



Improving The Quality of Water for Public Consumption in Dumai City, Riau-Indonesia

Perbaikan Kualitas Air Konsumsi Masyarakat di Kota Dumai

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Abstract

The poor quality of water that's available in Kota Dumai had forced some people in community to consume water that didn't meet health quality standards. As a result it had an impact on public health, such as skin diseases and diarrhea. Although the government had made efforts to provide clean water through Perusahaan Daerah Air Minum (PDAM), the benefits can't reach all of society. There were still many people who forced to consume this poor quality water. This community service activity aims to educate the society about the importance of clean water for health. And train the community to make a simple and low cost water purifiers. As a result, there was an improvement in water quality after the filtering activity, and there was an increase in public knowledge about the importance of clean water for health. As conclusion, this activity really helped the community to get high quality water with low cost.

Keywords: Water Quality, Water Filter, Filtration media, Community service, Dumai City

Abstrak

Buruknya kualitas air yang tersedia di Kota Dumai menyebabkan sebagian masyarakat terpaksa mengkonsumsi air yang tidak memenuhi standar kesehatan. Akibatnya berdampak terhadap kesehatan masyarakat, seperti penyakit kulit dan diare. Meskipun pemerintah sudah berupaya menyediakan air bersih melalui Perusahaan Daerah Air Minum (PDAM), namun manfaatnya belum bisa menjangkau seluruh lapisan masyarakat. Masih banyak masyarakat yang terpaksa mengkonsumsi air berkualitas buruk ini dalam memenuhi kebutuhannya. Kegiatan pengabdian masyarakat ini bertujuan untuk mengedukasi masyarakat mengenai pentingnya air bersih untuk kesehatan, dan melatih masyarakat untuk membuat alat penjernih air sederhana berbiaya rendah. Dari hasil kegiatan, terjadi peningkatan kualitas air setelah dilakukan penyaringan, dan terjadi peningkatan pengetahuan masyarakat tentang pentingnya air bersih untuk kesehatan. Kegiatan ini sangat membantu masyarakat, terutama masyarakat berpenghasilan rendah untuk mendapatkan air yang lebih layak pakai dengan biaya pembuatan alat penyaring yang cukup terjangkau.

Keywords: kualitas air, alat penyaring air, media filtrasi, pengabdian masyarakat, Kota Dumai



INTRODUCTION

Water is a natural resource that is of interest to many people to meet their daily needs, both for drinking and for other needs. The use of water must pay attention to its impact on the environment, and must pay attention to its sustainability for future generations (1). More than 70% of our earth consists of water, both on the surface and in space(2). Water can be found in liquid, solid, and gaseous forms. In liquid form, we encounter water in the form of rivers, seas, lakes, reservoirs, and swamps. While in solid form, water is found in the form of snow, and ice flakes at the poles. In the gaseous state, water is found in the form of water vapor and clouds in space. Water moves in a cycle called the water cycle, namely evaporation of water found on the surface of the sea and land, rain, water flowing on the surface (seas, rivers, lakes, and others). The largest bodies of water are the sea (97%) and fresh water (3%). This fresh water is then consumed by the community.

In general, water on the earth's surface is divided into:

1. Surface water, namely rain water flows on the earth's surface and is not absorbed by the soil and flows to a low place to form a pool, such as a lake. Rivers also include surface water whose source comes from groundwater, flowing towards low places to the sea.
2. Space water is water that comes from the air/atmosphere that falls to the earth's surface. Examples are rain and snow.
3. Groundwater, which is water below the ground surface, which accounts for about 0.6% of the total water on the earth's surface. The amount of water below the ground surface is more than that on the surface. Groundwater consists of deep groundwater (300-800m) and shallow groundwater (<100m).

Dumai City consists of seven sub-districts, namely West Dumai, East Dumai, South Dumai, Dumai City, Medang Kampai, Sungai Sembilan, and Bukit Kapur. Part of this area is directly adjacent to the sea, namely the West Dumai District, Sungai Sembilan and Medang Kampai. While some other areas consist of swamp and peat areas. The geographical shape of this area causes some areas in Dumai City to experience clean water problems (1,3). As an industrial city that has many palm oil mills, and an oil refinery owned by Pertamina, Dumai City has problems with water quality (4). Its location is close to the coast, and some areas that have peat land types worsen water quality. The impact is that it is difficult for the community to get access to clean water (4). Groundwater around the RT 011 area, Jaya Mukti Village, Dumai Timur District, Dumai City has poor water conditions. This can be evidenced by the discharge of water that is cloudy, blackish-brown in color, and rusty.

In the community in Jaya Mukti Village, especially in the RT 011 area, the condition of well water was found to be brownish yellow, blackish brown, smelly, and rusty. For daily needs such as cooking and washing, people are forced to buy clean water. Purchasing clean water is not effective for the community's economy, especially for people with low incomes. Therefore, it is necessary to create a peat water management system with filtration and a combination of filter media and activated charcoal. In addition, the lack of public insight on how to manage peat water into clean water is also a problem in this region. The community in this location really needs assistance about the importance of clean water, and how to get clean water with a water filter.

Several simple water filtration methods have been applied in communities that have difficulty getting clean water. Filtration or filtration is the process of separating particles that are not deposited in sedimentation through a porous medium. Filtration is needed to complete the reduction of contaminant levels such as bacteria, color, odor and iron content so that clean water is obtained and meets drinking water quality standards. The water that comes out of the filtration process is clear and colorless (5).

Filters in simple filtration are divided into two types, namely slow sand filters and fast sand filters (6). Slow sand filter is a sand filter that was first introduced to the public, without going through the processes of coagulation, flocculation and sedimentation. Usually, the quality of the water produced still does not meet the standards. While the rapid filtration process is a process of filtering water that has undergone a preliminary treatment process, namely coagulation, flocculation and sedimentation. According to Reynolds in Asmadi (7), the filter speed comparison includes:



- 1) slow sand filter, 0.1-0.24 m³/hour
- 2) Quick sand filter, 4-21 m³/hour

The media that is often used is quartz sand because it is easy to obtain and the price is affordable. In addition, gravel, charcoal, palm fiber, activated carbon and others are also used. Filtration media is the material that fills the filter. In order for water to pass through the filter media, the filter media must have a system of pores (5,7). Quartz sand serves to remove physical properties such as turbidity and odor. The use of charcoal and activated carbon is also effective in the water filtration process. Charcoal has pores that are useful for absorbing dirt. Activated carbon has much more pores than ordinary charcoal, so its ability to absorb impurities is much more effective (8,9).

One of the water treatment efforts that can be done is with a filtration process using a combination of several media. In this activity, a gradual water filtration method is used, by adjusting the water conditions of the community wells. The high content of dissolved particles causes the water to undergo a sedimentation process in a holding tank (10). This sedimentation process can be accelerated by the addition of a simple coagulant such as alum, or PAC (Poly Amylum Chlorida)(1). To kill pathogenic bacteria can also be added chlorine (chlorine).

The purpose of this activity is to educate the public about the importance of clean water for health, as well as teach how to make simple water filtration media so that they can produce water that is suitable for use based on water quality standards in the Regulation of the Minister of Health No.492 of 2010.

METHODS

The first step taken by the PKM team from the Industrial Engineering Study Program, Dumai College of Technology, was to conduct observations and interviews with the community in RT.11 Jaya Mukti Village, Dumai Timur District, Dumai City. The team also took water samples to be examined at the Chemical Laboratories of STT Dumai, and took photos of the condition of well water consumed by the people of RT 11 Jaya Mukti.



Figure 1. Community Well Water Conditions



Figure 2. Available Water in Community Bathrooms

From Figure 1 and Figure 2 it can be seen that the water used by the community in RT 11 is of poor water quality, blackish brown in color, and contains sediment. From the results of community interviews, it is known that apart from well water, there are other alternatives, namely water from PDAM and water purchased from a plumber. Unfortunately, PDAM water has not been able to reach the entire community due to limited facilities and infrastructure, as well as water meter fees that the poor cannot afford. Meanwhile, water purchased from a water handyman is preferred because it can be purchased in small quantities, ie per conductor, at a price of Rp. 3000-4000 per conductor of 20 (twenty) liters. However, the conductor water is usually only used for drinking, cooking, and washing water. As for the purposes of bathing, flushing flowers, toilets, and others, they still use this well water.

The next step is to go to the community and conduct counseling about the importance of clean water for public health. The PKM team then socialized clean water products that have been filtered in the laboratory and taught the community how to filter their own water at home with a simple water filter. By giving a direct example of the technique of filtering water to the community, it is hoped that the community can provide clean water for themselves and their families, without the need for expensive costs.

RESULTS AND DISCUSSION

This PKM activity was carried out from May 1, 2022, to June 30, 2022. An overview of the implementation of the activity is presented in Table

Table 1. The sequence of Activities for PKM Implementing Community Water Quality Improvement in Jayamukti Village, Dumai

No	Name of Activity	Conditions before	Conditions after
1	Observation and interviews on the condition of community well water	quality is very poor. Yellow, brown, and even blackish brown. Oily contains sediment	Water quality improved, bright yellow water was close to clear, not oily, and did not contain sediment
2	Counseling to increase public understanding of the importance of clean water for health	People understand that dirty water causes itching, skin diseases, and diarrhea. However, they reasoned that clean water was expensive	understand that clean water is important for health and can be treated at affordable costs.
3	Training on how to filter water so that it is suitable for use using a simple water filter	People did not really understand the composition of the ingredients for filtering	People understand how to filter water using a simple water filter

below are before and after filters. So that they can see firsthand the difference in the quality of the water produced. So far, people have assumed that water filtration is expensive, even though it can be made at an affordable cost.



Figure 3. Mothers use poor-quality water for washing dishes



Figure 4. Condition of Water After Filtering..

Table 2. Costs for Making a Simple Water Filter

No	Name of Material	Use	Cost
1	Large bucket 50-80 cm in diameter	As a container for filtering water	Large buckets can use used drums or bought at a price of Rp. 70,000-100,000 per piece Pipe and faucet ± Rp. 30,000-50,000 depending on the length of the pipe from the water source
	Water distribution pipe		
	Large bucket for storing clean water		
	Faucet		
2	Brick, sand, gravel, palm fiber, charcoal, filter, alum	As tools and materials for filtering and purifying water	Sand and gravel can be free, bricks can be replaced with large stones. Filter price Rp. 50,000-120,000. Alum Rp.12,000
3	Total Cost		Rp.162.000-250.000



Figure 5. Making Filter Media and Filter Devices



Figure 6. Comparison of Water Conditions Before and After



CONCLUSION

This community service activity has an output in the form of increasing public knowledge and understanding of the importance of clean water for health. The problem of lack of understanding and limited funds can be resolved through this activity, namely by providing education in the form of counseling, and training in making filter media or simple low-cost water filter equipment. From the activities carried out, the community was given training in making filter media and water filter equipment by utilizing easily found materials such as sand, gravel, palm fiber, bricks, and alum. Water that has been filtered shows an increase in quality compared to before being filtered. Visually the water is clearer. Meanwhile, testing the sediment content (TDS) obtained a lower TDS number. The pH of the water has also increased to close to normal pH, so it is safe to use for bathing and washing. The need for drinking water consumption has not yet been tested, so further research is needed. If the results meet the requirements for cooking and drinking water, then it can be used as the next service activity.

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