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COASTAL SETTLEMENT SLUM LEVEL ANALYSIS (CASE STUDY: KAMPUNG TUA TIANGWANGKANG)

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ABSTRAK
Jumlah penduduk di pulau Batam tiap tahun bertambah secara signifikan, termasuk permukiman di Kampung Tua Tiangwangkang. Stereotipe dari masyarakat mengdeskripsikan bahwa permukiman pada kampung-kampung tua di Batam menjadi kumuh seiring majunya waktu. Faktor penyebab kumuhnya suatu permukiman adalah infrastruktur yang tidak tersedia atau tidak lengkap di permukiman yang kumuh tersebut, sehingga tujuan dari penelitian ini adalah untuk mengidentifikasi tingkat kekumuhan pada permukiman pesisir di Kampung Tua Tiangwangkang. Metodologi pada penelitian ini adalah metode kuantitatif yang disusun dengan metode indeks, yaitu data-data yang disusun dalam bentuk klasifikasi tabel. Teknik pengolahan dan analisis data yang dilaksanakan adalah analisis data kualitatif, berupa arsip serta gambar yang mampu dikuantifikasikan untuk penilaian tingkat kekumuhan permukiman yang menjadi objek penelituan. Hasil penelitian menyimpulkan bahwa Kampung Tua Tiangwangkang memiliki tingkat kekumuhan sebesar 39% berdasarkan pada variabel yang ditentukan dan dianalisis. Nilai tersebut dapat bertambah untuk ke depannya bila tidak segera diatasi permasalahan yang memengaruhi kekumuhan pada tempatnya.

Kata Kunci: permukiman kumuh, permukiman pesisir, Kampung Tua Tiangwangkang

ABSTRACT
The population on Batam Island increases significantly every year, including settlements in Kampung Tua Tiangwangkang (Tiangwangkang Old Village). Stereotypes from the community describe settlements in old villages in Batam become slums over time. The causative factor for the slums of a settlement is the unavailable or incomplete infrastructure in the slum settlement, so the purpose of this study is to identify the level of slums in coastal settlements in Kampung Tua Tiangwangkang. The methodology in this study is a quantitative method compiled by the index method, namely, the data arranged in table classifications. The data processing and analysis technique is qualitative data analysis in the form of archives and images that can serve as a basis for assessing the level of slum settlements that are the object of research. The study results concluded that Kampung Tua Tiangwangkang had a slum level of 39% based on the variables determined and analysed. This value can increase in the future if problems that affect slums do not receive immediate responses in their place.

Keyword: *slum, coastal settlement, Kampung Tua Tiangwangkang*

1. Introduction

In old settlements on Batam Island, Riau Archipelago, Indonesia has long lived on the island before the current mass development. As time progresses, the population on the island will increase significantly, both residential and residential residents. One explanation that distinguishes it is the pattern of the building area for the future. The arrangement pattern of buildings on the island of Batam in residential areas appears regularly, while patterns in settlement or slum areas are elongated, skipped, and irregular (Roziqin & Kusumawati, 2017). Consequently, this will result in wasted use of land area if structuring planning does not occur in residential areas, and the consequences do not include negative factors in old settlements in Batam, which make a stereotype in settlements.

Many things have become a stereotype for old villages in Batam, one of which is that

most of the old villages on Batam Island tend to be slums visually. The slums in question are environmental conditions that are unhygienic and unkempt in buildings that are still functioning. Several photos below explain the environmental conditions in the two old villages in Batam, which have pollution in their environment.

Figure 1. Tanjung Uma (Left) and Tanjung Riau (Right) Old Villages Surrounded by Various Types of Waste
Source: Google Images

Slums can exist anywhere based on social awareness from the provincial government and homeowners. Several factors cause a settlement to become a slum, including the unavailability of landfill or dumps, the unavailability of clean water, the absence of sanitation management, and the absence of structuring plans characterized by irregular patterns. Based on the social aspects, low human resource quality may producing wastes due to its bad habits procreated by poverty, such as littering that can damage the environment, reducing the quality of existing natural resource nearby that has potential of being utilized for economic purpose (Hikon, 2019).

Only a few media discuss the Batam's old villages in various media, especially on research journal sites. Hence, these settlements, especially Kampung Tua Tiangwangkang, still needs to be widely known, especially in the eyes of Indonesia. This place is only researched few by researchers of any field, thus making it a new thing that will raise information about the old village, especially the level of slums. The purpose of this study is to identify the level of slums of Kampung Tua Tiangwangkang. With the determined slum level of Kampung Tua Tiangwangkang, the local government can already have their data to collect from and start a new program(s) that will minimize the growth rate of existing slums to spread around. If some programs succeed minimalizing the slums-spreading issue, then the economic-boosting plan, like sustainable tourism can be applied to the village to continuously lessen the habit of slums-creating littering and poverty (Murtiono et al., 2022).

2. Literature Review

2.1. Old Village

Kampung, or old village, according to Batam City Regional Regulation No. 2 of 2004, is a group of residential buildings that have been on the island of Batam for a long time before 1970, which the city of Batam had not yet begun to be designed massively and dynamically. The main characteristic of the old village is that there is a culture that is still strong in the local community. Until now, as many as 37 old villages have been established around the island of Batam, one of which is Kampung Tua Tiangwangkang.

Tiangwangkang is one of the old villages located 3 km from the Barelang 1 Bridge. Residential buildings in Kampung Tua Tiangwangkang are predominantly built in the coastal area. This is because this old village was founded by the Sea Tribe community, which the ethnic group has settled activities on canoes as their residence (Chou, 1997). Following the name of the tribe and the placement of the house they live in, the livelihood in the village is as a fisherman. Before Batam developed rapidly, some residents worked as traders due to the 'Growth Triangle' cooperation agreement between Riau (Riau Archipelago was still part of Riau province), Singapore, and Johor in December 1989.

2.2. Settlements and Coastal Settlements

In the Government Regulation of the Republic of Indonesia Number 14 of 2016 concerning the Implementation of Housing and Residential Areas, it is explained that a settlement is an area consisting of several housing units that have facilities, public utilities, and support for other functional activities, both in urban areas and rural areas. Settlements are different from housing. One of the two points of difference is generally seen in the financial status of the residents and the facilities provided by the provincial government to the area.

Suprijanto (2013, in Renwarin et al., 2015) revealed that three topologies influence settlement patterns so that they become a characteristic of residential areas, including:

a. Hilly areas cause settlement patterns to follow the contours of the land;
b. Flat areas cause settlement patterns to follow the contours of the land; and,
c. The area above the water causes the pattern of settlements to be not neatly arranged.

Coastal settlements are areas where residents live on the outskirts of islands or coastal areas. In a broad sense, the definition of coastal settlements is a coastal environment with humans that complement each other to create a community that supports human life (Lautetu et al., 2019). The coast is where the land and sea areas interact, creating a different nature from the deep land area and the distant sea.

Residential buildings in settlements in coastal areas are dominantly built on the coast up to the sea, which is not deep. Suppose several buildings are built on the mainland. In that case, these buildings function as activity facilities or public services for residents in the area, one of which is a worship building. Not a few old villages on the island of Batam are coastal settlement types, including Tanjung Uma Old Village, Tanjung Riau, Tanjung Piayu, Tiangwangkang, and others.

2.3. Slums

Slum, according to the Big Indonesian Dictionary, is a basic word in the form of an adjective that means dirty or dirty related to the village and the like. Continuing the explanation from KBBI, slums are nouns that are defined as slums or slum conditions, but if translated into English, it will be the word slums. Slums, according to the Cambridge Dictionary, have a definition as dirty and crowded areas that are not neatly arranged. In contrast, the Oxford Learner's Dictionaries defines them as an impoverished area where the residential buildings are dirty and in bad condition.

Slums are residential areas where visually, the buildings are not cleaned or are rarely cleaned, and structurally, they are not maintained and not arranged neatly, and the facilities in the form of facilities and infrastructure are incomplete. Financially, residents who live in slums are often associated with poverty, but some have financially capable status. This was corrected in an article researching slum areas in Tanjung Pinang, Riau Archipelago, Indonesia. Through interviewing residents as data collection, Harianti & Nandi (2019) concluded that most of the residents in the slums they studied were high school graduates and had nominal incomes equivalent to the minimum wage in their area.

Slums according to the Directorate General of Housing and Settlements in 2002 (in Lantang et al., 2013) explained that there are seven typologies or types of slums based on location, namely:

a. Downtown slums;
b. Slums near the city centre;
c. Slums on the outskirts of cities;
d. Fishermen’s slums;
e. Slums in tidal areas;
f. Slums in disaster-prone areas; and,
g. Slums by the river.

According to Budiharjo (2011, in Yenny et al., 2019), the dominant characteristics of a slum settlement include:

a. Non-permanent or semi-permanent building factors.
b. Irregular layout
c. The status of the building has no ownership legality.
d. Tight buildings and dense population.
e. The condition of the building needs to be more convincing (safety and comfort).
f. Dirty and polluted environmental hygiene.
g. Facility and infrastructure factors (which are not complete).

2.4. Settlement Slum Factor

The slum factor in settlements, especially near urban areas, varies from several sources. In PUPR (Public Works and Public Housing) Government Regulations, in general, seven criteria determine whether a settlement is a slum or not, including:

a. Buildings (equivalent to a large building area);
b. The environment around the road;
c. Availability of clean water;
d. Drainage of the surrounding area;
e. Waste or dirty water management;
f. Management of domestic waste or other solid waste; and,
g. Fire protection.

According to Duque et al. (2013), five variables are applied as indicators to measure the slum index in settlements in their research, which are arranged in **Table 1**.

Table 1. Variables as Indicators of Slums in a Settlement

No.	Variable	Description
1	Material	Development or renewal of building materials
2	Density	Maximum benchmark is 3 to 4 people per room (adjusts to the area of the room)
3	Water	Existence of water pipes
4	Toilet	Connection of toilets with various sanitary utilities
5	Ownership	Legality of land and building ownership

Source: Duque et al., 2013 with Modification, 2021

Aguspriyanti et al. (2020) brings together several opinions and theories from other researchers, summarizing that there are as many as 8 physical aspect variables that are factors of slums in a settlement which are arranged in **Table 2**.

Table 2. Physical Aspect Variables of Slums

No.	Variable	Description
1	Main road network	Ease of accessing an area throught the main road
2	Road quality	Current road shape or condition
3	Residential density	Wide distance between buildings and green areas or large open areas
4	Settlement tidiness	Arrangement or grouping of buildings in an orderly manner
5	Quality of the building	Current form or structural condition of the building
6	Clean water	Provision of clean water pipes ready for use
7	Domestic waste management system	Provision of landfills, etc.
8	Drainage and sanitation	Provision of sanitation facilities in buildings and drainage in the surrounding residential areas

Source: Aguspriyanti et al., 2020 with Modification, 2021

The Directorate General of Residential Areas (in Putra & Pigawati, 2021) explains that to determine the level of slums in a settlement, an analysis is needed by measuring predetermined variables. There are five variables stated in the guidelines, one of the

three is arranged in the following table.

Table 3. Variables, Scores and Criteria for the Level of Slums in a Settlement

Variable	Criteria and Score		
	Light	Moderate	Heavy
Building density	Roof area per block is less than 65%	Roof area per block ranges from 65% to 77%	Roof area per block is greater than 77&
Distance between buildings	Longer than 3 m	1.5 m to 3 m	Shorter than 1.5 m
Road condition and quality	Good condition, more than 50% of the total road area have been repaired	Good condition, total areas that have been repaired ranges from 30% to 50%	Good condition, less than 30% of the total road area have been repaired

Source: Directorate General of Residential Areas (in Putra & Pigawati, 2021)

3. Research Methods

The methodology applied is a quantitative method by testing the above stereotypes as a hypothesis in this study (Sugiyono, 2008). The quantitative method in this study was compiled using the index method, namely the data arranged in tabular form. The data processing and analysis technique carried out is qualitative data analysis which can be quantified according to the variables or points to be studied. After collecting and indexing, it can be calculated how big the level of slums in the settlements in this study is by using the following formula:

$$\boldsymbol{TK} = 100\% - \left(\frac{\Sigma\, Sv}{Smax}\right)$$

Details:
TK : The slum level of a settlement
Σ Sv : Total score for each variable
Smax : Maximum score (18; no unit)
*Note : The smaller the value of the calculation results (towards 0%), the cleaner and more complete the facilities of a settlement

The research was conducted in 2021, the year world was being attacked by the COVID-19 pandemic. Due to the pandemic which was still spreading in the Batam area, all outdoor activities are still limited in accordance with regional and central regulations. With these activity limitations as research limitations, the data collection method in this study was archived and observational.

Archives in this study are a method of collecting references and/or data sourced from academic documents or social media that have discussed a particular topic or location. Sources from internet articles, especially on local news websites that will be taken are sources with the latest publication time so that the information obtained is the latest information in a place. Observation according to Morris (Hasanah, 2016) is a method of observing in a place that involves all human senses by collecting impressions from the target location as data for research, both with tools and without tools.

This study chose Kampung Tua Tiangwangkang as the research locus of this research. It is located about 3 km from the main route to first Barelang Bridge, Batam, Riau Islands, Indonesia.

Figure 2. Map of the Kampung Tua Tiangwangkang Area
Source: Google Maps

The implementation of the research focuses on testing certain variables which are studied from the slum factors in the settlement at the research location. From the results of the review of several literature, modifications were made to all the variables and descriptions obtained so that they became the points to be tested in this study in the following table:

Table 4. Indicators of Slums in a Settlement with Scores and Assessment Criteria

Research Variables	Poor (0)	Enough (1)	Good (2)
	Criteria	Criteria	Criteria
Road accessibility	So narrow that a car or motorbike cannot access the road	Narrow, but a car is still able to access the road	Wide; can be passed by the width of 2 or more cars
Clean water distribution	So narrow that a car or motorbike cannot access the road	Narrow, but a car is still able to access the road.	Wide; can be passed by the width of 2 or more cars
Sanitation facilities and sea water quality	Minimum access to clean water from local water supplier, not even identified	Only some buildings have access to clean water	All buildings have access to clean water
Drainage	The existence of sanitation utilities is not identified and almost the entire sea area is polluted	Only a few places have been facilitated by sanitation utilities and a small part of the sea area is polluted.	Dirt and liquid waste can be managed properly
Arrangement between buildings	The drainage of the surrounding area is not identified	Only a part of the area has drainage installed, especially around roads.	The entire area has drainage installed
Density between buildings	Very disorganized regularly	Unorganized, but patterns identified in the settlements	Settlement patterns are well-ordered, generally symmetrical if areas are separated
Building materials	Distance between buildings is shorter than 1.5 m	Distance between buildings is as far as 1.5 m to 3 m	Distance between buildings is longer than 3 m
Waste management	Availability of waste management facilities not identified	Only some areas have provided waste storage facilities	All areas have provided waste storage facilities
Environmental condition of the main road	Neither the main road nor the entrance to the building has ever been renovated	Only part of the road has been updated	All the roads have been renovated

Source: Authors, 2021

4. Results and Discussion

Based on the results of observations in Kampung Tua Tiangwangkang, there are several samples that can be taken to assess the level of slums in these settlements. The scope of these samples was taken from in front of the residential yard and in Kopak Jaya 007 as a seafood restaurant in the village.

Road accessibility for public buildings, such as restaurants in the Tiangwangkang settlement is made extensively to fit a safe traffic as wide as one car, however, road accessibility for residential buildings is not made extensively and can only accommodate one motorcycle wide.

Figure 3. Load Flow of Transportation Roads When Entering Kopak Jaya 007 Restaurant Parking Lot (Left) and When Entering Residential Areas (Right)
Source: Authors, 2021

Clean water distribution for the Tiangwangkang settlement has also been provided by the Batam city government as a form of realization of the KoTaKu (City without Slums) program since 2018.

Figure 4. Clean Water Reservoirs in Kopak Jaya 007 Restaurant (Left) and in One of the Residential Buildings (Right)
Source: Authors, 2021

The drainage system in the area was not designed in 2016. After conducting observations, it is known that to date, drainage for the Kampung Tua Tiangwangkang area has been realized, but only in areas where public places have been designed.

Figure 5. Drainage System that was not Visible in 2016 (Left) and Partially Constructed in 2021 (Right)
Source: Google Earth (Left); Authors, 2021 (Right)

In the inter-building arrangement, when viewed from above via Google Maps, it can be explained that the development in Kampung Tua Tiangwangkang follows the shoreline which

almost forms a symmetrical upward-curving line when split into two parts. The arrangement of the buildings in the village is quite neat and attractive in terms of shape, but there are problems related to the density of residential buildings that are very close together. After measuring the separation distance (measured from the outer wall), it is known that the average distance between buildings is more than 1 meter, but not up to 1.5 meters as the standard minimum separation distance for a settlement.

Figure 6. Arrangement of Buildings in Kampung Tua Tiangwangkang (Gray = Dividing Line Indicator; Blue = Mainland Public Buildings; Red = Traffic Flow and Human Circulation; Yellow = Residential Areas)
Source: Google Maps with Modification, 2021

Figure 7. Density of Buildings Close Together for Settlement
Source: Authors, 2021

Explanation of the building must be separated from the material or materials used to construct the building. The observation results show that each house has taken care of its front appearance by painting the surface of the house to resemble a national flag, but there are still parts that need to be updated even though the damage is evident.

Figure 8. Building Materials whose Visual Quality is Maintained (Painting is Done), But There Are Still Defects in Parts that are not Maintained
Source: Authors, 2021

After observing the area, waste management or management in Kampung Tua Tiangwangkang can be classified as 'not strictly enforced'. There is a garbage collection center in the center of the settlement (close to the Kopak Jaya 007 Restaurant). The existence of garbage in the shelter indicates that domestic waste was once managed by residents of the

settlement, but there is still plastic waste that is disposed of carelessly, especially in the drainage provided there.

Figure 9. Domestic Waste Storage in Kampung Tua Tiangwangkang
Source: Authors, 2021

Figure 10. Small Plastic Wastes that are Disposed of Improperly
Source: Authors, 2021

The quality of the road in the Old Village of Tiangwangkang was once managed by local residents. Figure 5 explains that roads for human circulation such as sidewalks have been designed with paving block material in the shape of a hexagon and are arranged at almost both ends of the settlement. The contours of the land in the parking area have been adjusted to ensure safety for each vehicle owner to be able to park in that area.

Figure 11. Paving Blocks as A Material for Residential Sidewalk
Source: Authors, 2021

To determine the quality of sea water in the Tiangwangkang settlement, it is necessary to carry out direct observations at the location. Based on observations, the condition of sea water in the settlement as a whole is still relatively clear, does not smell, and minimal small trash. Even though it is clean or minimally polluted, it is known that there are sinks from public buildings that flow directly into the sea. This clearly indicates sea water pollution at certain points.

Figure 12. Condition of Sea Water in the Tiangwangkang Settlement which is Polluted by Detergent or Domestic Chemicals (Soap, etc.)
Source: Authors, 2021

Figure 13. Sink Channel that Flows Directly into the Sea
Source: Authors, 2021

Due to regulations of COVID-19 prevention, sampling when observing the area cannot be carried out in depth, especially regarding the availability of sanitation facilities in the Tiangwangkang settlement. As an alternative to completing the lack of samples, this research also takes or borrows the results of analyzes that have been carried out by other researchers through the website. Reporting from *batamnow.com* (Domu, 2021), Amos as the head of the neighborhood in Kampung Tua Tiangwangkang stated that building utilities, such as sanitation facilities, were adequate in each building, so that local residents did not need to be ashamed of local or foreign tourists visiting their village. Despite the pandemic has passed and been overcome drastically, not only the settlement there, but the public place such as the seafood restaurant still hasn't changed their sanitation piping to flow the sewage into certain hygienic containment(s) like junction boxes or septic tank.

After obtaining these samples and analyzing each research variable, scores can be calculated to determine the slum level in the village. The following is the result of calculating each variable in tabular form:

Table 5. Research Results with Assessment of Each Variable

Research Variables	Score Analysis Results
Road accessibility	1
Distribution of clean water	2
Sanitation facilities and sea water quality	1
Drainage	1
Inter-building arrangement	2
Density between buildings	0
Building materials	1
Waste management	1
Main road environmental conditions	2

Source: Authors, 2021

5. Conclusion

From the results of the analysis and discussion in this study, it can be seen the level of

slums in settlements in Kampung Tua Tiangwangkang using the formula described above.

$$\boldsymbol{TK} = 100\% - \left(\frac{\Sigma\, Sv}{Smaks}\right) \rightarrow 100\% - \left(\frac{11}{18}\right)$$

$$\boldsymbol{TK} = 100\% - 0.61 \rightarrow 100\% - 61\%$$

$$\boldsymbol{TK} = 39\%$$

The calculation concludes that the coastal settlements in Kampung Tua Tiangwangkang are still classified as slums; at least the level of slums is likely mild-medium if the value does not exceed 50%. Things that affect the high value of the slum level, as well as being a problem in the village, include:

a. The density between residential buildings is quite close together, so it becomes a significant problem in the future when the population increases.
b. Lack of awareness of the importance of cleanliness in the surrounding area will cause environmental pollution and trigger tourists not to visit the Tiangwangkang Old Village if they know of wrong impressions regarding the village.
c. Some building materials need to be renewed, especially the foundation of the building made of wood. It will be a severe problem for affected building owners if the bars are no longer suitable for use but are not renewed.
d. Minimal sanitation facilities are implemented. If there is, the sewer will flow directly into the sea, as shown in Figure 13. If this problem is not resolved immediately, there will be an increase in seawater pollution in the village, and it threatens to disrupt the activities of the local community, especially people who work as fishermen and fish breeders.

Thus, the results of this study, it is hoped that this article can add information about Kampung Tua Tiangwangkang, which until now still needs more information. Authors hoped that this article can also help other researchers who are carrying out research to assist the process of developing a literature review on their articles.

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