J. Appl. Environ. Biol. Sci., 9(9)1-4, 2019
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ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Drinking Water Supply Systems Modelling on Pamsimas Program in Kabupaten Mojokerto

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Received: May 7, 2019
Accepted: July 11, 2019

ABSTRACT

The program for water supply and sanitation community based, commonly known as PAMSIMAS program, which planning to involve the community with a need of response approach. As well as in the implementation, operation and maintenance administered and managed by the community. This program targets a village that has no 100% access to a safe drinking water and safe sanitation access, and is located in rural and suburban areas (peri urban).
Management of Water Supply System (SPAM) in the operation and maintenance is essential to the fulfillment of providing safe drinking water in a sustainable manner. SPAM sustainability indicators are functioning means, there are users and application fees. Based on data from the national Pamsimas program there are some number of SPAM that are not working, not fully utilized, and there are no dues.
Based on those problems, the risk analysis study using Water Supply System modeling (SPAM) and Pamsimas Program in Mojokerto need to be conducted. The cause of failure in rural SPAM sustainability were analyzed using Fishbone Analysis. While the main failure was analyzed by modeling method Failure Mode and Effect Analysis (FMEA). Risk analysis includes operational, external and Internal factors. Research was conducted on SPAM and grouped according to the source of water used, such as springs, groundwater and surface water.
Risk analysis results using Fishbone Analysis and FMEA obtained the main failure for SPAM that used groundwater as its sources, namely: (i) Pump Maintenance, (ii) Dues Determination, (iii) Technical knowledge of human resources.
KEYWORDS: Sustainability of Rural SPAM, Fishbone Analysis, FMEA

1. INTRODUCTION

Indonesia is one of the countries that have committed to participate in the global development agenda in the framework of Sustainable Development Goals (SDGs). Program For Water Supply And Sanitation Community Based (Pamsimas) is one of the national community empowerment program using responsive approach needs. Management of Water Supply System (SPAM) is built based on the proposals submitted and approved by the people in a participatory manner [1, 2, 3, 4, 5, 6]. The Electoral system and facilities that will be built, funding patterns and manner of governance are the decision made by community meetings, and a group of Drinking Water Supply System Management (commonly known as KPSPAM) was formed to manage SPAM.

SPAM management in terms of operation and maintenance is essential to the fulfillment of providing safe drinking water in a sustainable manner. Indicators of SPAM sustainability are (i) the functioning of SPAM, (ii) there are people as beneficiaries of SPAM, and (iii) Agreable fee between users and managers of SPAM on water usage.

Based on data from the Management Information System (MIS) of Pamsimas Program, nationally there are numbers of SPAM that are not working, not fully utilized, and there are no dues. The biggest challenge in this program is achievement of Pamsimas Program in sustainability. Risk analysis modeling of SPAM failure in targeted villages in Mojokerto is an effort to support the functioning of SPAM in a sustainable manner.

2. METHODOLOGY

2.1. Type of research

Modeling analysis used in this study is intended to analyze the risk in sustainability. In this research, using qualitative descriptive analysis and modeling in rural water supply system management in Mojokerto.

2.2. Data Collection and Processing Method

The primary data collection using questionnaires and interviews of KPSPAM and SPAM users in the targeted villages for Pamsimas Program in Mojokerto, while secondary data were obtained from data SIM (System Information Management) Pamsimas Program.

The method that were used in this research were the Fishbone Analysis and Failure Mode and Effect Analysis (FMEA). Determination of risk factors for the sustainability of SPAM using Fishbone Analysis, and prioritizing risk of failure using FMEA. Beneficiary of Fishbone Analysis is to help identify the possible causes of

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the problem and find the root of the problem [7, 8]. While FMEA was used because of the feasibility and effectivity, especially for more operational corrective actions [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19].

3. ANALYSIS AND DISCUSSION

Based on data from questionnaires, interviews, and observations, Analysis Fishbone Diagram was compiled as shown in Figure 1 and the results obtained factors which influenced the sustainability of SPAM, as follows:

a. Operational: Piping, Pumping, SPAM Facilities, Operations and Maintenance Guide Book.
b. External: Dues, Accounting System, Fee Collection System.
c. Internal: Performance of SPAM, KPSPAM Organization, Human Resources.

The source of water used in SPAM is a spring (50.9%), ground water (47.3%) and surface water (1.8%).

SPAM sustainability factors were analyzed using FMEA, in order to obtain the main risk of failure that need to be solved [20, 21, 22]. FMEA results against SPAM that used ground water are as follows:

a. Piping: the mechanical joint between pipes is poor and underground pipes do not fit the criteria, those factors will affect the water discharge and reduced water pressure.
b. Pumping: improper use of pump stabilizers, the components of the pump already worn out, will cause the pump system disrupted and the pump effectiveness decreased.
c. SPAM FACILITIES: Irregularly maintaining and monitoring, will cause poor performance and reduced the quality of the water.
d. OPERATING AND MAINTENANCE GUIDE BOOK: unavailable guidebook or less simple, will cause operational and maintenance activities different from the procedure text.
e. DUES: dues that is collected can not cover the operational and maintenance cost, and there is no suitable amounts of fees, so it would cause lack of funds for operations and maintenance, and SPAM can not be developed.

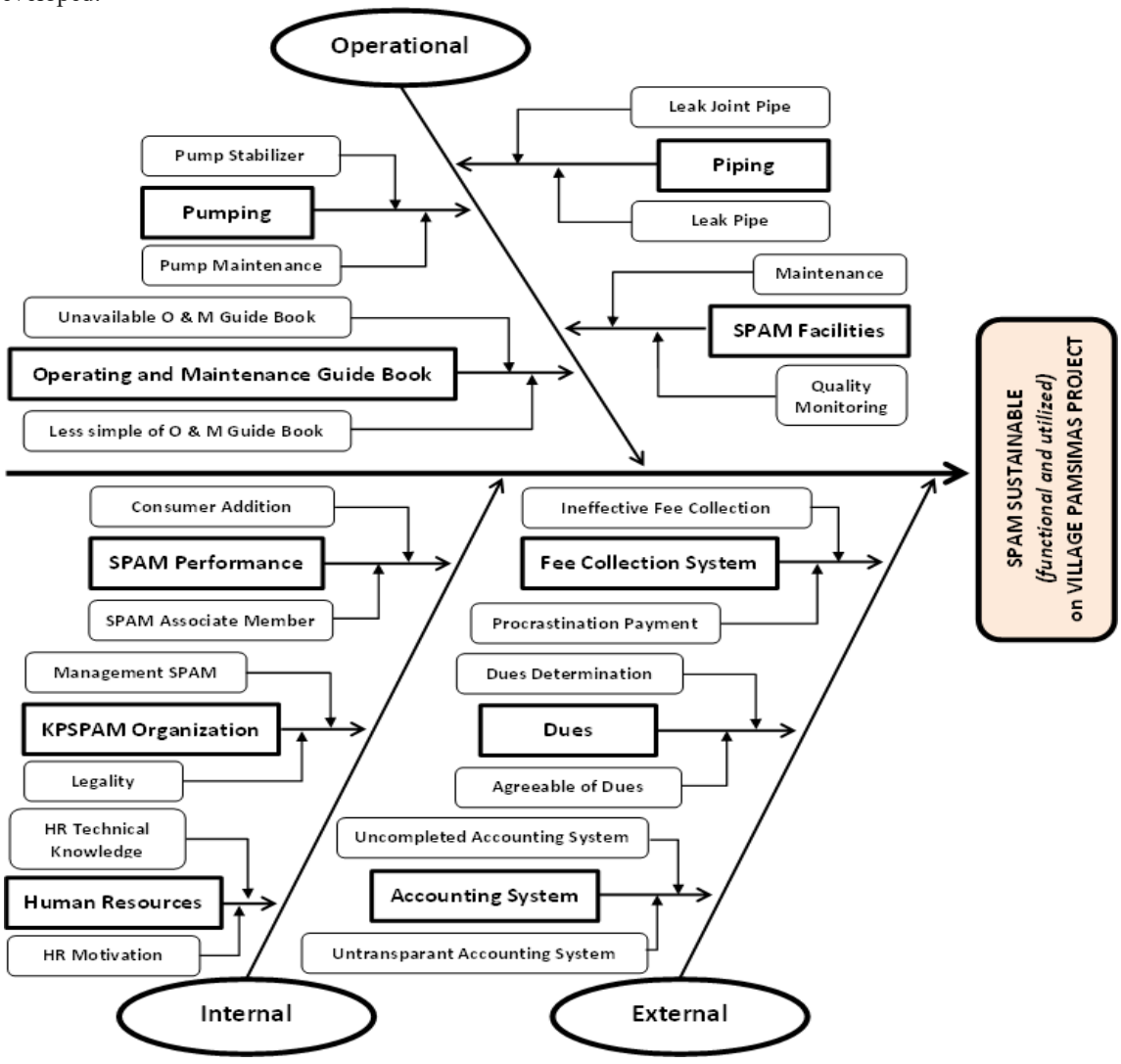

Fig. 1 Fishbone Diagram of the Sustainability SPAM

f. FEE COLLECTION SYSTEMS, caused by the clerk did not routinely collect and beneficiaries do not pay dues on time, so that dues are not collected as expected.
g. ACCOUNTING SYSTEM, lack of inadequate human resources and disorderly administrative ledger, it would affect to unknown finance condition whether is surplus or deficit, and the beneficiaries will lost trust to the management.
h. KPSPAM, the lack activities of KPSPAM, no legal support and recognition, will cause SPAM operational works not optimum and fail to carry the main duties and functions of KPSPAM.
i. SPAM PERFORMANCE, decreased SPAM Performance caused by KPSPAM did not have a work plan and less aware of the advantages of being a member of the KPSPAM, the absence of additional beneficiaries, lack of services development and not knowing the advantages of collaboration with other parties.
j. HUMAN RESOURCES, caused by a lack of human resources technical knowledge, lack of motivation, which resulting in less responsive to the problem.

4. CONCLUSIONS

Based on fishbone analysis and FMEA results, it can be concluded that the highest risk factors of SPAM uses groundwater as its source are:

a. Operational : Pump Maintenance
b. External : Dues Determination
c. Internal : Technical Knowledge of Human Resources

Ways to reduce failure based on the highest priority are:

a. Pump components must be maintained regularly to avoid pump components worn out and increased effectiveness and pump lifetime.
b. Discussion between managers and beneficiaries about amounts of dues, reducing maintenance and operating costs, budget reserves, as well as monthly administration fees apply.
c. Attend training and education program organized by Rural SPAM Association specially related to technical and financial administration.

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