Analysis of the Availability and Need for Public Facilities Based on Population Growth in the Next 20 Years in the Urban Area of Sei Rampah

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Abstract

The continuous population growth in Sei Rampah Urban Area has generated increasing demand for public facilities, particularly worship facilities. This study aims to analyze the existing condition of worship facilities, calculate population projections for the next 20 years, and determine the required number of worship facilities based on the SNI 03-1733-2004 standard. The research applies a quantitative and descriptive approach, while population projection analysis is conducted using the geometric method. The results show that there are 92 worship facilities distributed across five villages/sub-districts within the Sei Rampah Urban Area, the majority of which are mosques and mushollas. The population in 2024 totals 42,886 people and is projected to increase to 60,799 people by 2045 using the geometric projection method. Based on the worship facility standards, a total of 1,264 units will be required in 2045, consisting of 1,256 mushollas, four Christian churches, and four Catholic churches, with a total land requirement of approximately 32.36 hectares. These findings indicate that the current availability of worship facilities is insufficient to meet future population needs. Therefore, more structured and proportional planning is required to ensure equitable distribution, accessibility, and quality of worship facilities in the Sei Rampah Urban Area.

Keywords: Worship Facilities, Population Projection, SNI 03-1733-2004, Sei Rampah, Spatial Planning

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Introduction

The continuous population growth in urban areas has consequences for the provision of urban facilities and infrastructure, including worship facilities [1]. The Sei Rampah urban area, as one of the centers of development in the Serdang Bedagai Regency, has experienced rapid population growth in recent years [2]. This increase in population has led to a growing need for adequate public facilities in terms of number, capacity, and accessibility. One type of public facility that plays an important role in the social life of the community is religious facilities [3]. Worship facilities such as mosques, prayer rooms, churches, temples, and shrines not only serve as places for religious rituals, but also play a role as centers for spiritual guidance, social interaction, religious education, and character building in the community [4]. In the context of an ever-growing urban environment, the availability of adequate religious facilities is one indicator of the quality of public services and the level of community welfare. A mismatch between the population and the capacity of religious facilities can have an impact on the comfort of worship, the quality of services, and social harmony in urban environments [5].

In the Sei Rampah urban area, population growth has not been fully accompanied by optimal spatial planning, particularly in the provision of social and public facilities [6]. The development of new settlements, changes in land use, and increased economic activity require local governments to conduct a comprehensive evaluation of the adequacy of public facilities. In this context, worship facilities often receive less attention than other physical facilities, even though worship facilities are a basic need of the community that cannot be ignored [7]. In addition, the provision of worship facilities is closely related to spatial planning policies, minimum service standards (SPM), and the principle of equitable service for all levels of society [8]. There are standards for the provision of worship facilities based on population ratios— for example, one house of worship for a certain number of residents—which should be used as a reference in urban planning. However, in practice, the availability of worship facilities is often uneven, both spatially and in terms of number, causing some areas to have an excess of facilities, while others experience a shortage [9].

In principle, an ideal city needs to provide facilities that are easily accessible and affordable for all levels of society, including health facilities, educational facilities, and religious facilities. The existence of these facilities can become a forum for interaction for residents from various social backgrounds, thereby creating a harmonious social life [10]. Along with population growth, the need for the availability of social facilities will also increase. Based on the above description, this study was conducted with the title **"Analysis of the Availability and Need for Religious Facilities in the Sei Rampah Urban Area**," which aims to identify the existing conditions of the availability of religious facilities in the area. This study seeks to analyze the adequacy of worship facilities based on the population growth rate in Sei Rampah Urban Area using quantitative and spatial approaches [11]. The results of this study are expected to provide a strong scientific basis for regional planning and public policy formulation, as well as support the realization of an inclusive, harmonious, and sustainable urban environment.

The research problem formulation is as follows:

Based on this background, the research question in this study is as follows:

1. What is the current condition of worship facilities in Sei Rampah City?
2. What is the population growth and population projection in Sei Rampah City for the next 20 years?
3. What is the availability of religious facilities based on population growth over the next 20 years in Sei Rampah City

The objectives of this research are:

1. To analyze the existing condition of the availability of religious facilities in Sei Rampah City.

2. To analyze population growth and population projections for the next 20 years.
3. To analyze the availability of religious facilities based on the population in the next 20 years in Sei Rampah Urban Area.

Literature Review

According to Komarudin (2001), analysis is the activity of thinking to break down a whole into its components so that the characteristics of the components, their relationships with each other, and their respective functions within an integrated whole can be understood. The purpose of analysis is to collect data that can ultimately be used for various purposes by the analyst. It is usually used to resolve crises or conflicts, or it may simply be used as an archive.

Definition of city and small city

Gallion and Eisner (1980) define a city as a place where people are concentrated in an area or place that can geographically accommodate the permanent socioeconomic activities of its inhabitants. According to Rondinelli (1983) and Jayadinata (1999), as referenced by Nasution, et al. (2014), the definition of a small city can be obtained by knowing the size or dimensions of the city. Based on population size, a small city is a city with a population of no more than 100,000 people. Meanwhile, a small city in Indonesia is a city that meets the criteria of having a population of between 50,000 and 100,000 people if it is located on the island of Java or 20,000 to 100,000 people if located outside Java. In addition to population size, other characteristics of small cities include a high proportion of residents working in agriculture and other sectors related to agriculture, such as forestry, plantations, fisheries, and livestock. Urban Development Initially, cities grew and developed due to the influence of urban forces that emerged in rural areas as a result of the industrial revolution and agglomeration in rural areas that created development services, thereby creating urban conditions characterized by a non- agricultural way of life that has developed throughout the history of rural development (Soetomo, 2009). The larger a city is, the greater the interaction between people. The consequence of the characteristics of a communal or collective society is the high level of needs for infrastructure to support communal activities (Karyono, 2013). Cities continue to physically develop and expand towards the suburbs. The expansion of cities into suburban areas (urban sprawl) is sometimes accompanied by the conversion of agricultural land to non-agricultural land or the replacement of natural land cover with artificial land cover. This is a consequence of rapid demographic change (Kuffer, 2013). A common pattern of urban sprawl is the leap frog pattern, which requires the extension of public facilities (Yunus, 2008). In order for urban development and growth objectives to support human activities, especially social and economic life, urban planners need to consider aspects of economic needs and issues, population, transportation, the environment, urban infrastructure, education, housing and public buildings, aesthetic values, administration and law, as well as cost and capital analysis (Irwan, 2008), land use, and climate (Clarke, Hoppen, and Gaydos, 1995; Ernawi, 2010). This is very important because these aspects shape the characteristics of a city, which consist of buildings, road patterns, land use, open spaces, and skyline. These five aspects are interrelated and interact with the activities of the people who inhabit them (Heryanto, 2011).

Factors Affecting Population Growth

Factors Affecting Population Growth in a Region According to MKDU ISD (Basic Social Science Course), the factors affecting population growth in a region are birth rate (fertility), death rate (mortality), immigration, and emigration. Total Population Growth Total population growth is the increase or decrease in the population caused by the difference between the number of births, deaths, and migration (immigration and emigration). To calculate the increase or decrease in population due to total population growth, the following formula is used:

$$\mathbf{Pt = Po + (L - M) + (I - E)}$$

The total population growth rate can be calculated using the following formula:

$$Pt = Po\,(1 + r)^{1}$$

atau

$$r = \left(\frac{Pt}{Po}\right)^{\frac{1}{t}} - 1$$

Keterangan :

Pt	= Proyeksi penduduk pada tahun akhir periode (jiwa)
Po	= Penduduk pada tahun awal periode (jiwa)
1	= Angka konstanta
r	= Rata-rata tingkat pertumbuhan penduduk (%)
t	= Proyeksi tahun ke-t

Population Growth Projections Using the Geometric Method This method is often referred to as the population growth rate method. This method provides estimates and projections of the total population using the population growth rate or, for more advanced levels, through curve fitting that presents a mathematical description of changes in population size, such as a logistic curve. Population projections using the geometric method assume that the population will grow geometrically using compound interest calculations. The following formula is used in the geometric method:

$$r = \frac{(L-M)+(I-E)}{Po} \times 100\%$$

Keterangan :

Pt	= Jumlah penduduk tahun akhir perhitungan
Po	= Jumlah penduduk tahun awal perhitungan
L	= Jumlah Kelahiran/Fertilitas
M	= Jumlah Kematian/Mortalitas
I	= Jumlah imigrasi (penduduk yang masuk kesuatu wilayah)
E	= Jumlah emigrasi (penduduk yang keluar dari suatu wilayah)
r	= laju pertumbuhan penduduk total (%)

Indonesian National Standard (SNI 3-1733-2004) on Procedures for Urban Housing Environment Planning

This Indonesian National Standard establishes a planning system that facilitates the process of housing and settlement development in built-up areas and improves planning at the central level and, in particular, at the provincial and regional (city/district) levels.

Research Methodology Research Area

The Sei Rampah Urban Area is part of the Sei Rampah Subdistrict, which is one of the
subdistricts in Serdang Bededagai Regency. The area is located 5 m above sea level and has an area of 1970.35 Ha, consisting of 5 villages/kelurahan. For more details, see the following table

Table 1. Area of Sei Rampah Urban Area Delineation

No	Village	Area (Ha)
1	Cempedak Lobang	44.15
2	Firdaus	791.88
3	Pematang Pelintahan	154.50

4	Sei Rampah	577.89
5	Sei Rejo	401.69
Total		1970.11

Source: GIS Analysis Results, 2021

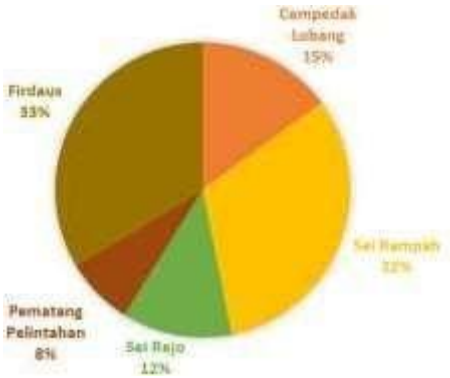

Figure 1. Graph of the Area of the Sei Rampah Urban Area

The area of the Sei Rampah Urban Area is 1970.11 ha, with a relatively flat and gentle morphology. The village/subdistrict with the largest area is Sei Rampah, which covers 32% of the total area of the Sei Rampah Urban Area.

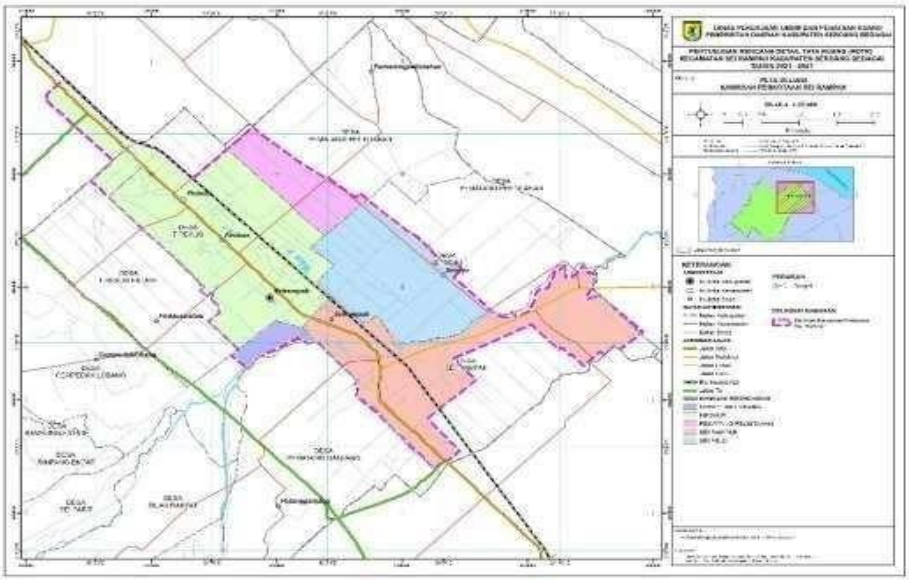

Figure 2. Map of the Delineation of the Sei Rampah Urban Area

Type of Research

This study uses a quantitative approach with descriptive analytical methods**.** The quantitative approach is used to analyze the availability and need for worship facilities based on population data and facility requirement standards. Meanwhile, descriptive analytical methods are used to describe the existing conditions of worship facilities and interpret the results of the needs analysis in the context of population growth

Data Collection Techniques

Data Collection Techniques In this study, data collection techniques were obtained through two types of data, namely:

1. Primary Data

Primary data collection was obtained through preliminary observation and direct observation in

the field to find accurate data. This data was obtained through observation, namely by taking photos of the existing research location and satellite images of the research location.

2. Secondary Data

Population size and number of available facilities (religious facilities) This research uses documentation sourced from publications by the Central Statistics Agency (BPS) for all subdistricts in the Sei Rampah urban area and other supporting documents.

Data Analysis Techniques

- Analysis of the Availability of Religious Facilities

To analyze the availability of social facilities in Sei Rampah Urban Area, the the Indonesian national standard (SNI 03-1733 2004) on procedures for urban housing environment planning.

- Analysis of population projections for the next 20 years

To obtain the results of social facility needs in the next 20 years, the the following geometric projection analysis

$$\mathbf{Pt = Po\ (1 + r)}$$

Explanation:

Pt = Population projection at the end of the period (souls) Po = Population at the beginning of the period (souls)

1 = Constant number

r = Average population growth rate (%) t = Projection for year t

- Analysis of Worship Facility Requirements

To obtain the results of social facility requirements in the Sei Rampah urban area for the next 20 years using Indonesian national standards (SNI 03-1733-2004) on procedures for urban residential environmental planning with the following calculations:

$$\text{Standar Ketersediaan Fasiltas Sosial} = \frac{\text{Proyeksi jumlah Penduduk 20 Tahun Kedepan}}{\text{Jumlah Penduduk Pendukung}}$$

Results

Existing Conditions of Worship Facilities

Worship facilities are a means of life to fulfill spiritual needs that must be provided in planned residential areas in accordance with established regulations and the decisions of the community concerned. Meanwhile, the majority of worship facilities in the planning area adhere to Islam. Based on the results of the field survey, there are at least 92 worship facilities spread across all villages in the Sei Rampah urban area, with the majority of worship facilities being mosques. For more details, see the following table.

Table 2. Number of Worship Facilities in Sei Rampah in 2022

No.	Village/ Neighborhood	Mosques	Prayer Room	Church	Church Catholic	Temple	Temple
				Protestant			
1	Cempedak Lobang	7	9	1	0	0	0
2	Sei Rampah	8	11	3	1	1	2
3	Sei Rejo	2	9	0	0	1	1
4	Pematang Pelintahan	4	2	2	0	0	0
5	Firdaus	10	13	3	2	0	0
Total		31	44	9	3	2	3

Source: Sei Rampah Subdistrict in Figures 2021

Figure 3. Existing Conditions of Worship Facilities in Sei Rampah Urban Area

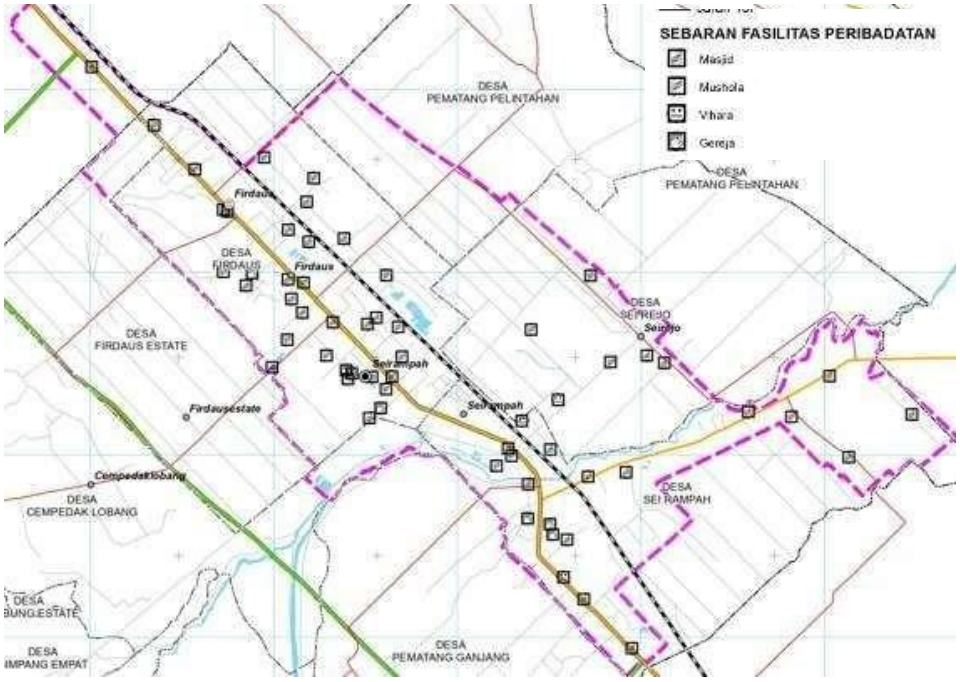

Figure 4. Map of the Distribution of Religious Facilities in Sei Rampah Urban Area

Population Growth and Population Projections for the Next 20 Years

Population

The population of Sei Rampah urban area in 2024 is 42,886 people spread across villages/subdistricts, as shown in the table.2 The highest population is in the village/subdistrict of Firdaus, with 14,386 people, while the lowest population is in the village/subdistrict of Pematang Pelintahan, with 3,238 people. For more details, see the following table.

Table 3. Urban Population of Sei Rampah in 2024

No.	Village/Subdistri ct	Populati on	ulation Density (per km2)
10	Cempedak Lobang	6,413	813
13	Sei Rampah	13,671	2,136
14	Sei Rejo	5,178	701
15	Pematang Pelintahan	3,238	1,255
16	Firdaus	14,386	2,694
Total		42,886	7,599

Source: Sei Rampah Subdistrict in Figures 2025

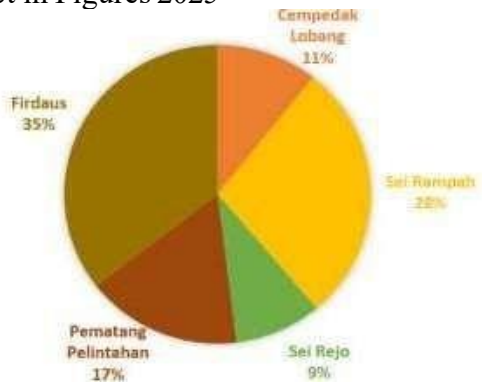

Figure 5. Graph of Urban Density in Sei Rampah

Population Growth and Population Projections for the Next 20 Years

Population growth and increase indicate that the city is growing and developing. The consequence of population growth is an increase in the need for space and land to accommodate the activities of residents and the need for urban facilities. The population in the Sei Rampah Urban Area has been increasing over the last 5 years. Over the past five years, from 2020 to 2024, the Sei Rampah Urban Area has seen a population increase of 3,198 people. The following is table and diagram illustrating the increase in the urban population of Sei Rampah. For more details, see the following table.

Table 4. Urban Population Growth in Sei Rampah from 2020 to 2024

No	Subdistrict	Population (Persons)				
		2020	2021	2022	2023	2024
10	Cempedak Lobang	5822	6029	6,041	6,212	6,413
13	Sei Rampah	13,126	13,238	13,252	13,514	13,671
14	Sei Rejo	4,800	4,860	4,881	5,106	5,178
15	Pematang Pelintahan	2,922	3024	3,069	3,155	3,238
16	Firdaus	13,018	12,913	12,964	13,979	14,386
Total		39,688	4,006 4	40,207	41,966	42,886

Source: Sei Rampah Subdistrict in Figures 2025-2022

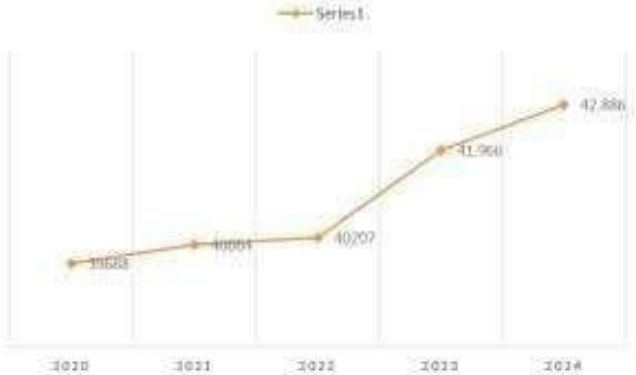

Figure 6. Graph of Sei Rampah Urban Population Growth

According to the analysis of the population in the next 20 years from 2025 to 2045, the population is projected to reach 60,799 people spread throughout the Sei Rampah urban area. The largest population in 2045 will be in the village/subdistrict of Sei Rampah, reaching

16,612 people.

Table 5. Population Projections for the Next 20 Years in Sei Rampah Urban Area

No	Subdistrict	Population (Persons)				
		2025	**2030**	**2035**	**2040**	**2045**
1	Cempedak Lobang	6,570	7,358	8,145	8,932	9,720
2	Sei Rampah	13,811	14,511	15,212	15,912	16,612
3	Sei Rejo	5,278	5,776	6,275	6,773	7,272
4	Pematang Pelintahan	3,322	3,744	4,165	4,587	5,008
5	Firdaus	14,757	16,615	18,472	20,330	22,187
Total		43,739	48,004	52,269	56,534	60.799

Source: 2025 Analysis Results

Availability of Worship Facilities Based on Population in 20 Years in Sei Rampah Urban Area.

To improve the quality of people's faith, worship facilities are needed, because with worship facilities, religious messages can be conveyed. Houses of worship will be needed as the population grows. However, in planning worship facilities, the population structure according to religion/belief must be taken into account.

Based on the standards of SNI No.03-1733-2004 concerning procedures for urban residential environmental planning, the type of religious facilities depends heavily on local conditions, taking into account the religious structure of the population and the local community's procedures or patterns for practicing their religion.

The types of worship facilities for Islam are planned as follows:

a. For a population group of 250 people, a musholla/langar is required.
b. For a population group of 2,500 people, a mosque is provided.
c. For a population group of 30,000 people, a sub-district mosque is provided for a population group of 120,000 people, a sub-district mosque is provided for other religious worship facilities, the following is planned:

a. Catholics follow the parish
b. Hinduism follows customs
c. Buddhist and Protestant Christians follow the kinship system or institutional hierarchy.

For Islamic worship facilities, the minimum land area is planned as follows:

a. Prayer room/mosque with a minimum land area of 45 m^2
b. Mosque with a minimum land area of 600 m^2
c. Subdistrict mosque with a minimum land area of 3,600 m^2
d. District mosque with a minimum land area of 5,400 m^2
e. Christian church with a minimum land area of 1,200 m^2
f. Catholic Church with a minimum land area of 1,200 m^2

Based on projections of worship facility needs in 2045, 1,264 units will be required, of which the need for Musholla worship facilities is 1,256 units with a land area of 31.4 hectares, 4 Christian churches with a land area of 0.48 hectares, and 4 Catholic churches with a land area of 0.48 hectares. For more details, please refer to the following table.

Table 6. Projected Religious Facility Requirements for the Next 20 Years in Sei Rampah

Urban Area

No.	Type of Facility	ea/Unit (m2)	Supporting Population (People)	Year 2025		Year 2030		Year 2035		Year 2040		Year 2045	
				43,739		48,004	52,269	56,534	60,799	48,004	52,269	56,534	60,799
				Total (units)	Area Land (Ha)	Number (units)	Area Land (Ha)	Number (units)	Area Land (Ha)	Number (units)	Area Land (Ha)	Number (units)	Area Land (Ha)
1	District Mosque	5,400	120,000	0	0	0	0	0	0	0	0	0	0
2	Prayer room	250	45	972	24.3	1067	26,675	1256	31.4	1067	26,675	1256	31.4
2	Christin Church	1,200	15,000	3	0.36	3	0.36	4	0.48	3	0.36	4	0.48
3	Catholic Church	1,200	15,000	3	0.36	3	0.36	4	0.48	3	0.36	4	0.48
TOTAL				978	25.02	1073	27,395	1,264	32.36	1073	27,395	1264	32.36

Source: 2025 Analysis Results

Conclusion

1. Existing Conditions of Worship Facilities

The Sei Rampah urban area has 92 worship facilities spread across five villages/subdistricts. The majority of these facilities are mosques and prayer rooms, reflecting the composition of the population, which is predominantly Muslim. However, in terms of number and spatial distribution, these facilities are not yet evenly distributed and are unable to meet the needs of each area proportionally.

2. Population Growth and Projections

The population in 2024 is estimated to be 42,886 and is projected to increase to 60,799 by 2045 based on geometric projection methods. This growth indicates a significant increase that will directly impact the need for space, public facilities, and worship facilities.

3. Religious Facility Needs for the Next 20 Years

Based on SNI 03-1733-2004 standards, by 2045 a total of 1,264 religious facilities will be required, consisting of:

- 1,256 prayer rooms
- 4 Christian churches
- 4 Catholic churches

4. Suitability of Current Facilities

The current worship facilities are inadequate to serve the population for the next 20 years. Without planning intervention, the lack of facilities will affect the comfort of worship, the equitable distribution of services, and social harmony in the community.

Suggestions and Recommendations

Recommendations

1. Local governments need to update their spatial plans to include long-term worship facility needs, based on population growth projections and SNI standards.
2. There is a need to evenly distribute the construction of worship facilities, especially in areas with high population growth, such as Firdaus and Sei Rampah sub-districts.
3. The provision of new facilities must consider land availability and spatial allocation so as not to conflict with other functions such as residential areas, public services, and green open spaces.
4. Coordination between religious leaders, the community, and the government needs to be improved to ensure that the types of facilities built are in line with the religious composition

of the population.

5. Regular monitoring of population growth dynamics and changes in religious facility needs should be conducted at least every five years.
6. Developing a 2045 Worship Facility Master Plan
   The government is advised to create a special planning document that includes priority locations for the construction of worship facilities based on spatial and demographic needs.
7. Optimizing land use through a zoning approach
8. Establishment of worship zones in the Spatial Plan (RTRW) and Detailed Spatial Plan (RDTR) so that the construction of worship facilities is more focused and does not cause land use conflicts.
9. Strengthening the religious facility database
10. The government needs to create a geospatial information system (GIS) to map all religious facilities and analyze their service levels in real time.
11. Promoting government-community partnerships
12. The development of religious facilities can be carried out through collaboration between local governments, religious institutions, and the community to accelerate the fulfillment of needs.
13. Prioritizing development in areas with deficit facilities such as Pematang Pelintahan and Sei Rejo, which have fewer facilities but are projected to experience population growth.

References

[1] B. Setiawan and R. M. Hakim, "Urban population growth and public facility provision," Journal of Urban Planning, vol. 15, no. 2, pp. 101–110, 2019.
[2] Serdang Bedagai Regency Central Statistics Agency, Serdang Bedagai Regency in Figures 2023. Sei Rampah: BPS Serdang Bedagai Regency, 2023.
[3] A. D. Nugroho, "Public facilities and social welfare in urban areas," Journal of Regional and Urban Planning, vol. 10, no. 1, pp. 45–54, 2020.
[4] M. A. Qodir, "The role of religious facilities in urban social life," Journal of Islamic Social Studies, vol. 8, no. 2, pp. 89–98, 2018.
[5] S. Riyadi and L. Suryani, "Accessibility of worship facilities in urban settlements,"IOP Conference Series: Earth and Environmental Science, vol. 447, pp. 1–8, 2020.
[6] R. Yunus, Urban Spatial Management. Jakarta: Bumi Aksara, 2017.
[7] S. Sugiyono, Planning of Social and Public Facilities. Bandung: Alfabeta, 2016.
[8] Ministry of Public Works and Public Housing, Minister of Public Works and Public Housing Regulation No. 14 of 2017 concerning Minimum Service Standards. Jakarta: Ministry of Public Works and Public Housing, 2017.
[9] D. Pratama and H. Wibowo, "Spatial inequality of public facilities in growing cities,"Journal of Regional Development, vol. 12, no. 3, pp. 211–220, 2021.
[10] K. Lynch, The Image of the City. Cambridge, MA: MIT Press, 1960.
[11] B. T. Pham and D. T. Bui, "GIS-based spatial analysis for urban facility planning,"Sustainable Cities and Society, vol. 45, pp. 90–102, 2019.