

Application of Mud Suction Technology to Lakes in Kaduella Village, Pasawahan District, Kuningan Regency

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Abstract

A decrease in water potential, both in quality and quantity, will become a problem if it is not managed properly by paying attention to aspects of conservation, utilization, and control. This community empowerment carried out from July to November 2023 is an effort to increase awareness of water resources through preserving water sources to meet the needs of living creatures. The urgency of the main problem is that the water source in Telaga Biru Cicerem, Kaduella Village, Pasawahan District, Kuningan Regency, has been naturally covered with mud, whereas this spring is used as clean water for the village community. The second problem is that clean water sources become cloudy because of mud. The clean water system in this village relies solely on the lake's spring water. These activities of community empowerment are carried out by applying the method of SEPUR (Mud Suction) Technology to improve water quality as well as increase the income of village-owned enterprises in Kaduella Village, Pasawahan District, Kuningan Regency. The results show that mud can be lifted by machines so that the lake water becomes clear, while the resulting mud residue can be used as material for making *paving blocks*.

Keywords: Springs; Mud; SEPUR Technology; Clean water

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Introduction

The springs are a potential water source that can be used for various purposes. The importance of spring water comes not only from its quality but also from its quantity. As an illustration, of all the water on earth, only 3% of freshwater can be utilized. Springs in the highlands (Dewanto, 2019) generally have very good water quality that attracts business people to use them commercially. Fulfillment of water needs for rural areas generally comes from springs, dug wells or rivers (Nurmasita *et al.*, 2021). A decrease in the water potential of water sources, both in quantity and quality, can become a serious problem if it is not managed properly by paying attention to aspects of conservation, utilization, and control (Febriarta *et al.*, 2020). One of the causes of such a problem is the increase in sediment or mud in water sources. Some water that falls to the earth's surface will seep into the ground, some will be intercepted by,

plants (vegetation), and some may fall directly into the sea, rivers lakes, and so on (Isniarno *et al.*, 2022). Telaga Biru, which is located in Kaduella Village, Pasawahan District, Kuningan Regency, is a water source in the form of a lake that is used for clean water. However, over time, the current condition of the lake shows that it has experienced a buildup of sediment in the form of mud. This accumulation of mud makes the water cloudy and affects the quality of clean water in the village (Setyo Pambudi & Muhammad Fikri Abubakar, 2020).



Figure 1. Mud Condition in Telaga Biru

Kaduella Village in Pasawahan District, Kuningan Regency, through BUMDesa Arya Kamuning, utilizes, maintains and preserves the Telaga Biru spring water source for the welfare of the community. Community participation is seen in managing and maintaining lake water by using it as clean water. However, the presence of mud in the lake becomes a problem for village communities regarding clean water and its use. Thus, the village wants the mud that has been sitting for decades to be



Figure 2. Mud Condition in Telaga Biru at a Depth of 3 Meters

removed immediately so that the lake's storage capacity, which now holds up to 5 m³ of mud, won't decrease and can be restored. Mud that has not yet entered the lake can be blocked by making soil/sediment retaining walls or by planting plants around the lake in the form of agroforestry. The plants planted are those that can resist soil erosion so that they do not enter the lake. Viewed from an environmental aspect, this agroforestry system can restore the carrying capacity of the land, reduce runoff, and prevent erosion and landslides (Wulandari *et al.*, 2021). However, the solution for the sediment that has already entered the lake is that it must be transported. Therefore, it is necessary to apply mud suction technology to remove mud deposits in Telaga Biru and use it for the benefit of the community, one of which is to use it as a basic material for paving blocks/stones since some of this mud is sand.

Research Method

The implementation of community service with the title “Application of Mud Suction Technology to Lakes in Kaduela Village, Pasawahan District, Kuningan Regency” consists of several stages as follows:

(1) Field Observation

At this stage, the team carried out direct observations in the field to determine the condition of the location and existing irrigation system, starting with the condition of the lake mud, location selection, and available resources. To determine the condition of a community's clean water, one of the qualities of the water must be colorless or clear (Yusuf *et al.*, 2021).

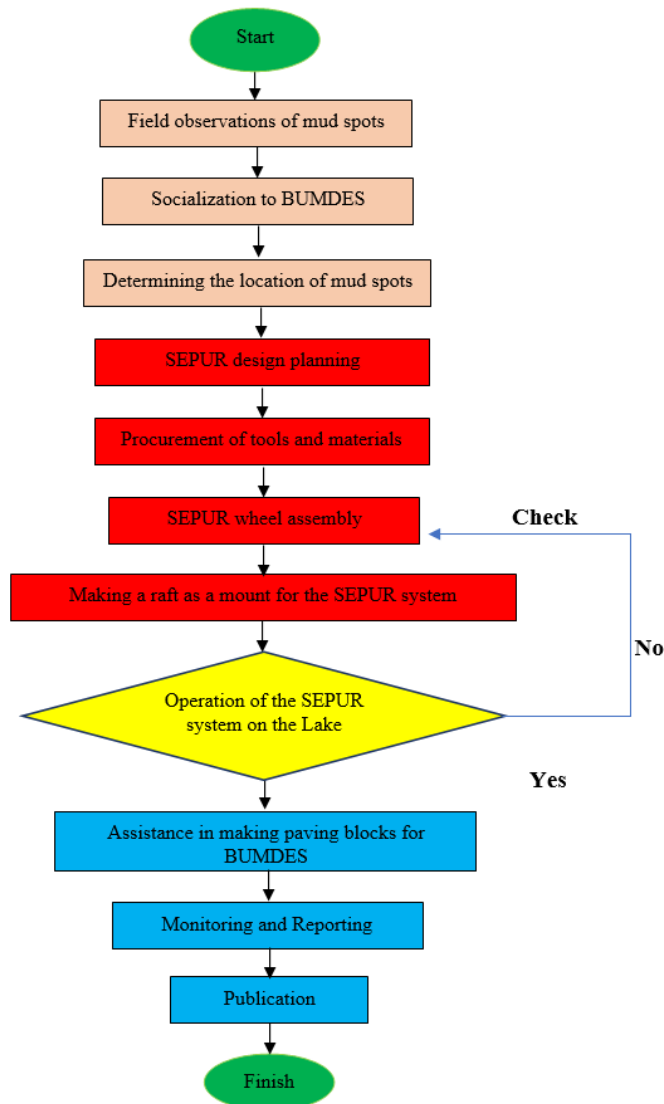


Figure 3. Stages of Implementing Activities

(2) Socialization, Technical Guidance, and the Application of SEPUR Technology

Socialization was carried out by presenting SEPUR technology to the people of Kaduela Village, Pasawahan District, Kuningan Regency. An explanation of the basic principles of this technology is provided through a slide show of the principles and assembly of the system. In general, socialization activities are divided into three categories: management of lake water for clean water, suction of mud using mud suction pumps, and utilization of waste mud. There are also methods of using a mud pump as a SEPUR system when the mud content increases, technical handling, maintenance, and light repairs to the system.

Table 1
Service Program

Program	Indicators of Success Achieved	Activity Progress Notes
Lake Water Management	Lake water is clean from mud	Lake water can be used by the community for clean water
Mud Suction	Pump systems can work	Mud can be lifted
Making Paving Block	The community can make paving blocks	Paving blocks can be used and installed around the lake

Source: Author, 2023

(3) Design and Manufacture of SEPUR Technology

The main design of the mud suction system is made as simple as possible so that it is safe to use and requires low maintenance and operating costs. A simple design is obtained by considering the distance between the depth of the mud and the suction power of the pump so that the mud can be lifted. The mud pump specifications show that with a minimum depth of 3 m, the mud can be lifted by a 7 HP capacity engine. The energy source uses three main components: a mud water pump, a flexible hose, a water reservoir, and mud a steering wheel. The type of pump used in this service activity is FGP 30, with a capacity of 56m³/hour. This tool is driven by a crank with a fuel capacity of 6 liters that works on a 3-inch suction pipe and a 3-inch push pipe. Two systems are used for flexible hoses, namely suction hoses and exhaust hoses. The suction hose is a flexible spiral hose that is stiff and hard because it has to withstand the suction pressure of water and mud. Meanwhile, the exhaust hose is a straight, flexible hose made of rubber. Water reservoirs are used with a capacity of 1050 liters to accommodate mud and wastewater. The SEPUR wheel is designed to suit the size of the suction hose, as this wheel is connected to the suction hose.

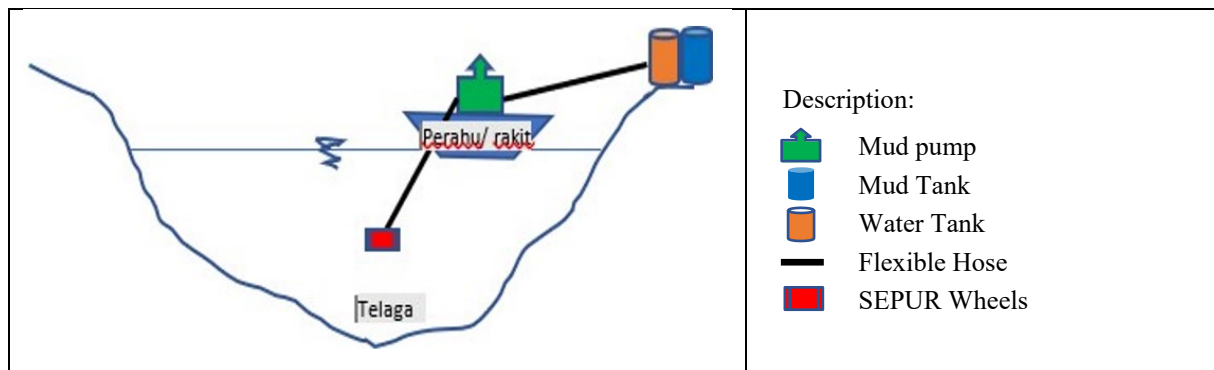


Figure 4. SEPUR Implementation Design

Results & Discussion

(1) Implementation of Socialization and Technical Guidance

Many benefits explained in this outreach and technical guidance activity are related to the application of SEPUR technology to improve water quality and community income, especially in the tourism sector. After the socialization activities were carried out in July 2023, discussions and Q&A (questions and answers) sessions were held with 20 participants regarding further service activities. The material provided for socialization was about the application of mud suction technology to Telaga Biru Cicerem. It also explained the benefits obtained from the mud residue, which can be used as a mixture for making paving blocks.

The technical guidance activity was conducted in August 2023 and attended by 15 participants. It delivered special material regarding the technical aspects of how to suck up the mud, the tools and materials used, as well as the methods and techniques for making paving blocks.



Figure 5. Socialization and Technical Guidance

(2) Making Rafts

People used ships to navigate rivers or seas, and it started with the invention of boats. In the past, people usually used canoes, rafts, or boats (Rochyat, 2015). Rafts made of bamboo are used to store mud suction machines. The mud suction machine is stored at the end of the raft so that the suction hose can easily move following the SEPUR wheels. Meanwhile, the exhaust hose is stored on a raft on the side of the machine so that the weight of the hose is supported by the raft. The raft is designed with a length of 10 meters and a width of 1 meter, using two layers, so that it can withstand the heavy buoyant force that exists. Between the first layer and the second layer, the raft is tied with wire ropes so that it does not shift. This raft works in the direction of the SEPUR wheels, which suck up the mud at the bottom of the lake.



Figure 6. Making Rafts

(3) Mud Suction

Soil erosion is one of the causes of a decrease in water quality and a source of lake mud input. The soil from this erosion is transported and collected in the lake, making it shallow (Rosita *et al.*, 2021). Monitoring, maintenance, and evaluation to maintain water sustainability in the lake must be carried out, one of which is to pay attention to the condition of the distribution of sediment or mud. The use of springs varies (Sudarmadji *et al.*, 2016). The springs in this lake are used for clean water (Zulhilmi & Idawati, 2019) and tourism, so providing clean water for the

community has become a serious problem (Rochmad Effendy, Rofiqul Amin, 2019). For this reason, it is necessary to apply Mud Suction (SEPUR) technology to extract mud and treat clean lake water from the mud. Mud suction is carried out using a mud suction machine with a capacity of 60m³/hour. To suck up the mud at the bottom of the lake, a SEPUR wheel is used, assisted by a spiral suction hose. Then, the mud flows through a flexible exhaust hose and is collected in a reservoir. The bottom of this lake consists of two layers of sediment, namely the top layer of mud and the bottom layer of fine sand. The distribution of this sediment varies depending on the location and depth. Based on the survey results, mud suction was carried out at locations where there was mud with a depth of between one meter and seven meters. Mud can be lifted by the suction machine when it works at half-to-full engine valve conditions. In the half-position valve condition, the mud is lifted at a shallow depth of one to two meters. However, for depths of more than two meters, the engine valve must work at full capacity. The mud then flows into the reservoir so that it can settle.



Figure 7. Mud Suction

(4) Making Paving Blocks/Stones

Before making paving blocks, there is technical guidance regarding the use of mud residue from the lake. It is explained that fine sand will be used as the basic material, and mud moulds will also be used. Next, the mud that has been deposited in a tank is dried. This mud is a type of fine sand so it can be made into a paving block mixture. By using paving block molds, the process of making paving blocks is easier and faster. The mixture used for paving blocks is in a ratio of 1:4. After the mixed material is made, put it into a mould measuring 40 cm x 40 cm x 4 cm. How to make it: Make mortar as a raw material for making paving blocks by mixing cement and sand in a ratio of 1:4. Add enough water to the mixture. Make sure the mixture is not too runny or too thick. You need to check the level of suitability of the mixture by holding it with your hands. Then, feel whether the bond is strong enough or not. If it's still weak, add water. Insert the mixture into the paving block mold in such a way that it fills all parts of the mold; there are no voids in the mold. Don't forget to first arrange the position of each part of the paving block mold. Make sure that all the parts are in order and installed correctly. After the material is put into the mold, wait a few minutes, then the mold can be removed. When lifting the mold, the corners must be lifted together so that the results are of good quality and precision.



Figure 8. Making Paving Blocks

(5) Monitoring and Evaluation

The service team carries out monitoring and evaluation of the process of implementing SEPUR technology, starting with conducting socialization and technical guidance, making rafts, suctioning mud, and making paving blocks. The results of monitoring and evaluation of community-based empowerment activities can be seen in the following table.

Table 2
Monitoring and Evaluation Results

Description	Monitoring	Evaluation
Socialization and Technical Guidance	Participants, in-depth study of the material	Participants take part in the activities and understand the material
Making Rafts	Technical assembly	Rafts can be built according to the plan
Mud Suction	The SEPUR system works	The machine is working, the mud can be lifted to the surface
Making <i>Paving Block</i>	How to make mixed materials. How to mold mud/materials. The number of paving blocks made was 144 pieces	Paving blocks can be made according to the plan

Source: Author, 2023

Conclusions

This community service activity with the theme of community-based empowerment has had a positive impact on the management of Telaga Biru Cicerem, especially BUMDes Arya Kamuning and the surrounding community. Telaga Biru, which initially naturally experienced shallowing due to mud that affected the quality of the water, is now clean and free from mud, and the quality of the lake's water is also clear. The application of SEPUR technology in Telaga Biru Cicerem can be implemented well according to the production capacity of the equipment and community participation. SEPUR technology utilizes a mud pump working system with suction and thrust power. The mud is sucked in by the machine through a suction hose connected to the SEPUR wheel. Then,

the mud is channeled through the exhaust hose into the reservoir. The results of the mud can be used as material for making paving blocks with a mixture of certain materials which can indirectly reduce costs. Paving blocks are made with molds to make them easier to work on and installed in the park around the lake.

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