# Performance Evaluation of Domestic Wastewater Treatment Plant Systems: *A Case Study of Domestic Wastewater Systems in Lembah Hijau Housing, Banda Aceh City, Indonesia*

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**Abstract -** One of the residential areas in Banda Aceh City that has problems with wastewater management is the Lembah Hijau housing, Lueng Bata District. In 2018, the government has built and operationalized 2 units of Local Domestic Wastewater Management Installation (WWTP) with a service capacity of 50 households per unit and a capacity of 72m$^3$/day. The purpose of this study was to examine the existing conditions and functions of WWTP, technical aspects, social aspects and institutional aspects, and the impact of Communal WWTP on the environment with parameters namely pH, BOD, COD, TSS, oil and grease. The method used in this research is a quantitative method. The results showed that the existing conditions of 2 communal WWTP units in the Lembah Hijau Housing, namely one WWTP unit Jl. Al-Firdaus functions and can be operationalized. One unit of communal WWTP Jl. Barata V could not be operated because the elevation of the house's drain pipe was lower than the installation pipe for the complex shelter being built. The technical aspect is disposal (*overflow*/ overflow) in which the end of the septic tank is discharged into the local canal or drainage. Test results for pH, BOD, COD, TSS, oils and fats show a BOD value of 54.7 mg/L with a quality standard of 30 mg/L, meaning that the BOD value has exceeded the quality standard. Therefore, the follow-up and management of the wastewater is required. The pH test results were still below the quality standard of 5.5. The COD test result was 92.6 mg/L. Test results against *Total suspended Solid* (TSS) of 20.9 mg/L with a quality standard of 30 mg/L means that the TSS value is still below the quality book which is still permissible.

Keywords: *Lembah Hijau Housing, WWTP, functioning, not functioning*

## INTRODUCTION

The development of an area followed by an increase in population has a lot of influence on the residential environment. One of the impacts that can be felt is the unbalanced provision of environmental sanitation facilities and infrastructure due to the increasing amount of domestic wastewater. Waste water consists of domestic, industrial and agricultural waste water which contains various potential contaminants (Gahalod et al, 2017). According to Lestari et al (2020) the number of residents' activities affects the type of waste produced. One of them is domestic wastewater originating from household activities. The local domestic wastewater management system is a wastewater management system in an urban area where some households use a local system in the form of a septic tank. The implementation of domestic wastewater management aims to increase access to environmentally friendly domestic wastewater services in order to improve the quality of life of the community and a better and healthier environment. Law Number 23 of 2014 concerning Regional Government, states that waste water management is included in the obligatory affairs of the Regional Government and is a basic service for the community. Furthermore, Presidential Regulation Number 2 of 2015 concerning the 2015–2019 National Medium-Term Development Plan also states the attainment of universal access to sanitation in 2019.

Responding to these universal sanitation challenges, the government is committed to increasing access to domestic wastewater in the form of developing wastewater infrastructure in districts/cities which includes a local wastewater management system (*on-site system*), centralized wastewater management system (*off-site system*) and the construction of a Fecal Sludge Treatment Plant (IPLT). Domestic waste water is water that has been used and comes from households or settlements. Sources of domestic wastewater from households are as follows: (1) WC/latrine/latrine where domestic wastewater originating from this source is often referred to as *black water*; (2) Bathrooms, washing areas, and cooking areas (kitchens) where domestic wastewater originating from this source is

often referred to as *grey water*. Domestic wastewater needs to be collected and treated somewhere. Treatment can be done by combining the two sources of wastewater.

Domestic wastewater treatment is necessary because it can contaminate before being discharged into the environment or receiving water bodies. Receiving water bodies include: groundwater, drainage, rivers and seawater. Household domestic wastewater treatment can be done with various systems. One of them uses the local system. Local system domestic wastewater treatment can be interpreted that wastewater treatment is carried out on available land in the household producing the wastewater source. The technology used for individual onsite systems is generally a septic tank. The septic tank used must meet the planning criteria of the Indonesian National Standard (SNI) 03-2398-2002 concerning procedures for planning septic tanks.

One of the residential areas in Banda Aceh City that has problems in managing domestic wastewater is the Lembah Hijau Housing, Cot Mesjid Village, Lueng Bata District, Banda Aceh City. Waste water goes directly to the ground surface without being treated first, causing pollution in water bodies which results in a decrease in the quality of surface water around Lembah Hijau Housing. For this reason, a domestic Wastewater Treatment Plant (WWTP) was built to tackle groundwater pollution which has an impact on environmental quality and health, to control the quality of domestic wastewater effluent so that it does not exceed the domestic wastewater quality standards set by the government in the Lembah Hijau housing.

To deal with domestic wastewater problems in the Lembah Hijau housing, in 2018 two units of Local Domestic Wastewater Management Installation (WWTP) were built and operated for the Community Based Sanitation Program (SANIMAS) in Banda Aceh City with a service capacity of 50 families per unit equal to 72 $m^3$/day. The WWTP building was built with an area of length x width x height of 10 m x 3 m x 3 m = 90 $m^3$. The two communal WWTPs were built using *Anaerobik Baffled Reactor* (ABR) technology, of the two buildings only one unit is functioning and operational. One communal WWTP unit that has been built cannot be operated because the elevation of the house drain pipe is lower than the sump installation pipe.

The Communal WWTP system can be used for wastewater management in densely populated, slum, and sanitation-prone settlements. Sanitation systems or household waste disposal systems are important in maintaining the quality of groundwater, because an improper waste disposal system will cause contamination of groundwater quality. The condition of this poor sewage system can cause high contamination and affect the quality of well water and can cause high numbers of E. coli bacteria (Aji, 2007). According to Harudyawati (2016) household or domestic liquid waste is waste water originating from use for cleaning, which is a combination of kitchen, bathroom, toilet, laundry, and garbage etc. The composition of liquid waste generally includes mineral compounds derived from food waste, urine and soap. Some household wastewater is suspended in the form of dissolved substances. This wastewater can be divided into two, namely: toilet wastewater which is commonly called *black water* and the liquid waste from bathing-washing is known as *gray water*. *Black water* removed by the population through *septic tank*, but some are dumped all at once into the river. Meanwhile, *gray water* discharged into the river through the channel. The population of big cities is growing rapidly, along with the rapid development of the times, so that the amount of household domestic wastewater that is produced is also greater. Meanwhile, the potential carrying capacity of rivers or water bodies receiving domestic household wastewater tends to decrease, as seen from the decrease in river discharge.

Evaluation is a systematic and continuous process for collecting, describing, interpreting and presenting information about a program to be used as a basis for making decisions, formulating policies and preparing subsequent programs (Raharjo, 2016). According to Uddin et al, (2013), the definition of performance is related to infrastructure facilities serving their users and meeting their development or acquisition goals, measured by the accumulated quality and length of service provided to their users. Performance evaluation is a method and process of assessing the implementation of tasks (*performance*) a person or group of people or work units within a company or organization in accordance with predetermined performance standards or objectives (Widyaningrum, 2000). This study aims to examine the existing conditions and functions of WWTP, examine technical aspects, social aspects and institutional aspects. Assessing the impact of the Communal WWTP on the environment with parameters namely pH, BOD, COD, TSS, oil and grease.

# METHODOLOGY

## Research Objects

The object of this research was the evaluation of the Domestic Wastewater Treatment Plant (WWTP) system in terms of the feasibility and management of the Domestic WWTP in Lembah Hijau housing.

## Research Location

The method used in this research was a quantitative method that conveys objectively to answer the research objectives. Where quantitative data was supported by the theory of domestic WWTP management, data processing was carried out using a descriptive approach. Analyzing the feasibility of WWTP construction construction, namely:

1. The feasibility of WWTP development construction could be seen by taking into account technical aspects and institutional aspects.
2. The effectiveness of WWTP management for community service needs could be seen, namely processing efficiency could be reached wastewater quality standards, easy management, the required land was not too large, low energy consumption, low operating costs, small sludge produced. It could be used for wastewater with a large enough BOD load, remove suspended solids (SS) well, remove ammonia until it reaches applicable quality standards, and easy and simple maintenance.
3. Efficiency alternative to communal WWTP settling tanks.

This research methodology was a method with a quantitative research type in which the author conducts a field survey to find out and observe the conditions of the Domestic Wastewater Treatment Plant and the influence on the surrounding environment. The results of the analysis analyze the processing system and the reconstruction and reuse of WWTP settlements in the Lembah Hijau housing.

## Total of Samples

The sampling technique employed a questionnaire which was done using a random technique or *random sampling/probability sampling*. Determining the number of samples that represent the population uses the Slovin formula (1975) in Husen Umar (2015) where the minimum sample size is (n) if the population size is known (N) at the significance level e is:

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

$$n = \frac{223}{2{,}23+1} \qquad \text{n = 69}$$

From the results of the above calculations, it was obtained that the questionnaire that had to be addressed was as many as 69 (sixty nine) respondents.

# TECHNIQUE OF DATA ANALYSIS

Lembah Hijau is a residential area that is experiencing very rapid development and population growth, especially in the Lembah Hijau Housing area. This residential area is a developing area where sanitation is a major problem.

## Existing condition of WWTP in Lembah Hijau Housing

Existing condition of the WWTP in Lembah Hijau housing was obtained by conducting a preliminary survey at the study site. The results of the preliminary survey on the existing conditions of the WWTP are condition of the breaker tub, setler tub, AF tub, ABR tub, inlet pipe, outlet pipe and whether the WWTP was watertight. The results of the survey carried out to obtain data on the existing condition of the WWTP.

## Functions of WWTP in Lembah Hijau Housing

Function of WWTP was obtained from the preliminary survey, which then condition of WWTP was analyzed. The physical condition of the building was still complete and functioning properly, the condition of each house's control tub, the condition of the pipe network that has been built and the condition of the flow of domestic waste water from all toilet cubicles to the communal WWTP functioning by gravity. The data is compiled and discussed.

Then the data obtained was analyzed using descriptive analysis method, namely to describe in detail and comprehensively the management of the domestic wastewater sanitation system.

## Study of Technical Aspects

Data analysis used was qualitative analysis with descriptive statistical methods of the specified variables. The analysis was carried out based on observations of the Minimum Service Standard (SPM) services for the domestic wastewater sub-affairs, the Director General Letter of CK No.03/SE/DC/2020 concerning technical guidelines for the implementation of work-intensive activities of the Director General of Cipta Karya in the study area by analyzing the processing and utilization systems WWTP for settlements in the Lembah Hijau housing, as follow.

### 1. Construction Feasibility

Evaluation of the Communal WWTP used (according to design criteria). Analysis indicators by looking at the technical aspects, namely the quality of the influent that enters the WWTP and the quality of the effluent produced. The physical condition of the Communal WWTP includes operation and maintenance. Assessment of the physical condition of the Lembah Hijau Housing WWTP was carried out to see the current condition of the existing WWTP. WWTP is one of the components in the domestic wastewater management system that functions to process waste *blackwater* in the form of water containing faecal sludge into water that meets water quality requirements for disposal into receiving water bodies. Design of the WWTP of the Lembah Hijau housing is shown in Figure 1.

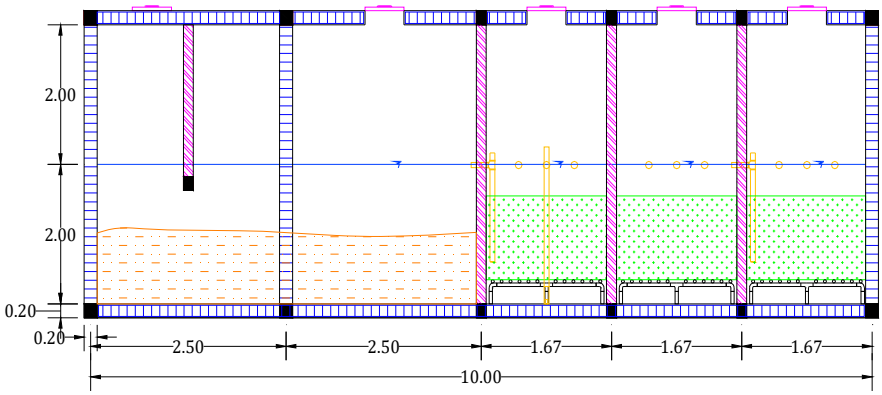


FIGURE 1. Part of the WWTP of Lembah Hijau Housing

### 2. WWTP Management Effectiveness

Analysis of indicators is carried out by looking at institutional aspects through Beneficiary and Maintenance Groups (KPP) in carrying out operations and maintenance. The existing condition of Lembah Hijau WWTP shown, there are two units of WWTP facilities built, including: a) one WWTP unit was functioning and one unit was not functioning, (b) Due to the lack of land, one WWTP unit was built on the road body, c) when rainy season, rainwater will overflow into residents' houses, d) high population level; e) The water source that serves public bathing, washing, and toilet facilities were PDAM water which could be relied upon in terms of quality, quantity and continuity.

## RESULTS AND DISCUSSION

### Existing Condition and Function of WWTP in the Lembah Hijau Housing

Existing conditions of 2 (two) units of Local Domestic Wastewater Management Installation (WWTP) with a service capacity of 50 family per unit and 72 m capacity$^3$/day. Only one unit of the communal WWTP functions and can be operationalized. One more communal WWTP unit that has been built cannot be operational because the elevation of the house's drain pipe is lower than the installation pipe for the storage basin of the Lembah Hijau

Housing which was built through the Community-Based Sanitation Program (SANIMAS) for Banda Aceh City with a service capacity of 50 units per unit head of family and a capacity of 72 $m^3$/day. The WWTP building was built with an area of length x width x height of 10 m x 3 m x 3 m = 90 $m^3$ can be seen the existing condition and function of WWTP by conducting a preliminary survey to the location.

**Table 1. Type and Weight of Condition of WWTP Infrastructure Jln. Al-Firdaus**

| Processing Unit | Assessment components | Weight (%) | Assessment Score | | | |
|---|---|---|---|---|---|---|
| | | | Completeness | Condition | Function | Weight |
| | | | Exist (1) | Good (3) | Good (3) | |
| | | | | Minor damage (2) | Less (2) | |
| | | | Not Exist (0) | Moderate Damage (1) | Not Working (0) | |
| | | | | Heavily Damaged (0) | | |
| Mainhole | Mainhole | 7 | 1 | 3 | 3 | 100 |
| | | **7** | | | | |
| Tub Breaker | Body Tub Breaker | 6 | 1 | 3 | 2 | 100 |
| | Inlet/unloadi-ng | 4 | 1 | 1 | 2 | 100 |
| | Pipe | 5 | 1 | 2 | 2 | 100 |
| | Breaker Area | 3 | 1 | 1 | 1 | 100 |
| | | **18** | | | | |
| Set Tub | Set Pond | 7 | 1 | 3 | 3 | 7 |
| | Pipe | 6 | 1 | 2 | 3 | 6 |
| | Inspection road | 5 | 1 | 2 | 2 | 5 |
| | | **18** | | | | |
| AF Tub | Set Pond | 7 | 1 | 3 | 3 | 7 |
| | Pipe | 6 | 1 | 2 | 3 | 6 |
| | Inspection Road | 5 | 1 | 2 | 2 | 5 |
| | | **18** | | | | |
| ABR Tub | ABR Pond | 7 | 1 | 3 | 3 | 7 |
| | Pipe | 6 | 1 | 2 | 3 | 6 |
| | Inspection Rute | 5 | 1 | 2 | 2 | 5 |
| | | **18** | | | | |
| Inlet Pipe | Pipe | 5 | 1 | 2 | 2 | 5 |
| | | **5** | | | | |
| Outlet Pipe | Pipe | 5 | 1 | 2 | 2 | 5 |
| | | **5** | | | | |
| Pipe Network | Pipe | 5 | 1 | 2 | 2 | 5 |
| | | **5** | | | | |
| Tub Control | Tub Control | 6 | 1 | 3 | 2 | 6 |
| | | **6** | | | | |
| | | **100** | | | | |

Table 1 explains that WWTP Jl. Al-Firdaus Cot Masjid is still functioning by serving communal domestic wastewater services for the Lembah Hijau community. The community has used the domestic wastewater installation in Lembah Hijau and has benefited from the wastewater installation with a value of 100%.

**Table 2. Types and Weights of the Condition of WWTP Infrastructure Jln. Barata V**

| Processing Unit | Assessment components | Weight (%) | Evaluation Score | | | |
|---|---|---|---|---|---|---|
| | | | Completeness | Condition | Function | Weight |
| | | | Exist (1) | Good (3) | Good (3) | |
| | | | | Minor Damage (2) | Less (2) | |
| | | | Not Exist (0) | Moderate Damage (1) | Not Functioned (0) | |
| | | | | Heavily Damage (0) | | |
| Mainhole | Mainhole | 7 | 1 | 2 | 2 | 71.4 |
| | | **7** | 1 | 2 | 2 | **71.4** |
| Tub Breaker | Tub Breaker Body | 6 | 1 | 2 | 2 | 83.3 |
| | Inlet/unloadi-ng | 4 | 1 | 1 | 1 | 75 |
| | Pipe | 5 | 1 | 2 | 1 | 80 |
| | Breaker Area | 3 | 1 | 1 | 1 | 100 |
| | | **18** | | | | **84.5** |
| Set Tub | Set Pond | 7 | 1 | 2 | 2 | 71.4 |
| | Pipe | 6 | 1 | 2 | 2 | 83.3 |
| | Inspection rute | 5 | 1 | 2 | 2 | 100 |
| | | **18** | | | | **63.7** |
| AF Tub | Setler Pond | 7 | 1 | 2 | 2 | 71.4 |
| | Pipe | 6 | 1 | 2 | 2 | 83.3 |
| | Inspection Rute | 5 | 1 | 2 | 1 | 71.4 |
| | | **18** | | | | 80 |
| ABR Tub | ABR Pond | 7 | 1 | 2 | 2 | **58.6** |
| | Pipe | 6 | | | | 57.1 |
| | Inspection Rute | 5 | 1 | 1 | 0 | 83,3 |
| | | **18** | | | | 100 |
| Inlet Pipe | Pipe | 5 | 1 | 1 | 0 | **60.1** |
| | | **5** | | | | 40 |
| Outlet Pipe | Pipe | 5 | 1 | 1 | 0 | **40** |
| | | **5** | | | | 40 |
| Pipe Network | Pipe | 5 | 1 | 2 | 2 | **40** |
| | | **5** | 1 | 2 | 2 | 40 |
| Control Tub | Control Tub | 6 | | | | **40** |
| | | **6** | 1 | 1 | 0 | 83.3 |
| | | **100** | | | | **83.3** |

Table 2 explains that WWTP Jl. Barata V Lembah Hijau was no longer functioning to serve domestic wastewater services for the Lembah Hijau community. Selection of WWTP construction site Jl. Barata V was in the middle of a green gem complex. The reason for choosing the location for the WWTP development was because there was no land that could be donated for the construction of the WWTP facility, so the location for the WWTP construction was chosen, Jl. Barata V in the middle of the road.

## WWTP Management of the Lembah Hijau Housing

The selection of a Wastewater Treatment Plant (WWTP) must pay attention to the technical, environmental, socio-cultural aspects of the local community and be equipped with a buffer zone (PP No. 16/2005 concerning the development of a drinking water supply system). The second part, articles 15 to 18, describes wastewater infrastructure and facilities. Wastewater infrastructure and facilities are carried out through a local and/or

centralized wastewater disposal system. The local wastewater disposal system is carried out individually through local wastewater treatment and disposal. A centralized wastewater disposal system is carried out collectively through a collection network and is treated and disposed of centrally. If wastewater infrastructure and facilities are available, individuals or community groups are prohibited from disposing of wastewater directly without treatment to raw water sources. If wastewater infrastructure and facilities are not yet available, individuals or community groups are prohibited from disposing of wastewater directly without treatment to raw water sources determined by the Government/Regional Government according to their authority.

The technical aspect in managing Lembah Hijau WWTP is disposal (*overflow*/ overflow) the end of the septic tank is discharged into the local canal or drainage. The minimum service for the wastewater disposal system in the form of a human excrement treatment unit is carried out using a local system or a centralized system so as not to contaminate the raw water catchment area. The local wastewater disposal system is for individuals/households. A centralized wastewater disposal system is intended for densely populated areas by taking into account the conditionscarrying capacity of the land and SPAM as well as taking into account the socio-economic conditions of the community.

**Table 3. Technical Aspects of Lembah Hijau Housing WWTP**

| Question | Very Strong (5) | Strong (4) | Medium (3) | Low (2) | Very Low (1) |
|---|---|---|---|---|---|
| WWTP facilities in clean condition (no moss, no smell, no flies) | | | 3 | | |
| Operations & Maintenance (septic tank desludging) | | | | | 1 |
| Desludging of fecal sludge is carried out routinely and periodically | | | | | 1 |
| Service improvement is carried out through future performance improvements | | | 3 | | |

Table 3 explains that the management conditions of the Lembah Hijau Housing WWTP were obtained from a number of questions, namely: Cleanliness in the WWTP facilities in clean condition (no moss, no smell, no flies) is in the moderate category with a value of three (3), where above the WWTP building rarely cleaned so that plants grow in the form of grass and other small plants. The second question, Operations & Maintenance (septic tank desludging) is in the category of very low scores with a score of one (1). Third question: Routine desludging is carried out periodically, it is in the category of very low value with a score of one (1). Fourth question: To improve service, performance improvements will be made in the future, the score is moderate with a score of three (3).

Pangestu M.P (2021) in his research stated that one of the wastewater management systems in Sleman Regency is the communal system. The existence of a Communal WWTP should have a positive influence on sanitation risk areas. Communal WWTP is selected using the technique *stratified random sampling*, while taking samples using the method *grab sampling* at the inlet and outlet. The results of Pangestu M.P's research (2021) state that on average the Communal WWTP has generally met the quality standards for the BOD parameter, but has not met the ammonia and COD parameters. While the results of the scoring and weighting analysis show that most of them (5 Communal WWTPs) have a moderate effect. These results are inconsistent with the strata that the researchers have formulated where the higher the stratum, the higher the risk, in fact at stratum 2 the effect given by WWTP was low, while strata 3 and 4 have a moderate effect.

## Impact of the Communal WWTP on the Environment of the Lembah Hijau Housing

## Impact of Communal WWTP on the Environment

Table 4. explains the impact of the Lembah Hijau Housing WWTP on the housing environment of Lembah Hijau housing that have been built are not functioning, so not all households can take advantage of the WWTP facilities. Second question: Smells of the communal WWTP settling tub, the score was low at 2 (two) because the WWTP settling tub creates an odor in the rainy season. Third question: All toilet cubicles can be accessed easily, the score

was moderate at 3 (three) because all households have their own bathing, washing and toilet. Fourth question: Availability of water for every house at any time and continuously flowing, the score is moderate at 3 (three) because all households already have access to clean water from PDAM Tirta Daroy Banda Aceh City and water from communal wells for each head of household. Fifth question, all the toilet cubicles are physically complete and functioning properly, the score is low at 2 (two) due to the rare maintenance of the toilet facilities that are already owned by every household.

**Table 4. Impact of Lembah Hijau Housing WWTP on the Environment**

| Question | Very Strong (5) | Strong (4) | Medium (3) | Low (2) | Very Low (1) |
|---|---|---|---|---|---|
| All households as users of the public toilet facilities (80-100 households) | | | | 2 | |
| Smells of communal WWTP settling tub | | | | 2.56 | |
| All toilets are easily accessible | | | 3 | | |
| Water is available for every house at any time and flows continuously | | | 3 | | |
| All physical equipment of the building is still complete and functioning properly | | | | 2.1 | |

## Wastewater Analysis Results

The results of water quality analysis from WWTP of Lembah Hijau housing are shown in Table 5.

**Table 5. Results of Wastewater Quality**

| Parameter | Unit | Quality Standards | Results of Analysis | Method |
|---|---|---|---|---|
| pH | - | 6-9 | 5.5 | SNI 6989.11.2019 |
| TSS | mg/L | 30 | 29.6 | SNI 6989.3.2019 |
| COD | mg/L | 100 | 92.6 | SNI 6989.15.2019 |
| BOD | mg/L | 30 | 54.7 | SNI 6989.72.2009 |
| Oil/Fat | mg/L | 5 | 4.5 | SNI 19.1660.1989 |

Table 5 describes the results of testing the wastewater from the Lembah Hijau Housing, that the pH is still below the quality standard of 5.5 with a quality standard of 6-9. *Total suspended Solid* (TSS) is a suspended solid that causes water turbidity, cannot precipitate and does not dissolve in water. The suspended solids are in the form of small particles and weigh less than sediment, for example clay, microorganism cells and certain organic materials (Bahagia, 2020). Test results against *Total suspended Solid* (TSS) shows a comparison of the TSS value of the test results of 20.9 mg/L with the quality standard of 30 mg/L meaning that the TSS value is still below the quality book so it is still permissible.

*Chemical Oxygen Demand* **(**COD) is a measurement of the amount of organic matter required to chemically oxidize organic matter in one liter of wastewater. The results of the COD parameter test in the laboratory presented above show that the COD value of the test results is 92.6 mg/L with a quality standard of 100 mg/L, meaning that the COD value is still below the quality book so it is still permissible.

The amount of oxygen required to oxidize organic matter by aerobic bacteria to inorganic substances is called *Biochemical Oxygen Demand* **(**BOD). BOD states the oxidation of aerobic bacteria into organic matter with the amount of oxygen consumed by bacteria at a certain time and temperature. The dissolved oxygen content will decrease as a result of the release of high BOD values in water into the waters naturally. The results of the BOD parameter test for black water waste water in the Lembah Hijau Housing are presented above showing that the BOD value of the test results was 54.7 mg/L with a quality standard of 30 mg/L, meaning that the BOD value has exceeded the quality standard. so that follow-up and management of the waste water is needed.

The results of the oil/fat parameter test show that the test value is 4.5 mg/L while the quality standard is 5 mg/L, meaning that the oil/fat value is still below the quality book so it is still permissible.

Diavid et al., (2018) regarding the feasibility evaluation of the Sembir WWTP system, there was a decrease in influent to effluent concentration on several parameters, namely pH, BOD5, COD, TSS, oil and grease, detergent, except for the parameters total coliform, Ammonia, TDS, and Temperature. The influent discharge is greater than the planned discharge (113.53 $m^3$/day ≥ 35.63 $m^3$/day) so that WWTP's performance capacity is less than optimal in treating domestic wastewater. Physical infrastructure has met the criteria which is having the five required criteria and functioning as it should. The effluent quality for the pollution index is in the medium polluted category. Diavid et al., (2018) stated that there was a decrease in concentration in the Madurejo WWTP *influent* the *effluent* occurs in all parameters except for Total Coliform. The influent discharge meets the design discharge (34.44 $m^3$/day ≤ 36 $m^3$/day) so that WWTP performance capacity can still treat domestic wastewater according to plan. DAs for quality *effluent* for the pollution index is in the moderately polluted category. Wijayaningrat (2018) conducted research on the efficiency of removing physical and chemical parameters that worked effectively on the BOD and TSS parameters, while the COD, ammonia and oil and grease parameters were not yet effective. The efficiency of the removal of physical and chemical parameters at the Communal WWTP in Banguntapan Sub-District has been quite effective, while in the Bantul Sub-District it has been less effective. To overcome this, the recommendations given are making SOPs, increasing participation and the role of the community, managers and the government in maintaining the Communal WWTP. Mulia (2015) regarding the physical condition of the Communal WWTP in Gresik Regency in general, it was in fairly good condition, except for the WWTP at the Roomo location. However, there are still problems such as odor and WWTP discharge that were not in accordance with the planned discharge, namely Singosari 2 WWTP of 52.7 $m^3$/day and Singosari 3 WWTP of 83.8 $m^3$/day. The removal efficiency of BOD and COD in all processing units for BOD was good with a range of 79-96%, but for oil and grease parameters it was also very small at 13%. While related to institutional management, especially the main tasks and functions of the KPP, it is still low due to the lack of socialization and training on an ongoing basis so that implementation has not run optimally. Susanthi, et al. (2018) in general, three communal WWTP locations that have been operating for more than 5 years and are in areas of high sanitation risk are still being utilized and managed quite well even though they have exceeded their design capacity. The performance of the communal WWTP with the ABR system was only for KSM Roselle which had high efficiency, while KSM Cidinding Indah and KSM Amanah had low efficiency and did not meet quality standards. Meanwhile, the sustainability status of communal WWTP management in Bogor City was classified as moderate. Aspects that contribute to sustainability was social (community participation) and institutional (the existence of KSM).

## CONCLUSION

Evaluation results showed that only one existing WWTP unit was functioning and operating, while the other one was not operating, because the elevation of the house's drain pipe is lower than the complex storage tank installation pipe built through the Community-Based Sanitation Program (SANIMAS) for Banda Aceh City. The selection of a Wastewater Treatment Plant (WWTP) must pay attention to the technical, environmental, socio-cultural aspects of the local community and be equipped with a buffer zone (PP No. 16 of 2005 concerning the development of a drinking water supply system).

The technical aspect in managing WWTP is disposal (*overflow*) end of the septic tank was discharged into the local canal or drainage. The community still needs technical guidance from the Banda Aceh City government so that they are able to manage the operation and maintenance of the WWTP facilities that have been built.

The existence of the Lembah Hijau Housing communal WWTP has had an impact on the environment. Analysis results for pH, BOD, COD, TSS, oils and fats showed a BOD value of 54.7 mg/L with a quality standard of 30 mg/L, meaning that the BOD value has exceeded the quality standard, so follow-up and management of the wastewater is required. The pH test results were still below the quality standard of 5.5 with a quality standard of 6-9. The COD test result was 92.6 mg/L with a quality standard of 100 mg/L meaning that the COD value was still below the quality book so it was still allowed.

Test results against *Total suspended Solid* (TSS) shows a comparison of the TSS value of the test results of 20.9 mg/L with the quality standard of 30 mg/L meaning that the TSS value is still below the quality book so it is still permissible.

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