Can be combined with village halls
MCH Clinic / Birth Clinic	30,000	1,600	3,000	0.1	4,000 m	Located on collector or local roads, accessible by vehicles/public trans.	-
Auxiliary Community Health Center	30,000	100	300	0.01	1,500 m	<i>idem</i>	Can be combined with village or sub-district office
Community Health Center	30,000	1,200	1,000	0.04	3,000 m	<i>idem</i>	Can be combined with sub-district office
Private Doctor Practice	5,000	60	200	0.012	1,500 m	<i>idem</i>	Can be attached to residence/workplace
Pharmacy / Drug Store	30,000	120	250	0.025	1,500 m	<i>idem</i>	-

## Methods

In this study, data collection techniques were obtained through primary data and secondary data as follows: 1) Primary data includes observations and direct observations in the field; 2) Secondary data includes institutional data, policies, regulations, and other written sources, both printed and electronic.

Data collection techniques in this study are through: 1) Library Research, Library research is any effort made by researchers to *collect* data related to the subject or problem that will or is being studied. *This* data can be obtained from scientific books, research reports, logical articles, propositions and expositions, guidelines, rules, yearbooks, reference books, and other sources that are compiled and printed; 2) Field Research *for* more specific direct perception to the area connected with the exploration title to gather the necessary information.

This research is a qualitative descriptive study. The qualitative descriptive approach is considered appropriate for the purpose of the study to describe and examine the SWOT analysis in the Analysis of Availability and Spatial Distribution Patterns and Accessibility of Health Facilities in Regional Development in Batam Kota District, Batam City. Primary data collection was conducted through in-depth interviews, limited FGDs and direct observation and documentation. While secondary data sources are data obtained indirectly from the object, but through other sources verbally or in writing.

In addition to using SWOT analysis, the study also uses spatial analysis, which identifies the distribution of facilities using spatial analysis. In this study, a map of the distribution of health facilities, the number of health facilities, and then an analysis of the radius of the reach of health facility services was used. The analysis was carried out based on a map of the distribution of health facilities, so that the radius of service reach can be known based on SNI 03177-2004 and the Decree of the Minister of Settlement and Regional Infrastructure No. 534/KPTS/M/2001.

Here are some of the main benefits of this study: This study helps identify gaps in the provision of health facilities in a particular area. By knowing these gaps, the government and stakeholders can plan and allocate resources more effectively. The results of this study can be used as a basis for long-term strategic planning in health infrastructure development. This study can help improve the accessibility of health services for residents of Batam Kota District. By identifying areas that require more attention, health services can be expanded to previously underserved areas.

## Result and Discussion

Batam Kota District as part of Batam City, has a population that continues to increase from year to year, so the procurement of health facility buildings must also be balanced. To meet the needs of health facilities in Batam Kota District, the government and also the private sector have built several health facility buildings such as hospitals, health centers, assistant health centers and so on.

From the population density data, it can be seen that the concentration of population density in Batam Kota District is in Belian Village (42.47%) and the 2nd density is in Baloi Permai Village (18.73%). The population in this area follows the main road (secondary arterial road), namely Jalan Sudirman, and its surroundings. In addition, this is because the airport, trade center, government center, and main facilities are in relatively close areas. The distribution of health facilities in the form of hospitals in Batam Kota District can be seen in the analysis below.

## Hospital

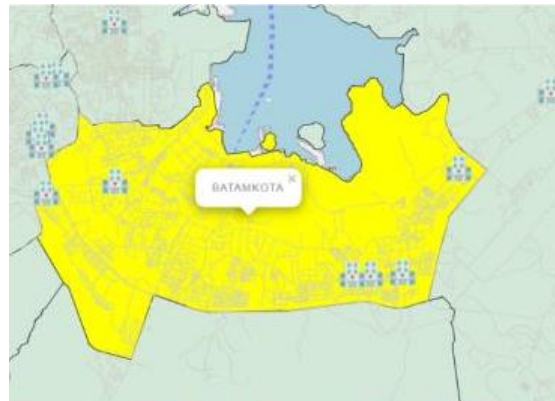


Figure 3. Map of Hospital Distribution in Batam Kota District

The availability of health services in the form of hospitals in Figure 2 is spread across Belian and Baloi Permai Sub-districts.

Meanwhile, the hospital has a population service standard or supporting population according to the Decree of the Minister of Settlement and Regional Infrastructure No. 534/KPTS/M/2001 of 240,000 people.

Table 7. Results of Needs Analysis Hospital Health Facilities in Batam City District

No.	Type of Facility	Supporting Population (people)	Population of Batam Kota District (people)	Number of Existing Health Facilities	Minimum Number of Health Facilities	Coverage Radius (meters)	Remarks
1	Hospital	240,000	183,655	5	1	-	Suitable

Source : Author's Analysis, 2024

From the data, it was found that health facilities in the form of hospitals in Batam Kota District reached 5 hospital units, meaning that there was an accumulation of hospital health facilities, because with the standards of the Minister of Settlement and Regional Infrastructure No. 534 / KPTS / M / 2001 Batam Kota District can be served by 1 hospital. This *cluster pattern* occurs in Belian Village where There is a hospital on 1 road and close by.

## Community Health Centers and Assistant Community Health Centers



Figure 4. Map of Health Center Distribution and Assistant Health Centers in the Sub-district Batam City

The availability of health services in the form of Community Health Centers and Assistant Community Health Centers in Figure 3 are spread across Belian, Baloi Permai, Sei Panas and Taman Baloi Sub-districts.

With a population of 183,655 people in Batam Kota sub-district, and referring to SNI 03-1733-2004, the number of supporting residents is 120,000 people with a reach radius of 3,000 m for

the Health Center, and the number of supporting residents is 30,000 people with a reach radius of 1,500 m. The health facilities of the Health Center are appropriate, but the Assistant Health Center is not yet in accordance with the standards/regulations.

Table 8. Results of Analysis of Health Facilities Needs for Health Centers and Assistant Health Centers in Batam Kota District

Type of Facility	Supporting Population (people)	Population of Batam Kota District (people)	Number of Existing Health Facilities	Minimum Number of Health Facilities	Coverage Radius (meters)	Remarks
Public Health Center (Puskesmas)	120,000	183,655	2	2	3,000	Suitable
Auxiliary Health Center (Puskesmas Pembantu)	30,000	183,655	3	6	1,500	Not yet suitable

Source: Author's Analysis, 2024

Distribution of Health Facilities Health Centers are located in Belian Village and Baloi Permai Village, while Assistant Health Centers are located in Belian Village, Sungai Panas Village and Taman Baloi Village. The number of assistant Health Centers with reference to the SNI 03-1733-2004 standard is not yet in accordance with the existence of 3 Health Centers so that there is a shortage of 3 Health Centers.

### Clinic

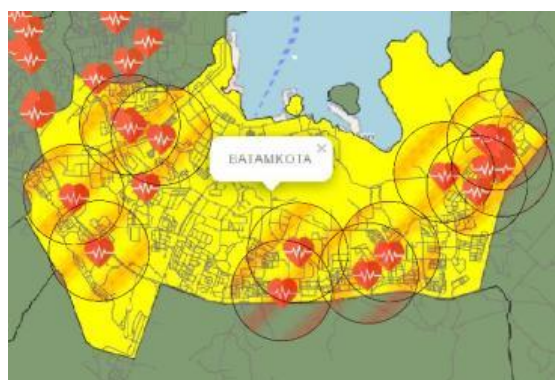


Figure 5. Map of Clinic Distribution in Batam Kota District

Availability of health services in the form of clinics in Figure 4 which are spread across all sub-districts in Batam City District.

With a population of 183,655 people in Batam Kota sub-district, and referring to SNI 03-1733-2004, the number of supporting residents is 120,000 people with a reach radius of 1,000 m, the Clinic health facilities do not yet comply with the standards/regulations.

Table 8. Results of Analysis of Health Clinic Facilities Needs in Batam Kota District

Facility Type	Supporting Population (people)	Population of Batam Kota District (people)	Existing Facilities	Minimum Required Facilities	Coverage Radius (meters)	Remarks
Clinic	2,500	183,655	61	73	1,500	Not adequate

Source: Author's Analysis, 2024

The distribution of health facilities in the form of clinics/ treatment centers is mostly in Belian Village, then Baloi Permai Village, Taman Baloi Village, and Sei Panas Village. In terms of service radius, there is a gap in Baloi Permai Village where within the service radius there are areas that are not served.

## Pharmacy



Figure 6. Map of Pharmacy Distribution in Batam Kota District

Availability of health services in the form of Pharmacies in Figure 5 which are spread across all sub-districts in Batam Kota District. With a population of 183,655 people in Batam Kota District, and referring to SNI 03-1733-2004, the number of supporting residents is 30,000 people with a radius of 1,500 m, Pharmacy health facilities are in accordance with standards/regulations.

Table 9. Results of Analysis of Health Facilities Needs for Pharmacies in Batam Kota District

No.	Facility Type	Supporting Population (people)	Population of Batam Kota District (people)	Existing Facilities	Minimum Required Facilities	Coverage Radius (meters)	Remarks
1	Pharmacy	30,000	183,655	6	6	1,500	Adequate

Source: Author's Analysis, 2024

The distribution of health facilities in the form of pharmacies/drug houses in Batam Kota District has covered all districts, where in terms of service radius there are almost no areas that are not served.

### Identification of the Number of Health Facilities Against Population Density.

The population density value is related to the number of existing health facility buildings. To see the relationship between the population density value and the number of existing health facilities, see the following table.

Table 10. Ratio of Number of Health Facilities to Population Subdistrict Batam City

Sub-District	Area Size (Km <sup>2</sup> )	Population Density per Km <sup>2</sup>	Number of Hospitals	Number of Community Health Centers	Number of Auxiliary Health Centers
Taman Baloi	4.065	11.76			
Baloi Permai	4.960	18.73	1		1
Belian	24.931	42.47	4	1	1
Teluk Tering	6.487	9.57			
Sungai Panas	2.991	14.38		1	1
Sukajadi	3.374	3.09			

Source: Batam City in Figures, 2024

Based on the table above, it informs that the area and population density can affect the number of health facilities in an area. High population density with narrow area conditions also indicates that the area has a larger land use in the form of settlements than other areas so that it requires a greater number of health facilities.

The largest number of hospital buildings or clustered in Belian Village. While the number of Puskesmas buildings is divided into Belian Village and Baloi Permai Village, each of which has 1 Puskesmas unit . Then the Assistant Puskesmas (pustu) is divided into Belian Village, Taman Baloi Village and Sungai Panas Village.

### SWOT Analysis

Table 11. SWOT Analysis Matrix Internal and External Factors

FACTOR	Strengths	Weaknesses
<b>Internal</b>	<ul style="list-style-type: none"> <li>- Availability of various health facilities such as hospitals, community health centers, clinics, and pharmacies</li> <li>- Availability of health workers despite limited numbers</li> </ul>	<ul style="list-style-type: none"> <li>- Uneven distribution of health facilities across sub-districts</li> <li>- Limited number of clinics and pharmacies in some sub-districts</li> </ul>
FACTOR	Opportunities	Threats
<b>External</b>	<ul style="list-style-type: none"> <li>- Development of new health facilities in densely populated sub-districts</li> <li>- Implementation of information technology in health services for efficiency</li> <li>- Improved training for health workers</li> </ul>	<ul style="list-style-type: none"> <li>- Limited government budget for developing health facilities</li> <li>- Increasing population density potentially exceeding health service capacity</li> <li>- Socioeconomic changes that affect distribution and accessibility of services</li> </ul>

Identification of internal factors (strengths and weaknesses) and external factors ( opportunities and threats) which are the basis for compiling the SWOT matrix are the results of the author's analysis after conducting a spatial analysis of health facilities in Batam Kota District using the Indonesian National Standardization (SNI 3-1733-2004) Concerning Procedures for Planning Housing Environments in Urban Areas and Decree of the Minister of Settlement and Regional Infrastructure No. 534/KPTS/M/2001.

Further use of SWOT Analysis is very necessary to facilitate the formulation of strategies and programs to be implemented.

### TOWS Strategy: Definition and Application in Research

TOWS (Threats, Opportunities, Weaknesses, Strengths) is a matrix developed from SWOT analysis. TOWS functions to help formulate action strategies based on the results of SWOT analysis in a more structured manner. While SWOT analysis identifies internal factors (Strengths, Weaknesses) and external factors (Opportunities, Threats), TOWS focuses on developing strategies based on the relationships between these factors.

### Analysis for Health Facilities in Batam Kota District

#### *SO Strategy (Strengths-Opportunities)*

A strategy that leverages existing strengths to take advantage of available opportunities.

Strengths : 1) There are several large, well-established hospitals in Batam Kota District; 2) Adequate transportation infrastructure for access to health facilities; 3) There are sufficient medical personnel, although they are still limited in several areas.

Opportunities: 1) The increasing number of people requiring more health facilities; 2) Government programs that support the development of health facilities; 3) Potential for cooperation with the private sector for investment in the health sector.

SO Strategy : 1) Taking advantage of existing transportation infrastructure to expand access to hospitals and health centers in areas with high population density; 2) Optimizing existing large

hospitals to increase service capacity, as well as build new health centers or health facilities in sub-districts with high population density and lack of health facilities; 3) Involves collaboration with the private sector or government programs to increase health facilities. and medical personnel to support equal distribution of health services.

### ***WO Strategy (Weaknesses-Opportunities)***

A strategy that overcomes weaknesses by exploiting existing opportunities.

Weaknesses : 1) Unequal distribution of health facilities (some areas lack health facilities); 2) Lack of medical personnel in some areas (such as nutritionists and pharmacists); 3) Limited facilities such as assistant health centers and clinics.

Opportunities : 1) Availability of funds from the government or international cooperation to build health facilities; 2) There are opportunities for training or recruitment of new medical personnel from the government or health institutions; 3) The government provides support in the development of community-based health facilities.

WO Strategy : 1) Taking advantage of government programs to build new health facilities in areas that have not yet been reached by health facilities; 2) Developing cooperation with health institutions to increase the number of medical personnel in areas lacking medical personnel, especially pharmacists and nutritionists; 3) Leveraging government funding to improve the distribution of health facilities and meet the need for facilities such as sub-health centers and clinics in areas in need.

### ***ST Strategy (Strengths-Threats)***

A strategy that utilizes existing strengths to overcome possible threats.

Strengths : 1) There are several large hospitals and well-established health centers; 2) Transportation infrastructure that supports accessibility to health facilities; 3) There are sufficient medical personnel although there are some shortcomings.

Threats : 1) Rapid population growth, especially in densely populated areas, has led to an increased need for health facilities; 2) Increasing competition in health services from the private sector; 3) Challenges in funding and managing health facilities .

ST Strategy : 1) Optimizing existing hospitals and health centers by increasing capacity and quality of service to address the surge in demand for health facilities; 2) Leveraging transportation infrastructure to facilitate patient distribution to larger health facilities and supporting collaboration with the private sector to expand health services; 3) Improving the efficiency of health facility management to address funding challenges , as well as seeking alternative funding through collaboration with the private sector .

### ***WT Strategy (Weaknesses-Threats)***

A strategy that focuses on efforts to reduce weaknesses and avoid existing threats.

Weaknesses : 1) Unequal distribution of health facilities in several regions; 2) Lack of medical personnel in some areas, such as nutritionists and pharmacists; 3) Limited health facilities in areas with high population density.

Threats : 1) Rapid population growth increases the demand for health services; 2) The challenge of providing funding for the development of health facilities in areas of high need.

WT Strategy : 1) Developing cooperation with the private sector or donor agencies to meet funding needs in developing health facilities; 2) Improve training and recruitment of medical personnel, and develop strategies for recruiting local medical personnel to reduce dependence on medical personnel from outside the region; 3) Leveraging sustainable development

programs to reduce the disparity in the distribution of health facilities in areas that require new facilities.

## Conclusion

Based on the spatial analysis and SWOT analysis that have been carried out, the following are the conclusions that can be drawn from the study " Analysis of Availability and Spatial Distribution Patterns and Accessibility of Health Facilities in Regional Development in Batam Kota District " : Availability of Health Facilities : Batam Kota District has 5 hospitals , 2 health centers , 3 assistant health centers , 61 clinics/treatment centers , and 6 pharmacies spread across almost all areas of the district. However, there is still an imbalance in the distribution of health facilities, where these facilities are not evenly distributed throughout the sub-districts, especially in sub-districts with high population density.

The distribution pattern of health facilities in Batam Kota District has two main patterns: a) Cluster Pattern in hospitals, which is more concentrated in Belian Subdistrict; b) Random Pattern in health centers, sub-health centers, clinics, and pharmacies spread across various sub-districts without clear concentration.

Accessibility to health facilities is quite good, thanks to the support of adequate transportation infrastructure. However, in areas further from the city center or with low population density, accessibility to health facilities is still limited. Therefore, expanding health facilities to these areas is very important to improve the distribution of health services.

Based on the SWOT analysis and spatial analysis results, several strategies that can be applied in the development of health facilities in Batam Kota District are as follows: 1) Optimizing existing health facilities to increase capacity and quality of services, as well as expanding service coverage to sub-districts that require more facilities; 2) Building new health facilities , especially in areas that are not yet covered by adequate health facilities, using government programs or collaboration with the private sector; 3) Adding medical personnel to areas with shortages, by involving local medical personnel training or recruitment programs; 4) Utilizing good transportation infrastructure to improve public accessibility to health facilities; 5) Improving the efficiency of health facility management to reduce waste and improve service quality.

This study shows that although health facilities in Batam Kota District are quite available , there is still an imbalance in the distribution of health facilities, especially in urban villages with high population density. Through spatial and SWOT analysis, several challenges were found that need to be addressed, such as the imbalance of facilities in several areas, the shortage of medical personnel in certain fields, and the threat of rapid population growth. Therefore, a strategy for developing more equitable health facilities , increasing the number of medical personnel, and optimizing existing facilities is needed to support regional development and improve the quality of health services in Batam Kota District.

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