

## ANALYSIS OF THE EFFECTS OF URBAN SPRAWL ON THE TRANSFORMATION OF PANGKALPINANG CITY

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### ABSTRAK

*The characteristics of Pangkalpinang City as an archipelagic area have undergone a spatial transformation. Historically, the Pangkalpinang City area has been a mining area since 1973, and is currently developing into the capital city of Bangka Belitung province. developed into the service sector, industry, and trade. This study aims to analyze the spatial transformation of Pangkalpinang City due to urban sprawl and the pattern of changes that occur. The methodology used in this study is a mix method consisting of several methods such as the city's economic development sector using Dynamic Location Queationt, socio-spatial analysis, and leapfrog analysis. This study found that several sub-districts in the Pangkalpinang City area experienced a leapfrog type of spatial development, which was characterized by the orientation of the development of residential and industrial areas. The land in Pangkalpinang City is not productive agricultural land, but dry land plantation areas, so that the development of urban physical expansion does not eliminate the essential benefits of agricultural land for food productivity. Meanwhile, under the ex-mines, currently it has been used for the development of the fishery sector and the use of renewable energy development. Another finding is that the limited space of Pangkalpinang City to support the growing development will result in the orientation of land use towards the surrounding suburbs.*

**Keyword** : Leapfrog, Ribbon development, Urban Sprawl,

### A. INTRODUCTION

Urban areas always experience dynamic growth due to population growth and economic activity. The development of built-up land always follows population growth as a place to live and activity (Jain et al., 2016). The need for built-up land continues to increase, while the area of urban administration tends to remain constant (Mouratidis & Poortinga, 2020). This encourages the complexity of the urban regions beyond the city's administrative limits, causing symptoms of urban sprawl (Follmann et al., 2021). Activities of various dimensions of development in different urban areas have led to increased economic growth. Through multiple actions of the urban population, which is expanding, it will affect the need for land, which is also growing (Soma et al., 2021). Residential land becomes very limited in the city center while land prices are high and causes the area to be unable to accommodate the activities of its inhabitants. One of the issues that need attention

is the suburban phenomenon and the spatial change and social characteristics in the area (Lai, 2020).

Pangkalpinang City is the capital of the Province of the Bangka Belitung Islands and is an overgrowing archipelagic city. Pangkalpinang City was a part of South Sumatra Province and was uncategorized as an urban area. Pangkalpinang City has a unique characteristic, namely as a former tin mining area. The tin mining activity has a significant influence on the changes in city morphology and spatial structure. As an area whose main activity was mining, the city of Pangkalpinang is still able to maintain its existence through the orientation of economic activities. The attractiveness of Pangkalpinang City as a tin mining area in 1995 was the cause of the development of the population to come to this city. Pangkalpinang City has experienced a population growth of 20% over the last five years. Significant population growth occurred in Gerunggang District, Bukit Intan District, and Gabek District. Rapid population growth accompanied by complex economic activities has caused the Transformation of physical development in the downtown area to increase and move towards the suburbs of Pangkalpinang. Based on the results of (Jain et al., 2016) research, if urban areas experience complex spatial developments, it causes the productive land to decrease, causing changes in the shape of the city or irregular city morphology. Therefore, the characteristics of Pangkalpinang City as an archipelagic region are also experiencing rapid spatial differences, and it is essential to identify its development. But on the other hand, as a city located in an archipelagic area, the urban transformation of Pangkalpinang City is not influenced by population movements from towns within the administrative area of Bangka Belitung province or the influence of other urban area extensions that cause faster urban Transformation, such as the Jabodetabek case (Nagasawa et al., 2015). However, the population growth in Pangkalpinang City during the last two decades has grown quite rapidly. This also affects the need for new settlements in the city.

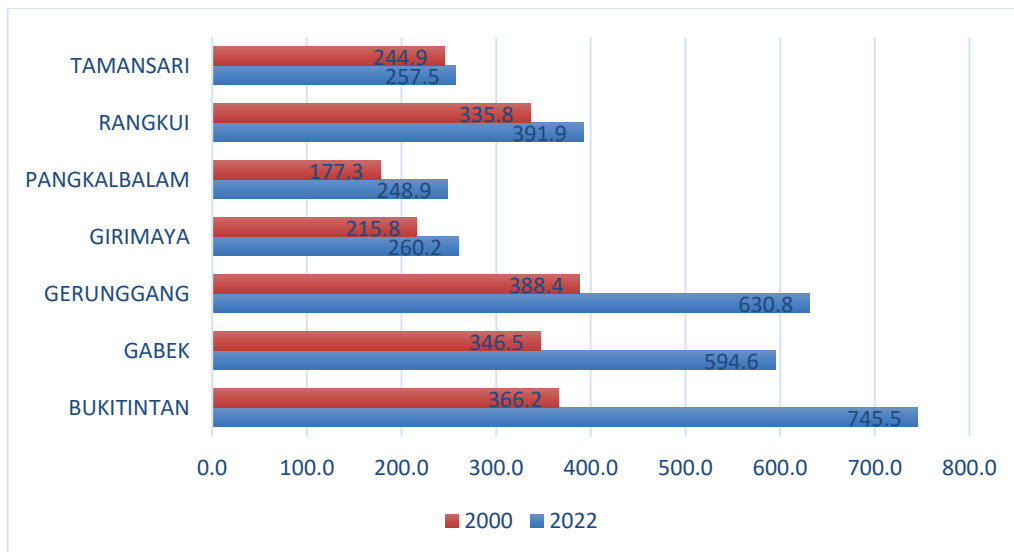


Figure 1. Land Use in Pangkalpinang City, 2022  
Source: Landsat Image Analysis Pangkalpinang City, 2022

The city's morphology is seen from the road network pattern, land use, and the type or characteristics of the building. In other words, this approach emphasizes more on physical conditions (Lai, 2020). The same thing also happened in Pangkalpinang, undergoing urban development transformation towards the city's outskirts. The increasing demand for space in the urban area of Pangkalpinang encourages the development of urban fringe areas and random regional developments in peri-urban regions (Rahman et al., 2021). The purpose of this research is to describe the transformation of Pangkalpinang City both physically and economically which has resulted in symptoms of urban sprawl. Physical changes emphasize that it is necessary to identify indications of changes in land use due to physical development, the influence of urban activities towards the outskirts of the city, which were originally agricultural and plantation land. Meanwhile, economic transformation describes the factors causing changes in people's economic activities, which were originally agriculture and mining, turning to industry and trade.

## B. RESEARCH METHODS

The analysis used in this research is mixed methods analysis which emphasizes the use of quantitative and qualitative analysis to obtain the expected research objectives. Identification of the physical transformation and spatial patterns of Pangkalpinang city using quantitative analysis through a spatial approach. This spatial approach uses reading software Quantum GIS and Google Earth Pro, by providing meaning based on the observed spatial perspective. Spatial analysis with Quantum GIS software functions to identify urban growth and acceleration patterns with data in the form of images of the Pangkalpinang City area, related to distance, land density, road network, and analysis of spatial change patterns. Finally, scoring analysis is used to determine the typology and level of urban sprawl according to the predetermined urban sprawl variables. Specifically, this analysis uses leaffrog analysis. Spatial changes are more complex due to the urban sprawl phenomenon using observation distance analysis from the outskirts of the city to the city center using Quantum GIS and Google Earth Pro software in each sub-district in Pangkalpinang City which is identified as sprawl, with the assumption that the closer the distance to the city center, the higher spatial changes that occur. Next, analysis of leapfrog spatial development patterns was identified by calculating the distance from the center of new buildings and settlements to the old payment center in each sub-district in Pangkalpinang City where sprawl was identified. Frog jumping like this is considered detrimental, unaesthetic and inefficient (Rosni & Mohd Noor, 2016). The calculation of leapfrog development patterns can be seen from the leapfrog index with the assumption that the higher the leapfrog index value, the greater the level of sprawl in the area being observed. So, to measure the leapfrog index, it will be analyzed using the formula.....(1)

$$Leapfrog = \frac{\text{Total New Buildings Fragmented with Old Buildings}}{\text{Number of new buildings}} \dots\dots\dots(1)$$

Meanwhile, qualitative analysis is used to identify the factors that cause changes in the economic community that play a role in influencing physical

changes in Pangkalpinang (Rahman et al., 2021). However, beforehand, to find out which sectors are economic priorities in Pangkalpinang City, they will be analyzed using Location Quotient (LQ) and Dynamic Location Quotient (DLQ). Location Quotient (LQ) analysis specializes in developing economic sectors in Pangkalpinang City, the base sector (Mo et al., 2020). Many commodities produce an LQ value > 1 which is the normative standard to be designated as a leading commodity, so one entity with the highest LQ must be selected (Mo et al., 2020). While the analysis of Dynamic Location Quotient (DLQ) accommodates the growth rate factor of sectoral economic output periodically. The effect of the development of the economic sector analysis will be related to the occurrence of urban sprawl in Pangkalpinang City. To calculate the LQ, you can use the following formula.....(1)

$$LQ = \frac{S_i / S}{N_i / N} \dots \dots \dots (2)$$

Information

- LQ = Location Quotient
- $S_i$  = The amount of income for sector  $i$  in Pangkalpinang City
- $N_i$  = Amount of income for sector  $i$  in Bangka Belitung Province
- $S$  = Total income in Pangkalpinang City
- $N$  = Total income in Bangka Belitung Province

Dynamic Location Quotient analysis, has this principle not much different from LQ, with the following equation formula..... (3)

$$DLQ = \left\{ \frac{(1+g_{ik}) / (1+Gk)}{(1+G_i) / (1+g)} \right\}^t \dots \dots \dots (3)$$

Information

- DLQ = Dynamic Location Quotient
- $g_{ik}$  = Sector growth rate  $i$  in Pangkalpinang City
- $gk$  = Average sector GDP growth rate in Pangkalpinang City
- $G_i$  = Sector growth rate  $i$  in Bangka Belitung Province
- $G$  = Average GRDP growth rate in Bangka Belitung Province
- $T$  = Number of years for analysis

If the LQ value is > 1. It means that the growth of the sector with the GRDP of Pangkalpinang City is potentially faster than that of the Province of Bangka Belitung, and vice versa. LQ and DLQ analysis in addition to describing the basic sector which is developing and will experience development in the future. Therefore, when you have found the base sector, the next step is to identify it directly through direct observation in the field to find out areas that are experiencing rapid physical changes as a result of being influenced by the development of the base economic sector in Pangkalpinang city.

### C. RESULT AND DISCUSSION

#### Changes in the Economic Sector Influence the Development of Pangkalpinang City

The existence of rapidly growing trade and service activities in Pangkalpinang City has impacted changes in land use. The development of trade and service activities triggers the growth of economic activities, both similar activities and supporting activities that attract residents to Pangkalpinang City. The continuous development of these activities has caused Pangkalpinang City to experience changes in the orientation of the economic sector during the last two period. More clearly shown the economic industry that developed in 2022 in Pangkalpinang City.

**Table 1.** Dynamic Location Quotient (DLQ) Pangkalpinang City 2005 dan 2022

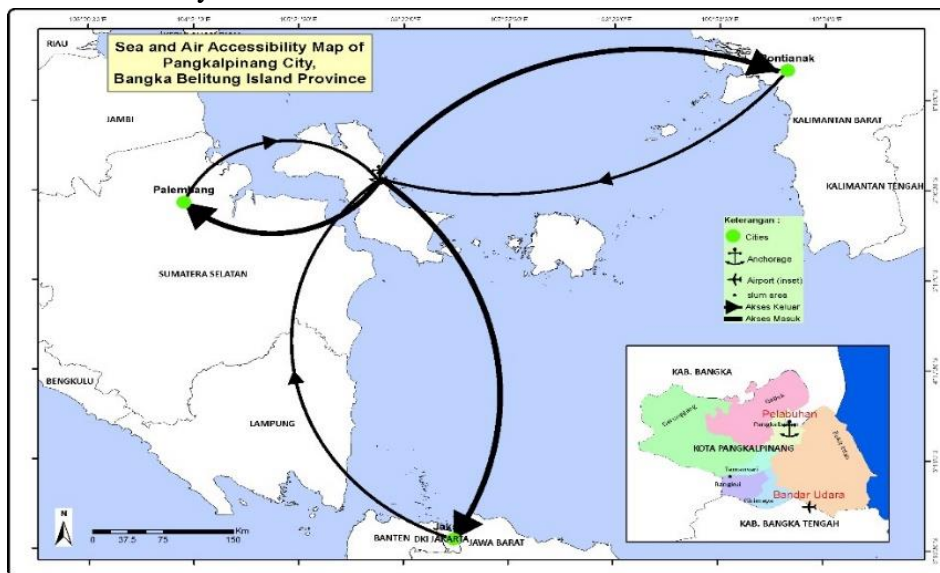
Sectors	DLQ 2004/2005		DLQ 2021/2022	
	Value	Rate	Value	Rate
Agriculture, Forestry and Fisheries	0,06	Slow	0,40	Slow
Mining and excavation	-	-	-	-
Processing industry	1,89	Fast	0,09	Slow
Procurement of Electricity, Gas	0,21	Slow	4,47	Fast
Water Supply	-0,03	Slow	2,46	Fast
Construction	-0,21	Slow	0,75	Slow
Wholesale and Retail Trade, and Car and Motorcycle Repair	-0,22	Slow	0,94	Slow
Transportation and Warehousing	0,56	Slow	0,30	Slow
Provision of Accommodation and Food and Drink	0,10	Slow	0,92	Slow
Information and Communication	-0,06	Slow	0,38	Slow
Financial Services	-0,11	Slow	0,85	Slow
Real Estate	-0,14	Slow	0,30	Slow
Company Services	-0,90	Slow	0,63	Slow
Government Administration, Defense and Social Security Mandatory	0,64	Slow	1,07	Fast
Education Services	7,09	Fast	0,87	Slow
Health Services and Social Activities	-0,03	Slow	0,87	Slow
Other services	-0,13	Slow	0,82	Slow

Source: Secondary Data Analysis, 2022

The mining and quarrying sector in Pangkalpinang has not been a basic sector since the beginning of the formation of the Bangka Belitung Islands Province in 2000. However, previously the city of Pangkalpinang was part of the province of South Sumatra, at some points locations in this region were used as tin mines. Since the cessation of mining operations and activities in Pangkalpinang City, several pits from former tin ore mining have been used to cultivate freshwater, brackish, shrimp and crab fisheries to encourage production and export of the fisheries sector in the archipelagic province. In addition, the area under the tin mine is also used as a place for developing the latest energy, in order to meet the electricity needs of the surrounding community. This of course will reduce the environmental impact of mining activities in the past. After becoming the capital city of Bangka Belitung Province, Pangkalpinang City has developed and has a very prominent sector,

namely the large trade sector, with  $LQ > 1$ . However, during the pandemic from 2020, the large trade sector experienced a slowdown. In Table 4, in 2020, the non-base sector experienced a rapid growth rate, namely the provision of electricity and water this was due to an increase in the number of residents and settlements in Pangkalpinang City which caused a significant increase in the DLQ value. Based on the results of the DLQ calculation, it is also seen that the Construction Sector experienced an increasing growth rate from 2005-2022. At the same time, the Manufacturing Industry sector has a slow growth rate in 2020, after 2004-2005, it has a fast growth rate. This indicates that physical development in the Pangkalpinang City area has increased.

The characteristics of suburban areas in Pangkalpinang City that accommodate the growth of economic activity and settlements are Gerunggung and Gabek Districts, which are new housing development areas, businesses in services such as laundry, mobile phone service, computer service, etc. Meanwhile, Bukit Intan District, which is in the West, serves as an alternative area for developing industrial and residential activities in Pangkalpinang City due to land saturation. The increasing of those activities starts land transformation and affects the pattern of land use and road network pattern, which is a constituent element of the structure of urban space. Those facts prove that economic development affect the system of urban area and city structures.



**Figure. 2** Pangkalbalam Port and International Airport as Access in and Out of Pangkalpinang City

Source: Landsat 8 Image Analysis, Pangkalpinang City, 2022

Moreover, related to population growth, the Pangkalbalam port becomes the entry point of population movement and access to goods and services on a national scale. Meanwhile, other areas are saturated with trading activities and government administration. The mobility of people entering and leaving Pangkalpinang City can be through the Pangkalbalam port and Depati Amir International Airport. The dominating population migration to Pangkalpinang City is from Palembang City, Bandar Lampung City, and Pontianak City. The mobility of the population entering Pangkalpinang City is caused by the tendency of economic factors to get a job, open

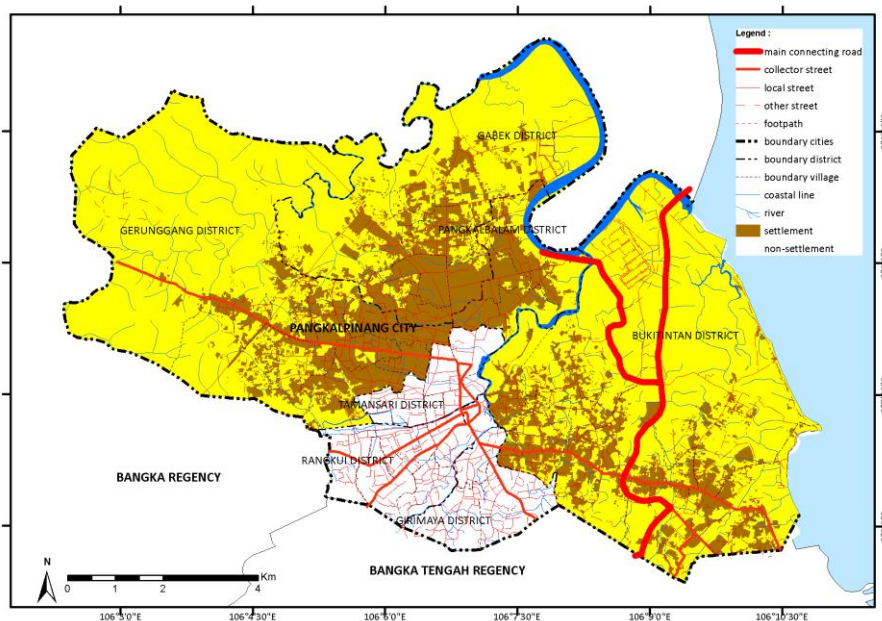
a business, and do other economic activities. The increasing number of workers concentrated in the area will affect the city's growth and cause the reduced availability of land in the area (Surya et al., 2020). The Transformation of the economic development for a decade turned out to have placed Pangkalpinang City growing rapidly and not even being limited as an archipelago. Unlimited access to Pangkalpinang city leads to an identity as an "open city." The open city in question is that Pangkalpinang acts as the highest transmigrant receiving area from the area's residents around the city. Migration in Bangka Belitung Province began in 2000 and experienced a rapid increase in 2010 with a total of 60,808 people. One of the biggest destinations for residents to make choices is in Pangkalpinang City. Unlimited access to the city of Pangkalpinang is one of the supports for increasing the industrial size by the government of Pangkalpinang even though the current Analysis of the Location Quotient (LQ) of the Economic Sector shows the LQ of the industrial sector is  $<1$ .

### **Analysis of Spatial Transformation Due to Urban Sprawl in the Urban Peri Area, Pangkalpinang City**

The physical transformation in the Pangkalpinang City area was analyzed using the development of built-up and non-built land use from 2000 to 2022. The increase in population is directly proportional to the activities produced, causing the increasing demand for land. Land that has been turned into a built area, such as residential and land use for economic activities, has dominated the suburban area of Pangkalpinang City. The analysis results show a benefit of built-up land in Pangkalpinang City experiencing a change in development orientation. Tin mining activities are no longer a strong dominance in economic activities that change the morphological structure of urban areas but are currently oriented towards the development of services, trade, and industry sectors. The increase in population density mainly occurred in the western region of Pangkalpinang, namely in Gerunggang District and Gabek District. Both areas experience high density because they have a strong appeal as a developing region in the context of local economic growth. They become areas for housing complex development and economic activities such as trade and services.

The rise of immigrants who came to Pangkalpinang City finally chose the Gerunggang District and Gabek District as temporary or permanent places to live. The spatial Transformation that occurs in Gerunggang District is influenced by a university called Pertiba in the area. The university encourages significant land-use changes in the vicinity. In addition, the spatial transformation of the built-up area and the transformation that occurred in Gerunggang Districts were also in the form of a modification of the function of the building. Around the college area, settlements have begun to be built vertically because the role of the building is not only used as a residence but also as a business area for selling and especially as a rental residence for students or boarding houses (Ewing, 2008).





**Figure 3.** Map of sub-districts experiencing physical development of the city and increasing road capacity

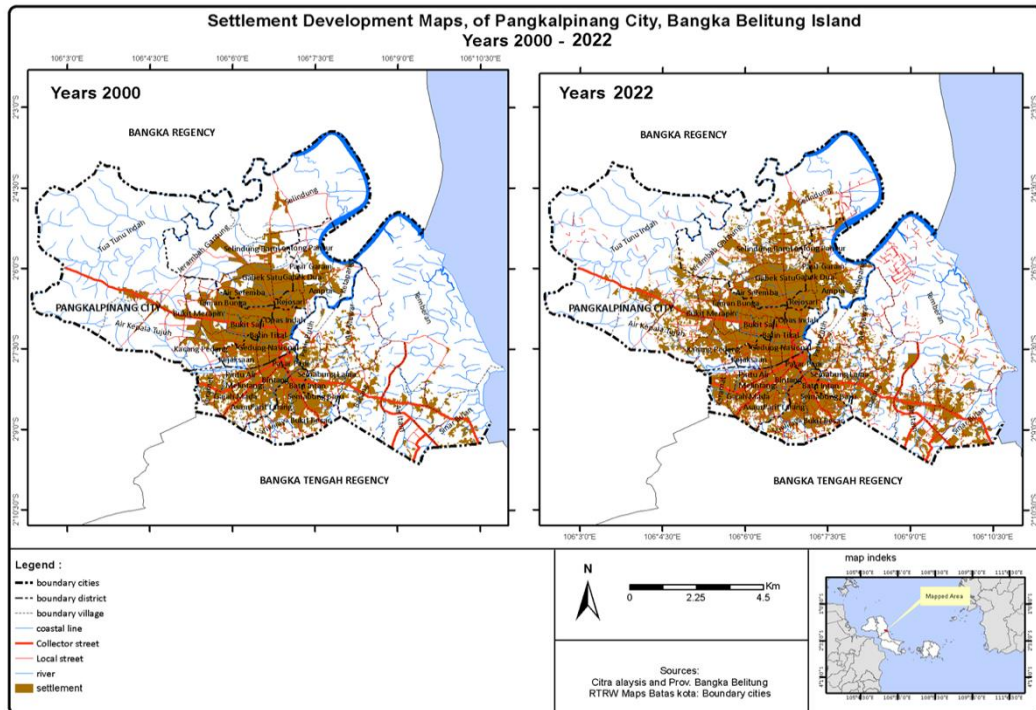
Source: Land Use Map, Google Earth Image, Years 2000-2022

Changes in the function of productive land in the Gerunggung and Gabek sub-districts cause a spatial transformation with a complete urban nature. This causes the suburbs to no longer provide plantation land because most of the land has been acquired into plots to be sold by landowners (Resnik, 2010). As a result, in this area, the impact of land speculation. Despite its limited existence, landowners prefer to sell their land for reasons of economic compulsion (Barrington-Leigh & Millard-Ball, 2020). In addition, residential area developers also greatly influence the spatial transformation in this area by establishing housing complexes on vacant land (Wagistina & Antariksa, 2019). In this case, developers have high expectations for the site in the future. Subsidized houses with affordable prices provide a perspective for migrant residents who prefer the area to be used as a place to live (Resnik, 2010). This condition will eventually lead to the increasingly dense construction of housing complexes for migrant residents who want to live on the outskirts of Pangkalpinang City.

Bukit Intan sub-district has the lowest population density among other sub-districts. However, this area in the future is projected to become a large industrial and trade area. Currently, the orientation of activities such as industrial, business, and service areas have developed. Bukitintan sub-district is a developing area oriented to industrial regions, settlements, trade, and services. As a form of transformation, the spatial changes that occur are changes in the road network that are increasingly widening for the capacity of the mode of transportation of goods transport from Depati Amir Airport to Pangkalbalam port. The area is the entrance and exit for the city of Pangkalpinang, both for the movement of the flow of goods and the mobility of the population. The high activity of transportation flows on this route impacts increasing road density (Kalyani et al., 2020). In 2012, the industry on the Pulau Pelepas Road corridor-Depati Hamzah Road continued to grow. The



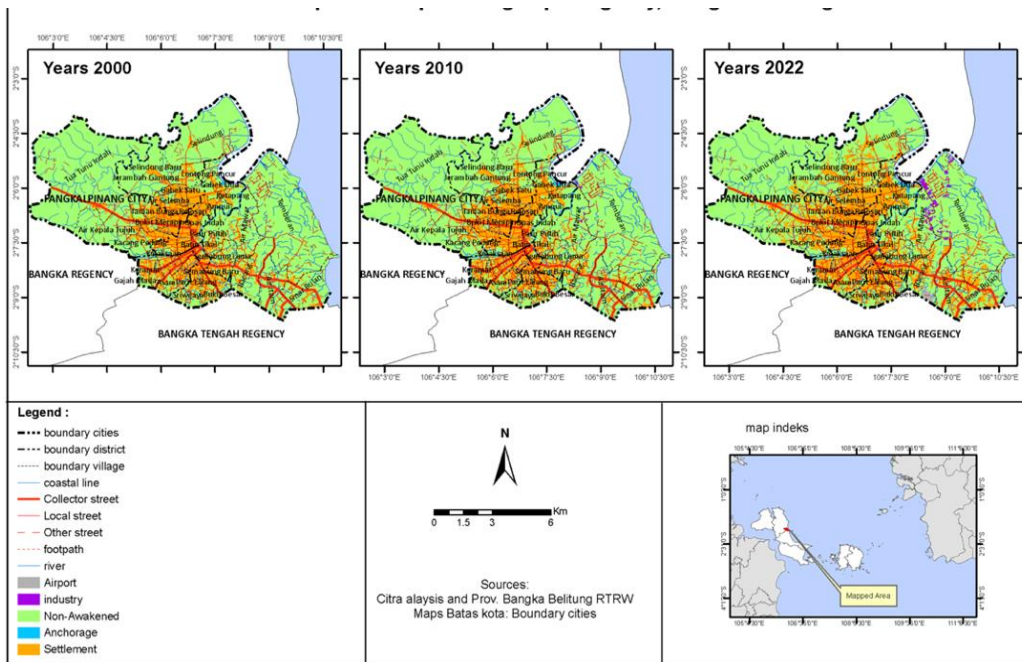
absorption of labor in this sector causes the surrounding population to switch from agrarian to industrial. The port of Pangkalbalam, one by one sea route, is the fastest route for population mobility to enter Pangkalpinang City because the city area is an archipelago, so access to enter can be by sea or using air transportation. Therefore, this industrial sector will increase the spatial transformation that occurs in Pangkalpinang District.



**Figure 4.** Settlement Development Map, of Pangkalpinang City, Years 2000-2022  
Source: Land Use Map, Google Earth Image, Years 2000-2022

Based on the results of the analysis of the spatial development of Pangkalpinang City, it shows an immediate difference over 20 years. Land use for non-agricultural activities is overgrowing, causing land-use orientation for industrial activities, trade, services, etc. Significant developments in land-use changes in the city center affect the development of the suburbs of Pangkalpinang City. The increase in land use for built-up areas in 2010 increased by 112.34 ha compared to 2000. The increase in land use in 2020 also increased by 989.85 ha compared to 2010. Changes in the land-use area occurred significantly and directly proportional to the mobility of people who come to Pangkalpinang City is also increasing. The most significant increase in land-use changes for built-up land occurred in Gerunggang District and Bukit Intan District because these areas are the economic growth centers in Pangkalpinang City. Apart from being the center of economic growth, this spatial Transformation occurs due to the expansion of downtown activities that have spread to the outskirts of Pangkalpinang City. The main thing affects the ease of obtaining land as a new residential area and economic activity. Based on the spatial mapping analysis of the development of Pangkalpinang City, there have been significant changes that have spread to the suburbs, marked by the increasing

intensity of development and widening of roads. Geographically, the distance between the city center and the suburbs of Pangkalpinang is very close. This is also the influence that the faster the Transformation of physical, social, and economic changes in the suburbs (Festus et al., 2020).



**Figure 5.** Built-Up Land Map of Pangkalpinang City, Bangka Belitung Island Source: Land Use Map, Google Earth Image, Years 2000, 2010 and 2022

Intensive development of built-up areas refers to and towards the West and East. This is primarily due to the physical aspects of the site in the form of a landform in the form of a plain, which is very suitable to be used as a built area. The development of the built area towards the West is influenced. The East of Pangkalpinang City is influenced by the availability of land that is still sufficient and close to the exit and entrance of Pangkalpinang City. These symptoms also impact the implementation of the Pangkalpinang City policy in 2017, which directs the development of the area to be used as an industrial, trade, and service area. The development of the built-up area to the north and south has a lower development because it is not the main area for economic activities (Shao et al., 2021). Leapfrog index measurements show that the road network is lower to the north from the city center than the more densely populated western and eastern areas. This further emphasizes the linear urban propagation pattern of the leading road network. The road network in Gerunggang District, Bukit Intan District, and Pangkalbalam District show a linear regional propagation pattern. Still, the tendency is that the propagation of the road network is getting further apart and random, but the width of the road remains constant. This is due to the narrow condition of the land due to residential houses and permanent building areas.

**Table 2.** Leapfrog Index in the Peri Urban Region of Pangkalpinang City

No	Kecamatan	Low (1.00-1.99)	Midle (2.00-3.99)	High (4.00-6.00)
1	Bukit Intan	1.16	-	-
2	Gabek	1.29	-	-
3	Gerunggang	-	2.50	-
4	Girimaya	-	-	4.13
5	Pangkalbalam	-	2.85	-
6	Rangkui	-	-	4.38
7	Taman Sari	-	-	5.83

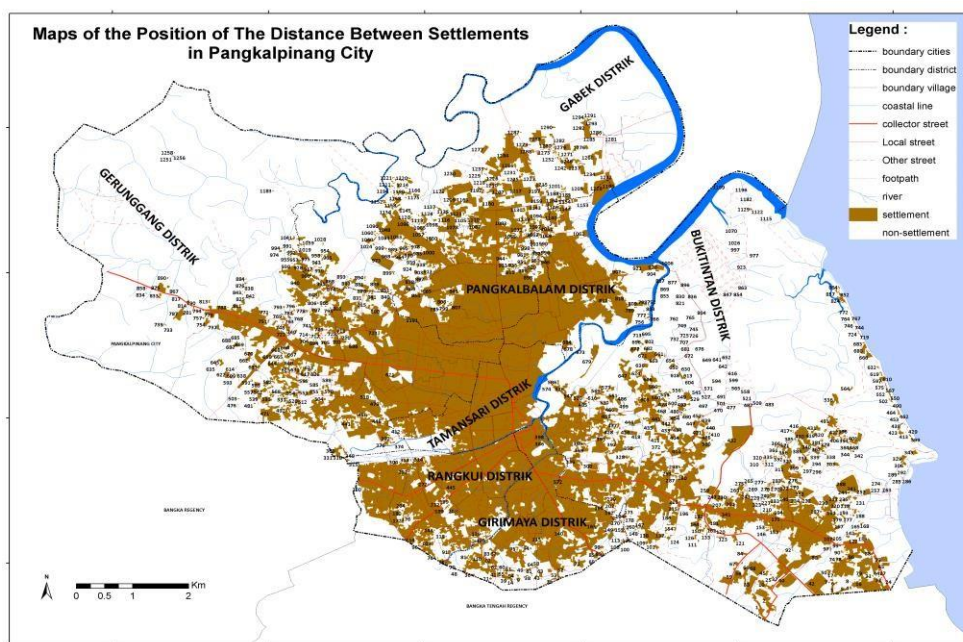
Source: Secondary Data Analysis 2022

The leapfrog phenomenon in Pangkalpinang City has several main symptoms. The development of residential areas does not occur centrally in one location but is spread over specific points in the suburbs. The characteristic of the leapfrog leaving significant plantation lands as a space to fill the void between built-up lands. The leapfrog functions as a trigger with the same development typology in the suburbs of Pangkalpinang. The development of built-up land with the leapfrog type in Bukit Intan and Gabek sub-districts indicates an interaction between Pangkalpinang City and the hinterland outside the city's administrative boundaries. This interaction will indirectly encourage the phenomenon of urban sprawl towards areas outside the Pangkalpinang city (Nechyba & Walsh, 2004). Changes in economic activity are also influenced by the presence of residents who move closer to the suburbs area, so it requires space for housing and economic activities (Laidley, 2016).

Gerunggang and Pangkalbalam sub-districts are the main attractions for developing economic centers in the trade and service sector in suburban areas, spatially having ribbon development characteristics. These characteristics are reflected in the influence of the construction of new residential areas built in the middle of open land, and the development of road infrastructure, and the commercial activities of shops with an elongated spatial pattern (Guerra & Li, 2021). The two sub-districts are predominantly urban areas, namely the development of their spatial pattern is influenced by the development of infrastructure and city facilities such as terminals, markets, and other centers of economic activity, causing the spatial pattern to have a ribbon development pattern (Yazdanifard et al., 2021). This is indicated by the emergence of the development of a road network to connect the city center with new settlements, industrial areas, and other infrastructure in Pangkalpinang City. This follows the research results (Gerten et al., 2019) which states that ribbon development is a type of urban sprawl that develops following the main transportation corridors. This condition is strongly influenced by the strategic value of the existence of roads as transportation infrastructure that has been built in suburban areas. This type of ribbon development pattern occurs in inland areas that have direct access to highways (Polidoro et al., 2012).

The road network in the ribbon development pattern functions as an intermediary that can increase the economic value of agricultural land in suburban areas. This Ribbon development accelerates changes in the spatial expression of the suburban regions linearly along the road (Rubiera-Morollón & Garrido-Yserte, 2020). The development of the built-up area in Pangkalpinang City linearly spread mainly in the suburbs of Gerunggang and Pangkalbalam districts. Symptoms of this

type of ribbon development are the main characteristics of urban sprawl developments in the western and eastern parts of Pangkalpinang City, which are depicted through time series maps. Ribbon development phenomenon has few primary symptoms, settlement development occurs centrally along the main road, massive and full ribbon development changes plantation land along the road into built-up land, ribbon development develops due to the existence of road infrastructure development, and this type functions as a generator of economic value for plantation lands in suburban areas. The development of built-up land with the ribbon development type in Gerunggung and Pangkalbalam Districts indicates high economic growth, which is thought to result from the construction of shopping centers and trade distribution channels. The offer of plantation land in suburban areas at high prices cannot be separated from the availability of accessibility (Murakami & Palijon, 2005).



**Figure 6.** Map of the distance between settlement points in Pangkalpinang City  
Source: Land Use Map, Google Earth Image 2022

This study found that the phenomenon of population transmigration that occurred was caused by several things such as the change in the status of the city of Pangkalpinang to become the capital of the province of Bangka Belitung. These changes encourage several areas to become centers of strategic activity and "attractions" for . An attraction is the final destination of a non-home trip or a non-home travel destination for the surrounding area. City infrastructure is also a component that acts as the "attraction" of Pangkalpinang City. In addition, the lack of operation of public transportation modes that serve movement between cities and regencies in Bangka Belitung Province triggers the desire to change residence to reduce travel distances between cities and regencies within the region. As a result, people tend to move permanently in Pangkalpinang City rather than making daily trips to the city center. The mobility pattern in Pangkalpinang City is quite dense



because the suburbs are experiencing expansion and there are no available modes of public transportation and a road network with adequate carrying capacity. As a result, residents use private vehicles which cause congestion at several points which are new development areas.

The cessation of mining activities in Pangkalpinang City which left the pits of former tin ore mining through the policy of the Bangka Belitung Provincial government to seek to be used for cultivating freshwater fisheries for residents' activities. In addition, the area under the tin mine is also used as a place for developing renewable energy, in order to meet the electricity needs of the surrounding community. The Provincial Government of Bangka Belitung is collaborating with PT Timah to utilize the ex-mining pit as an area for the development of a power plant. Most of the undeveloped land in Pangkalpinang City is not productive agricultural land, so the development of urban physical expansion eliminates the essential benefits of agricultural land. But some undeveloped land is dry land area. Symptoms of rapid urban development have also reduced land use for protected areas such as urban forests which have begun to be used as built-up land for new settlements. The availability of these new settlements attracts residents to live in the area, and changes the spatial expression of suburban areas. As a result, patterns of physical development that are not well planned are built. The main implication of the development of the city is more towards urban sprawl.

The condition of high land prices due to rapid urban development, encourages these land owners to sell their land, to be used as a location to open new businesses, thus creating the growth of shops, shopping centers, and other industrial areas (Salem et al., 2021). Another trend of the development of this type of tape is the creation of new motion generators in suburban areas to attract more people, which affects the density of buildings. Pangkalpinang city, which is a city in the archipelago region, has very limited productive agricultural land, plantations and protected forests. There must be selective efforts to limit land commercialization and massive physical development. Regarding the impact of changes in economic activities from tin mining to trade, industry and services, it must be prepared through comprehensive long-term planning. The unavailability of new industrial, commercial and residential area arrangements will result in uncontrolled development. Gerunggang District, which still has minimal development, has begun to be exploited for physical development over the last two years, causing various negative impacts such as reduced productive land, increased carbon emissions, traffic jams and so on.

#### **D. CONCLUSION**

Changes in economic development from the mining sector to the service and trade sectors have caused the demand for land in the downtown area of Pangkalpinang to increase. Migrants prefer to live and carry out their economic activities in the suburbs of Pangkalpinang. The existence of plantation land is gradually decreasing quantitatively due to the influence of urban sprawl with the leapfrog type and the ribbon development type. The leapfrog type changes plantation land randomly and on a not-too-large scale but consistently transforms one by one agricultural land use function into built-up land. Meanwhile, urban

sprawl-type ribbon development will drastically reduce the area of plantation land, primarily plantation land located along the road that has been built. the mobility pattern in Pangkalpinang City is different from java island's urban sprawl pattern because the suburbs experiencing expansion are not provided with public transportation modes and road networks with supporting capacity. Housing developers drive the leapfrog type that develops in Pangkalpinang City. In contrast, the ribbon development type is driven by businesspeople transforming plantation land into an economic or trade center.

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**Dessy Mayasari and I Gede Wyana Lokantara, Analysis Of The Effects Of Urban Sprawl On The Transformation Of Pangkalpinang City**

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