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Environmental health risk assessment to determine sanitation risk area in Jember district in supporting millennium development goals

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A B S T R A C T

Sanitation generally refers to the provision of facilities and services for the safe disposal of urine and feces. Inadequate sanitation is the major cause of disease throughout the world and sanitation is known to have a positive impact on health both within the household and in society in general. Environmental Health Risk Assessment (EHRA) is a district-level participative survey aimed to determine the condition of sanitation infrastructure, health / hygiene, as well as the behavior of the community that can be utilized for the development of sanitation and advocacy programs at the district level to the village. This study aimed to describe and determine the sanitation risk area in Jember**.** Number of samples in the study of EHRA is 2000 respondents spread in 50 villages in 7 sub-districts, divided into 3 clusters. Sampling is done by cluster random sampling system. The results showed that risk areas affected by these factors: 1) Household Waste Management, 2) Domestic Wastewater Disposal, 3) Environmental Drainage Around The House and Flooding, 4) Water Resources, 5) Hygiene Behavior, 6) Diarrhea Cases.

Introduction

The 7th aim of the MDGs is to ensure the environmental preservation, including the household access to adequate sanitation facility. The Ministry of National Development Planning Agency (Bappenas) (2010) revealed that access to adequate sanitation showed an increase of 24.81 percent in 1993 to 51.19 percent in 2009. This figure is still below the target of the MDGs by 2015 that is equal to 62.4 percent. Beside that, the study results of Indonesia Sanitation Sector Development Program (ISSDP) in 2006, showed that 47 percent of community still defecate into rivers, fields, ponds, gardens and open space [1]. According to UNICEF, the behavior of washing hands with soap can reduce the risk of diarrhea by up to 44 percent through the safe water management reaches 39 percent, improved sanitary conditions reaches 32 percent and clean and healthy lifestyle

behaviors can reduce the risk of diarrheal diseases by 28 percent [2].

Environmental Health Risk Assessment Study or EHRA study is a participatory survey at the district level in order to understand the condition of sanitation and hygiene as well as public behavior that can be utilized for the development of sanitation, including advocacy programs at the district level down to the Village / Village. The purpose and benefits of the EHRA study is to get an overview of sanitation conditions and behaviors that have risk to the environmental health.

This study used a quantitative approach with the implementation of two data collection techniques, they were interview and observation. The primary sampling was household. The sampling unit proportionally and randomly selected based on the total household in all neighborhood in each village which has been determined to be the survey area. The number of household samples per village was at least 8 households and the number of samples per household was 5 respondents. Thus the number of samples per village was 40 respondens. Total respondents in this study was 2000 people. Respondents in this study was a husband or wife, or children who are married and aged between 18 to 60 years old.

This research was conducted in Jember East Java in March to June 2012. Survey target area was determined by dividing in four cluter, as table 1 below.

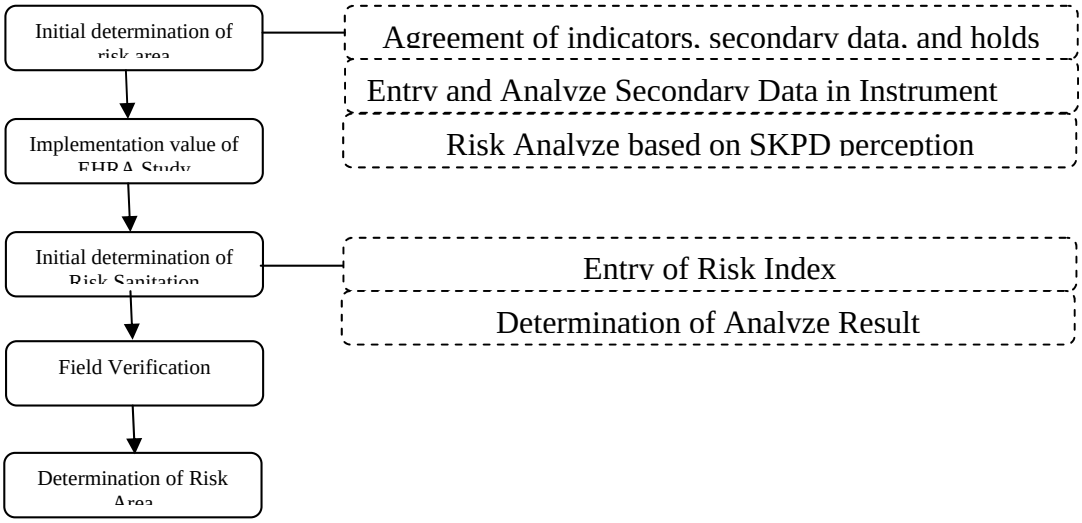

Figure.1 Steps to Determine Risk Area

Table.1 Cluster categories based on The Environment at Risk Indication Criteria

Cluster Category	Criteria
Cluster 0	Village region that do not meet the environment at risk indication criteria at all.
Cluster 1	Village region that meets at least one of the environment at risk indication criteria.
Cluster 2	Village region that meets at least two of the environment at risk indication criteria.
Cluster 3	Village region that meets at least three of the environment at risk indication criteria.
Cluster 4	Village region that meets at least four of the environment at risk indication criteria.

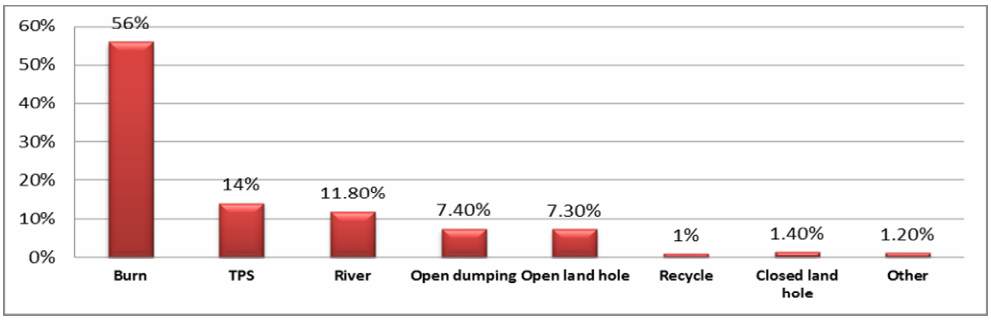

Figure.2 Management of Waste of Household

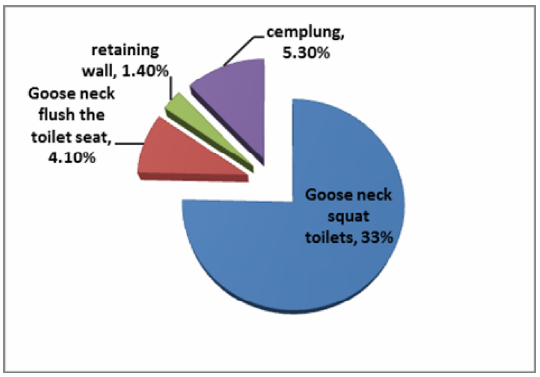

Figure.3 Varian of Toilets

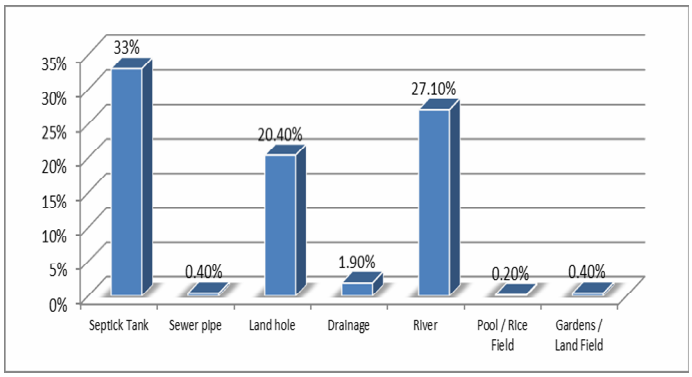

Figure.4 Channelization of feses waste

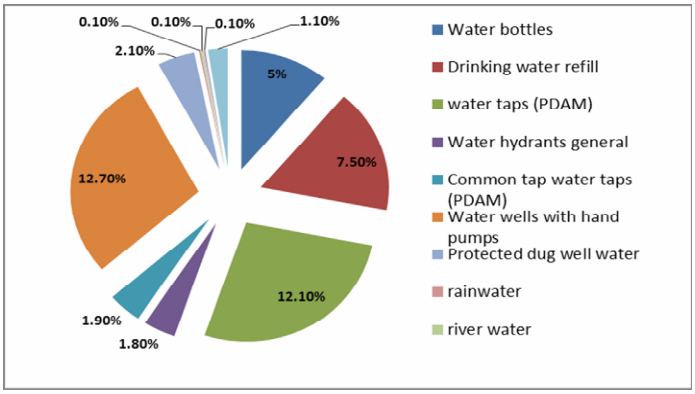

Figure.5 Source of drink water

Table.2 Total Sanitation Risk Area

No.	Catagory of Risk Area	Number of Area	Score index
1.	Low risk	2 villages	132 - 165
2.	Moderate risk	27 villages	166 – 199
3.	High risk	14 villages	200 – 232
4.	Very high risk	7 villages	233 - 266

General Overview

From the 2,000 samples taken by cluster random sampling in 50 Villages in 7 Subdistricts based on Risk Level determinant Indicator of Public Health which includes: (1) Household waste management, (2) Domestic Wastewater disposal, (3) the drainage around the house and flooding, (4) treatment of drinking water and domestic water supply; (5) hygiene behavior; (6) cases of diarrheal disease.

Household Waste Management

Waste management is very important, start in the household level by sorting, temporary collection, transportation and final disposal. Based on the EHRA study, the majority of waste management in the household level in 3 clusters in the district of Jember (Figure 2).

Domestic Wastewater Disposal

For wastewater disposal or human fecal waste, from the results of the EHRA study it's known that community has been defecate in private toilet 58.2%, in public toilets 2.9%, and the other was still defecate in the river, garden / yard, etc.

While the survey results of the emptying of septic tanks showed that generally the septic tank was never been emptied (81.6%), ever been emptied (18.4%). Emptying septic tanks was carried by feces suction service providers (53.7%), carpenters (10.7%), selfemptied (5.8%), and 29.8 percent said they do not know.

Drainage Around the Home and Flooding

The EHRA study results showed that in general respondents in 3 Cluster stated that they have sewerage in addition to feces disposal channel (71.7%) and that do not have sewerage (28.3%). Kitchen waste water disposal disposed into the river/canal (39.7%), road/homeyard (5.2%), open channel (22.5%), closed channel (20.2%), pits (15, 5%), sewer pipes (3.6%), SANIMAS WWTP (1%). Bathroom waste water disposed into the river/canal (40.5%), road/homeyard (3.7%), open channel (21.5%), closed channel (20.7%), pits (15, 1%), sewer pipes (3.9%), SANIMAS WWTP (1.1%).

Laundry wastewater disposed into the river/canal (41,3%), road/homeyard (3,4%), open channel (20,4%), closed channel (19,8%), pits (14,1%), sewer pipes (3,5%), SANIMAS WWTP (1%). Sink waste water disposed into the river/canal (10.7%), road/homeyard (0.4%), open channel (2.5%), closed channel (6%), pits (3.2%), sewer pipes (0.7%), SANIMAS WWTP (0.8%). While related to flood events that have occurred around home environment, the survey results showed that most had never experienced flooding (91.9%) and ever experienced flooding (8.1%).

Management of Drinking Water and Domestic Water Supply

Water is an essential requirement of every individual and society. Adequacy of water and water quality will greatly affect the individuals, communities and environmental health. The types of water sources has its own level of security especially drinking water sources that are globally considered as a relatively safe source, such as tap water, boreholes, protected dug wells, protected springs and rainwater (captured, streamed and stored cleanly and protected). For access to drinking water based on the survey results showed in figure below.

For the public convenience in accessing clean water for daily needs, survey results indicated that people generally did not have difficulty in accessing clean water (83.3%) and who felt have trouble getting clean water was only a small (6.7%). In general, people are satisfied with the quality of water used (90.6%) and generally people treat water before use (93.7%). As for how to treat water for drinking is boiled (96.5%), added chlorine (0.6%), using ceramic filters (0.6%), other (2.2%).

Hygiene Behavior

Hygiene behavior in question is the behavior of a clean and healthy life, especially concerning about the personal hygiene, especially in relation to the use of soap in doing the personal hygiene. Based on survey results, generally people were already using soap (98.8%). The use of soap was to bathe themselves (98.6%), bathing the children (46%), cleaning a child (30.1%), self hand washing (59.3%), hand washing the children (33%), washing appliances (76.7%), washing clothes (75.7%), other (0.7%). Related to location that is often used when washing hands was in the bathroom (42.8%), near the bathroom (8.8%), toilet (3%), near the toilet (1.8%), at the well (30, 8%), around the water storage (0.9%), in the plate wash (47.8%), in the kitchen (42.2%), and others (4.7%).

While the activity time in washing hands with soap was before to the toilet (4.9%), after cleaning a child (27%), before eating (81.2%), after eating (72.5%), before feeding a child (21 , 6%), before preparing meals (27.7%), after handling animals (29.2%), before praying (35.6%), and others (2.9%).

Diarrhea Cases

Diarrheal disease is one of the diseases associated with sanitation and clean and healthy behavior. Based on the survey results related to the incidence of diarrhea in the family in the past year was never (65.3%) and ever (34.7%). While the percentage of family members who had experienced diarrhea were children under five (31.4%), non-toddler children (8.8%), males teenager (4%), female teenager (5.8%), adult males (20.3%), and adult females (36.4%).

Sanitation Risk Area

Determination of risk area based on risk sanitation level which use result of EHRA study and perception assessment by unit of district official (SKPD), it showed in table 1. Based on result study, generally Based on the results of the study showed that in general sanitation in Jember is still not good, only 2 villages (4 percent) were at low risk. Under the terms of the management of solid waste, most are still burning, open dumping, and dumping in water. Solid waste is called trash, garbage, rubbish, and many other names. Solid waste does not have to cause health problems. It can even become a

source of income and of resources for making new products. But when solid waste is not safely collected, separated, reused, recycled, or properly disposed of, it can be ugly, smelly, and cause serious health problems [4]. Worldwide scientific research has conclusively demonstrated that burning of waste at landfills produces air and toxins. Typically, burning occurs at low temperatures (250 ºC to 700 ºC) in oxygen starved conditions. Hydrocarbons, chlorinated materials and pesticide compounds under these conditions produce a wide range toxic gases harmful to the environment and public health. These gases contain dioxins / furans, volatile organic compounds, particulate matter (PM), hydrogen chloride (HCl), carbon monoxide (CO) and oxides of sulfur and nitrogen and liberate metals including antimony, arsenic, barium, beryllium, cadmium, chromium, lead, manganese, mercury, phosphorus and titanium [5].

The finding of this study shows that 39,9% of the respondents has been defecate in open place (river, garden, yard, etc). This result is consistent with the findings of the Health Officer of Jember Regency in 2013, which indicated that about 38,47% of rural areas lacked of latrine facilities [6]. The practice of open defecation facilitates the transmission of pathogens that cause diarrheal diseases – the second leading contributor to the global burden of disease, as measured in disability-adjusted life years (DALYs) [7].

New sanitation policies adopted in recent years throughout the developing world have shown remarkable success and have led to unprecedented increases in sanitation coverage. These policies focus on stopping the practice of open defecation through community-level action and influencing social norms to the point where open defecation is no longer considered acceptable. In almost 100 countries around the world, new approaches to sanitation have taken root and the number of declared 'open-defecation-free villages' is rising [8].
Sanitary conditions greatly influenced by people's access to clean water. The behavior of washing hands with soap as well as poor access to clean water may be the cause of various infectious diseases, such as diarrhea. Most diarrhea diseases are caused by a lack of water for personal cleanliness, toilets that are not clean and safe, and contaminated water and food [4]. Ministry of Health states that the bad quality of water drink cause 300 case diarrhea of 1000 population. The contaminated water drink by bacteria *E.coli* can be cause diarrhea case [9].

The result of EHRA showed that 48 villages (90%) are still have sanitation risk (moderat until very hight risk), whereas the villages which have low risk are 10%. This condition showed that the condition of study area is still bad. MDGs Target 7C goals in 2015 for the proportion of households with access to basic sanitation facilities in urban areas is 76.82 percent and 55.55 percent in rural areas (Bappenas, 2012). This condition requires serious efforts from the government and the community to achieve the MDGs targets. To achieve the MDGs, some programs have made such inroads: drinking water program grants, bank loans for taps, a national program providing drinking water and sanitation community-based (PAMSIMAS), and corporate social responsibility [10]. Jember Regency government has established a Working Group to facilitate and coordinate separately Sanitation programs related to sanitation.

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