The characteristics of fecal disposal system in Penyengat Island, Kepulauan Riau

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Abstract. Indonesia is the largest archipelagic country in the world, there are thousands of small islands that have to be managed. One of the main managements in small island is related with sanitation issue, especially the fecal (black water). This research is aimed to identify the characteristics of fecal disposal system in a small island and analyse the related factors affecting it. The research was conducted in Penyengat Island, Kepulauan Riau. Descriptive and Inferential Statistics were applied by using SPSS. The characteristics of fecal disposal system is determined by latrine and sewage disposal type. Meanwhile, the related factors included are settlement type, education, income, and ethnicity. The result shows that fecal disposal system of Penyengat is dominated with modern latrine (71.4% Gooseneck Latrine) and conventional sewage disposal (53.5% simple pit sewage). Preferency of fecal disposal type is related with settlement type, ethnicity, and highest education level of household members. Besides, the income level is not related with the fecal disposal type at all. The result of this research is expected as a reference of sanitation programs in small island.

1. Introduction

The number of islands in Indonesia is about 16,056 [1] consisting of hundreds of large islands and thousands small islands. Small islands are island with an area smaller than or equal to 2000 km² and its ecosystem according to Law Number 27/2007 on the Management of Coastal Areas and Small Islands). Indonesia’s status as an archipelagic country certainly indicates that the development of the region is not only centered in the large islands such as Sumatra, Java, Kalimantan, Sulawesi, and Papua but also the small islands. Regional development is related to the growth and population density that encourages the new settlement area not only in terrestrial area and mainland categories but also in the small islands. Population growth and widespread settlement expansion in various regions, especially small islands, of course bring various adverse effects. One of the impacts is environmental pollution due to the disposal of liquid waste, especially fecal. Increasing population activity has an impact to increasing wastewater volume too. This is often not supported by the provision of environmental sanitation infrastructure.

Kepulauan Riau (Kepri) is a region with high economic growth that is 6.33% which exceeds the national economic growth is 5.12% [2]. Economic growth in a region encourages infrastructure development and population growth [3]. Population growth caused the widespread of settlement land. Two types of settlements are commonly found in small islands, which are land settlements and coastal
settlements. Land settlements are located in the central part of the island and the settlements built on land, while coastal settlements are located jutting into the sea and some of it built on the sea. Coastal settlements in Kepri are referred to as "Pelantar" as shown in Figure 1. The pelantar settlements are commonly found in Tanjungpinang City, Kepri. Tanjungpinang City as the capital of Kepri has 18 sub-districts, two of which are separated from Bintan Island (mainland). One of them is Penyengat Sub-district located in Penyengat Island.

Penyengat island has an area of 4.6 km² with the population amount of 2,577 people consisting of 775 households and population density of 1,073 people per km² [4]. Penyengat is the second highest density sub-district in Tanjungpinang Kota District. However, in reality most of the land in Penyengat Island cannot be used for settlements because it consists of forest and cultural heritage sites. Penyengat Island is a historical part of the Riau Lingga (Malay) Kingdom with various cultural heritage sites that are still preserved. The Malay historical in this island made the state of society not only depend on the wealth, education level, and other aspect that common in some region but also the royal lineage or the ethnicity. It is the value proposition of Penyengat Island as the research location than the other small islands in Kepri. The existence of the Malay heritage site causes people that have royal lineage to settle in Penyengat Island for generations. The impact is increasing needs against settlement land due to limited land area. Increased land area due to economic and social sectors led to emergence of various problems. One of the problems that need to be addressed is the potential for environmental pollution due to domestic wastewater.

![Figure 1. ‘Pelantar’ settlement in Penyengat Island](source: Researcher Documentation, 2015)

Domestic wastewater management, both latrines and non-latrines, has been regulated through the Minister of Public Works and Public Housing Regulation Number 04/2017 on the Implementation of Domestic Wastewater Management System. However, the regulation does not further explain the system of managing domestic wastewater (blackwater, fecal) in a particular ecosystem that causes no differences management in continental area (large islands) and small islands. In fact, the carrying capacity of small island is significantly different with large island. The level of vulnerability for small island groundwater to pollute is high because of the very limited water resources. In addition, the disposal of fecal into the sea also causes threats to marine life and indirectly to the sustainability of community's economy [5].

Fecal disposal is intended to isolate the fecal so that infectious seedlings in it cannot reach the new host. The methodology chosen for different areas will depend on several factors including geological and hydrogeological conditions, culture and customs of community, availability of local materials and both short-term and long-term costs [6]. Therefore, the study of fecal disposal system characteristics in
Penyengat Island, Kepri becomes important as an illustration of wastewater management in referring to other small islands. The study of fecal disposal system characteristics can provide information about latrine and sewage disposal types and its distribution including factors related to the selection of a disposal system. This can give an idea of how the real condition of domestic wastewater management, especially fecal disposal in a small island ecosystem, that is in Penyengat Island, Kepri.

2. Methods of the study

2.1. Research design

This research is a quantitative descriptive research with two segments of research. The research segment is differentiated by population and the method used. The first segment is intended to identify the characteristic and distribution of fecal disposal system in the research area. The second segment is aimed to analyze the related factors of fecal disposal system selection in the research area. The population which are selected in the second segment is based on the results of the first research segment.

2.1.1. Segment 1. The first research objective will be answered in segment 1. Identification of the fecal disposal system characteristics and the distribution is done by mapping in the research area using the census of 301 units of houses as the research population. In the segment 1, the information that have to collect are latrine type and sewage disposal type. There are three types of latrine and sewage disposal might be found in this research area such as shown in Table 1.

| No. | Latrine Type                         | Sewage Disposal Type       |
|-----|--------------------------------------|----------------------------|
| 1   | Pit latrine (*jamban cubluk*)        | Simple pit sewage          |
| 2   | Gooseneck trap/latrine (*jamban leher angsa*) | Individual septic tank |
| 3   | Simple pour-flush latrine (*jamban pelengsengan*) | Communal septic tank |

The latrine type and sewage disposal type of the research population would make new categories population into a smaller group known as strata to simplify the research of segment 2.

2.1.2. Segment 2. This segment is aimed to analyze the factors related to fecal disposal system characteristics in the research area or the second research objective. The related factors information is collected based on the sampling of sewage disposal system and latrine type findings that is mentioned in segment 1 explanation. The sample is a part of the population which are collected randomly by strata based on the result of segment 1 which means the segment 2 used stratified random sampling as a data collection method.

Stratified random sampling is a technique used if the population has a member or elements which are heterogenic. It is method of sampling that involves the division of a population into smaller groups or subgroups known as strata. In stratified random sampling or stratification, the strata are formed based on members' shared attributes or characteristics either qualitative or quantitative data. Stratified random sampling is also called proportional random sampling or quota random sampling.

Stratified random sampling is a probabilistic sampling option. The first step in stratified random sampling is to split the population into strata, i.e. sections or segments. The strata are chosen to divide a population into important categories in relevance to the research interest [7], for this research there are nine strata that might be found based on the latrine and sewage disposal type, i.e. 1) pit latrine-simple pit sewage, 2) pit latrine-individual septic tank, 3) pit latrine-communal septic tank, 4) gooseneck latrine-simple pit sewage, 5) gooseneck latrine-individual septic tank, 6) gooseneck latrine-communal septic tank, 7) simple pour-flush latrine-simple pit sewage, 8) simple pour-flush latrine-individual septic tank, and 9) simple pour-flush latrine-communal septic tank. The number of samples is accounted for according to Slovin method [8] the formula is shown as follows.
4

\[ n = \frac{N}{1 + N(d^2)} \]  

Definition :
- \( n \) : Number of sample
- \( N \) : Number of population
- \( d \) : Error level

The number of samples which are used in segment 2 of the research is based on the results of segment 1. The error level of this research is 5% or 0.05. The less error level, the more accurately the sample describes the population and lead to the higher number of samples. Actually, the \( n \) value defines the new population (segment 2) for each strata and sample size. The next step is selecting the sample by using random sampling method. Each element of a random sample is chosen entirely by chance and has an equal probability of being selected. Random sampling can be done by using dice in a conventional way but this research used Microsoft Excel (part of Microsoft Office) as a software that supports picking random data by using formula ‘randbetween’. All of the data is named by numbers that represent the latrine type, sewage disposal type, house number and coordinate. The numbers of houses will be used in random sampling process with randomize feature in Microsoft Excel.

This research has four independent variables to fulfill the second objective which is to analyze the related factor of fecal disposal system in Penyengat Island. First, settlement type is categorized according to the foundation of houses, which is land or sea. Second, education level that affect attitude and knowledge of the resident in many aspects of sanitation. Education level of resident could not be only represented by householder’s education level, so the highest education level of the resident’s member is used because that it might influence the decision making in the household. Third, income level as a variable to determine economic condition in the household that is represented by householder’s income and the total income of the resident’s member to minimalize bias of household with retired or unemployed householder. Last, the ethnicity as an also important variable to use in this research. Penyengat island is part of Malay kingdom historical, most of community is from Malay ethnic and some of them have royal linkage. Profile book of Penyengat sub-district 2017 mentioned that 86% community ethnic is Malay, it means the ethnicity may be affected the ways of community to agree and connect them on fecal disposal system selection.

2.2. Data Collection

The data collection is conducted with field survey and interview using questionnaire as the tool. The data that needs to be collected in this research is included as follow.

| No. | Data                                | Source          | Method                                           |
|-----|-------------------------------------|-----------------|--------------------------------------------------|
| 1.  | Settlement map of Penyengat Island  | Secondary       | Digital processing of Google Earth Imagery using Geography Information System (GIS) |
| 2.  | Absolute location of houses, black water disposal system type, and laterine type. | Primary | Information collection using GPS plotting (survey) and Census method checklist |
| 3.  | Socio-economic condition of residents | Primary | Information collection using questionnaire with Random Sampling Method |

2.3. Data Analysis

The data analysis which is used to identify the characteristic of fecal disposal system in Penyengat Island is descriptive and inferential statistical analysis. There are several differences and aims between those type of statistical analysis as mentioned below that are appropriate to this research’s segment and objectives.
2.3.1. **Segment 1 (Descriptive statistic analysis).** Descriptive statistic is a statistic used to analyze data with describing and picturing the collected data as it is without the intention to conclude for generalization. A few things that can be done is data presentation using table, graphs, pie charts, pictogram, modus calculation, median, mean (central tendency measurement), decile, percentile, data distribution calculation using average and standard deviation calculation, and percentage calculation. Descriptive statistic tests that is used in this research is frequency table and cross tabulation. The input data of this analysis are number of latrine and sewage disposal type in Penyengat Island. Frequency table can show the domination of latrine and sewage disposal type, meanwhile the cross tabulation of it with the settlement type would explain about the tendency correlation of those variables. The segment 1 data analysis is a manner to identify the fecal disposal characteristics in Penyengat Island as first research objectives.

2.3.2. **Segment 2 (Inferential statistics).** Inferential statistic is a statistic used to analyze the data sample and the results is implemented for the population. This statistic is suitable to use if the sample is taken randomly from a clear population. This method is also often known as inductive statistic or probabilistic statistic because the conclusions which is implemented to the population based on the data sample and the truth is a probability that is marked by a significance level and level of confidence. Commonly, inferential statistics are started by doing normality test to identify the distribution of data. The assumption of that normality test would be the indicator for the next steps in inferential statistics. It means that if the data are not distributed normally, the statistical analysis could not be conducted. SPSS provides various type of normality test such as Shapiro-wilk, Kolmogorov-smirnov, and Liliefors, and Skewness-Kurtosis [9].

Inferential statistic test in this research is Chi Square Test. Chi square is used to test the relationship between two nominal variable and measure the significance relationship between those variables with coefficient of contingency [10]. The significance level determination or $X^2$ on chi square is formulated as follow.

$$x^2 = \sum \frac{(O - E)^2}{E}$$  

(2)

**Definition:**
- $O$ : Observation result frequency
- $E$ : Expected Frequency
- Number of $E$ : Number of row * number of column/number of data ($n$)

$H_0$ or hypothesis is always declared as no relationship between the variable, if the value of Asym Sig or Sig. $X^2 (H_0)$ is more than the significance level stated before, then the hypothesis is accepted and vice versa. Chi Square obligated only nominal data processed so that some variables in the other data scale has to be changed into a nominal data. Although, the significance level determination requires a prior calculation of the available data, but based on the population number of 524 with four independent variable indicating that there are more than 2x2 cells, it could be possible to conduct a Chi Square using 95% as a significance level or the value of $\alpha = 0.05$ and the relationship is said to be significant if the value of $p \leq 0.05$ and there is no significant relationship if the value of $p > 0.05$ as other studies in general [11].

3. **Results**

3.1. **The characteristics of fecal disposal system in penyengat island**

Data collection of the latrine and sewage disposal type in Penyengat Island involves 377 houses. Based on the census, there are 440 houses but 73 of it are houses without toilets and some are used as storage warehouses. The data collected into the population in characteristics of fecal disposal system in Penyengat Island research is only 301 houses because 76 others can be said to be unidentified data (see the following reasons in Table 3). 68.4% of the unidentified data are abandoned houses, generally the
reason for the buildings not being used is that the homeowners or families of the residents have migrated out of the island. The reason for the migration is to get a job or access to health and other livelihoods.

Table 3. Excuse of Unidentified Data Frequency

| Excuse of Unidentified Data                  | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------------------------|-----------|---------|---------------|--------------------|
| Uninhabitable/Damaged House                  | 17        | 22.4    | 22.4          | 22.4               |
| Alternative House (Investment)               | 5         | 6.6     | 6.6           | 28.9               |
| Abandoned House                              | 52        | 68.4    | 68.4          | 97.4               |
| Unwilling to respond                         | 2         | 2.6     | 2.6           | 100.0              |
| **Total**                                    | **76**    | **100.0** | **100.0**     |                    |

As a consequent of unidentified data, the population in this study is only 301 houses even though there are 377 houses. The data in segment 1 of this study refers to the questionnaire containing the information about the type of settlement, latrine, sewage disposal, and fecal disposal system in Penyengat Island. Based on the result of the census, settlement type in Penyengat is dominated by coastal settlement as shown in Table 4, even though the difference between the number of settlement type is not significant. This condition is similar with the previous research by [12] that stated the houses type in small island are dominated by stil house, which is part of coastal settlement.

Most of the community in small island prefer to live in coastal settlement cause of several excuses such as the feasibility to have their own port in their ‘backyard’, to easier predict the weather for their mobility, and is part of the local wisdom that they believe land is the sacral area. This statement is also supported by settlement geography study, a line settlement group are generally built linier with road or coastline. The type of settlement would affect the community’s preference of their household sanitation facilities, that are the latrine and sewage disposal type.

Table 4. Settlement Type Frequency

| Settlement Type  | Freq  | %    | Valid % | Cum. % |
|------------------|-------|------|---------|--------|
| Land Settlement  | 145   | 48.2 | 48.2    | 48.2   |
| Coastal Settlement| 156   | 51.8 | 51.8    | 100.0  |
| **Total**        | **301**| **100.0** | **100.0** |        |

Gooseneck latrine is considerable latrine type in Penyengat, it more than 70% of the population as shown in Table 5. This latrine type is semi-modern but with affordable price than the pour-flush. Unfortunately, most of sewage disposal that was found in Penyengat is simple pit sewage. It means the community already cared about their toilets interior facility but they did not realize that the sewage has potential to contaminate the soil and sea water. Even though 44.5% of the population used individual septic tank it still led the potential soil contamination. There are only six houses connected to two communal septic tanks. The sewage disposal information can be identified in Table 6.

Table 5. Latrine Type Frequency

| Latrine Type         | Freq  | %    | Valid % | Cum. % |
|----------------------|-------|------|---------|--------|
| Pit Latrine          | 82    | 27.2 | 27.2    | 27.2   |
| Gooseneck Latrine    | 215   | 71.4 | 71.4    | 98.7   |
| Simple Pour-flush Latrine| 4   | 1.3  | 1.3     | 100.0  |
| **Total**            | **301**| **100.0** | **100.0** |        |
Table 6. Sewage Disposal Type Frequency

| Sewage Disposal Type     | Freq. | %    | Valid % | Cum. % |
|--------------------------|-------|------|---------|--------|
| Simple Pit Sewage        | 161   | 53.5 | 53.5    | 53.5   |
| Individual Septic Tank   | 134   | 44.5 | 44.5    | 98.0   |
| Communal Septic Tank     | 6     | 2.0  | 2.0     | 100.0  |
| Total                    | 301   | 100.0| 100.0   |        |

Based on the census data included, the latrine and sewage disposal type characteristics’ of fecal disposal in Penyengat can be stratified into six categories or strata that are (1) pit latrine - simple pit sewage, (2) pit latrine - individual septic tank, (3) gooseneck latrine - simple pit sewage, (4) gooseneck latrine - individual septic tank, (5) gooseneck latrine - communal septic tank, and (6) simple pour-flush latrine - simple pit sewage. The strata can be name as fecal disposal type (FDT) 1, 2, 3, 4, 5, 6 and will be mentioned throughout this research. The result of strata number shown that the hypothesis to find nine strata of fecal disposal is rejected. There are no houses used pit latrine are not connected into communal septic tank. Most of FDT 1 houses are part of coastal settlement. The one and only latrine type that used various sewage disposal type is gooseneck with the domination as FDT 4. This fecal disposal type is generally found in land area. See Figure 2 that represent the portrait of latrine type domination. The detail information about each FDT number in Penyengat is shown in Table 7.

Figure 2. Portrait of FDT 4 and FDT 1 as the dominated FDT in Penyengat
Source: Researcher Documentation, 2018

Table 7. Frequency of Fecal Disposal Type

| FDT | Frequency |
|-----|-----------|
| 1   | 80        |
| 2   | 2         |
| 3   | 78        |
| 4   | 131       |
| 5   | 6         |
| 6   | 4         |
| Total | 301     |

The domination of FDT that is found in Penyengat is FDT 4 (43%) which means the community used the gooseneck latrine and individual septic tank. It led to the assumption that community were already prefer to use modern latrine and aware to good sanitation as they used septic tank. But we could not ignore another fact that most of them used simple pit sewage (FDT 1, FDT 3, and FDT 6) even with three types of latrine. If we calculated the total of simple pit sewage percentage in FDT
strata, we can conclude that, most of community dispose their fecal to the sea because they might not have any option to dispose the fecal to the land. Land is the sacral area in Penyengat cause of spiritual-historical value. The characteristics of fecal disposal system in Penyengat Island is shown by the latrine and sewage disposal type. The highest number of latrine type that is used is gooseneck latrine (71.4%) and the highest number of sewage disposal type is simple pit sewage (53.5%). However, by the strata of fecal disposal system, the highest type is FDT 4 (43%). This result is not totally wrong because the second highest number of latrine type (44.5%) is individual septic tank. Nevertheless, we could not ignore the fact that Penyengat island has high potential to pollute the sea environment by disposing the fecal directly to the sea through simple pit sewage. Then, we also need to be concern about the second highest fecal disposal type which is FDT 1.

There are 27% of houses in this small island that still use pit latrine and simple pit sewage. It represented the main problem of our national obstacle in the specific area like small island as discussed in Buku Penuntun Opsi Sanitasi yang Terjangkau untuk Daerah Spesifik or Guidebook of Affordable Sanitation Option for Specific Area [13]. This book explained that the community in small islands were using conventional fecal disposal system because of their financial and the geography factors. The income level and transport cost of the sanitation facilities market in small island will influence the willingness to pay of the community. The related factors of fecal disposal system characteristics in each small island is different. In order to identify the related factors of fecal disposal system in Penyengat Island, this research is continued by analyzing several factors as explained in segment 2.

The distribution of fecal disposal type in Penyengat Island is literally depending on the latrine type, sewage disposal type, and settlement type. The houses that are located in the coastline or part of settlement type have simple pit sewage and pit latrine. Besides, the houses that located in land used sewage disposal, that is septic tank. Most of the septic tank type is individual (44.5%) and only 2% of it is communal septic tank. The houses in land area also have various latrine type than houses in coastline. Meanwhile, disposing the fecal directly to the sea should not be recommend. As you could see in the figures below, the distribution of fecal disposal in Penyengat is dominated in north of the island.

![Figure 3. Distribution of Fecal Disposal Type in Penyengat Island](image)
3.2. The related factors with fecal disposal system in Penyengat Island

The inferential statistics used is Chi Square Test with 95% significance level or $\alpha$ value is 0.05. This test is used for analyze that both of variables (dependent and independent) are related or not. The dependent variable is fecal disposal type and the independent variables are settlement type, education level (householder and the highest), monthly income (householder and total), and ethnicity. The result of chi square test of those variables is shown in Table 8.

Table 8. Chi Square Test Result

| No | Variables                                      | $\alpha$ |
|----|------------------------------------------------|----------|
| 1  | Settlement Type                                | 0.000    |
| 2  | Education Level of Householder                 | 0.087    |
| 3  | Highest Education Level of Household Members   | 0.016    |
| 4  | Monthly Income Level of Householder            | 0.916    |
| 5  | Monthly Income Level of Household Members (Total) | 0.990    |
| 6  | Ethnicity                                      | 0.003    |

3.2.1. Relation of settlement type with fecal disposal system in Penyengat Island

Settlement type in Penyengat Island is divided into two type that are land settlement and coastal settlement. Coastal settlement is more dominant than land settlement, 54% houses are coastal settlement. Besides, 46% houses are land settlement (displayed in Figure 4). With an area only 4.6 km$^2$, it is normal if the community prefer to build the house along the coastal. Settlement type are the first variable that we assumed have relation with fecal disposal characteristics in small island like [12] mentioned in their previous research.

Figure 4. Settlement Type in Penyengat Island

Based on chi square test in this research, $\alpha$ value of FDT with settlement type is 0.000 (see Table 8). It means that the hypothesis is rejected, furthermore we know that settlement type has relation with FDT. This statement was proved by the linier data of settlement type and sewage disposal type. 54% of houses are part of settlement type and 53.5% of houses are used simple pit sewage.
3.2.2. Relation of education level with fecal disposal system in Penyengat Island. Education is something that really influence us in making decision. It is considered an investment in human capital which in turn contributes to knowledge of economy and development of a nation. Education is a diverse and dynamic sector and has been ever changing as per the needs of society. Education is a form of learning in which the knowledge, skills, values, beliefs, and habits of a group of people are transferred from one generation to the next through teaching, training, research, or simply through auto didacticism [14]. Socio-economic status (SES) emerges as one of the most significant factors influencing the choices of the individuals regarding their education. Socio-economic status is defined as a relative standing in society based on an individual's income, power, occupation, education, and prestige [15].

There is an indicator to identity the education variables, commonly used the education level. The education level represented the community status by which level of school they had graduated. In this research, education level is not reviewed only by householder, besides we take the information of the highest education level of their household members. It aimed to control the fact that might be the decision making in one household are a result of discussions. So, the members have the same possibility and rights to influence their decision. The decision in this context is about their preferences of latrine and sewage disposal type. Based on chi square test for education level variables, we can see that householder education level’s is not related with FDT is shown by its $H_0$ value is 0.087. On the other side $H_0$ value of FDT with highest education level of household members is 0.016. This is an interesting point that the highest education level in one household has affect to their decision making of FDT more than the only the householder education background.

3.2.3. Relation of income level with fecal disposal system in Penyengat Island. As mentioned before by [15] socio-economic is defined based on an individual's income, power, occupation, education, and prestige. Many important economic decisions such as labor supply, residential location, buying insurance, buying new goods, investing in stocks and bonds or in children’s education also the willingness to pay sanitation facilities in house often made by households rather than by individuals [16]. Most financial education and counseling took place at the individual level, whereas financial decisions took place at household and intrahousehold levels. However, all family members in the household including spouses (partners) and children influence financial decisions [17].

This research collected two indicators of income level. First, the monthly income level of householder and second is the monthly income level of all members in the household which means the total income of working members. Chi square test of this variable shown that income level either the householder or total members are not related with FDT. The $H_0$ value of monthly income level of householder and all members (total income) is bigger than 0.05, respectively 0.916 and 0.990. This fact shown that income level or economic status do not influence their sanitation facilities. It is linier with the data of latrine and sewage disposal type number.

As we discussed before, 71% of the household can buy the modern latrine meanwhile more than 50% were still using simple pit sewage. Latrine is part of sanitation facilities that is built inside the house or especially in the toilets. People will make efforts to fulfill their comfort, without exception for their toilets. So, the willingness to pay for the modern latrine is high but it is contradictive with the sewage disposal. Sewage disposal are part of sanitation facilities that is built outside of the house. If people are not concerned and aware about their environmental issues, the good sewage disposal are not particularly important to pay for them. Matt Damon as actor and founder of Water.org quotations is related with this phenomenon, he said in National Geographic Magazine Edition November, 2017.

“2.4 billion people in the world have bad sanitation facilities, but most of them have smartphones rather than the toilets”

3.2.4. Relation of ethnicity with fecal disposal system in Penyengat Island. Ethnicity is part of socio-culture society, its social identity of individuals. In Indonesia, the ethnicity has important roles to give special characteristics of each individuals and regions. Ethnicity is also part of prestige and in other
ways as power. While, the power and prestige of the ethnicity is locally. Penyengat Island has strong connection with Malay Kingdom (Johor-Riau Lingga), which means the Malay ethnic has more power and prestige than the others there. The Malay ethnic is also divided into two types i.e. royalist and non-royalist. The royalist linkage has special name given as their first name e.g. Raja, Dutok, Sultan, Daeng, and Engku. The royal family linkage would act or might be giving punishment to whoever break the rules of their local wisdom. This statement is supported by [18], they mentioned about culture in Penyengat Island and almost of others Malay (Melaka – Riau Lingga – Johor) Kingdom Island that is distributed in Malaysia, Singapore, and Indonesia (Kepri), the community in those islands have to protect their island from any “foul and messy” activities in direct or indirect meanings.

The stakeholders (hamlet and neighbourhood) of the Penyengat Island commonly is someone who has royal linkage. The community have local wisdom that really appreciate the royalist. People in Penyengat who are not Malay will be considered as an immigrant the whole time. The ethnicity as culture aspect also influence the decision making. Assumption of this variable is the royalist Malay might be having sense of belonging for their island more than the non-royalist Malay and non-Malay. Cultural aspect as a variable that influence sanitation systems in community is already explained by [19] they stated the local people’s in Pakistan have some primary criterion to select sanitation model i.e. prestige, comfort, privacy and had little motivation for environmental. Every household in their research location wanted water in the toilet or latrine for anal cleansing because of their culture as Muslims. It is proved that sanitation systems including latrine, sewage disposal, and fecal disposal might be affect by the culture or in this context is the ethnicity.

The result of chi square test of fecal disposal type and ethnicity shown that both variables are related. The Ha value is 0.003, it means the ethnicity in Penyengat Island is influencing the community to choose their fecal disposal system. This result indicates that community have prestige and social status by their ethnic, not their occupation or economical aspect. Even though, most of previous researches stated that economic aspect divided coastal and small island communities’ layers as mentioned by [12] that most of coastal communities in Indonesia have vertical classes by their socio-economic condition. But this research proved that for some special region with pilgrim typical, socio-culture has more influence rather than the wealth and assets.

4. Conclusion
The characteristic of fecal disposal system in Penyengat Island in term of latrine and sewage disposal type are dominated by 43% gooseneck latrine-individual septic tank (FDT 4), 27% pit latrine-simple pit sewage (FDT 1), and 26% gooseneck latrine- simple pit sewage (FDT 3). Meanwhile, 71% used the gooseneck latrine and 53% used the simple pit sewage. The result preferred to have modern latrine but old or traditional sewage disposal.

The characteristics of fecal disposal system in Penyengat Island is related to settlement type, the highest-level education of household’s members, and ethnicity. Education level of household is not related to FDT. Besides, the income level as a representative of economical aspect, either the householder income nor the total income is not related with the FDT preference.

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