

Morphology of Kisaran City: The Circulation System in Urban Transformation 1929-2022

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Abstract

The rapid economic growth and significant urbanization in Kisaran City have posed several challenges in urban planning, including adequate housing, health facilities, education, and transportation. The city's development was also influenced by its colonial history, with the dominance of colonial power regulating the production and trade of plantation products as well as the lives of local people. The morphological transformation of the city from 1929 to 2022 reflects the challenges related to infrastructure, visual appearance, and the growth of the commercial sector, which have affected the lives of citizens and demanded the city's adaptation to the development of the times. Historical events, such as colonization by foreign powers and Chinese immigration, have affected the population growth of Kisaran and caused pressure on infrastructure and socio-economic inequality. This study aims to understand the morphology of Kisaran City and the factors that influence its transformation by using the methods of literature study, synchronic approach, and diachronic approach. The results of the study concluded that the morphological transformation of Kisaran City was influenced by the circulation system, which adapted to the needs and trends of society, and interacted with each other in forming the morphology of Kisaran City that continues to develop over time.

Keywords: Transformation; Morphology; Kisaran City 1929-2022.

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1. Introduction

Kisaran City, as one of the cities in North Sumatra, has experienced rapid economic growth and significant urbanization over the past few decades. This growth has brought various complex challenges in urban development planning. Providing adequate housing, healthcare facilities, education, and transportation are major concerns in efforts to meet the increasing needs of the city's population. Additionally, the city has a colonial history that has significantly impacted its current development and characteristics. The past colonial dominance reflects its influence in controlling the production and trade of plantation products in the region and regulating the lives of the local population. Furthermore, Kisaran City serves as a convergence point for various plantation products and is also influenced by the colonial government's control over distribution routes and international markets. During this transformation process, challenges arise concerning infrastructure, visual appearance, and the growth of the commercial sector. These changes affect the lives of the residents and demand the city to adapt to ongoing developments.

The city's history also records significant events, such as foreign colonization and the immigration of Chinese people to Deli Afdeling, which also contributed to the city's population growth. The rapid population growth puts pressure on existing infrastructure and resources, leading to socio-economic disparities within the urban area. Despite the potential for progress and opportunities that rapid urban development brings, it is not always accompanied by adequate infrastructure development. Consequently, issues such as traffic congestion, environmental damage, and a decline in the quality of life for city residents become primary concerns that need to be addressed. To understand the dynamics of Kisaran City's development and tackle the challenges it faces, research on the morphological transformation and the factors influencing it from 1929 to 2022 is highly relevant. Transformation is the process of significant change or shift from one form or condition to another. In an urban context, transformation encompasses substantial changes in the form, structure, and characteristics of the city. Various factors such as social, economic, geopolitical, and cultural changes can cause transformations (Bentley, 1999), (Doxiadis, 1968), (Henri Lefebvre, 1974). Morphology is the study of the form or structure of an object or entity. In the urban context, urban morphology focuses on studying the physical form of the city, including layout, settlement patterns, building design, and other physical characteristics. The study of urban morphology can involve analyzing how the city has evolved over time, how urban planning changes over time, and how the physical elements of the city interact with society and the environment (Kropf, 2017), (Sima et al, 2009), (Smailes, 1955), (Moudon, 1997), (Muratori, 1959), (Conzen, 1966).

Urban morphological transformation involves changes in the form and structure of the city caused by various factors. This transformation occurs in the urban context and directly impacts the city's morphology. For example, rapid population growth can lead to the expansion of urban areas and the development of new areas that were previously rural, changing the city's layout and creating new settlement patterns. Urban transformation and morphology are closely related, resulting in changes in the urban form and structure. The study of urban morphology helps us understand these changes and their impacts on society and the environment.

To understand the factors influencing the morphological transformation of Kisaran City from 1929 to 2022, existing facts and theories will be utilized, including literature

focused on theories, concepts, and approaches to urban transformation analysis over time, as viewed from the city's morphology.

2. Method

This research discusses Kisaran City as the research subject. Information about its history, geographic location, economic development, and land use changes from 1929 to 2022 will be collected and presented during the research process. Kisaran City is located in the North Sumatra province of Indonesia, with boundaries to the north with Asahan Regency, east with Tapanuli Tengah Regency, and south with Labuhanbatu Regency. The city covers an area of 1,310.27 km². Based on 2019 data, the estimated population of Kisaran City is around 121,567 people. The city is well-known as an industrial center, especially in the textile and textile products sector. The government also develops the agricultural and commercial sectors in the area to stimulate economic growth. Currently, Kisaran City is one of the most populous cities in Indonesia, with a population of approximately 200,000 people. Through literature studies and gathering various information related to Kisaran City, authentic data related to its past journey influencing the morphological transformation of the city has been found. The data for the year 1929 comes from KITLV Leiden, 1960 is reconstructed based on relevant informants residing in Kisaran City until now, 1970 from the National Library of the Republic of Indonesia, 1977 from KITLV Leiden, 1983 from the Public Works Department stored in monographs at the National Library of the Republic of Indonesia, 2006 from Satellite Imagery, and 2022 from observation results. The choice of the year 1929 is appropriate to observe the city's changes due to the global economic crisis caused by the New York stock market crash. This event led to changes in market behavior and global trade downstream, resulting in reduced city activities worldwide, including Kisaran City, which played a crucial role as a city exporting raw materials such as rubber plantation products and other plantation products to Europe. Hence, world traders sought raw materials directly from the original production site of the plantations, leading to significant expansion in 1929. The largest group that successfully occupied the Asahan region was the Dutch colonial and its troops. They established districts to control plantation products and ensured that downstream of plantation results could be brought to the port and further transported to their countries for resale at high prices, while the colonial government bought them at very low prices from the farmers. One of the districts where the Dutch controlled the plantations, including rubber, gambier, tobacco, and others, was the Kisaran District. In 1929, the Dutch constructed several infrastructures, including Kisaran Station connected to Tanjung Balai Station on the port side, and then the bridges connecting the areas to transport plantation products. The Dutch also added Bunut Station, which transported processed raw rubber in blocks directly to Tanjung Balai Port. By choosing the year 1929 to study the morphological transformation of Kisaran City's land use, researchers can gain a deeper understanding of how these events have influenced the city's morphology in the past and present. Kisaran experienced significant transformations after the Dutch colonial handed over power to the Japanese government and in the post-independence era.

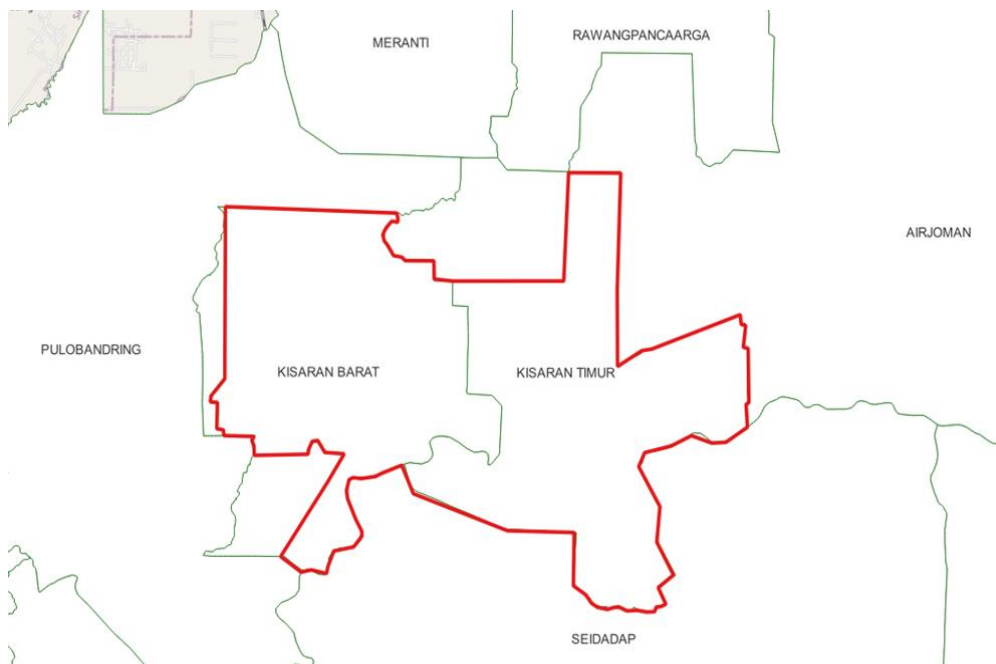


Figure 1. Redrawing the boundary map of Kisaran District.

Source: Kisaran Barat District in Figures, 2019 and Kisaran Timur District in Figures, 2020

This research focuses on Kisaran City as the subject of study. Information regarding its history, geographical location, economic development, and changes in circulation patterns from 1929 to 2022 will be collected and presented during the research process. The method of literature review will be employed to gather data and information about the history and development of Kisaran City from various sources, such as books, scientific journals, government reports, and archival documentation (Conzen, 1960; Muratori, 1959). This information will serve as the basis for understanding the city's development from 1929 to 2022. The synchronic approach will be used to analyze phenomena that occur within the same context simultaneously (Mahsun, 2000). In the context of this research, the synchronic approach will be used to analyze the morphological changes in Kisaran City within the same time frame, i.e., from 1929 to 2022. Data and information regarding circulation patterns will be identified and analyzed to understand the city's transformation during this period.

The diachronic approach will be used to examine changes in phenomena from year to year (Mahsun, 2000). In this research, the diachronic approach will be employed to observe the morphological changes in Kisaran City from year to year during the research period. Data and information about the city's transformation and development from 1929 to 2022 will be identified and analyzed to understand the changes that occurred over different periods. Both primary and secondary data will be collected to support this research. Primary data may include survey results, interviews, or direct field observations. Secondary data will be obtained from the sources identified during the literature review. The collected data will be analyzed using qualitative and quantitative analysis methods. Qualitative analysis will be used to understand and interpret descriptive data, while quantitative analysis will be employed to measure and analyze numerical data. The results of the data analysis will be

interpreted to provide an understanding of Kisaran City's morphological transformation from 1929 to 2022. The findings from this research will be used to draw conclusions and make recommendations for better urban development in the future.

3. Results and Discussion

From a synchronic perspective, the factors influencing the morphological transformation of Kisaran City from 1929 to 2022 can include significant population growth that leads to changes in the city's morphology. During this period, the population of Kisaran experienced a considerable increase, impacting the physical development of the city, such as the expansion of settlements, construction of new infrastructure, and changes in circulation patterns. Government policy changes, both at the national and local levels, can also influence the morphological transformation of Kisaran City. Policies related to infrastructure development, accessibility improvements, or urban spatial planning can affect road layouts, urban planning, and regional development. Economic growth is an essential factor in the city's morphological transformation. Significant economic development in Kisaran during this period may have led to the establishment of new industries, trade centers, and business districts. This would impact infrastructure improvements, changes in circulation patterns, and commercial sector growth. Social and cultural changes can also contribute to the morphological transformation of the city. Social developments and changes in the lifestyle of Kisaran's residents during this period might be reflected in alterations in the design and function of public spaces, iconic buildings, and settlement patterns.

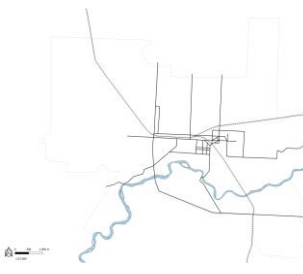

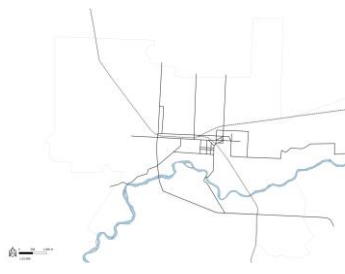
From a diachronic perspective, the factors influencing the morphological transformation of Kisaran City from 1929 to 2022 include urbanization, which involves population movement from rural to urban areas, impacting changes in the city's morphology. Urbanization can also affect urban layouts, settlement growth, and infrastructure development. Technological, transportation, and infrastructure advancements during this period have influenced the morphological transformation of Kisaran. Introductions like automobiles, highway constructions, and the development of public facilities such as electricity, clean water, and telecommunications can impact changes in the city's circulation patterns, urban networks, and infrastructure. The overall transformation of Kisaran City can be understood by examining changes that occurred during the colonial period (including 1929) and beyond.




In 1929, Kisaran was under Dutch colonial rule. The colonial government's policies had an impact on urban planning and development. They might have constructed infrastructure such as roads, bridges, and government buildings that gave the city a new form. One of the objectives of colonialism was the exploitation of natural resources in the colony. If Kisaran had valuable economic resources like plantations or mines, the colonial government might have facilitated access and built transportation facilities, and other related infrastructures to support that exploitation. This could have influenced settlement patterns and circulation in Kisaran. As a colonial administrative center, Kisaran experienced changes in urban planning and morphology to meet administrative and governance needs. The construction of government buildings, administrative offices, and other related infrastructure might have shaped the city's new face during that period. The transformation of the city's morphology can also be seen in aspects of culture and architecture. Dutch colonial architectural styles might have influenced the construction of buildings and houses in Kisaran. The colonial cultural influence might have been reflected in the city's spatial



arrangements and settlement patterns different from pre-colonial times. The transition from an agricultural to an industrial and service-based economy could also influence the morphological transformation of Kisaran City. The growth of the industrial or trade sector might have altered settlement patterns, urban spatial planning, and infrastructure development to cater to the growing economic needs.

Changes in urban planning policies, zoning regulations, or spatial plans can significantly impact the morphological transformation of Kisaran City over time. These changes may involve the development of new residential areas, the construction of shopping centers, or the establishment of industrial zones that affect the city's physical structure. In the past, the Asahan Sultanate in Asahan Regency, North Sumatra, had abundant natural resources. Rubber, gambier, tobacco, and spices were the primary commodities that attracted European interest in developing and exploiting them. These commodities were considered valuable and had high demand in the European market, making trade and exports essential for the sultanate. This development became the starting point for the region to have many activities that eventually formed Kisaran City. The European interest in the natural wealth of the Asahan Sultanate had a significant impact on its development. Rubber production became one of the major commodities that attracted investment and trade interest from European traders. Additionally, gambier, tobacco, and spices were also vital sources of income for the local population. The high demand from the European market encouraged the development of production systems and infrastructure to support trade activities. Along with the trade development, the area became more bustling with economic and social activities.

Table 1. Descriptive Statistic

1929s	1960s	1970s
		
<p>In 1929, when looking at the circulation patterns, it can be seen that Kisaran City was still in its early stages of formation. At that time, the material used for circulation was soil, which was then compacted to become hardened.</p>	<p>In 1960, there were no additional changes to the circulation patterns; however, post-independence, there was an expansion where the width of the circulation increased from three meters to six meters.</p>	<p>In 1970, the circulation patterns in Kisaran City had not undergone significant development or additions. During that period, there were no major changes in road infrastructure and transportation systems in the city.</p>

1977s	1983s	1998s
		
<p>In 1977, there was an addition to the circulation patterns in Kisaran City around the shopping and wholesale centers. This addition had an impact on dividing the roads that connected those areas, making them interconnected. The improvement in circulation patterns might have involved constructing or expanding roads leading to the shopping and wholesale centers, aiming to enhance accessibility for visitors and customers coming to the area. area tersebut.</p>	<p>In 1983, the circulation patterns in Kisaran City underwent rapid development, making it easily accessible. With the improvement of road infrastructure and transportation, accessibility in the city significantly increased. The existing circulation patterns at that time might still follow the previous designs and planning. The main road network and the environment might not have undergone notable expansions or changes.</p>	<p>In 1998, the existing circulation patterns still followed the previous designs and planning. The main road network and the environment might not have undergone significant expansions or noticeable changes due to the economic crisis. The economic crisis that occurred during that time impacted city development and infrastructure projects. With limited financial resources, there were constraints on implementing large-scale expansions or major changes to the circulation patterns. As a result, the city might have focused on maintaining the existing infrastructure and optimizing the available resources during the economic downturn. This could have led to a lack of significant alterations in the circulation patterns and road network during that period.</p>
<p>2006s</p>	<p>2022s</p>	

	
<p>In 2006, the existing circulation patterns still followed the previous designs and planning. The main road network and the environment might not have undergone significant expansions or noticeable changes.</p>	<p>the circulation patterns in the city might have become disorganised, leading to frequent congestion at several crucial points. This could be attributed to the rapid growth in population and the number of vehicles, while the existing road infrastructure was unable to accommodate the increasing volume effectively.</p>

Infrastructure development such as roads, ports, and processing facilities became a priority for the sultanate. Rapid economic development directly impacted the formation of Kisaran City, becoming a center of economic and trade activities in the region. The presence of Kisaran City became a symbol of prosperity and economic growth for the Asahan Sultanate. The transformation of Kisaran City's morphology in terms of circulation patterns was influenced by the colonial period and continued post-independence with regional autonomy. This allowed for significant development and improvements in circulation patterns in Kisaran City. During the colonial period, the regulation of circulation patterns in Kisaran was based on colonial interests, which might have focused on exploiting natural resources. With regional autonomy, the Kisaran City government became more responsive to local needs and had the authority to regulate circulation patterns. The overall morphological transformation of Kisaran City from 1929 to 2022 can be observed in Table 1. The table visualizes the changes that occurred in circulation patterns, population growth, and infrastructure development during the mentioned period. Initially, the city was dominated by residential areas with limited space for wholesale activities and public facilities. However, with social and economic development, circulation patterns began to change.

Regional autonomy after independence provided opportunities for broader development. Kisaran City grew rapidly, showing significant changes in Kisaran City's morphology.

Kisaran City underwent significant changes as a result of the global economic crisis in 1929. Being a city that produced raw materials, particularly rubber, Kisaran became essential for world traders seeking direct access to the source of production. During that year, the Dutch colonial authorities occupied the Asahan region and initiated crucial infrastructure development, such as the Kisaran station, bridges connecting different areas, and the Bunut station for distributing raw rubber products. The transformation of Kisaran City's morphology occurred after the Dutch colonial rule was succeeded by the Japanese government and continued into the post-independence era. The factors influencing the transformation of the circulation patterns can be seen in Figure 2, which depicts the development and changes in Kisaran City from 1929 to 2022. Initially, the circulation patterns in Kisaran City were shaped by agricultural trade activities. However, in 1929, the Dutch colonial administration took control of Kisaran City and started constructing healthcare facilities and station to cater to the needs of plantation workers and facilitate the distribution of agricultural products from the city to the port. The presence of these facilities made Kisaran City play a significant role in the journey of goods distribution, especially due to its strategic location at the intersection of stations leading to the port. The Dutch colonial authorities then established a cargo inspection post that handled administrative tasks and quality checks for goods. With the increasing activities of plantation workers, the Dutch also built dispersed settlements to enhance efficiency. Additionally, they established rubber packaging industries to produce rubber blocks and constructed the Bunut Station as a distribution center. Around this station, upper-class settlements were established as residences for plantation officials. As time went on, until the year 2022, the population of Kisaran City continued to increase, and the dispersed settlements expanded and developed further to accommodate the growing population. The transformation of the circulation patterns in the depicted image reflects the changes in scale and the expansion of residential areas in Kisaran City due to population growth until 2022.

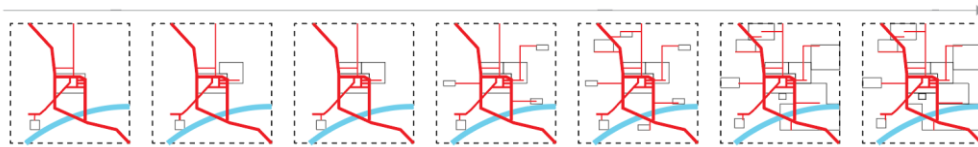


Figure 2. Morphological transformation of circulation system 1929 - 2022.

The morphological transformation of Kisaran City's network began with the presence of river networks, providing the initial foundation for the city's development. These rivers not only served as a water source but also as natural transportation routes that influenced the growth of settlements and economic activities around them. Furthermore, with the establishment of a railway network, Kisaran City became connected to other cities on a regional scale. This railway network became the backbone of transportation, facilitating the movement of people and goods between cities. This transformation had a significant impact on the city's growth and development, connecting Kisaran to other regions and expanding the scope of economic activities. Moreover, the development of road networks also had a substantial influence on the shape of Kisaran City. An expanding and well-connected road network facilitated the mobility of the population, trade, and accessibility to various essential

facilities. The morphological transformation of the road network reflected the city's expansion and changes in settlement development patterns and economic activity centers. The period of morphological transformation of Kisaran City's network from 1929 to 2022 signifies long-term changes. The river networks, railway systems, and roads played a crucial role in shaping the city's spatial layout, influencing the location and distribution of settlements, and regulating population growth and mobility. The transformation of Kisaran City's network is a reflection of the dynamic development of the city, aiming to accommodate the needs of its residents and adapt to transportation infrastructure trends and developments. These changes reflect the complex interaction between geographical, social, economic, and development policy factors that shaped the face of Kisaran City over time.

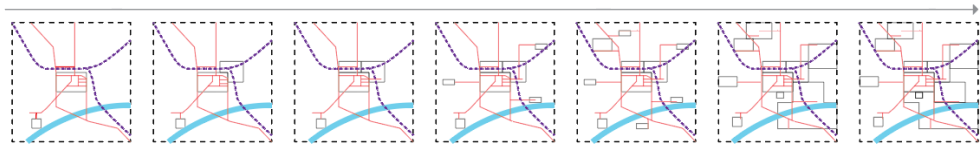


Figure 3. Morphological transformation of circulation, roads, rivers, and railways.

The morphological transformation of Kisaran City is an essential process that has influenced its development and structure. The research on this transformation is based on various theories proposed by several experts. One relevant theory concerning Kisaran City's morphological transformation is Mumford, L.'s theory from 1961. This theory emphasizes the significance of urban artifacts in influencing the city's characteristics and form. Urban artifacts such as historical buildings, monuments, and business centers reflect the identity and history of Kisaran City. Understanding these urban artifacts allows us to observe how the city has evolved and how its physical aspects have changed in line with social and economic changes. Besides urban artifacts, the development of railway facilities also plays a vital role in the morphological transformation of Kisaran City. Babcock's theory from 1992 highlights how the development of railway facilities can affect the city's form and structure. With the presence of railway facilities in Kisaran, transportation and city connectivity have rapidly improved. The railway station becomes a primary focal point attracting populations and economic activities, thereby creating changes in settlement patterns and the city's layout. The development of Kisaran City as a response to the railway station's establishment can also be understood through the dual-core theory proposed by Harris, C.D., and Ullman in 1945.

Several findings regarding the structural form of Kisaran City have caught the attention of researchers. Historically, Kisaran has undergone development that reflects the influence of various factors, including the significant function of plantations during the period of 1929. During this time frame, Kisaran played a crucial role as a producer of raw materials, particularly rubber and other plantation products. Its role as an economic center in the plantation sector has deeply influenced the city's current form and structure. One significant finding is the presence of a grid pattern in the layout of Kisaran City. The grid pattern appears as straight lines that form organized blocks in the arrangement of roads and settlements. This pattern seems to be triggered by the need for efficiency in transporting plantation products from production sites to the station and the central area of the city. With the grid pattern in place, the distance between locations can be better managed, thus making the distribution of plantation products smoother and more efficient. This condition has an

impact on the rapid economic and trade development in the city. Furthermore, another interesting finding is the presence of angular and organic patterns in the structure of Kisaran City. The angular pattern emerges due to the influence of the surrounding topography. The undulating terrain and hills may have affected the direction of road construction and settlements, resulting in non-parallel road patterns that follow the natural contours of the land. Additionally, the flow of rivers passing through the city also plays a role in shaping the organic pattern. Roads and settlements tend to follow the river's flow, creating a more free-flowing and organic pattern. It is essential to understand that the findings concerning the city's structural form are not merely related to physical aspects. Through further research, we can explore the social, economic, and political contexts that also influence the formation of these patterns. For instance, the existence of the railway station during the period of 1929 has significantly contributed to Kisaran City's development. The station became a central point connecting Kisaran with other cities, and its impact can be seen in the patterns of settlement growth and economic activity in its vicinity. The morphological transformation of Kisaran City from the past to the present provides a comprehensive overview of the city's history and development dynamics. The discovered patterns of the city's structural form are reflections of how it has adapted to the needs and changes of time. A deep understanding of these findings can serve as a strong foundation for planning sustainable and future-oriented city development. By harnessing the potential and uniqueness of its existing urban form, Kisaran can continue to evolve into a more advanced, comfortable, and environmentally friendly city for all its residents.

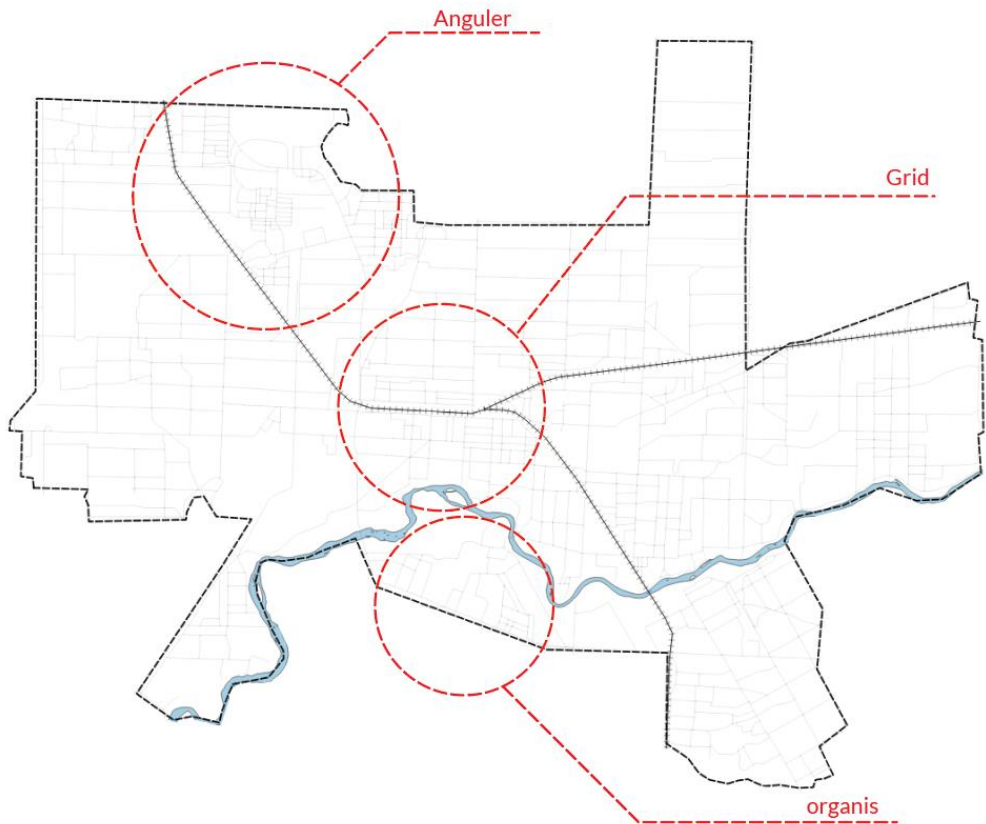


Figure 4. Findings on the structural form of Kisaran City.

4. Conclusion and Recommendation

The results of this research indicate that Kisaran City plays a crucial role as a center for trade, industry, and services in the North Sumatra region. The rapid economic growth and increased investments have strengthened its position as a thriving business hub. The historical colonial past has also left an impact on the city's development, with the influence of the Dutch colonial government's dominance in controlling the distribution of agricultural products still being felt today. The transformation of Kisaran City's morphology from 1929 to 2022 signifies its potential and adaptability to changing times. However, the rapid economic growth and significant urbanization pose challenges in urban development planning, requiring collaboration and comprehensive urban planning. The implications of this research provide insights into the city's significance as an economic and social center in its region and contribute to formulating city development strategies that positively impact the residents of Kisaran City. Nevertheless, the research also faces limitations due to the availability of artifact data that may affect the understanding of the city's history and transformation.

The research findings have several implications for the future development of Kisaran City.

First, the city should continue to invest in its economic development. This includes attracting new businesses and industries, as well as developing the city's infrastructure.

Second, the city should work to preserve its cultural heritage. This includes documenting the city's history and architecture, as well as promoting its cultural attractions.

Third, the city should develop a comprehensive urban plan that takes into account the needs of its growing population and changing economic landscape. This plan should include provisions for transportation, housing, and public space.

The research also faces some limitations. First, the availability of artifact data is limited. This makes it difficult to fully understand the city's history and transformation. Second, the research is based on a case study of Kisaran City. This means that the findings may not be generalizable to other cities.

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