

Domestic Waste Pollution of River Settlements, Banjarmasin City, Indonesia

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ABSTRACT

The increase in the amount of household domestic waste is getting bigger every year as the population increases. Domestic household waste pollution is increasingly polluting rivers, especially on the riverbanks of the City of Banjarmasin whose residents live on the banks of the river. The purpose of the study was to estimate the population, the amount of domestic waste, and the amount of domestic waste pollution on the riverbanks of Banjarmasin City. The research population is the head of the family who lives on the banks of the river Banjarmasin as many as 10,724 houses. The number of samples based on the Slovin method with a margin of error of 5% is known as 386. Sampling using a proportional random sampling technique. Analysis of the data in a quantitative description using the formula for domestic waste generation. The results of the study estimated that the population of the settlements along the riverbanks of Banjarmasin City was 43,618 people. The amount of domestic waste in settlements along the riverbanks of Banjarmasin City for one year is estimated that organic waste discharged to TPS is 865.05 tons/year, while that is disposed of into rivers as much as 1,204.5 tons/year, and inorganic waste disposed of to TPS as much as 2,193.65 tons/year. dumped into the river as much as 1,627.9 tons/year. The amount of liquid waste result from the activities of bathing, washing, and toilet for one year is estimated at 1,107,753.1 m³/year, which consists of a bath of liquid waste by 552,76.3 m³/year, wastewater washing for 337,676.1 m³/year, and wastewater outhouses of 217,317.35 m³/year. Efforts to control the amount of domestic waste pollution in riverbank settlements in every urban area in Indonesia are urgently needed by facilitating the construction of bathing, washing, and public toilets that are connected to the installation of wastewater disposal and garbage disposal sites.

Key words : *Pollution, Domestic waste, Settlements, Riverbanks*

Introduction

A clean environment is one of the benchmarks for people's quality of life (Boyko *et al.*, 2012). Ways to improve environmental quality include domestic waste management (Baud *et al.*, 2001; França *et al.*, 2020; Puspitawati and Rahdriawan, 2012; Zorpas, 2020). Domestic waste is the remnants of human activities that are not utilized or the result of residual products whose benefits are smaller than the products used so that they are immediately dis-

posed of or reused (Guirguis and Moussa, 2019; Kahfi, 2017; Zurbrügg, 2002).

The population growth rate of Banjarmasin City per year during 2010-2019 is 1.3% (Badan Pusat Statistik Kota Banjarmasin, 2020). The increasing number of urban residents from time to time has increased the amount of domestic waste produced, and the faster the level of technological and industrial mastery of a community group results in more and more domestic waste being produced (Hoornweg *et al.*, 2013, 2015). The problem of do-

mestic waste in Indonesia is complex because the public still lacks an understanding of the impact caused by domestic waste. The factors that cause domestic waste problems in Indonesia are the increasing standard of living of the community which is not balanced with knowledge of its management, and the low participation of the community in maintaining environmental cleanliness in disposing of domestic waste in its place (Mahyudin, 2017; Wahyono, 2011).

The riverbanks based on the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 28/Prt/M/2015 concerning the Determination of River Border Lines are the left and right parts of the river border with a minimum width of 30 meters in urban areas. People who live on the banks of the river view the river as a container for disposal, so that the river is used as a place for domestic waste disposal, and in general people’s houses are located with their backs to the river (Indrawati, 2011; Mentayani, 2019). The phenomenon of this community in Indonesia is in the city of Banjarmasin, which has many rivers and many people live on the banks of the river with a high population density.

Community activities on riverbanks produce domestic waste, which hurts human health, namely diarrheal diseases, decreased water quality, thereby increasing the cost of raw water treatment for drinking water and river silting (Halder and Islam, 2015; Mekonnen *et al.*, 2020).

Materials and Methods

Theresearch is located in Banjarmasin City, South Kalimantan Province, which is located at 3°16’46” – 3°22’54” South Latitude and 114°31’40” – 114°39’55” East Longitude with an area of 98.46 km², as presented in Fig 1.

The method is quantitatively descriptive, with the population of each head of the family (KK) in every house located on the riverbanks of Banjarmasin City. The results of the identification of residential houses on the riverbanks of Banjarmasin City using visual digitization of Worldview-3 satellite image dated May 31, 2021, in Figure 2, it is known that the number of residential houses is 10,724, so the number of samples based on the Slovin method with a margin of error of 5% is 386. Sampling using proportional random sampling technique, which consists of 108 houses in North Banjarmasin District, 147 South

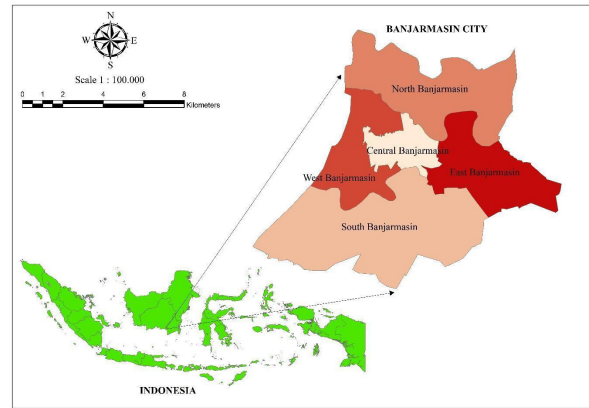


Fig 1. Location research

Banjarmasin Sub-districts, 19 Central Banjarmasin Sub-districts, 54 houses in East Banjarmasin District, and 58 West Banjarmasin Sub-districts.

Research materials are the total population of each dwelling house, the amount and method of disposing of domestic waste per residential house per day, which consists of solid waste and liquid waste, obtained from the results of structured interviews, observations, and measurements, then analyzed using the formula for domestic waste generation, namely:

$$V_s = P_0 \times xv$$

Explanation:

V_s: Volume of domestic waste

P₀: Total population (persons)

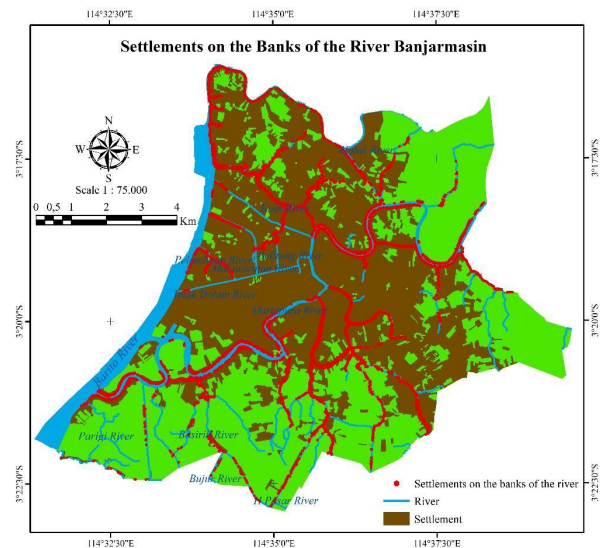


Fig. 2. Map of the distribution of settlements on the riverbanks of Banjarmasin City

v: the result of the average volume of domestic waste (liters/gr/kg/person/day) (Hafsari, 2019).

Results and Discussion

The results of the study can be described as follows:

a. Number of Residents of Banjarmasin Riverside Settlement

The average result of the population of each house from the research sample based on the results of structured interviews obtained a value of 4.07, so that with the number of riverbank settlements in Banjarmasin City as much as 10,724 it is known the estimated number of residential residents the riverbanks of Banjarmasin City as many as 43,618 people.

b. Amount of Domestic Waste Settlement Riverside Banjarmasin City

The calculation of the amount of domestic waste is divided into solid waste (organic waste and inorganic waste) and liquid waste (bathing, washing, and latrine). The results of the average amount of solid waste per house from the research sample based on the results of observations and measurements obtained a value of 0.37 Kg/day/person, consisting of organic waste of 0.13 Kg/day/person and inorganic waste of 0.24 Kg/day/person. The results of the average amount of liquid waste per house from the research sample based on the results of observations and measurements obtained a value of 69.58 liters/day/person, which consists of bathing liquid waste of 34.72 liters/day/person, washing liquid waste of 21.21 liters/day/person, and latrine liquid waste of 13.65 liters/day/person.

The amount of domestic waste in settlements along the riverbanks of Banjarmasin City based on an estimated population of 43,618 people, obtained an estimated amount of solid waste of 16.14 tons/day, consisting of organic waste as much as 5.67 tons/day and inorganic waste as much as 10.47 tons/day, while the estimated amount of waste liquid at 3,034.94 m³/day, consisting of a bath of liquid waste at 1,514.42 m³/day of wastewater wash at 925.14 m³/day of wastewater and latrine at 595.39 m³/day.

c. Amount of Domestic Waste Pollution in Banjarmasin City Riverbank Settlement

Results of structured interviews and calculations

obtained the percentage and amount of solid waste pollution discharged into TPS and rivers by residents of Banjarmasin City riverbank settlements, namely organic waste discharged to TPS by 41.79% or 2.37 tons/day, while the amount discharged into the river is 58.21% or 3.30 tons/day. The amount of inorganic solid waste pollution that is discharged to TPS is 57.44% or 6.01 tons/day, while that is disposed of into rivers by 42.56% or 4.46 tons/day, and the amount of liquid waste resulting from bathing, washing, and latrine activities is 3,034.94 m³/day, everything is thrown into the river.

The amount of domestic waste in settlements along the riverbanks of Banjarmasin City for one year is estimated that organic waste discharged to TPS is 865.05 tons/year, while that is disposed of into rivers as much as 1,204.5 tons/year, and inorganic waste disposed of to TPS as much as 2,193.65 tons/year. dumped into the river as much as 1,627.9 tons/year.

The amount of liquid waste result from the activities of bathing, washing, and toilet for one year is estimated at 1,107,753.1 m³/year, which consists of a bath of liquid waste by 552,76.3 m³/year, wastewater washing for 337,676.1 m³/year, and wastewater outhouses of 217,317.35 m³/year.

The results of the average value of domestic waste generation for each resident of Banjarmasin City riverbank settlements obtained are 0.37 kg/day/person for solid waste and 69.58 liters/day/person for liquid waste, indicating that the value is below the standard for domestic waste generation in Big City, with a value of solid waste between 0.7 – 0.8 Kg/day/person and liquid waste of 100 liters/person/day (SNI 8455:2017 P, 2017; SNI M-36-1991-03, 1991). The low average domestic waste generation for each resident of the riverbank settlements in Banjarmasin City is because the results of the study show that the income of the community is relatively low, which is below Rp. lower compared to people who live in complex housing with relatively higher incomes (Adiana and Karmini, 2012; Vidiawan and Tisnawati, 2015). Most of the domestic waste produced by residents on the banks of the river is discharged into rivers without management due to low public awareness when compared to the domestic waste of people living in urban complex settlements with high environmental management and awareness (Harahap *et al.*, 2012; Indrawati, 2011; Puspitasari, 2009).

Inorganic waste of residents of settlements along

the riverbanks of Banjarmasin City that is dumped into the river is very dangerous for the environment and health because inorganic waste is made from non-renewable natural sources and contains chemicals, while organic waste can cause pollution including causing unpleasant odors, turbidity, and odor, destroying the beauty of the environment (Marliani, 2015; Putra and Yuriandala, 2010; Straka *et al.*, 2018). The impact of domestic waste that is directly discharged into rivers can cause silting of river channels in Indonesia (Indrawati, 2011; Marliani, 2015; Zulfahmi *et al.*, 2016). The Barito River is one of the largest and longest rivers in Indonesia undergoing a process of silting due to domestic waste, so it is necessary to periodically dredge because it is a transportation route for passenger ships, cargo, and coal which is very important to support the economy of South Kalimantan Province (Novico *et al.*, 2018). The impact of domestic waste that is directly discharged into the river causes the large cost of clean water treatment that occurs in the Banjarmasin City area, due to factors of physical, chemical, and biological pollution (Auliani, 2011; Budi and Tantyoniumpuno, 2006).

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Conclusion

The results of the study estimated that the population of settlements along the riverbanks of Banjarmasin City is 43,618 people. The amount of domestic waste in settlements along the riverbanks of Banjarmasin City for one year is estimated that organic waste discharged to TPS is 865.05 tons/year, while that is disposed of into rivers as much as 1,204.5 tons/year, and inorganic waste disposed of to TPS as much as 2,193.65 tons/year. dumped into the river as much as 1,627.9 tons/year. The amount of liquid waste result from the activities of bathing, washing, and toilet for one year is estimated at 1,107,753 m³/ year, which consists of a bath of liquid waste by 552,76.3 m³/ year, wastewa-

ter washing for 337,676.1 m³/ year and liquid waste latrine amounting to 217,317.35 m³/ year. This study provides a way to estimate domestic waste pollution of riverbank settlements in developing countries. Efforts to control the amount of domestic waste pollution in riverbank settlements in every urban area in Indonesia are urgently needed by facilitating the construction of bathing, washing, and public toilets that are connected to the installation of wastewater disposal and garbage disposal sites. Monitoring changes in the amount of pollution from domestic waste in riverbank settlements for the next 5 to 10 years is very necessary, as an effort to identify the amount of pollution in Banjarmasin City which is a buffer area for moving the Indonesian capital to Kalimantan Island in 2024.

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