The Relationship Between Socioeconomic Status and Household Water Requirement in Muara Angke Inundation Area, Jakarta

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Abstract. Jakarta has approximately 40 percent of the area below sea level at high tide, one of which is located at Muara Angke. The area of Muara Angke experiences inundation and has groundwater contaminated by urban community activities and saltwater intrusion. As for the purpose in this research is two calculate the relationship between socioeconomic status and household water requirement. This research was conducted for 5 months from March to July during the Covid-19 pandemic. Respondents were 40 households which were determined by simple random sampling. Multiple regression is used to determine the relationship between the independent variables and dependent variable. The results showed that there was a strong relationship between socioeconomic status and household water requirement because the value was above 0.8. The value R Square obtained is 78.9% which can be interpreted that the independent variables contribute 78.9% to the dependent variable and remaining 21.1% is influenced by other factors. The most influential variable is the number of household members.

Keywords: Socioeconomic Status; Household Water Requirement

1. Introduction
Jakarta has 40% of the area which is below sea level at high tide and is in the form of a coastal swamp, making it very possible for flooding to occur. The sharply increased use of urban space also affected the return period of flood-stricken areas. The topography of the area, which is unsuitable for a built-up area and designated as a wetland used to collect water during floods since the 1960s, has been built for various urban purposes. The canal system was unsuccessful because of the flat topography of Jakarta. It made the water couldn’t flow by gravity. The existence of mud sedimentation also causes the water flow to be not smooth, so that the construction of canals only acts to cope with flooding for a moment [1], [2].

Jakarta is experiencing a rapid development in land use change from a vegetation area to a built-up area. The concentration of development of residential areas, industrial and office areas, infrastructure, and infrastructure facilities to support activities is expanding and consuming an area. The concentration of population density results in unavoidable overexploitation of groundwater. The development of built-up areas and exploitation of groundwater causes more intensive land subsidence due to not only natural factors but also human factors [3].
The city of Jakarta has grown to become the largest and most important metropolitan city in Indonesia because it has become the center of state administration and business. The city of Jakarta also has an important role in national and international trade, being a center of investment for foreign investors, not only in manufacturing but also in construction and services. This has boosted the economy of the city of Jakarta and made Jakarta one of the favorite cities for urbanization destinations. Economic and social changes have an impact on changing land use patterns, for example the city center of Jakarta has changed significantly in recent decades. Settlements in downtown Jakarta have turned into commercial areas, offices, and elite settlements such as apartments. Development in the city center of Jakarta affects the development of satellite cities in the vicinity such as Depok, Bogor, Tangerang, and Bekasi areas. These satellite cities grow in the service, residential and industrial sectors to support the city of Jakarta.

The availability of water resources and demand for water are subject to many uncertainties, so it is necessary to conserve water resources to ensure the sustainability of life in the future by taking into account the factors that affect water consumption [5]. Most of the urban population takes groundwater for their daily needs from shallow groundwater by making wells which can be in the form of dug wells, PAM water and deep groundwater (boreholes). The use of groundwater will continue to grow and increase in line with urban development. In line with urban development, water problems also increase both in terms of quantity and quality. This situation has also happened in Jakarta that facing serious water pollution problems. It due to economic development, the rapid growth of population, and urbanization [6].

The increasing population causes an increase in groundwater use which has an impact on decreasing the quantity of groundwater. The existence of a deficit of groundwater causes water vacancies in the soil pores, resulting in land subsidence and continuous intrusion in coastal areas. Apart from decreasing the quantity of groundwater reserves, the community also faces the problem of decreasing groundwater quality [7], [8], [9]. Groundwater is not the only source to fulfill household water demand in Jakarta, but it is necessary to utilise other sources of water [10]. There are many problems in this area, so that the aim of this research is two calculate the relationship between socioeconomic status and water quantity needed for domestic uses.

2. Methods
This research was conducted for 5 months from March to July 2020 during the Covid-19 pandemic. Respondents were 40 households which were determined by simple random sampling. Multiple regression is used to determine the relationship between the independent variables and dependent variable. The research implementation procedure was carried out in four stages. Stage 1, literature studies to build a theoretical foundation. Stage 2, the preparation of research instruments in the form of observation guidelines and questionnaires. The observation guideline is in the form of a basic map in the form of a PDF map which can be used during field observations with the application on a cellphone, while the questionnaire is used as a guide when the interview is conducted. Stage 3, collecting field data and secondary data from related agencies. Stage 4, analysis of research data according to research objectives. Multiple regression analysis with SPSS version 23 to determine the socio-economic condition variables that affect the amount of household clean water needs. The sample was determined by simple random sampling as much as 10% of the 369 population, namely 40 households.
3. Result and Discussion

3.1. Number of Household Members
The number of household members can be used as the basis for calculating the amount of household water needs each day or every month. Most of the number of household members is less than or equal to 4 people who are the nuclear family, which consists of father, mother, and their children. The number of household members consisting of 2 people is usually a young couple who has not been blessed with children or an elderly couple whose children are already married. The number of household members that is more than 4 people is dominated by the extended family. This type of household usually consists of several families, namely consisting of father, mother, children, grandchildren, and their relatives. The management of household finance with nuclear family is certainly different from household with extended family. According to Noh [11] that the number of household member is one of the factors that affected stress level.

| Household Members | Amount | Percentage |
|-------------------|--------|------------|
| 2                 | 6      | 15.0       |
| 3                 | 10     | 25.0       |
| 4                 | 12     | 30.0       |
| 5                 | 6      | 15.0       |
| 6                 | 6      | 15.0       |
| **Total**         | **40** | **100.0**  |

3.2. Education of The Head of The Household
It is important to know the education of head of household because it is related to the level of education completed by the head of the household. The higher the level of education a person is expected to have...
more knowledge as well as experience, especially related to the work they do. Most of the head of household respondents have low education, namely primary and junior high school education. Noh [11] stated that the educational level also affected stress level.

### Table 2. The Education of Head of Household

| Education                | Amount | Percentage |
|--------------------------|--------|------------|
| Primary School           | 12     | 30.0       |
| Junior High School       | 14     | 35.0       |
| Senior High School       | 11     | 27.5       |
| Bachelor’s degree        | 3      | 7.5        |
| Total                    | 40     | 100.0      |

#### 3.3. Age of the Head of the Household
Age is related to the productive age in the field of employment. People who are at the productive age are expected to be able to do their job well. Most of the respondents were <50 years old. This shows that the head of the household is dominated by young people who fall into the productive age group of the workforce. With a mature age of the head of the household, it is expected that they can better manage stress in their life. Noh [11] stated that age is one of the factors that affected stress level.

### Table 3. Age of Head of Household

| Age            | Amount | Percentage |
|----------------|--------|------------|
| < 30           | 8      | 20.0       |
| 30 – 39        | 11     | 27.5       |
| 40 – 49        | 14     | 35.0       |
| 50 – 59        | 3      | 7.5        |
| 60+            | 4      | 10.0       |
| Total          | 40     | 100.0      |

#### 3.4. Household Total Income
Household total income is the total income of all working household members. Most of the household total income is below three million rupiah. The greater the household total income, the more household needs that can be met, including household water needs. There is a small proportion of household whose household members work alone with an income below the minimum wage of Jakarta Special Province. It is this group of households with low income that still depend on a large part of their water needs from groundwater. his is in line with Kooy [12] that stated the significance of shallow sub-surface groundwater services for the poorest household and increasing services between income groups. The household total income is proportional to household water demands but it is inversely proportional to the share of groundwater utilisation [10]. Income is one of the parameters used to determine the socioeconomic conditions of a household. Increasing the economic capacity of the community will increase the need for water in line with the facilities owned and the higher demands of life. According to van Gent [13] household's suitability with its social environment affects its likelihood of leaving.

### Table 4. Household Total Income

| Total Income (Rp/month) | Amount | Percentage |
|-------------------------|--------|------------|
| < 3                     | 27     | 67.5       |
| 3 – 4,5                 | 2      | 5.0        |
| 4,5 – 6                 | 5      | 15.0       |
| > 6                     | 5      | 12.5       |
| Total                   | 40     | 100.0      |
3.5. House Area

The area of the house is calculated based on the length, width, and number of stories of the respondent's house. The limited land owned makes people tend to build their houses upwards, so to determine the area of the building it is necessary to consider the dimensions of the length, width, and number of stories of the house. In the research location, there are many houses with an area of less than 36 m$^2$ and a small part of which is more than 54 m$^2$. The higher the socioeconomic conditions of the household, the more likely the household has a wider area of house building.

| Area (m$^2$) | Amount | Percentage |
|-------------|--------|------------|
| ≤ 36        | 28     | 70.0       |
| 36 – 45     | 4      | 10.0       |
| 45 – 54     | 5      | 12.5       |
| > 54        | 3      | 7.5        |
| Total       | 40     | 100.0      |

3.6. Household Water Requirements

The amount of water needed in the dry season is greater than that of the rainy season. The amount of water needed during the dry and rainy seasons ranges from 134 - 172 liters/person/day with an average of 155 liters/person/day in the dry season and 151 liters/person/day in the rainy season. In general, it is known that there is more water demand during the dry season than during the rainy season. Most of the total household water needs are less than 450 liters/day to meet various household water requirement, including for cooking, bathing, and washing. Using sufficient water is essential for ecological sustainability. This is similar to what conveyed by Ebersbach that acting ecologically sustainably and not exhausting natural resources is becoming more and more important [14].

| Water Requirement (liters/day) | Amount | Percentage |
|-------------------------------|--------|------------|
| < 300                         | 12     | 30.0       |
| 300 – 450                     | 14     | 35.0       |
| 450 – 600                     | 7      | 17.5       |
| > 600                         | 7      | 17.5       |
| Total                         | 40     | 100.0      |

3.7. Relationship between Socioeconomic Status and Household Water Requirement

The analysis of the needs for the relationship between socioeconomic status and household water requirements was carried out using multiple regression using SPSS version 23. The Y variable is the household water requirement, while the x variable consists of number of household members (X1), education of the head of the household (X2), age of the head of the household (X3), household’s income total (X4), and house area (X5). The full regression results can be seen in Appendix 2. The unknown value is 0.824. This value indicates that there is a strong relationship between socio-economic conditions and household water needs because the value is above 0.8. Through this table also obtained the value of R Square which shows the regression model formed by the interaction of the independent and dependent variables. The value obtained is 78.9% which can be understood that the independent variable has a contribution of 78.9% to the y variable and 21.1% is obtained from factors outside the variables X1, X2, X3, X4, and X5.

The criteria for the significance level or linearity of the regression can be determined by the F test. The provisions of the f test if the sig value <0.05, then the regression model is linear, and vice versa.
The regression results show that the sig value is 0.004 so that it is <0.05. This means that the research data is significant, so the linear regression model meets the linearity criteria. The regression equation model obtained with the constant coefficients and variable coefficients in the unstandardized coefficients B column, the regression equation model is obtained as follows:

\[ Y = 4.235 + 115.583 \times X1 + 4.018 \times X2 + 0.418 \times X3 - 2.487 \times X4 - 0.530 \times X5 \]

This means that the number of household members is the variable that most influences the amount of household water requirement. The more household members, the greater the need for water. The education and age of the head of the household also contribute to the increase in household water requirement. Socioeconomic status is affected household water requirement. This is in line with Gomes [15] who found a relationship between socio-economic factors related to water access in rural area. Therefore, socio-economic factors influence the fulfillment of household water requirement in urban and rural area. This is also in line with the findings of Reniko [16] which states that economic factors greatly influence household water fulfillment, in addition to demographic and social factors.

4. Conclusion
The results showed that there was a strong relationship between socioeconomic status and household water requirement because the value was above 0.8. The value R Square obtained is 78.9% which can be interpreted that the independent variables contribute 78.9% to the dependent variable and remaining 21.1% is influenced by other factors. The most influential variable is the number of household members.

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