

Prevention and Enhancement of Housing Quality and Slum Settlements of Biawu-Biawao, Gorontalo City

Dr. Anton Kaharu, A.Ma.T.S., S.T., M.T.¹
Associate Professor
Departement of Civil Engineering
State University of Gorontalo
Gorontalo, Indonesia

Satar Saman, S.T., M.Sc.²
Assistant Professor
Departement of Architecture
State University of Gorontalo
Gorontalo, Indonesia

Mohamad Faisal Dunggio, S.T., M.T.³
Assistant Professor
Departement of Architecture
State University of Gorontalo
Gorontalo, Indonesia

Berni Idji, S.T., M.Sc.⁴
Assistant Professor
Departement t of Architecture
State University of Gorontalo
Gorontalo, Indonesia

Abstract:- This study aims to identify the slum conditions, develop a model of prevention, and improve the housing quality and the slum areas of Gorontalo City. The field survey with a proportional sampling of the Biwau and Biawao river banks was used as the slum identification area, prevention and improvement of housing quality and slum areas. Non-economic vitality criteria, economic vitality, land legality, location strategic value, population, condition of facilities and infrastructure, local government commitment, priority of prevention and quality improvement are used to analyse quantitative and qualitative descriptions. The results of the physical building planning strategies include building arrangements, density, and technical requirements. Facilities and infrastructure planning strategies include improving environmental roads, drinking water supply, environmental drainage, wastewater management, waste management and providing fire protection.

Keywords:- *Gorontalo City, Slum Prevention.*

I. INTRODUCTION

Housing and slum settlements are a classic problem that has often been confronted for a long time by both large and small cities, or even developing cities in Indonesia including those that are happened in Gorontalo City. The study of housing and slum settelemts generally includes three aspects, such as (1) physical conditions, (2) socio-economic and cultural conditions of communities who live in housing and settlements, and (3) the impact of both conditions. The physical condition can be seen based on the irregular condition of the building, the quality of the building which does not meet the provisions of the building layout codes in the Detailed Spatial Plan (RDTR) which include setting the form, dimensions, positioning, and look of the building in one zone; and also does not meet the provisions of building management and environmental quality in the Building and Environmental Planning (RTBL) which include the configuration of environmental blocks and plots of land,

buildings, height and elevation of floors, the concept of environmental identity, the concept of environmental orientation, and the face of the road. The face of this road consists of road network which is not patterned and hardened, public sanitation and drainage which are not functioning, waste which is not managed properly and fire protection facilities which are not available.

Prevention and enhancement of the quality of housing and slum areas actually need to be conducted not only in housing and slum areas that are part of metropolitan cities and/or big cities, but also in medium and small cities. Prevention and improvement of the quality of housing and slums in big, medium and small cities become quite strategic when the area has direct connection with parts of metropolitan cities such as the metropolitan downtown areas, the metropolitan growth centers, and other regions like industrial estates, trade areas, warehousing, and offices. Besides having a direct connection, it is assumed that the housing and slum areas in the buffer zone contribute to the difficulty of preventing and improving the quality of housing and slum settlements in metropolitan cities. The existence of a housing environment and slums has brought new problems, such as poor physical development of the city, bad visual effects, the level of public health which is getting lower as a result of conditions of settlements that are not in accordance with health standards and also give a negative social and economic impact on the community.

Problems of housing and slums that occur in each region need to be solved immediately in order to obtain a healthy, livable and high quality residential environment. The importance of preventing and improving the quality of housing and slums is in line with what is affirmed in the Law of the Republic of Indonesia Number 01 of 2011 concerning housing and slums which stated that prevention and improvement of the quality of housing and settlements to enhance the quality of life and the livelihoods of residents are conducted (1) to prevent the growth and development of

slums and new slums (2) to maintain and to improve the quality and function of housing and settlements.

The issues of Housing and slum areas are also happened in Kota Selatan District of Gorontalo City. The main cause is also similar to what happens in other cities which is also additionally affected by the rapid development of Gorontalo City as the capital of Gorontalo Province in the form of urban spatial structure that spreads naturally and sporadically contributes to the cause of the problem. Based on studies that have been conducted by the government of Gorontalo City, the slum areas are spreading in every district in Gorontalo City. This finding indicates that the problem of housing and slum areas has reached a very crucial stage that needs to be solved immediately. Based on the problems mentioned above, it is necessary to prevent and to improve the quality of housing and slums which are multisectoral and sustainable by focusing on the Tridaya Approach (human, environmental and economic development), to develop adequate facilities and infrastructure, to integrate all conditions and activities in housing and slums with the activities of the city, and to encourage the local government and the community as the main agents in the treatment of the slum areas.

II. RESEARCH METHOD

A. Data Collection Methods

Before conducting the data collection activities for the arrangement of the area, the data collected from the field observation must be initially formulated to support the depth of material plans and space programs that will be prepared. In this stage, the secondary data obtained from relevant agencies were used and were combined with the primary data obtained directly from the field observation. The principle of data collection was generally based on the guidelines contained in the Minister of Public Works and Public Housing Regulation No. 02 / PRT / M / 2016 concerning the Quality Improvement of Slum Housing and Slum Settlements, namely:

➤ Determining Location of Slum Housing and Slum Settlements

The process of identifying the location of slum housing and settlements can be observed in the flow chart as follows:

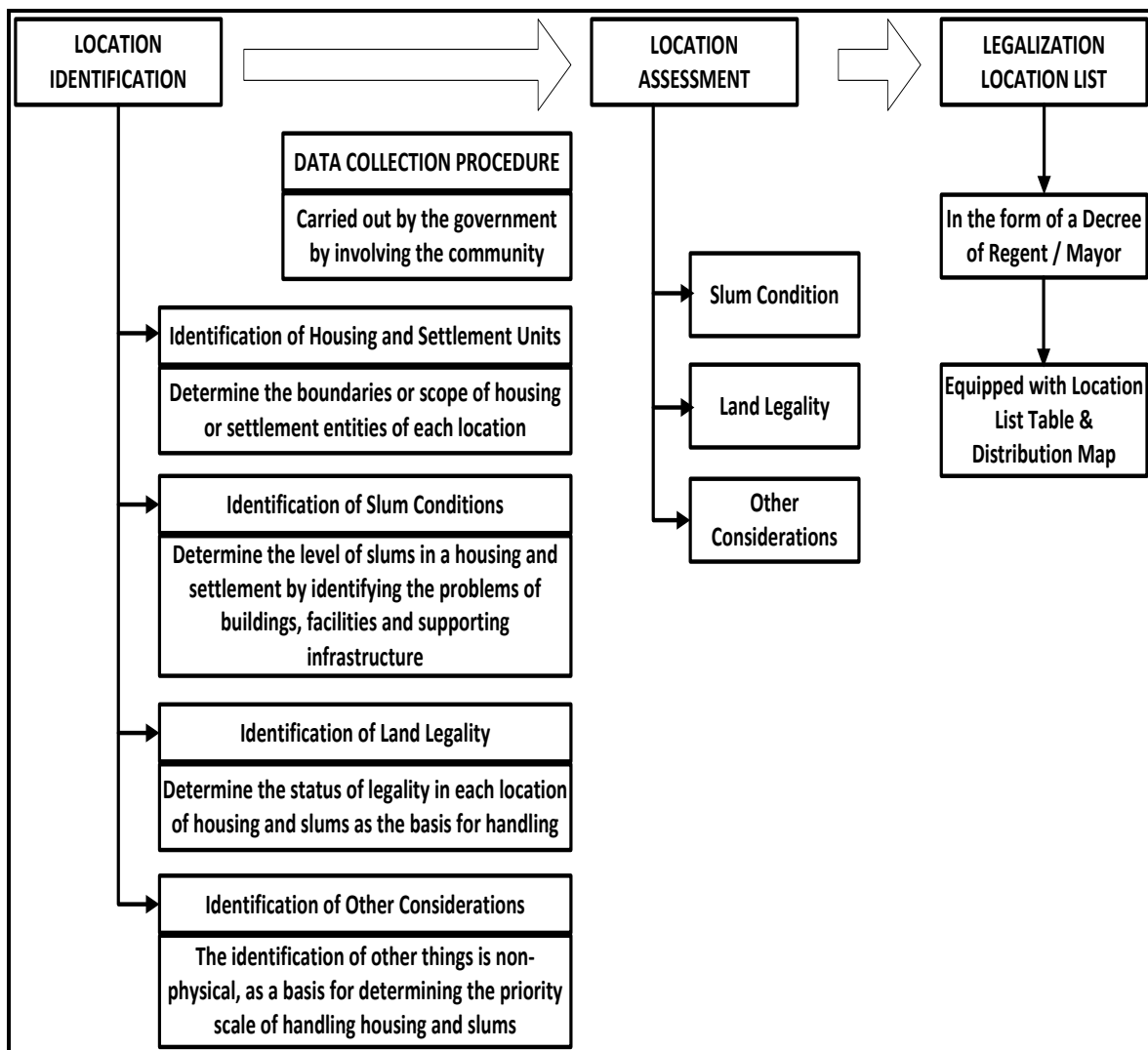


Fig 1 Location Determination Scheme

Source: Minister of Public Works and Public Housing Regulation (Permen PUPR) No 02/PRT/M/ 2016

➤ *Collecting Data on Slum Housing and Settlements*

The data collection was conducted by involving institutions of the sub-district/district, urban village/village, the neighborhood (RW) and the community in locations of indicated slum housing and slum settlements. Schematically, the procedure of data collection of slum housing and slum settlements is presented in the following figure:

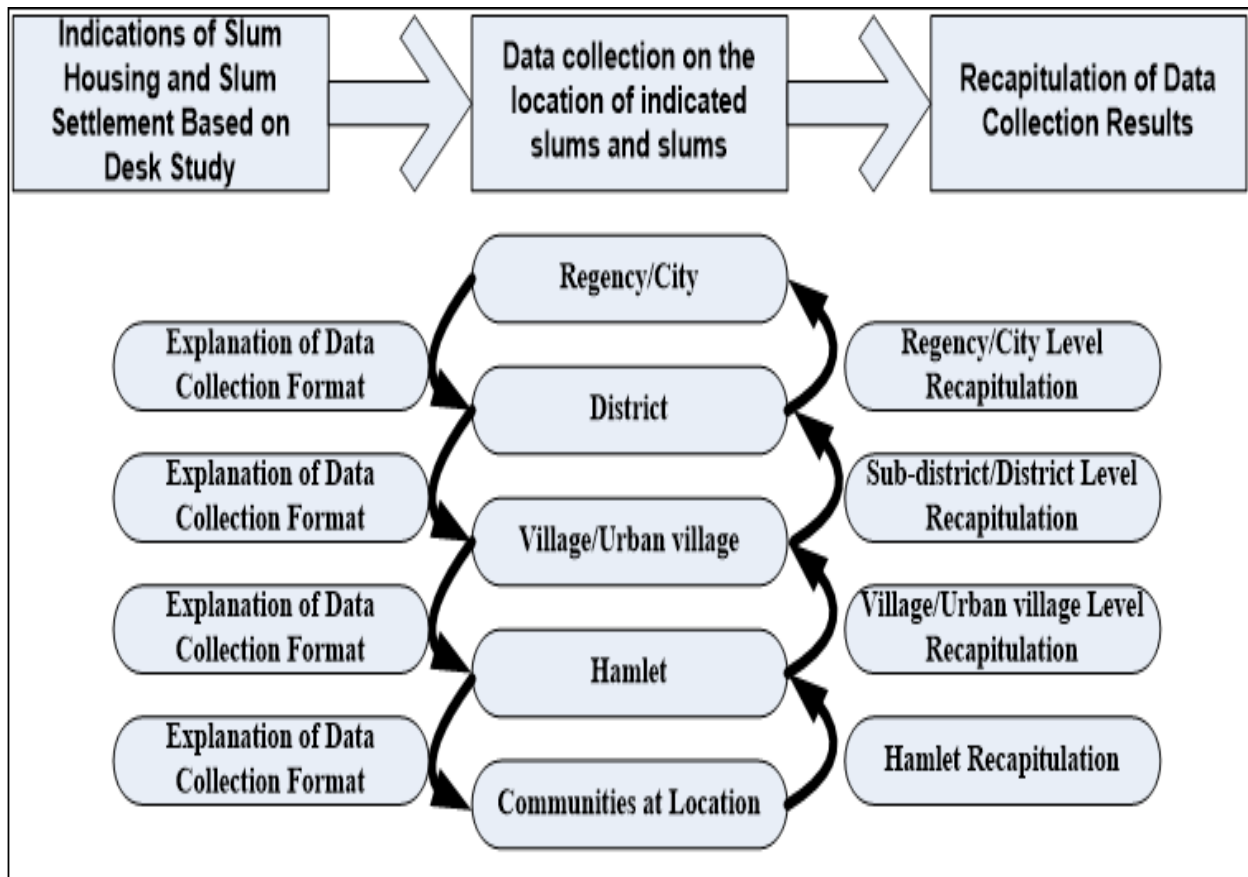


Fig 2 Data Collection Procedure Scheme

Source: Minister of Public Works and Public Housing Regulation (Permen PUPR) No 02/PRT/M/2016

Indications of slum housing and slum settlements based on desk study data collection on the location of indicated slum housing and slum settlements.

➤ *Evaluation Criteria for Slum Housing and Slum Settlements*

The standards for slum housing and settlements were determined by Minister of Public Works and Public Housing Regulation (Permen PUPR) Number 02/PRT/M/2016, which focuses on preventing and enhancing the quality of slum housing and settlements:

• *Building Conditions Include:*

- ✓ Building Irregularities
- ✓ Building Density
- ✓ Building non-compliance with Technical Requirements

• *Environmental Road Conditions Include:*

- ✓ The scope of environmental road services
- ✓ The road surface environment quality

• *Conditions for the Supply of Drinking Water*

- ✓ Lack of safe access to drinking water
- ✓ Failure to meet the requirements for drinking water

• *Environmental Drainage Conditions Include:*

- ✓ Water runoff cannot be drained.
- ✓ Drainage is unavailable.
- ✓ Drainage is unavailable.
- ✓ Not related to urban drainage system.
- ✓ The construction quality of drainage

• *Wastewater Management Conditions Consist of:*

- ✓ The wastewater management system does not comply with the relevant technical standards
- ✓ The wastewater management infrastructure and facilities are not in compliance with technical standards

• *Waste Management Conditions Include:*

- ✓ The solid waste infrastructure and facilities do not meet technical standards.

- ✓ The waste management system fails to meet technical specifications.
- ✓ Unmaintained waste management facilities and infrastructure lead to pollution of the surrounding ecosystem through garbage in clean water sources, soil, and drainage networks.
- *Fire Safety Requirements*
- ✓ The lack of fire prevention infrastructure
- ✓ The lack of fire protection facilities

III. RESEARCH RESULTS AND DISCUSSION

A. Overview of the Research Area

General description of this slum area is the existing condition of the area in accordance with the criteria for identifying slum areas. These criteria include non-economic vitality, economic vitality, legality of land, the strategic value of the location, population, condition of infrastructure and facilities, local government commitment, and priority of prevention and quality improvement. The location of Biawao-Biawu area is locationally shown in Figure 3.



Fig 3 The location of Biawao-Biawu Area
Source: Public Works and Public Housing (PUPR) of Gorontalo Province, Indonesia

➤ Regional Non-Economic Vitality

Non-economic vitality is a description of the feasibility of the settlement area whether it is still suitable as a settlement area or not. This vitality condition looks at the suitability of regional spatial use with the Detailed City

Spatial Plan (RDTRK), the physical condition of the building and population conditions. Slums in the study area can be categorized into several criteria based on the area location. These categories consist of slums along riverbanks and slums in settlements, as shown in Figures 4 and 5).



Fig 4 Riverbank Slums
Source: Observation Results, 2023



Fig 5 Slums in Settlements
Source: Observation Results, 2023

➤ *Economic Vitality*

Economic Vitality focuses more on the level of regional interest in the target of slum management programs. Besides, it also sees the level of importance and function of the area as well as the workplace distance of the slum communities.

➤ *Land Legality*

The status of the land is an important factor for the sake of its easy management. The ease of managing problems of the land status can be a guarantee of investment interest in an urban area. In the planning area of the suburbs, the status of the land has become the Freehold Title (SHM). In rural areas, on the other hand, the land status is still mostly in the form of certificates or Notification of Registration (SKT). The judicial program helps the community in owning the Freehold Title (SHM) of the land.

➤ *Population Conditions*

The condition of the population in the planning area of slums has a very high density. It can be seen based on the occupancy that is occupied by an average of 4-8 people/house. One house can be occupied by more than one family (KK). This happens because the economic conditions of the people in the planning area are so low that it is impossible for them to have a house especially for their children.

➤ *Condition of Infrastructure and Facilities*

The condition of infrastructure and facilities affects settlements to become slums. The inadequate condition of infrastructure and facilities is one of the causes which determines an area to become a slum. The condition of infrastructure and facilities consists of road conditions, drainage, clean water and waste water (Figure 6).



Fig 6 Condition of Infrastructure and Facilities of Slum Areas
Source: Observation Results, 2023

➤ *Distance of Livelihood*

Most of people in the slums work as day laborers, retail trade (markets, shops, stalls, restaurants, etc.), and/or home industry and/or services (repair shop, salons, photocopy services, etc.) with the distance to the workplace that is relatively far from the residence.

➤ *Local Government Commitments*

The commitment of the regional and city governments is considered to have a very large contribution to the implementation of managing the slum areas. Therefore, the regional government aspires a regularity of area development, especially in their territory or region. The involvement of the government in managing slums of the research area is proven by providing support through programs funded by the Local Government Budget (APBD), Village Allocation Fund (ADD), National Programme for Community Empowerment (PNPM) and others. This support is shown in the form of infrastructure improvements such as roads, clean water supply and other things according to the

needs of each region. Despite these programs, there are also some areas that have not been touched by the government supports.

B. Slum Condition of the Research Area

The poor living conditions in this research region are connected to the state of buildings, roads, water supply, drainage systems, wastewater management, and waste disposal. Furthermore, this slum condition is also closely related to the legality of the land, the strategic value of the location and population.

Based on the data profile of the settlement area of Gorontalo City in 2020 and the results of the primary survey in 2023, the Biwau-Biyawao region of Gorontalo City is classified as a moderate slum area, with the main problems confronted are drainage, road network and sanitation. The results of the survey and assessment of slum levels at the research location are summarized in Table 1.

Table 1 The Results of Location Assessment based on Criteria, Indicators, and Parameters of Slum in the Biwau-Biyawao Region of Gorontalo City

ASPECTS	CRITERIA	ASSESSMENT INDICATORS	ANALYSIS RESULTS
A. IDENTIFYING SLUM CONDITIONS			
1. BUILDING CONDITIONS	a. Building Irregularities	1. Does not meet the building plan specifications outlined in the Detailed Spatial Plan (RDTR), which include the configuration, dimensions, location, and aesthetics of the building within a designated area; and/or. 2. Does not comply with the regulations regarding building layout and environmental quality in Building and Environmental Planning (RTBL), which includes environmental block arrangement, land plots, building structures, floor height and elevation, environmental identity concept, environmental orientation concept, and road-facing design.	51% - 75% of buildings in the location do not have regularity
	b. The Density Level of Buildings	1. Building Coverage Ratio (KDB) exceeds the provisions of Detailed Spatial Plan (RDTR), and/or the Building and Environmental Planning (RTBL). 2. Floor-area Ratio (KLB) exceeds the provisions of Detailed Spatial Plan (RDTR), and/or the Building and Environmental Planning (RTBL) 3. High construction density in the area, specifically: a. for metropolitan and large cities ≥ 250 units / Ha b. for medium and small cities ≥ 200 units / Ha	51% - 75% of buildings have density level which is not in accordance with the regulations
	c. The Non-compliance of building with Technical Requirements	The condition of the building in the location does not meet the requirements, such as: 1. Environmental impacts control 2. Construction of structures on or below ground level, water, and public infrastructure/facilities 3. The safety of the building 4. The health of the building 5. The comfort of the building 6. The ease of the building	Between 51% and 75% of buildings in the area fail to meet technical standards

ASPECTS	CRITERIA	ASSESSMENT INDICATORS	ANALYSIS RESULTS
2. ENVIRONMENTAL ROAD CONDITIONS	a. Environmental Road Services coverage	Some housing or settlement areas lack environmental roadways that meet technical standards	25% to 50% of the area lacks coverage by the environmental road network
	b. Road Surface Environment Quality	There are damages occurred in some or all parts of the road surface in the location of housing and settlements	25% to 50% of the area exhibits substandard road surface conditions
3. CONDITIONS FOR THE SUPPLY OF DRINKING WATER	a. The Unavailability of Safe Access to Drinking Water	Residents in the housing and settlement areas lack access to potable water that is colourless, odourless, and tasteless	25% - 50% some of the population lack access to safe drinking water
	b. The Non-fulfillment of the Needs of Drinking Water	The community in the housing and settlements area need a minimum of 60 litres of drinking water per person per day	Between 25% and 50% of the population do not meet their basic requirements for drinking water
4. ENVIRONMENTAL DRAINAGE CONDITIONS	a. The Inability to Drain Water Runoff	The environmental drainage system is unable to handle water runoff, leading to flooding with a depth exceeding 30 cm for over 2 hours. The deluge occurs more frequently than twice a year	The flooding happens in 51% - 75% of the area with a height of 30cm, lasting more than 2 hours, and occurring more than twice a year
	b. The Unavailability of Drainage	The unavailability of environmental drainage channels in the housing or settlement environments, i.e. tertiary channels and/or local channels	25% to 50% of the land lacks environmental drainage
	c. The Environmental Drainage is not Connected to Urban Drainage System	The environmental drainage channels are not connected to the channels in the hierarchy above it which causes water not to flow and inundation	25% to 50% of environmental drainage is not linked to the higher levels of the hierarchy
	d. Unmaintained Drainage	The maintenance of environmental drainage channels in the housing or settlements locations is not conducted, either: 1. Routine maintenance 2. Periodic maintenance	25% to 50% of the region is affected by unsanitary and malodorous drainage systems
	e. The Excellence of Drainage Construction	The drainage construction quality is substandard due to it is in the form of soil excavation without coating or cover materials, or due to the damages occurred	Between 51% and 75% of the area exhibits substandard environmental drainage construction quality
5. WASTEWATER MANAGEMENT CONDITIONS	a. Wastewater Management System is not in Accordance with Applicable Technical Standards	Wastewater management in the housing or settlement locations does not have an adequate system, such as latrines / closets that are not connected to septic tanks either individually, communally or centrally.	Between 51% and 75% of the region has a wastewater system that does not meet technical standards
	b. The wastewater management infrastructure and facilities do not meet technical requirements	The condition of infrastructure and facilities for wastewater management in the housing or settlement locations is as follows: 1. The swan neck toilet is not linked to the septic tank 2. The unavailability of a local or centralized waste management system	Between 51% and 75% of the area lacks wastewater facilities and infrastructure that meet technical standards
6. WASTE MANAGEMENT CONDITIONS	a. Waste infrastructure and facilities do not meet technical requirements	Waste infrastructure and facilities in housing or settlement places do not meet technical criteria 1. Household garbage containers with waste sorting 2. Waste collecting facility for reducing, reusing, and recycling on an environmental level 3. Garbage carts and / or garbage trucks on an environmental scale; and 4. Integrated Waste Management Site (TPST) from an environmental perspective	Between 51% and 75% of the region lacks waste management facilities and infrastructure that fulfil technical standards

ASPECTS	CRITERIA	ASSESSMENT INDICATORS	ANALYSIS RESULTS
	b. The Waste Management System does not meet the technical requirements	Waste management in housing or settlement areas does not meet the necessary criteria: 1. Collecting and sorting 2. Environmental collection 3. Environmental transportation 4. Eenvironmental treatment	51% to 75% of the area lacks waste facilities and infrastructure that meet standard requirements
	c. Waste Management Facilities and Infrastructure are not maintained	The maintenance of waste management facilities and infrastructure in housing or settlement locations is not conducted, either: 1. Routine maintenance 2. Periodic maintenance	51% - 75% of the area has unmaintained waste management facilities and infrastructure
7. FIRE PROTECTION CONDITIONS	a. The Unavailability of Fire Protection Infrastructure	The absence of fire protection infrastructure at the specific location: 1. Water provision 2. Environmental road 3. Communication amenities 4. Environmental data on fire protection systems. 5. Fire post building	25% to 50% of the area lacks fire prevention infrastructure
	b. Lack of Fire Protection Facilities	The absence of fire protection facilities at the specified location: 1. Fire Extinguisher 2. Pump car 3. Stair car as needed 4. Other supporting equipments	Between 51% and 75% of the area lacks fire prevention facilities
B. LAND LEGALITY IDENTIFICATION			
1. LAND LEGALITY	a. Land Tenure Clarity	Land tenure status clarity comprises: 1. Possess ownership through documented evidence such as land rights certificates or other legal land status documents. 2. Ownership by third parties, such as customary land, must be supported by a land use permission issued by the land rights holder or landowners, demonstrated through a written agreement.	Some areas lack clear information on land tenure, whether owned by the individual or other parties
	b. The Conformity of the Spatial Plan (RTR)	Compliance with the land allocation in the Spatial Plan, supported by a Building Permit or District/City Planning Permit.	Some or 60% of locations are not in the housing / settlement allotment zone based on the Spatial Plan (RTR) and do not have a Building Permit (IMB)
C. IDENTIFICATION OF OTHER CONSIDERATIONS			
1. OTHER CONSIDERATIONS	a. Strategic Importance of the Location	Contemplation of the dwelling or settlement location: 1. the strategic functions of the district / city; or 2. not the strategic function of the district / city	The location is strategically positioned inside the district/city
	b. Demography	Population density should be taken into account while determining the site of houses or communities, with appropriate classification: 1. The population density is less than 150 persons per hectare 2. Moderate population density ranges from 151 to 200 people per hectar 3. High population density ranges from 201 to 400 people per hectare 4. Very dense population density is above 400 people per hectare	The population density in the area is approximately 150 individuals per hectare

ASPECTS	CRITERIA	ASSESSMENT INDICATORS	ANALYSIS RESULTS
	c. Low-income society	Consideration of the number of low-income people in housing or settlement locations	Consists of 25% - 50% of the population
	d. Social, Economic and Cultural Conditions	Assessment of the residential or commercial potential based on: <ol style="list-style-type: none"> 1. Social potential, which refers to the community's involvement in development 2. Economic potential, which involves the presence of key economic activities beneficial to the local community; 3. The cultural potential refers to specific activities or cultural heritage that are possessed by the local community cultural heritage owned by the local community. 	The location possesses social, economic, and cultural potential that can be enhanced or preserved

Source: Analysis Result in 2024

C. Priority of Prevention and Quality Improvement

Priority locations for prevention and quality improvement are determined using location criteria specific to slum housing and settlements.. The criteria are indicated to have an influence on (parts of) urban area as well as buffer zone of housing and settlements. Besides, the criteria will deliver the prioritized location of the housing and settlements since they are located near the urban area. Therefore, the regions that have the interests with urban area have more priority in handling or management than those which do not have the interests.

➤ *Physical Planning of Slum Buildings Building Density Planning*

Planning for building density is prioritized for areas with a density of more than 100 houses/ha. The planning can be accomplished with the following strategies:

- Make a vertical house-hold concept so that the remaining available land can be used for open space. The concept of vertical housing development is important to avoid horizontal house development which tends to use more land
- Maximize the existing open space by not closing the concrete pavement.
- Utilize the distance between green open spaces

➤ *The Planning of Building Density can be Illustrated in Figures 6, 7, and 8.*

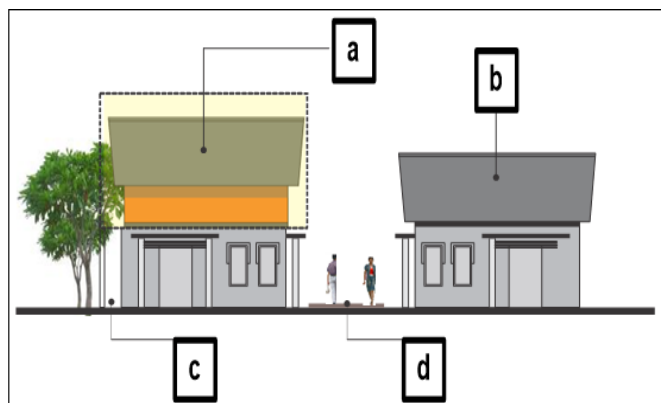


Fig 7 The Concept of Developing a Vertical House

Based on the concept in the Figure above, it is explained that (a) as a vertical housing development, (b) a one-story house concept, (c) a side of land where widening the house is not possible, (d) vehicle and pedestrian lanes.

For area that have a building density of less than 100 houses / ha, the strategies that can be used to prevent and to improve the quality of slums are described below (see Figure 7):

- Control building density with the regulation of Building Coverage Ratio (KDB) that is in accordance with the Regional Spatial Plan (RTRW).
- Maximize the open space in each region for social activities.
- Set the density of the building by setting a minimum distance between buildings.

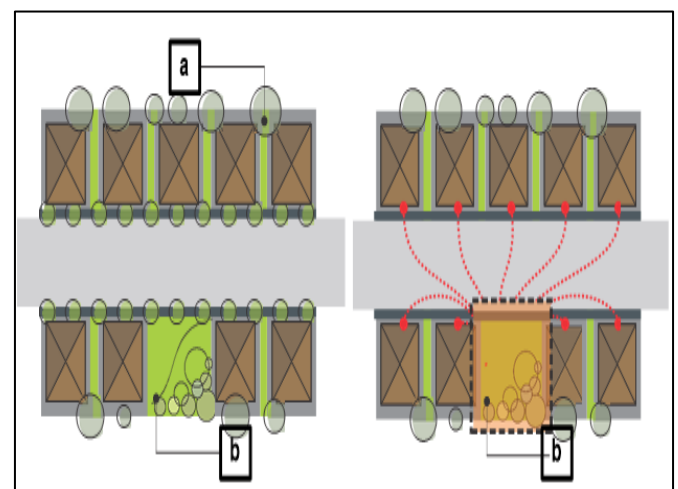


Fig 8 The Concept of Open Space Arrangement

Based on Figure 7, it can be explained that (a) the distance between buildings is not covered by pavement and can be used as an open space, and (b) the remaining land can be used for green open space or community social activities.



Fig 9 The Concept of Inter-Building Distance as a Green Area

➤ *Building Border Planning*

The building boundary planning is planned in settlements and on river banks. In the settlements, the building border planning follows the predetermined rule that is 1/2 of the width of the road. The strategies that can be used for the planning of housing and slum areas can be conducted based on these several steps (see Figure 9):

- Set a minimum limit of the building border that is about 1/2 of the width of the road. Besides, the limit set for the side building is 1.5 meters and the rear building is 2 meters from the back wall to reduce erosion that will make the river flow away.
- The window opening should not be located in the front of the road, especially the houses that are walled close to the access road.
- The function of the road is not used for personal purposes such as a clothesline, putting goods, parking area, etc.

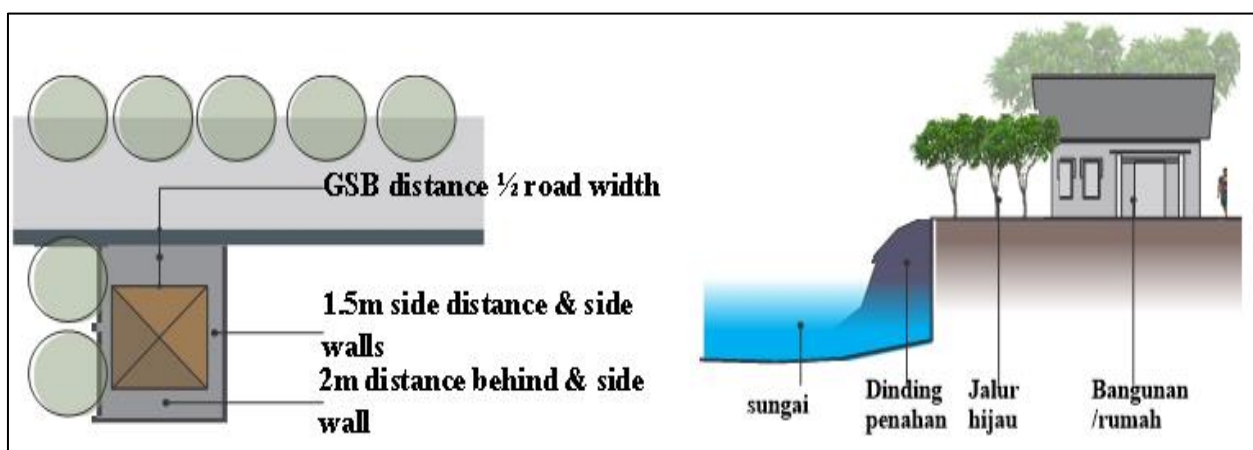


Fig 10 The Concept of Building Borderline (GSB) and River Border Design

The building border planning on the river border with the distance about 100 meters from the riverbank cannot be established since all buildings are distanced less than 100 meters. Furthermore, there are some houses which are located on the riverbank. Therefore, there are several strategies that can be conducted in terms of building planning in the riverbank areas, such as:

- Rewind the building (setback) from the riverbank
- Make a retaining wall to reduce erosion that will shallow the river flow
- Create a green belt along the riverbank as a barrier against erosion.

➤ *Building Physical Quality Planning*

The physical improvement of the building is related to the improvement of uninhabitable houses. The criteria for the uninhabitable houses can be observed based on the condition of the building which is structurally improper from the foundation to the roof. This physical condition is commonly dominated by impermanent houses. This improvement program can become the concern of related agencies such as the Public Works (Dinas PU Cipta Karya) and Social Services (Dinas Sosial).

➤ *The Planning Strategy in the Uninhabitable Houses in Slum Areas can be Applied by Following these Several Steps:*

- Building repairs are conducted by looking at priorities and the level of damage to buildings in slums.
- Building repairs are conducted by providing materials based on what is needed and not in the form of money. The money supplied was used for other requirements as indicated by the interview results.
- The government can collaborate with related institutions such as Menpera which has an improper house improvement program.

D. Facilities and Infrastructure Planning in Slum Areas

➤ *Environmental Road Planning*

Planning strategies for environmental roads in slums can be executed in several ways including:

- The improvement is prioritized for environmental roads rather than private roads that are related to environmental roads.
- The improvement is done based on each damage.

The improvement in the worst damage will be prioritized and the ground pavement should get top priority. It is because the ground will be muddy in the rainy season and make it difficult for vehicles to pass the road.

➤ *Wastewater Disposal Planning*

Wastewater management at the study location generally uses an individual system (on site system) with the following technical steps:

- The disposal of liquid and solid wastewater into ponds and rivers through a simple feces disposal system (*cubluk*) and family toilets is done by most residents.
- The disposal of solid waste into septic tanks for residents in urban areas.

The Bathing, Washing and Toilet (MCK) planning is needed for areas on the riverbank since some of the residents do not have this facility. The residents are still using branches of trees that can be found on the riverbank. Besides, a good wastewater management is crucial in order to solve some issues related to ground water pollution, surface water problem and the spread of infectious diseases. The wastewater management system in the Kubu Raya slum area is conducted as follows:

- The management of domestic wastewater in both rural and urban slums is directed by individual systems with disposal facilities such as family toilets.
- In the case of domestic waste disposal system in urban slums, some are directed by using a septic tank system with infiltration/filters, while others are directed with septic tanks without infiltration. These activities are done through the direct process into the existing Sewerage Treatment Plant (IPLT) by using septic trucks and in rural areas using the Wastewater Disposal (SPAL) system.

➤ *Clean Water Planning*

Nearly half (50%) of the area included in the slum area of the study site has not been flowed by water of the Municipality Waterworks (PDAM) since the only areas that are close to the road network that received water flow. Residents who live in other areas that have not yet received the water flow are using well water and engine pumps for drinking, cooking and the needs of Bathing, Washing and Toilet (MCK). The planning strategy for areas which have not yet reached by the Municipality Waterworks (PDAM) water flow is described as follows:

- For urban settlement areas, the clean water supply is directed through the Municipality Waterworks (PDAM) pipelines by utilizing raw water from rivers/surface water.
- For rural settlement areas, the clean water system can be developed by utilizing the existing raw water sources including ground water and rivers through a simple piped water network system.
- The pattern of development and management of rural water system is managed in a participatory manner whereby the society independently builds clean water installations facilitated by the government.

➤ *Waste System Planning*

The waste management system will be categorized into two types, namely the communal handling system and the individual handling system. The communal waste handling system is mostly conducted on public functions, such as markets and housing. In the market, the garbage is collected into a container bin as a Temporary Shelter (TPS) which will be transported by truck to the Final Processing Site (TPA). In the housing area, the garbage is collected communally by local officials in a cart and taken to Transfer Depo to be transported by garbage trucks to the Final Processing Site (TPA). The individual handling system, on the other hand, is managed by some residents by heaping and burning the trash.

The concept of waste management at the research location is more focused on the concept of processing waste into organic waste. Thus, there is only a small amount of waste that must be disposed of at the Final Processing Site (TPA). This concept will save the land of the Final Processing Site (TPA) and is also beneficial in the production of large organic fertilizer for the cultivation of agriculture.

Waste problem is an issue confronted by every area in the slums. Most household waste is disposed of in the yard, especially in slums located on the riverbank. Therefore, we need several planning strategies for the household waste management, namely:

- Providing trash bin spots in each slum area
- If the location is far from the Final Processing Site (TPA), a Temporary Shelter (TPS) should be placed to accommodate temporary household waste.

IV. CONCLUSION

Based on the analysis of preventing and enhancing slum housing conditions and the slum settlements quality in the region of Biawu-Biawao of Gorontalo City, there are several identification results of slums, prevention strategies and the quality improvement of the slum areas that can be obtained and is described as follows:

- In general, the level of slum that occurs at the study location is quite high that it even reach the range of 51-75%. The main problem can be found in some aspects, such as (a) buildings, (b) environmental drainage, (c) wastewater management, (d) waste management and (e) fire protection which do not meet the applicable standard.
- Building physical planning strategies include building density management strategies, building border management strategies and building physical quality improvement strategies.
- Facilities and infrastructure planning strategies consist of the road improvement, the provision of access roads/connecting bridges, the construction of drainage channels, the provision of Bathing, Washing and Toilet (MCK) for public, the provision of clean water by creating clean water networks, the provision of rainwater reservoirs and the provision of waste disposal spots.

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