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Redefining Order in Urban Areas: A Case Study of the Morphology of Medan and Palembang Cities

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ABSTRACT

Modern urban planning, which developed in the late 19th and early 20th centuries, established order as a fundamental principle in shaping urban structures. However, in the context of urban areas in Indonesia, not all cities exhibit a uniform pattern of spatial order. This study compares two provincial capitals—Medan and Palembang—which represent two contrasting poles in terms of urban spatial organization. Medan tends to exhibit a more regular and planned urban structure, while Palembang displays a more organic and unstructured pattern of urban growth. The aim of this study is to identify the factors that contribute to these differences and to understand how urban order is formed within each specific context. The study employs a conceptual framework based on Marshall's (2009) theories of systematic order *and* characteristic order*, as well as Doxiadis's (1968) concept of* ekistics*, to examine both the physical and social dimensions of urban order. A qualitative method is used, incorporating descriptive analysis through literature review, spatial interpretation, and historical analysis. The findings reveal that urban order is shaped by four main elements: the city's physical network, natural conditions, social dynamics, and economic structure. These elements interact in complex ways to produce the unique characteristics of urban order in each city. This research contributes to the development of urban planning theory by highlighting the importance of understanding the local context in the creation and maintenance of urban order.*

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1. INTRODUCTION

In recent years, a paradigm has emerged in which urban liveability is closely tied to the presence of conditions of order (MacAdoo et al., 2017). Order is generally defined as a form or arrangement that is neatly and consistently arranged and has a relationship with one another (Von Meiss, 1988). Indonesia is one of the countries with the highest urbanisation rates in Asia, order is one of the key elements in the ethos of good urban planning and design (Widiawaty, 2023), coupled with the decision to move the country's capital city opens new questions about the concept of order that can be applied in the future. Several studies have been conducted on the structure of large cities in Indonesia; however, they typically discuss only one city as a whole or provide brief coverage of many towns. There are still few studies that compare two cities in depth, especially regarding the topic of order (Romdhoni & Rashid, 2021).

In the context of modern cities and towns, order implies, at its most basic level, hierarchical control, geometric uniformity, aesthetics, and the consistent repetition of physical elements and patterns. However, not all cities have order in their structure and layout. Winding and organic street patterns, buildings with varying heights and construction designs, and differences in plot and grid sizes are some of the most basic examples of physical disorder in urban space (Arefi & Aelbrecht, 2024). In contrast, physical order in urban space is crucial because it serves as a reference for understanding the image of a city (Meliana et al., 2021). Elements that are easy to describe are paths, nodes, and landmarks, because these three elements are easy to see and identify (Wally, 2016).The image of a town can also be influenced by the history and culture of its people (Fahri et al., 2023). In addition, natural factors such as geographical conditions and accessibility have an impact on land changes, especially economic activities, which also contribute to the contrast between orderly and disorderly cities (Putra et al., 2022).

Indonesia has two capital cities, each representing order and disorder, namely Medan and Palembang. The initial development of these two cities followed the pattern of river flows: Medan City, along the Deli River and Babura River, and Palembang City, along the Musi River (Adiyanto et al., 2020). The development of the two cities initially followed the Dutch colonial model, but the city layout changed as colonial culture merged with local culture (Sujiyati Maryani, 2015).

During the colonial period, these two cities were important trade hubs due to their strategic locations (Veronica & Siregar, 2018), which led to uncontrolled development in various fields. Land that was previously designated for settlements was transformed into trade centres (Pangaribuan, 2022). The rapid population growth led to physical changes, particularly the conversion of suburban land to residential areas (Sipayung et al., 2019). The city planning that was initially linear, centric, and centred on colonial port cities evolved into a multinucleated form, influencing the density and direction of urban development concentration (Romdhoni, 2020). This is in contrast with modern European cities and those in North America, which pay special attention to combining suburban areas with historic cities to provide continuity and sustainability in urban geometry (Romdhoni & Rashid, 2022).

Currently, according to data from the Medan City Profile, 2015-2019 and the Palembang City Profile, 2015-2019, both Medan City and Palembang City serve as centres of government administration, industrial hubs, financial service centres, communication hubs, tourism accommodation centres, and various regional and international trade centres, both cities are also part of the metropolitan areas in Indonesia that have a high average annual rate of change of 1.0 per cent. Each city is expected to experience a significant increase in its urban population proportion from 2018 to 2030.

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Efforts to minimise the negative impacts and maximise the positive effects of developing this city area require the formulation of effective planning policies (Utama & Idris, 2025). To ensure the city remains orderly, apart from the similarities in origin and planning, these two cities exhibit very contrasting differences in terms of their order. This demonstrates that consideration of local context is crucial in implementing the concept of order in urban spaces. This study aims to reveal why and how this contrast occurs by comparing the characteristics of the two cities. Theory of 'systematic order' and 'characteristic order' Marshall, 2009 and ‘ekistik concept’ Doxiades, 1968 are used as a conceptual framework to explore the idea of order in each city. The results of this study will serve as a reference for improving urban planning and development in Indonesia in the future.

2. METHODOLOGY

The methodology employed is qualitative descriptive, utilising the urban morphology method. Urban morphology is the study of the physical forms and spatial arrangements of human settlements (e.g., buildings, plots, and streets) and how humans interact with and use these forms over time (Kropf, 2018). Urban Morphology conceptualises how urban elements concentrate population and buildings, combine different individuals and practices, and facilitate relationships or interactions between them (Pafka et al., 2020). This method refers to the study of urban form that focuses on the formation and transformation of urban form, spatial patterns, and physical characteristics of cities to inform appropriate interventions to promote sustainable urban development.

The analysis method shown in **Figure 1** aims to understand the physical complexity of cities at multiple scales, from individual buildings, plots, street blocks, and street patterns that form the structure of the city, to help humans understand how cities grow and develop. Primary geospatial data, in the form of infrastructure maps, were obtained from the Geospatial Information Management and Dissemination Centre of the Geospatial Information Agency (BIG) and OpenStreetMap (OSM), and then combined with GIS-based applications (ArcGIS 10.3.1). Even though advanced Geographic Information Systems (GIS), remote sensing data, and data science techniques have allowed scholars to delineate the extent precisely, morphology, and transformation of cities at the global scale (Zhu et al., 2019), there is still a lack ofattention and systemisation of quantitative measures in urban morphology. Other data in the form of city administration from the Medan and Palembang City Profiles for the 2015-2019 period. Secondary data, as a complement to further information, was obtained from local planning documents and previous research related to spatial morphology.

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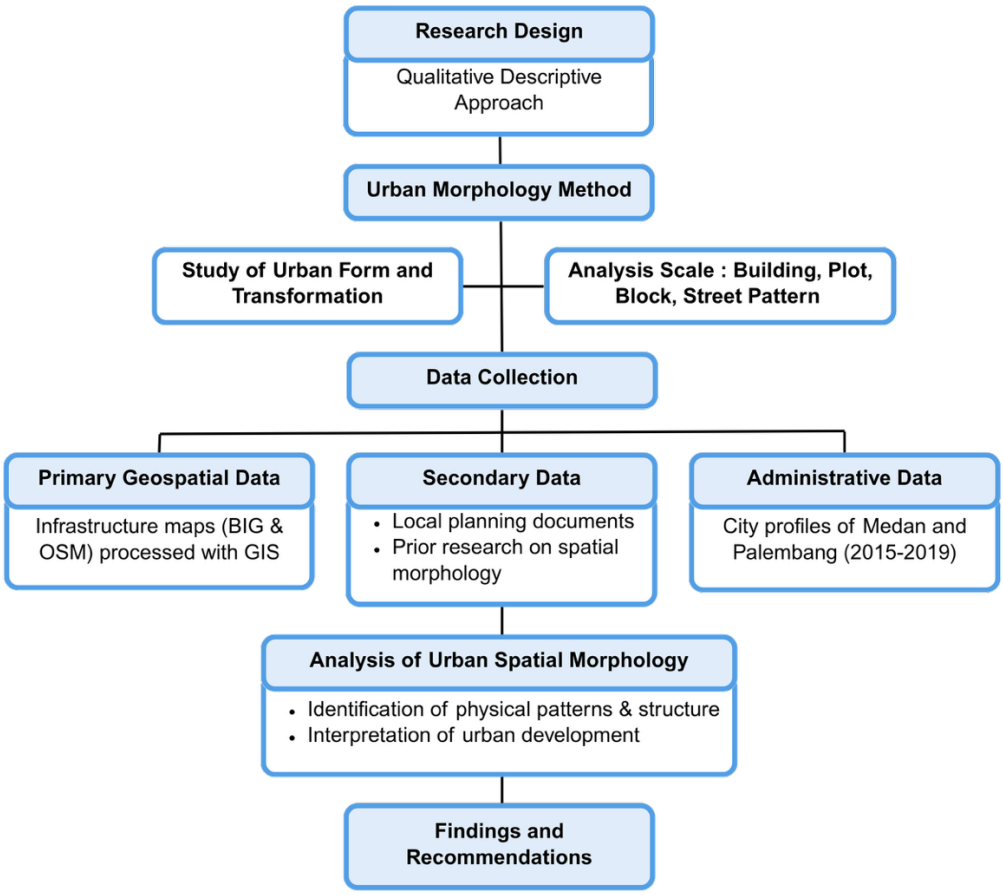

Figure 1. Method Research Flow

2.1 Concept of Order

Various methods can be used to identify urban spatial structures, including Marshall's morphological theory and Doxiadis' ekistic theory. Morphological theory is used to understand order in urban design by distinguishing between two types of order: systematic order and characteristic order. Systematic order is the type of order that is most easily identified, coherent, and generally visible quickly because it is related to the physical city, such as a consistent plot layout, even mass distribution, or a road network system with a repeating grid pattern. In contrast, characteristic order is a type of order that is produced by contextual social norms and values , resulting in a unique spatial and physical form (Marshall, 2009).

According to ekistic theory, a city is an environment formed by four elements, namely: (1) Nature; (2) Individual (Anthropos); (3) Society; (4) Life Space (Shells); and (5) Networks, (Doxiadis, 1968), by combining these two theories, it can be concluded that there are two main aspects in understanding the concept of order in urban areas, namely physical and non-physical aspects. Physical Order encompasses the city network and natural context, whereas Non-Physical Order comprises the social and economic aspects of urban society.

2.2 Physical Order "City Network"

The city is formed by a series of urban elements, namely: streets, street blocks, plots, and buildings (Yuniar et al., 2019), but in each city, these streets, street blocks, plots, and buildings are combined in a certain way, which then produces various types of networks. The regularity of the city structure is explicitly recognised in the form of street layouts, consistent

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setbacks, and uniform physical and visual attributes (Arefi & Aelbrecht, 2024), whether in residential areas on the outskirts of the city, in the central region, or the town, the explicit order of regularity is reinforced by uniform settlement styles and subdivisions consisting of similar plot sizes and consistent street networks.

2.3 Physical Order "Natural Context"

The natural context is the first condition for the formation and organisation of the various elements of urban form. The relief of the land, the quality and suitability of the soil and subsoil, the climate, exposure to the sun and wind, the type of natural landscape — all these factors influence how settlements are built, from their foundations, from the road network to the way the land is divided into different parts (plotting), and the buildings that will be built on those plots. At the beginning of each settlement, in various historical periods, the relief of the land has its configuration and geometry that influence the location and shape of the settlement. Depending on the concept of the city (limited, in a straightforward way, between the organic model and the rational model), the influence of the natural context on the city can be significant.

Geographically, Medan City and Palembang City have a tropical climate with relatively humid winds, with wind speeds ranging from 2.3 km/h to 4.5 km/h. Most of the Medan City area is a lowland with a topography that tends to slope to the North and serves as a meeting place for two important rivers, namely the Babura River and the Deli River. Palembang City has an average elevation of 8 meters, characterised by relatively flat and low land topography. Only a small part of the city area is located on slightly higher ground, specifically in the northern part of the city. Most of the land is a swampy area, so that during the rainy season the area is flooded. The type of soil in Palembang City is alluvial, clayey, and sandy, located in the youngest layer, and contains a significant amount of petroleum, which is also known as the Palembang-Jambi valley. Based on soil fertility criteria, the C/N content of soil in Palembang is relatively low (Utami et al., 2017).

2.4 Non-Physical Order "Socio-Economic"

The United Nations Human Settlements Programme issued a literature review on the economics of urban form. The report discusses two main characteristics of urban form at the macro scale: density and centrality. There is no single optimal city size; instead, the efficiency of city size depends on its features and locality. Economic and social dynamics related to regional decisions or policies can impact the spatial pattern of the region and socio-cultural dynamics, specifically their influence on the characteristics of the community as the outcome of the actors' activities. An increasing population and growing economic activities can significantly impact urban spatial planning (Sianturi et al., 2024).

3. RESULT

The results of the study indicate that urban structure regularity is influenced by four primary elements: the physical network of the city, natural conditions, social dynamics, and the economic structure of the community.

3.1 City Physical Network

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- **Medan City: The rectangular or grid system of road patterns**

Medan City, which has an area of 265.1 km², is divided into rectangular blocks with parallel longitudinal and transversal roads that form right angles. This system facilitates city development, ensuring the city appears orderly by following the established pattern. Medan City has a powerful grid pattern. There is a consistent relationship between street corners throughout the city and certain parts of the city that demonstrate good planning. The results of the analysis also show the density of functions and uses of Medan City, which is dominated by residential areas and commercial spaces. A comparison of the physical networks (building and massing) of Medan City and Palembang City is shown in **Figure 2.**

- **Palembang City: Irregular road pattern system**

Palembang City, which has an area of 400.6 km2 with a population density per km2 of 3351, is a city without a grid-like pattern in its town. However, in some parts of the city, especially in the developer's housing area, most of the housing districts apply a grid pattern but with different road network angles.

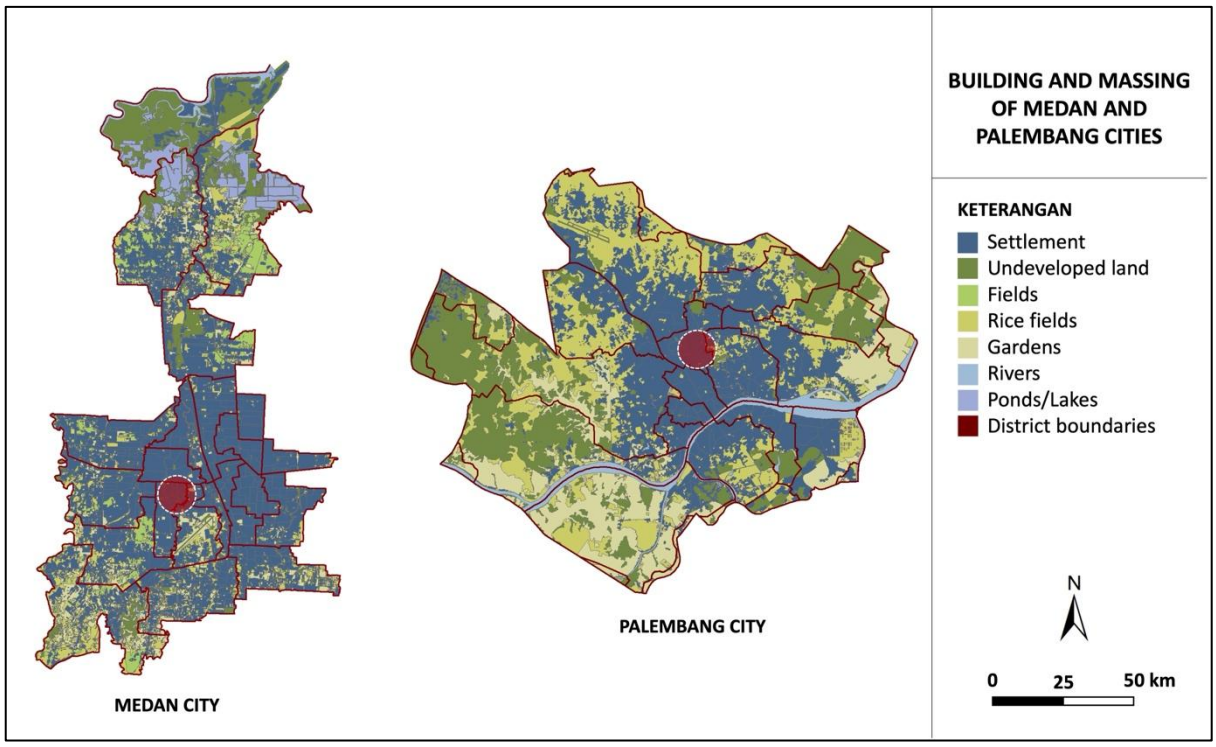

Figure 2. Building and Massing of Medan and Palembang Cities
source: BIG, OSM, 2021

There is irregularity in the road system, both in terms of width and direction of the road, as shown in **Figure 3 and 4**, where the width varies and is accompanied by numerous 'cul-de-sac' branches. The uneven topography of the city also affects the formation of this kind of road pattern system.

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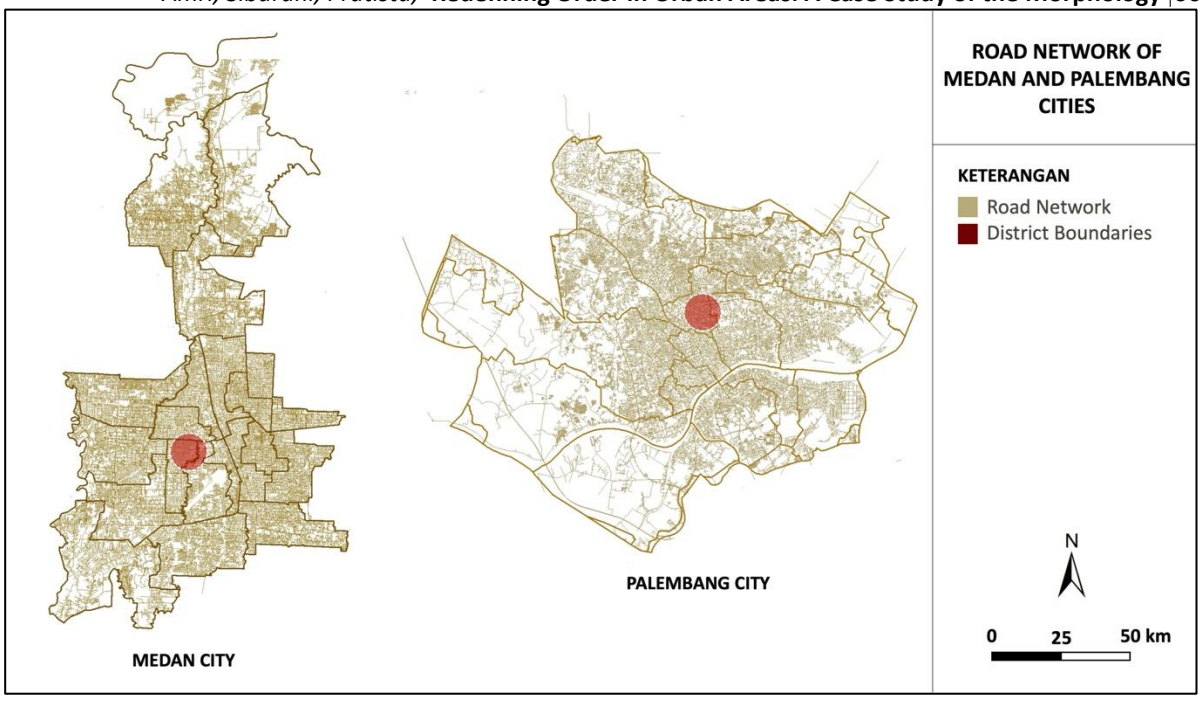

Figure 3. Road Network of Medan and Palembang Cities
source: BIG, OSM, 2021

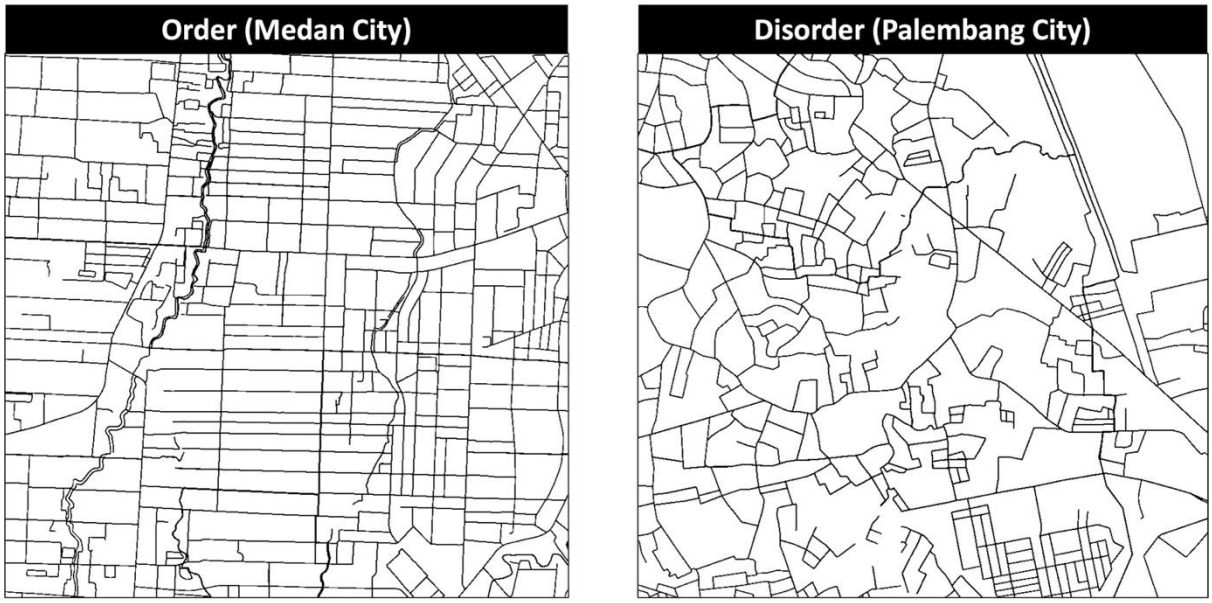

Figure 4. Details of the Road Network of Medan and Palembang Cities
source: BIG, OSM, 2021

3.2 Natural Conditions

- **Medan City: Homogeneous Area Pattern**

A transparent homogeneous regional structure, where there is only one structuring pattern. Homogeneous area patterns consist of solid and void elements that make up the area, characterised by shapes that tend to be uniform and usually exhibit a high level of

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density. A comparison of the natural conditions of Medan City and Palembang City is shown in **figures 5 and 6**.

- **Palembang City: Heterogeneous Area Pattern**

Heterogeneous regional arrangement, where there are two or more clashing patterns. Regional arrangement characterised by irregular patterns. This area is usually formed for specific reasons. This area lacks integration between functions, giving it an unplanned appearance.

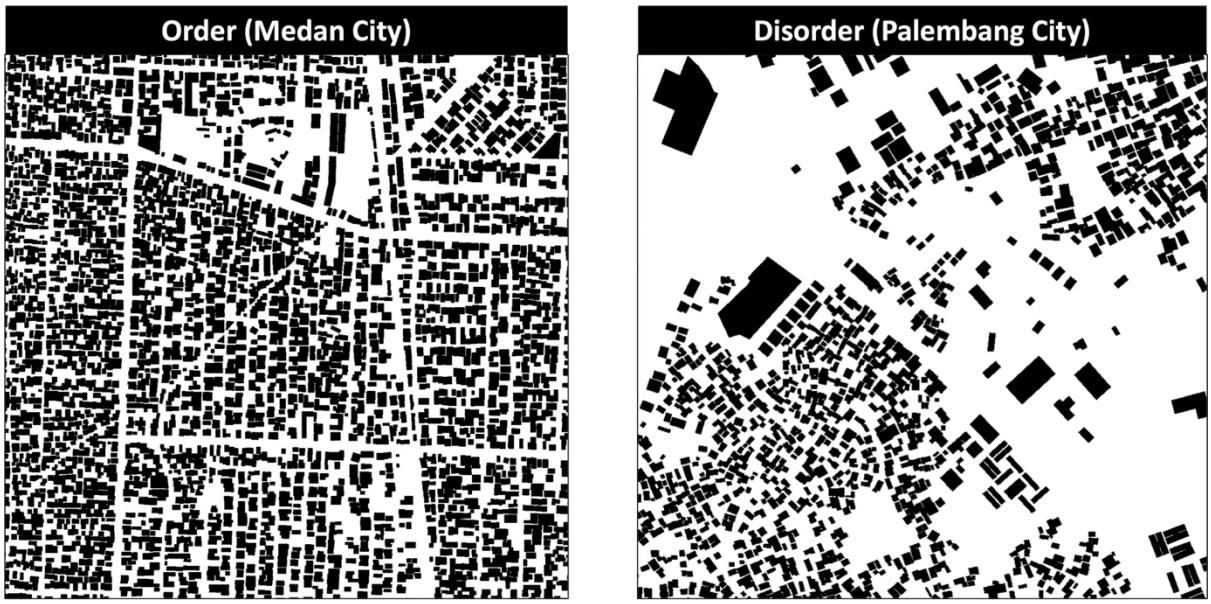

Figure 5: Building and Massing Details of Medan and Palembang Cities
source: BIG, OSM, 2021

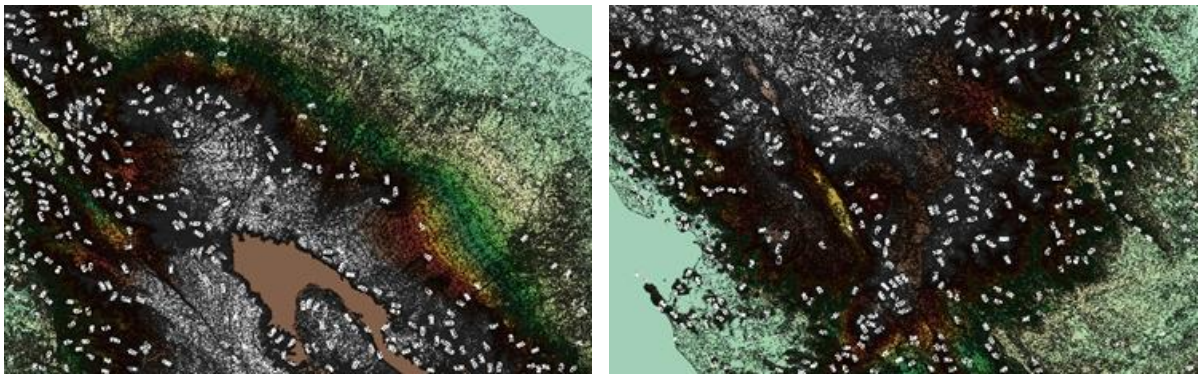

Figure 6: Contour of Medan and Palembang City
source: BIG, OSM, 2021

3.3 Social Dynamics and Economic Structure of Society

- **Medan City (Socio-Economic)**

Geographically, Medan City is supported by areas rich in natural resources, such as Deli Serdang, Labuhan Batu, Simalungun, North Tapanuli, South Tapanuli, Mandailing Natal, Karo, Binjai, and others. This condition makes Medan City economically capable of developing various cooperation and partnerships that are parallel, mutually beneficial, mutually reinforcing with the surrounding areas, in addition as a peripheral area of the Malacca Strait shipping route, Medan has a strategic position as a gateway (entry point) for trade activities

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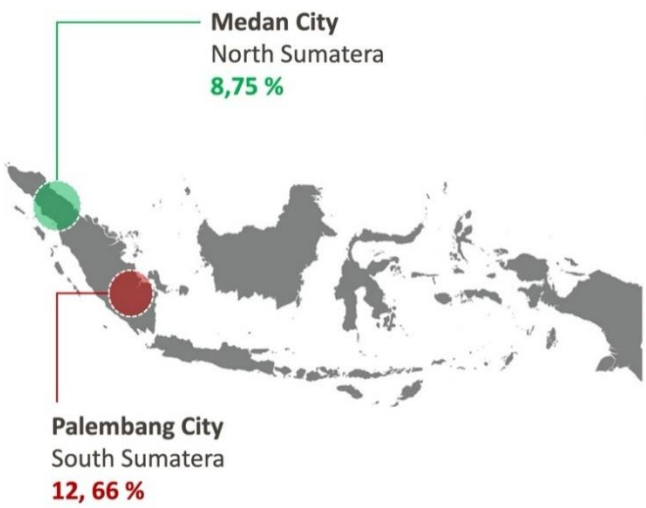
in goods and services, both domestic and foreign trade (export-import). Medan's geographical position has encouraged the development of the city into two distinct poles of physical growth: the Belawan area and the centre of Medan. A comparison of the socioeconomic structure of Medan City and Palembang City is shown in **Figure 7**.

- **Palembang City (Socio-Economic)**

Geographically, Palembang City also has a strategic location, like Medan City; however, the attraction of trade activities is much stronger in drawing investors than the various obstacles that exist. This is evident in the rapid construction of shophouses, malls, shopping centres, and hotels, in contrast to the housing and settlements that predominate, as seen in Medan City. However, the various constructions of places of economic activity are not supported by real calculations regarding how much of the place is needed. What will potentially happen is that the number of shophouses and malls may not be able to provide the income they should, because the real conditions of most Palembang residents do not require various products, services, and facilities considered luxurious, resulting in a relatively high poverty line.



Province	Sep'19	Mar'20
Aceh	15,01	14,99
North Sumatera	**8,63**	**8,75**
West Sumatera	6,29	6,28
Riau	6,90	6,82
Jambi	7,51	7,58
South Sumatera	**12,56**	**12,66**
Bengkulu	14,91	15,03
Lampung	12,30	12,34
Bangka Belitung Island	4,50	4,53
Riau Islands	5,80	5,92

Figure 7: Poverty Line of Medan and Palembang Cities 2020
source: BPS, 2020

4 CONCLUSIONS

Four main elements influence order in urban areas, namely the physical network of the city, the natural context, and the social and economic aspects of the surrounding community. Based on the results of a comparison of two case studies, it was found that Medan City, which has an area of 265.1 km² and a population density of 7,657 people/km², shows a higher level of order compared to Palembang City, which despite having a larger area (400.6 km²) and a lower population density (3,351 people/km²), actually shows an irregular city pattern. The order of Medan City is reflected in the use of a regular road network pattern (grid), which clarifies the structure of the city's spatial planning. Meanwhile, Palembang City develops with a more organic pattern, adapting to the natural landscape and its historical and cultural heritage, which shape its spatial planning gradually and are not formally planned.

The development patterns of these two cities are also influenced by the need for new settlements and the city's ability to respond to the social and economic dynamics of its

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people. The order in Medan City is supported by a natural context and, better, more stable socio-economic conditions compared to those in Palembang City. This indicates that differences in topography, climate, culture, economy, and politics significantly contribute to the emergence of contrasts between cities that develop regularly (in order) and those that develop irregularly (in disorder).

The main findings of this study indicate that the road network pattern—either grid-shaped or organic—has a direct correlation with the level of city order. Medan shows a higher order because it is supported by supportive topographic conditions and relatively strong socio-economic stability. In contrast, Palembang developed more adaptively to the landscape conditions and tended to form city structures through long historical and cultural processes. In addition, non-physical factors such as colonial policies, development strategies, and the role of institutions also influence the formation of city structures and their level of order.

Based on these findings, several recommendations are proposed for future research. First, it is essential to examine the relationship between formal and informal planning policies and urban order. Second, a deeper analysis of local cultural and political factors in each city will provide a more contextual understanding of the phenomenon of urban disorder. Third, comparative studies need to be expanded to other cities in Indonesia that have different geographical typologies and colonial histories, to provide a broader and deeper understanding of the dynamics of urban order in various local contexts.

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