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STUDY OF MEDAN HELVETIA SUB-DISTRICT MORPHOLOGICAL PATTERNS WITH URBAN DESIGN THEORY APPROACH

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ABSTRACT

This study aims to determine and understand the current morphological patterns of the Medan Helvetia Sub District. It is due to the need for reconsideration regarding the spatial structure of the sub-district because there are several problems troubling residents, namely frequent congestion and flooding. Using a descriptive methodology, this research uses several methods, starting with secondary data collection. Secondary data shows that the study of Medan Helvetia Sub District morphological patterns uses the urban design theory approach, which is composed of three aspects: figure-ground, linkage, and place. The following method discusses the data obtained and ends with finding answers to research problems. The findings are useful as references in developing the physical design of this sub-district in the future.

Keywords: figure-ground, linkage, place, morphological patterns, Helvetia

INTRODUCTION

The term morphology was first introduced by Johann Wolfgang von Goethe (1749-1832), which means the science dealing with the essence of form. In the context of the built environment, the morphology of an urban area is defined as the science of urban form and structure, which includes an analysis of the city's physical system. In a narrow sense, urban morphology refers to the study of urban structure from the aspects of buildings, land, and road patterns [1]. As for the city, as a dynamic area, it often experiences changes as a result of its growth and development of the town. According to Evans (2002), changes that often occur in a city make it essential to learn about the morphological patterns of the city. It is because the study can provide a detailed description of the shape of the town, both in the past and present. This description includes information regarding what to avoid and what to do in planning a better city in the future [2].

One of the cities in Indonesia that has experienced these changes is Medan City, precisely in Medan Helvetia Sub District. According to the Central Statistics Agency of Medan City in 2019, the Medan Helvetia Sub District area is 11.55 km2, with an altitude of 27 meters above sea level. It is located in 03° - 2°N, 62° - 41°S, 98° - 39°E [3]. Deli Serdang District borders it in the North, West Medan, and Medan Petisah Sub Districts in the East and is directly adjacent to the Medan Sunggal Sub-District in the South and West (Figure 1).

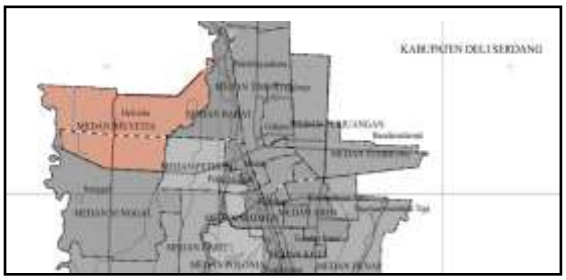

Figure 1. Medan Helvetia Sub District Location in Medan Administration Map
Source: https://indiemap.id/peta-administrasi/

Historically, in 1865, Medan Helvetia District was a tobacco plantation area named Helvetia Estate, covering Pulo Brayan, Ringroad, Millennium Plaza, and Helvetia National Housing (Perumnas Helvetia) areas [4]. Then from 1974 to 1982, there was an invasion of regional development so that part of the Helvetia area turned into a settlement

and was included in the administration of the City of Medan, precisely after the establishment of the Helvetia Perumnas [5]. Unfortunately, the growth and development in the District of Medan Helvetia caused several problems. Some of the most common issues are floods and traffic jams. Several locations in the sub-district that frequently experience flooding are Perumnas Helvetia [6], Cinta Damai Village, and Tanjung Gusta Village [7]. The location often experiences traffic jams is the Sei Sikambing Market corridor on Kapten Muslim Street [8]. One of the factors causing the two environmental problems in the sub-district is the change in urban morphology [9].

Therefore, this indicates that the morphological pattern of Medan Helvetia District still needs to be reviewed, both from the aspect of land use/land use, the shape and type of building, and the road network. The review of this morphological pattern aims to contribute to planning building layouts and the environment in the Medan Helvetia District in the future so that environmental problems, such as flooding and traffic jams, can be resolved [10].

To study the morphological pattern of Medan Helvetia District, the researcher used the Urban Design theory approach proposed by Roger Trancik. In this theory, Trancik argues that three methods can be used in identifying integrated urban areas: the figure-ground, linkage, and place techniques [13]. However, in the study of the morphological pattern of the Medan Helvetia sub-district, the researchers emphasized the figure-ground and linkage methods. The figure-ground approach stresses that analyzing the relationship between the mass of the building (figure) and open space (ground/void) is the starting point in understanding the textures and patterns of urban forms. The mass of the building (figure) refers to institutional facilities, edge buildings, and beam planes called urban solids.

Furthermore, open space (ground/void) refers to entrance spaces, parks, and gardens, a network of roads and squares, linear open spaces, and voids between blocks called urban voids. Both are needed to identify the pattern of urban spatial arrangement. By exploiting the hierarchical relationship and connectivity between these two elements, the figure-ground method aims to create a place's "urban structure" [14]. Theoretically, there are six typologies of patterns formed by the configuration between the building mass (figure) and open space (ground/void), namely angular, axial, grid, linear curve, radial concentric, and organic (Figure 2). Through this method, researchers analyzed the shape and type of buildings formed in the Medan Helvetia Sub-District.

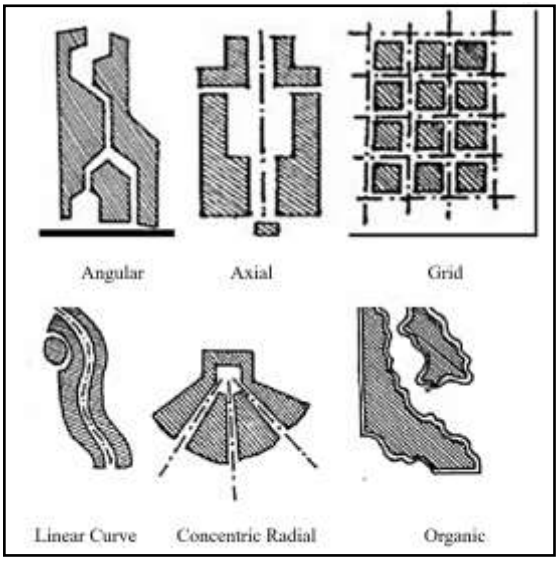

Figure 2. Figure-Ground Pattern by Roger Trancik
Source:
https://scholar.google.com/scholar?cluster=4705709531640186855&hl=en&as_sdt=2005&sciodt=0,5

Meanwhile, the linkage method emphasizes that circulation dynamics are the generator of urban form. In this study, a linkage method approach is a collective form of linkage, referring to the treatise entitled Investigations into Collective Form by Fumihiko Maki. In the treatise, the linkage is only an adhesive. This activity unites all activities and produces the physical form of a city, which is displayed in three types of city forms, namely compositional form, mega form, and group form (Figure 3) [15]. The researcher uses this method to analyze the structurally formed morphological organization or road network in Medan Helvetia Sub-District.

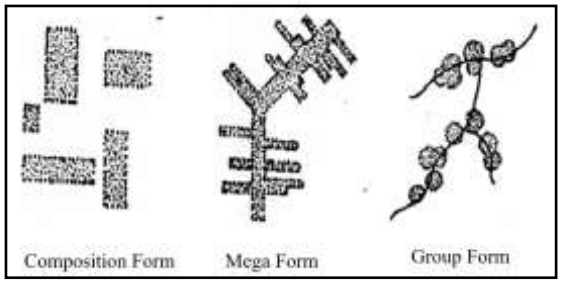

Figure 3. Spatial Types in Collective Form Linkage by Roger Trancik
Source: https://scholar.google.com/scholar?cluster=4705709531640186855&hl=en&as_sdt=2005&sciodt=0,5

METHOD

This study uses a descriptive methodology to understand the morphological pattern of the Medan Helvetia Sub District. This kind of methodology functions to gather valid information in detail. By describing existing symptoms, identifying problems or examining conditions and prevailing practices, making comparisons or evaluations that determine what other people do in dealing with the same problem, and learning from their experience to set plans and decisions for the future [11].

The target population in this study were all people living in the research locations, namely in Perumnas Helvetia, Cinta Damai Village, and Tanjung Gusta Village (to study the flood problem) and in the Sei Sikambing Market corridor on Kapten Muslim Street (to analyze the traffic congestion). By using the purposive sampling method, researchers took samples by making considerations regarding the sample criteria that contributed to answering research problems, including adults (over 17 years old), living and doing activities within the scope of the research location, understanding environmental issues, and understanding about urban morphological patterns.

The researcher does several research methods. The first method is collecting data. The data used in this research is secondary data. Secondary data is data that primary data collectors or other parties have appropriately processed. The secondary data sources do not directly provide data to the data collectors but rather through other people or documents [12].

The literature study resulted in a theory related to the urban morphological pattern, called Urban Design Theory by Trancik, which is reviewed by the figure-ground method and the linkage method. The two approaches are then used by researchers in reviewing the shape of the Medan Helvetia Sub-District. In addition, the researcher also used data from the 2015-2035 Spatial Pattern and Zoning Plan Map of Medan Helvetia Sub-District in reviewing aspects of land use in the sub-district, Figure-Ground Map of Medan Helvetia District in reviewing the shape and type of buildings in the sub-district. (figure-ground method), and Medan City Regional Regulation Number 2 of 2015 reviews the road network in the sub-district.

The data collected is then analyzed by the researcher qualitatively. It aims to gain an understanding of the quality of the form of the Medan Helvetia Sub-District, both from the aspect of land use, the form and type of buildings, and the road network. In addition, this qualitative data analysis technique also aims to obtain a correlation between the morphological pattern of the Medan Helvetia sub-district and the environmental problems that occur in the sub-district, namely flooding and traffic jams.

DISCUSSION

In studying the Medan Helvetia Sub-District's morphological pattern, the researcher reviewed aspects of land use, building forms and types, and the road network. The discussion regarding these three aspects is as follows:

Land Use Aspect

Based on the Spatial Pattern and Zoning Plan Map of Medan Helvetia Sub-District, most of the land in Medan Helvetia Sub-District functions as high-density housing (orange) and medium-density housing (yellow). Then followed by the trade zone (red) and the commercial service zone (pink), which have a distribution pattern that matches the housing pattern, making it easier for housing users to access the two zones. In addition, other functions contained in the land use of Medan Helvetia Sub-District are offices

(purple), public service facilities (blue), defense and security (dark brown), and other specialization zones (light brown) (Figure 4).

Figure 4. Spatial and Zoning Pattern Plan Maps of Medan Helvetia Sub District
Source: http://perkimtaru.pemkomedan.go.id/hasilcari.html

Based on the above map, the locations that need to be reviewed have the following functions: (1) Perumnas Helvetia functions as a high-density housing zone (R1); (2) Cinta Damai Village is dominated by the zone of medium-density housing (R2) and high-density housing (R1); (3) Tanjung Gusta Village is dominated by the zone of medium-density housing (R2) and high-density housing (R1); (4) The Sei Sikambing Market corridor on Kapten Muslim Street is flanked by the same two zones, namely the trading zone (K-1).

Figure-Ground Aspect

The configuration between the building mass (figure) and open space (ground/void) in Medan Helvetia Sub-District forms a grid pattern, as shown in the image below (Figure 5).

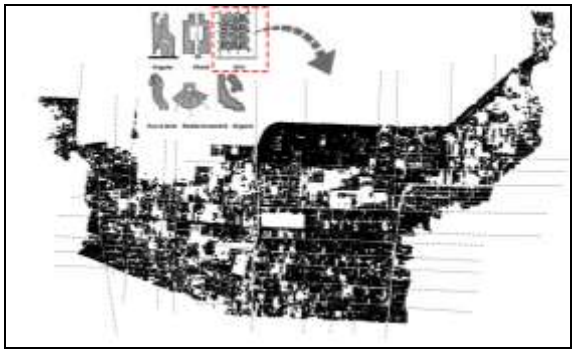

Figure 5. Grid Pattern on Figure-Ground Medan Helvetia Sub-District
Source: Researcher, 2020

According to Kwanda (2004), the grid pattern has the advantage of creating an efficient and practical form of plot. The configuration between the building mass (figure) and open space (ground/void) forms a homogeneous city texture. However, the pattern created through roads can lead to high traffic frequencies [16]. The texture homogeneity of Medan Helvetia Sub-District can be seen from the dimensions, shape, and density of the building masses and open spaces, which are relatively the same. In addition, the texture of the sub-district also shows a typology of mass density against the area, as seen in several scopes of research locations, namely as follows:

Perumnas Helvetia

Perumnas Helvetia has a typology of building masses lined up (about 7-15 masses in one row) and rectangular. These building masses have a Building Covered Ratio >70% and a Building Boundary Line of 0. The BCR >70% is classified in the high-density typology category [15]. The figure-ground and building typology at Perumnas Helvetia are shown in the image below (Figure 6).

Figure 6. Figure-Ground and Building Typology at Perumnas Helvetia
Source: Researcher, 2020

Cinta Damai Village

A row of building typologies also dominates Cinta Damai Village and a Building Covered Ratio >70%. However, the Building Boundary Line is 0-5 meters. The figure-ground and typology of buildings in Cinta Damai Village are shown in the image below (Figure 7).

Figure 7. Figure-Ground and Typology of Buildings in Cinta Damai Village
Source: Researcher, 2020

Tanjung Gusta Village

Tanjung Gusta Village, on the north side of Cinta Damai Village, has a building typology that looks like with it, namely the type of building that is lined up, the Building Covered Ratio in this area is >70%. The Building Boundary Line is 3-5 meters (high-density typology). The figure-ground and typology of buildings in Tanjung Gusta Village are shown in the image below (Figure 8).

Figure 8. Figure-Ground and Typology of Buildings in Tanjung Gusta Village
Source: Researcher, 2020

Sei Sikambing Market Corridor on Kapten Muslim Street

Unlike the previous three locations, the Sei Sikambing Market corridor on Kapten Muslim Street is dominated by the typology of shophouses that have a commercial function. The shophouses have a BCR >70% with a Building Boundary Line of 0-5 meters. The number of floors is 2-4 floors. The figure-ground and typology of buildings in the Sei Sikambing Market corridor on Kapten Muslim Street are shown in the image below (Figure 9).

Figure 9. Figure-Ground and Building Typology in the Sei Sikambing Market Corridor
Source: Researcher, 2020

Linkage Aspect

Medan Helvetia Sub-District has a linkage system consisting of road structures dominated by linear lines or grids and hierarchies. It can still be developed. The criteria for a linkage system like this are included in the mega form category [17]. The order of the road structure in Medan Helvetia District according to Regional Regulation of Medan City No. 2, 2015 concerning Detailed Spatial Planning and Zonation Regulations of Medan City 2015-2035, this sub-district has some hierarchy types of road, such as primary arterial roads, secondary arterial roads, secondary collector roads, and primary local road [18], as seen on Table 1.

Table 1. Road Types in Medan Helvetia Sub District

Road Type	Road Name
Primary Arterial Road	Asrama Street, Gatot Subroto Street
Secondary Arterial Road	Kapten Muslim Street, T. Amir Hamzah Street
Secondary Collector Road	Gaperta Street, Danau Singkarak Street, Setia Luhur Street, Bakti Luhur Street, Amal Luhur Street, Budi Luhur Street, Cempaka Street, Pantai Barat Street
Primary Local Road	Kelambir 5 Street

Source: Regional Regulation of Medan City No. 2, 2015 concerning Detailed Spatial Planning and Zonation Regulations of Medan City 2015-2035

A primary arterial road is a road that efficiently connects national activity centers or between national activity centers and regional activity centers. Meanwhile, a secondary arterial road is a road that connects primary areas to the first secondary areas, the first secondary areas to the first secondary area, or the first secondary areas to the second secondary areas. Besides, the secondary collector road is a road that connects the second secondary areas with the second secondary areas or the second secondary areas to the third secondary areas. And lastly, the primary local road is a road that efficiently connects national activity centers with

environmental activity centers, regional activity centers with environmental activity centers, between local activity centers, or local activity centers with environmental activity centers, and between ecological activity centers [19]. This hierarchy integrates the character of the individual components of the sub-district into a large array. The relationship of every road can be seen in the Medan Helvetia Sub District map below (Figure 10).

Figure 10. Medan Helvetia Sub-District and The Hierarchy Types of Roads
Source: Researcher, 2020

FINDING

The grid pattern category on the figure-ground in Medan Helvetia Sub-District makes the possibility of traffic jams high due to the many intersections. For example, the Sei Sikambing Market corridor on Kapten Muslim Street has many passageways on the west and trading functions along the corridor. Moreover, the passage is close to the intersection between the primary road (Gatot Subroto Street) and the secondary road (Kapten Muslim Street). Therefore, the Sei Sikambing Market corridor often experiences high traffic jams.

In addition, the texture of the Medan Helvetia Sub-District, which is dominated by a high-density typology (BCR >70%), causes the lack of water catchment areas. It can be seen clearly in flood-prone areas, such as Perumnas Helvetia, Cinta Damai Village, and Tanjung Gusta Village. Especially in Perumnas Helvetia, which is dominated by building masses without Building Boundaries. Apart from disturbing the audio comfort, it also leaves no open space for water catchment areas. The lack of water catchment areas causes the soil's lack of ability to absorb water, especially during prolonged rains, making it vulnerable to flooding.

CONCLUSION

The Medan Helvetia Sub-District, which continues to grow and develop, often experiences traffic jams and floods. It indicates that there is still a need for reconsideration related to the spatial structure of the sub-district.

The figure-ground way in this sub-district shows that the configuration between the building mass and the voids forms a grid pattern. This pattern consists of a hierarchy of primary arterial roads, secondary arterial roads, secondary collector roads, and primary local roads. This hierarchy makes the form of urban space mega because it combines the individual characters of the sub-district components into one broad order (linkage method). The higher the hierarchical level of a road, the higher the potential for congestion. Moreover, the spatial pattern of a grid creates many intersections that can be meeting points for vehicles from various directions. An example of a location that experiences traffic congestion the most is the Sei Sikambing Market corridor on Kapten Muslim Street, which is close to the intersection between the primary and secondary arterial roads. In addition, the texture of the Medan Helvetia Sub-District, dominated by a high-density typology (BCR >70%) and the violation of the Building Border Line, makes it vulnerable to flooding, especially at Perumnas Helvetia, Cinta Damai Village, and Tanjung Gusta Village.

Acknowledgment

This research is about the study of Medan Helvetia Sub District morphological pattern by using the urban design theory to know the causes of congestion and flood in this sub-district and as a reference in developing the physical design of this sub-district in the future. The author thank to the postgraduate program of Department of Architecture University of Sumatera Utara for the guidance in writing this research.

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