Carrying capacity and environmental capacity of water resources analysis in Maluku Province of Indonesia

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Abstract. Carrying capacity and environmental capacity of water resources is the ability of the water to support human life, other living creatures, and the balance between the two as well as the ability of the environment to absorb substances, energy and other components that enter or are incorporated into it. The purpose of this research is to analyze the level of carrying capacity and environmental capacity of water resources in several regencies in Maluku Province, Indonesia. The results showed that some water resources were already in a low environmental capacity due to limited availability, especially deep groundwater in Wamar Island, Aru Archipelago Regency and the environmental capacity of water resources had exceeded the quality standards set in Indonesia, especially fresh water in Southeast Maluku Regency and Ambon City. Meanwhile, the environmental capacity of fresh water that has exceeded the quality standard is due to the presence of e-colly bacteria. This condition shows the importance of water conservation through regulating human behavior that is not environmentally friendly, building rainwater control and runoff control infrastructure as well as law enforcement efforts related to watershed maintenance and the behavior of communities around water resources.

1. Introduction

The meaning of Carrying Capacity and Environmental Capacity and as stated in Law Number 32 of 2009 concerning Environmental Protection and Management is as follows. The carrying capacity of the environment is the ability of the environment to support the life of humans and other creatures and the balance between the two. Meanwhile, the environmental capacity is the ability of the environment to absorb energy substances and/or other components that are entered or incorporated into it.

In the implementation of national and regional economic development, it will always have an impact, especially the degradation of the environment and natural resources, including forests, land, water and air as a result of an imbalance in the ecosystem. This overall impact will lead to the welfare of human life which is also disturbed and even threatened by the survival of humans and other creatures.
Since the late 1990s, more thorough research has been conducted on the carrying capacity of water resources (WRCC). However, due to the regionality and complexity of influencing factors, the concept of WRCC at home and abroad has not been expressed in a unified way [1]. The water resource carrying capacity (WRCC) can be defined as the maximum capacity of regional water resources to support social and economic development based on a given living standard and production technology without degrading the water environment [2]. The WRCC is an important concept in judging the relationship between regional human activities and water resources [3]. Therefore, studying the water resources carrying capacity (WRCC) is necessary to obtain scientific guidance on water resources allocation and alleviate the conflict between the demand of the society–economy system and water resources supply. WRCC is generally quantified as the ratio between the water demand of social development and water supply under specific conditions [4].

In connection with the existence of environmental problems that have become a global issue, a movement to save the environment was born which resulted in various international policies including SDG’s or Sustainable Development Goal’s and has been adopted by our country in the form of the National Development Goal’s (NDG’s) with a set of different indicators starting from the National to Regency / City levels which are implemented in various regulations concerning the need for sustainable development which is of course environmentally sound. This concept in its implementation rests on the limits of the carrying capacity and the environmental capacity of a region’s environment. For this purpose, development violations must be preceded by conducting a strategic environmental study with one of the mandatory contents, namely the carrying capacity and environmental capacity (CCEC). If CCEC has been exceeded, the Development Activities, Plans and Programs must be repaired, and all efforts that have exceeded the carrying capacity and environmental capacity are no longer allowed. Referring to these facts, analysis of the carrying capacity and environmental capacity is very important and very much needed in development and must be compiled at every level of government.

The most important components of the environment for life are water and food. The focus in this study is the carrying capacity and environmental capacity of water resources which are common as sources of raw water in the region. [5] state that water is the force powering life, so it is an element crucial to human survival. Nevertheless, the increased number of industries in the area has brought about changes in the land, which, in turn, has made it increasingly more difficult to find clean water in the city of Ambon and the others city and regency in Maluku.

The objective of this research is to analyze the level of environmental capacity and carrying capacity of water resources in Maluku, Indonesia

2. Methods
2.1. Description of Study Site
The Maluku Islands consist of more than 1400 islands. The study was conducted in several regency and city of Maluku Province. The main purpose of the establishment of carrying capacity and environmental capacity of water resources. Sample surface water is taken from river bodies, lakes and springs water which are used as raw water sources.

2.2. Data Sources
The data used in this paper were collected from many reports such as Environmental Departement of Southeast Maluku Regency (2017) on Environmental Status of Southeast Maluku Regency, Environmental Departement of Southeast Maluku Regency (2017) on Environmental Status of Southwest Maluku Regency (2018), Environmental Departement of Aru Archipelago Regency (2018) on and Research in Ambon City (2019) and then compared with the water quality standards according to the ministerial regulation of health and the environment and forestry include Government Regulation No. 82 of 2001 concerning the Management of Water Quality and Water Pollution Control.
2.3. Data Analysis
Water quality data in water resources is obtained from monitoring regularly every year of Environment Agency of Southeast Maluku Regency, Environment Agency of Southwest Maluku Regency and Ambon City. Water quality data is used to determine water quality status, and the capacity of water pollution load or environmental capacity of water resources. Overall water quality is determined by comparing data with criteria from Government Regulation No. 82 of 2001 concerning the Management of Water Quality and Water Pollution Control and Minister of Health Regulation number 492/Menkes/Per/IV/2010.

This regulation is commonly used to determine the water class in nationwide that consists of four water quality criteria based on class, which each of class have different criteria that fit to its purpose. In this case, the designation to be used is the classification of class I-II water quality. First class, water whose designation can be used for raw water drinking, and for other designations that require the quality of water the same as these activities; Second class, the water it is intended for can be used for water recreation infrastructure/facilities, freshwater fish farming, livestock, water to irrigate agriculture, and other designations that require quality the same water for these uses.

2.4. Calculation of Water Demands
Water demand is the total of domestic and non-domestic water demands, and evapotranspiration. Domestic water demands ($Q_{domestic}$) [m$^3$/month] can be calculated by means of equation 1. The non-domestic water demands ($Q_{nondomestic}$) [m$^3$/month] considered for this calculation only come from the industrial sector as the main non-domestic water user in the region. Non-domestic water demand for the industry is calculated according to equation 2.

$$Q_{domestic} = \text{Water consumption} \times \text{population} \times \text{day}$$  
$$Q_{nondomestic} = \text{Water employee} \times \text{population} \times \text{day}$$

The amount of water consumption (water consumption) for domestic and non-domestic use is 0.12 and 0.5 [m$^3$/person/day], respectively [6]. Population is the total population in area [person]. Employee is the total number of employees in the area [person]. Day is the number of days in a month [day].

2.5. Testing the Capacity of Water Resources
To measure the capacity of water resources is carried out qualitatively by analyzing the data of available (laboratory analysis results) and compared with the quality standard of fresh water resources in accordance with applicable regulations [7].

3. Results and discussion
The result of this research showed that several parameters of water quality have exceeded the standard of water quality according to the minister of health and environment and forestry regulation too.

The results of the analysis of several water resources in Southeast Maluku Regency, Southwest Maluku Regency and Ambon City found that some surface water quality parameters have exceeded the water quality standard.

3.1. Carrying Capacity of Water Resources
3.1.1. Southeast Maluku Regency Water Resources
The following table presents the results of the analysis of the carrying capacity of water resources in Southeast Maluku Regency.
**Table 1.** The results of the analysis of the carrying capacity of water resources in Southeast Maluku Regency

| No. | Water Resources       | Annual volume of water (m³) |
|-----|-----------------------|-----------------------------|
| 1   | Springs water         | 179,881,344,00              |
| 2   | Lakes                 | 2,862,450,00                |
| 3   | Rivers                | 1,460,203,524,00            |
| 4   | Rainfall-runoff       | 963,593,383,57              |
|     | Total                 | 2,606,540,701,57            |

*Source: Environmental Departement of Southeast Maluku Regency (2017) [8] and Kunu (2019) [9]*

*Remarks: Prediction of Carrying Capacity of Water Resources until 2023 (Under Condition of Forest Area >40%)*

Based on the data in the Table 1, it can be seen that total annual available of water in Southeast Maluku Regency is 2,6 billion m³. The results of the analysis of the need for fresh water in the Aru Archipelago Regency, it was found that the amount was around 428 million m³. Compared to the large water availability, the fresh water in Southeast Maluku Regency is in a surplus condition. The following table presents data on water availability and fresh water needs of the people until 2023 in Southeast Maluku Regency. The biggest obstacle in the utilization of these abundant water sources is only the water quality, which is indicated to have been contaminated with e-colly bacteria.

### 3.1.2. Aru Archipelago Regency of Water Resources

Another research has been carried out in Wamar Island, Aru Islands Regency by Osok, et al (2017). The results showed that on Wamar Island there is a domestic water need of 1,446,145 m³ / year, with Non-domestic water needs are 178,101,520 m³/year, so the total water demand in this area is 1,624,246.52 m³/year. The following table presents the results of the analysis of water resources on Wamar Island under three different conditions. Under normal conditions and conditions of the impact of climate change that cause extreme rainfall. The extreme rainfall that occurs during the rainy season compared to the dry season is very different. Extreme rainfall in the rainy season is 278% greater than the dry season.

To maintain the availability of clean water throughout the year, water conservation efforts need to be put into practice. To increase groundwater recharge naturally, green open space especially in recharge areas must be maintained, meanwhile it is also necessary to harvest rainwater and surface runoff through the construction of water infrastructure such as infiltration wells and reservoirs.
Table 2. Prediction of Total Water Requirements and Availability until 2023 in Aru Archipelago Regency

| Year | Total Water Requirements and Availability | Total |
|------|-------------------------------------------|-------|
| 2018 | Total annual water requirements           | 428,540,111.40 m³ |
| 2023 |                                           | 486,391,130.67 m³ |
| 2018 | Total annual water availability           | 2,606,540,701.57 m³ |
| 2023 | The source from the river only            | 1,460,203,524.00 m³ |

Water Resources Condition until 2023: SURPLUS

Parameters of Environmental Capacity of Water Resources are Exceeded the Water Quality Standard (Ambon city, Southeast Maluku Regency)

Source: Environmental Departement of Aru Archipelago Regency (2017) [10], Southeast Maluku Regency (2017)

Remarks: Prediction of Carrying Capacity of Water Resources until 2023 (Under Condition: Forest Area >40%)

Table 3. The results of the analysis of the carrying capacity of water resources in Aru Archipelago Regency

| Rainfall condition | Annual Rainfall (m³) | Lost Total (m³) | Remaining Groundwater (m³) | Domestic and Non Domestic Needs (m³) | Annual Savings (m³) |
|--------------------|----------------------|----------------|---------------------------|-------------------------------------|---------------------|
| Normal             | 118,818,000          | 116,149,296    | 2,668,704                 | 1,624,246,52                       | 1,044,457.48        |
| Extreme wet        | 196,554,000          | 136,608,720    | 59,945,280                | 1,624,246,52                       | 58,321,033.48       |
| Extreme dry        | 70,454,400           | 65,273,640     | 5,180,760                 | 1,624,246,52                       | 3,556,513.48        |
| Total needs        |                      |                |                           | 1,624,246,52                       | 5                  |

Source: Osok, Kunu and Laimeheriwa (2017) [11]

3.2. Environmental Capacity of Water Resources
3.2.1. Water of Lakes
The results of the analysis of lake water samples in Southeast Maluku Regency showed that all water quality parameters of Abel Lake had not exceeded the fresh water quality standard according to Permenkes 492 / Menks / Per / IV / 2010 except for TDS and fluoride levels.
Table 4. Abel Lake Water Quality as an Indicator of Lake Environmentalal Capacity of Water Resource in Southeast Maluku Regency

| Parameters | TDS | pH  | DO  | NO3-N | NH3-N | Mn  | Fe  | Zn  | Fluoride | Nitrit | 
|------------|-----|-----|-----|-------|-------|-----|-----|-----|----------|-------|
| SWQ*       | 500 | 6,5-8,5 | - | 50 | 1,3 | 0,4 | 0,3 | 3 | 1,5 | 3 |
| Names of Lake |     |     |     |     |     |     |     |    |     |     |
| Abel       | 850 | 7,14 | 1,14 | 0,2 | 0 | 0 | 0,1 | 100 | 0 |
| Witir      | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Nuhuta     | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| El         | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Ohoidertwaun | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| Nuhu Jeujanan | -   | -   | -   | -   | -   | -   | -   | -   | -   |

Source: Environmental Departement of Malra Regency (2017)[12]

Remarks: ) - Data not available; ) * Standard of Water Quality according to Permenkes 492 / Menkes / Per / IV / 2010 on Drinking Water Quality Requirements

Fluoride plays a role in the formation of bones and teeth, and helps prevent tooth decay. We know that adjusting the fluoride in our water systems to ideal levels reduces cavities, strengthens teeth, and is an essential part of a healthy life. Fluoride is found naturally in soil, water and food. Minerals such as fluorapatite and fluorite also contain fluoride, such as iron and calcium, fluoride dissolves into the ground water we use for our drinking water. When there is not enough fluoride in drinking water, these elements can be added to optimal levels to protect teeth. Fluoride comes from natural calcium deposits in phosphate rock [13].

Fluorapatite, is a phosphate mineral with the formula Ca_5 (PO_4) _3F (calcium fluorophosphate), has a green, brown, blue, yellow, purple, or colorless color, a pure colorless mineral. Together with hydroxyapatite can be a component of tooth enamel. Fluorapatite crystallizes in the hexagonal crystalline system and combined as a solid solution with hydroxyapatite (Ca_5 (PO_4) 3OH or Ca_10 (PO_4) 6 (OH) 2) in a biological matrix. Fluorapatite as a mineral is the most common phosphate mineral, and occurs widely as an accessory mineral in igneous and metamorphic rocks rich in calcium. Based on these facts, the condition of fluoride-rich water exceeded the quality standard in Southeast Maluku Regency, naturally occurring, both from rocks that are rich in calcium as well as from laterite soils which were formed due to lake inundation.

This is according to local geological conditions. According to the Geological Map of Indonesia (1965) Southeast Maluku islands / islands are formed/composed of several types of rock including Alluvium Undak, Coral Reef, Seklis Habluk, Paleogene and Paleozoic Ulagan. Coral reefs or coral reefs are actually organic sedimentary rocks that occur because the deposition process gets help from organisms, namely the remains of houses or carcasses of marine animals buried on the seabed such as shells, coral reefs, bones, Guano bird droppings that mount in Peru and the topsoil in the forest. Examples of organic sedimentary rocks include coral limestone (coral reefs) and shell limestone.
WHO in 1984 and 1993 established a standard for fluoride content in bottled water not to exceed 1.5 mg/liter, because if it exceeds this standard limit can cause risk of dental fluorosis and in greater levels can cause bone fluorosis. In Indonesia Regulation of the Minister of Health of the Republic of Indonesia No. 492 / Menkes / Per / IV / 2010 regarding requirements for drinking water quality, the fluoride content in drinking water should not exceed 1.5 mg/L and a tighter limit is stipulated by SNI 01-3553-2006 concerning bottled drinking water, it is stated that the content of fluoride in mineral water should not exceed 1 mg/L.

The fluoride level found in lake water bodies in Southeast Maluku Regency is 100 mg/L, so the water is not suitable for use as a source of drinking water for the community unless the fluoride level can be reduced to 1.5 mg/L. Consumption of water with excessive fluoride levels is very dangerous, and can cause problems with teeth, bones and other organs. In addition, the use of drinking water with fluoride levels above 1.5 mg/L has an impact on: (1) The nervous system (decreased IQ) due to drinking water with a fluoride content of 2.5-4 mg/L; (2) The hormone system, which is due to excessive consumption of fluoride, can also cause a decrease in thyroid hormone, an increase in parathyroid hormone and calcitonin, will interfere with glucose tolerance and (3) the reproductive system.

3.2.2. Water Spring

In Southeast Maluku Regency, in addition to the 6 lakes described above, there are also 16 springs which are potential and reliable sources of fresh water if their quality status meets the quality standards of fresh water or drinking water. In Southeast Maluku, there are three parameters in several springs that have exceeded the quality standard of fresh water or are too low from the quality standard value according to Permenkes 492 / Menks / Per / IV / 2010 concerning Requirements for Drinking Water Quality. The results of the analysis found that all springs that have TDS levels have exceeded the quality standard of fresh water, while 8 springs namely Wear Er, Wear But, Wear Matan Manut, Rahareng Atas, Faan Hutan Kota Wells, Watngon 1, Watngon 2, Sumur Tua Warwut, and Faan has too low DO levels, 4 springs that have high fluoride levels are Wear Saai, Wear Er, Wear But and Watngon 1 springs. While the other 2 springs have high Nitrite (N) levels, namely Wear springs. Un and the Warwut Old Well.

In general, the higher the DO value in water, the better quality the water is; on the other hand, if the DO value is low, then it is assumed that the water has been polluted. DO levels indicate the extent
to which water bodies are able to accommodate aquatic biota such as fish and microorganisms. In addition, the amount of oxygen in water shows the ability of water to fresh water pollution. Nitrate is a form of nitrogen which acts as the main nutrient for plant and algae growth. Nitrate nitrogen is very soluble in water and has relatively stable properties. This compound is produced from a complete oxidation process in the waters. Basically, nitrate is the main source of nitrogen in water, however, plants prefer ammonium to be used in the growth process. The nitrate content in uncontaminated water is usually higher than the ammonium level. Nitrate levels greater than 5 mg / L. describes the state of the waters that have been polluted due to human activities and animal feces. Nitrogen levels greater than 0.2 mg / ltr indicate water eutrophication [14].

| Names of Springs Water | TDS | pH  | DO  | NO₃-N | NH₄-N | Zn | Fluoride | Nitrates (N) |
|------------------------|-----|-----|-----|--------|--------|----|----------|-------------|
| SQW* Class 1-2         | 1000| 6.0-9.0 | 6.0-4.0 | 10     | 0.5(-) | 0.05 | 0.5-1.5 | 0.06         |
| SQW** Drinking Water   | 500 | 6.5-8.5 | -    | 50     | 1.3     | 3   | 1.5      | 3            |
| Wear Saai              | 670 | 7.67 | 4.65 | 0      | 0.2     | 0.1 | 100      | 0            |
| Sumur Matwair          | -   | -   | -    | -      | -       | -   | -        | -            |
| Wear Er                | 880 | 7.63 | 2.15 | 0.2    | 0       | 0.2 | 100      | 0            |
| Wear But               | 910 | 7.71 | 3.53 | 0      | 0       | 0.3 | 100      | 0            |
| Wear Matan manut       | 1.220 | 7.6 | 2.39 | 0      | 0       | 0.2 | 0        | 0            |
| Rahareng atas          | 950 | 7.71 | 2.71 | 0      | 0       | 0   | 0        | 0            |
| Sumur Faan Hutan Kota  | 1.130 | 7.8 | 2.8  | 0      | 0       | 0   | 0        | 0            |
| Watngon 1              | 860 | 7.79 | 2.7  | 0      | 0       | 0   | 100      | 0            |
| Watngon 2              | 990 | 7.6  | 2.15 | 0      | 0       | 0   | 0        | 0            |
| Wear Un                | 710 | 8.04 | 9.48 | 0      | 0       | 0.1 | 100      | 0            |
| Wear Matan Rian        | 860 | 8.03 | 6.01 | 0      | 0       | 0   | 0.1      | 0            |
| Wear Er                | 710 | 7.95 | 5.13 | 0      | 0       | 0   | 0.1      | 0            |
| Sumur Tua Warwut       | 880 | 7.75 | 1.24 | 0      | 0       | 0   | 0.1      | 100          |
| Goa hawang             | 880 | 8.0  | 6.68 | 0      | 0       | 0   | 0.4      | 0            |
| Faan                   | 1.130 | 7.8 | 2.8  | 0      | 0       | 0   | 0        | 0            |

Source: Environmental Departement of Southeast Maluku Regency (2017)
* Standard of Water Quality according to Government Regulation No. 82 of 2001
** Standard of Water Quality according to Permenkes 492 / Menkes / Per / IV / 2010
* Data not available

Nitrite is an intermediate form between ammonia and nitrate (nitrification) and between nitrate and nitrogen gas (denitrification) which is formed under anaerobic conditions. Nitrite sources can be industrial waste and domestic waste. Nitrite levels in water are relatively stable because they are immediately oxidized to nitrate. Natural waters contains nitrite about 0.001 mg / L. Meanwhile, the allowable nitrite levels do not exceed 0.06-3 mg / L. Nitrate and nitrite levels in water that exceed the quality standard threshold according to Permenkes 492 / Menks / Per / IV / 2010 concerning drinking water quality requirements will have a negative effect on aquatic biota. Pollution is also evident from the results of the table analysis which shows that high TDS levels exceed the quality standard in all rivers in Southeast Maluku Regency. TDS consists of inorganic salts, especially calcium, magnesium, potassium, sodium, bicarbonate, chloride and sulfate and a small amount of water-soluble organic matter. To make it suitable as a drinking water source, treatment must be given in the form of using water purification filter techniques with reverse osmosis technology (RO).
The following table presents the analysis results of water samples from several springs in the city of Ambon.

| Water Source          | TDS Level |
|-----------------------|-----------|
| SOW* (Class I-2)      | 1000      |
| SOW** (Drinking Water)| 500       |
| Wear Saai             | 670       |
| Sumur Matwair         | 0         |
| Wear Er               | 880       |
| Wear But              | 910       |
| Wear Matan manut      | 950       |
| Rahabeng atas         | 1,220     |
| Sumur Faar Hitum Kola | 1,130     |
| Watungon 1            | 860       |
| Watungon 2            | 990       |
| Wear Matan Rain       | 710       |
| Wear Er               | 710       |
| Sumur Tua Warwut      | 880       |
| Goo Jaayang           | 880       |
| Faan                  | 1,130     |

**Figure 1.** The TDS levels in all water sources exceed the allowable TDS levels
Table 6. Quality of Spring Water Resources in Ambon City

| Parameters     | Water Quality Standard | Results of Water Quality Analysis |
|----------------|------------------------|-----------------------------------|
|                |                        | Bt Merah | Halong | Wainitu | Amahusu |
| TDS            | 500                    | 64       | 220    | 191     | 174     |
| Fluoride       | 1.5                    | 0.0      | 0.0    | 0.0     | 0.0     |
| Cadmium        | 0.003                  | -        | 0.0    | -       | -       |
| NO2            | 3                      | <0.01    | <0.01  | <0.01   | <0.01   |
| NO3            | 50                     | 0.51     | 0.42   | 0.94    | 0.09    |
| pH             | 6.5-8.5                | 5.64     | 5.16   | 5.38    | 5.52    |
| Amonia         | 1.5                    | 0.0      | 0.0    | 0.0     | 0.0     |
| E. Colly       | 0.0                    | 98       | 0      | 0       | 0.0     |
| Total Coliform | 0.0                    | 438      | 0      | 0       | 0.0     |

*The results of the analysis showed that the water was contaminated with bacteria. This result of analysis show that Bt Merah Water is not suitable to use.

Source: Uyara, L., Kunu, P., Talakua, S., 2018 [15]
Remarks: * Standard of Water Quality according to Government Regulation No. 82 of 2001
* Standard of Water Quality according to Permenkes 492/Menkes/Per/IV/2010
- Data not available

Figure 2. Quality of Spring Water Resources in Ambon City

According to the data in Table 3 above, it shows that in general the water quality in several springs in Ambon City has not exceeded the fresh water quality standard according to applicable regulations in Indonesia. These four springs are the source of fresh water for the people of Ambon
City especially in areas that are difficult to get fresh water or water from daily fresh water supply companies. The only source of fresh water that is no longer suitable for use is Air Besar located in the Batu Merah Village as a result of being contaminated by E-colly bacteria. A similar condition has been found in one of the community's clean water sources in the capital city of Southeast Maluku Regency.

3.2.3. Water of Rivers
The results of the analysis of river water samples in Southeast Maluku Regency and Southwest Maluku Regency are presented in the following tables.

Based on the data in the table below, it shows that the quality of river water in Southeast Maluku Regency, on several parameters does not meet the quality standards of fresh water. TDS levels have exceeded drinking water quality standards, with very low levels of Nitrate and DO and very high levels of fluoride in several rivers. The results of the complete analysis found that some water sources were contaminated with high levels of E-colly bacteria, especially the Evu river, which is the source of raw water for PDAM Southeast Maluku Regency.

**Table 7. Analysis of River Water Environmental Capacity in Southeast Maluku Regency**

| Parameter | TDS | pH | DO | NO3-N | NH3-N | Zn | Fluoride | NO2-N |
|-----------|-----|----|----|-------|-------|----|----------|-------|
| Class 2 * | 1000| 9  | 4  | 10    | (-)   | 0.05| 1.5      | 0.66  |
| Dirinking water ** | 500 | 6.5-8.5 | -- | 50.7  | 1.5   | 3   | 1.5      | 3     |

| Source: Environmental Departement of Southeast Maluku Regency (2017)
* Standard of Water Quality according (SWQ) to Government Regulation No. 82 of 2001
** Standard of Water Quality according to Permenkes 492 / Menkes / Per / IV / 2010 on Drinking Water Quality Requirements

The following table presents the results of the analysis of water resources in Southwest Maluku Regency.

**Table 8. Results of water quality analysis of River in Southwest Maluku Regency**

| Parameters   | Water Quality Standard* | Upstream | Downstream |
|--------------|-------------------------|----------|------------|
| Temperature  | Deviasi 3               | 25.7     | 27.1       |
| TDS          | 1000                    | 514      | 202        |
| TSS          | 50                      | 5        | 2          |

The following table presents the results of the analysis of water resources in Southwest Maluku Regency.
| Parameter | Value 1 | Value 2 | Value 3 |
|-----------|---------|---------|---------|
| pH        | 6       | 7.39    | 7.19    |
| COD       | 50      | 13.21   | 9.28    |
| BOD       | 12      | 4.21    | 4.94    |
| DO        | 6       | 6.35    | 6.32    |
| NO3 as N  | 10      | 0.53    | 0.17    |
| NH3-N     | 0.5     | 0.24    | 0.12    |
| Cuprum as N| 0.02  | 0.012   | 0.008   |
| Nitrit as N| 0.06  | 0.007   | 0.01    |

Source: Environmental Department of Southwest Maluku Regency (2017)
* Standard of Water Quality according (SWQ) to Government Regulation No. 82/2001

4. Conclusion
Based on the results of this study, it can be concluded as follows:
1. The availability of water from various water resources is generally still sufficient to meet the needs of the population
2. The environmental capacity of water resources in Southeast Maluku Regency, Southwest Maluku Regency and Ambon City generally has exceeded the water quality standard.
3. However, it should be noted that the condition of green open space must be maintained and efforts to conserve water resources so that water availability is guaranteed throughout the year.

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