Define the Valuation Variables of Aquatic Land Parcels in Coastline Settlements of Indonesia

Faus Tinus Handi FERYANDI, Nurul Putri PROBOWATI, and Yohanes Nurcahyo Agung WIBOWO, Indonesia

Key words: valuation variables, coastline settlement

SUMMARY

The process of appraising land parcels in residential areas has closely followed the approach used for property appraisal in mainland settlements. However, in archipelagic areas with a wider sea area than land area, such as in Indonesia, settlements are often found along the coastline. This unique formation of living spaces is specific to island regions, particularly among traditional communities whose livelihoods depend on fisheries and marine activities. These coastal settlements possess distinct physical, legal, economic, and social characteristics that differentiate them from mainland settlements. To ensure accurate land valuation and prevent under- or over-estimation of land value, precise value-forming variables based on these characteristics, along with models and data-driven valuation techniques, must be defined. This paper will present a study on defining those variables in coastal settlements of Indonesia, with case study located in Tanjungpinang City, Riau Islands Province, in order to provide more sensitive valuation techniques of fiscal cadastre in Indonesia.

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1. INTRODUCTION

Land valuation or land appraisal is a broad term that encompasses several methods and approaches used to determine the monetary worth of a piece of land. Land valuation can be categorized into two main types: area assessment, which involves evaluating the economic, socio-ecological, and environmental worth of a given region, and land parcel valuation, which focuses on assessing the value of land parcels (BPN, 2014).

Contrary to area assessment, which does not rely on market prices, land parcel valuation typically incorporates market prices into its evaluation. In the context of residential areas, the term "land valuation" is frequently employed synonymously with "real estate valuation" or "real property valuation." This study refers to property as a structure or structures along with the land, encompassing the interests, advantages, and entitlements associated with land ownership, as well as any fixtures or objects that are permanently affixed to the land or legally classified as immovable (IAAO, 2013).

The objective of the fit-for-purpose (FFP) for land valuation is to generate land value, in adherence to the cadastre principles suitable for the given purpose. The FFP signifies that the approach, methods, and techniques utilized in the appraisal and model creation are adaptable, in accordance with requirements (i.e., for what purpose the land's value is determined), and sensitive to the attributes of the assessment site. The assessment method does not prioritize the sophistication or uniqueness of the approach.

One of the fundamental ideas in the FFP land valuation is the utilization of spatial data from aerial photography or satellite imagery data by identifying and extracting characteristics that have an impact on the valuation, as well as incorporating spatial variables into the modeling process. Due to the fact that the outcomes are primarily utilized for cadastre objectives—specifically fiscal cadastre (taxation) and juridical cadastre (land registration)—land parcel valuation is also occasionally denoted as cadastral valuation, and the outcomes of the evaluation are known as cadastral value.

The land parcel valuation idea encompasses the appraisal of the land and the assessment of additional components that are either situated above or below the land parcel. If the purpose of the appraisal is only to obtain the land value of the land, then the additional component value (e.g., buildings) will be calculated separately with regards to their depreciation and excluded in the further calculation process.

2. FACTORS OF VALUATION

While defining a correct approach is crucial to guaranteeing the performance of a valuation model, selecting the proper factors through meticulous exploration is important to bringing the estimated model as close as possible to reality. Usually, the selection process takes two necessary actions: literature reviews and field observation. If the review would give some underlying knowledge of how to select a factor and what considerations should be made, the observation would identify the factual characteristics of the valuation area and give a sensible reason for why we select or put aside a factor from the valuation process. The factors themselves can belong to the economic, social, law-government-politics, and physical-environment-location groups (Eckert et al., 1990).

Economic factors
Economic factors generally relate to a country's economic situation and activities at the local, regional, and national levels. These factors can also be observed from a demand-supply perspective. Income level, purchasing power, interest rate, and transaction costs are some examples of the demand, whereas numbers of land parcels, land development costs, taxes, and ownership costs are examples of the supply.

Social factors
According to Stoykova and Chou (2013), social factors are the factors linked to ethnic and societal characteristics that affect the supply and the demand. Type of society (i.e., communal or not), existence of a social gap and social security system, interaction among ethnic groups, views towards land, population change, gender/age composition, and education belong to this group.

Law-government-politics factors
These factors are often called regulation factors, or, government factors, because they relate to property policy and regulations issued by the government. Some examples of these factors are the regulation of land management and spatial planning, land use restrictions, and property tax policy and rate.

Physical-environment-location factors
This group reflects the physical and environmental conditions concerning the geographical position of the property. Britton, Davies, & Johnson (1989) and Cohen & Coughlin (2008) argue that the geographical position of the property is very influential, expressing the traditional mantra used to describe the three main factors affecting the value of real estate as "location, location, and location". The physical attributes include plot and building size, topography, plot and building shape, frontage, building age, and other internalities. Environmental attributes are related to environmental quality and amenities, as well as the availability of utilities, infrastructure, and services in the neighborhood. Location factors are attributed to accessibility and spatial connection.

3. LITERATURE REVIEW AND FIELD ASSESSMENT

Following such classification, to understand which contextual factors that influence the value of the land in coastline settlement we use two approaches: literature study and field observation assessment.

3.1.Valuation Factors Used in Some Previous Study

We explored 10 previous studies to find out what the factors were and what the rationales were when choosing the factors. Our study is about a residential valuation, so the studies we took are the ones that applied to the residential area, not the industrial, agricultural, or tourism area. None of them researched coastlines or aquatic land valuation, which is the specificity of this research, but at least an understanding of the principles and considerations would be constructive for this research. Table 1 shows our identification result.

Table 1. Identification of the factors used for valuation

Weiss et al., (1966) Land value and land development influence factor: An analytical Approach for Examining Policy Alternatives in North Carolina's Piedmont Crescent, USA					
Economic (1)	Social (2)	Law, government, and politics (3)	Physical, Environment, Location		
			Physical (4)	Environment (5)	Location (6)
	▪ Dwelling density	▪ Zoning protection ▪ Suitability of buildings ▪ Proximity to non-white area		▪ Residential amenity ▪ Availability to work, sewage, and clean water	▪ Distance to major street, nearest elementary school, recreation area, and shopping area ▪ Total travel distance ▪ Accessibility to work area ▪ Proximity to blighted area
Mc Millen and McDonald (2002) Land value in a newly zoned city					
▪ District average home value	▪ District percentage of multifamily		▪ Buildings age ▪ District Percentage rental		▪ Distance to town center, Lake Michigan, El Station, commuter train station, and river ▪ Proximity to railway and main road
Yomralioglu and Nisanci (2004) Nominal asset land valuation technique by GIS					
		▪ Permitted number of floors 3 ▪ Permitted construction area	▪ Shape ▪ Street frontage ▪ Soil condition ▪ Topography	▪ Supplied basic services ▪ Landscape view ▪ Currently usable area ▪ Available utilities	▪ Access to street, highway, waterway, and railway ▪ Parcel location within block ▪ Distance from nuisances and from noise ▪ Distance to city center, educational centers, health services, shopping center, recreational areas, religious place, play garden, car parking area, fire station, and police station
Leksono et al., (2008) Automatic land and parcel valuation to support the land and building tax information system by developing the open source software					
▪ Mean income ▪ Credit ▪ Job chance ▪ Economic activities	▪ Security ▪ Social gap ▪ Culture ▪ Density	▪ Legal status	▪ Topography (contour) ▪ Land use ▪ Soil condition	▪ Availability of electricity, drainage, gas supply, phone line ▪ View amenity	▪ Hook parcel or not ▪ Distance to air pollution, public transportations, main roads, hospitals, and schools
Demetriou (2018) Automating the land valuation process carried out in land consolidation schemes					

▪ Land productivity ▪ Purchasing-power parity (PPP)		▪ Existence of irrigation rights	▪ Size ▪ Shape ▪ Slope ▪ Elevation ▪ Aspect ▪ Existence of a stream ▪ Soil type	▪ Existence of sea view	▪ Access through a registered road and a registered pathway ▪ Distance from residential zones and the main road
Hafiz (1994) in Ismail and Buyong (1998) Residential Property Valuation using GIS					
▪ Date of transaction	▪ "Fung sui" (a custom belief)		▪ Floor finishes ▪ Deterioration ▪ Building extension and renovation	▪ Landscape	▪ Location ▪ Position of lot
Silalahi (2010) The analysis of influencing factors of urban land price using GIS (Case Study of WP Gedebage, Bandung City)					
	▪ Villages density	▪ Conformity with spatial planning ▪ Legal status	,	▪ Availability of drainage	▪ Distance to arterial road, central business districts, and industrial center
Goffette-Nagot et al., (2011) A spatial analysis of residential land prices in Belgium: accessibility, linguistic border and environmental amenities					
▪ Accessibility to jobs ▪ Income of commune	▪ Population density		▪ Slope	▪ Percentage of forest and agriculture area ▪ Presence of coast and water (lake or river)	
Yalpir et al., (2014) Creating a valuation map in GIS through Artificial Neural Network methodology: a case study					
▪ Sale price			▪ Number of rooms and stories ▪ Buildings' age ▪ Frontier		▪ Distance to transportation network, green areas, trade centers, and to university
Ping (2005) Residential land value modelling					
				▪ Neighborhood quality ▪ View of water ▪ Influence of railway and industrial pollution	▪ Travel time to city center, and to school ▪ Access to sub-center, main road, and public transportation ▪ Distance to hospital, post office, to market (shopping)

From our investigation of those studies, we are able to resume some important points. Firstly, as far as we are aware, there is no binding and one-for-all rule of what factors and how many factors should be used, and from which group. As an example, the research from Silalahi (2010) only used seven factors, without the factors from the economic and physical group. Another example, Leksono et al. (2008), applied 22 factors from all groups, which also varied in number for each group. The physical, environment, and location group were used in all studies, while the factors from other groups were facultatively used.

The selection apparently depends on necessity and area characteristics. If there are buildings in the area of valuation, the buildings' attributes indeed affect the property price. Hence, these attributes need to be considered as affecting factors of property value. Hafiz (1994) in Ismail and Buyong (1998) used building deterioration and renovation. Yalpir et al. (2014) considered the number of rooms, number of stories, building age, and frontiers (the cardinal direction of the building's front). Besides, in the region where various land tenure forms take place

following the continuum of land tenure, tenure status is commonly accepted as one of the affecting factors, as shown by Leksono et al. (2008) and Silalahi (2010). If there were some factors that gave the same and uniform feedback to the property value, those factors would normally be eliminated from the analysis. Those factors are not relevant for modeling. This condition is also a reason why, in those studies, the involved affecting factors always vary from one another.

Secondly, from the cadastral point of view, among the factors used by those studies, there are cadastral factors and non-cadastral factors. The cadastral factors consist of juridical and physical cadastral datasets. The juridical data in those studies are the date of transaction (Hafiz, 1994, in Ismail and Buyong (1998), legal status of the property (Silalahi, 2010; Leksono et al., 2008), and conformity to spatial planning (Silalahi, 2010; Weiss et al., 1966). The physical data are property shape and property size (used in Yomralioglu and Nisanci, 2004; Demetriou, 2018), land use, and topography (used in Leksono et al., 2008). The remaining factors are considered non-cadastral factors.

Thirdly, the necessary use of the spatial-related factors that show spatial connectivity between the property and features of interest (FOI) or points of interest (POI). Those FOIs are the spots, services, or facilities considered important in the region, for example, business centers,, transportation services, markets, health centers, religious places, and education centers. Every place would have various important facilities or services, depending on the region's characteristics. If an area is known as a student city, the important facilities or services might be university buildings, schools, a library, or other educational supports. If the area is a coastal city, water transportation facilities and other services and amenities related to the coastal and sea environment would be the important ones.

As shown in Table 1, commonly used spatial connectivity model is accessibility. Accessibility can be viewed in the form of travel time, distance, proximity, and access availability. Travel time shows the duration of travel. Travel time measurement would be operative if the road infrastructure, services' coverage, and punctuality were guaranteed. Distance is a linear measure in metric units. Proximity is a nearness to a certain threshold; for example, if the threshold is 100m, then the straight distance from the center to the threshold could be considered near. Access availability can be seen as the availability of access to transportation facilities and infrastructure in the neighborhood.

Fourthly, it is noticed that the most frequently used factors related to amenities are the ones related to the presence and provision of facilities, services, and infrastructure. However, the usage of leisure attributes (e.g., presence of water, landscape view, water view) was also shown by Weiss et al. (1966), Hafiz, 1994 in Ismail and Buyong (1998), Leksono et al. (2008), Demetriou (2018), Goffette-Nagot et al. (2011), and Ping (2005). We also took note that while most of the factors are quite general and, to some extent, could be applied to another similar area, a few are fully contextual and time-specific (i.e., only applicable to the particular time and area). An example of this situation can be seen in Weiss et al. (1966), who selected proximity to the non-white area (the term 'white' refers to skin color) as one of the affecting factors. The

social background in America at that time, where skin color matters in society, can be the reason behind this choice.

3.2. Observation of the Characteristics of Study Area

Land is unique in terms of immobility and inhomogeneity. The location is fixed, situated immobile in a particular area, but at the same time, no plot is exactly the same as another plot. Therefore, the importance of doing an investigation of the study area characteristics is actually a necessity to avoid a misleading decision about the affecting factors that may appear if we just rely completely on a review of the previous studies. Although the review may have a scientific basis, it still has a chance to fail to capture the locality and specificity of the study area.

Our valuation area is shown in the Figure 1.

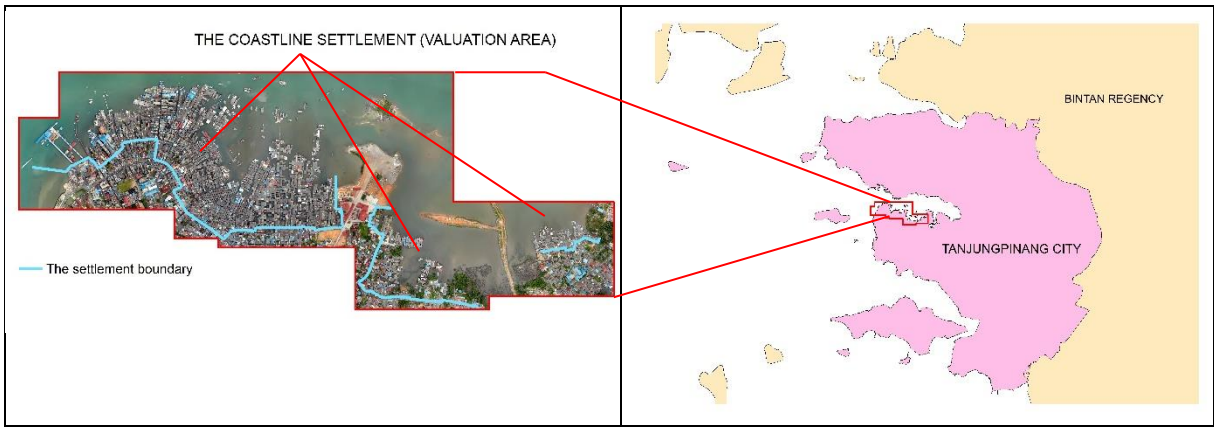

Figure 1. Study area

The investigation of the local characteristics also follows the categorization from Eckert et al. (1990).

a. Economic characteristics

The study area, which today consists of three villages (Kelurahan Tanjungpinang Kota, Kamboja, and Tanjung Unggat), is the oldest settlement in Tanjungpinang City, according to BPS (2002). A couple of Chinese merchants founded it in the 17th century. The local predicate for the area is “Kampung Tua” or Old Village. Since 1784, the area has been served as a “bandar”, or seaport,that has been known for its loading services of goods and materials, besides fishing and fishery in the Malayan Peninsula. Most of the residents rely on fishery activities as anglers or in sectors related to fishery affairs (i.e., as shopkeepers, carriers, fish-processing factory laborers, fish delivery drivers, shipping company workers, and ship repair and maintenance workers). Fishery commodities are the biggest commodity, with 46.7% of the total market share for all traded commodities in Tanjungpinang (BPS, 2015). Because fishery affairs drive the economy, the land market in the area is inevitably

influenced by the presence of some related infrastructure, such as a fish market as a business center, ports, and jetties.

b. Social characteristics

There is no social exclusion or discrimination that influences the land market in the area. The sellers and buyers may come from any ethnic group or social class. Also, unlike in some neighboring coastline settlements in the Tanjungpinang area, such as the Pulau Penyengat or Kelam Pagi settlement, the settlement does not show a communal system of land occupation that restricts land transfer and affects the land market. From the cultural aspect, although the Chinese's view about way of living and housing luck might have been influential a few decades ago, nowadays it has been left by most of the actors in the land market.

c. Characteristics from law, government, and political situation

- With regards to the conformity to spatial planning or zoning bylaws in coastal areas, generally the conformity should be viewed towards:
  - Protected and reserved areas (e.g., conservation zone, forests, and heritage zone)
  - Navigational zone/shipping line
  - Port areas
  - Prone areas for hazards and disasters
  - Open green space
  - Other zones that are restricted to residential buildings, such as governmental and military zone.

  From our investigation, performed by overlaying the area with the spatial planning map of Tanjungpinang City for 2014–2024 by means of GIS, the area only belongs to residential zones, trade and service zones, and purposely reclamation zones. The area is not located in any zones, as we mentioned earlier. Hence, we concluded that the aspect of conformity to spatial planning has been fulfilled, and our research will not use this factor to model land value because its feedback will be uniform to the model.
- In our study area, where the heterogeneity of tenure forms is apparent, the property occupation status in the area exists in two types. First, the properties lack legal proof documents. Mostly, the properties of this status are vacant lands or informal leased buildings. Second, the properties have a legal document, which can be a contractual lease document or a letter (SKT, or Letter to Prove the Possession) given by the village administration.

d. Characteristics based on physical, environmental, and location

- One unique characteristic of the coastline settlement is having two modes of transport: road and water transport, either for people or for goods delivery (cargo). According to the locals, the settlement is called pemukiman pelantar, so the roads there are also called jalan pelantar ("pelantar roads"). Although called roads, actually most of pelantar roads are still in the form of bridges, erected above the water surface. Some road segments are already hardened with concrete and coated with asphalt ("asphalt roads"). Some are already concreted but not yet asphalted ("concrete roads"), and a few are still made of wood ("wooden roads"). The pelantar roads, following a classification from Law No.

22 of 2009 on Transport and Traffic, can be categorized into collector roads, local streets, and neighborhood streets. The city's public land transportation does not serve the settlement, so the locals make use of their own vehicles for their mobility. Water transport is made by personal boats that pass through the outlet in-between the buildings or through public transportation that serves some ports along the settlement. In total, there are 14 ports in the area; 11 of them are jetties.

- There is a difference in depth across the settlement. The depth will increase gradually from the land to the sea, following the slope. The deepest position is in the outermost part of the settlement. The more jutting into the sea, the closer the access to the sea, but on the contrary, the farther the access to the land.
- The established buildings are not floating but piled, stilted buildings with a foundation that meets the water bottom. In the theory of property valuation, these non-portable buildings are called real property (IAAO, 2017). Most of them are single-family housing, not condominiums or multi-family housing.
- In the matter of road connectivity, the properties in the settlement can be classified into the properties with road connection ("road-connected properties" or "direct-access properties") and the properties without road connection, i.e., the accessibility is made through a connection from another building ("indirect-access properties") or by water only ("water-locked properties").
- The settlement is a long-standing residential area with a variety of property sizes and road frontages. The buildings were established at different times following the city's growth. It also makes the building condition vary from one another. Thus, logically, in the process of buying and selling properties, a depreciation of buildings matters. This situation is in contrast to a newly built settlement, where depreciation normally does not necessarily apply.

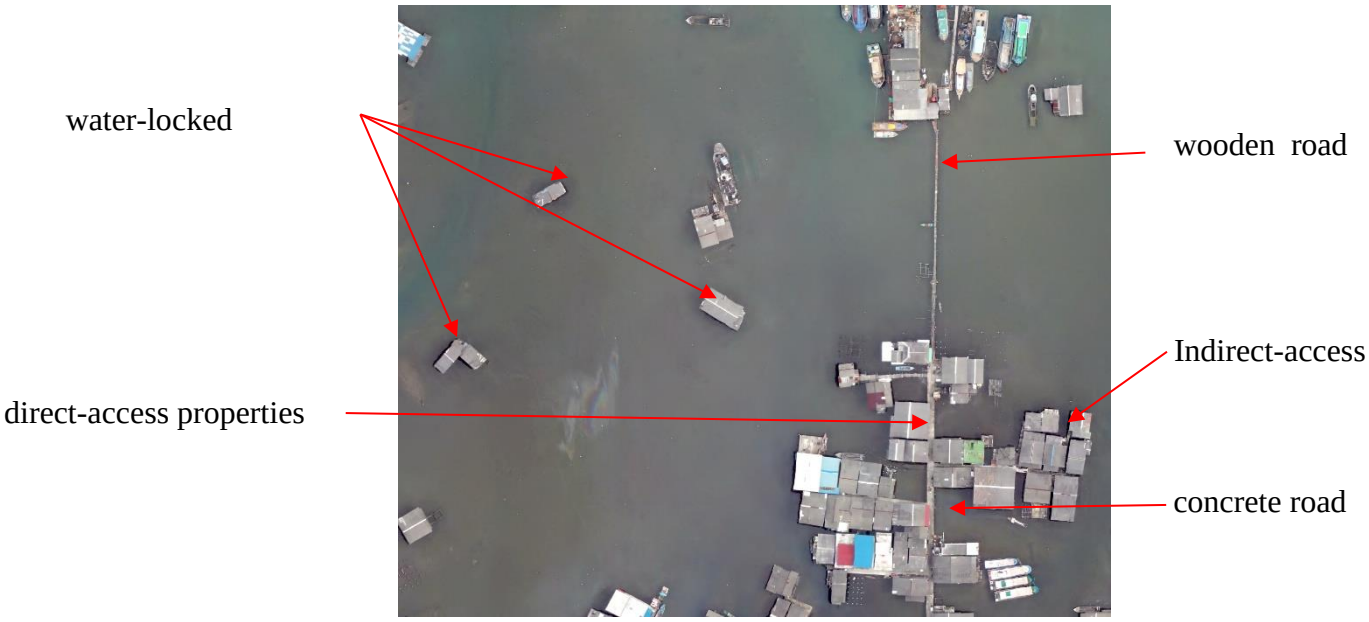

Figure 2. Properties situation based on road-connectivity characteristics

- From the field observation, it is known that clean water and electricity are distributed evenly in the settlement. Drainage, gas, and fixed-line telephones remain unavailable. This uniform situation made us unable to incorporate the factors related to the availability of utilities.
- The use of land in the study area is multifarious. Most plots are vacant lands or already in the built-up area for houses and *ruko* (or shophouses: mixed-use buildings, mostly two or three stories high, with a shop on the ground floor for mercantile activity and a residence above the shop). There are no public facilities, such as hospitals and schools, in the coastline area or its nearby surroundings that can be assumed to influence the local land market. A small number of the plots are used for worship places (mosques and temples), port buildings, shipping warehouses, hotels, swiftlet nests, and restaurants. Not all properties are saleable in the land market; for example, the properties whose uses are mosques and temples. The others are saleable and therefore have a market value, or, in other words, can be used in valuation modeling.

4. DEFINING THE VARIABLES

After knowing the rationale from the previous studies and the characteristics of the study area, we selected affecting factors from all groups. The selected factors are only the ones considered relevant. There is no factor from social group. The UAV orthophoto, field survey, and Tanjungpinang Land Office records were used to obtain the factors' datasets. The operational definition (i.e., the definition that applies specifically to this research), the description, and the process for transforming those datasets into ready-to-use variables for the modeling process are described below.

1. Date of property transfer ("dt_transf")
   A date of property transfer is a date when the transfer of a property occurs from one party to another. The date can be the date of transaction, the date of sale, the date of mortgage, or the date of contract. The letter No. 55/PJ.6/1999 from the General Director of Taxation stipulated that the date of transfer is not supposed to be more than 5 years before the valuation year (Dirjen Pajak, 1999). In this research, we took the date of transfer from 2014–2017 (4 years). In a mass appraisal, the date of valuation is normally set up in January 1st of the valuation year. Consequently, the property prices need to be adjusted following the time span from the date of transfer to the date of valuation. In this research, the valuation date is January 1st, 2018. We adopted a formula from the letter to get the percentage of correction. The formula is as follows:

$$PI = \frac{(dv - dt)}{365} * ir$$

   Where:
   PI = percentage of price increase
   dv = date of valuation
   dt = date of transfer
   ir = interest rate

2. Property price ("pr_price").
   A property price is the market price of a property in a monetary system. The price data appears in the form of transaction, sale, and contract prices. Research often only uses transaction prices and sale prices. In this research, we also used contract prices to achieve a representative number of samples in the modeling process. The data were taken from a field survey and from Tanjungpinang Land Office records. Following our consideration, as stated in Number 1 about the date of property transfer, we only took a transfer price from 2014 to 2017.
   a. Transaction price or purchase price
      A transaction price is the deal price based on an agreement between the seller and the buyer. The price is an actual price reflecting the ideal property price, and therefore there is no need for a correction.
   b. Sale price or offer price
      A sale price is the price offered by the seller. This price is usually broadcast higher than the actual price of the transaction. Thus, a correction is necessary. In this research, we used a 10% correction to get close to the actual price, following the recommendation by BPN (2014). A calculation to get the actual price from the sale price is:

$$Property\ price = sale\ price * 90\%$$

   c. Contract price.

A contract price is the price of property leasing. In a normal land market, the contract price per year is anticipated at 5–10% of the actual price, depending on the type of property (Filbert, 2014). The percentage is known as the property's yield. Vacant plots have a yield ranging from 0,5-2,5%; houses are from 3 to 5%; and shophouses are from 6.5 to 9%. This research took the highest yield percentage, meaning 2.5% for vacant plots, 5% for houses, and 9% for shophouses. To get close to the actual price, we use the calculation below:

$$Property\ price = \frac{contract\ price\ per\ year}{yield}$$

3. Interest rate ("rate")
   An interest rate is the amount of interest due per period published by the Bank of Indonesia, the country's central bank. We used the average rate from 2014-2017 to adjust the property price increase per year that is 6,4%.

4. Property use ("pr_use")
   Property use shows what kind of use the land or the buildings make. Because this research is about the valuation of residential areas, to achieve a fair market value, the properties whose utilization is commercial (shophouses, restaurants, swiftlet nest buildings, hotels) should be adjusted. Following Letter No. 55/PJ.6/1999 from the General Director of Taxation (Dirjen Pajak, 1999), we used a 25% reduction of the property price.

5. The factors related to building depreciation
   a. Building age ("bd_age")
      Building age is building effective age at the time of the valuation. In the research, we use the maximum building age of 50 years as a threshold. For a practical purpose, the effective age of the building was calculated from the last renovation, except for the ones that have never been renovated (which is very unlikely to occur) and from the construction year. According to a regulation from the Indonesian Minister of Public Works No. 24/PRT/M/2008 about Maintenance and Treatment of Buildings (Ministry of Public Works, 2008), renovation means the improvement is significant by fixing the big damage to the building with the intention to regain the functions that might be similar or improved in terms of the structure, architecture, and utilities. Renovation differs from rehabilitation, as rehabilitation only repairs the small or medium damage to the building. To calculate building effective age, we deployed a calculation from BPN (2014) as follows:

$$\text{BEA} = valuation\ year - construction\ or\ renovation\ year$$

b. Building condition ("bd_cond")

Building condition is the condition of the building seen from its structures, components, and facilities. We categorized the conditions into five categories from BPN (2014): very good (VG), good (G), average (A), bad (B), and very bad (VB).

Building effective age and building condition factors play a role as inputs for determining building depreciation. The rate of depreciation is derived from a table provided by BPN (2014).

Building effective age	Depreciation rate (in %) according to building condition				
	VG	G	A	B	VB
0	0	0	0	0	0
1	3	4	5	6	7
2	5	7	9	11	11
3	7	10	13	16	16
4	10	13	17	20	21
5	12	16	20	24	27
6	14	19	23	28	31
7	15	22	26	31	35
8	15	24	29	34	38
9	15	26	32	37	43
10	15	28	35	40	47
11	15	30	38	43	50
12	15	32	40	46	53
13	15	32	42	49	56
14	15	32	44	52	58
15	15	32	46	54	60
16	15	32	48	56	63
17	15	32	50	58	65
18	15	32	50	60	67
19	15	32	50	62	69
20	15	32	50	64	71
21	15	32	50	66	73
22	15	32	50	67	75
23	15	32	50	67	76
24	15	32	50	67	77
25	15	32	50	67	78
26	15	32	50	67	79
27	15	32	50	67	80

28	15	32	50	67	80
29	15	32	50	67	80
30	15	32	50	67	80
31	15	32	50	67	80
32	15	32	50	67	80
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40	15	32	50	67	80
41	15	32	50	67	80
42	15	32	50	67	80
43	15	32	50	67	80
44	15	32	50	67	80
45	15	32	50	67	80
46	15	32	50	67	80
47	15	32	50	67	80
48	15	32	50	67	80
49	15	32	50	67	80
50	15	32	50	67	80

Explanation of building condition:

VG : Structures, components, and facilities are in perfect state
G : Structures and components are no damage, several facilities less function
A : Structures are no damage, damage on some components and facilities
B : Structures are in small damaged, damage to most components and facilities
VB : Structures, components, and facilities are in damaged condition

6. Tenure status (te_status)
   Tenure status is defined as the tenure status of a property occupation. The status affects the property price. In a normal market value, the ideal property is one that has a formal and legalized proof of occupation. The transfer of a property without proof is considered to not deliver the actual market price, and the price is usually lower than its ideal price. Therefore, the property price must be adjusted. The letter No. 55/PJ.6/1999 from the General Director of Taxation stipulated that the adjustment is about 10–30% of the transfer price. In this research, we used 10% correction for the property without a proof of occupation and 0% correction (i.e., no correction) for the one with a proof of occupation.

7. Size of property (“size”)

The size of a property is the area of a property in square meters. We calculated two datasets concerning the size: the size of the land and the size of the building.

8. Depth ("depth")

Depths are the vertical distance from the water's bottom to the building's floor.

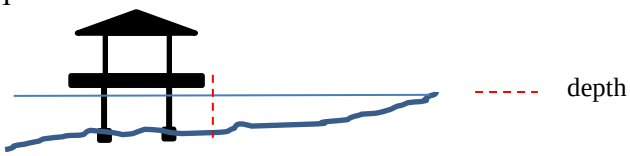

Figure 3. Illustration of depth

The depth can be seen as the affecting factor of land value in the coastline settlements because it is associated with construction costs and the risks borne by the settlers. The deeper the water, the higher the construction costs and risks due to tidal influences, currents, and waves. In his research, Firdaus, et., al (2013) explains that the threats to the area and other coasts in Tanjungpinang might come from a north wind, a natural occurrence that strikes the coastal area from November to February every year. We deployed a direct measurement using a measuring bar to obtain the depth at certain points (i.e., measurement points) near the properties. In total, we measured 60 points. Then, in order to get all the depth values for the whole area, using GIS, we converted the data into a raster by making an interpolation. Finally, we extracted the depth value of each property from the resulting raster.

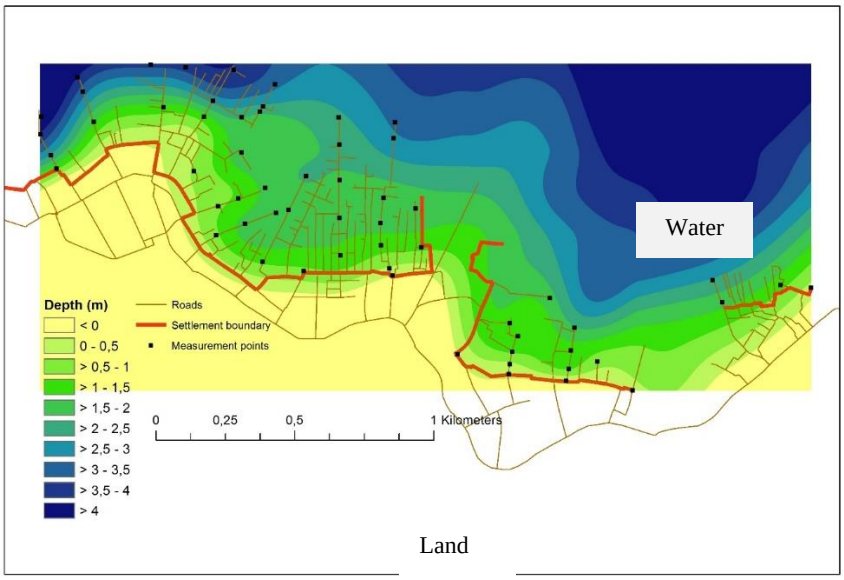

Figure 4. Depth data collection

9. Road functional-class (“road_cl”)
The road functional class is a variable showing the class based on the functionality and capacity categories of the nearest roads to the properties. As has been identified before in Section Characteristics of the Study Area, in the settlement there are three types of roads: collector roads, local streets, and neighborhood streets. The collector roads are low-to-moderate-capacity roads that serve to move traffic from the local streets to arterial roads and are designed to provide access to residential areas. All the collector roads are asphalted, which makes them the best quality for mobility and accessibility for the occupants in terms of safety and amenity. The local streets are roads that provide access inside the area and have a lower carrying capacity than the collector roads, and almost all of these roads have been concreted. The neighborhood streets are branches of the local streets and have the lowest carrying capacity. Small wooden roads, alleys, and pedestrian streets belong to the neighborhood streets. In this study, we assigned a score of 3 to collector roads, a score of 2 to local streets, and a score of 1 to neighborhood streets. The road layer was delineated from the UAV orthophoto produced before, and the road name was collected from a field survey.

Figure 5. Road functional class

10. Sea view (“se_view”)
Sea view is an amenity variable showing how the view is towards the water. This variable is categorical, where score 1 represents the properties with a water view and score 0 is for the properties that have no water view.

11. Variables related to distance
    a. Distance to central fish market (di_markt)
    Distance to central fish market is a variable that shows the shortest route from the property centroid to the central fish market as the central business district (CBD). The market is located on Jalan Pelantar KUD.
    b. Distance to nearest port (di_port)
    Distance to the nearest port is a variable that shows the shortest route from the property centroid to the nearest port.
    c. Distance to land (di_land)
    Distance to land is a variable that shows the shortest route from the property centroid to the settlement boundary that separates the coastline settlement from the mainland.

    Some notice in this distance measurement:

    - The centroid was created by GIS.
    - The route distance was measured by implementing road network modeling that finds the shortest path in the ArcGIS geodatabase.
    - If the property has two adjacent roads, we took the road situated right in front of the property, or the one with a higher level than the other one.

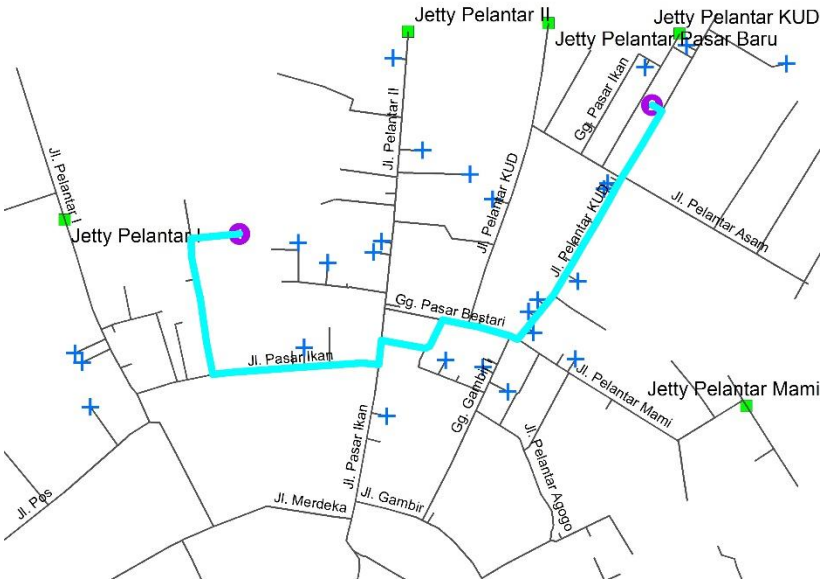

Figure 6. Distance measurement by GIS

5. Variables related to access availability

a. Access to road ("ac_road")

Access to roads is a variable that shows the connectivity of the properties to the roads. For the property that has direct access to the road (i.e., direct-access properties), we assigned a score of 1. Score 0 was assigned to the property that has no direct access (i.e., indirect-access properties or water-locked properties).

b. Access to waterway ("ac_water")

A waterway is a body of water serving as a route or a channel for vessels (i.e., a navigable body of water). Access to waterway is a variable that shows whether the properties have a waterway. Score 1 was assigned to the property that has a waterway, while score 0 is for the property that has no water access.

6. Frontage ("frontage")

Frontage is the length of the property's front side that faces directly onto the road. The frontage for the road-connected properties was measured from the UAV orthophoto using a distance measurement facility from GIS and is expressed in meters. As the water-locked properties and indirect-access properties do not have a real road frontage, we assigned a value of 0,90 meters (equal to the normal size of the entrance or door of houses in the area).

Figure 7. Property's front side

7. CONCLUSION

Based on literature review and field characteristic assessment, this paper exposes that there are 17 affecting factors of land value in the study area. No social factors are relevant in the study area and the most dominant factors based on Eckert's categorization is Physical, Environmental, Location aspects. The factors are various in characteristics as shows in Table 2.

Table 2: Affecting factors of land value

Economic (1)	Social (2)	Law, government, and politics (3)	Physical, Environment, Location		
			Physical (4)	Environment (5)	Location (6)
▪ Date of property transfer[1,a,**] ▪ Property price [1,b,**]		▪ Tenure status [1,a,**]	▪ Property use [1,a,*] ▪ Depth [3,b,*] ▪ Building age [1,b,**] ▪ Size of property [1,a,*]	▪ Sea view [3,b,*]	▪ Distance to central fish market [3,*] ▪ Distance to land [3,b,*] ▪ Distance to nearest port [3,b,*]

▪ Interest rates [1,b,**]			▪ Building quality [1,b,**] ▪ Frontage [1,b,*] ▪ Road functional class [1,b,*]		▪ Access of road [1,b,*] ▪ Access of waterway [3,b,*]

Information:
[1] = *common factors for residential area valuation*
[2] = *factors specific with local circumstances in the study area*
[3] = *distinctive factors which only apply for such settlements*
[a] = *cadastral factors*
[b] = *non-cadastral factors*
* = *spatial factors*
** = *non-spatial factors*
Our study also shows that for practical arrangement, in term of statistical approach of valuation, we need to transform those factors into dependent and independent variables. In the formation of the dependent variable (la_value), to reflect the ideal market conditions, an adjustment is made. The adjustment applies to property price, date of transfer, property use, building depreciation, tenure status, and valuation date factors. It means there will be factors will be used as build dependent variables and factors that directly used as the independent variables.

Table 3. Used variables

No	Factors	Role in the modeling	Abbreviation (variable name used in the modeling) and unit	Type of variable
1	Property price	Factors to build the dependent variable: "Land Value"	la_value (IDR/m^2)	numerical
2	Interest rates			
3	Date of sale/transaction			
4	Property use			
5	Tenure status			
6	Building age			
7	Building quality			
8	Size of property			
9	Depth	Independent variables	depth (m)	Numerical
10	Distance to central fish market		di_markt (m)	Numerical
11	Distance to land		di_land (m)	Numerical
12	Distance to nearest port		di_port (m)	Numerical
13	Frontage		Front (m)	Numerical
14	Sea view		se_view	Categorical/dummy (ordinal 2 categories)
15	Road functional class*		road_cl-local	Categorical/dummy (2 categories)
			road_cl-collector	Categorical/dummy (2 categories)

16	Access to road		ac_road	Categorical/dummy (2 categories)
17	Access to waterway		ac_water	Categorical/dummy (2 categories)

* Road functional class factor is an ordinal variable with three categories or levels. To use the regression algorithm for correctly analyzing attribute variables and logical interpretation of the result, this variable should be split into k-1 binary dummy variables; k here means the number of categories. As a result, with the neighborhood category as a reference, we will create two dummy variables, road_cl-local and road_cl-collector. The first is a dummy variable for local streets, and the latter is a dummy for collector roads.

As conclusions, this study shows that to build a sensitive model of aquatic land value, we need to elaborate many factors, and to use those factors into variables, some factors are needed to be treated accordingly. Most factors, especially the factors from physical/location aspects are different from the common factors used to build the valuation model for residential area in the mainland. Some spatial factors, such as distance, and accessibility, can be generated properly by measuring indirectly from high resolution raster data.

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BIOGRAPHICAL NOTES

Faus Tinus Handi Feryandi is a PhD student in University of Bonn with research interest in fit-for-purpose land administration and management in coastal areas. As a surveyor, currently

he is working at the Directorate General of Spatial Planning, Ministry of ATR/BPN, Republic of Indonesia in Jakarta, Indonesia.

Putri Nurul Probowati is a head of Program and Data Information Section of Directorate General of Spatial Planning, Ministry of ATR/BPN, Republic of Indonesia in Jakarta, Indonesia.

Yohanes Nurcahyo Agung Nugroho is a head of Strategic Cooperation and Data Information sub-section of Directorate General of Spatial Planning, Ministry of ATR/BPN in Jakarta, Indonesia.

CONTACTS

Mr. Faus Tinus Handi Feryandi
Ministry of Agrarian and Spatial Planning/National Land Agency
Jl. Raden Fatah No 1, Kebayoran Baru Jakarta Selatan
jakarta
INDONESIA
Email:faustinushandi@atrbpn.go.id
Web site: www.atrbpn.go.id