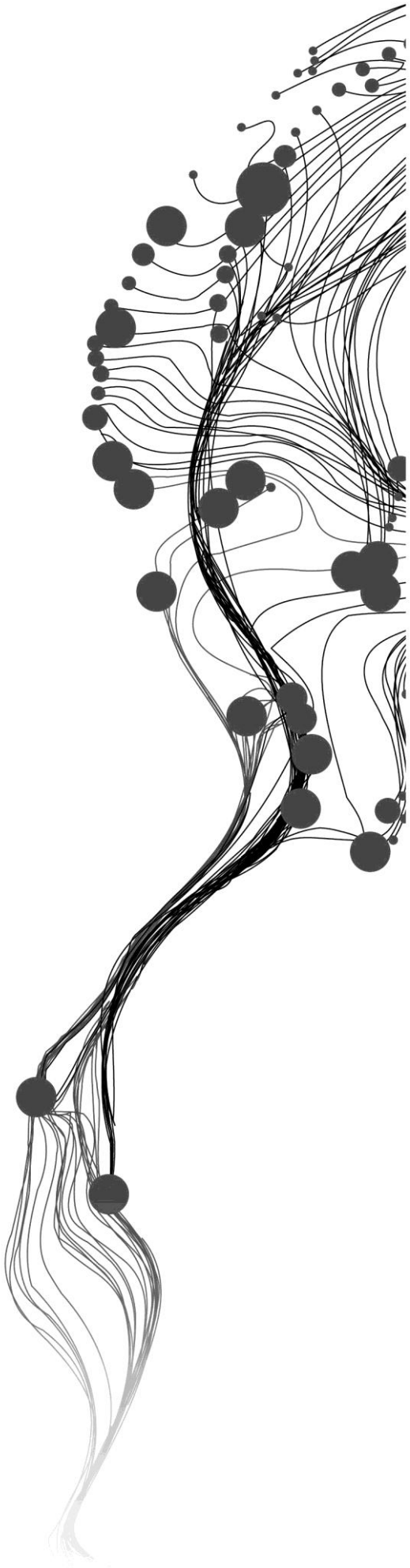
AN ALTERNATIVE APPROACH OF INDUSTRIAL LAND VALUATION IN BATAM

FESLY PARANOAN
September, 2011

SUPERVISORS:
Drs. Emile Dopheide
PhD.Haryo Winarso



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FESLY PARANOAN
Enschede, The Netherlands, September, 2011

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation and for the degree of Master in Institut Teknologi Bandung.
Specialization (ITC): Urban Planning and Management
Specialization (ITB) : Development Planning and Infrastructure Management

SUPERVISORS:
Drs, Emile Dopheide
PhD,Haryo Winarso

THESIS ASSESSMENT BOARD:
Prof. Dr. Ir. M.F.A.M. van Maarseveen (Chair)
Dr. M.J.C. Weir (External Examiner, NRM-ITC)]

ITC
UNIVERSITY OF TWENTE.

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ABSTRACT

A Land valuation has an important role in optimizing the revenue from the land. The land valuation could be based on market and non market approach. However, some experience in other countries show that the non-market approach lacks to generate government's income, and it could cause insufficient budget for infrastructure development, inequalities competition among companies, and inefficiency of the use of the land. On the other hand, the implementation of market based approach in other countries has improved the revenue from the land significantly. In Special Economic Zone (SEZ), as provision of reliable infrastructure is critical to support the economic activities and attract foreign investment, the revenue from the land must be optimized. In SEZ area, the revenue from the land was collected by retaining the ownership of the land and transferring the land use right from the government to the private sector through lease mechanism. There are some types of market based approaches of land valuation that could be applied in capturing the market value. Thus, a thorough examination of market consideration and valuation principle must be done in selecting the proper approach.

This study takes Batam as a case study, a SEZ area in Indonesia, to explore the development of land valuation approach. This study focuses only on the valuation of industrial land. Similar to other SEZ area in other countries, land in Batam is owned by government institution called BIDA. BIDA gets the revenue from transferring the use right over the land to industrial companies for 30 years, and charged them with lease tariff. However, the lease tariff was determined by obsolete approach and was adjusted with improper variables. The need for more fund of infrastructure development to support industrial activities in Batam was the main justification for BIDA to review its income from the land lease which is the main source of its revenue contributing 60% of its total income.

By using data of land lease transaction from 1998-2008 occurred inside 15 industrial estates, this study employs Sales Comparison approach to develop a land valuation model, Multi Regression Analysis with Cross Sectional analysis to calibrate the model focusing on spatial variation of market value, and Kriging method to visualize the continues of spatial variation of the model . At the end, the feasibility of the proposed model is also discussed.

The result of this study shows that the approach presently used was not developed from proper market considerations, and it does not comply with the principle of land valuation. As result, it fails to reflect the market value, and there is deviation between the pattern of spatial variation of land value derived from existing approach and the market approach. Furthermore, this study also yields a model of land valuation proposed as bench mark price at second layer. Even though the model proposed in this study provides relatively moderate statistical result, this study has improved the performance of the land valuation model, in term of its capability to reflect the market value and its market consideration basis.

Keyword : industrial land, land valuation, market value, spatial variation, land lease, sales comparison approach, factors affecting land lease price.

ACKNOWLEDGEMENTS

Praise the Lord, for His blessing and giving me strength so that I can finish my research as the final assignment for master degree Study at ITC

Firstly, I would like to give my gratitude to my supervisors Drs. Emile Dopheide and Haryo Winarso PhD. for their unlimited and continuous support, critical comments and guidance to the success of this research. I also must thank to our course directors Mrs. Monica Kuffer, MSc and UPM staff for their assistance during my study.

I am very much grateful to Ariastuty Sirait, Brian Maolana and Ferdi Dian, who devoted their time for helping me to collect the data. I also appreciate the time for all my colleagues in BIDA for providing me all data required for this research.

I would like also to thank all UPM 2010-2012 classmates for their friendship. Let me also says thank you very much to all my Indonesian friends who create home away from home. Special thanks go to my ITC-9 friends; Arie Yulfa, Doddy M Yuwono, Idham Effendy, Debi Mutia, Hidayah Hamzah, Fitriani Agustin, Rani Charisma Dewi, Tiur Hotdelima for sharing the cheerful life in Enschede. Our togetherness always recharges and makes me strong to face all the challenge during study here. What a blessing to have you all surrounding me.

Last but not least, I would like to express my sincere thanks to my parents and my brothers for their endless love and pray. Finally, my forever grateful goes to my beloved wife, Ellyzabeth Maranatha, and my two little angels, Jesaiah Kinawa Paranoan and Eunique Kayla Paranoan for their wonderfully warm support and encouragement during my study.

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ACRONYMS

- BIDA Batam Industrial Development Authority
- CPI Consumer Price Index
- FTZ Free Trade Zone
- GOI Government of Indonesia
- MRA Multi Regression Analysis
- MNC Multi National Company
- PPI Property Price Index
- SEZ Special Economic Zone
- UWTO Uang Wajib Tahunan Otorita Batam/ Annual Payment of Otorita Batam
- WPI Wholesale Price Index

1. INTRODUCTION

1.1. Background

In order to generate national economic growth, the Government of Indonesia (GOI) develops some special areas called Free Trade Zones (FTZ) or Special Economic Zones (SEZ). These areas are designated as the centre of economic growths by boosting foreign investment. Through Indonesian Law No.44/2007 and Government Regulation No.46/2007 about Free Trade Zone and Free Port, land management right (Hak Pengelolaan Lahan) is decentralized from the national level to the local level or from the Central Government to the Zone Authority. The decentralization aims to ease land acquisition for development and investment processes in the Free Trade Zone area. By putting the land allocation permit together with other required permits in one institution, called the Zone Authority, it is expected that the procedure to set up the investment will be streamlined.

According to Indonesian Basic Agrarian Law (UUPA), Law No.5/1960, there are some rights given by the state to the owner of land's Management Right, in this case Zone Authority. These rights are rights to plan the land use, to utilize the land, to allocate the land to the third parties. In addition, according to Regulation of Home Affairs Minister No.5/1973, the owner of land management right is allowed to receive revenue, compensation or annual payment. The implementation of such a right makes land matters in the Special Economic Zone different from that in other areas in Indonesia.

One of Free Trade Zone or Special Economic Zone areas developed in Indonesia is Batam Island. Batam has been developed by GOI since the 1970's, and the main considerations were its strategic location situated at one of the busiest lanes in South East Asia and its proximity to Singapore. Furthermore, the scarcity of land in Singapore provides the opportunity for Batam to catch overflow investment. As an area that is developed from an empty island, government planning intervention has existed since early stage of Batam's development. An extensive capital has been allocated by GOI to accelerate the development. As a result, Batam undergoes rapid development, has more reliable infrastructure, and is relatively better managed compared to other areas in Indonesia. However, the development of Batam needed more budget than it was available. Therefore, the government involved the private sector to finance the infrastructure development. In this way, the government could focus on more strategic infrastructure, such as the airport, seaport, main roads. GOI institution having responsible to develop Batam is Batam Industrial Development Authority (BIDA)

One of the revenues sources of BIDA to develop required infrastructures is land lease. At an early stage of development, due to the absence of a land market, the base value of the land lease was determined by a cost approach of infrastructure development. However, not all the cost of infrastructure development could be charged over the land, as this would make the land lease in Batam is very expensive. Moreover, to make Batam competitive compare to other areas having advantages on skilled labour and reliable infrastructure availability, GOI offers the ease to get the land by keeping the land price much lower and more streamlined procedures. Given this situation, the central government allocated budget to BIDA to build infrastructure and to avoid BIDA having to charge the full cost of development in the land rent.

After 30 years of development, the internal and external situations of BIDA have changed. Some of the internal changes are: the rapid growth of the investments in the area and the consequent need for more infrastructures; the requisite to BIDA to be more self-financing and not to burden the GOI budget; and the emergence of a land market. An external factor is the competition with other free trade zones in region that become tighter than ever and insist BIDA to provide more reliable infrastructures. Therefore, to deal with this situation, revenue sources of BIDA consisting of airport management, seaport management, water concession and land lease must be reviewed. As the land lease contributes the highest income for BIDA which is 60 % of BIDA's revenue (BIDA, Development Progress of Batam 2009), the review of BIDA's revenue from land lease is critical. Even though the internal and external situation has changed, the existing tariff of land lease is still based on the cost approach which has been used since the initial stage of Batam's development. It means that the existing approach does not deal with the changes situation and ignores the potential value of the land resulting from the emerging land market. As a result, there is a big gap between the land lease tariff charged by BIDA and the land lease price generated by the market scheme.

The land market in Batam emerges on the second layer (see fig. 1.1). On the first layer, BIDA allocates the land by leasing it to the industrial estates and other big companies. BIDA charges them with tariff that has been determined for 30 years of usage. The tariff is called *Uang Wajib Tahunan Otorita Batam* (UWTO). On the second layer, the industrial estates allocate the land to smaller companies by renting and leasing the land with market mechanism.

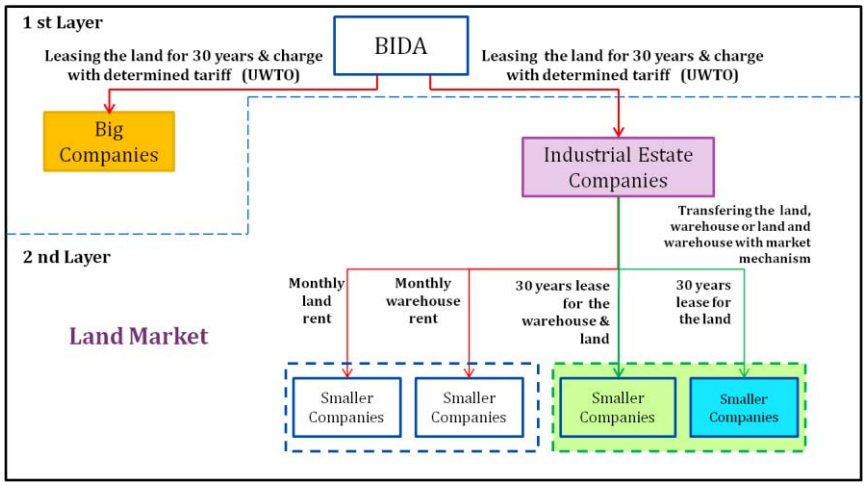


Figure 1-1. Land Allocation Scheme in Batam

The big gap between the land tariff charged by government and the land price implies that private sectors involved in industrial land provision absorb a large part of the land rent, because they pay a low land rent to the government but they charge the smaller companies with the market price. Moreover, the study conducted by Xie, et all (2002) shows that the lacks of land valuation to capture the land market value also led to unequal competition between enterprise. This issue is related to the difference between spatial variation of the tariff of lease and market value of lease of industrial land. The inequalities occurred when the companies occupied industrial land with higher market values but charged by lower tariff (UWTO) or vice versa. As the existing approach leads to some drawbacks, an alternative approach that more market based approach is necessary to be explored.

1.2. Research Problem

Studies about valuing industrial land are limited compared to valuation of other land use such as residential and commercial use. Furthermore, there are limited studies about industrial land valuation on SEZ and FTZ areas done previously. Therefore, this study tries to fill this gap. For this research, Batam serves as a case Study.

It is estimated that BIDA needs around Rp. 500 billion per year to develop new infrastructure (BIDA, Strategic Planning of BIDA 2009), while only around Rp. 200 billion its revenue earned from land rent (BIDA, Development Progress of Batam 2009). One of the causes of the low revenue from land rent is that the present approach fails to capture the potential of land value. As a consequence, there is a big gap between government tariff and asking rent for the industrial land in Batam (see appendix 1). The asking rent of industrial land in Industrial estate Batam for 30 years is Rp. 5.800,000-10.800.000 ($SGD 970-1800)/sq meter, while the government tariff over the land in the same length of time is Rp.20.000- 50.000 ($SGD 3-9)/sq meter (BIDA, Industrial Estate Profile 2009), or in other words a difference of a factor up to 1:20. Furthermore, the industrial land rent tariff has remained unchanged over the last 20 years: the average land rent tariff in 1990 is Rp. 30.000 (U$ 2.3) and now is Rp. 40.000. In other words, government tariff for industrial land in Batam does not reflect the dynamics of the market price from time to time.

The unchanged rate is expected also to make the spatial variation of the land tariff charged by government oversimplified and lack to reflect the market value. With cost approach basis, the land rent tariff among areas in Batam is differentiated based on cost of infrastructure development. Thus, it has simple variation, and each sub area of development has a single value. Moreover, even though there are 8 classification areas for existing land tariff, industrial land only has three variations of tariff. However, after almost 20 years of development, basic infrastructure developed by BIDA generates different scale of development conducted by private sector, and it causes some areas undergoes more rapid development than others. As consequences, the areas that are more demanded have higher price than those having less. As result, the spatial variation of land tariff derived from cost approach does not in line with land price derived from market. For instances, the development of Batam Centre as center of administration and commercial makes the land price in that area increases more rapidly compare to it in other areas in Batam.

In brief, cost approach, an approach used in determining the existing land tariff is not able to capture the potential value of the industrial land, because it neglects the value of land generated by the existence of land market in Batam. As a consequence, a new approach for determining the land tariff that could reflect better the market value is proposed.

1.3. Research Objectives

1.3.1. General Objective

This study aims to develop an alternative method to value industrial land in view of the need to increase the income-generating capacity of BIDA. It is expected that the improved method enables BIDA to charge land lease that better reflects the market value, incorporating spatial aspects

1.3.2. Specific Objective

1. To assess the effectiveness of the existing land valuation model
2. To analyze alternative approaches and models to value industrial land
3. To develop an alternative model for valuing industrial land in Batam
4. To apply and discuss the proposed land valuation model in Batam.

1.4. Research Question

1. To assess the effectiveness of the existing land value model.
   i. What is the approach presently used by the Zone Authority to value industrial land in Batam ?
   ii. What is the existing spatial pattern of industrial land tariff of government and land price in Batam?
   iii. What are the variables affecting industrial land lease price in Batam?
   iv. What is the method to assess the goodness of the existing method, and what is the result of the assessment?

2. To analyze alternative approaches and models to value industrial land
   i. What are the alternative approaches and models could be applied to value industrial land in Batam?
   ii. What is the most appropriate approaches and models in valuing industrial land in Batam?

3. To develop an alternative model for valuing industrial land in Batam.
   i. What are the variables used by the proposed method to value industrial land in Batam?
   ii. What is the method to assess the goodness of the proposed method, and what is the result of the assessment?

4. To apply and discuss the proposed land valuation model in Batam.
   i. What would be the pattern of industrial land values based on the proposed model?
   ii. What is the feasibility of the implementation of the proposed method

1.5. Conceptual Framework

The conceptual framework of this study starts with the brief discussion of justification for the need in proposing alternative approach for land valuation in Batam. After that, this study will discuss and explore the theory related to land valuation, the characteristic of FTZ and some experiences of the implementation of land valuation in other SEZ areas. The theory of the Free Trade Zone is discussed to give a better understanding of the characteristics of the Free Trade Zone area that could affect the implementation of a certain land valuation scheme in Batam as a Free Trade Zone. Next, the literature review becomes a reference in reviewing the existing land valuation approach and proposing a proper model as an alternative approach.

Next, to specify the proposed model, an exploration of factors affecting land price used by previous studies is conducted. Then, model calibration and validation also will be done to measure the fit of the model. After that, the model also will be visualized. The last, this study also will assess the feasibility of the model implementation in Batam. The theoretical framework in this study is presented in figure 1.2 .

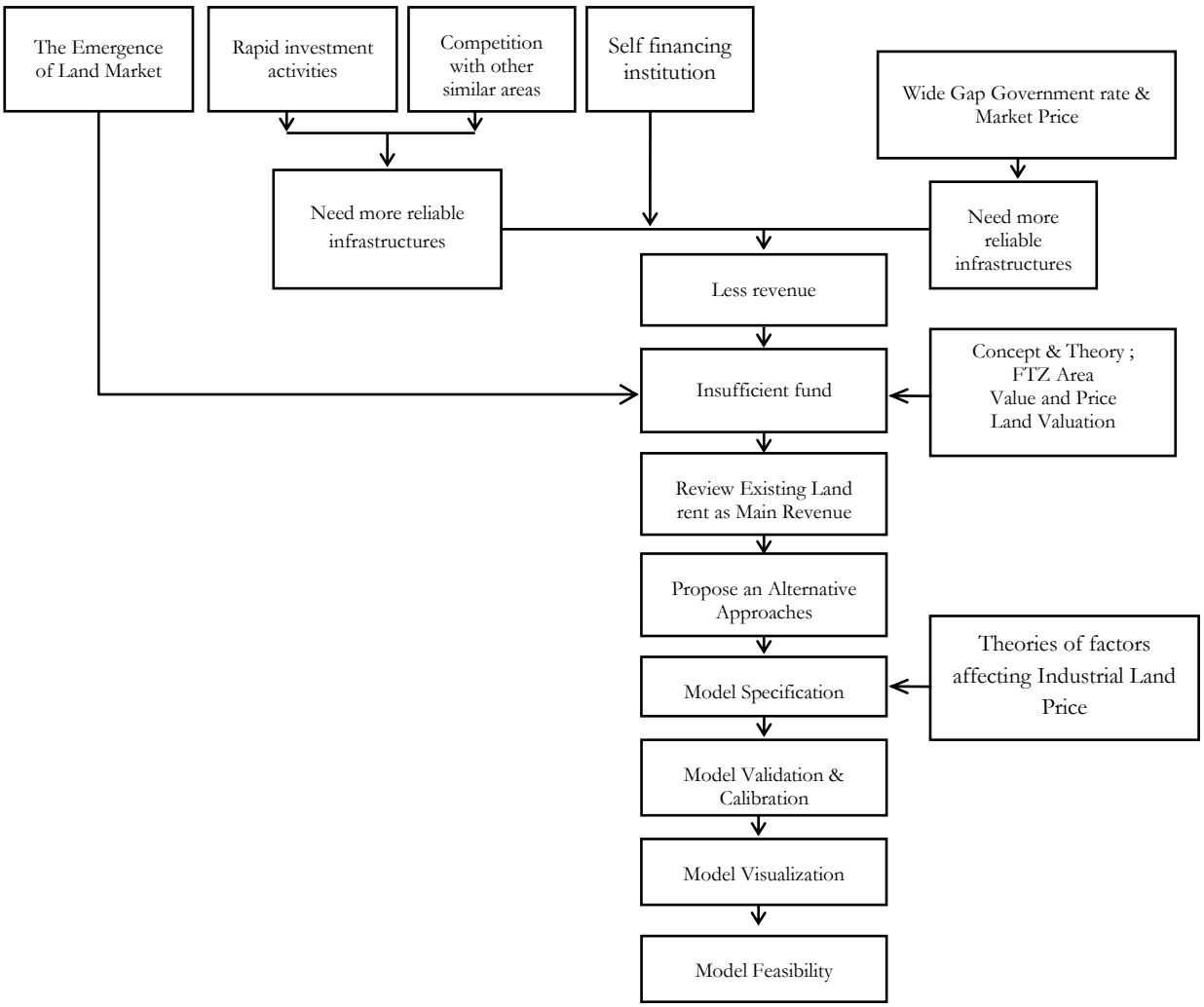


Figure 1-2 Research Framework

2. LITERATURE REVIEW

The aim of this chapter is to get a better understanding of how the land valuation is supposed to be implemented in Free Trade Zone. The literature review will be started with the exploration of theories related to land valuation including the concept of value and price, land market, factors affecting industrial land price, and approaches and methods of land valuation. After that, the theory related to Free Trade Zone also will be explored to give a better insight regarding the characteristics of the Free Trade Zone area that relevant to industrial land valuation. Furthermore, the experience of the implementation of land valuation in other FTZ areas will be explored to define the criteria that will be used to assess the feasiblity of proposed approach.

2.1. Concept of Value & Price

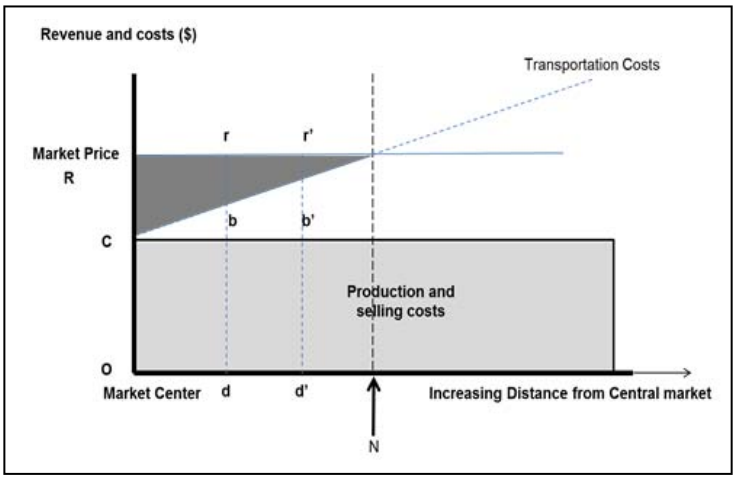
The value of a good is the monetary worth of a property, good, or service to buyer and seller at a given time and the present worth of the future benefits that accrue to real property ownership. To have a value, a good must have utility, it must be scarce, and there must be desire of it (Eckert, 1990). There are two types of value, namely value in use and value in exchange. Value in use is related to the current use of the object. On the other hand, value in exchange is the value determined by the market, and it is relative value in that the good must be compared to other substitute goods and services in a competitive, open market (Eckert, 1990). Furthermore, Eckert (1990) distinguishes between the market price and market value. Market price is represented by the equilibrium price determined by supply and demand in a market. It is the amount actually paid in a particular transaction, and the competition prevailing in the market is ignored. Thus, it can be said that market price often does result from carelessness, ignorance, pressure and many other factors (Eckert, 1990). On the other hand, the market value is a hypothetical or estimated price perceived by the buyer and seller, and it can be estimated based on the available data by using some appraisal approaches. It is not a fact like market price. It is an estimate of the likely to be concluded by the buyers and sellers of a good or services at a given tie in accordance with a particular definition of value. The market value is concerned with the type of competition prevailing in the market, and it is a result from the careful consideration by the buyer and seller of data reflecting the actions of responsible, prudent buyers and sellers under condition of a fair sale. (Eckert, 1990) (International Standard Committee, 2003). Market price will close to market value under some assumptions : i) no coercion or undue influence over the buyer or seller in an attempt to force the purchase or sale; ii) well-informed buyers and sellers acting in their own best interests; iii) a reasonable time for the transaction to take place; iv) payment in cash of its equivalent

The concept of land rent and land value has been introduced long before the industrial era began, and those theories were developed by scholars with different backgrounds and in different contexts. Some of them are well known theories such as Von Thunen's theory, Ricardian theory, Neoclassical theory, Urban Rent theory, and the Urban Rent Theory. As each of theory was developed in the different contexts, the assumptions used are also different. In the following, those theories will be discussed briefly.

Von Thunen's theory

First, Von Thunen's, as a geographer, discusses the price of land from a spatial perspective. The theory explains a basic analytical model of the relationships between markets, production, land use, and distance to trading centres. In other words, land rent and value vary, depending on the distance to the market

centre. By adopting the concept of Von Thunen in urban area, the price of land declines at a decreasing rate with distance from the city centre or Central Business District CBD. The location of the various activities within the urban area, in the absence of planning constraints, will be determined by a 'trade off' between the cost of transport to the centre and the cost of land. In other hand, if planning controls the supply of land for some uses, but demand increases and remains high, then the price of land in those uses will increase.



Source : Urban Land Economy (Harvey 1996)

Figure 2-1 Von Thunen's Concept

Ricardian theory

Second, Ricardian theory developed during the Napoleon era tried to explain the causes of the rapid increase of corn price at that time. According to this theory, the price of agricultural land is determined by its fertility, and production is characterized by the input-output relationship. Therefore, the more productive the land, the more a tenant farmer is willing to pay to use the land. Moreover, this theory assumes that the supply of land is fixed, and that a single product is produced from a fixed supply land. The conclusions of the theory are that the rent of land is only determined by demand, and that the rent of land is not included as a cost of production. In brief, the higher the price of a product derived from the land, the higher the price of the land. Ricardian and the Von Thunen approaches have as a feature in common that it is the demand for land that determines the rent or the value of land and neglect the supply side.

Neoclassical theory

Third is the neoclassical theory. Different from Ricardian's theory, the neoclassical rent theory assumes that the land has alternative uses, and that it has opportunity cost. Furthermore, the rent of land is put into cost of production. This is contrary to Ricardian theory which does not include the rent into cost production. The conclusion of this theory is that the increase of land rent can cause an increase in the price of good. In other words, the increase of the product price is determined by the increase of the land price.

Urban rent theory

Urban rent theory is based on the theory from Von Thunen, and it is modified by the effects of planning control to give better representation of the situation in urban areas than the Ricardian and Neoclassical

version set our earlier. According to this theory, the variability of the rent and the value of the land are based on the distance or transportation to the market centre. In the urban version, the market centre is substituted by the Central Business District (CBD). Furthermore, this theory tries to overcome the deficiency of the Ricardian and Neoclassical theory which do not deal with spatial variation of the land value.

According to the Urban rent theory, in the absence of planning control on the supply side, the Neoclassical approach is more suitable than the Ricardian approach, since there is no limitation for certain use of the land. While in the presence of planning control, the Ricardian is more appropriate than the neoclassical approach since the supply of land tend to become fixed. In a flexible system of planning control, the situation can be explained sometimes by Ricardian and sometimes by the neoclassical theory. Finally, if the situation is best represented by the Ricardian model, because of planning constraints, the restricted availability of land through the planning system will result higher land prices.

2.2. Land Market

The 'land market' is an institutional arrangement or mechanism whereby buyers and sellers of virgin land, agricultural estate, industrial buildings, offices, shops and houses are brought into contact with each other to determine a price at which particular property can be exchanged (Harvey, 1996). It is not necessarily a physical entity or a geographical location. It can be formal or informal and it is related to "property rights". However, land market is not an efficient market (Evans, 2004). It means that the change of the price of land is not sensitive, and the change does not happen over a short period, such as days, weeks, or months. Furthermore, the land market is an imperfect market due to the heterogeneity of the land being sold. There are several reasons of the heterogeneity. First, the location of the land is unique and each parcel has a different location. Second, the price of the characteristics of the properties may vary with location. Then, the trading of land is so infrequent and as a result one transaction is independent on the other transaction. As a consequence, the land market only can determine the range of the price. The final price has to be agreed by the seller and the buyer and this is affected by the behaviour of the buyer and seller.

2.3. Factors Affecting Industrial Land Price

The price for land and property refer either to the amount sought called asking price or the sum received called prices paid. The price of land is determined by the interaction of supply and demand in the market (Harvey, 1996). Since the supply side tends to be inelastic, the price is determined mostly by demand. Moreover, demand is affected by many factors, and it seems so difficult to measure all factors affecting the demand. However, Eckert (1990) simplifies the factors by classifying them into four (4) groups, namely economic factors; social factors; legal, governmental and political factors; and physical, environmental and locational factors. A brief description of each factor is given in the table 2-1 below.

Factors	Description
Economic Factors	General state of international, national, regional and local economies. Demand: employment level, wage rates, income level, purchasing power, availability of financing, interest rates and transaction costs. Supply: available land, development, construction, financing costs, taxes.
Social Factors	Explain pattern of land use as well as demand and price. Age distribution, education, crime rates, and pride of ownership.
Legal, Governmental and Political Factors	These factors are provided by government through mechanisms as taxation, zoning, land use controls and rent control, local government services such as roads, schools, public transportation, police and fire protection.
Physical, Environmental and Locational Factors	These factors largely explain patterns of land values within a city or market area. Site attributes: size, topography, other physical feature of a given parcel. Situation attributes: location of the parcel relative to other places such as SBD, freeway access, shopping, school, the ocean front, or dump.

Table 2-1 Factors Affecting Land Price (Eckert 1990)

Furthermore, Evans (2004) divides the land price change into two, general price change and relative price change. General price change is experienced by all the land in one area caused by inflation. Whilst relative price change means that the price in one area will rise or fall relative to prices in another area.

In industrial land context, Weber (1909) in Daljoeni (1992) elaborates in more detail three main factors that affect the demand of the land in an industrial area, namely: (i) raw material; (ii) consumption or market; and (iii) workforce. Robert M Haig (1926) completes the previous land valuation theories by adding the transportation variable. Furthermore, Thrall (2002) mentions seven categories of locational factors generating demand of industrial area, namely: i)agglomeration economies; ii) variation in manufacturing cost including labour, capital, land, heating and air conditioning, and energy; iii) resources; iv) transportation; v) government; vi) amenities; vii) technology, scope and scale.

More recent empirical studies related to industrial land and property valuation elaborate the factors affecting industrial land value. The studies refer to a range of different variables as outlined in the table below.

No	Authors	Factors affecting Industrial Land & Property Value
1	The Impact of Location on Urban Industrial Land Prices (Kowalski & Paraskevopoulos, 1990)	• Distance variable, expressway visibility dummy, dummy variable for platted industrial park, size of parcel in acres, number of frontage feet available to the parcel, year of sale, dummy variables for recession year, dummy variables which equals one if grantee was a land fill operator
2	"Determinants of Industrial Property Value" (Lockwood & Rutherford, 1996)	• Physical characteristic (total square feet of industrial space, total square feet of office space, total square feet of land), national market factors (U.S Employment rate, U.S national income, US gross national product), regional market factors (Texas employment rate, Texas income, Texas gross state product), interest rate market factors (long-term treasury bond yield, industrial conventional rate, Moody's AAA industrial yield), and location in local market (distance to CBD, distance to Airport, distance to major road, access to rail, and dummy variable for county.
3	**I**ndustrial Rents and Land Values in the Sydney Property Market (Kim, 1998)	• Consumer Price Index; Building Price Index, Gross Domestic Product New capital expenditure on plant and equipment in

		Australia for the financial year; Short-term interest rate; Long-term interest rate; Values of industrial building approvals in the Sydney Values of industrial building approvals in NSW for the financial year; Values of industrial building commencements in NSW for the financial year.
4	Rent Adjustments and Forecasts in the Industrial Market (Thompson & Tsolacos, 1999)	• Index of national industrial rents adjusted for inflation using the *GDP* implicit price deflator series ; the Jones Lang Wootton Index and the CB Hillier Parker Index. Gross Domestic Product. Manufacturing employment. King Sturge & Co series of the level of industrial floorspace vacancy. Absorption rate.
5	"Model Penilaian Properti Berbagai Pengunaan Tanah di Indonesia" (Dr. Machfud Sidik, 2000)	• Industrial location classes, road classes, area of land, dummy variable for distance to CBD, dummy variables for flood threat, dummy variables for land certificate availability, area of building, structure of the construction classes, building condition, power of electricity, coefficient of building, age of building.
6	"Industrial Land Values-A Guide to Future Markets?" (Bob & Sotiris, 2001)	• Gross Domestic Product, Manufacturing Employment, Residual Industrial Land Values.
7	"Affordability and Performance in the Industrial Property Market" (McGough, Tsolacos, & Thompson, 2001)	• Output of the manufacturing sector and the gross domestic product, location and physical characteristics, economic variables and hybrid variables such as type of tenant.
8	The Spatial Pattern of Industrial Rents and the Role of Distance"(Dunse, C, J, & W, 2002)	• Physical Accomodation (floor area of the industrial unit, age of building, type of construction, the use of building, condition of building), distance from a central point within the city of Glasgow, the distance to the nearest major trunk road/motorway junction, and dummy variables the relative location to River Clyde.
9	"Public provision versus private provision of industrial land: a hedonic approach" (Saz-Salazar & Menendez, 2004)	• The lot size of a parcel measured (m2); the distance (km) to a highway or expressway,to the CBD, to the capital of the province; the maximum percentage of usable space in a parcel following municipal laws; a dummy variable that takes the value of one if the industrial land was provided by a public developer and zero in the rest of situations; a dummy variable that accounts for economic recession; the population of the town
10	"Valuation of Urban Industrial Land : an Analytic Network Process Approach "(Beltran, Aznar, Onate, & Melon, 2006)	• Plot characteristics (plot area, corner position), Plot location in the industrial park (Proximity to industrial park exit, proximity to common facilities, proximity to green areas, position facing motorway)
11	"Impact of government and industrial agglomeration on industrial land prices: A Taiwanese case study" (Lin & Ben, 2009)	• General attributes (form of parcel, size, width of abutting roads, a street lot), locational characteristics (distance to highways and local administration, urban hierarchy, percentage of regional industrial land), , the role of government, and attributes of industrial agglomeration (LQ of the manufacturing employees

Table 2-2 Factors Affecting Industrial Land Value according to Different Authors

The empirical studies listed above have explored vary of explanatory variables. However some of them deal with the explanatory variables related to industrial properties, which are not merely land but also the building (Lockwood & Rutherford, 1996) (Dr. Machfud Sidik, 2000). Thus, there are some variables that are not relevant to be used as factors affecting industrial land value. These studies also explore different type of value of the land. Some of them deal with land price (Kowalski & Paraskevopoulos, 1990) (Lockwood & Rutherford, 1996) (Kim, 1998) (Saz-Salazar & Menendez, 2004) (Beltran, Aznar, Onate, & Melon, 2006) (Lin & Ben, 2009) , others deal with land rent (McGough, Tsolacos, & Thompson, 2001) (Dunse, C, J, & W, 2002)and the others discuss the link between the land rent and land prices. (Bob & Sotiris, 2001).

Some studies listed above show that the economic and social factors at national or regional level used such as employment rate, income, GNP GDP, CPI, interest rate and others generate general increase of land value (Lockwood & Rutherford, 1996) (Kim, 1998) (Thompson & Tsolacos, 1999) (Bob & Sotiris, 2001) (McGough, Tsolacos, & Thompson, 2001). Whilst locational and physical factors such as express way visibility, distance to the city centre, distance to important facilities such as airport, major road, rail, size of parcel, type of tenant and soon, have significant contribution to the spatial variation of land value. Beltran et all (2006) explores the locational factors inside of industrial estates and found that those factor has contribution to the spatial variation of land value inside the industrial parks. Some other studies also mention other factors that could affect the spatial variation of land value, namely tenure right of the land (Dunse, C, J, & W, 2002) (Dr. Machfud Sidik, 2000), government role (Lin & Ben, 2009) and industrial agglomeration (Lin & Ben, 2009).

In brief, based on listed studies above, variables that could affect the spatial variation of land value are those related to locational, physical, government role and industrial agglomeration factors as can be summarized as follow;

No	Factors	
1	Locational	Distance variable (distance to CBD, distance to Airport, distance to major road, distance to the nearest major trunk road/motorway, access to rail, expressway visibility, distance to the capital or centre of administration, industrial location class, flood threat, relative location to nature object (river), urban hierarchy, percentage of regional industrial land
2	Physical	Size of parcel, number of frontage feet available, maximum percentage of usable space. width of abutting road
3	Legal and Governmental	Type of land tenure, role of government
4	Others	Industrial agglomeration

Table 2-3 Summary of Factor Affecting Value of Industrial Land

2.4. Land Valuation Approaches and Methods

The land valuation is a process to estimate the value of the land. As there are two type of values, use value and exchange value (discussed in section 2.1), the land valuation approaches and methods can refer to these two types of value. However, in this study, the land valuation discussed is confined to exchange value which is determined by the market, as an experience in China shows that land valuation with non-market based led to low revenue from land rent (Xie, Parsa, & Redding, 2002). Hereafter, the land valuation term used in this study refer to the market based land valuation.

Eckert (1990) mentions that one of the objectives of model development for land valuation is to estimate the value of unsold properties. Besides that, a model can provide statistical reliability and can be updated easily if there is new information. There are several approaches that are commonly known to model land valuation, namely residual approach, sales comparison approach, cost approach and income capitalization approach (Eckert, 1990)(Geho, 2002). To choose which method is the most appropriate to use, the objective and the data availability must be taken into account, since each method has its advantages and disadvantages.

2.4.1. Sales Comparison Approach

The concept of the Sales comparison approach is that value of a property is equal to the prices recently paid for the purchase of similar properties (Eckert, 1990). It means that properties with similar

characteristics have similar value (Waljiyanto, 1994). This approach is directly rooted in market data and it can be used where properties are relatively homogenous, and this approach is preferred where an active market exists. However, in reality land can never be absolutely identical. Therefore, an adjustment is needed between the reference property and the subject property to be valued. The basic formula of this approach is;

$$MV = \mathrm{S} + \mathrm{ADJ} \quad \text{.....(1)}$$

Where;
MV is a market value
S is the sale price of comparable property
ADJ is the total dollar adjustment to the sale price

The challenge of this approach is how to determine the attributes that will be used in defining the similar property, since in the reality the properties will not be exactly the same. Furthermore, the selected attributes must reflect the important supply and demand variables in the market at the time of the valuation.

2.4.2. Residual Method

The Residual method is an appropriate approach to use if land price data are not available (Geho, 2002). To estimate the land value, this approach use two variables, namely gross development value and cost of development. For residential property, the gross development value can be determined by comparing with other similar property. For commercial property, the gross development can be determined by anticipated price sale by capitalization method (Geho, 2002). Next, the cost of development including building cost, professional fees, and finance cost and the developer's profit are deducted from the gross development value. The basic formula of this method is:

$$LRV = GDV - CD \quad \text{..... (2)}$$

Where;
LRV is Land Residual Value
GDV is Gross Development Value
CD is Cost of Development

Furthermore, the residual value has to be discounted to reflect present value because the land development takes several years to complete (Wong K. C., The Evolution of Land Valuation in China, 1998. Since this method is derived from development cost, complete data related to the cost of development must be available to give accurate result. Geho (2000) mentions 8 (eight) components of cost of development, namely i) the cost of physical preparation, ii) the cost of legal preparation of the land, iii) building cost, iv) cost for construction of roads, pavement, trenches, landscaping and other services, v) fees, vi) the cost of finance, vii) developer's profit and viii) cost of sale. In brief, this approach is able to extract the land value from the property price.

The important things should be notified in using this approach is to define into what extend the development cost should be taken into account in valuing the land. In reality, the land value is affected by the development of various infrastructures conducted by government and private companies. For instance, government develops infrastructure such as road, drainage, fresh water, electricity, gas or even seaport and airport that could improve the land value in certain area. On the other hand, private

companies such as industrial estate companies put their capital on utilities provision such as local infrastructure to improve the land value inside the industrial estates. In brief, the scope of infrastructure development that should be counted in the formula in this approach must be defined properly. Otherwise, the land value will be underestimated or overestimated.

2.4.3. Income Capitalization

This approach uses income capitalization to determine the land value, and the essence of this approach is to divide the annual land rent of a land parcel by a selected capitalization rate. The market value of land reflects the present worth of future benefits (Zheng, 2006). The basic formula of this approach is (Eckert, 1990);

$$V = {}^{I}/_{R} \quad \ldots\ldots (3)$$

Where;
V is Present value of the land
I is Income
R is Capitalization Rate

The advantage of this approach is that it can be used where sales data is limited, because the land value is estimated from the income expected and the rate capitalization (Zheng, 2006). Therefore, this approach is proper if the rent prices are available. It means that the land value will really depend on the income generated for land rent. Thus, the future value must be done with great care and supported by market analysis data (Eckert, 1990). The challenge in using this approach is to find the value of income and the discount rate, particularly in developing countries which have more dynamic economic growth, and the selection of a capitalization rate has been the subject of much debate (Zheng, 2006). Therefore, determining the benefit of property in the future is very difficult to quantify (Zheng, 2006).

2.4.4. Cost Approach

This method is used to value urban or potentially urban land where neither the comparative nor the residual method can be applied (Geho, 2002) (Eckert, 1990) (Wong K. C., The Evolution of Land Valuation in China, 1998). This approach is proper to use on land valuation where there is no land market, and the market value of improved parcel can be calculated as the sum of the land value and the depreciated value of the improvement (Eckert, 1990). The basic formula of this approach is;

$$MV = LV + IV \quad \ldots\ldots (4)$$

Where;
MV is Market Value
LV is Land Value
IV is Depreciated Value of Improvement.

The principle to justify this approach is that an informed buyer will pay no more for an improved property than the price of acquiring a vacant site and constructing a substitute building of equal utility, assuming no costly delay in construction. Furthermore, this method is based on the understanding that urban land value consists of the cost of expropriation and associated interest of cost, the cost of site preparation, and the total land rent for the lease period. As the depreciated value of the improvement is one of the variables

in estimating the market value, this approach will give more accurate result if it is implemented in new land development project as depreciation is still limited. Because the variables used in this approach are derived from the market value, this approach is often called hybrid cost-market approach.

Land valuation approaches and methods are summarized in the table 2-4 below

No	Approach/ Valuation Method	Brief Description	Strength	Weakness
1	**Sales Comparison Method**	• Value of land is equal to the prices recently paid for the purchase of similar property (Eckert, 1990). • Properties with similar characteristic have similar value. (Waljiyanto, 1994) • It is a powerful way for the government to control both land price and land use (Eckert, 1990)	• Efficient approach for determining market value of a land plot (Eckert, 1990) • Can be used where properties are homogenous and there is an active market. (Eckert, 1990)	• In reality properties can never be absolutely identical (Eckert, 1990) • Adjustment may need to be made for differences between the reference property and the subject property to be valued & need sufficient transaction data. (Eckert, 1990) • Cannot deal with parcels that vary in certain factors defined (Eckert, 1990)
2	**Residual Method**	• The gross development value is determined by comparison approach or income capitalization approach. (Geho 2002) • The cost of development includes building cost, professional fees, and finance cost (Geho, 2002)	• Can be used to extract the land value from property market price (Geho, 2002) • Proper where the land sales transaction data are not exist and only property sales data are available • Land value can be estimated from the value of property and cost of development.	• The land value estimation is not directly rooted to the market price, and more vary data are needed, since it depends on; – The accuracy in estimating gross development value of property that could be done by comparison approach or capitalization approach. – The accuracy in estimating construction cost. The absence of sufficient data and inaccurate assumption will lead to imprecise estimation of development cost and yield less accurate land value (Geho, 2002) – Need accurate definition of the scope of the infrastructure cost must be incorporated
3	**Income Capitalization approach**	• It is based on rental value. Market value of land reflects the present worth of future benefits.(Zheng, 2006). • The essence is to divide the annual land rent of a land parcel by a selected capitalization rate	• Proper for land valuation of area where rent data are available and sales data is insufficient (Zheng, 2006)	• Determine the benefit of property in the future is very difficult to quantify (Zheng, 2006) • Future value must be done with great care and supported by market analysis data (Eckert, 1990). • The selection of a capitalization rate is the subject of much debate (Zheng, 2006).
4	**Cost Approach**	• Assumes that the property value is equal to the market value of land plus cost of replacement minus depreciation (Eckert 1990) • Based on the understanding that urban land value consists of cost of expropriation and associated interest, cost of site preparation and associated interest, and total land rent for the lease period (Eckert, 1990)	• Useful where sales are not frequent and rent information is not available. (Eckert, 1990) (Geho, 2002) (Wong K. C., The Evolution of Land Valuation in China, 1998) • It is useful to value urban or potentially urban land where neither the comparative nor the residual method can be applied (Geho, 2002) • It is proper to use to the new building where the depreciation value is relatively small (Geho, 2002)	• The cost method is deficient in that it usually undervalues a developable site by failing to reflect its potential. (Eckert, 1990)

Table 2-4 Summary of Land Valuation Approaches

Land valuation model is needed because there is a need to capture the market value, but the land lease data does not exist. In Batam, the transaction data is absence because of several reasons. First, the land is located outside of the industrial estates, thus the land sales activity is absence. Second, the land is rented instead of leased. Third, the land is leased along the warehouse. Finally, a model is needed to estimate the land lease price when the land value data is not available due to confidentiality issue or an inaccurate data recorded at government institution.

2.4.5. Discussion of Approach Selection

The aim land valuation in this study is to ascertain the market value of the land. Thus, an approach that can replicate how the land market works is required. As discussed in the previous section, there are four possible approaches to do land valuation that can be implemented in different context. Moreover, all discussed approaches have a similar aim in trying to replicate the functioning of the market. However, each approach is calibrated with different factors (Eckert, 1990). First, residual approach which is derived from Gross Development Value and Cost of Development is calibrated by the market price of property and construction cost. This approach can be used if the land sale data are not available. The data required for this approach are property sale and income data. The second approach is income capitalization approach, this approach is suitable to use if there is no land sale data. However, this approach requires land rent data. Since the land value is generated from the income of land rent, it can be concluded that this approach is calibrated by the capitalization rate developed from local real estate market. The third is Cost Approach, this approach is proper to use if the land market is absence, and this approach determine the land value base on construction and development cost. As a result, this method is calibrated by the market price of construction and development cost. Finally, the fourth approach is Sales Comparison Approach. This approach uses other property having the same attribute as reference to determine the value of one property. Therefore, this approach is suitable to use where active market exists, and transaction data of the land are available. For many appraisal activities, the Sales Comparison Approach is the most prefer method in doing land valuation based on market price, because it is rooted directly to the market price of the land (Eckert, 1990).

In selecting the most suitable approach, the purpose of land valuation and the data availability must be considered. As one of the purposes of this study mentioned on section 1.3 is to develop an alternative approach to increase income generation, and since market approach is selected after considering other countries experience (see section 2.4). Thus, the approach that could reflect the market better is the most preferred. Furthermore, in order to explore the data availability, the land market in Batam will be discussed briefly here to give insight which is useful for approach selection. More detail discussion will be performed in chapter 4.

There are two types of land market schemes prevalent in Batam. First is the land rent scheme in which industrial estate companies rent their land to smaller companies or tenants, and the industrial estates receive a payment for the rent monthly. The second scheme is the industrial estates transfer its land use right to smaller companies, and receive payment for that transferring from those companies. With this land market characteristic, all approaches are possible to use. However, since the land lease data for industrial land in Batam is available, sales comparison approach is chosen as the first priority to be employed in this study. In case the land lease sales data are not available in term of data accessibility, the other approaches can be selected to be used by considering the available data.

A. Model Specification

As discussed in the previous section, the sales comparison approach has been chosen as the approach that will be used in this research. This approach estimates the market value of a subject property by adjusting the sales prices of comparable properties for differences between the comparable and the subject. There are several important aspects that must be discussed related to specify the model of Sales Comparison.

First is the selection of the number of comparables and the issue of comparability. To compare between the subject and the sale, Eckert (1990) mentions that sale and subject should be similar with respect to date of sale, economic conditions, physical attributes and competitiveness in the same market. Competitiveness is the most important factor. If they do not compete in the same market, then they do not face the same supply and demand forces. Thus, the value resulted by this approach could be misleading. Second is the unit of comparison, to make the comparison of land value easier, the sale and subject must have the same unit of comparison. In land valuation, the sale price should be converted to a price per unit. Third is the selection of the attributes that will be used to compare the sales and the subject. In this study, the used attributes are resulted from the discussion of factors affecting land price on previous section

B. Model Calibration

Next, after selecting the most appropriate approach, a proper model must be chosen to calibrate the land valuation model. Calibration is the process of estimating the coefficients in a mass appraisal model. As previously discussed, Sales Comparison Approach provides better method for reflecting the land market. Thus, possible models of this approach must be discussed. Eckert (1990) mentions that there are two ways to calibrate the Sales Comparison Approach. Those are (i) Multiple Regression Analysis (MRA) and Feedback Equations (Eckert, 1990)

MRA is a statistical technique for estimating unknown data on the basis on knows and available data (Eckert, 1990). The advantage of this model are : i) it has simple mathematic model and it easy to use; ii) the result of the model is easy to be interpreted; iii) the relationship between the dependent variable and independent variables can be interpreted easily.

However, due to its effectiveness, simplicity and accuracy, MRA is the most often chosen method in analysing land value. The advantage of MRA is that it allow for interpreting the relationship between variables used in the model. The MRA can be implemented to analyse time series and cross sectional data. However, MRA has less statistical accuracy than other model such as ANN (Noelia, Matias, & Esteban, 2007). The MRA model can be applied by using time series or cross sectional analysis.

One of MRA variants is the Hedonic Price Model. Hedonic Price model is a procedure of regressing the price of differentiated goods on quantities of characteristics or attributes associated with each good (Dale-Johnson, 1981). It refers to the amenity variables of a certain property. For modelling using Hedonic Price, some studies use economic, locational, environmental and physical variables that can represent the amenity, such as a distance from certain land to important facilities such as distance to road, train station, airport, seaport and others. As it is based on MRA model, Hedonic price has advantages and disadvantages that the same to MRA's

Study conducted by Mc Gough, et all (2001) employ cross sectional model to assess the industrial property market. Cross sectional is based on multi regression model. However, the dependent and independent variables are analysed at defined time. The study shows that this model is useful to give insight about the effect of location.

Feedback equation or Adaptive estimation procedure is the procedure done and analyzed sequentially to specify the equation of land valuation model (Eckert, 1990). The process continues by processing each sale many times, and finish when the model converges on satisfactory solution. Furthermore, Eckert (1990) mentions that this model has a drawback in specifying the model due to the absence of stepwise procedure. Thus, the specification of the model must be done carefully. Moreover, it does not contain goodness of fit statistic. The advantage of this method is that it has an ability to calibrate the general hybrid model structure and it can give better result than MRA.

Other recent developed methods are Analytical Network Process (ANP) and Artificial Neural Network (ANN). ANP is based on Multi Criteria Decision Analysis. ANP is useful to solve the problem which caused by the partial data availability, qualitative variables and the influence among variables. However, the drawback of ANP is that it has complex mathematical model and super matrix operation to represent the relation among variables. Thus, the relation between variables is difficult to be explained. ANN is based on neural work principle. A massive parallel distributed processor that has a natural propensity for storing experiential knowledge and making it available for use. It resembles the brain in two respects (Haykin, 1998): i) Knowledge is acquired by the network through a learning process; ii) Interneuron connection strengths known as synaptic weights are used to store the knowledge. The advantages of ANN model are (Noelia, Matias, & Esteban, 2007) (Consultant, 2009): i) It is able to deal with non-linear relationships; ii) It performs better than multipleregression analysis; iii) It can approximate a wide range of statistical models without requiring that hypothesizing in advance of certain relationships between the dependent & independent variables; iv) It is suitable if the model interpretability is not important. The drawback of this model is that the result of this model is not easy to be interpreted. Moreover, the relationship between independent variable and dependent variable cannot be easily traced and explained.

Due to the improvement on Geographic Information System (GIS) and the advanced computer software development, some recent studies also incorporated spatial analysis such as network analysis into their models to give better result. With GIS software, spatial analysis can be done easily. In the case of land valuation, the concept of accessibility to important facilities can be applied by using network analysis facilities in GIS software. In Table 2 a summary is given of a comparison of the various methods for applying the Sales comparison approach.

No	Method	Brief Description	Strength	Weakness	Previous Study
1	MRA (Multi regression Analysis)	A way of predicting and outcome variable from several predictor variables (Eckert, 1990)	• Simple mathematic model and easy to use (Eckert, 1990) • Can interpret the relationship between dependent variable and independent variables (Eckert, 1990).	• Less statistical accuracy (Eckert, 1990)(Noelia, Matias, & Esteban, 2007) • Cannot explain the causality aspect (Eckert, 1990)	• "Model Penilaian Properti Berbagai Pengunaan Tanah di Indonesia" (Dr. Machfud Sidik, 2000) • "Determinants of Industrial Property Value" (Larry J & Ronald, 1996) • "Industrial Land Values-A Guide to Future Markets?" (Bob & Sotiris, 2001) • Rent Adjustments and Forecasts in the Industrial Market (Thompson & Tsolacos, 1999) Industrial Rents and Land Values in the Sydney Property Market (Kim, 1998)
2	Feedback equation	• Procedure done and analyzed sequentially to specify the equation of land valuation model (Eckert, 1990)	• Able to calibrate the general hybrid model structure and I could give better result than MRA (Eckert, 1990)	• The specification of the model must be done carefully (Eckert, 1990)	-
3	Hedonic Price	• Refer to the procedure of regressing the price of differentiated goods on quantities of characteristics or attributes associated with each good.(Dale-Johnson, 1981)	• Simple mathematic model and easy to use (Eckert, 1990). • Can interpret the relationship between dependent variable and independent variables (Eckert, 1990).	• Less statistical Accuracy (Eckert, 1990)(Noelia, Matias, & Esteban, 2007). • Cannot explain the causality aspect (Eckert, 1990).	• "The Spatial Pattern of Industrial Rents and the Role of Distance"(Dunse, C, J, & W, 2002) • "Impact of government and industrial agglomeration on industrial land prices: A Taiwanese case study" (Lin & Ben, 2009) • "Public provision versus private provision of industrial land: a hedonic approach" (Saz-Salazar & Menendez, 2004)
4	Cross Sectional	• It is based on multi regression analysis. • Dependent and independent variable are analyzed at defined time. • Provide useful insight the effect of location	• It is used to examine the role of physical and location factors in determining the value and return on industrial real estate.	• Cannot be used to calculate variables that incorporate independent variables in time series format.	• "Affordability and Performance in the Industrial Property Market" (McGough, Tsolacos, & Thompson, 2001)
5	Analytical Network Process (ANP)	• The method is based on Multiple Criteria Decision Analysis (MCDA). (Beltran, Aznar, Onate, & Melon, 2006)	• It can deal with partially available data, qualitative variables and influences among the variables (Beltran, Aznar, Onate, & Melon, 2006)	• Complex mathematical model and super matrix operation to represent the relation among variables.	• "Valuation of Urban Industrial Land : an Analytic Network Process Approach "P. Aragone´s-Beltra´n a,*, J. (Beltran, Aznar, Onate, & Melon, 2006)
6	ANN (Artificial Neural Network)	• A massive parallel distributed processor that has a natural propensity for storing experiential knowledge and making it available for use. It resembles the brain in two respects(Haykin, 1998): o Knowledge is acquired by the network through a learning process. o Interneuron connection strengths known as synaptic weights are used to store the knowledge.	• Able to deal with non-linear relationships (Noelia, Matias, & Esteban, 2007). • Performs better than multipleregression analysis (Noelia, Matias, & Esteban, 2007) • Can approximate a wide range of statistical models without requiring hypothesizing in advance of certain relationships between the dependent & independent variables. • Suitable if model interpretability is not important. (Consultant, 2009)	• The result is not easily interpretable(Consultant, 2009)	• "Combining Artificial Neural Networks & GIS for Land Valuation Purposes", (Brondino & Silva) • ANN+GIS: An automated system for property valuation (Noelia, Matias, & Esteban, 2007)
7	Spatial GIS analysis	• It is used to support other methods to analyze spatial distribution aspects (Noelia, Matias, & Esteban, 2007)	• Enable spatial analysis operation (Noelia, Matias, & Esteban, 2007) • Pattern of the errors can be found (Noelia, Matias, & Esteban, 2007)	• Should be used with other approaches	• Combining Artificial Neural Networks & GIS for Land Valuation Purposes (Noelia, Matias, & Esteban, 2007)

Table 2-5 Land Valuation Methods

Various methods commonly used to calibrate sales comparison approach has been discussed and listed above. As, one of the research question of this study is "what are variables affecting land lease price ?" (see section 1.3), a model that could explain the variables must be selected to address this question. Thus, MRA model having capacity to explain the relationship between variable is the most proper model to be used in this study. Furthermore, the contribution of each factors affecting industrial land price can be analysed. Moreover, to deal with the research question "what is the existing spatial pattern of industrial land tariff of government and land price in Batam?", the MRA must be analysed by using cross sectional method. The spatial analysis also will be employed in this study to support the Multi Regression Analysis with cross sectional method in dealing with spatial data.

2.5. Free Trade Zone

Free Trade Zone is not a new concept in the world, and some countries have implemented this concept for a long time such as Gibraltar (1704), Singapore (1819), Hong Kong (1848), Hamburg (1888) and Copenhagen (1891) (FIAS, 2008). In FIAS (2008), Free Zones are defined as outside the customs territory for purposes of the assessment of import duties and taxes, and it allows for duty and tax free imports of raw and intermediate material and in many cases, capital equipment. Furthermore, FIAS (2008) mentions several variant of Special Economic Zones that are differentiated based on its objective, physical configuration, location, eligible activities, and markets namely; Export Processing Zones (EPZ); Enterprise Zones; Freeport; Single Factory EPZ and Specialized Zones. The rationale of the development of such areas is different between developing countries and developed countries. In the developed countries the rationales are: i) to develop and diversify the export activities; ii) to generate more employment; iii) as experimental laboratories for the application of new policies and approaches; iv)and to attract foreign direct investment. On the other hand, in developed countries, the rationales are more varied. Some of them are manufacturing competitiveness (Republic of Korea), enhancing trading manufacturing competitiveness (USA), creating new pole of economic growth (Ireland) (FIAS, 2008).

Typically, the Free Trade Zone is managed and operated by one institution, and it can be a part of central government or local government. However, since the implementation requires the backing from powerful government, the institutions are usually under central government (Wong K. C., The Evolution of Land Valuation in China, 1998). Furthermore, the government control and intervention in this area is relatively stronger compare to other areas. One way to allow an extensive government control onto this kind of area is by acquiring the land. Furthermore, after acquiring the land, government retains the ownership of the land, and does not transfer it to the private sector. Instead of transferring full ownership of the land, the government just transfers the land use right to the private companies for certain period of time, and this scheme is called lease. Thus, by remaining own the land, Government not only can control the land, but also can get revenue from leasing the land. Furthermore, the experience of other countries such as Hong Kong, Singapore and China shows that the land market emerges as the consequence of the land transfer mechanism.

2.6. Some Experience of Land Valuation in FTZ area

In the context of land valuation, SEZ or FTZ area has more market oriented land valuation approach compare to other regular area. Even in the socialist country such as China. In China, SEZ or Free Trade Zone area have different approach in land valuation from other areas. As a communist country that started to adopt open door policy, the government transforms the land use right system from a rigid centrally planned allocation system to a market oriented one (Wong K. C., The Evolution of Land

Valuation in China, 1998). This new system allows the land in SEZ to be transferred and leased trough a premium payment, and becomes one of the sources of government's revenue.

The land valuation in FTZ area is become important for government, since it wants to capture the surplus land value as revenue to finance public infrastructure and social services. There are some studies has been conducted to improve the land valuation method in determining the premium must be paid to the government. The justification was that the traditional approach referring to the production of the land led to serious waste of land, low efficiency of land use, lack of funds for infrastructure, and unequal competition between enterprise (Xie, Parsa, & Redding, 2002). Wong (1980) mentions that there are several prevalent methods are used to value the land in China such as Residual Method, Comparative method, Investment Method and Cost Method. These approaches are used in determining the amount of the premium payment over the land use right (Wong K. C., The Evolution of Land Valuation in China, 1998). In SEZ of ShenZhen, government used baseline price to estimate the market value. The baseline price called Bench Mark Price (BMP), and it is derived from transaction data and expected revenue from the land (Li & Walker, 1996).

The transaction price can be resulted from two procedures namely private treaty and land use auction (Gwing, Ong, & Spieler, 2005) (Li & Walker, 1996). Li (1996) shows that BMP is not much different with land price resulted from private treaty procedure. However, it significantly different from market price resulted by way open tender due to the existence of market competition. This led to the conclusion that BMP does not provide a realistic reference reflecting the actual market demand and supply situation, and it means there are other market factors excluded when government developed BMP. Furthermore, Li (1996) also mentions that even though the BMP is always updated by the latest transaction, the problem is remain whether records of land sold by open tender or auction or those of land sold under private treaty should be taken into consideration. To eliminate the impact of this dual procedure, Bao et all (2007) mentions that Government of China encourages the implementation of open tender in land allocation to capture the market value better. However, the implementation of this procedure makes the land price in China skyrocketing, the property becomes very expensive, including industrial property. Bao et all (2007) also mentions that the public auction also makes the domination of state owned companies over private companies due to their capability to access easier to the capital

The experience of Hong Kong and Singapore is quite different from China's in implementing the land valuation in SEZ area. In Hong Kong and Singapore, the coverage of SEZ area encompasses the whole of country's area is SEZ, while ini China it just cover a small part of the country. However, to deal with the market value, there are some similarities among SEZ area in these countries, namely: i) the government retains the ownership of the land and transfer merely the land use right to other parties. ii) Using private treaty and land auction procedure in transferring the land use right.

These two countries have been implemented Free Trading system longer than China has done, and these countries have more advanced approach benefited from abundant land sale data in capturing the surplus of land value generated by market mechanism. Hong Kong can get significant revenue by capturing the land value, since 55 percent of Hong Kong annual investment is financed by lease revenue between 1970 and 1990(Hong Y.-H. , 1996) In valuing the land, government of Hong Kong uses residual approach to value the leased site. It is determined by finding the gross development value first. Furthermore, the gross development value is calculated based on comparable sales data (Wong K. C., The Evolution of Land Valuation in China, 1998). This value becomes a reference for Government to justify whether the

land price resulted from auction procedure is too low or not. Thus, the Government can withdraw the land form the auction if the price is to low (Bao, Glascock, & Zhou, 2007). The bidder with the highest premium will win the auction.

In 1997, the government changes the method to deal with the market value of the land from land lease to annual land rent. Besides paying a premium at the initial establishment of leases, lessees need to pay an annual rent to the government. By implementing this approach, government can adjust the rent level whenever it reappraises the rental value of properties in Hong Kong. This system allows government to rely more on land rent collection than just collect the revenue from initial premium determined based on future value of the land.

Besides public auction, the government of Hong Kong also uses private treaties to transfer the land to special industries and non-profit organization. This procedure is used because government want to encourage the development of key industries (Hong, 1998). However, Hong (1998) give good insight about the problem aroused due to the implementation of new system. The implementation of this new system turns into a series of public protest, and it tooks six years for government to resolve the issue. Another problem is that the land lease becomes so high, and burden industrial companies which have invested in Hong Kong. Then the government try to formulate the some long term strategies to deal with the problem, but there are some resistances from the developers who benefit greatly from the existing land system. Hong (1998) also recommended that to deal with this problem it by giving clear information to the lessee long time before the due time of lease period. He also give suggest to reduce the time period for leasing the land from 50 years to 30 years. Thus, the government can reduce the difference between the lease and the market value.

The experience from Singapore is similar to what happen in Hong Kong. Due to scarcity of the land, Government of Singapore decides to retain the ownership of the land. The rent over the land was introduced in Singapore in 1947 by the British Colonial government. Nowadays, the land rent has significant contribution to the revenue of Singapore government (Hong Y.-H. , 1996). The industrial land lease is given for 30 years (http://www.jtc.gov.sg/FAQ/Pages/Index.aspx). The industrial land in Singapore is managed by Jurong Town Corporation (JTC), a government institution having responsible to managed the industrial land in Singapore

To capture the land market value, the JTC does auction procedure over the industrial land, and before the auction, the government conducts the land valuation to estimate the value of the land. The land valuation refers to the transacted property having similar attributes, and this approach is called comparison approach. In case land sale data is not available, other approaches such as cost approach is employed. Similar to Hong Kong, the land valuation in Singapore also gets benefit from the availability of abundant data from existing of active land market. Thus, the land valuation developed by government can estimate the market value of the land relatively well. The estimated value of the industrial land becomes a reference by government in assessing whether the price resulted by auction is not too low. Besides for determining the baseline, land valuation is also used by government to determine the land taxes. There are some approaches used in calculating the land tax, and it depends on the data availability.

However, like what happen in Hong Kong, the land auction also contributes to the skyrocketing of land price in Singapore (Pereira, Revitalizing National Competitiveness: The Transnational Aspects of Singapore's Regionalization Strategy (1990-2000), 2001). The rapid economic growth, labour and land

costs in Singapore burden the multinational enterprises by increasing of operating costs and land rent costs. These factors weakened the profit margins for many multinational enterprises, especially those involved in labour intensive and low-value added manufacturing. Thus, these companies try to find other places where the land is still affordable. Johor and Batam becomes alternative (East Asia Analytical Unit, 1995)

From the experience of China, Hong Kong and Singapore discussed above, there are some points that can be drawn, namely ;

i. Due to the emergence of land market in SEZ area, land valuation is critical to capture the improvement of land value generated by market mechanism.
ii. Revenue from the land in SEZ area has significant contribution in financing the infrastructure development.
iii. The aim of the implementation of land valuation in SEZ area in China, Hong Kong and Singapore is similar. It is to reflect the actual market value. However, due to the different level of land market, they have different approach in valuing the industrial land. In ShenZhen, SEZ of China, due to the more recent implementation of land use transfer system, the land market is relatively infant compare to it at Hong Kong and Singapore. It just turns from traditional approach based on production cost to more market oriented land valuation approach. The experience shows that the traditional implemented in China before open policy was enacted, led to insufficient fund and inefficiency of the use of land. However, the new approach is still has limitation in reflecting the market value due to the lack of land sale transaction generated by infant land market in China. On the other hand, Hong Kong and Singapore with more mature and active land market, can provide enormous of land transaction data that very useful in developing more sophisticated land valuation approach. Hong Kong take one step ahead compare to its in Singapore. It turns from land lease to land rent. The implementation of rent basis in Hong Kong offers better capability to capture the market value of the land than just estimating the future value of the land.
iv. These countries have implemented private treaty and public auction to capture the market value of the land. The experience shows that public auction is superior to private treaty in capturing the land market.
v. The experience of Hong Kong in implementing the new system shows that well information to the lessees long time before the due time is critical to prevent the political impedance of the implementation of new system.
vi. Government must anticipate the consequences of more market oriented valuation as undergoes by these countries, including the skyrocketing of operational cost, and land rent cost that burden the companies invested in this country.

2.7. Characteristic of Good Valuation Model

Based on the practice of land valuation in SEZ area in some countries, it can be acknowledged that the aim of land valuation in SEZ area is to reflect the market value. Thus, the assessment of land valuation model is done in the view how the model can reflect the market value. Furthermore Zhao (2006) synthesizes the characteristics of good model for land valuation as formulated by Agumya (1993), Waljiyanto (1994) as follows;

1. The model must be sound base. It means that the model should be based on market considerations, and economic and valuation principals.

2. The model must be feasible. It means that the model should be feasible to apply. The cost should be manageable by authority to use the model. The cost includes data collection, verification, and analysis, as well as the employment for high skilled staff.
3. The model must be rational. It means that the model should not be contradictive with what is intuitively accepted.
4. The model must be decomposable and explainable. It means that the model should able to show how each of the identified property characteristic contributes to value. When decomposed, a model should be easy to explain and understand.
5. The model must be accurate. It means that the model should be able to predict the value of land that close to sale price that assumed take place in a competitive market. To assess the accuracy, two set data are required. First set is to develop the model, and the second to test the model.
6. The model should be reliable. It means that the predicted value lay within specified range of sale value. The reliability of a model may be stated as follow "for 95% of the properties, the model predicts value between 95% and 105% of their corresponding market values.
7. The model must be equitable. The equitability of the model may be viewed from two perspectives. First, level of predicted values within a group of comparable properties or called horizontal equitability, and the level of uniformity of above between groups of comparable properties (vertical equitability). The equitability of the model is enhanced it relies less on subjective judgment of valuation, and more on standardized procedures.
8. The model should be stable. It means that the model coefficients should not be overly influenced by the individual sales or a category of sales, such as high valued properties.
9. The model should be insensitive to errors or small differences in specifying characteristics. The sensitivity to errors or small differences in property characteristics occurs when model coefficient are large.
10. The model should be acceptable by the community and the public. The acceptable of the model will be dependent on the factors mentioned before.

However, not all of these characteristic can be adapted to assess the model of land lease developed in this study for several reasons. First, some of criteria mentioned above are not clear and not well defined (criteria no.6,7,8,9). Thus, it is difficult to be implemented. Second, because the limitation of data, there are some criteria could not be examined (criteria no. 5). The accuracy assessment of the model in predicting the market value could not be done since it need two sets of data, one is used for developing the model, and another one is used to test the model. As the collected data in this study is limited to develop the model, there is no data set can be used to assess the accuracy. Eckert (1990) proposes some statistical indicator can be used to measure the goodness of the model, namely R square value, t significance value, and multicolinearity. Third, there are some criteria that still need further examination (criteria no. 10). To make the model acceptable by the community and the public is quite abstract criteria, since the acceptability of community and public is determined by more complex factors.

The experience also shows that the model not only should be able to reflect the market value, but it also must be feasible to be implemented (criteria no.2). Eckert (1990) proposes some principal features of an effective land valuation, to be implemented namely: i) Legal support; ii) Annual reappraisal; iii) Periodic ratio studies; iv) Adequate budget; v) Competent staff; vi) Effective training programs; vii) Complete maps and property data; viii) Accurate sales data; ix) Modern data processing; x) Effective valuation techniques; xi) Active public relations. These features are briefly explained as follow;

Legal Support

Legal Support is needed to support land valuation process. The law should: i) mandate the disclosure to assessors of such market data as sales process and terms, rents, and operating expenses; ii) establish effective assessment notification, review, and appeal; iii) provide warranted property tax relief through reductions in assessed values; iv) require public notice of, and controls on ,increase in tax levies made possible by reappraisals. The legal also needed to regulate the effective coordination among involved agencies and institution. Laws also must to ensure that the assessor follow the procedure to yield proper market value.

Annual Reappraisal

The land valuation model must be updated for certain period through reappraisal. The interval period for reappraisal can be done in range from one to ten years. Three, four or six year period are most common. If the reappraisal for land valuation is annual, the value of the land is maintained at current market as of each assessment date. If the reappraisal is done for longer interval, the land value is brought to the end of each period, or to reappraise a fraction of the properties

Adequate Budget

Land valuation must be supported by adequate budget. The budget is allocated for the salary of the assessors. Other expenses including cash expenditures and non-direct expenses such as equipment maintenance and employee fringe also must be budgeted

Competent Staff

The land valuation also must be supported by the qualified staff. They must have sufficient knowledge of traditional appraisal method, real estate market, capital markets and local condition. Statistical skill for building and applying statistical model; management skill for recruiting, training and directing staff; data processing skill for designing and maintaining computer program, public relation skill for dealing with the media and the public.

Effective Training Program

The staff involved in Land Valuation process must attend the appropriate courses. The fund for training also must be budgeted, and the training must be well planned in advance. The employees can be encouraged appropriate increase in salaries.

Complete Maps and Property Data

Complete spatial data is needed to develop accurate land valuation model, including updated map. The map should be indexed. Each parcel should be assigned a unique parcel identification number that will link all records containing data on that parcel. All required data will be used in the land valuation must be available such as date of sales, income and expense for income-producing property, ownership information and others.

Modern Data Processing

The rapid development of information technology, computer, has improved capacity in data storage, processing, retrieving, analysing and visualization. By optimizing the capability of computer in dealing with the data, an effective land valuation can be realized. An advanced in computerized mapping enable to link appraisal data with spatial data. Geographic information system is the application that can be used to address this issue. The computerized data processing also makes the data integration with other department of institution such as planning, transportation and tax agencies.

Effective Valuation Techniques

An effective valuation can done by implementing a model that can replicate the land market. By using the model, a mass appraisal can be done. Data on properties that have sold can be used to develop valuation model for estimating the values of unsold properties. Furthermore, the other benefit of the model is that it can deal with a large data bases, can be tested by statistical test of reliability, and it is easy to be updated if a new information is available.

Active Public Relation Program

A good public relation is important in land valuation. It helps public to understand and accept the implementation of land valuation, especially when a major change of valuation will be imposed. This activity includes talking to public, news media, providing information and so on.

The criteria formulated by Zhao (2006) mostly emphasize on how the model of land valuation can reflect the market value and does not emphasize on the implementation feasibility of the land valuation model. On the other hand, Eckert (1990) elaborates the criteria no 2, feasibility issue, which is also mentioned in the list synthesized by Zhao (2006). Therefore, criteria no 1,2, 3 and 4 could be used to assess the existing and proposed land valuation model and its implementation. To elaborate the feasibility of the proposed model, features explained by Eckert (1990) will be used.

3. RESEARCH METHODOLOGY

3.1. Research Methodology

3.1.1. Research Design

This section explains the main steps taken to deal with the research questions formulated on the Chapter 1. Furthermore, the data needed and techniques used to answer the research question are explained. The main steps done in this research are;

1. Identifying and formulating the problem.
2. Exploring the approaches and models of land valuation, and factor affecting land lease price for industrial land in FTZ or SEZ area.
3. Exploring the existing approach and mapping the spatial distribution of existing land lease price in Batam.
4. Confirming the factors derived from literature review to the local context.
5. Developing and Visualizing the model uses confirmed predictors.
6. Discussing the feasibility of the proposed approach.

A summary for required data and techniques used to answer the research question of this study is given on the table below.

Research Sub-Objectives	Research Question	Required Data	Technique/Tools
1. To assess the effectiveness of the existing land price model	i. What is the approach presently used by the Zone Authority to value industrial land in Batam	Literature	Literature Review
	ii. What is the existing spatial pattern of government rate for industrial land and land price in Batam?	Spatial distribution of Land Price	Literature Review
	iii. What are the variables used in defining industrial land tariff in Batam?	Factors affecting industrial land price	Literature review Expert Interview
	iv. What is the method to assess the goodness of the existing method, and what is the result of the assessment?	Literature	Literature Review
2. To analyze alternative approaches and models to value industrial land	i. What are the alternative approaches and models could be applied to value industrial land in Batam?	Literature	Literature Review
	ii. What is the most appropriate approaches and models in valuing industrial land in Batam?	Literature	Literature Review
3. To develop an alternative model for valuing industrial land in Batam	i. What are variables used by proposed method to value industrial land in Batam?	Factors affecting industrial land price	Multi regression Analysis
	ii. What is the method to assess the goodness of the proposed method, and what is the result of the assessment?	Literature	Literature Review & Multi Regression Analysis
4. To apply and discuss the proposed land valuation model in Batam	i. What would be the pattern of industrial land values based on the proposed model?	Index Price	Spatial Analysis
	ii. What is the feasibility of the implementation of the proposed method	Assessment Criteria	Descriptive

Table 3-1 Required Data & Techniques

3.1.2. Methodology

In creating the land valuation model, the following steps are done;

1. Converting the land price to comparable unit
   The data collected from the field are the transaction price over the land having various size, currency and time period. Therefore, the transaction price must be converted to comparable unit. In this case, the land price is converted to price in Singapore dollar per meter square per year (S$/m2/year).
2. Adjusting the land price to eliminate the effect of inflation
   Since the transaction occurred in different time, the land lease price must be freed from the effect of inflation before the price analyzed with cross sectional method. The land price must be adjusted to the selected basis year. The Private Property Index of Singapore is used to adjust the land lease price, and 2006 is used as basis year
3. Converting the cad format to GIS format, and creating geodatabase for this data
   Most of data collected from the field are in Cad Format. Thus, to apply spatial analysis i.e network analysis in Arc GIS software, a conversion to GIS format is required.
4. Calculating the Euclidean and Network distance.
   The Euclidean distance is used to calculate the distance from industrial land to CBD, while Network distance is used to calculate the distance from industrial land to seaports and airports. More detail flow chart describing the distance calculation in Arc GIS can be seen on the appendix 6.
5. Calibrating the model
   The model is calibrated by using Multi Regression Analysis. The predictors used in calibrating the model are those are derived from distance calculation, the adjacent to main road and the availability of dormitory facilities
6. Predicting the market value of industrial land
   By using the model resulted from the previous step, the market value of industrial land in Batam is calculated. The flow chart of market value calculation can be seen on the appendix 7
7. Visualizing the market value of Industrial Land in ArcGIS
   To visualize the market value calculated on previous step, Kriging method is used in Arc GIS software.

The scheme of methodology in this study can be seen on the figure 3-1

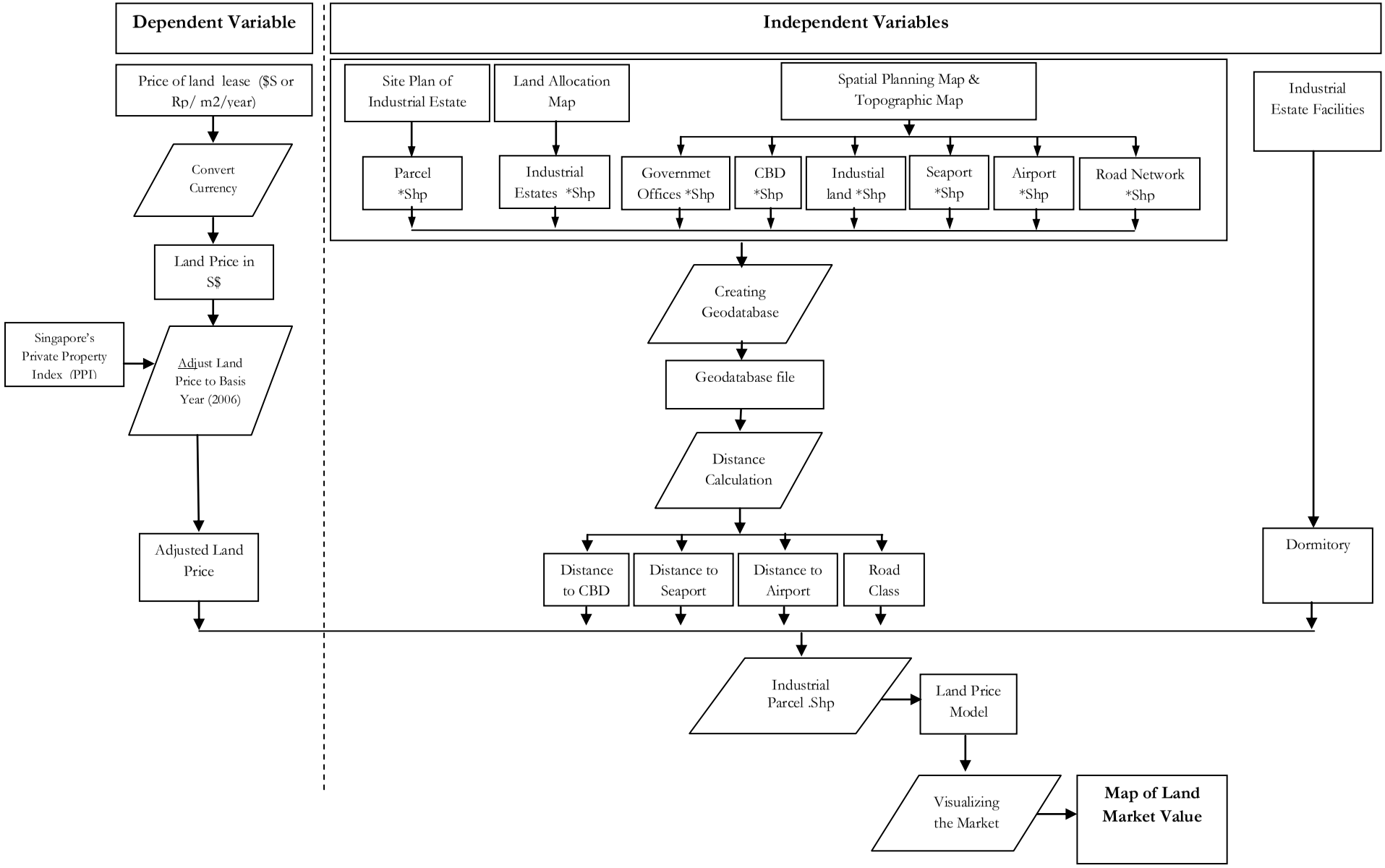


Figure 3-1 Methodology of Model Development

3.2. Data Collection

In collecting the data, this research uses several methods. First is an interview. It is conducted by telephone and emails to 6 experts consisting of 2 government officers, 2 industrial estate managers and 2 company managers. The aim of the interview was to collect factors affecting the demand of industrial land. Second, 21 standardized questionnaire were distributed among industrial estates to collect land price, and other attributes data of industrial estates. However, there are only 14 industrial estates returning the questionnaires. Third, secondary information was collected to give a better insight into the characteristics of Batam as Free Trade Zone. For examples are as the Master Plan report of Batam (1990-1999, 2000-2010, 2010-2015) , a digital map of Batam (1992, 2006) scale of 1:2000 and SPOT satellite images of 2003. Data from google earth in various time which get by using historical imageries facilities also used to verify the existence of land parcel.

3.2.1. Factors Generating Demand of Industrial Land

In chapter 2, a literature review has been conducted to formulate the relevant factors affecting land price used by related studies. In order to get the information related to local context, the factors resulted from literature review will be confirmed to local expert. The interviews were deemed necessary to collect information about the local context. 2 two officers of BIDA, 2 marketing officers of Industrial estates and 2 of company managers were interviewed to get the factors perceived by the stakeholders.

The list resulted from literature review was given to the interviewee of factors affecting land. The interviewee was asked to check list the factors that perceived to be considered as the factors affecting industrial land price. Furthermore, the interviewees also are allowed to add some more factors that are not exist on the given list. The interview yield a sort list of factors affecting land price in local context that will be used in creating the model.

3.2.2. Land Price Data Collection

Collecting land price data is critical in determining the land value. The proper method must be used to get data which reflect the actual transaction value. In fact, In Indonesia, the accurate land price data are difficult to collect, even in governmental institutions. Land transactions in Indonesia are recorded by a land deed official, since seller and the buyer must come to the Office of the Official Manufacturer Deed Land (*Pejabat Pembuat Akta Tanah*-PPAT*)* to make the deed of sale and purchase of the land. However, land buyer and seller mostly do not report the actual price of land transaction to avoid transaction tax over the land (Tamtomo, Eresta, Farnkvist, & Roos, 2008). Therefore, to deal with this issue, some studies do not use the land price recorded at PPAT for valuing the land. For instance, Dowal (1991) uses broker's information, and Tamtomo (2008) conducts field survey by asking the owner of property to get the transaction price. Based on the condition of land price data mentioned above, this study will adopt the method held by Tamtomo. The land price will be collected by using standardized questionnaire (see appendix 3) distributed to people who in-charge in marketing department. The price asked in the questionnaire is the price of last transaction occurred over the land or parcels inside the industrial estates.

3.2.3. Spatial Data Collection

Some independent variables such as distance of certain parcels of industrial land to central business district (CBD), airport, seaport, housing for labour can be derived from the topographic map, land used

map and spatial planning map and satellite imagery of Batam. These data were gathered from the Batam Industrial Development Authority and Batam Municipality. Furthermore, the site plan of each industrial park is also collected. The site plan of industrial estate is required to know the location of each parcel inside the industrial park. To validate the data google earth imagery was used.

3.2.4. Macroeconomic Indicator Data

Some macroeconomic indicators were collected to adjust the land price transaction as dependent variables given in different times and currency. Eckert (1990) explains that inflation rate can be used to adjust the land price within different time. To eliminate the effect of inflation, Inflation rate for Batam, Wholesale Price Index (WPI) for industrial sector in Indonesia, Wholesale Price Index of Singapore's and Industrial Private Property Index of Singapore are examined. The description of all collected data can be seen on the table 3-2 below.

Type of Data	No	Data Required	Date of Data	Format Data	Source
Spatial Data	1	***Map & Images***			
		Land Use of Batam Island	2006	Cad	Batam Municipality & BIDA (Batam Industrial Development Authority)
		Topography Map of Batam	1992,2006	Cad	
		Master Plan of Batam Island	1990-1999, 2000-2010, 2010-2015	JPEG	
		Infrastructure and utility Map of Batam	2006	Cad	
		Land Parcel Map	2006	Cad	
		Site Plan of Industrial Park		Cad &JPEG	
		IKONOS satellite images & Aerial Photo	2003 & 2006	Tiff & JPEG	
	2	***Distance to important infrastructure***			
		Airport facilities	1992,2006	Cad	Derived from Topographic Map
		Seaport facilities	1992,2006	Cad	
		Highway and Main aspalt road	1992,2006	Cad	
Non spatial Data	**3**	***Macroeconomic Indicators***			
		Inflation in Batam	1990-2010	Excel	Statistic Bureau
		Population in Batam	1990-2010	Excel	Statistic Bureau
		Number of Foreign Companies	1990-2010	Excel	BIDA
		Income	1990-2010	Excel	Statistic Bureau
		Export and Import	1990-2010	Excel	Statistic Bureau
		Indonesia's Wholesale Price Index for Industrial sector	1998-2008	Excel	Statistic Bureau
		Singapore's Wholesale Price Index	1998-2008	Excel	www.singstat.gov.sg
		Singapore's Private Property Index for Industrial sector	1998-2008	Excel	www.singstat.gov.sg
	4	***Industrial Land Value***			
		Government's Land Lease Tariff	1990-2010	Excel	BIDA
		Land Lease Price	1998-2008	Excel	Postal Survey Industrial Estate Companies
	5	*Other Factors affecting land rent*	-	-	Postal Survey to Companies

Table 3-2 Data Description

4. STUDY AREA

4.1. Study Area Description

Batam is situated at the busiest shipping lane in South East of Asia (see fig 4-1). It is located near Singapore, the hub of Asia, which is only 20 km away. Due to its strategic location, In 1971 Batam was started to be developed by the Government of Indonesia (GOI) as Bounded Ware House to attract Foreign Direct Investment. The scarcity of land, the high production cost including wages of labor in Singapore became an opportunity for development of Batam. Due to its prospective investment demand, in 2006, Batam has been declared as Free Trade Zone area for the whole island covering 410 square km. Besides that, the GOI also included two other undeveloped island as Free Trade zone area namely Rempang and Galang islands that are connected to Batam by bridges.

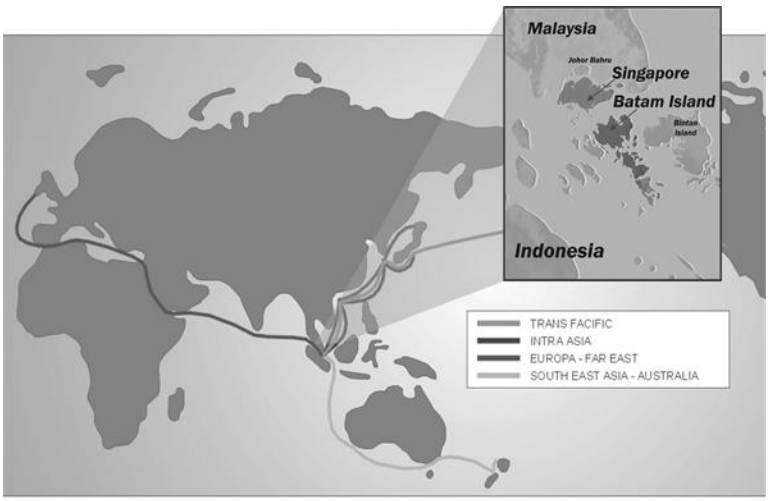


Figure 4-1 Strategic Location of Batam

4.2. Economy of Batam

The economy of Batam is dominated by the industrial sector. The industrial sector contributes for more than 60% to Batam's economic structure. Furthermore, there are 854 companies in Batam in 2009. The number of Multinational Companies MNC's in Batam always has increased since 1992 up to 2007. The investment value of the private sector also has improved significantly from U$ 1.08 Billion in 1992 to U$ 4.47 Billion in 2007. Because of the dominance of MNC's investment, Batam was less affected by the economic crisis of 1998 compared to other areas in Indonesia. At that time Batam still had a positive economic growth while other areas in Indonesia experienced a negative growth. Moreover, economic growth in Batam has always been above the national level of economic growth.

The increase of private investment in Batam is also followed by population growth, since more people from other area in Indonesia come to Batam to find a job. As a result, population growth in Batam has increased rapidly from less than 8,000 in 1971 (Pertamina, Nissho Iwai, Pacific Bechtel, 1972), 16,237 people in 1977 to 123,000 people in 1992 and to 988,555 people in 2009.

4.3. Spatial Planning of Batam

Spatial Planning of Batam is a kind of government intervention in land use in Batam. The first Spatial Plan in Batam was made in 1979 when Batam was relatively empty. Therefore, the spatial planning at that time could be implemented with little conflict of interest. According to the Master plan of Batam (see fig 4-2), the development of Batam was planned based on some global, regional and internal considerations. Global means the world economic in general, and Asia Pacific in particular. Regional scope encompasses

the neighbouring countries such as Singapore and Malaysia. While, the internal scope encompasses the province in which the Batam island is located, and the surrounding other islands. The concept of spatial planning of Batam is Multi Nuclei (Batam, 2000), and the aim of this concept was to make the development more evenly distributed. Moreover, Batam has been notified at the national level as the centre of strategic activities. Batam is divided into 8 (eight) Sub Development Areas (see table 4-1)

No	Sub Development Area	Area (Ha)
1	Batam Centre (BC)	2,567
2	Batu Ampar (BA)	3,609
3	Muka Kuning (MK)	6,931
4	Sekupang (SK)	4,563
5	Tanjung Uncang (TU)	6,789
6	Nongsa (NO)	3,706
7	Kabil (KB)	5,165
8	Duriangkang	8,270

Table 4-1 Sub Development Area of Batam

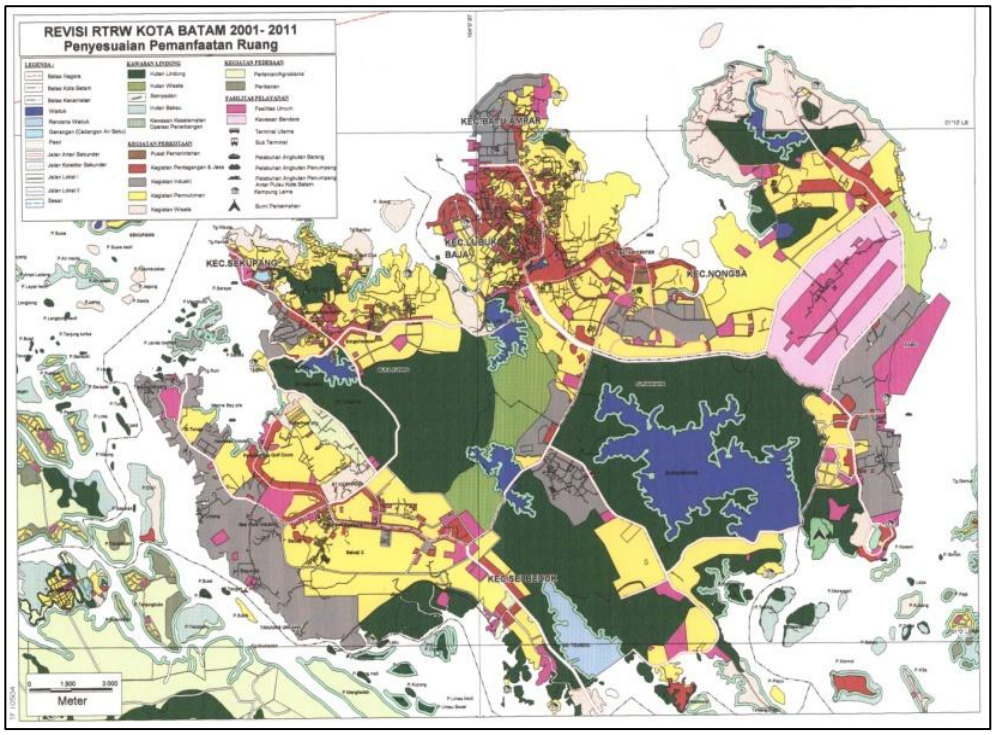


Figure 4-2 Spatial Planning of Batam 2001-2011

4.3.1. Central Business District (CBD) in Batam

There are two locations of main the Central Business District (CBD) in Batam, namely Batam Centre and Nagoya (BIDA, Evaluasi Master Plan Barelang, 1999) (see figure 7). However, the two CBDs have different characteristics. Batam Centre is a CBD developed by the government from empty land and the area is dominated by government offices (Batam, 2000). In 1999, the Batam Centre was still relatively empty, and it was occupied mostly by government offices. According to the report of the Master Plan

Evaluation (1999) and the growth of Batam Centre CBD tended to be relatively stagnant. On the other hand, Nagoya CBD has grown naturally with limited government intervention, and it has been growing since the early 1970's following industrial development in the North part of Batam. The population around this area grew rapidly from 300 people in 1968 to 4000 people in 1970s, and 7000 people in 1979, around 5000 people of them working in the commercial sector. (BIDA, Rencana Kerangka Dasar Tata Ruang Pengembangan Daerah Industri Pulau Batam, 1979), and this area still is growing rapidly nowadays.

4.3.2. Industrial Land in Batam

Based on the Master Plan of Batam 2001-2011, the area of industrial land in Batam is 49,26 square km area, and it is represented with grey color area in the Master plan map (see figure 2). It means more than 10 % of total area of Batam is planned to be industrial land. The industrial land is distributed in 4 locations: the northern part (Batu Ampar) area, south east (Kabil) coast area, the central (Batam Centre) area and the west coast (Tanjung Uncang) area of Batam Island. The east coast was planned for heavy industry, the north and west coast of the island for medium industry, and centre of island for light industry. Furthermore, due to resource limitations, the GOI determined some conditional requirements for industrial activities in Batam. These requirements included: the industry requires a limited amount of water, applies middle technology, is capital-intensive and is non-pollutant (Batam, 2000).

Industrial Area at North Cost (Batu Ampar Sub Area)

Some oil and gas supporting companies have already been operating since late 1960's at the north shore of the island (Pertamina, Nissho Iwai, Pacific Bechtel, 1972). The existence of these companies caused the development of other economic activities in northern part of the island. When the industrial activities started in 1968, the population in this area was only 300 people. After Mc Dermott, a company from the United States started its operation in 1968, the population in this area increased rapidly, and the population became 3000 people by mid of 1972 (Pertamina, Nissho Iwai, Pacific Bechtel, 1972). The consideration for this area to be developed as oil and gas supporting industry was the shortdistance to Singapore compared to other parts of the island, thus it can be more easily accessed from Singapore straits. There are a number of industrial estates developed in this area, namely Citra Buana Park I (1994), Malindo Cipta Perkasa (1995), Megacipta Industrial Park (1997), Citra Buana Park (2000), and Union Industrial Park (2003). The existence of these companies has generated commercial activities in its surrounding, and this has led to the growth of the Central Business District called Nagoya.

Industrial Area at West Cost (Tanjung Uncang and Sekupang Sub Area)

The industrial area in this part along with industrial area at north and east cost of the island havs been identified as the potential area for industrial activities. At first, this area was planned to be wood industry activities. However, at the moment this area is dominated by shipyard industries. Nowadays there are around 70 of shipyard companies operating in Batam.

Industrial Area at East Cost (Kabil Sub Area)

The east coast of Batam was assessed as the most suitable area for heavy industrial use because of its deep water, prevailing wind and its long coast line. These characteristics are suitable for big ships. Thus, a big port is (was?) planned to develop in this area. Furthermore, its topography is relatively flat, which makes this area highly suitable for industrial use. There are two industrial estates operating in this area, namely Kabil Industrial Estates (1991) and Taiwan Industrial Estates (1990).

Industrial Area at The Centre of Island (Batam Centre and Muka Kuning Sub Area)

At the centre of the island, there is the biggest industrial park in Batam, namely Batamindo Industrial Park. It was developed in 1991, as a part of Government of Singapore's program called regional industrial park. This program was designed to generate profits through developing, leasing and managing industrial estates in selected locations across the Asia Pacific region. Batamindo Industrial Park is mostly dominated by electronic and manufacturing companies that have their headquarters in Singapore. There were 15 (fifteen) companies in 1991, 77 (seventy seven) companies in 1995 and 87 (eighty seven) companies in 1998 (Pereira, State Entreprenurship and Regional Development : Singapore's Industiral Park in Batam and Suzhou, 2004). In 2009 this number dropped (?) to 74 (BIDA, Industrial Estate Profile, 2009). The occupancy rate of these industrial estates in 1998 was 93%. This Industrial Park has the most sophisticated infrastructure, and it provides dormitories and other facilities that make it having the highest level of amenities compared to other companies.

Following the success of Batamindo Industrial Estates, more recently industrial parks were built in the centre of the island, such as Cammo Industrial Park (1995), Kara Industrial Park (1996), Tunas Industrial Park (1999), Panbil Industrial Estates (2001), Citra Buana Park III (2002), Hijrah Industrial Estate (2002), Executive Industrial Park (2004) and Sarana Industrial Estate (2004). As the central part of Batam is designed only for the light industries, the industrial estates in the centre of Batam are dominated by light industrial estates.

Presently in 2011, there are 21 industrial estate companies in Batam. The industrial estates in Batam are distributed across in five area of the island, due to government intervention through spatial planning (see figure 4-3)

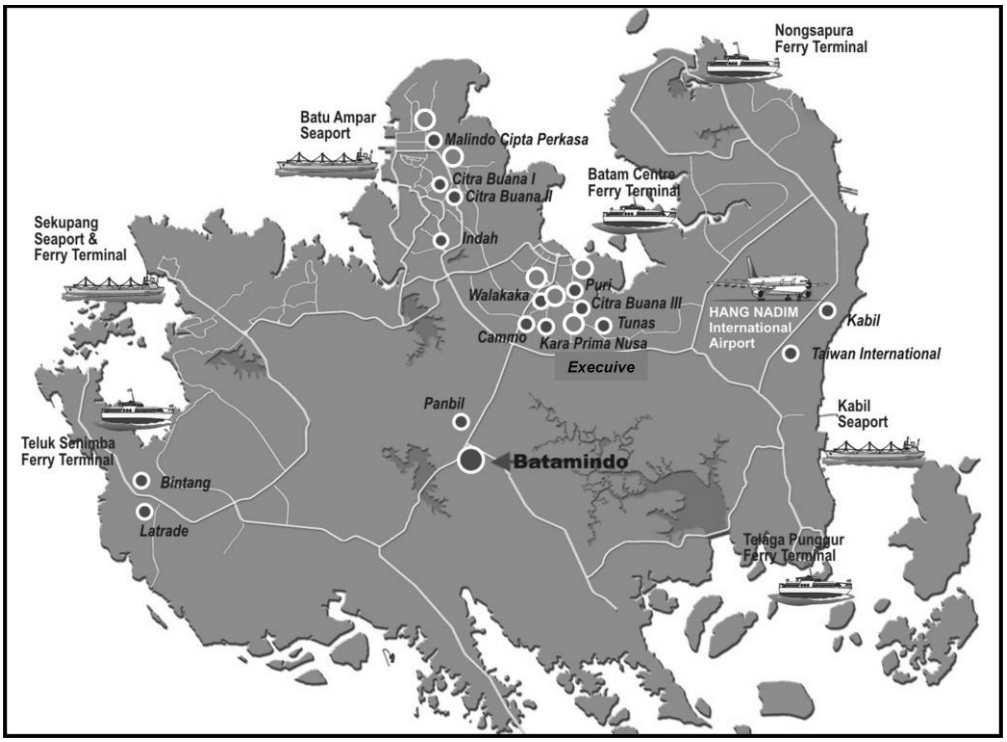


Figure 4-3 Distribution of Industrial Estates in Batam

4.3.3. Supply and Demand of Industrial Land

To describe the demand and supply of industrial land in Batam over time, this study employs the number of companies, the amount of investment and the volume of export. On the other hand, the supply side is explained by the amount of area planned as industrial land in the Spatial Plan.

The demand of industrial land in Batam has increased rapidly from 1991-1998 (see fig.4-4). This can be seen from the area of industrial land allocated by BIDA: from 420ha in 1991 to 3,867 ha in 1998. Meanwhile from 2003 up to 2008 the industrial land allocated relatively steady due to the limitation of the area of Batam. On the other hand, supply of industrial land in 1991 and 1998 is only around 3,000 ha. In 1991, the industrial land was still abundant, and more than 85% of industrial land was still available, and it has not been allocated by BIDA to a third party. However, during the period 1991-1998 the demand for industrial land in Batam increased rapidly, and at the end of 1998, BIDA allocated industrial land more than it is planned for in the Spatial Plan.

To accommodate the demand for industrial land, BIDA revised it Spatial Planning in 1999, and converted other land use to industrial use, and the industrial area became 4,926ha. However, at the end of 2008, the demand for industrial land excess the supply, and BIDA needed to revise its Spatial Plan again. In general the allocated industrial land exceeded the supply that was originally planned in the Spatial Plan. It shows that BIDA is not very strict to its own spatial plan. It tends to be flexible to accommodate the demand for industrial land.

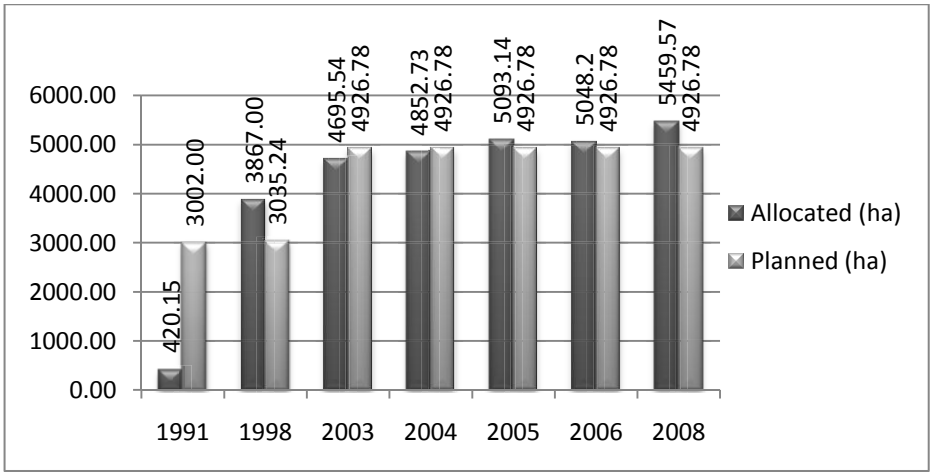


Figure 4-4 Land Allocation for Industrial Use in 1991-2008

However, some studies show that even though the land has been allocated to a third party, most of the land remains vacant, and only a small portion of each parcel has been developed. This means that only a little portion of allocated land has been used for industrial activities. The low rent charged by the government to acquire the land, attracted many companies to propose land acquisition to BIDA and paid all the rent in advance. For several possible reasons, the land is not entirely used. It could be because the companies do not realize improvements in its investment and production, or it could be that they just act as speculator. Another possible reason could be that they just act as an industrial developer, try to

develop the land with basic infrastructures and subsequently sell it or transfer it to smaller companies when the demand for land is high and get a higher price accordingly

Furthermore, the number of Multinational Company (MNC) investing in Batam always has been increasing. The trend of the growth started to increase from 1990 to 2002. In average, there are 50 new MNC's every year registered in Batam (see fig.4.5). The improvement of the number of MNCs in Batam shows that the monetary crisis hitting Indonesia in 1998 has not affected much the industrial investment in Batam, and in 2006, the increase of the number of industrial estate reached 81 companies.

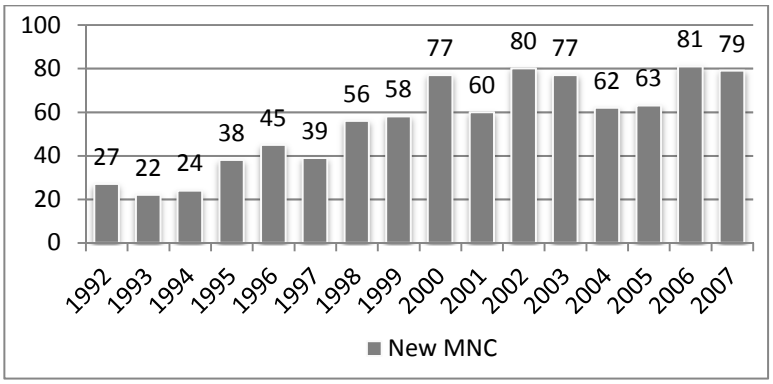


Figure 4-4 The Number of Additional MNCs

The amount of investment of MNC from 1993 to 2007 relatively fluctuates. Its peak occurred in year 2001 and 2006. While in 1994, 1996 and 1998 the investment value experiences the lowest improvements which are US$ 0.09 and US$0.11

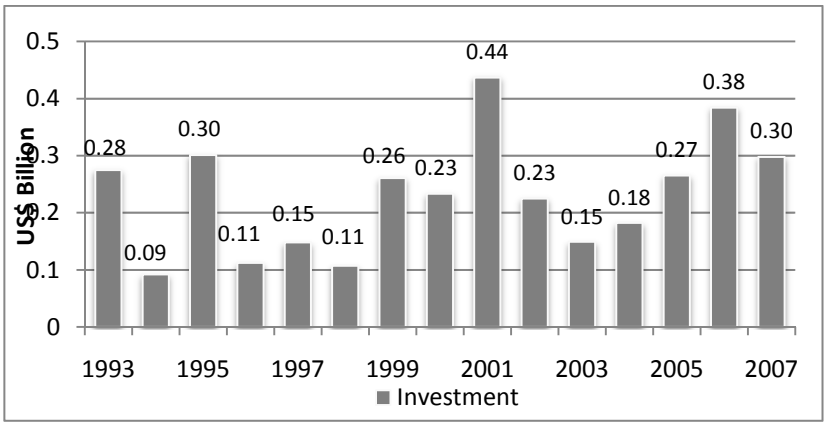


Figure 4-5 The Amount of Additional MNC's Investment

The export volume of non-oil and gas commodities is remained relatively steady. During period 1992 up to 1997, the export increased significantly (see fig 4-7). The booming of electronic industry in the world in that period also affected the production of electronic manufactures in Batam which is dominated by big MNC's.. During period 1997 up to 2000 the value of export from Batam is relatively steady while other parts of Indonesia were hit harder by the crisis. From 2001 up to 2004 the value of export went a little bit down, but then it increased again in the period 2005- 2008. The MNC companies benefited from the recession in Indonesia, because of the reduction of production costs. Since the value of rupiah is weak

compared to the foreign currency, the export activities will benefit most to the country with stronger currency.

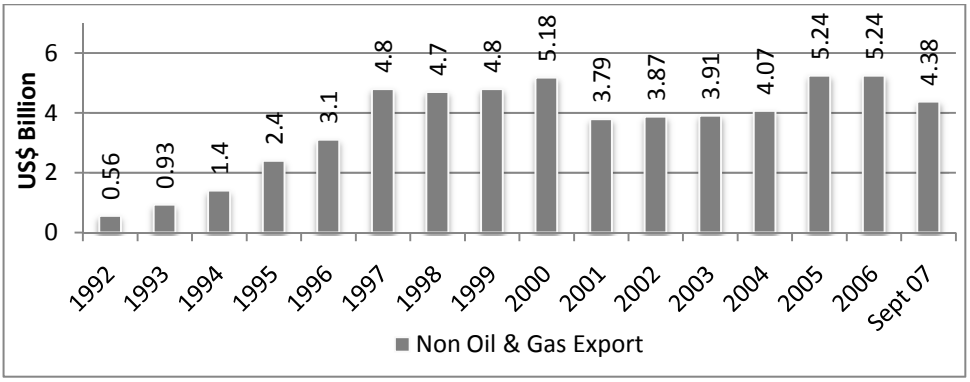


Figure 4-6 Non-Oil & Gas Export

The export is mainly dominated by industrial goods such as electronic equipment, machinery and other industrial products. Most of the export goes to Singapore which is almost 60% of total export of Batam.

4.3.4. Transport Infrastructure of Batam

Road Network

The hierarchy of roads in Batam consists of Secondary Arteries and , Secondary Collectors. The secondary arteries are roads connecting the primery zones to secondary zones, or connecting between one secondary zone to another secondary zone. The width of right of way (ROW) of Secondary Artery is between 70 meters up to 200 meters. This road was constructed to support industrial activities. (Batam, 2000).

On the other hand, the secondary collector roads are constructed to support people movements from one area to another area. Typically this road is not used for container vehicles which are used in industrial estate. The width of the ROW for this road is between 30 to 50 meters. The distribution of main roads in Batam can be seen in Fig.4- 8

Sea Port

There are 4 (four) main sea ports in Batam. Sea ports have an important role in delivering the industrial goods to the export market in other countries. Furthermore, the seaport also becomes the gate for raw material delivery from other areas in Indonesia. . The four ports are Batu Ampar Port, Sekupang Port, Kabil Port and KCN Port. Up to 1996 all exported cargo was sent through Batu Ampar port. From 1997, the Kabil Port started to operate, and the percentage of cargo transported through Batu Ampar decreased to 88 % ((BIDA, Evaluasi Master Plan Barelang, 1999). Up to now, most of the export is being sent through Batu Ampar Port and Kabil Port. In 2008, around 60% export and import activities used Batu Ampar Port and 40 % used Kabil Port (BIDA, Development Progress of Batam, 2008).

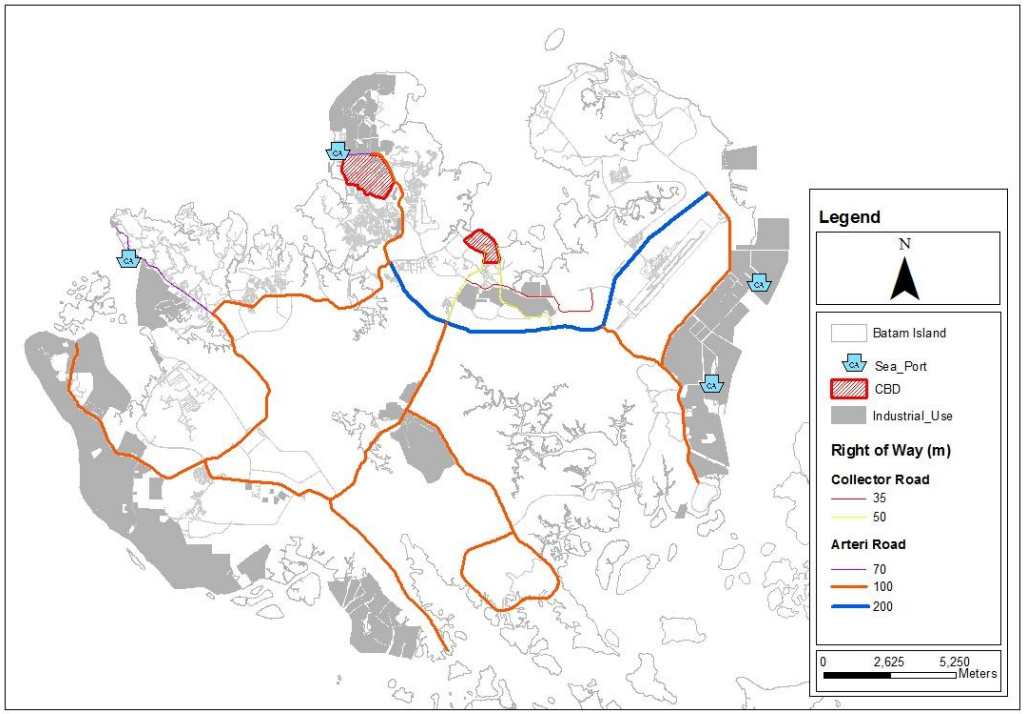


Figure 4-7 Main Road Network & Seaports

4.3.5. The Relationship between Batam and Singapore

The main consideration for the development of Batam was to catch the opportunity of investment over flow in Singapore. Thus, Batam and Singapore have a strong relationship in terms of economic growth. It can be seen from the volume of the export of Batam, of which 60 % goes to Singapore (BIDA, Development Progress of Batam, 2008)

As the centre of economic growth in South East Asia with rapid development and investment, Singapore experiences high production cost. Moreover, it also experiences a limited availability of labour and scarcity of the land. (BIDA, Evaluasi Master Plan Barelang, 1999). This situation forces many transnational companies, having regional office in Singapore, to relocate their companies to Batam in Indonesia. These companies become the generator of economic growth of Batam in period 1990-2000.

However, Batam is not the only relocation destination for transnational companies from Singapore. Johor at Malaysia, is a competitor of Batam to attract investments from Singapore since Johor is also located at a short distance from Singapore. Compared to Batam, Johor has better accessibility to Singapore, because of a bridge connection. Meanwhile, the advantage of Batam compared to Johor is the low price of land.

4.4. Outlook

The strategic location of Batam was the main reason for GOI to develop Batam as a centre of oil logistic, industrial area, transhipment point and tourism destination. Besides its strategic location, the availability of cheap land and low cost of labour are the advantages of Batam as investment destination. Government intervention has had an important role since the early stage of Batam's development. The concept of the spatial planning of the development was to optimize the land use at Batam as an Industrial area applying the Multi Nuclei concept. However, this does not mean that the market forces did not exist and didn't

have any influence on the existing land use including industrial use. Because several times, BIDA revised its spatial planning to accommodate the market demand of industrial land. Even though the market forces became a consideration behind the spatial planning, it has not significantly affected the land use. There are some efforts to deal with the bureaucracy, administration processes and other considerations to revise the spatial planning.

The industrial land market in Batam complies with the urban land theory and can be explained by Neoclassical and Ricardian theory. In some cases, the industrial land market in Batam can be explained by Neoclassical theory where the land has its opportunity use, and the supply of industrial land is not fixed. The revision of Spatial Planning to accommodate the industrial demand shows that the supply of industrial land is relatively flexible. However, in other cases, The industrial land market can be explained by the Ricardian theory where the spatial planning is not flexible, thus supply of land is fixed. For example, converting land use from protected forest to commercial area is difficult to do, because it is regulated by higher hierarchy of regulation which is less flexible to modify. Moreover, the competition among different types of land generates by market demand can be controlled by Spatial Planning. However, the enormous demand for industrial land has not been followed up by an increased occupancy rate of industrial land. Some studies mentioned that in the early 1990's, most of the allocated industrial land was vacant.

Due to the existence of Spatial Planning, the industrial land is distributed evenly across the island. The types of industries that are allowed to operate are also spatially managed. Heavy industries were located at east coast of the island; medium industries are located at the north part and west part of the island. Finally, light industries are located at the centre of the island. Clustering this type of industry complies with the pattern of market where companies having the same business will tend to agglomerate to get more benefit.

Batam has relatively reliable infrastructures including road, seaport and airport to serve industrial activities compared to other area in Indonesia. The roads that can be used for industrial vehicles are clearly classified. Furthermore, the role of seaports for industrial activities is important in Batam. The raw material and the end product of industrial companies in Batam is delivered through the seaports. Therefore, in the development of a model for land prices in Batam, the proximity to the seaports seems to be an important variables that must be taken into account.

4.5. Existing Land Valution in Batam

According to Presidential Decree No.41/1973, BIDA is allowed to allocate the land in Batam and to get revenues from allocating the land. Land allocation to a third party will last for a specific number of certain years. For industrial use the allocation will be 30 years. The right that will be given to the third party is *Hak Guna Bangunan* (The right of building on land). The revenues from the land are used to pay the compensation for the right of the people over the allocated land, surveying and land development cost, administration, donation for infrastructure developed by BIDA and other costs.

At the early stages of development of Batam, the revenues from the land were not intended to be the source of infrastructure development, because the main objective of the initial development of Batam was to attract investors. Thus, the availability of cheap land became one of the incentives given by government to the investors to make Batam attractive. To determine the spatial pattern of the land tariff in Batam, BIDA still considers the cost of infrastructure development spent in a certain area, and also the dominant

activities at those areas. For example, since Nagoya area is dominated by commercial activities, and the land availability is less than other part, this area is considered to be charged with higher tariff.

To use the land in Batam, a company must pay a rent to BIDA called *Uang Wajib Tahunan Otorita Batam* (UWTO). This is an amount of money that must be paid by the applicants for using the land in Batam for 30 (thirty) years and this must be paid in full in advance. The tariff for UWTO is differentiated according to the location of the land. The tariff of the industrial land in Batam is divided into 8 (eight) sub are, namely: Batam Centre Suburbs; Sei Panas; Muka Kuning; Sekupang; Tanjung Uncang and Sagulung; Nongsa; Kabil; and Tanjung Piayu. According to the interviews, this tariff is differentiated based on the costs of infrastructure in each area. BIDA classified the cost of infrastructure development into several purposes, such as industrial, commercial, and housing. After that, BIDA has calculated the total amount of budget for each category, and divided it by the area of the land for the respective use. Unfortunately, the document explaining how the tariff determined was determined could not be gathered. The tariff of each area can be seen on the table 4-2 below.

No	Sub Area	Tariff (Rp/m2/30 yrs)	No	Sub Area	Tariff (Rp/m2/30 yrs)
1	Batam Centre	32,205	5	Tanjung Uncang/ Sagulung	22,500
2	Batu Ampar	49,500	6	Nongsa	32,250
3	Muka Kuning	22,500	7	Kabil	32,250
4	Sekupang	22,500	8	Tanjung Piayu	22,500

Table 4-2 Industrial Land Tariff of BIDA

Even though BIDA has land lease tariff for 8 sub area, the industrial land is in only exist in 6 sub area (see fig 5-4). Furthermore, the spatial variation of the tariff of industrial land charged by BIDA in Batam can be seen in figure 4-9 below

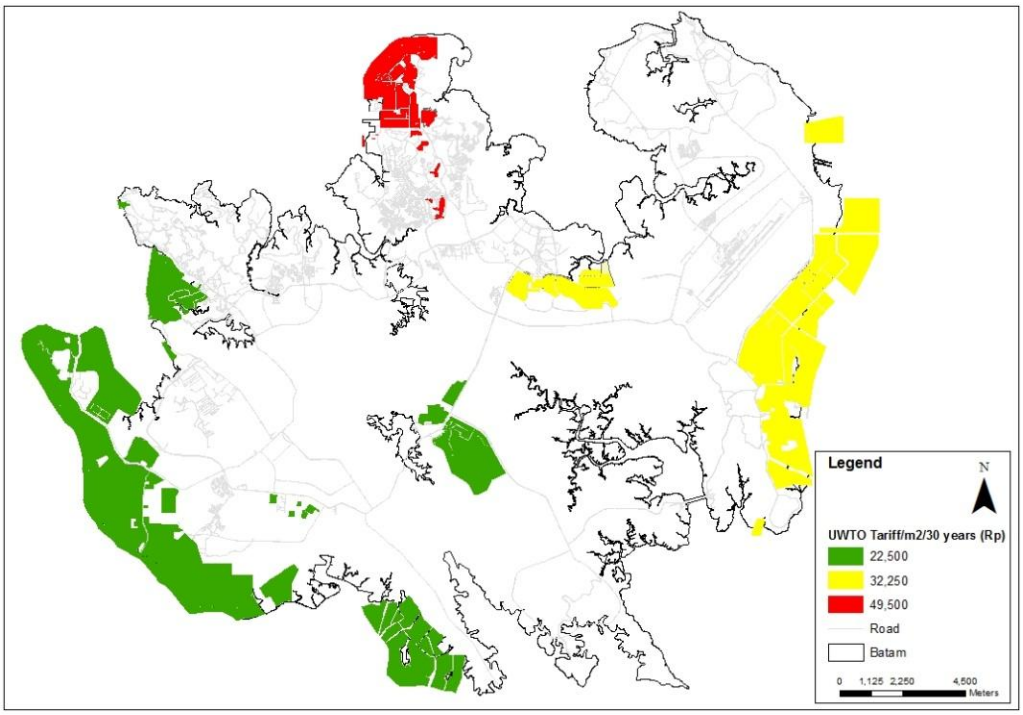


Figure 4-8 UWTO Tariff for Industrial Land

There are two schemes of land allocation of industrial land in Batam. First, BIDA allocates the land directly to big industrial companies (1), and those big companies will pay the lease for (mostly) 30 years to BIDA (2) (see fig. 4-10). In the second scheme, BIDA allocates the land to industrial estate companies (3), and industrial estates pay the lease for 30 years for using the land (4). In both these schemes, big companies and industrial estates companies pay the lease in one amount in advance. After getting the land, industrial estate companies rent (5) or sell the land to smaller companies (6). In the case the smaller companies rent the land or warehouse from the industrial estate, the smaller companies pay the land rent monthly to the industrial estates (7). On the other hand, if the smaller companies purchase land from the industrial estate, they must pay an amount of money to the industrial estate company for acquiring the right of using the land for 30 years (8). However, this price is higher than the government charges to the industrial estate, because the price has incorporated the land development cost spent by industrial estate companies. After the first 30 years which is the term of land lease, the small companies have to pay the rent directly to BIDA to extend the term (9). If smaller companies buy the warehouse, then the construction cost also must be added to the price. The scheme of industrial land allocation and its payment can be seen on the figure below.

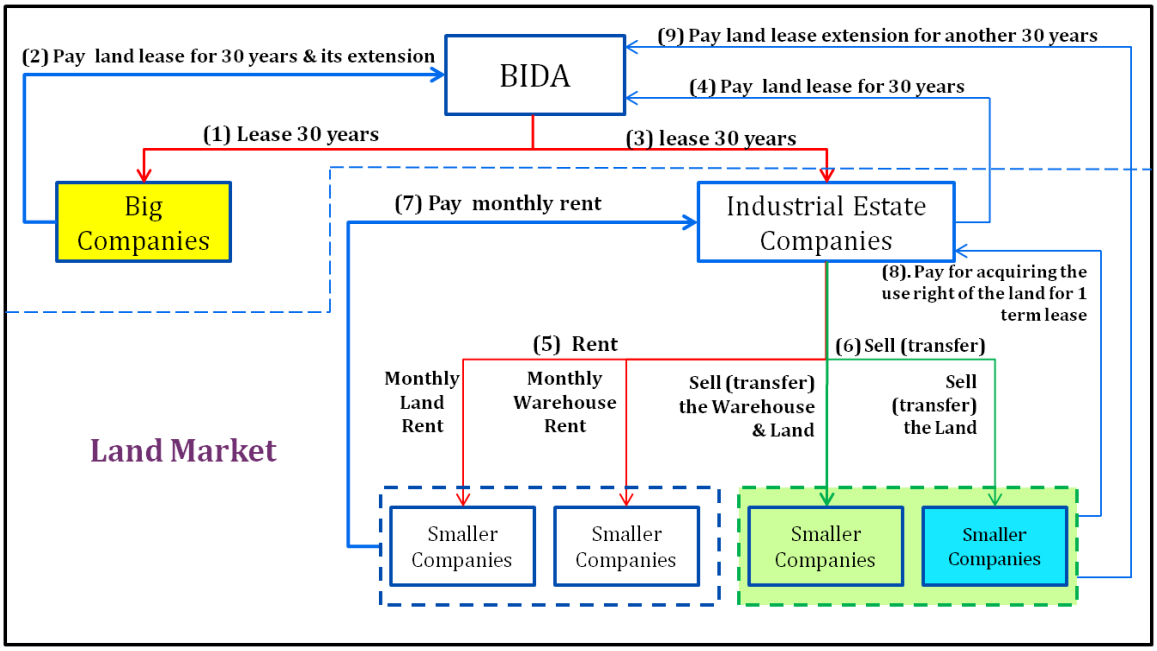


Figure 4-9 Land Allocation Scheme at Batam

5. RESULT

5.1. Spatial Data Conversion

The spatial data that were acquired from the field were mostly in CAD format. Therefore a conversion step must be done from CAD to ArcGIS format. This step is required since spatial analysis such as the Euclidean distance measurement and network analysis shortest path that will be used in this study can be performed easily in Arc GIS software.

5.2. Land Price Data

From 21 industrial estates operating in Batam, 15 industrial estates could provide 154 land lease transaction within period 1998-2008. The collected data were limited to the period 1998-2008 to reduce errors in adjusting the land price to the base year. However, the sample data only available in 4 sub area from 6 sub area in Batam. Therefore, there are 2 sub areas that are not represented by the sample, namely Sekupang and Muka Kuning. The sample data is not well spatially distributed since most of samples are located at Batam Centre (94 samples), while in Kabil there are only 3 samples. The number of sample distribution per sub area can be seen on the table below.

Area	Total Sample
Batam Centre	94
Batu Ampar	42
Kabil	3
Tanjung Uncang	15

Table 5-1 Number of Sample per Sub Area

The land transactions were done in two currencies, namely Rupiah (Rp) and Singapore Dollar (S$). The detailed description of land transaction of industrial estates can be seen on the appendix 5. The most transaction occurred in 2006 which is 48 transactions. The highest frequency of transaction occurred at Union Industrial Estates which is 26 transactions, while the least transaction occurred at Malindo Industrial Estates which is 2 transactions. A detail figure of transaction per year can be seen on the table 5.2 below.

No	Industrial Estates	Year of Transaction											Total
		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
1	Bintang Industrial Park II	0	0	0	0	0	0	0	3	2	0	2	7
2	Cammo Industrial Park	0	0	0	0	0	1	7	2	2	0	0	12
3	Citra Buana Park II	0	0	0	0	0	0	1	1	0	0	0	2
4	Executive Industrial Estate	0	0	0	0	0	0	0	2	3	0	0	5
5	Hijrah Industrial Estate	0	0	0	0	0	2	3	2	0	0	0	7
6	Indah Industrial Park	0	0	0	1	2	1	1	0	3	0	0	8
7	Kara Industrial Park	1	1	3	4	5	1	3	4	3	0	0	25
8	Latrade Industrial Estate	0	0	0	0	0	0	3	2	3	0	0	8
9	Malindo Industrial Park	0	0	0	1	0	0	0	1	0	0	0	2
10	Megacipta Industrial Park	0	0	0	0	2	0	1	1	0	0	0	4
11	Puri Industrial Park	0	0	0	0	0	4	6	4	4	1	0	19
12	Sarana Industrial Point	0	0	0	0	0	0	3	3	7	0	0	13
13	Taiwan Industrial Estate	0	1	1	1	0	0	0	0	0	0	0	3
14	Tunas Industrial Park	0	0	0	0	0	0	2	1	10	0	0	13
15	Union Industrial Park	0	0	0	0	0	0	6	6	11	2	1	26
	Total	1	2	4	7	9	9	36	32	48	3	3	154

Table 5-2 Cross Tabulation of Industrial Estates & Year of Transaction

The histogram lot of the land lease data (see fig 5-1) shows that the distribution of land transactions is not completely normally distributed. This plot is necessary to see the sample distribution. Moreover, the sample distribution is important in selecting the base year that will be used as reference in land price adjustment. To represent the sample, some average indicators of sample could be used, namely mean, media, and modus. Furthermore, another consideration in selecting the base year is the effect on inflation. A base year should not be too far from the land lease to reduce the effect of inflation. Since the land lease data taken in period 1998-2008, 2003 must be selected as base year. Nevertheless, this study uses 2006 as base year after considering the number of transaction which is the highest among other year

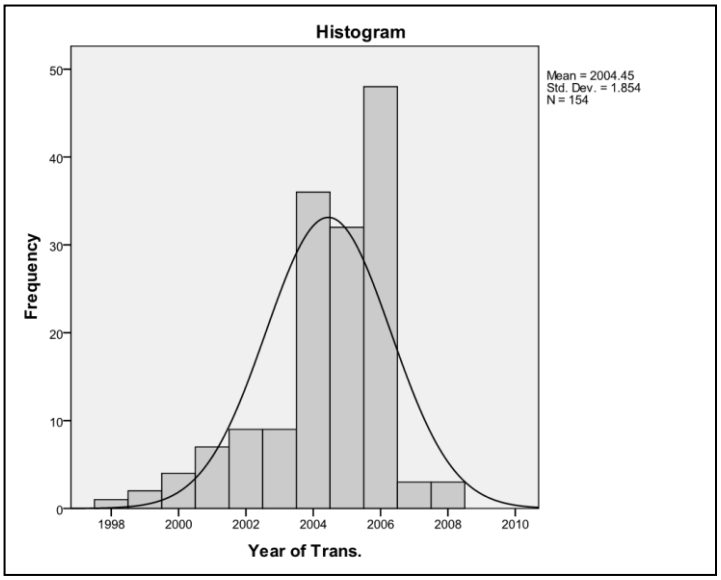


Figure 5-1 Histogram of Industrial Land Lease Sample

5.3. Land Price Adjustment

There are two main issues in adjusting the land price in Batam. The first is related to the unit comparison. Eckert (1990) mentions that to make the land price comparable, the transaction price must be converted to a unit price. Thus, the transaction price collected from the field was converted to per meter square price per year. (Rp/m2/year) Secondly, the transaction price must be in the same currency. There are two currencies used in land transactions in Batam, namely: Rupiah (Rp) and Singapore dollar (S$). Accordingly, the land price was converted to a more stable currency, namely the Singapore dollar. The currency rate for converting the Singapore dollar to the Rupiah can be seen on the table below (Singapore, 2009/2010)

Year	Currency Rate for 1 S$	Year	Currency Rate for 1 S$	Year	Currency Rate for 1 S$
1998	5780.347	2003	4926.108	2008	6802.721
1999	4587.156	2004	5291.005	2009	7142.857
2000	4830.918	2005	5813.953	2010	6622.517
2001	5681.818	2006	5780.347		
2002	5181.347	2007	6060.606		

Table 5-3 Currency rate of S$ in Rp (1998-2010)

After converting to the unit price, the transaction price was corrected from the effect of inflation and all the prices were set into the base year. There are several types of price indices that could be used in correcting the price, namely: the Wholesale Price Index (WPI) and Consumer Price Index (CPI). For industrial property, some countries such a Singapore have more detailed indicators, namely the Private Property Index (PPI), which is divided into several categories, including industrial property. At the other hand, the available data in Indonesia or Batam in particular, is limited. The available data includes the Wholesale Price Index for industrial sector in Indonesia and Inflation rate of Batam derived from CPI. In brief, four type of indexes will be examined in this study, namely Batam's Inflation rate, Indonesia's WPI for Industrial sector, Singapore's WPI for all sector, and Singapore's PPI for industrial property. The development of the various price indices is given in the appendix 8. Finally, in selecting base year for land price adjustment as discussed in section 5.2, the year with the highest frequency of transaction was chosen, i.e. 2006.

The range of adjusted price in Rupiah (Rp) by inflation rate of Batam is wider than those adjusted by Indonesia's WPI for industrial sector. Meanwhile, the range of adjusted price in Singapore dollar (S$) by Singapore's WPI and Singapore's PPI index is only slightly different. The detail of descriptive data can be seen on the figure 5-4 below.

Land Lease Price	N	Minimum	Maximum	Mean	Std. Deviation
Adj_Rp_yr_inf_Btm	154	7128.05	35000.00	1.498855E4	5.69E3
Adj_Rp_yr_WPI_Indo	154	9286.42	36061.96	1.769906E4	6.79E3
Adj_S$_yr_WPI_Sing	154	1.44	6.05	2.762893	1.06
Adj_S$ yr_PPI_Sing	154	1.21	6.05	2.625713	1.06
Valid N (listwise)	154				

Table 5-4 Descriptive Statistic of Adjusted Land Price

Where

- Adj_Rp_yr_inf_Btm is adjusted price in Rupiah (Rp) by Inflation rate of Batam derived from Consumer Price Index
- Adj_Rp_yr_WPI_Indo is adjusted price in Rupiah (Rp) by Wholesale Price Index of Indonesia for industrial sector
- Adj_S$_yr_WPI_Sing is adjusted price in Singapore Dollar (S$) by Wholesale Price Index of Singapore fo all sector
- Adj_S$ yr_PPI_Sing is adjusted price in Singapore Dollar (S$) by Private Property Index of Singapore for industrial sector

In general, the of the charts representing the average land price of each industrial estates in Batam adjusted by Batam's inflation rate, Indonesia's WPI industrial sector, Singapore's WPI and Singapore's PPI for industrial property have relatively similar pattern (see fig. 5.2 and fig. 5.3). However, the value for land lease price adjusted by inflation rate of Batam and PPI of Singapore is slightly lower.

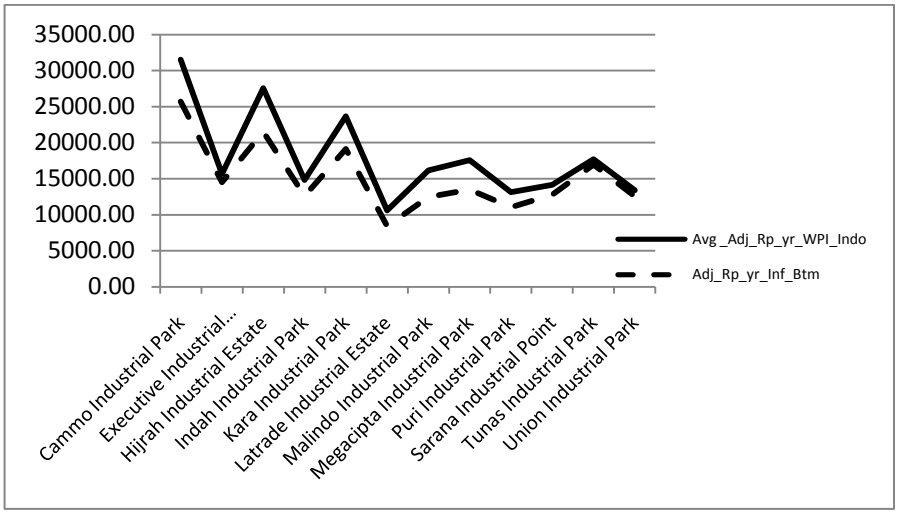


Figure 5-2 Adjusted Land Rent by Indonesia's WPI for Industrial Sector & Batam's Inflation Rate

Where

- Adj_Rp_yr_inf_Btm is adjusted price in Rupiah (Rp) by Inflation rate of Batam derived from Consumer Price Index
- Adj_Rp_yr_WPI_Indo is adjusted price in Rupiah (Rp) by Wholesale Price Index of Indonesia for industrial sector

On fig 5.3. below we can see that land price in Singapore Dollar (S$) currency relatively has the same pattern, either adjusted by WPI or PPI.

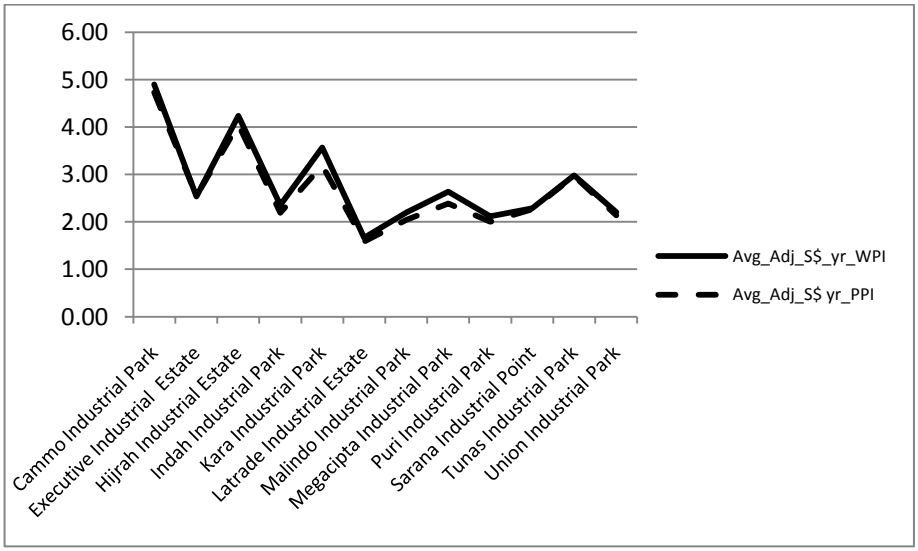


Figure 5-3 Adjusted Land Rent by Singapore's WPI and PPI

Where

- Adj_S$_yr_WPI_Sing is adjusted price in Singapore Dollar (S$) by Wholesale Price Index of Singapore for all sector
- Adj_S$ yr_PPI_Sing is adjusted price in Singapore Dollar (S$) by Private Property Index of Singapore for industrial sector

By considering that there is no significant differentiation of adjusted land price by those indexes, this study will chose PPI of Singapore to adjust the land price of industrial land price in Batam. Furthermore, by using this index, this study can adjust the land price in Singapore Dollar which is more stable currency than Rupiah.

5.4. Spatial Variation of Land Price

The spatial variation of adjusted land price distribution in Batam can be seen on the figure 5-4 below. It shows that the industrial land located near to Batam Centre CBD has the highest average of lease price (S$3.00), while industrial land located surrounding of Nagoya CBD and Batu Ampar Seaport have the second highest average price (S$2.21). Finally, the industrial located at South West (Tanjung Uncang) and West Coast (Kabil) of the island which are far away from CBD have the lowest average price which are S$1.65 and S$1.49

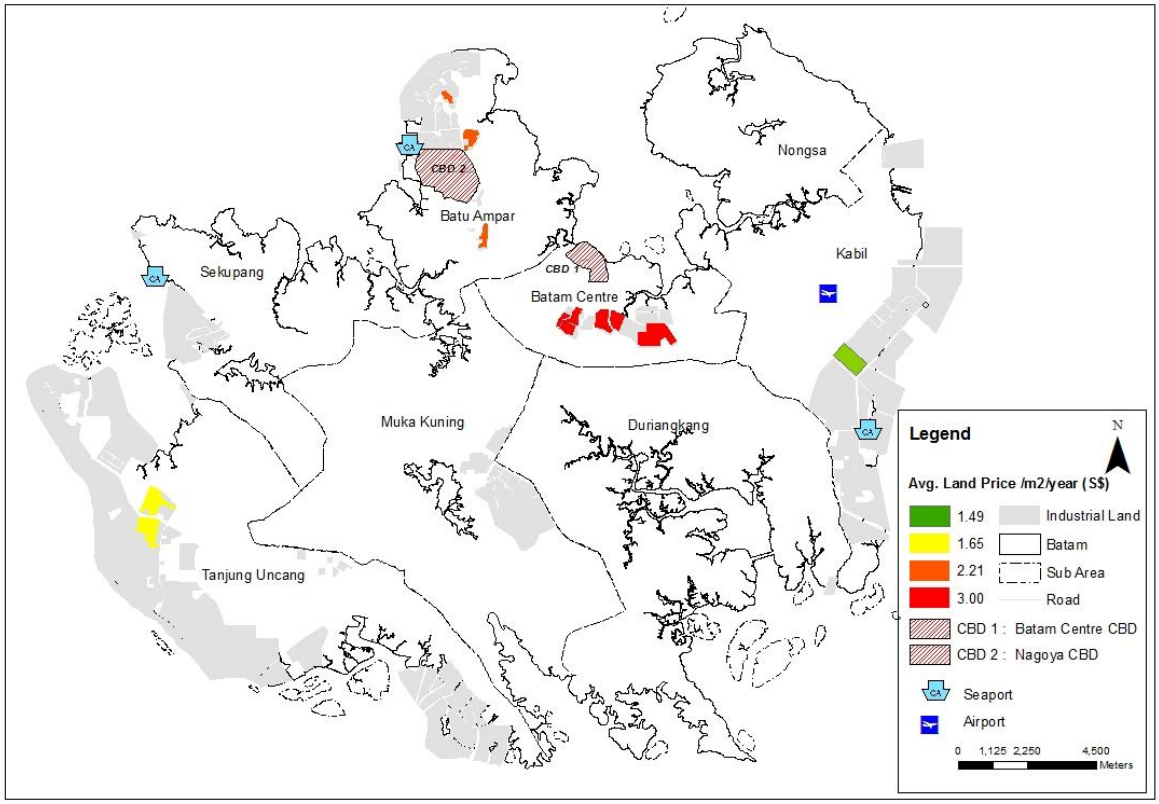


Figure 5-4 Map of Land Price Average of Industrial Estates

Besides it has the highest average value, the land lease price in Batam center is the most vary than other areas, with maximum value 6.05 and minimum value S$1.22, and the standard deviation is 1.15. While, industrial land in Tanjung Uncang is the least vary compare to other sub areas. More detail statistical data of land lease price per sub area can be seen on the table5-5 below

Area	Adjusted price in Singapore Dollar (S$) by Singapore's Private Property Index (Adj_S$ yr_PPI_Sing)					
	Mean	Maximum	Minimum	Range	Standard Deviation	Total N
Batam Centre	3.00	6.05	1.22	4.83	1.15	94
Batu Ampar	2.21	3.15	1.39	1.77	.48	42
Kabil	1.49	1.70	1.2	.49	.25	3
Tanjung Uncang	1.64	1.83	1.37	.46	.15	15

Table 5-5 Adjusted price in Singapore Dollar (S$) by Singapore's Private Property Index per Sub Area

Furthermore, for the land lease price per industrial estate, Cammo Industrial estate has the highest mean land lease price, while Taiwan Industrial Estate has the lowest mean of land lease price. The land lease price in Kara is the most vary of compare other industrial estates. While, Citra Buana has the least vary land lease price among industrial estates. A detail land lease price is given on the table 5-6 below

Industrial Estate	Location	Adjusted price in Singapore Dollar (S$) by Singapore's Private Property Index (Adj_S$ yr_PPI_Sing)					
		Maximum	Minimum	Mean	Standard Deviation	Range	Total N
Cammo Industrial Park	Batam Centre	5.8292	4.6100	5.1279	.3701	1.2192	12
Executive Industrial Estate	Batam Centre	2.7221	2.3369	2.5483	.1442	.3852	5
Hijrah Industrial Estate	Batam Centre	4.4688	3.6850	4.0552	.2778	.7839	7
Kara Industrial Park	Batam Centre	6.0550	1.2219	2.9335	1.0989	4.8331	25
Puri Industrial Park	Batam Centre	2.2462	1.7579	2.0026	.1408	.4883	19
Sarana Industrial Point	Batam Centre	2.3975	1.9411	2.2693	.1704	.4563	13
Tunas Industrial Park	Batam Centre	3.3696	2.0064	2.9681	.4956	1.3631	13
Citra Buana Park II	Batu Ampar	3.1552	3.1362	3.1457	.0134	.0189	2
Malindo Industrial Park	Batu Ampar	2.6669	1.4157	2.0413	.8847	1.2512	2
Megacipta Industrial Park	Batu Ampar	2.9093	2.0093	2.3859	.4511	.9000	4
Union Industrial Park	Batu Ampar	2.6062	1.5530	2.1368	.3604	1.0531	26
Bintang Industrial Park II	Tanjung Uncang	1.8325	1.7437	1.7727	.0373	.0887	7
Latrade Industrial Estate	Tanjung Uncang	1.6667	1.3672	1.5423	.1288	.2994	8
Taiwan Industrial Estate	Kabil	1.7031	1.2125	1.4936	.2530	.4906	3
Total							**154**

Table 5-6 Descriptive Statistic of Sample per Industrial Estate

5.5. Relation between Adjusted Land Rent and UWTO

The correlation between the adjusted land price and UWTO is weak. Or in other word, the existing tariff charged by government does not reflect the market price. The correlation between the land price and UWTO can be seen from the figure 5-5

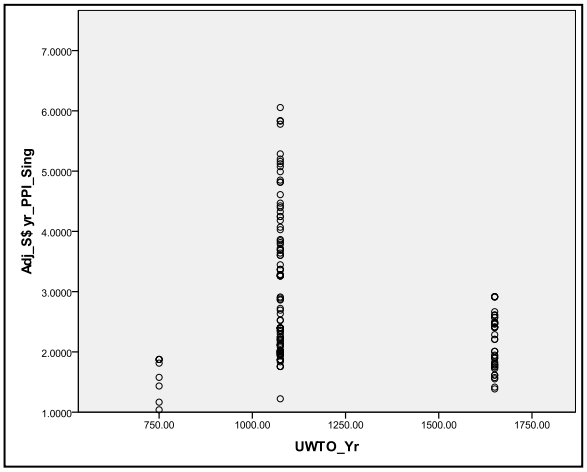


Figure 5-5 Scatter Plot of Relationship between Adjusted Land Price & UWTO

- UWTO Yr is the UWTO per year which is calculated by divided the land lease tariff with 30 years
- Adj_S$ yr_PPI_Sing is adjusted price in Singapore Dollar (S$) by Private Property Index of Singapore for industrial sector

Figure 5-6 shows that industrial land located near to Batam Centre CBD has the highest ratio between land price and UWTO. It means that the market price in this area has the biggest gap compare to the tariff charged by government derived from cost of infrastructure development. The government investment for infrastructure development in this area can attract more private investment compare to other area in Batam. The private investment includes the development of industrial estate, the development of housing, the development of offices and commercial area. These investments also generate more economy activities surrounding this area, increase the demand over industrial land, and increase the land value in this area. The, ratio between land lease tariff charged by BIDA (UWTO) and land lease price generated b land market can be seen on the figure 5-6 below

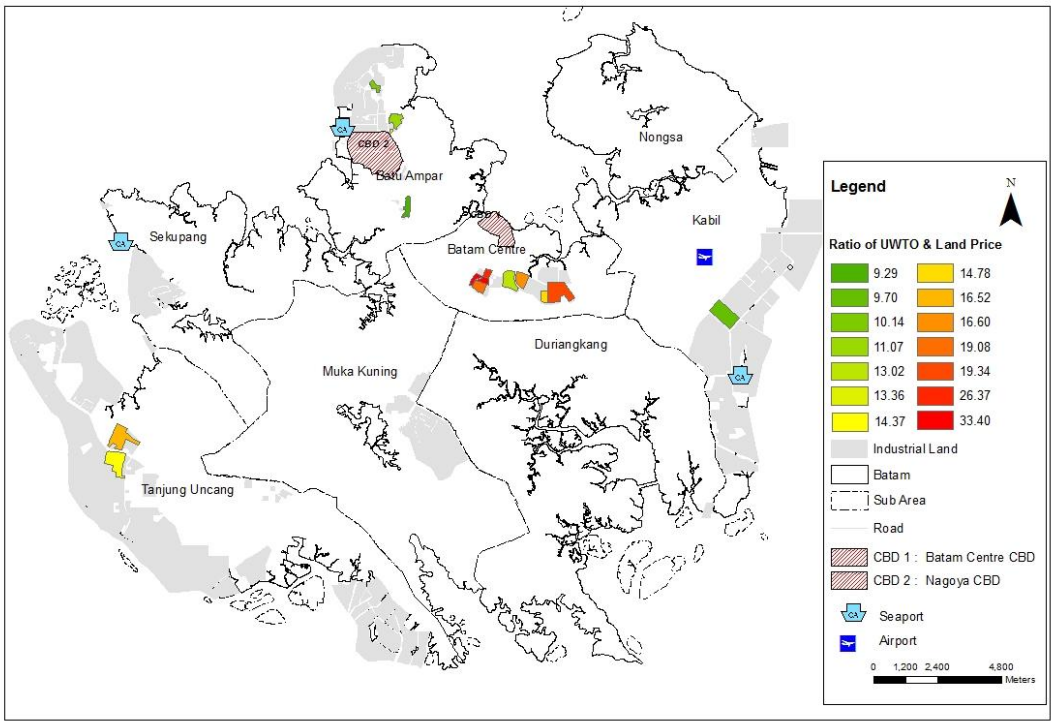


Figure 5-6 Map of Ratio of Price and Tariff Industrial Land Lease

5.6. Factors Affecting Industrial Land Price

After doing some interviews to BIDA officers, Marketing Officer of Industrial Estate Companies and Manager of Smaller companies, some factors perceived as the main consideration for industrial estates and smaller companies in determining the price of industrial land are listed below

No	Factors
1	Industrial Estate Facilities (Power of Electricity, Dormitory, Water, Security)
2	Proximity to Seaport, Airport
3	Proximity to Main Road
4	Type or Class of Abutting Road
5	Agglomeration
6	Size of parcel

Table 5-7 Factors Affecting Land Lease Price Perceived by Stakeholders

The interview confirm some general factors derived from literature review such as distance to CBD, distance to seaport and airport, proximity to main road, type or class of abutting roads, and proximity to its supplier or its client. However, there are some others factors are not considered as the factors determining the land lease price, such as the position of parcel inside the industrial estate, visibility to motorway. The industrial estates in Batam do not differentiate the location of land inside the industrial estate by its proximity to main gate or visibility to motorway. Some others relevant factors such as proximity to main road, agglomeration and industrial estate facilities are unable to be examined due to the limitation of data. By considering the opinion of the expert and the data availability, the independent variables that will be examined in developing a model in this study are limited to type of roads, provision of dormitory for labour and distance between parcels of industrial land and the central business district (CBD), airport, and seaport.

5.7. Distance Calculation

In creating the model of land value by using locational factors, the distance is the important variable. There are several ways to measure the distance namely Euclidean distances, vector-based road-network distances, and raster-based cost-weighted distances (Sander, Ghosh, Van Riper, & Manson, 2010). However, only the first two methods are used in this study. First, the Euclidean distance measurement. This method is used to calculate the distance between Industrial land and CBD. This method has been used by many previous studies to represent the interaction between CBD and land at certain location. The consideration is that the influence of CBD is so complex, and it does not follow certain path formed by physical obstruction such as building or other constructions. More recent studies show that Euclidean distance has a drawback in a situation where accessibility must be measured following certain network path. To deal with this situation, network distance measurement is proposed. In this study, this approach is implemented to measure the distance between the land and important facilities such as seaports and airport. The method follows the distance calculation method used in Rodriguez et al (1995). Furthermore, the road used in the network are those roads having width of Right Of Way (ROF) 35 m, 50 m, 70 m, 100 m and 200 m. The assumption is that industrial vehicles will only use this certain types of road to deliver goods to the seaport.

5.8. Correlation between Land Price and Distance Variable

This study will explore the correlation between the land lease price with its distance variables. There are 4 distance variables will be examined, namely; distance to CBD of Batam Centre (BTC), distance to CBD of Nagoya (NGY), distance to Batu Ampar (BTA) Seaport, Kabil & Sekupang (KBL SKP) Seaport, and distance to airport. All variable of distance to CBD is calculated by using Euclidean distance. While distance to seaport and airport is calculated by using network distance. Even though there are three main seaports in Batam used for export and import activities, only two distance variables will be used. First is distance to Batu Ampar (BTA) Seaport. Second is distance to Kabil seaport or Sekupang seaport. The latter is defined by the distance to the more near seaport between respective ports. Furthermore, there are two more general distance variables will examined, namely distance to nearest CBD and distance to nearest seaports.

To explore the correlation between the land price and these variables, some scatter plots are produced by using SPSS software (appendix 9a). From the scatter plots, it can be seen that the correlation between adjusted land lease price and the variables of distance to CBD Batam Centre (BTC), CBD Nagoya (NGY)

and CBD form relatively non-linear plot. Meanwhile, the variables distance to seaport consisting of three variables namely distance to Batu Ampar (BTA) seaport, distance to Sekupang & Kabil (KBL_SKP) seaport and distance to nearest seaport show that the correlation between land price and these variables relatively linear, though it is not a strong correlation. The last independent variable, distance to airport, also form linear path with land price on its scatter plot. To ensure the variables having linier or non-linear relation with the land price, this study also calculate and compare between the R square value of original data and its of log transformed data (see 9b, 9c). The summary of the R square value of original data and log-transformed data can be seen on the table below.

Dependent Variable	Independent Variable	Orig. Data		Log. Transformed Data	
		Gradient	R Square	Gradient	R Square
Adj_S$_yr_PPI_Sing	Distance to CBD BTC	Negative	0.216	Negative	0.246
	Distance to CBD NGY	Negative	0.062	Negative	0.014
	Distance to CBD	Negative	0.141	Negative	0.185
	Dist_Seaport_1_BTA	Positive	0.02	Positive	0.004
	Dist_Seaport_2_KBL_SKP	Negative	0.037	Negative	0.015
	Distance to Seaport	Positive	0.013	Positive	0.037
	Dist_Airport	Negative	0.099	Negative	0.065

Table 5-8 Correlation between Land Lease Price and Independent Variables

- Distance to CBD BTC is the distance from a parcel to CBD of Batam Centre
- Distance to CBD NGY is the distance from a parcel to CBD of Nagoya
- Distance to CBD is the distance from a parcel to nearest CBD
- Dist_Seaport_1_BTA is the distance from a parcel to Batu Ampar Seaport
- Dist_Seaport_2_KBL_SKP is the distance from a parcel Kabil seaport of Sekupang seaport.
- Distance to Seaport is the distance from parcel to nearest seaport
- Dist_Airport is the distance from parcel to the airport

From the table above, it can be seen that there are some variables such as distance to CBD of Batam Centre (BTC), distance to CBD, distance to Seaport having higher if it is log-transformed, while the others such as distance to CBD Nagoya (NGY), distance to seaport Batu Ampar (BTA) and seaport Kabil or Sekupang (KBL_SKP) and distance to airport, have higher R square value with its original form. Next, this result is used in multi linear regression discussed in the next section

5.9. Multilinear Regression

After exploring the correlation between adjusted land rent and each distance variable, this study will explore how the predictors identified from literature review and confirmed by interviews can be used to explain the land price. Thus, besides distance variables, there are some additional variables added into the model, namely size of parcel, dummy variable of dormitory availability, and dummy variables of the class of abutting road consisting of two variables, namely adjacent to ROW 200 &100 and adjacent to ROW 50 & 70. The road with ROW 30 is not used since there is no sample data located adjacent to it.

In exploring the relationship between the land price and all the predictors, 3 ways are done. The first, all the original data of predictors will be examined. The Second, all the predictors are log-transformed, and the last is combining between the log transform data and original data. In combining between original data and log transformed data of predictor, R square value of one predictor mentioned in the table above is used to determine whether its original data or log-transformed data should be incorporated to the model

(see appendix 10). The result shows that the combination between log transformed and original data yields the highest R square value (see appendix 10c).

In exploring the predictors, this study will employ multi linear regression with Stepwise Backward. In this method, the first stage is the SPSS software will put all the predictors in the model, and then calculating the contribution of each predictor at the significance of value of the t test for each predictor (Field, 2009). If the significance value meet the removal criterion then it is removed from the model, and the mode is re-estimated for the remaining predictors.

The Multi linear regression or original data, log-transformed data and combination data yield some models that can be seen on the table below

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
Original Data	1	.732[a]	.535	.506	.7459323
	2	.730[b]	.532	.507	.7456402
	3	.726[c]	.527	.505	.7470451
a. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Adjacent_ Row_200_100, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70					
b. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70					
c. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70					

Table 5-9 R Square of MRA Models for Original Data

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
Log Transformed Data	1	.722[a]	.522	.492	.7566018
	2	.722[b]	.522	.496	.7540326
	3	.720[c]	.519	.496	.7537465
	4	.718[d]	.516	.496	.7538179
	5	.714[e]	.510	.493	.7557893
a. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Adjacent_ Row_200_100, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70					
b. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70					
c. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70					
d. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP					
e. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_Seaport_2_KBLSKP					

Table 5-10 R Square of MRA Models for Log Transformed Data

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
Combination	1	.746[a]	.557	.529	.7283248
	2	.746[b]	.557	.532	.7260657
	3	.745[c]	.555	.534	.7246237
	4	.740[d]	.548	.529	.7285223
a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport					
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport					
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport					
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport					

Table 5-11 R Square of MRA Models for Combination Data

Tables above show that the highest of R square value can be achieved by combining the log transformed data with original data into the model. There are four models proposed by SPSS using this set of predictors. The value is between 0.548 and 0.557. However, this value is not significantly different compare to the other two approaches which is between 0.510 and 0.522 for log transformed predictors and 0.527 to 0.535 for original form of predictors. The F value of the model (see appendix 10c) shows that the model is significant to explain the land lease price.

Most predictors in model 4 have significance values <0.05 except the variable of Dormitory and Adjacent_row_200_100 for 95% confidence interval, while for 90% confidential interval, these two variable have significant value, since the sig. Value <0.1 (see appendix 10c). Considering the important of this variable, then these two variables are decided to be employed in the mode. Therefore, the model 4 is selected to be used for modelling the land lease.

The value of R square of the selected model is 0.548. It means that 54.8% of the variance of land price can be explained by the predictors used in the model, and 45.2 % the rest are explained by other factors. With 90% of confidence interval

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
4	(Constant)	6.310	.811		7.781	.000
	Log_DistancetoCBD1BTC	-1.425	.143	-1.053	-9.929	.000
	Dist_SeaPort_1_BTA(2)	-.099	.021	-.721	-4.665	.000
	Dist_Seaport_2_KBL/ SKP	-.295	.060	-1.094	-4.890	.000
	Dist_Airport	.266	.045	1.511	5.958	.000
	Dormitory	.571	.199	.259	2.862	.005
	Adjacent_ Row_200_100	-.565	.305	-.206	-1.855	.066

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Table 5-12 Coefficient of Model

However, the multicollinearity test shows that there are some variables having variance inflation factor (VIF) that could indicate the existence of multicollinearity effect (see appendix 10c)

From the table above, it can concluded that the proposed model for land lease in Batam is

Land Price ($S) = -1.425 log (distance to CBD_BTC in kilo meter) + (-0.099) (distance to Batu Ampar Seaport in kilo meter) + (-0.295) (distance to Seaport Kabil/Sekupang in kilo meter) + 0.266 (distance to Airport in kilo meter) + 0.571 (dormitory availability) + (-0.565) (adjacent to Row 200_100)

5.10. Market Value of Industrial Land in Batam

By using proposed model above, the prediction of land lease of other industrial land can be calculated. To visualize the pattern of industrial land lease, the interpolation Kriging feature in Arc GIS software is used. The Kriging method offer capability to perform continuous spatial variation of industrial land lease price in Batam can be seen on the map below.

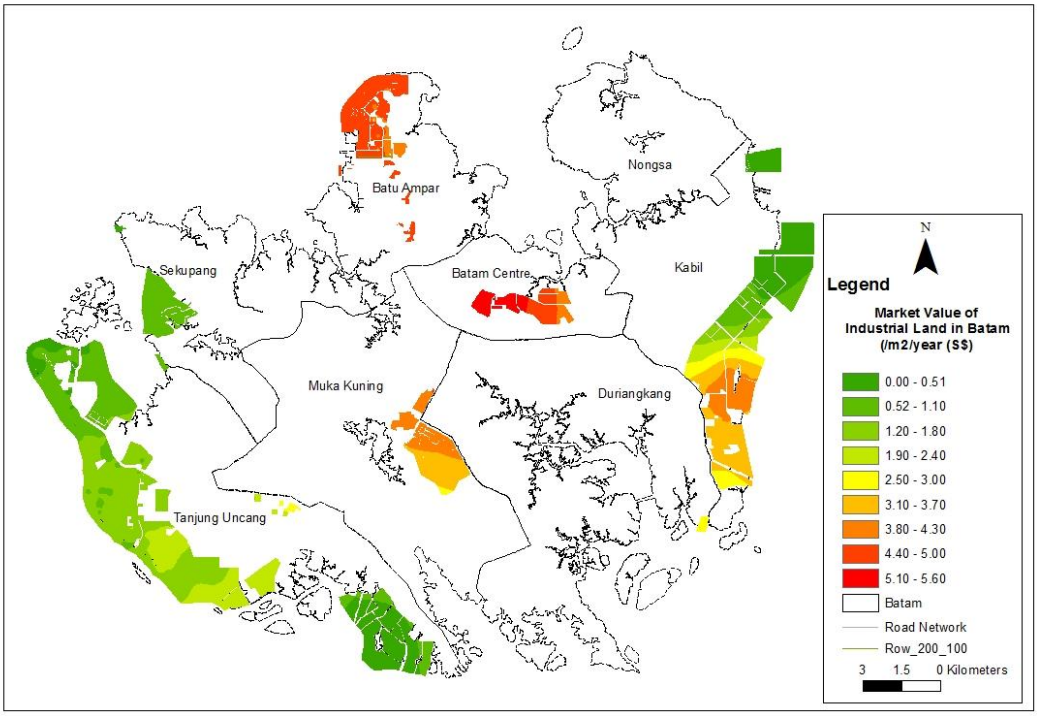


Figure 5-7 Map of Market Value of Industrial Land

Batam Centre has the highest market value. Tanjung Uncang, Sekupang and some part of Kabil and Tanjung Uncang have the lowest market value. Next, most industrial land at Batu Ampar area has the second highest market value. Furthermore, some part of industrial land at Kabil area has quite high market value while its north part has lower value. Sub area of Muka Kuning has middle rate of market value. Finally, most industrial land atsub area of Tanjung Uncang has the lower market value.

6. DISCUSSION

6.1. The Approach of Existing Land Valuation

In this chapter, the discussion will be done by referring to the questions of this research.

i. *What is the approach presently used by the Zone Authority to value industrial land in Batam ?*
To value the land in Batam, BIDA as Zone Authority uses a Cost approach derived from the development cost of major infrastructures such as road, drainages, and other infrastructures in certain sub area. The cost of infrastructure development has become the index to differentiate land tariff in Batam. At early stage of development of Batam, the cost approach was a proper approach for land valuation due to the absence of land market. This approach is also implemented in SEZ area in China if the land sales data are unavailable (Xie, Parsa, & Redding, 2002). Furthermore, the land price at Johor and Singapore also was used as a bench mark in determining the land lease price in Batam. The price of land lease in Batam was retained much lower than that in Johor, since the low land lease price became the main advantage of Batam compare to Johor having better infrastructure. As a consequence, the revenue from the land lease was low, and it was not the main source income of BIDA. At the moment, there are some other importan sources of BIDA's revenue besides land lease, namely: i) airport management; ii) seaport management; iii) water concession. Nevertheless, since land lease contributes the biggest portion to BIDA's revenue which is 60% of total income of BIDA, the review of the land lease is prioritized.

The exploration in this study shows that the cost approach presently used in Batam lacks to reflect the market value which varies over time and spatially. Even though the cost approach is calibrated by market value of construction, it is not proper to be used where the data of land lease price is available. As the land market for industrial land in Batam emerges at the second layer, sales comparison approach is suggested to be employed. This follows the basic theory of land valuation that the cost approach is the most proper to be used when the land transaction data are not available. The application of an impropriate approach in valuing the industrial land in Batam is even worse since the cost approach is adjusted by an improper component, namely the exchange rate Rupiah to Singapore Dollar instead of its actual components, such as the index of property, interest and so on.

The experience from SEZ of China shows that the use of an improper approach in valuing the industrial land will lead to a lack of funds for infrastructure, and a unequal competition between enterprise (Xie, Parsa, & Redding, 2002). It complies with what happens in Batam nowadays as discussed in this study. Even though this study does not explicitly address the time series issue that should be considered in adjusting the land lease price from time to time, the increase of demand discussed in section 4.3.3 suggests that the land lease tariff should be adjusted to improve the revenue of BIDA. The unequal competition issue will be discussed further at the next point of discussion

ii. *What is the existing spatial pattern of industrial land tariff of government and land price in Batam?*
There are 6 sub areas of development in Batam having industrial land. Since the land tariff by BIDA is derived from existing land valuation, the spatial variation of the cost approach value is similar to that of land lease tariff. Thus, the pattern of land value derived from existing approach can be

represented by the spatial pattern of land tariff. Based on existing land tariff, all industrial land in each sub area has one single value of land lease tariff. Sub area of Batu Ampar is charged by the highest tariff. It means this area was developed with highest infrastructure cost among sub areas in Batam. The existence of CBD Nagoya since the early development of Batam became the reason for BIDA to develop more infrastructures to support economic activities in this area. The second is Batam Centre, Kabil and Nongsa. The lowest is Muka Kuning, Sekupang, Tanjung Uncang and Tanjung Piayu. On the other hand, the lease price of the industrial land has different spatial pattern. Based on samples of land lease price taken at 4 sub area, the pattern of land lease price can be explained as follows; Batam Centre has the highest average price compare to other area. The second highest is Batu Ampar. The third is Kabil and the lowest is Tanjung Uncang. If we compare between the land tariff and the land lease price, the order is different. (see table 6-1 below)

Area	Order in Land Lease Tariff	Order in Land Lease Price
Batam Centre	2	1
Batu Ampar	1	2
Tanjung Uncang	3	3
Kabil	2	4

Table 6-1 Different Order Land Tariff and Land Lease Price

The difference of order of land tariff and land lease price shows that the land tariff charged by BIDA does not reflect the spatial variation of land lease price generated by market. This supports the argument of Xie, et all (2002) mentioning that the ignorance of the emergence of land market will create an unequal competition between enterprise in term of the payment of land lease. In case of Batam, the unequal competition can be explained as follow; industrial land at sub area of Batam Centre having the highest market value was not charged with the highest lease tariff. While, Industrial land at Kabil sub area having the lowest lease price is charged with tariff higher than those at Tanjung Uncang sub area.

iii. What are the variables affecting industrial land price in Batam?

Even though there are many factors affecting the industrial land price according the literature review which are mostly from demand side rather than supply side, only 6 main factors were confirmed by the stakeholders contributing to the land price in Batam, namely Industrial Estate Facilities, proximity to CBD, proximity to Seaport and Airport, Proximity of Main Road, Type of Class of Abutting Road and Agglomeration.

Since the factors formulated in this study were not differentiated by type of industrial activities, the factors listed in the questionnaire merely consisted of factors affecting land lease price for general industrial activities. Moreover, the interviews were made only with the manager of industrial companies inside industrial estates which are electronic industrial companies, and manager of industrial estates. This sample did not represent all type of industrial companies. As result, the confirmed predictors and additional factors perceived by stakeholder in Batam do not cope with the different type of industrial activities. In fact, as discussed on section 4.3.2 that there are other type of industrial activities besides electronic or light industry. The knowledge of other factors is got from BIDA officer.

Since each type of industry has different supply and demand, one type of industry will face different market competition from other industries. As discussed in section 4.3.2, the location and the area of each type of industrial estates has been determined by Spatial Planning of Batam. Moreover, the demand over certain type of industrial activities also has different period of time. The demand for offshore and oil and gas support industry in Batam arose at late 1960's. Next, the electronic industry started experiencing its booming from year of 1990 to 2000. Finally, shipyard industry activities have started to increase in these recent days. Furthermore, different type of industry activities has different factors determining the demand over the land. For instance, shipyard companies must use the proximity to coast rather than to CBD. Thus, a further study to address these issues is recommended to be done.

iv. What is the method to assess the goodness of the existing method, and what is the result of the assessment?

The experience from other SEZ area discussed on section 2.6 and the criteria of a good valuation model discussed on section 2.7 proposed some assessment indicators that could be used to assess the existing method. However, due to the limitation of data availability in this study, the existing approach only can be assessed by its goodness to reflect the market value. Thus, it must be analyzed whether the existing market based on market consideration, and economic and valuation principals.

As discussed in the point (i) above, the existing approach presently used, cost approach, lacks to reflect the market value which varies in term of time and spatial context, because it is calibrated by market value of construction instead of market value of land lease. Furthermore, according to the concept of land valuation discussed on section 2.4, the cost approach is not proper to be used when the data of land lease price is available. As the land market for industrial land in Batam emerges at the second layer, cost approach should be replaced by sales comparison approach. Moreover, the application of an impropriate approach is even worse due to the use of an improper adjustment component. Instead of using indexes related to cost component, the existing approach was adjusted by exchange rate Rupiah (Rp) to American Dollar (US$). The scatter plot given in section 5.7 shows that the cost approach presently implemented in Batam could not reflect the land lease price in Batam . In brief, the implementation of the cost approach in Batam was not based on the proper market consideration and valuation principals.

The implementation of inappropriate approach in valuing the land contributes to the low land lease tariff charged by BIDA that seems successfully generate demand for industrial land in Batam.. The land lease price in Batam is much lower than in Johor and Singapore, which becomes an attraction for investor to acquire industrial land in Batam. In section 4.3.3 it is explained how the demand over the industrial in Batam increases rapidly during period 1991-2008. In brief, the low price of land lease has generated demand over the industrial land in Batam. Nevertheless, the rapid demand over industrial land is not followed by industrial activities with the same growth. Thus, most of industrial land allocated by BIDA remains vacant (Warr, Peachey, & Martin, 1999). This is also supported by recent imageries data provided by Google Earth displaying the vacant land at industrial area. Even though the method to validate need to be examined further, at least it can give an initial description. Thus, to assess how success the low land lease price could generate investment activities a further analysis must be conducted; the multiplier effect of the industrial land also must be calculated thoroughly by using proper indicators such as employment rate. Furthermore, more advanced method, such the calculation of added value generated by industrial

land is recommended to conduct. This method has been used by government of Singapore to measure the efficiency of its land use.

6.2. The Proposed Approach of Land Valuation

i. What are the alternative approaches and models could be applied to value industrial land in Batam?

As discussed in section 2.4, there are several possible approaches to reflect the market value; cost approach, residual approach, sales comparison approach and income approach. The sales comparison approach is preferred if the transaction of comparable property is available because it is directly rooted to the market. Since the lease transaction for industrial land occurred inside industrial estates, the sales comparison was proposed to use in this study. However, this study has shown that the land lease transaction data were not well spatially distributed. The sub area Batam Centre was represented by more samples than other sub area. While Kabil sub area was represented by the least sample, even Sekupang and Muka Kuning sub area were not represented by any sample. To deal with this drawback, other approach should be used to capture the unsold land. Thus, it is recommended to use the other approaches, income approach, residual approach or cost approach, as it is done in SEZ area in China, Singapore and Hong Kong. As consequences, more data are required to employ more approaches, in case the sales comparison could not be applied due to the absence of data.

ii. What is the most appropriate approaches and models in valuing industrial land in Batam?

As discussed on chapter 2, the Sales comparison approach is the most appropriate approaches when the land transactions of comparable property are available. Sales comparison approach which is directly rooted to the market offers an ability to capture market value of the land better than other approaches. This approach has been used in Special Economic Zones of China, Hong Kong and Singapore as the main approach. The other approaches are used if the land transaction data is limited, and the sales comparison approach could not be implemented (Xie, Parsa, & Redding, 2002) (Hong H. Y., 1998). In this study, 154 data were collected for land transaction during period 1998-2008 which were used to make a model. However, the number of data is very limited, and those are not distributed well across the island. As a result, the statistical calculation does not provide quite good result since the predictors explain about 55% of the land lease price. Therefore, other approaches such as Residual Method, Income Capitalization and Cost Approach are recommended to be examined to be employed while the land sale data are not available.

iii. What are the variables used by the proposed method to value industrial land in Batam?

Based on literature review, and questionnaire to the expert in Batam, 6 main factors were identified that affect the land lease price in Batam. However, due to the limited data availability, only 4 main factors has been examined in this study, namely industrial estate facilities, size of parcel, proximity to seaport and airport, type of class of abutting road will be examined. These 4 factors comprises of 10 predictors, namely: provision of dormitory; i) size of parcel; ii) distance to CBD Batam Centre (BTC); iii) distance to CBD Nagoya (NGY); iv) distance to CBD; v) distance to Batu Ampar Seaport; vi) distance to Sekupang and Kabil seaport; vii) distance to Seaport; viii) distance to Airport, ix) Adjacent to roads row 200_100, x) adjacent to road row 30_50_70 . However, the statistical result shows that there are 6 predictors considered to be used in the model, namely

distance to CBD BTC, distance to Batu Ampar Seaport, distance to Sekupang and Kabil seaport, distance to Airport, provision of dormitory, adjacent row 200_100.

iv. What is the method to assess the goodness of the proposed method, and what is the result of the assessment?

To assess the proposed method, the criteria discussed in section 2.7 are applied. Thus, the discussion of the assessment will be done against each of criteria. The criteria no.2, model feasibility, will be discussed further on next point of discussion to answer another research question.

- The model must sound base; should be based on market considerations, and economic and valuation principals;

  The model is developed by sales comparison, which is the most preferred to be used in reflecting market value when the land lease transaction is available. Thus, it can be said that the proposed model based on market consideration and valuation principals. However, the level of data availability must be examined further. This is related to the representation issue of the sample since less available data will make the model less accurate.

- The model must be rational.

  The model resulted in this study is relatively rational, the distance from CBD and Seaport has negative effect to the industrial land value. It follows the common sense that the more far the location of parcels from CBD and Seaport, the lower the market value of the parcels.

- The model must be decomposable and explainable.

  Since the proposed model uses the MRA model, the model can be interpreted from its statistical indicators. The statistical indicators can explain the correlation between the dependent variable (land price/value) with its predictors, or in other words, the statistical number can represent how good the model can explain the correlation between dependent variable and its predictors. Furthermore, it can explain the contribution of each predictor to the market value of the industrial land.

- Statistical Indicators

  In chapter 5, by using Multi regression with least square calculation, it can be seen that the model does not have robust statistical result since only around 55% of land lease price could be explained the predictors. This result is relatively weak compare to other similar studies in developing land value. For instance, the study conducted by Kowalski & Paraksevopoulos (1990) yields 89% and 85% for R square value of their model.

  Furthermore, the distance from CBD of Batam Centre, distance to Seaport Kabil and Sekupang, distance to Batu Ampar Seaport, distance to Airport significant at confidence interval 95%, and other two predictors, the adjacent to Row 200_100 and the dormitory availability are added to the list of predictor if the significant in confidence interval was set become 90%. From the model, it can be seen that the availability of dormitory give the highest contribution compare to other predictors with coefficient 0.571. Furthermore, it means that the private investment in providing the facilities of industrial estates has important role in improving the land lease price. It agrees with many previous study where distance to

important facilities including seaport, airport and CBD has significant contribution to the land lease price in Batam.

The statistical result shows that 45% of the variation of land lease price could be explained by other predictors such as agglomeration and others. Thus, more comparable attributes of the industrial land are needed to improve the statistical result. The predictors indicating agglomeration is recommended to be incorporated into the model.

The main idea of this study is predicting the industrial land by using model developed by data taken from industrial land inside the industrial estates. As consequence, the spatial distribution of sampling data is clustered and not well distributed since the sample only taken inside the industrial estates. Thus, predicting the value of industrial land, using the model generated from the value of land inside industrial estates is not robust. Furthermore, the issue of spatial autocorrelation in the data should be addressed. Unfortunately, due to the limitation of the data, thus this issue could not be addressed.

Finally, the used data, is the land lease from 1998-2006, the wide span of transaction time could affect the accuracy of the model since the market condition is affected by different scale of supply and demand over the time. A transaction conducted at different time scale, experience different market situation. Some industrial land transacted in 1998 made relatively high prices since the demand land was high but the supply of the industrial land inside industrial estate was less. In 1998, there are only 9 industrial estates operating in Batam, while in 2004 there are 21 industrial estates.

The industrial land price in Batam Centre is relatively higher compare to other area. In some industrial estates, the transaction occurred in early 1998, has higher value since at that time the supply for industrial land is very limited. It is different with the transaction occurred after 1998 the supply of the industrial land is more abundant. As result, according to the theory discussed in section 2.4.5, the model resulted by this study violates the ideal condition for Sales Comparison Approach which it is required that the sale and the subject should be similar with respect to date of sale, economic condition and competitiveness in the same market. Furthermore, the use of general indicators in adjusting the price to eliminate the inflation effect could contributes to the inaccurate result of the model.

v. *What would be the pattern of industrial land values based on the proposed model?*

The result of this study shows that Batam Centre has the highest market value. Tanjung Uncang, Sekupang and some part of Kabil have the lowest market value. It is different from the pattern of land tariff charged by BIDA. Batam centre has the highest market value charged by 2nd highest land tariff. Batu Ampar has the second highest market value charge by the highest tariff. Kabil area charged also by the middle tariff, some of its part has quite high market value while its north part has low value. The lack of data in this area make the north part of this area has low market value. Muka Kuning and Tg Uncang charged by the lowest tariff, but Muka Kuning has quite high market value, while Tg. Uncang has low market value.

The existence of spatial planning that has developed 2 main CBDs in Batam, and 3 three main seaports have a strong influence in controlling the land value in Batam. It can be seen in Batam Centre, a CBD that developed by government, can improve the land value in Batam Centre. By developing a new centre, It can increase the land value in Batam centre increase. Nevertheless, industrial land at Kabil is charged a higher tariff, but has a low market value. Furthermore, the well planned road infrastructure network encompassing all the industrial estates makes the contribution of infrastructure in land price is difficult to be observed.

In this study, the spatial variation of land lease price is visualized by using Kriging method. Thus, the continuous variation can be performed. Thus to determine the market value of one industrial parcel, further study must be done. The average is one of the possible way to be implemented. By using this continuous variation, BIDA can charge more variable land lease tariffs to private companies

vi. *What is the feasibility of the implementation of the proposed method?*

Most industrial estates started to operate between years of 1984-2006. It means the lease of industrial land in industrial estates will start to expire in 2014. While, most other industrial land located outside of the industrial estates will be due between 2021 and 2028 since most of industrial land was allocated in period 1991-1998. Thus, in 2014, BIDA could start to implement the new model. In order to implement this new approach, BIDA has to start to socialize the proposed model to the lessee. The experience of implementing a new approach at Hong Kong shows that the socialization held long time before the due time is important to reduce the political impedance.

The authority of SEZ area in China develops a land value model used to develop a reference for determining the land lease called Bench Mark Price (BMP). The value resulted from the model merely becomes a reference since the market value could be higher or even lower than the value resulted by the model. This could happen since the model is derived mostly from private treaty which is quite different with price derived from public auction method. Thus, this is a proper way to deal with the limitation of private treaty method in capturing the market value in SEZ area.

However, the model resulted from this study is slightly different from the land valuation model in China discussed above. The land valuation mentioned above was developed to model the land value at first layer, where the government transfers the land to industrial companies through private treaty or public auction. Thus, it can be used to predict the value of the land that will be allocated by the government to the private sector. Whereas, the model resulted in this study is the model derived from the land transfer from industrial estates to smaller companies occurred in second layer. Therefore, this model cannot be used as a reference for determining land value at firs layer directly. To make the model resulted from this study is used as a Bench Mark in the first layer, the investment of industrial estates must be deducted from the model. Furthermore, the statistic shows that the availability of dormitory has the highest coefficient in the model level confidence 90%. It means that the investment done by industrial estate has important role to improve the market value. Nevertheless, this model can be used as an input in determining the spatial pattern of the land lease price in Batam besides an incentive to support certain type of activities and other factors.

For more accurate result, the model must be always updated by the latest transaction. In the future, since most of industrial land would have been developed, the property transaction including building on it will be more prevalent. Therefore, it must be anticipated by implementing other approaches requiring more completed data related to cost of property construction.

A more technical issue is that since the map market value produced by MRA and visualized by Kriging performs a continuous variation of market value, the map must be overlaid with the site map of industrial estates to get the market value of each parcel inside the industrial estates. In case, the industrial estate has not been divided in to parcels, the map value can be overlaid with the map of the parcels of industrial estates. Further study is needed to examine how to determine the value of the land having variation of continuous value inside.

To apply the model resulted by this study, the important features for an effective land valuation as discussed in section 2.7 also must be notified. First is legal support, it means the implementation of new model produced by this study must be supported by legal to allow the coordination among involved agencies and institutions. In Batam, at least there are two government agencies that have interest in doing land valuation besides BIDA, namely Land Agency Office and Land Tax Office. The coordination among these three institutions is necessary to realize the effective land valuation, including in data sharing. The law is also useful to enable data accessibility in doing refinement of the proposed model in the future. Second is annual reappraisal, the model proposed in this study must be refined through Reappraisal conducted for certain period. This has been implemented in Batam by existing land valuation, and it is also regulated by BIDA chairman decree, which is a part of legal support. According to the Decree of Chairman of BIDA, the land tariff in general will be revised for each 5 years. Next is Competent Staff, to implement the model effectively, it must be operated by competent staff with sufficient skill of GIS mapping, statistic and basic land valuation method. It can be realized by giving effective training to the existing staff in BIDA. Furthermore, it also must be supported by complete and up to date data, spatial and non-spatial data. The data processing also should be assisted by modern data processing using Information Technology and Advanced GIS software. The computerized data processing also make the data integration with other institution easier and more efficient. Finally, the implementation of the proposed model should be well informed to the public, in this case the industrial companies. In this case, a good and active public relation program has important role. The experience in other SEZ area has proven the importance of public relation in implementing a new model of land valuation.

7. CONCLUSION & RECOMMENDATION

The aims of this chapter are to summarize the study of this research. It consists of three main sections. First, is the conclusive remark from the objective of this study. The second discuss the limitation of the study. The last section proposes some recommendations for further study to address the limitation of this study.

7.1. Conclusion

The conclusions in this study are drawn by evaluating the objectives of this research against the finding of this research. The general objective of this research is to develop an alternative method to value industrial land incorporating spatial aspect. To realize the general objective, the specific objectives needs to be addressed. The conclusion will be drawn by referring to these specific objectives.

1. Assessing the effectiveness of the existing land valuation model

   BIDA as a Zone Authority uses Cost approach derived from the development cost of major infrastructures such as road, drainages, and other infrastructures in certain sub area. However, this study shows that nowadays, the existing approach in Batam lacks to reflect the market value which varies in term of time and spatial context generating by the emergence of land market. Improper adjustment of existing approach is done make the spatial variation of the industrial land more deviate to the market value.

   The spatial variation of existing land tariff is very simple. Even though there are 6 Sub areas having industrial land, there are only three classes of land tariff for industrial land. Furthermore, the pattern of spatial variation of the land lease price is different from that of land tariff. Batam Centre with has the highest market price but it is not charged by the highest tariff. On the other hand, Kabil has the lowest market price but was not charged by the lowest tariff.

   The existing approach is assessed in term of its purpose to generate more investment. In fact, the existing approach increases the demand over the industrial land, but it does not automatically generate industrial activities, since most of the land remains vacant. Further, study is required to measure this issue. Since a new objective of land valuation is proposed, which tries to generate more income by applying a more market oriented approach, the method to assess the existing approach refer to how good the approach can reflect the market value. The result of this study shows that there is hardly a relation between the land tariff and land price.

   Factors affecting the price of land lease are complex. However, there are 6 main factors perceived by stakeholders affecting the land price in Batam, namely Industrial Estate Facilities, proximity to CBD, proximity to Seaport and Airport, Proximity of Main Road, Type of Class of Abutting Road and Agglomeration

   The land valuation was assessed based on the aim of land valuation. The existing approach of land valuation can be said to meet the aim of the land valuation since all the industrial land can be allocated during period 1991-1998. However, this study could not measure how the existing method can generate industrial activities. Further study is required to deal with this question. Moreover, based on

the new objective of land valuation which is more market oriented, the existing approach could not reflect the spatial pattern of the market value of the industrial land.

2. Analyzing alternative approaches and models to value industrial land
   There are several approaches that could be implemented in Batam, cost approach, sales comparison approach, residual approach and income approach. However, the more advance the approach, the more data are needed. Due to the availability of land lease data, the sales comparison is the most appropriate to use.

3. Developing an alternative model for valuing industrial land in Batam
   In modelling the market value due to the limitation of data, the variables used in the model are 4 main factors, and it is elaborated into 6 predictors. The step wise method used in SPSS shows that log transformed distance to CBD Batam Centre, distance to Batu Ampar seaport, distance to Kabil & Sekupang Seaport, and distance to airport are significant on confidential interval 95% while dormitory and adjacent to Row 200 and 100 m are significant on confidential interval 90%. Furthermore, this model can explain around 55% of land market value. Even though the proposed model does not have sophisticated statistical result, it still has better performance compare to existing land valuation in term of its suitability with the land valuation principle and capability in reflecting the market value.

4. Applying and discussing the proposed land valuation model in Batam.
   The pattern of land market value is different from existing land tariff. By referring to the spatial pattern of market value, the order of existing land lease tariff should be adjusted. For instance, the industrial land in Batam Centre area should be charged with the highest tariff. On the other hand, industrial land at Kabil area should be charged by the lowest land tariff.

   The model resulted from this study is proposed as a Bench Mark in determining the industrial land value. But it is quite different from Bench Mark Price (BMP) in China, since the BMP is China was derived from land sale data at 1st layer, where the Government allocates the land through private treaty. Thus it can be used to predict the value of the land that will be allocated by government to private. On the other hand, the model in this study is derived from the land sale done at the second layer. Thus, it is can be used to predict the land value of industrial land at the second layer, which is the market value of industrial land that have to be paid by smaller companies to industrial estates instead of by industrial estates to BIDA.

7.2. Limitation of Study

Some limitations were encountered in this study are;

Limitation of the study's approach

The data used in this study merely rely on the lease transaction of industrial land inside industrial estates. As consequence, the sample tends to cluster inside the industrial estates. Therefore, the industrial lands in some areas are not well presented, while the others are over represented. Furthermore, since this research only uses the land lease transaction data inside industrial estates, the sales comparison approach was selected to be applied. The experience from other SEZ area shows that the other approaches of land valuation should be applied to deal with this issue.

Limitation of the data collection

Relying on sample taken from inside industrial estate and the method of sales comparison makes this study do not address different type of industrial activities, as the type of industrial activities inside industrial estate mostly electronic and light industries. In fact, there are two other types of main industrial activities in Batam, namely off-shore industry and shipyard industry. As a consequence, this study does not represent those two types of industries. The limited data could be collected also makes this study could not address the auto spatial correlation issue. This issue will be discussed further in next point of discussion. Furthermore, there is a limitation in formulating the factors affecting industrial land lease price. The literature review in this study does not deal with different type of industrial activities. Moreover, the interviews were done only to people from industrial estates and companies inside industrial estates. As result, the factors only derived from the factor perceived by light industry.

Limitation of the data processing and visualization

This study also has limitation in dealing with spatial autocorrelation issue that might affect the model. Even though the sample is clustered, this study does not examine the effect of spatial autocorrelation due to the limited number of data which can be collected.

7.3. Recommendation

The recommendations for future research related to the result of this study are;

1. This study has employed sales comparison approach. However, its statistical result reveals that the predictors do not well explain the land lease price. Thus, further study applying other approaches is suggested to be done to capture the value of unsold land located inside or outside industrial estates. Therefore, more variables can be examined as predictors, and the market value of the industrial land can be more elaborated based on each industrial types. It is expected, the land model will be give better accuracy.
2. The research has proposed an alternative approach land valuation that can reflect the market value of industrial land at second layer. Further study can be done aimed at determining the land value at first layer and the land lease tariff charged by BIDA. In the further study of determining land tariff, the assessment of land valuation should be put in the wider context. Not only in how can it reflect the market value, but it also must be assessed in the manner how it can give contribution to the export activities, generate more employment, and foreign direct investment, as those are the rational of FTZ development.

3. The research has proposed the land valuation in second layer since the existing scheme of allocation from BIDA to private sector does not apply private treaty or public auction. Thus, the further study assessing the feasibility of applying private treaty and the public auction by BIDA in allocating the industrial land is interesting to be done.

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APPENDICES

Appendix 1- Comparisson between Asking Price and UWTO of Industrial Land

Comparison between Price and Government's Tariff of Industrial Land

NO	INDUSTRIAL ESTATE	AREA	COMPANIES	LAND USE TENURE	LAND RENT (SGD)		LAND PRICE/ Sqm	PURCHASE RATE (SGD)/ sqm	START	Government Rate/ 30 years		Comparison Gov. Rate to land rent	Comparison Gov. Rate to Land Price	TRAVEL TIME (Minutes)				
		(Ha)		(Years)	/Month	30 years				Rp	SGD			Airport	Seaport 1	Seaport 2	Seaport 3	CBD
1	Batamindo Industrial Park	320	78	30	Negotiable	-	Negotiable	Negotiable	1990	22500	3,8	-	-	20	20	20	10	15
2	Bintang Industrial Park II	65	22	30	5/sqm	1800	60	500	2001	22500	3,8	480,0	16,0	50	40	40	35	5
3	Cammo Industrial park	18	18	30	Negotiable	-	Negotiable	Negotiable	1995	32250	5,4	-	-	15	20	15	5	15
4	Citra Buana Park I	10	58	30	3.5/sqm	1260	Negotiable	Negotiable	1994	49500	8,3	152,7	-	20	5	15	10	10
5	Citra Buana Park II	8	8	30	Negotiable	1800	Negotiable	Negotiable	2000	49500	8,3	218,2	-	20	5	15	10	10
6	Citra Buana Park III	20	5	30	-	1800	Negotiable	Negotiable	2002	32250	5,4	334,9	-	10	15	20	3	10
7	Executive Industrial Park	30	18	-	3/sqm	1080	100	Negotiable	2004	32250	5,4	200,9	18,6	15	30	60	10	20
8	Indah Industrial Park	16	11	30	4 /sqm	1440	150	425	2000	49500	8,3	174,5	18,2	20	10	20	10	5
9	Kara Industrial Park	19	30		500	-	Negotiable	600	1996	32250	5,4	-	-	10	10	15	5	10
10	Kabil Industrial Estate	410	26	30	4 /sqm	1440	Negotiable	369-800	1991	32250	5,4	267,9	-	10	30	45	20	30
11	Latrade Industrial park	60	12	30	4.5-5/ sqm	1620	60-80	300-350	2000	22500	3,8	432,0	20,0	35	25	20	25	25
12	Panbil Industrial Estate	103	16	30	5.50/sqm	1980	Negotiable	Negotiable	2001	22500	3,8	528,0	-	15	20	20	10	15
13	Puri Industrial Park 2000	30	29	-	4 /sqm	1440	75	425	2002	32250	5,4	267,9	14,0	10	20	25	5	15
14	Sarana Industrial Point	12	14	30	4 /sqm	1440	70	-	2004	32250	5,4	267,9	13,0	10	15	20	5	15
15	Taiwan International Park	54	10		5/sqm	1800	Negotiable	-	1990	32250	5,4	334,9	-	9	20	26	12	16
16	Tunas Industrial park	38	37	-	4 /sqm	1440	Negotiable	Negotiable	1999	32250	5,4	267,9	-	10	30	35	5	20
17	Hijrah Industrial Estate	6.4	19		2.7 /sqm	972	-	-	2002	32250	5,4	180,8	-	60	30	60	5	10
18	Malindo Cipta Perkasa	-	32	-	-	-	-	-	1995	49500	8,3	-	-	30	5	30	15	10
19	Megacipta Industrial Park	-	19	-		-			1997	49500	8,3	-	-	30	25	40	10	20
20	Sekupang Logistic	32	17	30	4 /sqm	1440	-	-	1984	22500	3,8	384,0	-	40	30	2	30	25
21	Union Industrial Park	25	33		3.5/sqm	1260	100	-	2003	49500	8,3	152,7	12,1	20	5	20	10	10

Appendix 2- Land Lease Tariff in Batam

Land Lease (per m²) in Batam

Tarif Tanah) per m² di Batam*

In Rupiah
Dalam Rupiah

LAND CLASIFICATION PERUNTUKAN	Payment Pembayaran	BATAM ISLAND / PULAU BATAM											REMPANG-GALANG ISLANDS PULAU REMPANG-GALANG		
		BATAM CENTRE		BATU AMPAR			EAST COAST / PANTAI TIMUR								
		CORE	SUBURBS	NAGOYA	SEI PANAS	MUKA KUNING	SEKUPANG	TANJUNG UNCANG/ SAGULUNG	NONGSA	KABIL	TANJUNG PIAYU	BATAM SURROUNDING ISLANDS PULAU SEKITAR BATAM	REMPANG ISLAND PULAU REMPANG	GALANG/ GALANG BARU ISLANDS PULAU GALANG/ GALANG BARU	REMPANG-GALANG SURROUNDING ISLANDS PULAU SEKITAR REMPANG GALANG
COMMERCIAL KOMERSIL	Full Payment 30 years	70,500	51,750	93,250	51,750	35,750	44,500	35,750	35,750	44,500	35,750	23,500	31,250	28,250	20,500
	Instalment :														
	12 months	81,075	59,512.5	107,273.5	59,512.5	41,112.5	51,175	41,112.5	41,112.5	51,175	41,112.5	27,025	35,937.5	32,487.5	23,575
	24 months	91,650	67,275	121,225	67,275	46,475	57,850	46,475	46,475	57,850	46,475	30,550	40,625	36,725	26,650
	36 months	102,225	75,037.5	135,212.5	75,037.5	51,837.5	64,525.5	51,837.5	51,837.5	64,525	51,837.5	34,075	45,312.5	40,962.5	29,725
HOUSING PERUMAHAN	Full Payment 30 years	-	46,500	51,000	42,000	35,500	42,000	35,500	29,000	29,000	29,000	19,250	25,250	22,750	16,750
	Instalment :														
	12 months	-	53,475	58,650	48,300	40,825	48,300	40,825	33,350	33,350	33,350	22,137.5	29,037.5	26,162.5	19,162.5
	24 months	-	60,450	66,300	54,600	46,150	54,600	46,150	37,700	37,700	37,700	25,025	32,825	29,575	21,775
	36 months	-	67,425	73,950	60,900	51,475	60,900	51,475	42,050	42,050	42,050	27,912.5	36,612.5	32,987.5	24,287.5
TOURISM PARIWISATA	Full Payment 30 years	51,250	36,250	36,250	36,250	25,000	30,500	30,500	36,250	30,500	25,000	16,000	21,750	19,500	14,000
	Instalment :														
	12 months	58,937.5	41,687.5	41,687.5	41,687.5	28,750	35,075	35,075	41,687.5	35,075	28,750	18,400	25,012.5	22,245	16,100
	24 months	66,625	47,125	47,125	47,125	32,500	39,650	39,650	47,125	39,650	32,500	20,800	28,275	25,350	18,200
	36 months	74,312.5	52,562.5	52,562.5	52,562.5	36,250	44,225	44,225	52,562.5	44,225	36,250	23,200	31,537	28,275	20,300
INDUSTRIAL INDUSTRI	Full Payment 30 years	-	32,250	-	49,500	22,500	22,500	22,500	32,250	32,250	22,500	14,500	19,500	17,750	12,750
	Instalment :														
	12 months	-	37,087.5	-	56,925	25,875	25,875	25,875	37,087.5	37,087.5	25,875	16,675	22,245	20,412.5	14,662.5
	24 months	-	41,925	-	64,350	29,250	29,250	29,250	41,925	41,925	29,250	18,850	25,350	23,075	16,575
	36 months	-	46,762.5	-	71,775	32,625	32,625	32,625	46,762.5	46,762.5	32,625	23,200	28,275	25,737.5	18,487.5
AGRICULTURE PERTANIAN	Full Payment 30 years	-	-	-	-	16,000	18,500	18,500	-	-	18,500	8,000	14,000	12,750	7,000
	Instalment :														
	12 months	-	-	-	-	18,400	21,275	21,275	-	-	21,275	9,200	16,100	14,662.5	8,050
	24 months	-	-	-	-	20,800	24,050	24,050	-	-	24,050	10,400	18,200	16,575	9,100
	36 months	-	-	-	-	23,200	26,825	26,825	-	-	26,825	11,600	20,300	18,487.5	10,150
FISHERIES PERIKANAN	Full Payment 30 years	-	-	-	-	10,750	9,500	9,500	-	-	10,750	4,500	8,250	7,500	3,750
	Instalment :														
	12 months	-	-	-	-	12,362.5	10,925	10,925	-	-	12,362.5	5,175	9,487.5	8,625	4,312.5
	24 months	-	-	-	-	13,975	12,350	12,350	-	-	13,975	5,850	10,725	9,750	4,875
	36 months	-	-	-	-	15,587.5	13,775	13,775	-	-	15,587.5	6,525	11,962.5	10,875	5,437.5
GOVERNMENT OFFICE AND BUILDING BANGUNAN DAN KANTOR PEMERINTAHAN	Full Payment 30 years	14,250	6,750	6,000	6,000	5,250	6,000	5,250	5,250	5,250	5,250	2,500	4,500	4,250	2,000
	Instalment :														
	12 months	16,387.5	7,762.5	6,900	6,900	6,037.5	6,900	6,037.5	6,037.5	6,037.5	6,037.5	2,875	5,175	4,887.5	2,300
	24 months	18,525	8,775	7,800	7,800	6,8250	7,800	6,8250	6,8250	6,8250	6,8250	3,250	5,850	5,525	2,600
	36 months	20,662.5	9,787	8,870	8,870	7,612.5	8,870	7,612.5	7,612.5	7,612.5	7,612.5	3,625	6,525	6,162.5	2,900
RELIGIOUS, SOCIAL & EDUCATION FACILITIES BANGUNAN FAS. IBADAH, SOSIAL DAN PENDIDIKAN	Full Payment 30 years	11,250	5,000	4,500	4,000	4,500	4,000	4,000	4,000	4,000	4,000	1,000	3,500	3,000	1,000
	Instalment :														
	12 months	12,937.5	5,750	5,175	4,600	5,175	4,600	4,600	4,600	4,600	4,600	1,150	4,025	3,450	1,150
	24 months	14,625	6,500	5,850	5,200	5,850	5,200	5,200	5,200	5,200	5,200	1,300	4,550	3,900	1,300
	36 months	16,312.5	7,250	6,525	5,800	6,525	5,800	5,800	5,800	5,800	5,800	1,450	5,075	4,350	1,450
SPORTING FACILITIES/ GOLF COURSES LAPANGAN GOLF DAN FASILITAS OLAH RAGA	Full Payment 30 years	-	-	18,500	18,500	18,500	18,500	-	18,500	-	-	-	16,000	14,500	-
	Instalment :														
	12 months	-	-	21,275	21,275	21,275	21,275	-	21,275	-	-	-	18,400	16,675	-
	24 months	-	-	24,050	24,050	24,050	24,050	-	24,050	-	-	-	20,800	18,850	-
	36 months	-	-	26,825	26,825	26,825	26,825	-	26,825	-	-	-	23,200	23,200	-
READY - TO - BUILD LOT KAVLING SIAP BANGUN	Full Payment 30 years	-	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
	Instalment :														
	12 months	-	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900
	24 months	-	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800
	36 months	-	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700
LOW COST HOUSING RUMAH SANGAT SEDERHANA	Full Payment 30 years	-	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
	Instalment :														
	12 months	-	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
	24 months	-	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400	23,400
	36 months	-	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100
LOW COST APARTMENT RUMAH SUSUN	Full Payment 30 years	-	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
	Instalment :														
	12 months	-	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900	6,900
	24 months	-	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800	7,800
	36 months	-	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700	8,700

*) Uang Wajib Tahunan Otorita (UWTO)

Published & Designed by Data and Information Division

Batam Industrial Development Authority - Otorita Pengembangan Daerah Industri Pulau Batam

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Appendix 3- Questionnaire Land Lease Price

QUESTIONAIRE FORM/ *FORMULIR KUISIONER*

MASTER PROGRAMME OF URBAN PLANNING & MANAGEMENT/ *PROGRAM MAGISTER PERENCANAAN DAN MANAJEMEN PERKOTAAN*
FACULTY OF EARTH SCIENCE AND GEOINFORMATION/ *FAKULTAS ILMU KEBUMIAN DAN GEOINFORMASI*
UNIVERSITY OF TWENTE/ *UNIVERSITAS TWENTE*

TITLE OF RESEARCH / *JUDUL PENELITIAN* : AN ALTERNATIVE APPROACH FOR INDUSTRIAL LAND VALUATION IN BATAM

Name of Industrial Estate/ :
Nama Kawasan Industri

Adress/ :
Alamat

Owner/ :
Pemilik

Start Operation/ :
Mulai Beroperasi

Area (m2) :
Luas Kawasan (m2)

Lease Period/ :
Periode Sewa

No	Companies/ Tenants	Price/ Harga	Currency/ *Mata Uang*	Area/Luas (m2)	Year of Transaction/ Tahun *Transaksi*

Appendix 4- Questionnaire Factors Affecting Land Price in Batam

QUESTIONAIRE FORM/ *FORMULIR KUISIONER*

MASTER PROGRAMME OF URBAN PLANNING & MANAGEMENT/ *PROGRAM MAGISTER PERENCANAAN DAN MANAJEMEN PERKOTAAN*

FACULTY OF EARTH SCIENCE AND GEOINFORMATION/ *FAKULTAS ILMU KEBUMIAN DAN GEOINFORMASI*

UNIVERSITY OF TWENTE/ *UNIVERSITAS TWENTE*

TITLE OF RESEARCH / *JUDUL PENELITIAN* : AN ALTERNATIVE APPROACH FOR INDUSTRIAL LAND VALUATION IN BATAM

Name / *Nama* :

Institution, Company/ *Institusi, Perusahaan* :

Position/ *Jabatan* :

No	Factors/ Faktor	Remark
1	**Locational**	
	Distance to CBD	
	Distance to Airport	
	Distance to major road	
	Distance to the nearest major trunk road/motorway	
	Access to rail	
	Expressway visibility	
	Distance to the capital or centre of administration	
	Industrial location class	
	Flood threat	
	Relative location to nature object (river)	
	Urban hierarchy	
	Percentage of regional industrial land	
2	**Physical**	
	Size of parcel	
	Number of frontage feet available	
	Maximum percentage of usable space	
	Width of abutting road	
3	**Legal and Governmental**	
	Type of land tenure	
	Role of government	
4	**Others**	
	Industrial agglomeration	
5	**Add Other Factors ***	

**) add other factors which are not mentioned in the list*

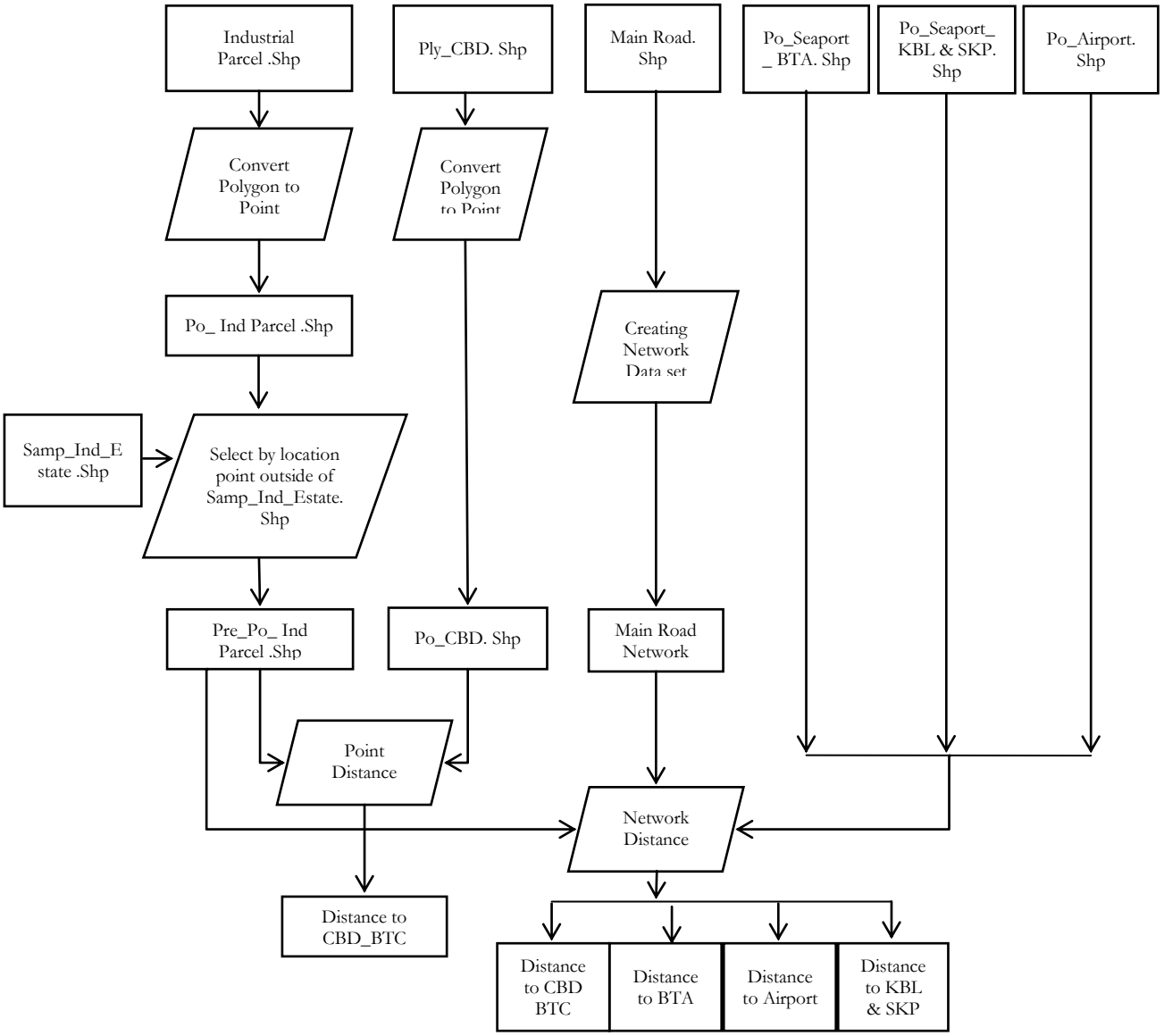
Appendix 5- Data of Land Lease Price

Table removed because of confidential data

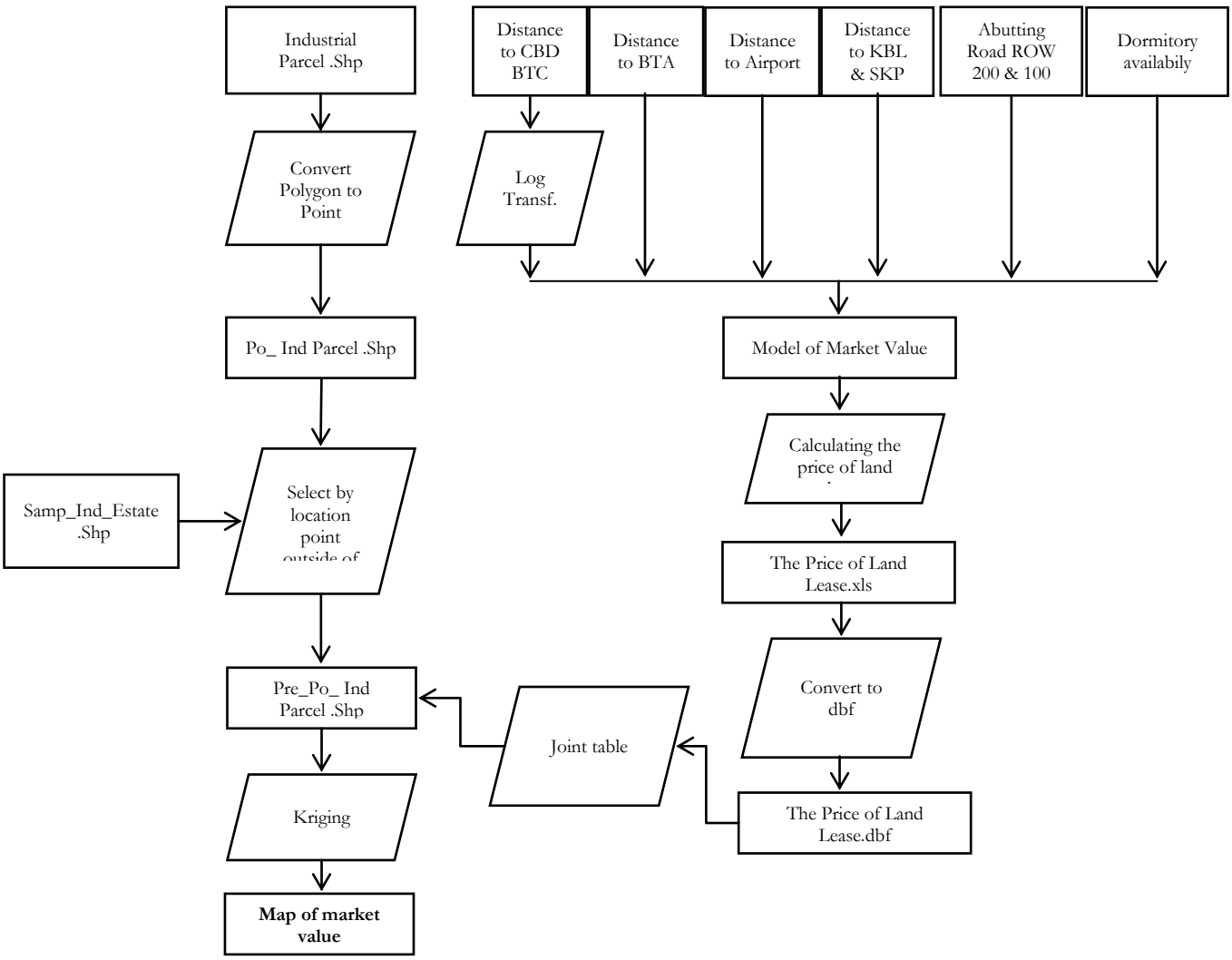
Table removed because of confidential data

Table removed because of confidential data

Appendix 6- Distance Calculation in Arc GIS



Appendix 7- Prediction of Market Value in Arc GIS



Appendix 8- Indices

The inflation rate of Batam from 1997 to 2009 can be seen on the table below

Year	Inflation Rate	Index
1997	100	100
1998	52.89	152.89
1999	-0.28	152.61
2000	9	161.61
2001	12.64	174.25
2002	9.48	183.73
2003	4.65	188.38
2004	4.22	192.6
2005	14.79	207.39
2006	4.58	211.97
2007	4.84	216.81
2008	8.39	225.2
2009	1.88	227.08

Table 5-2 . Inflation Rate of Batam

The Wholesale Price Index for industrial sector in Indonesia period 2000-2010 can be accessed in http://www.bps.go.id/tab_sub/view.php?tabel=1&daftar=1&id_subyek=20&notab=1, and the value can be seen on the table 3-6 below

Year	Index	Year	Index
2000	100	2006	195
2001	112*	2007	218
2002	124	2008	273
2003	130	2009	165
2004	136	2010	172
2005	158		

Table 5-2 . Indonesia's Wholesale Price Index for Industrial Sector

*) the value is interpolated

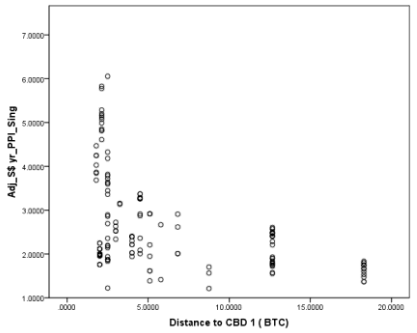
The Wholesale Price Index in Singapore for all sectors can be accessed in http://www.indexmundi.com/facts/singapore/wholesale-price-index; http://www.singstat.gov.sg/; http://www.singstat.gov.sg/pubn/reference/mdscontents.html#Prices; Yearbook of Statistic Singapore 2007 & 2010, and the value can be seen in the table 3-7 below

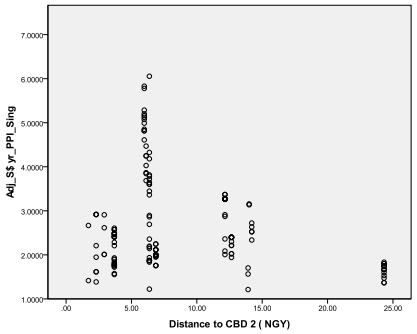
Year	WPI Index	PPI for Industrial Sector	Year	WPI Index	PPI for Industrial Sector
1998	78.04	100	2004	91.2	78.9
1999	79.68	94.9	2005	100	80.9
2000	87.72	**91.9***	2006	105.04	86.3
2001	86.33	**88.9***	2007	105.31	105.9
2002	85.06	85.9	2008	113.24	107.5
2003	86.77	78	2009	97.48	92.0

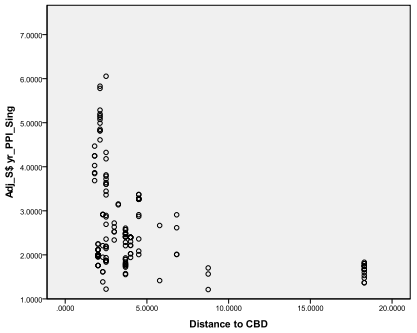
Table 5-3 . Singapore's Wholesale Price Index & Private Property Index for Industrial Sector

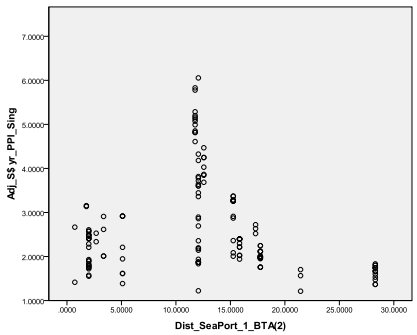
*) the value are interpolate

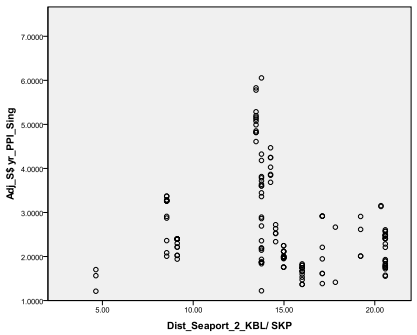
Appendix 9a

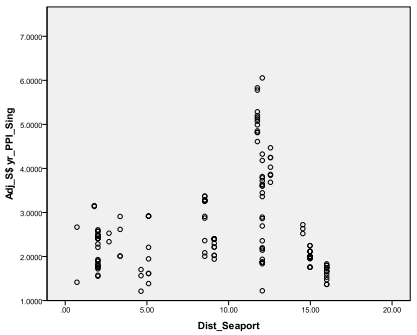

Adj_S$ yr_PPI_Sing
Distance to CBD 1 (BTC)

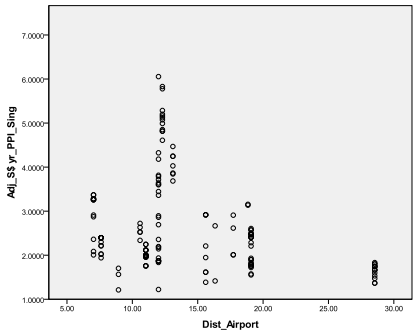

Adj_S$ yr_PPI_Sing
Distance to CBD 2 (NGY)


Adj_S$ yr_PPI_Sing
Distance to CBD

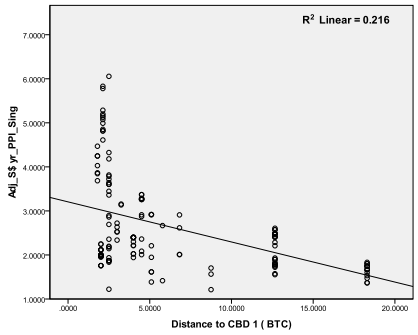

Adj_S$ yr_PPI_Sing
Dist_SeaPort_1_BTA(2)

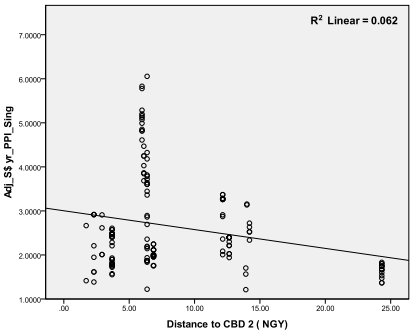

Adj_S$ yr_PPI_Sing
Dist_Seaport_2_KBL/ SKP

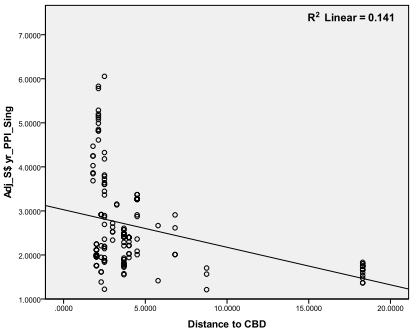

Adj_S$ yr_PPI_Sing
Dist_Seaport

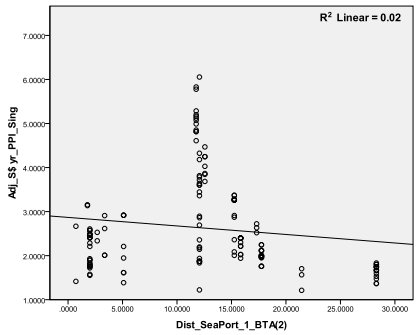

Adj_S$ yr_PPI_Sing
Dist_Airport

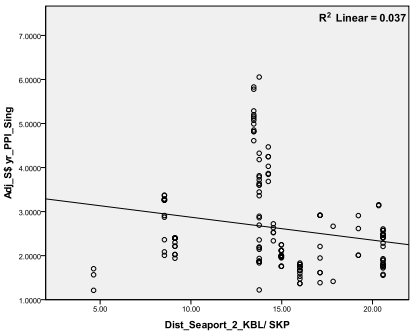
Appendix 9b

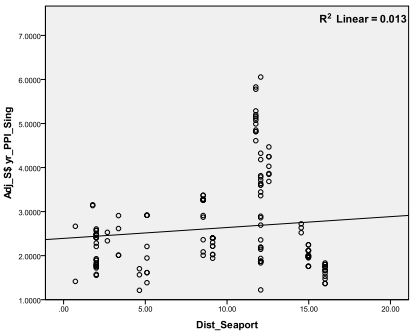

R² Linear = 0.216
Adj_S$ yr_PPI_Sing
Distance to CBD 1 (BTC)

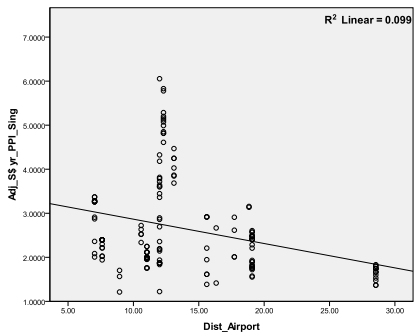

R² Linear = 0.062
Adj_S$ yr_PPI_Sing
Distance to CBD 2 (NGY)


R² Linear = 0.141
Adj_S$ yr_PPI_Sing
Distance to CBD

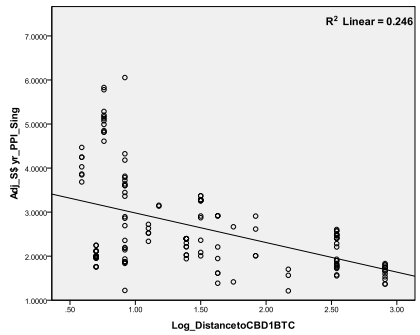

R² Linear = 0.02
Adj_S$ yr_PPI_Sing
Dist_SeaPort_1_BTA(2)

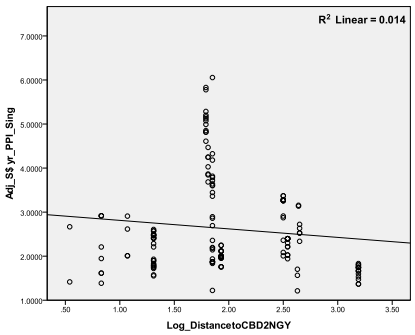

R² Linear = 0.037
Adj_S$ yr_PPI_Sing
Dist_Seaport_2_KBL/ SKP

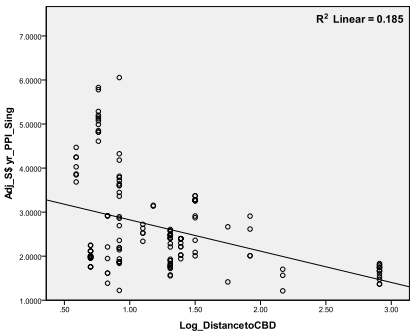

R² Linear = 0.013
Adj_S$ yr_PPI_Sing
Dist_Seaport

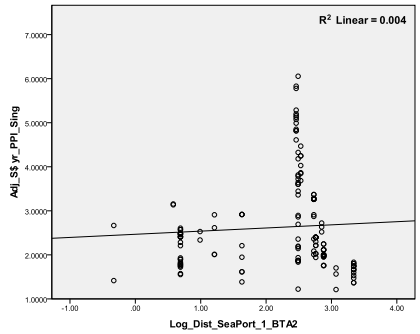

R² Linear = 0.099
Adj_S$ yr_PPI_Sing
Dist_Airport

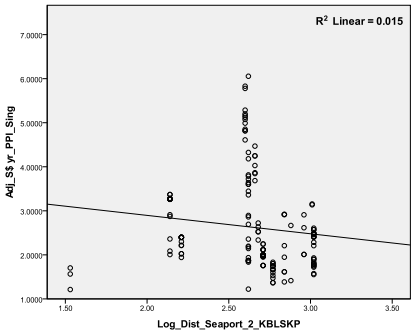
Appendix 9c

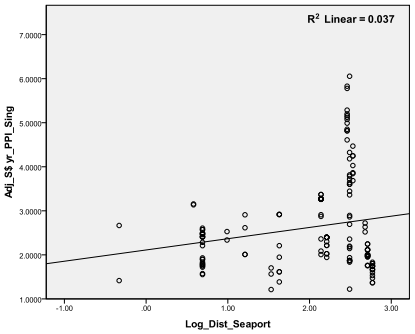

R² Linear = 0.246
Adj_S$ yr_PPI_Sing
Log_DistancetoCBD1BTC

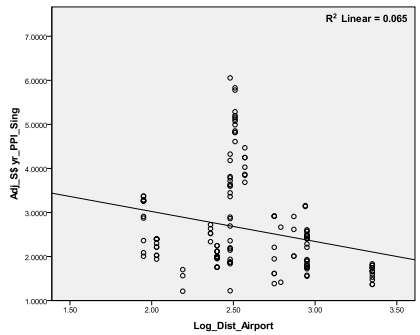

R² Linear = 0.014
Adj_S$ yr_PPI_Sing
Log_DistancetoCBD2NGY


R² Linear = 0.185
Adj_S$ yr_PPI_Sing
Log_DistancetoCBD


R² Linear = 0.004
Adj_S$ yr_PPI_Sing
Log_Dist_SeaPort_1_BTA2


R² Linear = 0.015
Adj_S$ yr_PPI_Sing
Log_Dist_Seaport_2_KBLSKP


R² Linear = 0.037
Adj_S$ yr_PPI_Sing
Log_Dist_Seaport


R² Linear = 0.065
Adj_S$ yr_PPI_Sing
Log_Dist_Airport

Appendix 10- Multi Regression Result

10.a Original Data

Notes

Output Created		15-Aug-2011 20:51:13
Comments		
Input	Data	E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	154
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT Adj_S$yr_PPI_Sing /METHOD=BACKWARD Dormitory Adjacent_Row_50_70 Adjacent_Row_200_100 Aream2 DistancetoCBD1BTC DistancetoCBD2NGY Dist_SeaPort_1_BTA2 Dist_Seaport_2_KBLSKP Dist_Airport.
Resources	Processor Time	00:00:00.110
	Elapsed Time	00:00:00.203
	Memory Required	6052 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Adjacent_Row_200_100, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/SKP, Adjacent_Row_50_70[a]	.	Enter
2	.	Adjacent_Row_200_100	Backward (criterion: Probability of F-to-remove >= .100).
3	.	Area (m2)	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.
b. Dependent Variable: Adj_S$ yr_PPI_Sing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.732[a]	.535	.506	.7459323
2	.730[b]	.532	.507	.7456402
3	.726[c]	.527	.505	.7470451

a. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Adjacent_ Row_200_100, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
b. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
c. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.306	9	10.256	18.433	.000[a]
	Residual	80.124	144	.556		
	Total	172.430	153			
2	Regression	91.813	8	11.477	20.642	.000[b]
	Residual	80.617	145	.556		
	Total	172.430	153			
3	Regression	90.951	7	12.993	23.282	.000[c]
	Residual	81.479	146	.558		
	Total	172.430	153			

a. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Adjacent_ Row_200_100, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
b. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
c. Predictors: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
d. Dependent Variable: Adj_S$ yr_PPI_Sing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.957	.805		4.914	.000
	Dormitory	.532	.251	.242	2.119	.036
	Adjacent_Row_50_70	.719	.733	.332	.982	.328
	Adjacent_ Row_200_100	-.437	.465	-.159	-.942	.348
	Area (m2)	-4.186E-5	.000	-.096	-1.363	.175
	Distance to CBD 1 (BTC)	-.191	.057	-.973	-3.359	.001
	Distance to CBD 2 (NGY)	-.037	.027	-.215	-1.354	.178
	Dist_SeaPort_1_BTA(2)	-.064	.031	-.470	-2.049	.042
	Dist_Seaport_2_KBL/ SKP	-.283	.064	-1.050	-4.426	.000
	Dist_Airport	.322	.051	1.827	6.320	.000
2	(Constant)	3.517	.655		5.368	.000
	Dormitory	.520	.251	.237	2.074	.040
	Adjacent_Row_50_70	1.220	.503	.562	2.425	.017
	Area (m2)	-3.788E-5	.000	-.087	-1.245	.215
	Distance to CBD 1 (BTC)	-.152	.039	-.774	-3.919	.000
	Distance to CBD 2 (NGY)	-.046	.025	-.268	-1.805	.073
	Dist_SeaPort_1_BTA(2)	-.073	.030	-.534	-2.438	.016
	Dist_Seaport_2_KBL/ SKP	-.264	.061	-.981	-4.350	.000
	Dist_Airport	.302	.046	1.715	6.512	.000
3	(Constant)	3.381	.647		5.224	.000
	Dormitory	.566	.249	.257	2.276	.024
	Adjacent_Row_50_70	1.232	.504	.568	2.445	.016
	Distance to CBD 1 (BTC)	-.151	.039	-.770	-3.896	.000
	Distance to CBD 2 (NGY)	-.044	.025	-.257	-1.728	.086
	Dist_SeaPort_1_BTA(2)	-.078	.030	-.566	-2.597	.010
	Dist_Seaport_2_KBL/ SKP	-.258	.061	-.958	-4.255	.000
	Dist_Airport	.297	.046	1.687	6.416	.000

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
2	Adjacent_ Row_200_100	-.159[a]	-.942	.348	-.078	.113
3	Adjacent_ Row_200_100	-.128[b]	-.759	.449	-.063	.115
	Area (m2)	-.087[b]	-1.245	.215	-.103	.660

a. Predictors in the Model: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Area (m2), Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
b. Predictors in the Model: (Constant), Dist_Airport, Dist_SeaPort_1_BTA(2), Dormitory, Distance to CBD 1 (BTC), Distance to CBD 2 (NGY), Dist_Seaport_2_KBL/ SKP, Adjacent_Row_50_70
c. Dependent Variable: Adj_S$ yr_PPI_Sing

10.b Log Transformed Data

Notes

Output Created		15-Aug-2011 20:42:11
Comments		
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	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	154
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT Adj_S$yr_PPI_Sing /METHOD=BACKWARD Dormitory Adjacent_Row_50_70 Adjacent_Row_200_100 Aream2 Log_DistancetoCBD1BTC Log_DistancetoCBD2NGY Log_Dist_SeaPort_1_BTA2 Log_Dist_Seaport_2_KBLSKP Log_Dist_Airport.
Resources	Processor Time	00:00:00.062
	Elapsed Time	00:00:00.274
	Memory Required	6052 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Adjacent_ Row_200_100, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70[a]	.	Enter
2	.	Adjacent_ Row_200_100	Backward (criterion: Probability of F-to-remove >= .100).
3	.	Log_DistancetoCBD2NGY	Backward (criterion: Probability of F-to-remove >= .100).
4	.	Adjacent_Row_50_70	Backward (criterion: Probability of F-to-remove >= .100).
5	.	Log_Dist_SeaPort_1_BTA2	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.
b. Dependent Variable: Adj_S$ yr_PPI_Sing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.722[a]	.522	.492	.7566018
2	.722[b]	.522	.496	.7540326
3	.720[c]	.519	.496	.7537465
4	.718[d]	.516	.496	.7538179
5	.714[e]	.510	.493	.7557893

a. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Adjacent_ Row_200_100, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
b. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
c. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
d. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP
e. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_Seaport_2_KBLSKP

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	89.998	9	10.000	17.468	.000[a]
	Residual	82.432	144	.572		
	Total	172.430	153			
2	Regression	89.988	8	11.248	19.784	.000[b]
	Residual	82.442	145	.569		
	Total	172.430	153			
3	Regression	89.482	7	12.783	22.500	.000[c]
	Residual	82.948	146	.568		
	Total	172.430	153			
4	Regression	88.898	6	14.816	26.074	.000[d]
	Residual	83.531	147	.568		
	Total	172.430	153			
5	Regression	87.890	5	17.578	30.773	.000[e]
	Residual	84.540	148	.571		
	Total	172.430	153			

a. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Adjacent_ Row_200_100, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
b. Predictors: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
c. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
d. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP
e. Predictors: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_Seaport_2_KBLSKP
f. Dependent Variable: Adj_S$ yr_PPI_Sing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.202	1.150		2.785	.006
	Dormitory	.766	.217	.348	3.530	.001
	Adjacent_Row_50_70	.959	.945	.442	1.014	.312
	Adjacent_ Row_200_100	.058	.446	.021	.130	.897
	Area (m2)	-6.374E-5	.000	-.147	-1.984	.049
	Log_DistancetoCBD1BTC	-.942	.327	-.696	-2.882	.005
	Log_DistancetoCBD2NGY	-.201	.225	-.123	-.896	.372
	Log_Dist_SeaPort_1_BTA2	-.305	.230	-.265	-1.326	.187
	Log_Dist_Seaport_2_KBLSKP	-2.712	.726	-.789	-3.736	.000
	Log_Dist_Airport	3.186	.687	1.190	4.635	.000
2	(Constant)	3.273	1.011		3.238	.001
	Dormitory	.768	.216	.349	3.559	.001
	Adjacent_Row_50_70	.869	.647	.401	1.344	.181
	Area (m2)	-6.454E-5	.000	-.148	-2.054	.042
	Log_DistancetoCBD1BTC	-.971	.241	-.717	-4.025	.000
	Log_DistancetoCBD2NGY	-.188	.199	-.115	-.943	.347
	Log_Dist_SeaPort_1_BTA2	-.290	.197	-.252	-1.471	.144
	Log_Dist_Seaport_2_KBLSKP	-2.721	.720	-.792	-3.780	.000
	Log_Dist_Airport	3.187	.685	1.191	4.654	.000
3	(Constant)	3.214	1.009		3.187	.002
	Dormitory	.818	.209	.372	3.911	.000
	Adjacent_Row_50_70	.573	.565	.264	1.014	.312
	Area (m2)	-6.472E-5	.000	-.149	-2.060	.041
	Log_DistancetoCBD1BTC	-1.105	.195	-.817	-5.675	.000
	Log_Dist_SeaPort_1_BTA2	-.313	.196	-.272	-1.601	.112
	Log_Dist_Seaport_2_KBLSKP	-2.458	.663	-.715	-3.706	.000
	Log_Dist_Airport	2.954	.638	1.104	4.628	.000
4	(Constant)	3.425	.987		3.470	.001
	Dormitory	.965	.151	.439	6.383	.000
	Area (m2)	-6.132E-5	.000	-.141	-1.963	.052
	Log_DistancetoCBD1BTC	-1.234	.147	-.913	-8.417	.000
	Log_Dist_SeaPort_1_BTA2	-.152	.114	-.132	-1.332	.185
	Log_Dist_Seaport_2_KBLSKP	-2.062	.536	-.600	-3.846	.000
	Log_Dist_Airport	2.500	.455	.934	5.492	.000
5	(Constant)	2.384	.605		3.940	.000
	Dormitory	1.020	.146	.464	6.993	.000
	Area (m2)	-6.736E-5	.000	-.155	-2.174	.031
	Log_DistancetoCBD1BTC	-1.126	.122	-.832	-9.205	.000
	Log_Dist_Seaport_2_KBLSKP	-1.579	.396	-.459	-3.987	.000
	Log_Dist_Airport	2.206	.399	.825	5.526	.000

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
2	Adjacent_ Row_200_100	.021[a]	.130	.897	.011	.126
3	Adjacent_ Row_200_100	-.045[b]	-.311	.756	-.026	.159
	Log_DistancetoCBD2NGY	-.115[b]	-.943	.347	-.078	.221
4	Adjacent_ Row_200_100	-.098[c]	-.886	.377	-.073	.267
	Log_DistancetoCBD2NGY	-.036[c]	-.332	.741	-.027	.289
	Adjacent_Row_50_70	.264[c]	1.014	.312	.084	.049
5	Adjacent_ Row_200_100	-.082[d]	-.737	.462	-.061	.270
	Log_DistancetoCBD2NGY	-.091[d]	-1.120	.264	-.092	.504
	Adjacent_Row_50_70	-.075[d]	-.488	.627	-.040	.142
	Log_Dist_SeaPort_1_BTA2	-.132[d]	-1.332	.185	-.109	.335

a. Predictors in the Model: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70

b. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70

c. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP

d. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_Seaport_2_KBLSKP

Excluded Variables[e]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	Adjacent_ Row_200_100	.021[a]	.130	.897	.011	.126
3	Adjacent_ Row_200_100	-.045[b]	-.311	.756	-.026	.159
	Log_DistancetoCBD2NGY	-.115[b]	-.943	.347	-.078	.221
4	Adjacent_ Row_200_100	-.098[c]	-.886	.377	-.073	.267
	Log_DistancetoCBD2NGY	-.036[c]	-.332	.741	-.027	.289
	Adjacent_Row_50_70	.264[c]	1.014	.312	.084	.049
5	Adjacent_ Row_200_100	-.082[d]	-.737	.462	-.061	.270
	Log_DistancetoCBD2NGY	-.091[d]	-1.120	.264	-.092	.504
	Adjacent_Row_50_70	-.075[d]	-.488	.627	-.040	.142
	Log_Dist_SeaPort_1_BTA2	-.132[d]	-1.332	.185	-.109	.335

a. Predictors in the Model: (Constant), Log_Dist_Airport, Log_DistancetoCBD2NGY, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
b. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP, Adjacent_Row_50_70
c. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_SeaPort_1_BTA2, Log_Dist_Seaport_2_KBLSKP
d. Predictors in the Model: (Constant), Log_Dist_Airport, Dormitory, Area (m2), Log_DistancetoCBD1BTC, Log_Dist_Seaport_2_KBLSKP
e. Dependent Variable: Adj_S$ yr_PPI_Sing

10.c MRA using Combination Original Data & Log Transformed Data

[DataSet1] E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport[a]	.	Enter
2	.	Adjacent_Row_50_ 70	Backward (criterion: Probability of F-to-remove >= .100).
3	.	Distance to CBD 2 (NGY)	Backward (criterion: Probability of F-to-remove >= .100).
4	.	Area (m2)	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.
b. Dependent Variable: Adj_S$ yr_PPI_Sing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746[a]	.557	.529	.7283248
2	.746[b]	.557	.532	.7260657
3	.745[c]	.555	.534	.7246237
4	.740[d]	.548	.529	.7285223

a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport[a]	.	Enter
2	.	Adjacent_Row_50_ 70	Backward (criterion: Probability of F-to-remove >= .100).
3	.	Distance to CBD 2 (NGY)	Backward (criterion: Probability of F-to-remove >= .100).
4	.	Area (m2)	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.044	9	10.672	20.118	.000[a]
	Residual	76.386	144	.530		
	Total	172.430	153			
2	Regression	95.990	8	11.999	22.761	.000[b]
	Residual	76.440	145	.527		
	Total	172.430	153			
3	Regression	95.768	7	13.681	26.055	.000[c]
	Residual	76.662	146	.525		
	Total	172.430	153			
4	Regression	94.410	6	15.735	29.647	.000[d]
	Residual	78.019	147	.531		
	Total	172.430	153			

a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
e. Dependent Variable: Adj_S$ yr_PPI_Sing

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	6.310	.811		7.781	.000	4.707	7.912					
Log_DistancetoCBD1BTC	-1.425	.143	-1.053	-9.929	.000	-1.708	-1.141	-.496	-.634	-.551	.274	3.655
Dist_SeaPort_1_BTA(2)	-.099	.021	-.721	-4.665	.000	-.141	-.057	-.141	-.359	-.259	.129	7.770
Dist_Seaport_2_KBL/ SKP	-.295	.060	-1.094	-4.890	.000	-.414	-.175	-.193	-.374	-.271	.061	16.270
Dist_Airport	.266	.045	1.511	5.958	.000	.178	.354	-.314	.441	.331	.048	20.892
Dormitory	.571	.199	.259	2.862	.005	.177	.964	.458	.230	.159	.375	2.668
Adjacent_ Row_200_100	-565	.305	-.206	-1.855	.066	-1.167	.037	-.326	-.151	-.103	.250	4.007

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.867	1.153		5.954	.000
	Log_DistancetoCBD1BTC	-1.507	.347	-1.114	-4.345	.000
	Distance to CBD 2 (NGY)	-.011	.028	-.063	-.379	.706
	Dist_SeaPort_1_BTA(2)	-.085	.028	-.623	-3.068	.003
	Dist_Seaport_2_KBL/ SKP	-.317	.063	-1.179	-5.035	.000
	Dist_Airport	.279	.048	1.586	5.819	.000
	Dormitory	.531	.236	.241	2.246	.026
	Adjacent_Row_50_70	-.255	.799	-.117	-.319	.750
	Adjacent_ Row_200_100	-.705	.448	-.257	-1.573	.118
	Area (m2)	-5.025E-5	.000	-.116	-1.666	.098
2	(Constant)	6.611	.828		7.986	.000
	Log_DistancetoCBD1BTC	-1.407	.150	-1.040	-9.353	.000
	Distance to CBD 2 (NGY)	-.016	.024	-.091	-.649	.518
	Dist_SeaPort_1_BTA(2)	-.090	.024	-.656	-3.796	.000
	Dist_Seaport_2_KBL/ SKP	-.318	.063	-1.182	-5.065	.000
	Dist_Airport	.283	.046	1.609	6.142	.000
	Dormitory	.494	.205	.225	2.406	.017
	Adjacent_ Row_200_100	-.600	.305	-.219	-1.968	.051
	Area (m2)	-4.880E-5	.000	-.112	-1.642	.103
3	(Constant)	6.543	.819		7.984	.000
	Log_DistancetoCBD1BTC	-1.437	.143	-1.063	-10.057	.000
	Dist_SeaPort_1_BTA(2)	-.097	.021	-.707	-4.589	.000
	Dist_Seaport_2_KBL/ SKP	-.307	.060	-1.142	-5.085	.000
	Dist_Airport	.277	.045	1.572	6.163	.000
	Dormitory	.489	.205	.222	2.387	.018
	Adjacent_ Row_200_100	-.607	.304	-.221	-1.997	.048
	Area (m2)	-4.761E-5	.000	-.109	-1.608	.110
4	(Constant)	6.310	.811		7.781	.000
	Log_DistancetoCBD1BTC	-1.425	.143	-1.053	-9.929	.000
	Dist_SeaPort_1_BTA(2)	-.099	.021	-.721	-4.665	.000
	Dist_Seaport_2_KBL/ SKP	-.295	.060	-1.094	-4.890	.000
	Dist_Airport	.266	.045	1.511	5.958	.000
	Dormitory	.571	.199	.259	2.862	.005
	Adjacent_ Row_200_100	-565	.305	-.206	-1.855	.066

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	Adjacent_Row_50_70	-.117[a]	-.319	.750	-.027	.023
3	Adjacent_Row_50_70	-.191[b]	-.616	.539	-.051	.032
	Distance to CBD 2 (NGY)	-.091[b]	-.649	.518	-.054	.157
4	Adjacent_Row_50_70	-.108[c]	-.348	.728	-.029	.032
	Distance to CBD 2 (NGY)	-.076[c]	-.545	.586	-.045	.157
	Area (m2)	-.109[c]	-1.608	.110	-.132	.657

a. Predictors in the Model: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

b. Predictors in the Model: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

c. Predictors in the Model: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

d. Dependent Variable: Adj_S$ yr_PPI_Sing

Notes

Output Created		17-Aug-2011 14:47:40
Comments		
Input	Data	E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	154
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS CI(90) R ANOVA /CRITERIA=PIN(.05) POUT(.06) /NOORIGIN /DEPENDENT Adj_S$yr_PPI_Sing /METHOD=BACKWARD Log_DistancetoCBD1BTC DistancetoCBD2NGY Dist_SeaPort_1_BTA2 Dist_Seaport_2_KBLSKP Dist_Airport Adjacent_Row_200_100 Adjacent_Row_50_70 Dormitory Aream2.
Resources	Processor Time	00:00:00.109
	Elapsed Time	00:00:00.187
	Memory Required	6052 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] E:\Thesis\Data\Kuisioner Kawasan Industri\SPSS\Statistik FInal.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport[a]	.	Enter
2	.	Adjacent_Row_50_ 70	Backward (criterion: Probability of F-to-remove >= .060).
3	.	Distance to CBD 2 (NGY)	Backward (criterion: Probability of F-to-remove >= .060).
4	.	Area (m2)	Backward (criterion: Probability of F-to-remove >= .060).
5	.	Adjacent_ Row_200_100	Backward (criterion: Probability of F-to-remove >= .060).

a. All requested variables entered.
b. Dependent Variable: Adj_S$ yr_PPI_Sing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746[a]	.557	.529	.7283248
2	.746[b]	.557	.532	.7260657
3	.745[c]	.555	.534	.7246237
4	.740[d]	.548	.529	.7285223
5	.733[e]	.537	.521	.7345072

a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
e. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.044	9	10.672	20.118	.000[a]
	Residual	76.386	144	.530		
	Total	172.430	153			
2	Regression	95.990	8	11.999	22.761	.000[b]
	Residual	76.440	145	.527		
	Total	172.430	153			
3	Regression	95.768	7	13.681	26.055	.000[c]
	Residual	76.662	146	.525		
	Total	172.430	153			
4	Regression	94.410	6	15.735	29.647	.000[d]
	Residual	78.019	147	.531		
	Total	172.430	153			
5	Regression	92.584	5	18.517	34.322	.000[e]
	Residual	79.846	148	.540		
	Total	172.430	153			

a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
e. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.044	9	10.672	20.118	.000[a]
	Residual	76.386	144	.530		
	Total	172.430	153			
2	Regression	95.990	8	11.999	22.761	.000[b]
	Residual	76.440	145	.527		
	Total	172.430	153			
3	Regression	95.768	7	13.681	26.055	.000[c]
	Residual	76.662	146	.525		
	Total	172.430	153			
4	Regression	94.410	6	15.735	29.647	.000[d]
	Residual	78.019	147	.531		
	Total	172.430	153			
5	Regression	92.584	5	18.517	34.322	.000[e]
	Residual	79.846	148	.540		
	Total	172.430	153			

a. Predictors: (Constant), Area (m2), Adjacent_Row_50_70, Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
b. Predictors: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
c. Predictors: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
d. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
e. Predictors: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport
f. Dependent Variable: Adj_S$ yr_PPI_Sing

10.d Eliminating variables having Sig value higher than 0,05

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.867	1.153		5.954	.000
	Log_DistancetoCBD1BTC	-1.507	.347	-1.114	-4.345	.000
	Distance to CBD 2 (NGY)	-.011	.028	-.063	-.379	.706
	Dist_SeaPort_1_BTA(2)	-.085	.028	-.623	-3.068	.003
	Dist_Seaport_2_KBL/ SKP	-.317	.063	-1.179	-5.035	.000
	Dist_Airport	.279	.048	1.586	5.819	.000
	Adjacent_ Row_200_100	-.705	.448	-.257	-1.573	.118
	Adjacent_Row_50_70	-.255	.799	-.117	-.319	.750
	Dormitory	.531	.236	.241	2.246	.026
	Area (m2)	-5.025E-5	.000	-.116	-1.666	.098
2	(Constant)	6.611	.828		7.986	.000
	Log_DistancetoCBD1BTC	-1.407	.150	-1.040	-9.353	.000
	Distance to CBD 2 (NGY)	-.016	.024	-.091	-.649	.518
	Dist_SeaPort_1_BTA(2)	-.090	.024	-.656	-3.796	.000
	Dist_Seaport_2_KBL/ SKP	-.318	.063	-1.182	-5.065	.000
	Dist_Airport	.283	.046	1.609	6.142	.000
	Adjacent_ Row_200_100	-.600	.305	-.219	-1.968	.051
	Dormitory	.494	.205	.225	2.406	.017
	Area (m2)	-4.880E-5	.000	-.112	-1.642	.103
3	(Constant)	6.543	.819		7.984	.000
	Log_DistancetoCBD1BTC	-1.437	.143	-1.063	-10.057	.000
	Dist_SeaPort_1_BTA(2)	-.097	.021	-.707	-4.589	.000
	Dist_Seaport_2_KBL/ SKP	-.307	.060	-1.142	-5.085	.000
	Dist_Airport	.277	.045	1.572	6.163	.000
	Adjacent_ Row_200_100	-.607	.304	-.221	-1.997	.048
	Dormitory	.489	.205	.222	2.387	.018
	Area (m2)	-4.761E-5	.000	-.109	-1.608	.110
4	(Constant)	6.310	.811		7.781	.000
	Log_DistancetoCBD1BTC	-1.425	.143	-1.053	-9.929	.000
	Dist_SeaPort_1_BTA(2)	-.099	.021	-.721	-4.665	.000
	Dist_Seaport_2_KBL/ SKP	-.295	.060	-1.094	-4.890	.000
	Dist_Airport	.266	.045	1.511	5.958	.000
	Adjacent_ Row_200_100	-.565	.305	-.206	-1.855	.066
	Dormitory	.571	.199	.259	2.862	.005
5	(Constant)	5.462	.675		8.087	.000
	Log_DistancetoCBD1BTC	-1.366	.141	-1.010	-9.680	.000
	Dist_SeaPort_1_BTA(2)	-.080	.019	-.580	-4.276	.000
	Dist_Seaport_2_KBL/ SKP	-.222	.046	-.825	-4.806	.000
	Dist_Airport	.210	.033	1.191	6.355	.000
	Dormitory	.808	.154	.367	5.252	.000

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Coefficients[a]

Model		90.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	4.957	8.776
	Log_DistancetoCBD1BTC	-2.081	-.933
	Distance to CBD 2 (NGY)	-.058	.036
	Dist_SeaPort_1_BTA(2)	-.131	-.039
	Dist_Seaport_2_KBL/ SKP	-.422	-.213
	Dist_Airport	.200	.359
	Adjacent_ Row_200_100	-1.446	.037
	Adjacent_Row_50_70	-1.577	1.067
	Dormitory	.140	.922
	Area (m2)	.000	.000
2	(Constant)	5.241	7.982
	Log_DistancetoCBD1BTC	-1.657	-1.158
	Distance to CBD 2 (NGY)	-.055	.024
	Dist_SeaPort_1_BTA(2)	-.129	-.051
	Dist_Seaport_2_KBL/ SKP	-.422	-.214
	Dist_Airport	.207	.360
	Adjacent_ Row_200_100	-1.105	-.095
	Dormitory	.154	.834
	Area (m2)	.000	.000
3	(Constant)	5.186	7.900
	Log_DistancetoCBD1BTC	-1.674	-1.201
	Dist_SeaPort_1_BTA(2)	-.132	-.062
	Dist_Seaport_2_KBL/ SKP	-.407	-.207
	Dist_Airport	.202	.351
	Adjacent_ Row_200_100	-1.111	-.104
	Dormitory	.150	.827
	Area (m2)	.000	.000
4	(Constant)	4.968	7.652
	Log_DistancetoCBD1BTC	-1.662	-1.187
	Dist_SeaPort_1_BTA(2)	-.134	-.064
	Dist_Seaport_2_KBL/ SKP	-.394	-.195
	Dist_Airport	.192	.340
	Adjacent_ Row_200_100	-1.070	-.061
	Dormitory	.241	.901
5	(Constant)	4.344	6.580
	Log_DistancetoCBD1BTC	-1.600	-1.133
	Dist_SeaPort_1_BTA(2)	-.110	-.049
	Dist_Seaport_2_KBL/ SKP	-.298	-.146
	Dist_Airport	.155	.264
	Dormitory	.554	1.063

a. Dependent Variable: Adj_S$ yr_PPI_Sing

Excluded Variables[c]

Model						Collinearity Statistics
		Beta In	t	Sig.	Partial Correlation	Tolerance
2	Adjacent_Row_50_70	-.117[a]	-.319	.750	-.027	.023
3	Adjacent_Row_50_70	-.191[b]	-.616	.539	-.051	.032
	Distance to CBD 2 (NGY)	-.091[b]	-.649	.518	-.054	.157
4	Adjacent_Row_50_70	-.108[c]	-.348	.728	-.029	.032
	Distance to CBD 2 (NGY)	-.076[c]	-.545	.586	-.045	.157
	Area (m2)	-.109[c]	-1.608	.110	-.132	.657
5	Adjacent_Row_50_70	.221[d]	.942	.348	.077	.057
	Distance to CBD 2 (NGY)	-.087[d]	-.619	.537	-.051	.158
	Area (m2)	-.098[d]	-1.427	.156	-.117	.662
	Adjacent_ Row_200_100	-.206[d]	-1.855	.066	-.151	.250

a. Predictors in the Model: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

b. Predictors in the Model: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

c. Predictors in the Model: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

d. Predictors in the Model: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

Excluded Variables[e]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	Adjacent_Row_50_70	-.117[a]	-.319	.750	-.027	.023
3	Adjacent_Row_50_70	-.191[b]	-.616	.539	-.051	.032
	Distance to CBD 2 (NGY)	-.091[b]	-.649	.518	-.054	.157
4	Adjacent_Row_50_70	-.108[c]	-.348	.728	-.029	.032
	Distance to CBD 2 (NGY)	-.076[c]	-.545	.586	-.045	.157
	Area (m2)	-.109[c]	-1.608	.110	-.132	.657
5	Adjacent_Row_50_70	.221[d]	.942	.348	.077	.057
	Distance to CBD 2 (NGY)	-.087[d]	-.619	.537	-.051	.158
	Area (m2)	-.098[d]	-1.427	.156	-.117	.662
	Adjacent_ Row_200_100	-.206[d]	-1.855	.066	-.151	.250

a. Predictors in the Model: (Constant), Area (m2), Distance to CBD 2 (NGY), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

b. Predictors in the Model: (Constant), Area (m2), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

c. Predictors in the Model: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Adjacent_ Row_200_100, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

d. Predictors in the Model: (Constant), Dormitory, Dist_Seaport_2_KBL/ SKP, Dist_SeaPort_1_BTA(2), Log_DistancetoCBD1BTC, Dist_Airport

e. Dependent Variable: Adj_S$ yr_PPI_Sing