Mapping Of Water Sanitation Lines Using Drones In The Residential Area Of BTN Grha Tegal Amertha, Banjar Tegal, Buleleng, Bali

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Abstract. Sanitation is a part of an effort to produce conditions free from the emergence of disturbances and diseases. The local sanitation system (on-site) is a wastewater disposal system in which wastewater is not collected and channeled into a network of channels that will take it to a wastewater treatment plant or receiving water body but is disposed of on-site. This study aimed to determine the existing sanitation conditions in the residential area of BTN Grha Tegal Amertha and to map the adjustment of the sanitation disposal lines in the residential area of BTN Grha Tegal Amertha. This study used a qualitative method to conduct a field survey to look for visual images which would later determine the classification of good or bad sanitation disposal lines. Also, this study used a descriptive method to describe the adjustment of the sanitation disposal lines, namely where the appropriate sanitation lines are supposed to be based on the classifications and what recommendations can be given regarding the existing sanitation conditions. The results of this study regarding the existing sanitation conditions showed that the good sanitation disposal line conditions are at 17 points with an overall length of 38,280 cm and are recommended to be monitored regularly. The bad sanitation disposal line conditions are at 11 points with an overall length of 2,357 cm and are recommended to be repaired.

Keywords: Drones, Mapping, Sanitation Lines.

1 Introduction

Banjar Tegal Urban Village is located in Buleleng Sub-district, Buleleng Regency, Bali. This urban village is located 18 meters above sea level. Astronomically, Banjar Tegal Urban Village is located at coordinates 8° 7'25.43"S, 115° 5'15.01"E. This urban village is divided into 4 sections, namely Tegal Anyar, Tegal Wangi, Tegal Sari, and Tegal Asatan. This urban village uses two sanitation systems, namely on-site (local) and off-site (centralized) sanitations. The location used in this study uses an on-site sanitation system.

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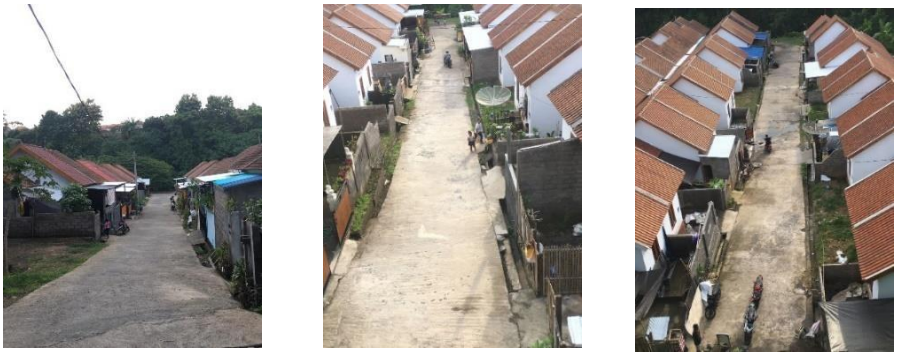

A. Block I B. Block II C. Block III

Fig 1. Sanitation Blocks of the Residential Area

In Figure 1, it can be seen that the size of the sanitation in the residential area is the same for each block. For the location, Block I is in the south, Block II is in the middle, and Block III is in the north.

Sanitation is a part of an effort to produce conditions that are free from the emergence of disturbances and diseases. The on-site sanitation system is a sanitation facility located inside the parcel (limited land owned), on the other hand the off-site sanitation system is a sanitation facility located outside the parcel[1]–[3].

Regarding the on-site sanitation system, it is a wastewater disposal system in which wastewater is not collected and channeled into a network of channels that will take it to a wastewater treatment plant or receiving water body, but is disposed of on-site[4]. The developer of BTN Grha Tegal Amertha has realized that in the residential area of BTN Graha Tegal Amertha an on-site sanitation system is used. This study only studied gray water, namely liquid waste from washing and bathing which directly leads to the sanitation end line which is an absorption sanitation system.

The sanitation line channels in the residential area of BTN Grha Tegal Amertha has a problem caused by local residents. The problem is that there is still household waste that clogs up the channels and makes the water stagnate causing many mosquitoes to nest that can lead to many diseases. For now, with the number of residents that are still small, this problem can be overcome by cleaning or widening the sanitation channel.

In this modern era, aerial photography can be done not only by using manned aircrafts, but also by using unmanned aircrafts or UAVs (Unmanned Aerial Vehicles). UAVs or better known as drones have quite affordable prices, easy to obtain, and have the capability to carry out shooting like manned aircraft[5]–[8]. Therefore, to map sanitation lines in the residential area of BTN Grha Tegal Amertha, another alternative is needed, one of these alternatives is the use of drones that can produce small-format aerial photos so as to create large-scale maps that are useful for accurate data information.

2 Methods

This study used a field survey method, with natural primary data collection in the field. The collected data were then analyzed using a qualitative descriptive method to obtain the results of data analysis conducted from the field survey. According to Lindawati (2016), a qualitative descriptive method is carried out by analyzing, describing, and summarizing various conditions, situations from various data collected in the form of interviews or observations about the problems studied in the field[9].

2.1 Variables and Operational Definitions of Research Variables

Based on the problem in this study, the researchers determined a research variable, namely mapping of sanitation lines by taking data in the form of aerial photos to the field and in mosaics on dronedeploy software so as to produce data in the form of sanitation lines in the area. The operational definition of variable, namely knowing the existing sanitation lines conditions and determining the sanitatation line classification of good or bad in the residential area so that these sanitation line channels can be monitores, or rearranged (if needed).

2.2 Data Analysis Technique Methods and Results

The data on the results of sanitation lines in the residential area of BTN Grha Tegal Amertha that have been known were analyzed to determine the existing conditions in the field using a qualitative method to conduct a field survey to look for visual images which would later determine the classification of good or bad sanitation lines. This was used as a basis in development of a sanitation disposal lines adjustment scheme. The results of the analysis are outlined in the following Table 1.

Table 1. The Existing Sanitation Conditions

BLOCK	TYPE	CONDITION	COORDINATE	Length
Block area	Type of sanitation	Conditions of the sanitation	Coordinate of the sanitation	Length of the sanitation

Furthermore, this study used a descriptive method to describe the adjustment of the sanitation disposal line analysis, namely where the appropriate sanitation lines are supposed to be based on the classifications (good or bad) and what recommendations can be given regarding the existing sanitation conditions which are categorized as bad. The results of the analysis are outlined in the following Table 2.

Table 2. Adjustment of the Sanitation Disposal Lines

BLOCK	TYPE	CONDITION	LONG	RECOMMENDATION
Block area	Type of sanitation (Existing and plan)	Conditions of sanitation	Length of sanitation	Recommendations for the existing sanitation lines

3 Results and Discussion

3.1 The Conditions of the Existing Water Sanitation at BTN Grha Tegal Amertha

Data collection on the existing sanitation lines conditions in the residential area of BTN Grha Tegal Amertha was carried out through a field survey. There are 28 points of sanitation lines, including 17 points with good conditions and 11 points with bad conditions. The existing sanitation line channels have an overall length of 406 m, a width of 25 cm, and a depth of 40 cm. The map of the existing water sanitation lines conditions in the residential area of BTN Grha Tegal Amertha is as follows:

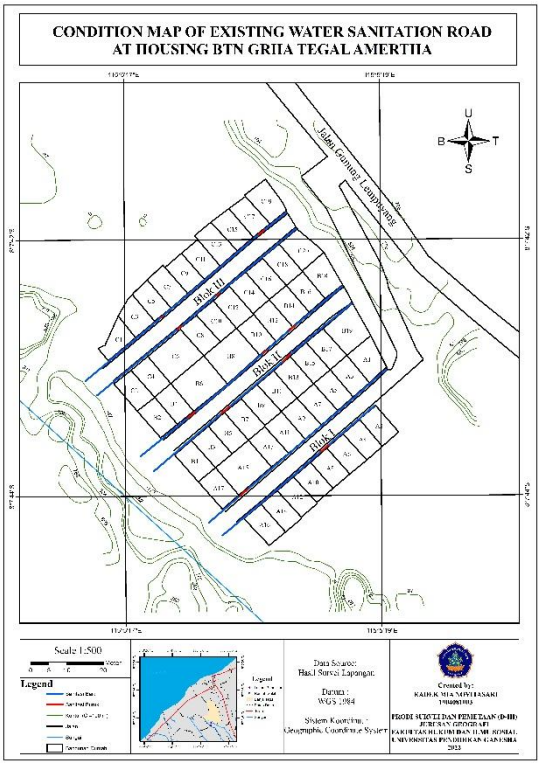

Fig 2. Water Sanitation Conditions in the Residential Area

In Figure 2, it can be seen that each block has a bad santiation condition with a different number of points. Block I has 2 points of bad sanitation, Block II has 5 points of bad sanitation, and Block III has 4 points of bad sanitation. There are 11 points of bad sanitation in the residential area of BTN Grha Tegal Amertha.

3.2 Recommendations for Sanitation Pathways and Buildings for Absorption Sites

The on-site sanitation system in the residential area of BTN Grha Tegal Amertha follows the existing sanitation lines by using a processing method in the sanitation with a drying system or water drainage in an area—which is carried out by draining water through a drainage system and its complementary buildings (structures), and at the end of sanitation disposal lines, with an absorption sanitation system. Then the final absorption area is made so that the absorption is combined into several sources of absorption communally.

The absorption area is one of the methods used to reduce the flow of water on the ground surface. The main principle of this absorption area is to expand the area of absorption. By making absorption wells that can function to hold and accommodate water, water will have the opportunity to be absorbed into the ground which will become groundwater reserves in the area.

Recommendations for the sanitation lines plan are made according to the results of the study, namely a planned line length of 6,293 cm and the building area for the final absorption area is 16.18 m^2. The planning can be seen on the following map in Figure 3.

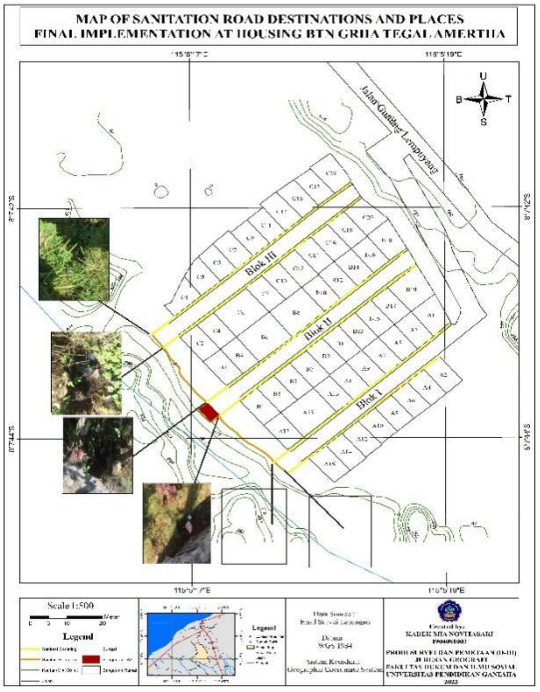

Fig 3. Map of Sanitation Road Destination and Final Absorption Area

In Figure 3, it can be seen that each end of the existing sanitation line is obtained by pulling polylines at each end of sanitation I and III and making the building where the final absorption is,—is in the form of a polygon by following the physical form of the visual image. At the end of block II, the final absorption area is designed so that the absorption is combined into several absorption sources.

4 Conclusion and Suggestion

Sanitation with good conditions totaled 17 points with a length of 38,280 cm and sanitation with bad conditions amounted to 11 points with a length of 2,357 cm. There is a need for regular monitoring by outreach to the public so that they are more aware of maintaining sanitation channels and need to repair sanitation channels that are in poor condition. Recommendations for sanitation lines are made by drawing a polyline at the end of the sanitation that follows the physical shape with a path length of 6,293 cm. At the end of block II, a final infiltration building is made so that there is no more garbage in the sanitation lines. Infiltration area is one of the methods used to reduce the flow of water on the ground surface. The final infiltration building is made in a polygon shape which has an area of 16.18 m^2

5. References

[1] Suryahadi and Y. T. Nurteisa, "Teknologi Pesawat Tanpa Awak Untuk Pemetaan Skala Detail Rencana," *Indones. J. Community Engagem.*, Vol. 02, No. 01, Pp. 1–13, 2016.

[2] Z. N. Andriani And I. F. Purwanti, "Perencanaan Peningkatan Pelayanan Sanitasi Di Kelurahan Pegirian Surabaya," *J. Tek. Its*, Vol. 5, No. 1, Pp. 25–30, 2016.

[3] S. W. Jannah, Z. I. Bathista, A. Hikmah, And Y. S. Pratiwi, "Sanitasi Tempat Tempat Umum Dan Makanan Gambaran Sanitasi Jasa Boga Di Wien's Catering Lembengan Ledokombo," *J. Sos. Dan Sains*, Vol. 1, No. 8, Pp. 930–942, 2021.

[4] M. Arsyad, "Perencanaan Sistim Perpipaan Air Limbah Kawasan Pemukiman Penduduk," *J. Ilm. Media Eng.*, Vol. 5, No. 2, Pp. 406–412, 2015.

[5] M. A. Hakim, H. Emawati, And D. E. Mujahiddin, "Pemanfaatan Pesawat Tanpa Awak Untuk Pemetaan Dan Identifikasi Penutupan Lahan Pada Kawasan Hutan Pendidikan Unmul," *J. Agrifor*, Vol. Xx, No. 1, Pp. 1–14, 2021.

[6] A. Y. Mabrur, "Analisis Pemanfaatan Opensource Dronedeploy Dalam Proses Mozaik Foto Udara (UAV)," *Pawon J. Arsit.*, Vol. 3, No. 2, Pp. 79–92, 2019.

[7] D. R. H. Saputra And B. Pramujati, "Rancang Bangun Prototype Unmanned Aerial Vehicle (UAV) Dengan Tiga Rotor," *J. Tek. Pomits*, Vol. 2, No. 1, Pp. 47–52, 2013.

[8] H. S. Widodo, R. Effendie, And J. Susila, "Perancangan Dan Implementasi Kontroler Pid Untuk Pengaturan Heading Dan Pengaturan Arah Pada Fixed-Wing Unmanned Aerial Vehicle (UAV)," *J. Tek. Its*, Vol. 1, No. 1, Pp. A174–A178, 2012.

[9] S. Lindawati, "Penggunaan Metode Deskriptif Kualitatif Untuk Analisis Strategi Pengembangan Kepariwisataan Kota Sibolga Provinsi Sumatera Utara," In *Seminar Nasional Aptikom (Semnastikom), Hotel Lombok Raya Mataram*, 2016, Pp. 833–837.