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Direction for Physical Arrangement of Slums in Coastal Areas (Case Study: Liem Hie Djung Area, North Nunukan Village, Nunukan Regency)

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ABSTRACT

The process of urban development is always faced with various kinds of problems. One of the most important problems is the limited ability of cities to provide housing for residents who continue to grow and grow rapidly. The objectives of this study are: (1) To find out the extent of the level of slums in the Coastal Area around Liem Hie Djun, (2) To find out the correlation between the factors causing slums to the level of slums, and (3) To formulate directions for the arrangement of physical buildings of houses and the arrangement of basic infrastructure of the residential environment in the research area so that a residential environment with healthy and good environmental quality is realized. This research method uses the Spearman correlation method, and (3) The results of these two analyses are used as inputs in efforts to organize the slum environment, using the development analysis method. Based on the results of the analysis that has been carried out, it was found that the level of slums in RT 9 and RT 10 is heavy slums with weighting values of 374.8 and 328.5, respectively. Meanwhile, RT 11 is included in the category of medium slum level with a weighting value of 297. The results of the correlation analysis showed that the indicators of the level of health and comfort of buildings and environmental sanitation conditions had a perfect relationship that affected the level of slums. In RT 9, the level of health and comfort of buildings has a strong relationship affecting the level of slums.

Introduction

Many cities in Indonesia have experienced quite rapid development and will continue in the future (Nurmandi, 2022). The realization of the development of this city is reflected in the rapid expansion of the city, the high level of urbanization, and the increase in economic development which is characterized by the concentration of various kinds of economic activities, especially industry, modern services, and large-scale trade. All of these have encouraged the development and change of life of most urban people

(Suryawan, 2014). Social changes and modernization of life have changed consumption patterns, lifestyles and social behaviours towards improved welfare (Adinda et al., 2022).

Facing the process of urban development, the city government is always faced with various kinds of problems. One of the most important problems today and likely to happen in the future is the limited ability of cities to provide housing for residents who continue to grow and grow rapidly (Adawiyah et al., 2023).

Based on the history of urban growth in Indonesia, it can be traced that the housing problem has never been completely addressed. This condition triggers the development of illegal settlements that do not have a plan so they are slums (Hatuwe et al., 2021).

The problem of slums also occurs in coastal areas, including in the Coastal Area around Liem Hie Djung which is located in North Nunukan Village, Nunukan Regency. Nunukan Regency has great potential, especially in the trade sector because it is supported by the role of Nunukan City as a transit city before traders make transactions to Malaysia and vice versa (inter-island trade).

Economic activities in Nunukan City are growing rapidly in the Coastal Area around Liem Hie Djung which is known as a trading landing point from and to Malaysia. This condition causes the area to become crowded for job seekers in Nunukan City (Jones, 2015).

Along with time, in 2003 the Coastal Area around Liem Hie Djung changed with the construction of a pier and a trading centre and was used as a strategic place for the development of building spatial planning and coastal environment in Nunukan City. This condition affects the increase in the number of job seekers who choose to settle in the area so that from year to year the number of settlements without planning (slum settlements) is increasing (Ardi & Rahmawati, 2019).

The slums that exist in the Coastal Area around Liem Hie Djung at this time can be described through various conditions such as inadequate basic infrastructure of the residential environment, the physical condition of residents' houses, and the low socio-economic conditions of the community in the area (Hendriani et al., 2023).

The high level of slums in the coastal area around Liem Hie Djung hurts the health of the surrounding community. Based on data obtained from the North Nunukan Village Health Center, until 2005 the most common types of diseases suffered by the community, especially children, were diarrhoea, upper respiratory tract infection (ISPA), and itchy skin disease. This is a follow-up impact of unhealthy environmental conditions. In addition, the slums in the area have a bad visual impact so it affects the physical development and image of Nunukan City as the capital of the district (Lekipiouw, 2020).

This study aims to determine the level of slums in the Coastal Area around Liem Hie Djung, identify the correlation between the factors causing slums and the level of slums in the area, and formulate directions for the arrangement of physical buildings of houses and basic infrastructure of the residential environment to create a healthy environment and by healthy settlement standards. This research is useful for academics as an addition to scientific discourse, providing input for the Nunukan Regency Regional Government in formulating efforts to organize slum areas, helping coastal communities

to realize a healthy settlement environment, and as a medium for scientific development for authors in responding to slum problems.

Method

The sampling method was used in the distribution of questionnaires to respondents with the sample used in the form of houses that were divided into several types, including permanent houses, semi-permanent houses, and non-permanent houses. Sampling is within the scope of RT 10, RT 11, and RT 12 North Nunukan Village with the target of distributing questionnaires is the heads of families living in the three RTs. The sampling technique is *Stratified Random Sampling*, which is stratified or layer-based sampling (Tatang, 2000:154).

The determination of the number of house samples that are the object of research uses a formula developed by Slovin (1960) in Kusmayadi (2000:74), namely:

$$n = \frac{N}{N(e)^2 + 1}$$ ..... (Equation 1)

Information:

n = Number of samples

N = Number of population

e = Margin error (precision degree value)

The margin of error was 7%. This shows that the level of scrutiny of the research can be categorized as meticulous with a confidence level of 93%.

The number of houses according to the type in each RT is as follows:

Table 1
Number of Houses by Type in 2005 (Units)

Location	House Type			Number of Population
	Permanen	Semi-Permanent	Non-Permanent	
RT 9	0	31	0	**31**
RT 10	16	170	1	**187**
RT 11	2	69	22	**93**
Sum	**18**	**270**	**23**	**311**

The calculation of the number of samples for each type of house from each sub-population uses the following formula:

$$ni = \frac{Ni}{Nt} \times nt$$ ..... (Equation 2)

Information:

Ni = Number of subpopulation samples

Ni = Number of sub-populations

nt = Number of population samples

Nt = Number of population

Based on the formula above, the calculation of the number of samples for each type of house in each RT is obtained as follows:

Table 2
Sample Distribution

Location	House Type			Total Samples
	Permanen	Semi-Permanent	Non-Permanent	
RT 9	0	27	0	27
RT 10	8	89	1	98
RT 11	1	47	15	64
Sum	9	163	16	189

Data Collection Techniques

1. Data Primer

Primary data collection techniques are carried out through:

2. Observation

It is carried out to obtain qualitative and quantitative data related to the substance of the research and can be done using photos, among other things, providing information about the existing conditions of the residential environment including the physical condition of the building and the condition of basic infrastructure facilities in the research area.

3. Questionnaire/ Spread of Question List

It was carried out through the distribution of questionnaires to several residential houses located in RT 9, RT 10, and RT 11 according to the details of the number of samples needed. The purpose is to find out the perception of community needs regarding the improvement of basic infrastructure in the residential environment.

4. Data Seconds

Obtained based on literature studies through various literature or data obtained from related agencies.

Data Analysis

Research on the slum environment is carried out through several stages of analysis:
Stage I: analysis of the assessment of the level of slums and analysis of the correlation of factors affecting the level of slums.
Phase II: efforts to arrange the slum environment, including analysis of the arrangement of the physical buildings of the house and the basic infrastructure of the residential environment.

Results and Discussion

Basic Physical Characteristics

Nunukan Regency as a district bordering Malaysian territory has a land area of ± 13,917.76 km2. Nunukan Regency is divided into 21 sub-districts, including Nunukan District, Sebatik District, Sebuku District, Lumbis District, Sembakung District, Krayan District, and South Krayan District.
Nunukan Regency has the following administrative boundaries:

North: East Malaysia, Sabah
East: Sulawesi Sea
South: Bulungan Regency and
Malinau Regency
West: East Malaysia, Sarawak

The research area is located in North Nunukan Village with the following administrative boundaries:
North: Luciana Strait
(East Malaysia, Sabah)
East: East Nunukan Village
South: South Nunukan Village
West: West Nunukan Village
The research area was then narrowed again, including RT 9, RT 10, and RT 11.

Population Characteristics

Table 3
Number of Residents of North Nunukan Village per RT in 2005

RT	Total Population (Soul)		
	Man	Woman	Sum
1	81	135	216
2	289	215	504
3	213	206	419
4	319	293	612
5	218	184	402
6	415	329	744
7	229	195	424
8	326	47	126
9	79	254	578
10	345	312	657
11	301	268	569
12	324	272	598
Total	**3139**	**2710**	**5849**

As of 2022, the number of residents in North Nunukan Village reached 5849 people with a ratio ratio between men and women of 54% men and 46% women. The largest population of 744 people is in RT 6 and the smallest 126 people are in RT 9.

Table 4
Number of North Nunukan Village Households per RT in 2022

Location	Number of Households
1	43
2	118
3	117
4	144
5	79
6	183
7	109
8	125
9	130

10	188
11	105
12	31
Total	**1372**

The number of households in North Nunukan Village as a whole is 1388 households. The largest households are in RT 10, which is 188 families, and the smallest in RW I2, which is 31 families (Widyastuty & Ramadhan, 2019).

Land Use Characteristics

Land use in North Nunukan Village until 2005 as much as 56% (7,500 km2) was dominated by dryland or field agricultural activities and 20% in the form of bushes. Meanwhile, the use of land for housing and yard activities is 13% of the total existing land.

Table 7
Land Use of North Nunukan Village in 2005

Land Use	Total (km2)	(%)
Housing and Yards	1729	13
Simple Rice Fields	0	0
Dryland Farming/ Plantation	7500	56
Pond	1500	11
Industrial	0	0
Bushland	2750	20
River, Alley, Road, Cemetery	0	0
Total	**13479**	**100**

Housing Characteristics

Housing in North Nunukan Village, which is located in the Coastal Area around Liem Hie Djung, is dominated by traditional houses in the form of stilt houses built using plank/wooden foundations. The roof used to protect the residents is made of zinc/nipa leaves. Meanwhile, the floor material of the house also uses wood/boards.

Socio-Economic Characteristics

According to data summarized from the 2022 North Nunukan Village Monograph document, there are 85% of the population in the area have a livelihood as traders. Meanwhile, the average level of education of the community in the region is mostly graduates of the First Level Senior High School (SLTP), which is as much as 35% of the population.

Table 8
Number and Type of Occupation of Residents in the Coastal Area around Liem Hie Djung in 2022

No	Work	Sum
1	Company Employees	31
2	Farmer	120
3	Merchant	2478
4	Tukang	34
5	Civil Servants	219
6	TNI/POLRI	40

Sum	**2922**

Table 9
Final Education Level of Residents in the Coastal Area around Liem Hie Djung in 2022

No	Final Education Level	Sum
1	Not yet in school	128
2	Not Graduated from Elementary School / Equivalent	674
3	Elementary School Graduation	1210
4	Completion of Junior High School	1887
5	High School Graduation	1439
6	Academy Graduation	0
7	Graduated from College	33
8	Illiteracy	0
	Sum	**5371**

Correlation Analysis of Influencing Factors on Slum Levels

Variables that affect the level of slums can be seen in the following correlation interpretation table.

Table 10
Interpretasi Hasil Korelasi

Variable Y	Variable X	Correlation Coefficient	I'll screw up Relationship
Slum Level	Environmental Sanitation Conditions	-0,811 (**)	Sempurna
	Health and comfort level of the building	-0,802(**)	Sempurna
	Building Ownership Status	-0,636(**)	Strong
	Waste Services	-0,560(**)	Enough
	Dengue Fever Pain Figures	0,488(**)	Enough
	Quality Level of Building Structure	-0,484(**)	Enough
	ISPA Pain Figures	0,453(**)	Enough
	Number of households per house	0,449(**)	Enough
	Clean Water Service	-0,442(**)	Enough
	Income Level	-0,286(**)	Weak
	Malaria Morbidity Rate	0,249(**)	Weak
	Diarrhoea Pain Figures	0,231(**)	Weak
	Road Condition	-0,180(*)	Very Weak
	Educational Status	-0,161(*)	Very Weak
	Floor Area Utilization Rate of Building	-0,148(*)	Very Weak
	Land Legality Status	-	No relationship
	Frequency of Fire Disasters	-	No relationship
	Frequency of Flood Disasters	-	No relationship
	Average Household Members	-	No relationship
	Building Floor Quality Level	-	No relationship

The level of slums has a perfect relationship with environmental sanitation conditions and the level of health and comfort of buildings where the correlation value is between 0.80 – 1.00.

Meanwhile, the interpretation of each RT is as follows:

RT 9

Table 11
Interpretation of Correlation Results in RT 9

Variable Y	Variable X	Correlation Coefficient	I'll screw up Relationship
SLUM LEVEL	The health and comfort level of the building	0,678	Strong
	Building ownership status	0,470	Enough
	Clean water service	0,470	Enough
	Environmental sanitation conditions	0,470	Enough
	Dengue Fever pain rate	- 0,470	Enough
	ARI's pain rate	- 0,470	Enough
	The quality level of the building structure	0,454	Enough
	Land legality status	-	No relationship
	Frequency of fire disasters	-	No relationship
	Frequency of flood disasters	-	No relationship
	Average household members	-	No relationship
	Number of households per house	-	No relationship
	Malaria morbidity rate	-	No relationship
	Diarrhea pain rate	-	No relationship
	Level of use of building floor area	-	No relationship
	The quality level of the building floor	-	No relationship
	Waste service	-	No relationship
	Road conditions	-	No relationship
	Educational status	-	No relationship
	Income level	-	No relationship

Based on the table above, it is known that 7 variables have a significant influence on the level of slums in RT 9. The variables that influence RT 9 in order are the level of health and comfort of the building, the status of building ownership, clean water services, environmental sanitation conditions, Dengue Fever pain rate, ISPA pain rate, and the quality level of building structures.

The variable that has a strong influence is the level of health and comfort of the building.

RT 10

11 variables affect the level of slums in RT 10 with different correlation coefficients. RT 10 is an RT with a level of slum that is classified as a heavy slum. Variables that affect the level of the slum are the level of health and comfort of the building, environmental sanitation conditions, diarrhoea pain rate, ISPA pain rate, building structure quality level, malaria pain rate, dengue fever pain rate, number of households per house, building ownership status, flood disaster frequency, and clean water services.

Table 12
Interpretation of Correlation Results in RT 10

Variable And	Variable X	Correlation Coefficient	I'll screw up Relationship
SLUM LEVEL	The health and comfort level of the building	0,958	Sempurna
	Environmental sanitation conditions	0,872	Sempurna
	Diarrhea pain rate	- 0,441	Enough
	ARI's pain rate	- 0,411	Enough
	The quality level of the building structure	0,337	Lemah
	Malaria morbidity rate	- 0,323	Lemah
	Dengue Fever pain rate	- 0,300	Lemah
	Number of households per house	- 0,263	Lemah
	Building ownership status	0,256	Weak
	Frequency of flood disasters	0,249	Weak
	Clean water service	0,249	Lemah
	Land legality status	-	No relationship
	Frequency of fire disasters	-	No relationship
	Average household members	-	No relationship
	Level of use of building floor area	-	No relationship
	The quality level of the building floor	-	No relationship
	Waste service	-	No relationship
	Road conditions	-	No relationship
	Educational status	-	No relationship

Variable And	Variable X	Correlation Coefficient	I'll screw up Relationship
	Income level	-	No relationship

Variables that have a perfect relationship in the sense that it is very strong to the level of slums in RT 10 are the level of health and comfort of buildings and environmental sanitation conditions.

RT 11

5 variables affect RT 11. Influential factors include building health, sanitation, ARI sickness rate, malaria sickness rate and income level.

Variables that have a strong influence on the level of slums in RT 11 are the level of health and comfort of buildings and environmental sanitation conditions.

Table 13
Interpretation of Correlation Results in RT 11

Variable And	Variable X	Correlation Coefficient	I'll screw up Relationship
SLUM LEVEL	The health and comfort level of the building	0,632	Strong
	Environmental sanitation conditions	0,632	Strong
	ARI's pain rate	- 0,370	Weak
	Malaria morbidity rate	- 0,343	Weak
	Income level	0,257	Weak
	Land legality status	-	No relationship
	Building ownership status	-	No relationship
	Frequency of fire disasters	-	No relationship
	Frequency of flood disasters	-	No relationship
	Average household members	-	No relationship
	Number of families per umah	-	No relationship
	Diarrhea pain rate	-	No relationship
	Dengue Fever pain rate	-	No relationship
	The quality level of the building structure	-	No relationship
	Level of use of building floor area	-	No relationship
	The quality level of the building floor	-	No relationship
	Clean water service	-	No relationship
	Waste service	-	No relationship
	Road conditions	-	No relationship
	Educational status	-	No relationship

Efforts to Arrange the Slum Environment

In this study, the direction of the physical building arrangement activities of the house refers to the General Guidelines for Healthy Simple Houses No. 403/KPTS/M/2022. The directions for the arrangement of the physical building of the house are as follows:

a. Improvements to the minimum needs of mass (appearance) and space (inside and out)

Efforts to improve the minimum needs of mass (appearance) and space (inside and out) can be carried out through the expansion of house buildings which is calculated using the minimum standard of space area requirements per person of 7.2 m2 (by the General Guidelines for Healthy Simple Houses No. 403/KPTS/M/2022). The minimum house building area in the study area is 7.2 m2 X 6 (average house occupants) = 43.2 m2 with the calculation of the average ceiling of the house being 2.80 m.

b. Improvement of health and comfort needs of home buildings

The results of the correlation analysis show that in the research area, the indicators of building health and comfort have a perfect relationship with the level of slums. This means that the more unhealthy and comfortable the house building is, the more slum the residential environment. The unhealth of house buildings in the study area can be seen from the poor quality of building floors and air circulation systems. Based on these conditions, improvement efforts that can be made to meet the health and comfort needs of house buildings in the research area include:

a) Improving the quality of the floor of the house building

The location of the research area in the coastal area causes residents' houses to be dominated by stilt houses made of boards/wood that are susceptible to moisture. To meet the requirements of the health and comfort needs of house buildings, house floor materials at least use board materials in good condition, dry, and not easily weathered.

b) Improvement of the air circulation system

The density between one house building and another in the research area causes the air circulation system and solar lighting in the house to be disrupted. In addition, based on the observation results, the ventilation and height of stilt houses in the research area tend to be limited. To meet the requirements of the health and comfort needs of the house building, it is necessary to add ventilation and windows as well as the height of the house building. The goal is so that air and sunlight can freely enter the house and reduce humidity.

c) Improvements to the minimum security and safety requirements

Improvements to the minimum security and safety needs are carried out by improving the quality of the structure of simple residential buildings, including the foundation of the house building, walls (and building frames), and roofs. In the research area where most of the residents' houses are stilt houses, the building structure can at least use good quality and durable wood (not easily weathered).

d) Implementing control efforts on the construction of new houses as one of the measures to prevent the development of the slum environment from becoming uncontrollable. It can be done through the issuance of a Building Permit (IMB) so that every new development must be equipped with an IMB.

e) Carry out continuous maintenance of the environment and house buildings, especially the environment and house buildings that have become habitable, both in terms of the quality of the building structure and in terms of the health of the building and the environment.
f) House buildings that are still non-permanent can be upgraded to semi-permanent houses by replacing the building structure that currently uses plywood with boards/wood that are in good condition, dry, and durable (not easily weathered).

Arrangement of Basic Infrastructure for Residential Environments

1. Clean Water Service Level

The reach of clean water services from PDAM has not reached all levels of society, so to meet the needs of clean water, they get it from well water and rainwater. (the percentage of the number of houses that have not received clean water services in RT 9, RT 10, and RT 11 is 96%, 72%, and 70%, respectively). The arrangement of basic infrastructure for the residential environment in the clean water service sector is directed to expand the reach of clean water services from PDAMs through direct connections, the placement of hydrants, and public faucets. This aims to meet the community's needs for clean water.

2. Waste Services

The results of the slum-level assessment analysis showed that the percentage of houses that threw garbage out of place was 78% in RT 9, 80% in RT 10, and 67% in RT 11. The habit of people throwing garbage out of place is due to the reach of garbage disposal locations that are far from their homes. The direction of arranging settlement infrastructure in the waste system in this study is as follows:

1) Providing waste disposal locations at several strategic and affordable points for the entire community, namely 1 TPS each in each residential neighbourhood in each RT that must meet the requirements, such as a minimum environmental waste bin capacity of 2 m3, garbage cans made of water-tight materials and can be an open space that can place 1-2 containers with a capacity of 6 m3.
2) Waste transportation facilities in the form of wheelbarrows which are currently only available for 1 unit for the needs of several RTs are directed to increase the number, namely, each RT is provided with 1 unit of the wheelbarrow.
3) The period of waste transportation is set to a maximum of every 2 days and it is attempted that waste transportation is carried out every day.
4) Provide counselling in an incentive manner by the government and related parties to the community in slum areas about the importance of healthy living so that it is hoped that gradually the habit of people throwing garbage out of place can be reduced and even disappear.

Environmental Sanitation Conditions

The problem of environmental sanitation in the research area is the absence of toilets and toilets for stilt house buildings above seawater bodies due to the absence of land and weak economic capabilities. An alternative solution to this problem is to make

a public WC/MCK. The standard for the use of public toilets is 140 people (SNI No. 03-2399-2002 concerning Procedures for Planning Public Toilets Buildings). The standard number of public toilet users is equivalent to 23 housing units (one house has 6 people). Based on the available data, in the research area, 48 housing units have not been equipped with WC/MCK with details of 24 housing units in RT 9, 16 housing units in RT 10, and 8 housing units in RT 11.

Adapun arahan teknis pembangunan MCK umum, adalah sebagai berikut:

1. Sesuai dengan standar yang ada, di wilayah penelitian diarahkan untuk dibangun 2 unit MCK umum untuk melayani 48 unit rumah yang belum dilengkapi dengan WC/ MCK. Penempatan 2 MCK tersebut diarahkan pada lahan kosong yang berada di RT 9 dan RT 11.
2. Arahan pemilihan lokasi didasarkan pada lahan kosong dan radius pelayanan 50 m serta jarak ke lokasi sumur gali 10 m.

Road Condition

The condition of the road in the research area uses pavement in the form of wood. Based on the results of the assessment of the level of slums, it is known that the percentage of damaged roads at this time is higher. The percentage of damaged roads in RT 9, RT 10, and RT 11 is 100%, 96%, and 100%, respectively. According to the results of the correlation analysis, the condition of the road network does not have a close relationship with the level of slums, but road repairs need to be carried out for the safety and comfort of the community.

Directions for the arrangement of residential environmental infrastructure in the road network sector can be carried out through:

1. Rehabilitation of main roads that are currently in a damaged condition by using good quality, sturdy, durable, and not easily weathered wood. Meanwhile, on environmental roads that are lightly damaged, routine maintenance is carried out through patchwork/repair of damaged roads only.
2. Conducting road inspections on an incentive basis by the government and related parties to find out the feasibility of these roads.

In addition, the direction of slum arrangement in this study was also differentiated according to the level of slums, namely heavy slums in RT 9 and RT 10 and medium slums in RT 11.

Direction for Arrangement of Settlement Environments in the Heavy Slum Category

1. Improving the quality of wall and roof structures by replacing weathered boards/wood with good quality and durable boards/wood.
2. Improvement of the health and comfort needs of house buildings through the addition of windows, ventilation, and height of house buildings.
3. Improving the quality of the floor of a stilt house building uses a board floor that is good, safe, and not easily weathered
4. Improvement of the minimum needs of mass (appearance) and space (inside and out) through the expansion of the house building to 43.2 m2.
5. Supervise the construction of houses through IMB ownership.

6. Maintenance of building conditions and the environment that are good and habitable continuously.

Arrangement of the basic infrastructure of the settlement environment

1. Clean water service

Trying to expand the reach of PDAM's clean water services to all housing units in RT 9 through direct connections, because based on the results of the assessment of the slum level 96% of the houses in this RT have not received clean water services from PDAM. Another alternative is to place 1 public faucet and 1 hydrant unit near the location of the Public Toilet.

2. Waste service

Provide trash cans made of water-meeting materials in several locations that are easy for cleaners to reach and do not interfere with traffic.

Providing a waste disposal location directed to vacant land near the market.

3. Provide waste transportation facilities in the form of wheelbarrows and set a maximum period of waste transportation every 2 days and try to transport waste every day.

Environmental sanitation conditions

Based on the results of the previous analysis, it is known that environmental sanitation conditions affect determining the level of slums in RT 9. The direction of structuring environmental sanitation conditions in RT 9 is to plan to make 1 unit of public toilets on vacant land with a service radius of 50 m and a distance to the location of the dug well of 10 m.

Road conditions

1. Carry out total rehabilitation on main roads that are currently in a damaged condition by using good quality, sturdy, durable, and not easily weathered wood.
2. Perform routine maintenance on environmental roads that are in a lightly damaged condition through repairs to damaged parts only (patchwork).
3. The government and related parties incentivize the feasibility of these roads.

Clean water service

The results of the analysis of the slum level assessment through the weighting method show that 72% of residential houses in RT 10 have not received clean water services from PDAM so the direction of structuring the basic infrastructure of the residential environment in the clean water service sector is to try to expand the reach of PDAM clean water services to all housing units in RT 10 through direct connections and the placement of 1 public faucet in densely populated areas.

Waste service

1. Provide trash cans made of water-meeting materials in several locations that are easy for cleaners to reach and do not interfere with traffic.
2. Providing a waste disposal location directed to vacant land whose location is not too close to the residential environment.
3. Provide waste transportation facilities in the form of wheelbarrows and set a maximum period of waste transportation every 2 days and try to transport waste every day.

Environmental sanitation conditions

Based on the results of the previous analysis, it is known that environmental sanitation conditions have a perfect relationship in determining the level of slums in RT 10. The limited land in the RT 10 environment makes it impossible for the area to be directed to make public toilets. However, those who live in the RT 10 neighbourhood can take advantage of the public toilet facilities which are directed to be in the RT 11 neighbourhood with a service radius of 50 m.

Road conditions

The direction of structuring the basic infrastructure of the residential environment in the road condition sector in RT 10 is the same as RT 9, namely:

1. Carry out total rehabilitation on main roads that are currently in a damaged condition by using good quality, sturdy, durable, and not easily weathered wood.
2. Perform routine maintenance on environmental roads that are in a lightly damaged condition through repairs to damaged parts only (patchwork).
3. The government and related parties incentivize the feasibility of these roads.

Clean water service

Trying to expand the reach of PDAM clean water services to all housing units in RT 11 through direct connection and the placement of 1 hydrant unit near the Public Toilet, because based on the results of the analysis of the slum level assessment, 67% of the houses in the neighbourhood have not received clean water services from PDAM.

Waste service

1. Provide trash cans made of water-meeting materials in several locations that are easy for cleaners to reach and do not interfere with traffic.
2. Providing a waste disposal location directed at vacant land that is not too close to the residential environment.
3. Provide waste transportation facilities in the form of wheelbarrows and set a maximum period of waste transportation every 2 days and try to transport waste every day.

Environmental sanitation conditions

The direction of structuring environmental sanitation conditions in RT 11 is to plan to make 1 unit of public toilets on vacant land with a service radius of 50 m and a distance to the location of the dug well of 10 m.

Road conditions

The direction of the arrangement of basic infrastructure for the residential environment of the road condition sector in the RT 11 environment is as follows:

1. Total rehabilitation on main roads that are currently in a damaged condition using good quality, sturdy, durable, and not easily weathered wood.
2. Regular maintenance on environmental roads that have suffered minor damage through repairs in certain parts that have been damaged.
3. The government and related parties incentivize the feasibility of these roads.

Conclusion

The results of the study show that the level of slums in the Coastal Area around Liem Hie Djung varies, with RT 9 and RT 10 included in the category of heavy slum

level, having a weighting value of 374.8 and 328.5, respectively, while RT 11 is included in the medium slum category with a value of 297. The highest weighting value is in RT 9 and the lowest is in RT 11. Based on the results of the analysis, it was found that there was a strong relationship between certain factors and the level of slums, such as in RT 9, the indicators of building health and comfort had a strong relationship (0.678), while other indicators such as building ownership status, clean water services, and environmental sanitation conditions had sufficient relationships. In RT 10, there was a perfect relationship between the level of health, building comfort, and environmental sanitation conditions, with correlation values of 0.958 and 0.872, respectively. Meanwhile, in RT 11, indicators of health, building comfort, and environmental sanitation also have a strong relationship (0.632).

The direction of physical arrangement and basic infrastructure in this area includes repairing house buildings with house expansion up to 43.2 m^2, improving the quality of house structures, and improving building health and safety by adding ventilation and windows. In addition, there needs to be development supervision through IMB and periodic maintenance of buildings. In terms of environmental infrastructure, the expansion of PDAM's clean water services through direct connections and the placement of public hydrants in each RT is urgently needed. Environmental planning also includes the provision of easily accessible waste disposal facilities, waste transportation facilities, and counselling to the community about the importance of healthy living. The construction and maintenance of public toilets are also highly recommended, as well as the rehabilitation of damaged roads and regular inspections of road infrastructure.

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