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Revitalizing slum residential areas through land consolidation approaches in Pekalongan City

A case study of Kampung Bugisan

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ABSTRACT

The development of housing and residential areas plays a crucial role in creating livable environments and mitigating the rise of slum areas in urban settings, which often result from inadequate urban planning. This study focuses on addressing slum settlements through the Land Consolidation approach in Kampung Bugisan, Pekalongan City, Central Java. The method employed is qualitative through analysis of regulations and design considerations as well as determining design criteria and concepts through community participation. The results of the study indicate that community participation and collaboration among stakeholders are key factors in the success of this Land Consolidation program. The findings of this research are expected to provide insights and sustainable strategic solutions for improving environmental quality and addressing slum settlement issues in densely populated urban areas in major cities across Indonesia.

Introduction

Slum environments and settlements pose negative impacts not only on public health but also on various aspects of the inhabitants' quality of life. Creating livable environments and reducing the proliferation of urban slum areas can be achieved through proper settlement development. One effective method to address slum settlements is by implementing Land Consolidation.

Land Consolidation is a strategic effort in spatial planning for slum settlements, focusing on optimizing land use efficiency (Sitorus 2015). The benefits of Land Consolidation in slum settlement revitalization include:

1. Improving Environmental Quality
   Land Consolidation facilitates the provision of livable, safe, and healthy housing for communities, thereby enhancing their living environment (Nur and Sarwadi 2021).
2. Land Use Efficiency
   By consolidating land, more efficient land use can be achieved both vertically and horizontally, reducing negative environmental impacts.
3. Enhancing Accessibility
   Land Consolidation is often accompanied by the development of improved infrastructure, such as roads, drainage systems, and public

facilities, which increases accessibility for residents.

4. Community Participation
   The consolidation process involves community participation in planning and implementation, fostering a sense of ownership and responsibility toward their environment (Nurlinda 2011).
5. Natural Resource Management
   Land Consolidation can support sustainable natural resource management, including environmental preservation with proper planning.
6. Disaster Risk Reduction
   Revitalizing slum areas reduces disaster risks, such as floods, through better spatial planning.

A key challenge in providing housing lies in the limited availability of land (Nur and Sarwadi 2021). The varied characteristics of land and differing environmental carrying capacities are crucial factors in determining development strategies.

Collaboration across various fields of expertise is essential to produce comprehensive and sustainable solutions. This interdisciplinary approach enables a deeper understanding of complex problems while facilitating the development of innovative strategies (Halim 2005).

In Central Java, Pekalongan City is a strategic node along the northern coastal route (Pantura), as it lies midway between Jakarta and Surabaya on Java Island.

Pekalongan City is situated in a lowland area at an elevation of 0–2 meters above sea level. The flat topography, with a slope gradient of 0–8%, indicates low ground movement levels but makes the area susceptible to inundation, particularly in the coastal regions along the northern coastline (Direktorat Konsolidasi Tanah dan Pengembangan Pertanahan 2023). Additionally, the region frequently experiences daily tidal flooding (rob), independent of seasonal changes.

As a coastal city, Pekalongan is also home to various heritage buildings from the Dutch colonial era, most of which are located in Pekalongan Utara District, particularly in the Jetayu Area (Hendro and Sari 2018).

Historically, Kampung Bugisan was a docking point for ships from the Bugis Tribe of Makassar during trade transactions. This history is reflected in its location upstream of Pekalongan City and its development into what is now known as "Kampung Bugisan."

Today, Kampung Bugisan is classified as a slum area according to Pekalongan Mayor's Decree No. 430/1131 of 2020, covering an area of 9.51 hectares with 246 household lots, 326 families, and a total population of 1,150. Approximately 99% of the resident's work in the informal sector (Pemerintah Daerah Tingkat II Pekalongan 2020).

This historical and socio-economic background underscores the importance of targeted efforts, such as Land Consolidation, to address the challenges faced by Kampung Bugisan and similar areas. A general overview of Kampung Bugisan is provided in table 1.

Table 1. General Overview of Kampung Bugisan

Aspect	Note
Area boundaries	Located in RW 001, RT 1–5.
	Total Area: 9.51 hectares
Population	Total households: 326
	total population: 1,150
	population density: 120 people/ha.
	Predominantly workers in the informal sector.
Buildings	150 units located along the riverbanks
Land and legal status	*Surat Hak Milik* (SHM)
Public and social facilities	2 places of worship
	1 sports facility
	2 communal sanitation facilities (MCK).

The delineated area for the Land Consolidation process is shown in figure 1.

Figure 1. Scope of the land use area and spatial planning in Kampung Bugisan

The current environmental conditions within the delineated area are presented in figure 2.

Figure 2. Kampung Bugisan Settlement

Kampung Bugisan is prone to tidal flooding, particularly during heavy rainfall when river water overflows into the residential areas. The infrastructure, including drainage, clean water supply, waste management, and the lack of adequate sanitation facilities, is also insufficient. In addition, road damage and environmental pollution are major concerns that affect public health.

Although tidal flooding is caused by rising sea levels and climate change, land subsidence in Kampung Bugisan is a primary factor that contributes to daily tidal flooding.

Activities and stakeholders

The Ministry of Agrarian Affairs and Spatial Planning, National Land Agency (BPN), as the Project Implementation Unit (PIU), is collaborating with the World Bank in organizing the Land Consolidation Program for a Slum-Free City (KT-KOTAKU). The Ministry of ATR/BPN is supported by the National Development Planning Agency (Bappenas) as the Central Collaboration Management Unit (CCMU) and the Ministry of Public Works and Public Housing as the Project Management Unit (PMU) (Direktorat Konsolidasi Tanah dan Pengembangan Pertanahan 2021).

In the planning phase of Land Consolidation, local governments and stakeholders collaborate to create the best planning outcomes (Nur and Sarwadi 2021). Key participants include regional state-owned enterprises (BUMD), private sectors, cooperatives, and other community-based organizations. Moreover, support from various urban development stakeholders is crucial in the implementation phase of the KT-KOTAKU program (Direktorat Konsolidasi Tanah dan Pengembangan Pertanahan 2023), as shown in figure 3.

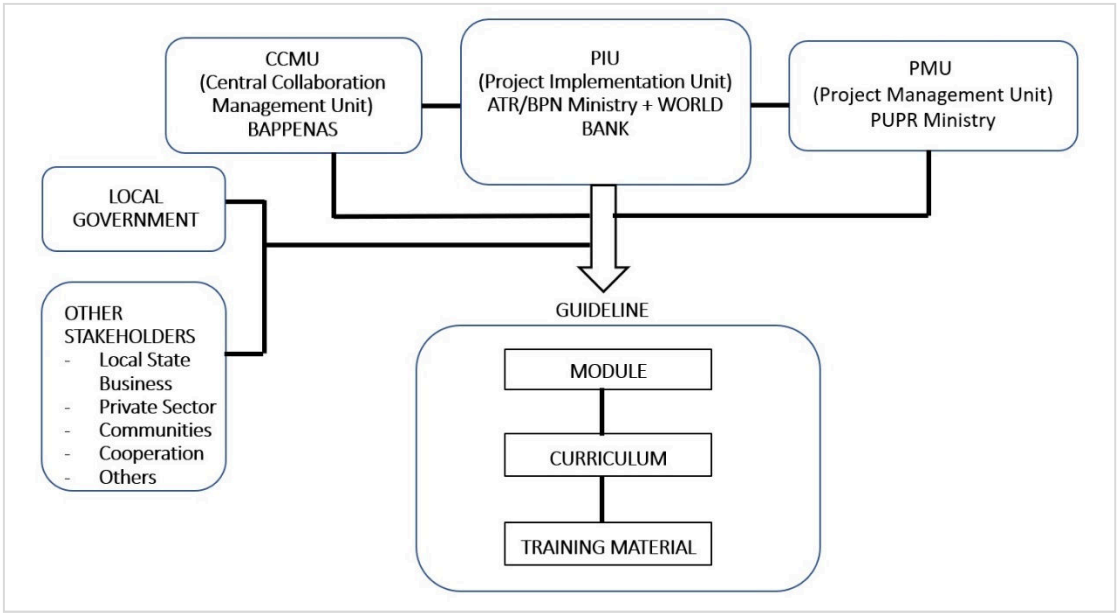


Figure 3. Activities and stakeholders
Source: Final report, O.S.P. Support for KOTAKU, 2023

Regulations and design considerations

The policy for handling slum settlements refers to several national regulations and considerations when planning urban areas. National regulations include the Regional Spatial Plan (RTRW), Detailed Spatial Plan (RDTR), Building Line Regulations (RTBL), and Urban Design Guidelines (UDGL), which guide spatial regulations, city structures, and urban morphology. Design considerations for the area include regulations for Land Consolidation and strategies for slum housing development, as shown in figure 4.

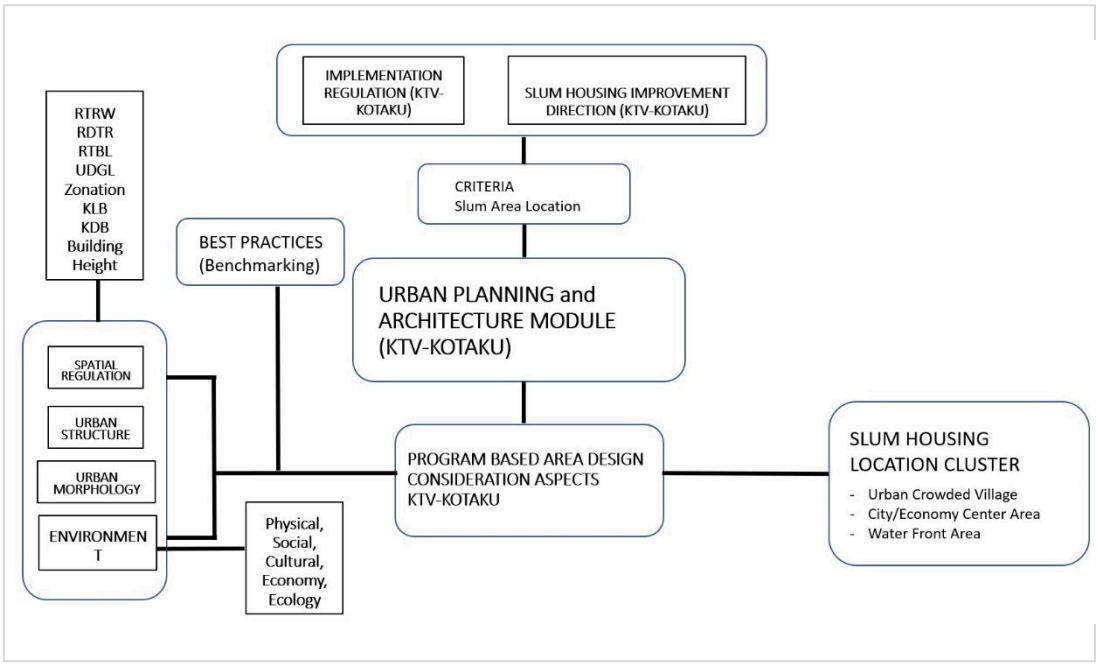


Figure 4. Regulations and design considerations for urban areas
Source: Final report, O.S.P. Support for KOTAKU, 2023

Design criteria and concepts

In its application, urban planning and architectural design must adjust to the local environment, considering specific environmental conditions and the carrying capacity of the area. Slum environments in densely populated urban villages, economic development zones, and waterfront areas (such as riverbanks, lakes, or coastal zones) require different design solutions, as illustrated in figure 5.

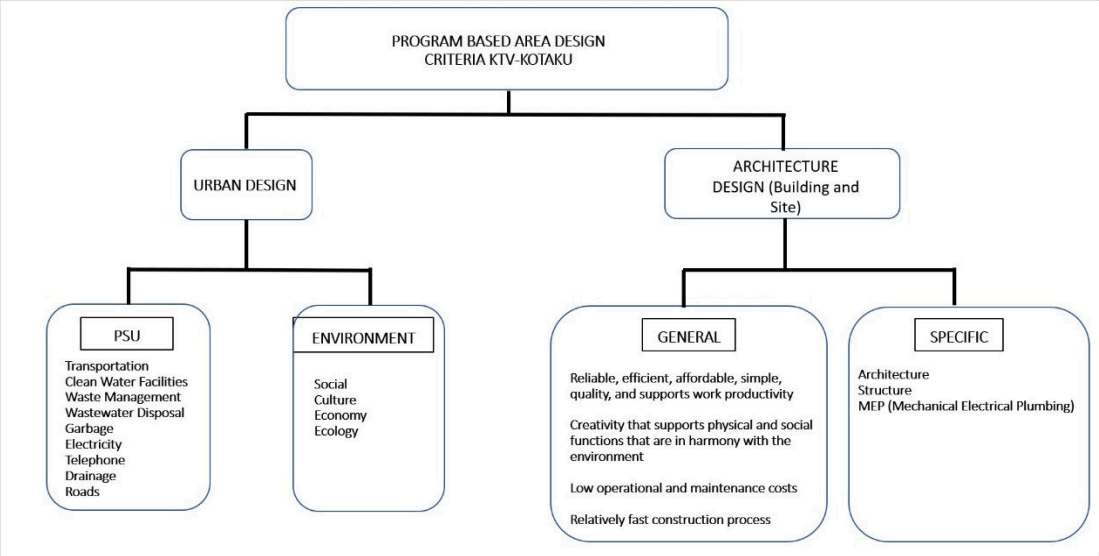


Figure 5. Design criteria and concepts for urban areas
Source: Final report, O.S.P. Support for KOTAKU, 2023

State of the art

The Land Consolidation activity is relatively new in its implementation. Its success is still under evaluation in several areas of Indonesia, given that the impacts of Land Consolidation are long-term. This situation is reflected in the issuance of new guidelines and technical instructions by the Ministry of ATR/BPN, beginning with the publication of the Profile of Vertical Land Consolidation Potential in 2020.

Several journals on Land Consolidation written by Sitorus, O., Nurlinda, I., and Wijaya, G. P. in 2015, 2011, and 2016 provide theoretical reviews without case studies. However, in 2021, Nur, Y., and Sarwadi, A. examined the practical application of Land Consolidation in Gadingsari Village, Sanden District, Bantul, Yogyakarta, in the Journal of Land Policy.

Methods

The research methodology used is qualitative, involving the analysis of both general and specific data (Arnowo 2022), covering regulations, design considerations, and the determination of design criteria and concepts. The primary focus of this research is on Land Consolidation and the revitalization of slum residential areas in Kampung Bugisan, Pekalongan City.

According to the final report by the Oversight Service Provider of the Ministry of ATR/BPN in 2023, the implementation of Land Consolidation includes a series of processes involving field case studies, and social, economic, and physical data analysis from the affected areas (Direktorat Konsolidasi Tanah dan Pengembangan Pertanahan 2023). These processes include: planning, socialization, and deliberation, measurement and assessment, land acquisition, infrastructure development, land utilization, and monitoring and evaluation.

Data collection involves land measurement and assessment of Land Consolidation objects, as well as legal data concerning land ownership. A participatory approach is also used, engaging key stakeholders such as local communities, local governments, and international agencies (e.g., the World Bank). Spatial planning studies and data collection through surveys and interviews are conducted to assess the relevance of proposed solutions.

The background, objectives, and issues leading to the involvement of stakeholders are analyzed. By examining regulations and design considerations and determining design criteria and concepts, urban planning elements and architectural design elements for the buildings and site are developed. These design elements are then applied to Kampung Bugisan, Pekalongan, as a pilot project to create design proposals as part of the Land Consolidation process, as shown in figure 6.

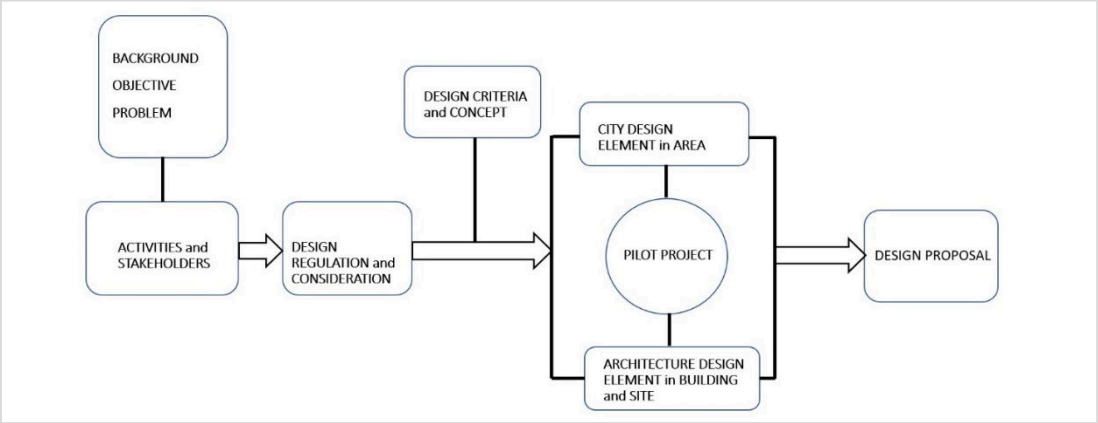


Figure 6. Methodology of activities implementation

The proposed design is then grouped into two phases based on the planning process that involved community consultations:
• 2022 Design Proposal
• 2023 Design Proposal
This includes the planning of infrastructure in the Bugisan area.

Results and discussion

The design process is dynamic and evolves from the initial phase in 2022 to the final phase in 2023, incorporating several design changes. The 2022 and 2023 design proposals are based on the qualitative research methodology and the Land Consolidation process, which includes planning, socialization, and deliberation, measurement and assessment, land acquisition, infrastructure development, land utilization, and monitoring and evaluation.

2022 Design proposal

The surveyed area is located in RT 02, 03, 04, and 05 in RW 01, Panjang Wetan Village, Pekalongan City. This area was selected for Land Consolidation due to recurring tidal floods that affect the comfort of local residents. The research area is presented in figure 7.

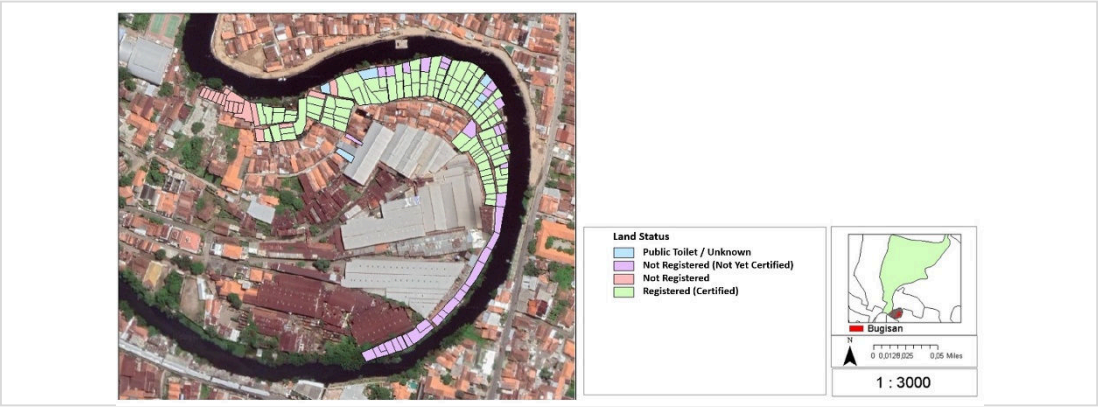


Figure 7. Research area in Kampung Bugisan

Based on the survey and the data collected from the Inventory of Land Ownership, Use, and Utilization (IP4T), the land use area is calculated as follows:

a. Area after river widening: 1.53 hectares (16% of Kampung Bugisan's total area of 9.5 hectares or 39% of the total residential area).
b. Area for the River Buffer Zone (GSS) of 3 meters: 0.25 hectares, which includes a promenade/inspection path of 2.5 meters, pedestrian paths, and Green Open Space.
c. Residential area: 1.53 hectares – 0.25 hectares = 1.28 hectares.

- Residential: 0.6 hectares
- Pedestrian way: 0.15 hectares
- Green open space within plots: 0.5 hectares.

2023 Design proposal

Based on the existing conditions, there were challenges in measuring land areas, so the Master Plan still uses IP4T data, as shown in figures 8-12.

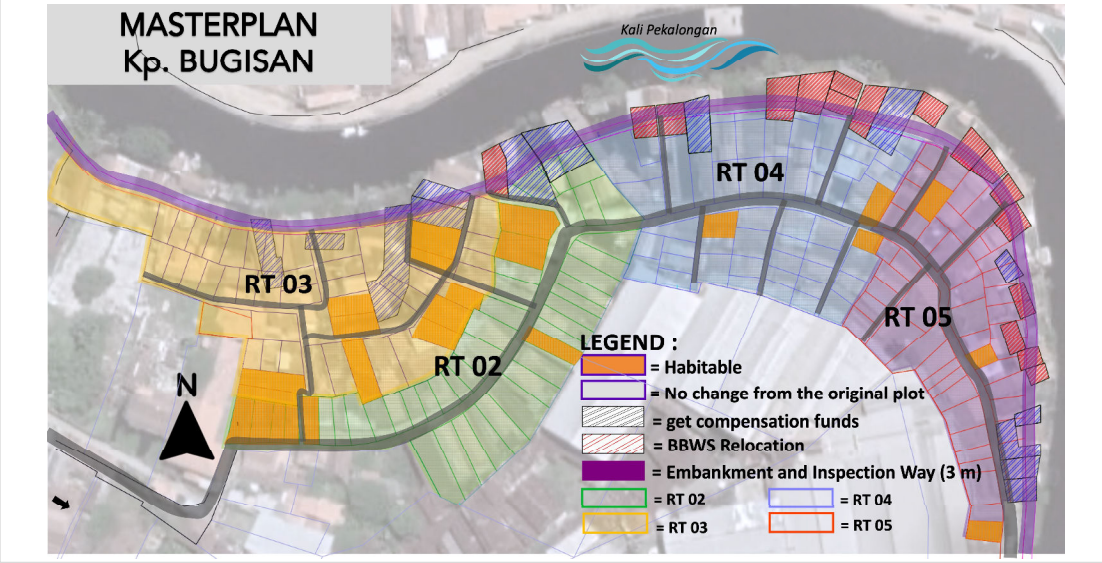
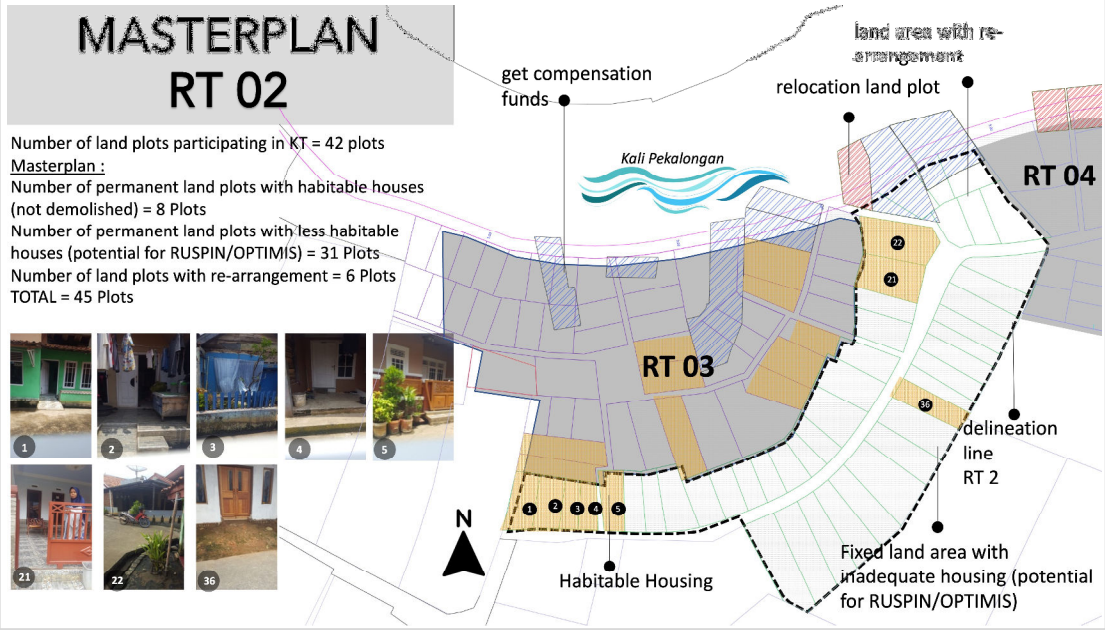
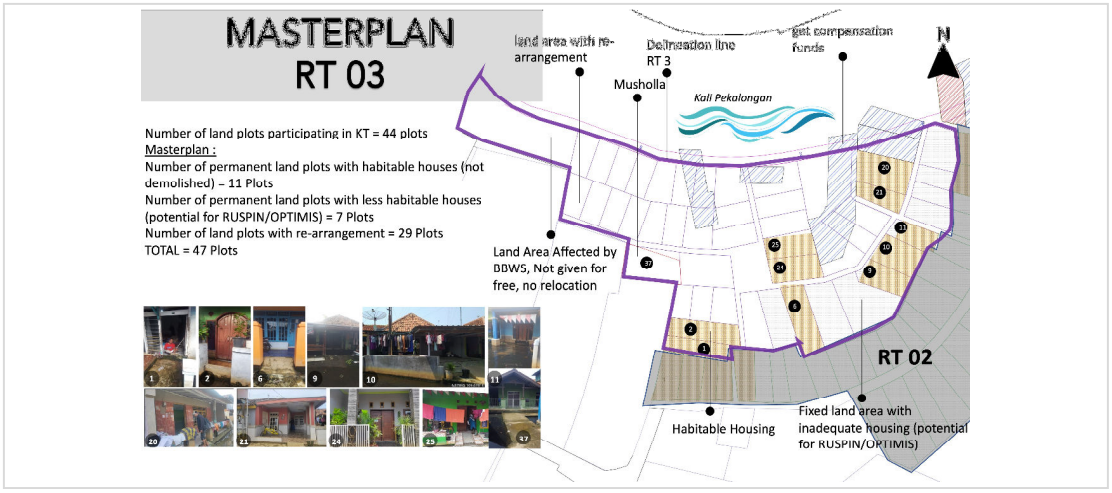


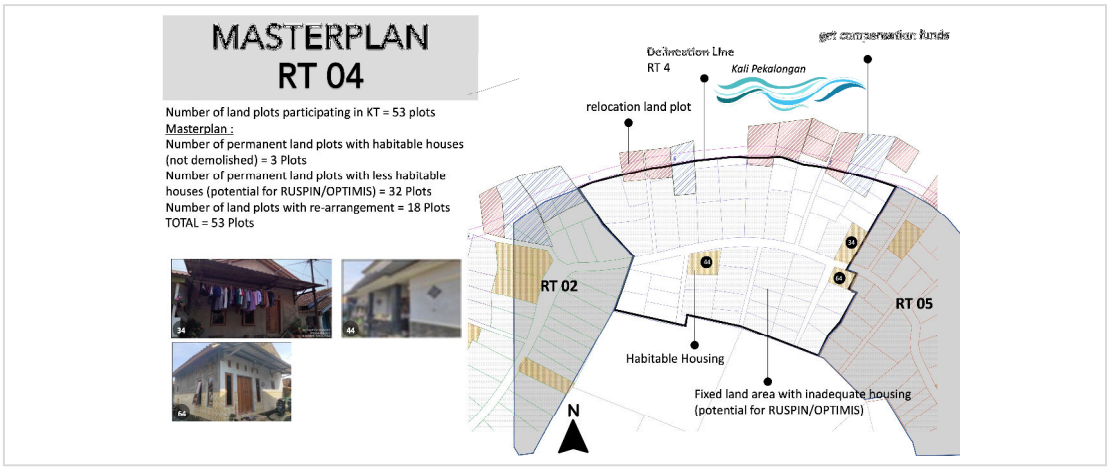
Figure 8. 2023 Initial land consolidation designs for Kampung Bugisan



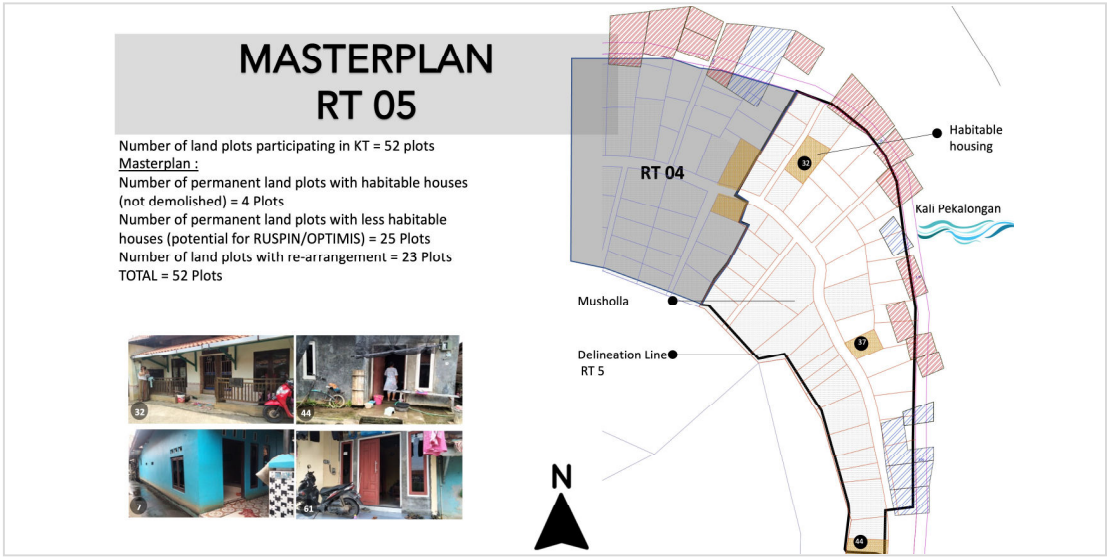
Figures 9. 2023 Initial land consolidation designs for Kampung Bugisan RT 02



Figures 10. 2023 Initial land consolidation designs for Kampung Bugisan RT 03

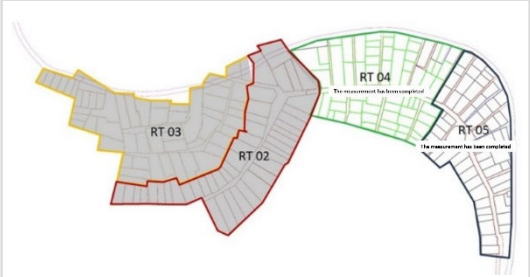


Figures 11. 2023 Initial land consolidation designs for Kampung Bugisan RT 04



Figures 12. 2023 initial land consolidation designs for Kampung Bugisan RT 05

The measurement process has just been completed for 2 out of 4 RTs, specifically RT 04 and RT 05. The delineation of the masterplan design for the Land Consolidation of Kampung Bugisan has been designed in these two RTs, where the measurements have been completed, with the number of land plots being 62 in RT 04 and 51 in RT 05, for a total of 113 plots. The area of RT 04 is 5,777 m², and the area of RT 05 is 5,154 m². The total area of the land consolidation planning delineation is approximately 10,931 m². The measurements resulted in 113 land plots, consisting of 62 plots in RT 04 and 51 plots in RT 05, with two existing facilities, namely a mushola (prayer room) and a public toilet, located in RT 05. The results of the measurements for the delineation design can be seen in figures 13-14.



Figures 13. Delineated design based on measurement results

On these two RTs, the following measurement results are noted:

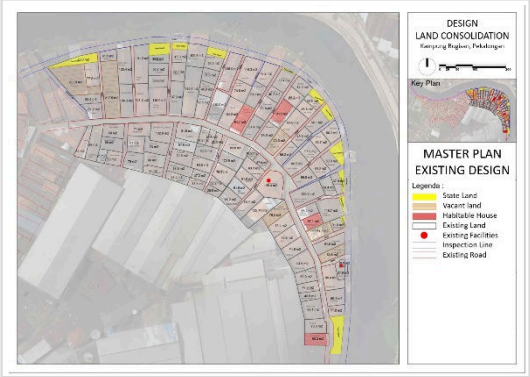


Figure 14. Measurement results for land plots and existing buildings in RT 04 and RT 05

There are 4 habitable plots scattered across the area, and 6 vacant plots, one of which is used as a community hall. In the area next to the inspection road, there are several state-owned lands that can be utilized for open space, as shown in figure 15.

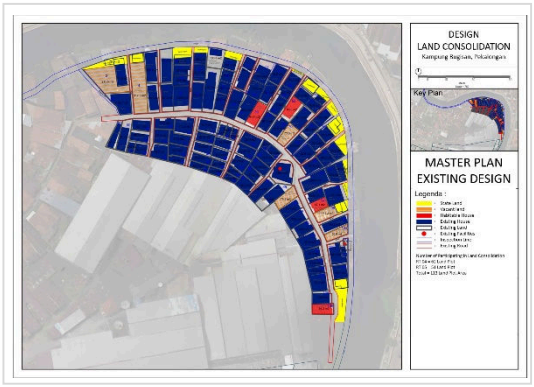


Figure 15. Measurement results of existing land and houses in RT 04 and RT 05

The initial delineation of the Land Consolidation planning covers 4 RTs (neighborhood units), namely RT 02, 03, 04, and 05. Based on the measurements, only RT 04 and RT 05 have been fully measured. In the following figure, the masterplan design is illustrated in full for the two RTs where measurements have been completed, with the areas of RT 02 and RT 03 that have not been measured shown using IP4T data, as seen in figure 16.

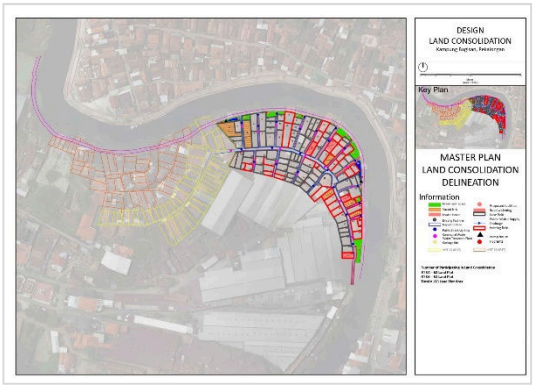


Figure 16. Final design of land consolidation in Kampung Bugisan RT 04 and RT 05, June 2023

The masterplan design for the Land Consolidation in Kampung Bugisan, Panjang Wetan subdistrict, Pekalongan city, takes into account the results of community discussions, which prioritized not relocating the land plots so that neighbors would remain the same, as depicted in figures 17–19.

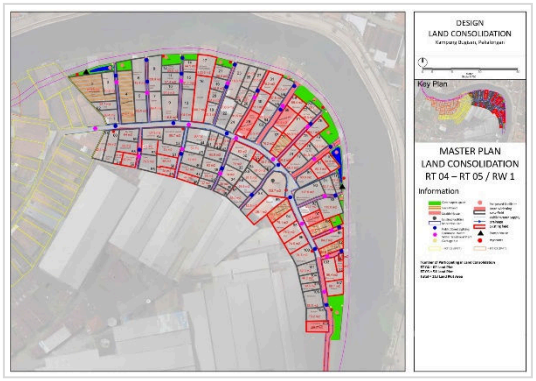


Figure 17. Land consolidation design in Kampung Bugisan RT 04 and RT 05, June 2023

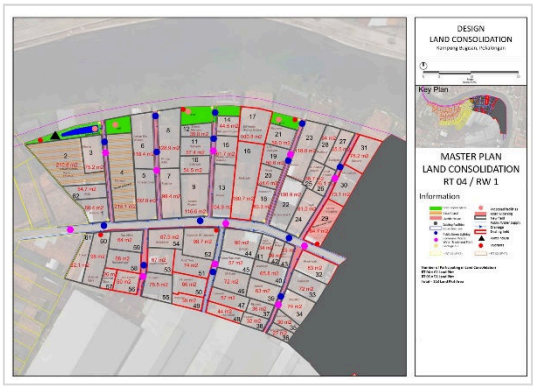


Figure 18. Land consolidation design in Kampung Bugisan RT 04, June 2023

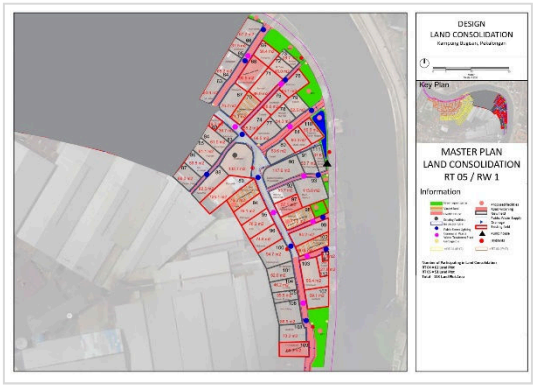


Figure 19. Land consolidation design in Kampung Bugisan RT 05, June 2023

Infrastructure planning in Bugisan area

In addition to the design proposals for 2022 and 2023, the infrastructure in Kampung Bugisan is also planned with consideration for flood management in Pekalongan. The placement of retention ponds and pumps is considered as an effort to address the tidal flood issues in Kampung Bugisan, with the concept of land shifting to maximize space by closing non-functional drainage channels and converting them into roads. Additionally, there is a proposal for a 1.5-meter widening of the secondary road to ease motor vehicle access, and a 3-meter widening of neighborhood roads to allow access for four-wheeled vehicles, as shown in figure 20.

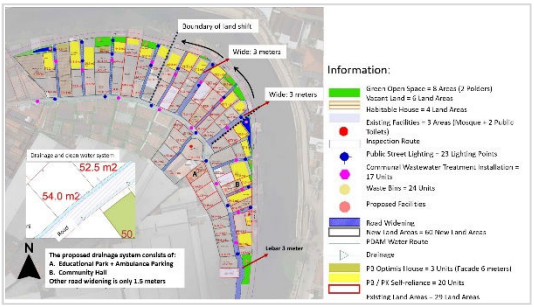
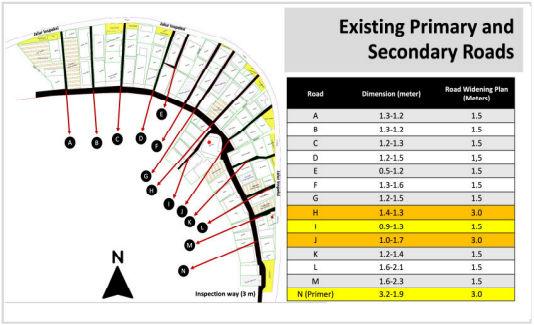


Figure 20. Concept of land shifting arrangement

The road widening concept in front of the mosque creates a grand impression in the area and also allows easy access for emergency vehicles to reach the mosque. On the other side, the widening of the road facilitates maneuvering for four-wheeled vehicles. The concept of road widening can be seen in figure 21.



Road	Dimension (meter)	Road Widening Plan (Meters)
A	1.3-1.2	1.5
B	1.3-1.2	1.5
C	1.2-1.3	1.5
D	1.2-1.5	1.5
E	0.5-1.2	1.5
F	1.3-1.6	1.5
G	1.2-1.5	1.5
H	1.4-1.3	3.0
I	0.9-1.3	1.5
J	1.0-1.7	3.0
K	1.2-1.4	1.5
L	1.6-2.1	1.5
M	1.6-2.3	1.5
N (Primer)	3.2-1.9	3.0

Figure 21. Comparison of existing road width and road width after design

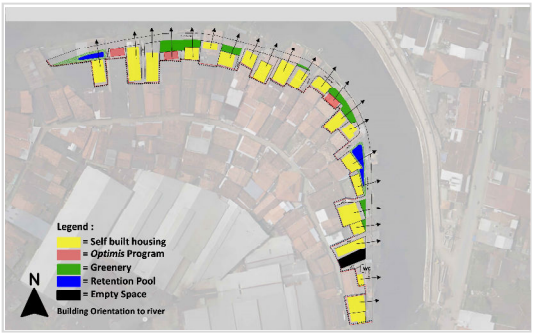


Figure 22. Concept of waterfront housing arrangement

As illustrated in figures 21-24, the housing located beside the river inspection road applies the waterfront concept using Optimistic Houses, which are Simple Ownership Panel Houses, 6 meters long and 3 meters wide with 2 floors, and a building area of 32 m². These modular houses are planned with the first floor for residential use and the second floor for commercial purposes, thus contributing to the local economy. The waterfront concept considers the economy while also focusing on the facade's view toward the Loji River.

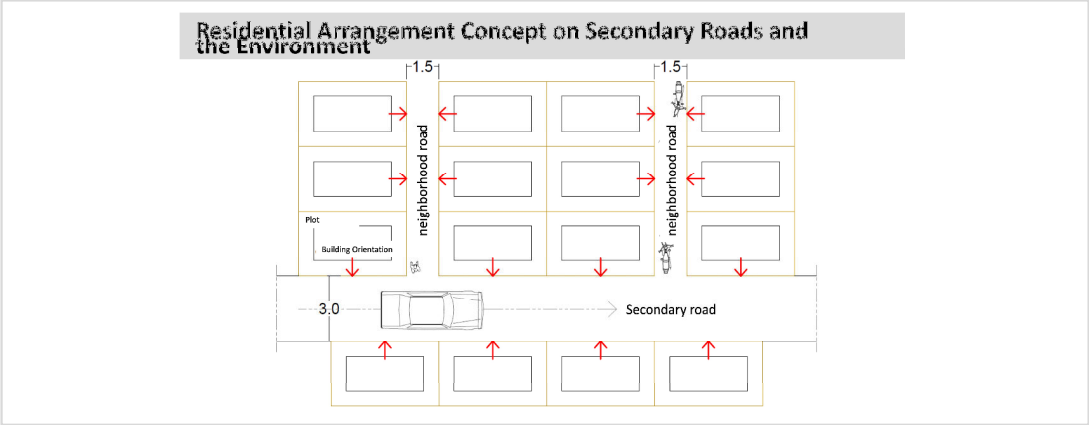


Figure 23. Orientation concept for housing arrangement

The land arrangement optimizes the orientation of the houses so that no plots are sandwiched between two roads, thus minimizing slum conditions with back-to-back houses. Every house faces the road.

The neighborhood road width of 3 meters is planned to minimize the land loss for residents. Existing drainage is planned to be covered with concrete pipes, making the road width more efficient, as shown in figure 24.

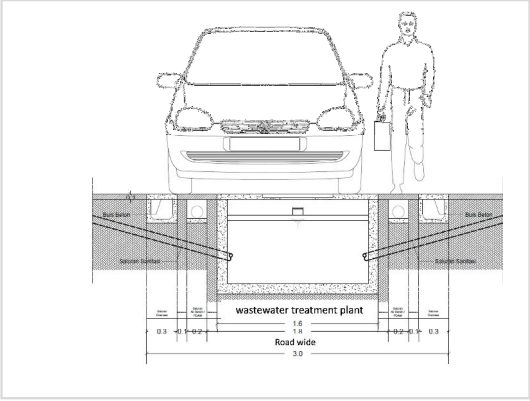


Figure 24. Utility concept

Percentage of land area in land consolidation

The existing land area compared to the designed land area for the Land Consolidation has undergone changes, which can be seen in tables 2 and 3.

Table 2. Percentage of area change in RT 04

No	Land Name	RT	Status	Existing Land Area (m2)	Area After Design (m2)	Area of the Cut Plane (m2)	Land Cut Percentage (%)
1	Land to 1	4	Owned	61.2	60.4	0.8	1.31%
2	Land to 2	4	Owned	211.5	210.6	0.9	0.43%
3	Land to 3	4	Owned	77.5	75.2	2.3	2.97%
4	Land to 4	4	Owned	217.5	214.1	3.4	1.56%
5	Land to 5	4	Owned	104.3	102	2.3	2.21%
6	Land to 6	4	Owned	120.4	118.4	2	1.66%
7	Land to 7	4	Owned	101.2	99.4	1.8	1.78%
8	Land to 8	4	Owned	131.2	128.9	2.3	1.75%
9	Land to 9	4	Owned	118	116.6	1.4	1.19%
10	Land to 10	4	Owned	55	54.5	0.5	0.91%
11	Land to 11	4	Owned	57.7	57.4	0.3	0.52%
12	Land to 12	4	Owned	39.9	39.8	0.1	0.25%
13	Land to 13	4	Owned	107.3	104.9	2.4	2.24%
14	Land to 14	4	Owned	45.3	44.5	0.8	1.77%
15	Land to 15	4	Owned	62.7	61.7	1	1.59%
16	Land to 16	4	Owned	180.7	180.7	0	0.00%
17	Land to 17	4	Owned	108	108	0	0.00%
18	Land to 18	4	Owned	62.5	60.3	2.2	3.52%
19	Land to 19	4	Owned	51.6	50.6	1	1.94%
20	Land to 20	4	Owned	45.9	44.6	1.3	2.83%
21	Land to 21	4	Owned	56.3	56	0.3	0.53%
22	Land to 22	4	Owned	110	108.9	1.1	1.00%
23	Land to 23	4	Owned	118	118.9	-0.9	-0.76%
24	Land to 24	4	Owned	110	108.9	1.1	1.00%
25	Land to 25	4	Owned	37.3	35.7	1.6	4.29%
26	Land to 26	4	Owned	37.3	36.1	1.2	3.22%
27	Land to 27	4	Owned	57.1	54.8	2.3	4.03%
28	Land to 28	4	Owned	57.1	54.8	2.3	4.03%
29	Land to 29	4	Owned	84.7	84.7	0	0.00%
30	Land to 30	4	Owned	73.1	73.1	0	0.00%
31	Land to 31	4	Owned	78.2	78.2	0	0.00%
32	Land to 32	4	Owned	83.8	83	0.8	0.95%
33	Land to 33	4	Owned	72.8	72	0.8	1.10%
34	Land to 34	4	Owned	76.3	74	2.3	3.01%
35	Land to 35	4	Owned	32.2	30	2.2	6.83%
36	Land to 36	4	Owned	28.9	27	1.9	6.57%
37	Land to 37	4	Owned	37.2	36	1.2	3.23%
38	Land to 38	4	Owned	33.3	32	1.3	3.90%
39	Land to 39	4	Owned	63.6	63	0.6	0.94%
40	Land to 40	4	Owned	65.8	66	-0.2	-0.30%
41	Land to 41	4	Owned	34.2	34	0.2	0.58%
42	Land to 42	4	Owned	26.5	26	0.5	1.89%
43	Land to 43	4	Owned	25.5	25	0.5	1.96%
44	Land to 44	4	Owned	91.5	90	1.5	1.64%
45	Land to 45	4	Owned	57.6	57	0.6	1.04%
46	Land to 46	4	Owned	72.6	72	0.6	0.83%
47	Land to 47	4	Owned	57.6	57	0.6	1.04%
48	Land to 48	4	Owned	69	64	5	7.25%
49	Land to 49	4	Owned	38	38	0	0.00%
50	Land to 50	4	Owned	66	66	0	0.00%
51	Land to 51	4	Owned	74	74	0	0.00%
52	Land to 52	4	Owned	102.8	98	4.8	4.67%
53	Land to 53	4	Owned	67	67	0	0.00%
54	Land to 54	4	Owned	71	71	0	0.00%
55	Land to 55	4	Owned	78	75	3	3.85%
56	Land to 56	4	Owned	50	50	0	0.00%
57	Land to 57	4	Owned	26	26	0	0.00%
58	Land to 58	4	Owned	68	68	0	0.00%
59	Land to 59	4	Owned	44.4	44	0.4	0.90%
60	Land to 60	4	Owned	99	98	1	1.01%
61	Land to 61	4	Owned	62	62.1	-0.1	-0.16%
62	Land to 62	4	State Land	55.4	54.7	0.7	1.26%
					Average percentage of land cutting		1.64%

The percentage change in land area in RT 04 for 62 plots is 1.64%.

Table 3. Percentage of area change in RT 05

No	Land Name	RT	Status	Existing Land Area (m2)	Area After Design (m2)	Area of the Cut Plane (m2)	Land Cut Percentage (%)
1	Land to 1	5	Owned	67.4	60.9	6.5	9.64%
2	Land to 2	5	Owned	71	65.2	5.8	8.17%
3	Land to 3	5	Owned	40.2	37.5	2.7	6.72%
4	Land to 4	5	Owned	71.4	67.2	4.2	5.88%
5	Land to 5	5	Owned	76.9	76.2	0.7	0.91%
6	Land to 6	5	Owned	90.5	90.5	0	0.00%
7	Land to 7	5	Owned	56.4	56.4	0	0.00%
8	Land to 8	5	Owned	73	71.1	1.9	2.60%
9	Land to 9	5	Owned	91	86.9	4.1	4.51%
10	Land to 10	5	Owned	46.8	45	1.8	3.85%
11	Land to 11	5	Owned	29.5	28.7	0.8	2.71%
12	Land to 12	5	Owned	58.2	58.2	0	0.00%
13	Land to 13	5	Owned	48.6	48.6	0	0.00%
14	Land to 14	5	Owned	64.1	64.1	0	0.00%
15	Land to 15	5	Owned	80.5	68.5	12	14.91%
16	Land to 16	5	Owned	57.6	54	3.6	6.25%
17	Land to 17	5	Owned	53.7	52.5	1.2	2.23%
18	Land to 18	5	Owned	65.5	63.6	1.9	2.90%
19	Land to 19	5	Owned	60.3	60.3	0	0.00%
20	Land to 20	5	Owned	19.2	19.2	0	0.00%
21	Land to 21	5	Owned	37.4	36.7	0.7	1.87%
22	Land to 22	5	Owned	63.3	61	2.3	3.63%
23	Land to 23	5	Owned	61.8	61.1	0.7	1.13%
24	Land to 24	5	Owned	61.6	59.8	1.8	2.92%
25	Land to 25	5	Owned	68.2	66	2.2	3.23%
26	Land to 26	5	Owned	85.4	82.5	2.9	3.40%
27	Land to 27	5	Owned	125.1	125.1	0	0.00%
28	Land to 28	5	Owned	120.3	117.6	2.7	2.24%
29	Land to 29	5	Owned	54.4	53.7	0.7	1.29%
30	Land to 30	5	Owned	55.2	53.7	1.5	2.72%
31	Land to 31	5	Owned	116.7	115	1.7	1.46%
32	Land to 32	5	Owned	79.1	79.1	0	0.00%
33	Land to 33	5	Owned	78.2	78.2	0	0.00%
34	Land to 34	5	Owned	74.6	74.6	0	0.00%
35	Land to 35	5	Owned	57.1	57.1	0	0.00%
36	Land to 36	5	Owned	71.3	71.3	0	0.00%
37	Land to 37	5	Owned	84.2	84.2	0	0.00%
38	Land to 38	5	Owned	94.6	94.6	0	0.00%
39	Land to 39	5	Owned	62.3	62	0.3	0.48%
40	Land to 40	5	Owned	60.8	60.8	0	0.00%
41	Land to 41	5	Owned	96.4	96.4	0	0.00%
42	Land to 42	5	Owned	47.6	46.2	1.4	2.94%
43	Land to 43	5	Owned	40.8	39.5	1.3	3.19%
44	Land to 44	5	Owned	89.1	86.5	2.6	2.92%
45	Land to 45	5	Owned	69.1	69.1	0	0.00%
46	Land to 46	5	Owned	73.3	73.2	0.1	0.14%
47	Land to 47	5	Owned	66.3	66.3	0	0.00%
48	Land to 48	5	State Land	50.9	50.9	0	0.00%
49	Land to 49	5	State Land	37.9	37.6	0.3	0.79%
50	Land to 50	5	State Land	27.8	27.8	0	0.00%
51	Land to 51	5	State Land	8.8	8.8	0	0.00%
					Average percentage of land cutting		2.07%

The percentage change in land area in RT 05 RW 01 for 51 plots is a 2.07% reduction in land. Thus, the land reduction in the design is about 2% of the existing land area. The blowup of the existing and designed land areas for the Land Consolidation can be seen in figure 25.

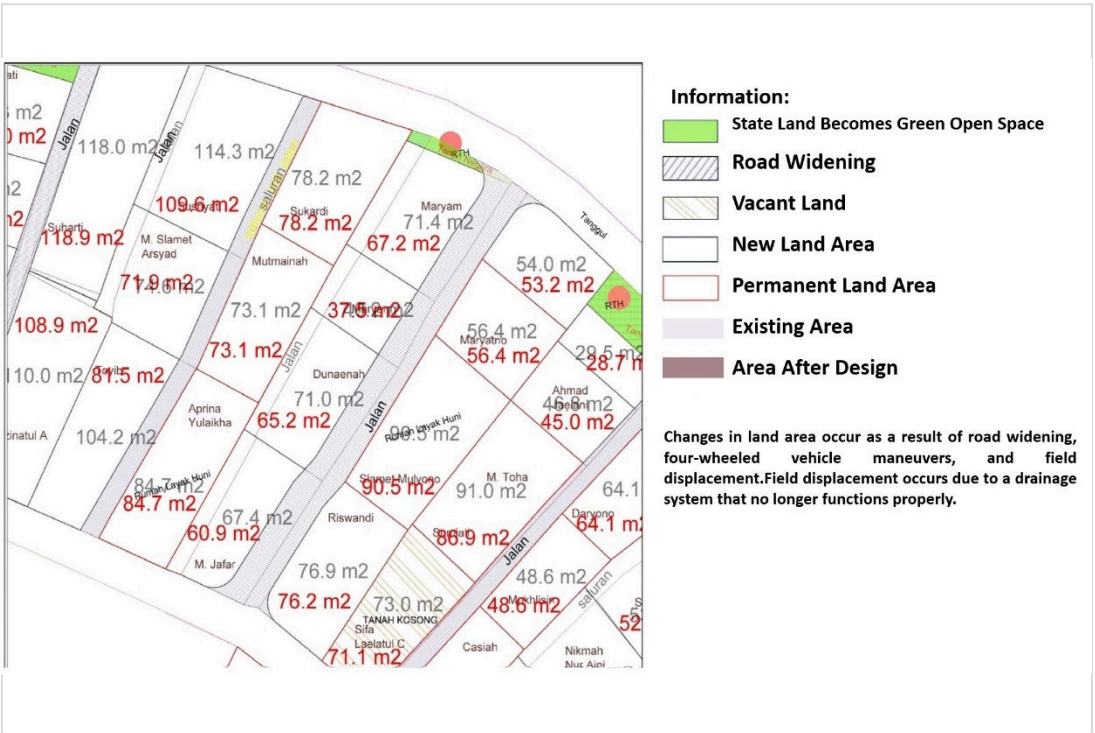


Figure 25. Example of land area change

Conclusions

This program has successfully implemented a comprehensive Land Consolidation concept with a sustainable approach in a slum urban area. Through collaboration between the central government, local government, community, and private sectors, the program has improved the environmental quality of the slum area and enhanced the urban spatial planning. Additionally, the participatory approach and the use of modern technology in architectural design and urban planning have contributed to achieving long-term sustainable solutions.

This research also provides an overview of the design proposal process that adjusts to the existing conditions, data, and directions from various stakeholders, including community participation. The design changes have been communicated to all parties and used as a basis for engaging the community to reach a consensus.

The results of this study will also serve as one of the foundations for the implementation of the Land Consolidation process and housing arrangement based on the interests of the community, while still adhering to various regulations, laws, and decisions. With the various directions and design constraints, it is hoped that a healthy, good, safe, and sustainable environment can be produced.

Furthermore, the proposed design is expected to be used for the implementation of construction, which will be clearer and more measurable. Community involvement in decision-making for its implementation remains a priority in the subsequent Land Consolidation process, which also involves related stakeholders. Therefore, feedback and suggestions from all parties involved in the development and arrangement of housing in Kampung Bugisan, Pekalongan, Central Java, are still needed to ensure the success of the planned Land Consolidation program.

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Nida Fadhilah contributed to the research. concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

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