

# Policy Implementation of Environmental Health of Relation Between Environmental Sanitation, Construction Factors and Habits of Society With Water Quality of Dug Well and Patient with Diarrhea in Paiton Sub District Probolinggo Regency

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**Abstract.** One of the major problems in the implementation of environmental health policy through the Clean Water Sanitation Program in Paiton Subdistrict Probolinggo Regency is poor water quality of dug well, the lack of activity examined by doctors at the health center facility dug against the high risk of contamination and diarrheal diseases as well as construction factors. The purpose of this study is to identify and analyze environmental health policy implementation in relation between environmental of sanitation, construction factors and habits of the society with the water quality of dug well. This study was an observational study, conducted by cross sectional. The sample was the head of the family as much as 5 users dug well in the Paiton subdistrict Probolinggo regency. This study uses statistical test Multiple Logistic Regression and Chi-Square test. The results of this study indicate that environmental sanitation, construction factors, has a significant relationship to the quality of well water and diarrhea. Habits of the society at the time took no relationship to water quality dug well water. The results of this study suggest the need for researchers Puskesmas doctors providing health education to the community about the users dug clean water wells, dug wells physical condition, the need for monitoring and surveillance of water quality, and should involve the community so that people can satisfy the absolute needs of clean water.

**Key-Words:** water quality of digging well, environmental sanitation, construction, habits of the society, diarrheal diseases

## 1. Introduction

Until now the disease because of water and environment-based illnesses, one of which is diarrhea, it is still a public health problem. The number of cases of diarrhea in Probolinggo city, Indonesia country in 2012 as much as 52.30 / 1,000 population (12 232 people).

In 2011 as many as 42.30 / 1,000 population (9125 patients), while in 2010 amounted to 30.12 / 1,000 population (6499 patients). According to the survey and Surkesnas 2001, diarrheal disease remains a major cause of infant and child mortality. Diarrheal disease is a disease with the highest number of patients than other diseases such as respiratory infections, skin infections diseases, eye, pulmonary tuberculosis and dengue. When seen from the number of diarrhea patients in each district amounted to 1.99% of the total population.

**Table 1.** Diarrhea diseases in Paiton Subdistrict Probolinggo Regency in 2012

Number	Districts	The population	Total of visits to the case of diarrhea	Diarrhea patients (%)
1.	Sukapura	19,558	193	0.98
2.	Sumber	26,149	115	0.44
3.	Kuripan	29,171	122	0.42
4.	Bantaran	40,639	577	1.42
5.	Leces	54,506	711	1.30
6.	Tegalsiwalan	36,179	210	0.58
7.	Banyuanyar	52,306	895	1.71
8.	Tiris	63,413	1.211	1.91
9.	Krucil	51,971	340	0.66
10.	Gading	48,069	399	0.83
11.	Pakuniran	42,254	391	0.93
12.	Kotaanyar	35,158	280	0.80
13.	Paiton	68,904	1.230	1.99

14.	Besuk	45,682	395	0.87
15	Kraksaan	65,622	1.098	1.67
16.	Krejengan	37,976	152	0.40
17.	Pajarakan	33,687	124	0.37
18.	Maron	61,776	983	1.43
19.	Gending	39,050	191	0.49
20.	Dringu	50,791	841	1.66
21.	Wonomerto	38,523	253	0.66
22.	Lumbang	31,039	104	0.34
23.	Tongas	63,530	1.033	1.63
24.	Sumberasih	59,417	384	0.65
Kabupaten		1.095.370	12.232	1.06

Sources : Health Department. Annual Report Probolinggo District Health Office in 2012 [1].

In District Paiton of 110 dug wells means only 25% eligible bacteriological. Of these 28 wells apparently consumed as drinking water and cooking purposes. Though only a fraction of the dug wells that have been conducted sanitation inspections by environmental health officers in the health centers found that the construction is not eligible and the risk of environmental pollution due to sanitation around.

The dug wells that is located close to a variety of pollutant sources such as latrines, waste disposal and sewerage can affect water quality. Although there is no damage to parts or walls, floors and lips on wells construction allowed contaminated into dug wells.

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 416/MENKES/PER/IX/1990 [2] explained that the water is drinking water, clean water, pond water, water pools and public baths. Further water is water quality qualified health and can be drunk directly. While clean water is water used for everyday purposes that qualify the quality of health and can be taken when it is cooked.

The dug wells are one source of water supply for communities in rural and urban areas. The dug wells provide water from soil layers that are relatively close to the soil surface, and therefore susceptible to contamination through seepage derived from human waste, animal, domestic or household purpose. They dug wells as a source of clean water should be supported with construction requirements, location requirements for the construction of a dug well, it is necessary for safe dug well water quality in accordance with the rules set [3]. The use of dug wells due to water company that provided by the government has not fully reach the public, so that people using wells dug as a relatively inexpensive alternative and affordable [4].

Environmental health behaviors is the role of the community to maintain the cleanliness of dug wells, dug wells so it can be used as a means of providing a safe for consumption [5]. The physical of dug wells health based standards is seen from the seepage of pollutants into dug well, such as contamination by fecal (coliform bacteria), among others, is determined by the physical structure of the building is dug wells. Health requirements for clean water wells in particular by the Ministry of Health (1995) [6] have given several components to prevent contamination of the well water. The function of some component dug wells are as follows (Ministry of Health, Republic of Indonesia, 1998):

- The dug lip serves as a protective safety for the user and to prevent overflow of water / pollution into the well.
- Well wall prevents leakage of pollutants that come from the ground or from the side, as well as retaining the ground so as not to erode or landslides.
- Floor wells serves to prevent leakage of waste water into the well and as a place to conduct activities in the well.
- Sewerage works to deliver water to the waste disposal sites away from the well.

According to the Directorate General of PPM and PLP (1995), the physical quality of dug wells that meet the health requirements for water supply are: First, the location of well construction requirements:

- To avoid direct pollution should pay attention to the distance between the wells and rubbish pits with pit for wastewater, the distance is 10 m and arranged so that its location is not under the pollution source areas,
- Be made where there is water in the soil;
- Should not be made at the lowest possible ground when the floods submerged or rain.

Second, the construction requirements:

- The well wall 3 m from ground level and it is made of water impermeable wall to prevent seepage;
- The floor must be watertight with a minimum width of 1 meter and tilted so that water easily flows into waterways waste;
- On the ground made the wall (the well) are watertight at least 80 cm to prevent fouling of the surface and for the safety of the wearer;

- (d) If the collection of water with buckets, should always be hung and not placed on the floor of the well;
- (e) Waste water drainage around the well is made of water-resistant wall with a length of at least 10 m or hole created by digging the ground along the 10 m or more.

Water dug wells can be the transmission of diseases (water borne disease). Allergy and Skin Disease Diarrhea in 10 diseases, including prominent in Puskesmas. This is consistent with the results of research conducted Hanafi [7] that the condition of dug wells have significant effect on the prevalence of diarrhea. In the review of environmental health aspects of dug wells as provision of clean water is necessary to monitor and supervise the provision of clean water. Provision of clean water as a preventative measure, which can reduce morbidity rate due water borne mechanism. In this case the course will form a society so concerned with environmental health. Environmental health effort materializes with increased personal health, which contributes to the improvement of public health. Such an understanding would certainly encourage society to live productively, and participate in health-oriented development.

## 2. Material and Methods

This study includes descriptive analytic study by conducting an observational study of risk factors for affecting the water quality of the dug well and diarrheal disease. This study uses cross-sectional.

The population in this study are dug wells in District Paiton number of 110 pieces. Target population is dug well who consumed as drinking water and cooking purposes 28 units of the 30 dug wells samples taken at random. As a respondent is user dug wells families taken as many as 52 people. The sample can examination of the water quality, then each dug well was observed covering the state of environmental sanitation, construction and the habits of the user community dug wells and diarrheal disease.

Descriptive analysis used in this study is the frequency distribution and cross tabulation. To determine the relationship between variables is partially independent variables and dependent variables used Multiple Logistic Regression Testing. Relationship variables simultaneously to determine the contribution of each variable. Chi-square test to determine the relationship between water quality of dug well with the occurrence of diarrheal disease.

## 3. Research Results ESEARCH RESULTS

**Table 1.** Physical of water quality dug well in Paiton Subdistrict Probolinggo Regency in 2012

Physical quality	Total n (%)
Qualified,	30 (100,0)
Not qualified	0 (0,0)
Total	30 (100,0)

Table 1 shows that all dug wells of 30 pieces (100%) meet the physical requirements include the parameters smell of clean water, the amount of dissolved solids (TDS), turbidity, temperature and color.

**Table 2.** The Bacteriological quality of dug well in Paiton Subdistrict Probolinggo Regency in 2012

Bacteriological quality	Total N (%)
Qualified,	7 (23,33)
Not qualified	23 (76,67)
Total	30 (100,0)

The results of the bacteriological laboratory of the 30 water samples from 30 wells dug in the District Paiton indicate that as many as 7 common dug wells (23.33%) meet the requirements of bacteriological water quality. The dug wells while 23 (76.67%) did not qualify as clean water.

**Table 3.** Bacteriological quality of water based on the state of construction of dug wells in Paiton subdistrict Probolinggo Regency In 2012

Water Quality			
Construction	Qualify n (%)	Not qualify n(%)	Total n (%)
Good	5 (62,50)	3 (37,50)	8 (100,0)
Less	2 (9,090)	20 (90,90)	22 (100,0)
Total	7 (23,33)	23 (76,67)	30 (100,0)

Based on Table 3 is known that water samples contained more qualified in dug well construction generally as many as 5 pieces wells (62.50%), while water samples are not eligible more numerous in the dug wells which construction of the 20 pieces are less good (90.90%).

**Table 4.** Bacteriological quality of water based sanitation dug well in Paiton subdistricty, Probolinggo Regency Year 2012

Water Quality			
Environmental sanitation	Qualify n (%)	Not qualify n(%)	Total n (%)
Good	6 (66,67)	3 (33,33)	9 (100,0)
Less	1 (4,76)	20 (95,24)	21 (100,0)
Total	7 (23,33)	23 (76,67)	30 (100,0)

Based on Table 4 shows that the water quality there are more qualified on dug wells with good environmental sanitation is the 6 wells (66.67%). Water quality does not meet the requirements found in many wells dug with less environmental sanitation is 20 pieces wells (95.24%).

**Table 5.** Bacteriological quality of water based habits user dug well Paiton subs district Probolinggo Regency in 2012

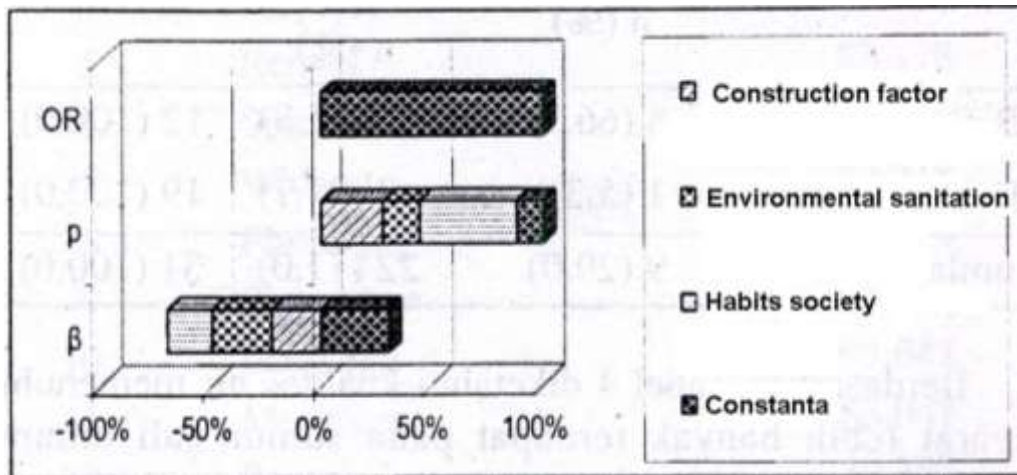
Water Quality			
Habits of the society	Qualify n (%)	Not qualify n(%)	Total n (%)
Good	5 (55,56)	4 (44,44)	9 (100,0)
Less	2 (9,52)	19 (90,48)	21 (100,0)
Total	7 (23,33)	23 (76,67)	30 (100,0)

Table 5 shows that the water quality there are more qualified on the habits of the society dug well that is 5 pieces (55.565), while water samples are not eligible more abundant in the habits of the society dug wells less that 19 pieces wells (90.48 %).

**Table 6.** Complaints of diarrhea user community water wells dug in the District Paiton Probolinggo Regency in 2012

Diarrhea	Total n (%)
Yes	31 (59,62)
No	21 (40,38)
Total	52 (100,0)

From 52 people who consume water from 30 wells dug under study, 31 people (59.62%) claimed a family member had suffered from diarrhea in the last 1 month, while 21 people (40.38%) claimed no family members diarrhea within the last 1 month.



**Figure 1.** Correlation between an environmental sanitation, construction and habits of the society with water quality of dug well

Data on environmental sanitation factors, construction, and customs of the people as well as dug well water quality tested using *Multiple Logistic Regression (multiple logistic regression)* of the three variables for construction variables obtained p value = 0.046 ( $< \alpha 0.005$ ) means that there is a relationship between the quality of construction dug well water with a value of OR = 0.049. Produce environmental sanitation variable p value = 0.029 ( $< \alpha 0.05$ ) means that there is a relationship between environmental sanitation in water quality wells with OR = 0.025 means that the possibility of obtaining water quality dug well qualified in environmental sanitation dug the well is 30 times greater than in a dug well less environmental sanitation. While the habits of variable yield p value = 0.073 ( $> \alpha 0.05$ ) mean that there is no relationship between the habits of the society at the time took the water with the water quality of dug well.

Further note that by looking at the significance of environmental sanitation variables have the smallest value ( $p = 0, 029$ ) compared with the other variables (variables construction  $p = 0.046$ ) means environmental sanitation is factored that most influence on water quality dug well, where the pollutant source most are wasting water.

**Table 7.** Water Quality Relationships With Diarrhea

	X squared	Df	p	Conclusion
Pearson Chi-Squared	4,467	1	0,027	0,027 < 0,05 Ho is rejected, no water quality relationships with diarrhea

Based on the data in table 8 above by using the Chi-square test  $p = 0.027$  obtained values ( $p < 0.05$ ), meaning that there is a relationship between water quality dug well with the incidence of diarrhea in people who consume it because most people do not cook that well water prior to boiling before consumption as drinking water.

#### 4. Discussion

Sub districts of Probolinggo is a region largely made up of fields and rice fields. Most of the residents get clean water from dug wells means either public or private property, especially people living in rural areas. Of the data report Paiton District Environmental Health Program revealed that only 38.95% of its population living in rural areas have access to clean water that meets health requirements. The lack of provision of means of dug wells causes to be one option to get clean water.

There are some 110 pieces of dug wells in the District Paiton consumed jointly by the society around it, dug a 6-8 consumed jointly by the family. Of 110 wells dug in the subdistrict Paiton, note that as many as 28 pieces of which wells are used daily by people around for drinking and cooking purposes. From interviews revealed that only 18.23% of respondents claimed to always cook the well water to boiling before consumption as drinking water. According to them, the high price of kerosene at this time led to boil water prior to boiling before drinking it felt quite heavy for most of the population have livelihoods as farmers and farm laborers. In addition, because it was used to drink water without boiling, they admitted feeling raw drinking water feels fresher than the water that has been cooked.

From the results of the study proved to be no significant relationship between the construction of the water quality dug well with a value of OR = 0.049, meaning that the possibility of obtain water quality dug well qualified in the general construction of dug well is 18 times greater than in dug well construction is less . This means the

construction of a dug well can improve water quality. Construction dug affect water quality, because the quality of the water with coliform bacteria content in the upper limit of sysrat 50 colonies / 100 ml (Minister Regulation. 416/MENKES/PER/IX/1990) water samples were more prevalent in dug wells contained the damage to construction. This is in accordance with the instructions of the Ministry of Health which states that in order to meet water quality requirements in building health dug well construction must comply with the requirements of the wall covering water resistant to a depth of 4-6 meters from the ground, the edge of a watertight wall as high as 0, 5 to 0.7 meters from ground level and floor wells should also be made waterproof and plastered at least 1 meter from the edge of the wells so that the water does not seep into it.

Type of pollutant sources were mostly stagnant water is wastewater that is equal to 63.19% of the 30 wells dug under study. The waste water coming from the water activity at the time of taking either draw or pour the water, also comes from the water used to wash clothes or bathe. Through the pores of the soil or waste can go back in the water wells, even more so when the construction of the wells are not perfect. Stagnant water will increase the volume of waste when the rainy season arrives. More dangerous when the waste water containing the excreta of human feces and urine because it contains many pathogens.

Besides that, the damage is also on the edge of the well (34.67%) and the wall of the well (30.27%). Most of the wall is found not intact and plastered not perfect and there are fractional or cracks in some parts. Likewise, the well wall prevalent type of damage is no layer of stucco, even some parts of the wells are perforated walls inward. A variety of possible damage to the construction of the water pollution in the event of seepage through soil pores derived from the sources of pollution in the vicinity such as infiltration pits. Water quality dug wells are not eligible to increase the incidence of diarrhea. This is consistent with the theory Andrianto (2000) [8] and the Ministry of Health (2007) that one way to prevent diarrhea is by consuming water that meets the health requirements of the water source to keep her protected from pollutant sources with a distance of 10 meters. In addition, the use for drinking should be boiled. This contrasts with the situation in the sub district Paiton, because only a few people who claimed to always put the kettle on to boil before drinking.

## **5. Conclusion**

There is a significant relationship between water quality factors in the construction of digging wells. An environmental sanitation factor is the largest factor that the most dominant effect on the water quality of the dug wells. While water quality of digging will have a relationship with the incidence of diarrhea.

## **6. Suggestion**

Need to be improved environmental sanitation activities around the facility dug wells. Local government on health sector authorities have conducted training on water quality and sanitation diarrhea alleviation to improve the environmental performance of health workers and the need for follow-up research to further the theme of environmental sanitation for future improvements.

Implementation of policies that can be done by Probolinggo regency government in tackling cases of diarrhea are implementing environment-based education about the disease, one of which is diarrhea, provision of household toilets and clean water are eligible, socialization PHBs through washing hands with soap and clean water to the school children as well as to the treatment of patients with diarrhea.

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