

OPTIMIZATION OF BIOPORI AND CONSTRUCTION OF ABSORPTION WELLS IN BLAWI VILLAGE TO OVERCOME ANNUAL FLOOD DISASTERS

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ABSTRACT

This activity was carried out in Blawi Village - Lamongan Regency. Floods often hit this village due to overflowing rivers and waterways due to high rainfall. In practice, infiltration wells for rainwater have never been implemented in Blawi Village, while biopores were only added at several points because this activity continued the previous year's activities. This community service activity made several rainwater infiltration wells and added biopores to accommodate the surface runoff water component from rainfall. This Student Organization Capacity Strengthening Program (PPK ORMAWA) activity was carried out by the Civil Student Association (HMS) of Lamongan Islamic University in collaboration with Blawi Village officials and residents for conservation-based waterlogging mitigation. Infiltration wells and biopores use a method that is very easy to implement, this activity is also useful for maintaining groundwater and utilizing biopore leaves for compost. This program can reduce the problem of inundation in Blawi Village during the rainy season.

Keywords: *Infiltration Well, Biopore, Flood*

ABSTRAK

Kegiatan ini mengambil lokasi di Desa Blawi - Kabupaten Lamongan. Di Desa ini sering dilanda bencana banjir akibat meluapnya sungai serta meluapnya saluran air akibat curah hujan yang tinggi. Pada pelaksanaannya belum pernah dilakukan penerapan sumur resapan air hujan di Desa Blawi, sementara untuk pembuatan biopori hanya menambahkan di beberapa titik karena kegiatan ini melanjutkan kegiatan tahun sebelumnya. Kegiatan pengabdian kepada masyarakat yang ini melaksanakan pembuatan beberapa sumur resapan air hujan dan penambahan biopori untuk menampung komponen air limpasan permukaan yang berasal dari curah hujan. Kegiatan Program Penguatan Kapasitas Organisasi Kemahasiswaan (PPK ORMAWA) ini dilaksanakan oleh Himpunan Mahasiswa Sipil (HMS) Universitas Islam Lamongan yang bekerja sama dengan perangkat dan warga Desa Blawi untuk penanggulangan genangan berbasis konservasi. Metode sumur resapan dan biopori ini sangat mudah dilaksanakan dan juga dapat memelihara air tanah serta pemanfaatan daun sisa biopori untuk kompos. Dengan adanya program ini permasalahan genangan di Desa Blawi dapat berkurang pada saat musim hujan.

Kata Kunci: *Sumur Resapan, Biopori, Banjir*

A. INTRODUCTION

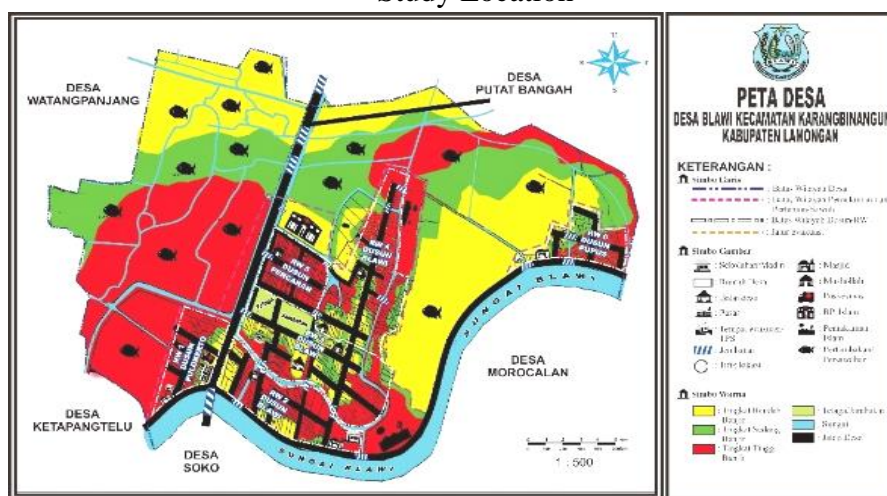
Flooding is one of the natural disasters that often occurs in various areas, both rural and urban. Floods are ranked as the second most frequent natural disaster in Indonesia. (BNPB, 2023). Flooding is the condition of land that is inundated with stagnant water due to increased water volume caused by heavy rainfall, overflowing rivers or broken river banks. (Ali, 2019).

Every year in Lamongan Regency, flooding occurs due to damaged infrastructure and disrupted activities of the population and local government, this is a serious problem that needs to be addressed more quickly. (BNPB, 2021) Lamongan Regency is surrounded by the Bengawan Solo and Bengawan Jero Rivers with a large upstream discharge that flows through the downstream areas in several villages in each sub-district. In the rainy season, rainfall is evenly distributed and quite high, causing water overflow and flooding in several areas due to the absence of river embankments, which is the main cause of the non-optimal condition of the river. Other surface water runoff areas and rainwater puddles are caused by low-lying land between 0 and 10 meters high, which also contributes to flooding from Bengawan Jero located in Blawi Village. (Hasan, 2015).

Blawi is a village in Karangbinangun sub-district which is a bonorowo area. It has an area of 6.27 km², with a population of 3,596 people and a density of 193 people/km² which is divided into 6 RW, 16 RT. (Masyarakat, 2013). Blawi Village is one of the villages affected by flooding every year. Floods not only inundate roads but also enter residential areas and even damage some ponds owned by the local community. This disaster almost paralyzed economic activity in the village, as around 85% of the community work as pond farmers

(Masyarakat, 2013). The flood was caused by the village's low topography and an ineffective or clogged drainage system that made it difficult for rainwater to flow smoothly, high rainfall, changes in land use that led to a lack of water catchment areas and the large number of water hyacinth plants along the Blawi River that disrupted the smooth flow of water. So that water overflows and triggers flooding. Therefore, alternatives are needed to reduce unwanted negative impacts.

Figure 1.
Study Location



Source: Blawi Lamongan Village Data

There are several previous studies that have similarities with this activity. The first is a service carried out by Melia (2023) which focuses on analysing the usefulness of biopore infiltration holes. In addition, there is a study conducted by Bahagia et al (2024) which has the theme of Processing Soil Infiltration Water into Clean Water in Cibodas Village.

The implementation of alternatives to reduce the impact of flooding has been carried out in last year's PPK Ormawa activities, namely making biopores. The activity has been running for one year, so that flooding in Blawi recedes faster. In this second proposed activity,

Optimizing Biopores and Making Infiltration Wells can help manage rainwater locally, prevent inundation, and relieve pressure on the village drainage system.

B. METHODS

Community service activities (PKM) in Sukajadi village are carried out using the method of counselling, training and direct practice. The stages carried out are shown in the following details:

- a. Socialisation and Counseling Activities; This activity is carried out as a means of providing additional knowledge to the community about clean water parameters that are suitable for use, and water treatment techniques that are less suitable for use. The counselling will also explain the principles of water treatment, the function of each material used and how to maintain water treatment equipment.
- b. Training/workshop activities; This activity is a community participation activity, namely joint learning where the entire community is directly involved in the programme activities. In this activity, the community is directly guided by the implementation team.
- c. Mentoring and monitoring activities; In this activity, assistance is provided for the application of appropriate technology (TTG) to treat infiltration water on a household scale. In this activity, the community is accompanied by the implementation team to carry out demonstrations and application of water treatment technology.

C. RESULTS AND DISCUSSION

1. The course of activities

In order to achieve optimal regional development, integration, coordination, and balance are needed in the utilization of existing natural resources. This aims to optimize regional potential in a planned,

reasonable, and responsible manner. To achieve development goals, various aspects of environmental sustainability are ignored in the implementation process. In fact, allowing such activities often leads to the exploitation of scarce natural resources, including the massive conversion of open land into closed land, which ultimately has a negative impact on the area concerned.

Because of these problems, it is necessary to plan a system to overcome the rainfall that occurs without neglecting the aspects of water and environmental sustainability. One way to overcome these problems is by using infiltration wells and biopores. Biopores that have been installed last year are regularly maintained and replaced with compost. This year's program added biopore planting at several points to optimize water absorption to reduce inundation in Blawi Village. The following are the stages of making holes for planting biopores (Wijaya et al., 2019):

- a. Determination of the location that will be used for making biopore planting holes.
- b. After determining the location, drilling is then carried out, before that, first flush the soil with water so that the drilling process becomes easier.
- c. Make a hole with a depth of 1 meter / 100 cm with a diameter of about 10 cm.

Figure 2.
Soil Drilling for Biopore Planting



Source: Author's Documentation

- d. After the hole making is complete, insert the PVC pipe that has been punched several holes on the side of the pipe.
- e. Then, after the PVC pipe is installed in the ground, insert organic waste - organic waste from plants or organic kitchen waste such as eggshells, vegetable and fruit scraps, and the like.
- f. Give a little EM4 liquid, you can buy it on the market or make it yourself (in this program, EM4 is made independently), making EM4 from organic materials. The purpose of EM4 is to accelerate the decay process of organic waste that is put into biopores (Sakroni et al., 2023).
- g. Finally, cover the PVC pipe with a pipe cover that has been perforated at the top.
- h. Replace the compost in the biopore periodically with new organic waste. The compost in the biopore can be used as compost for plants.

Furthermore, in this year's program we added a new innovation, namely the construction of infiltration wells. Infiltration wells are wells or holes used to collect rainwater to be absorbed into the ground. (Bahunta & Waspodo, 2019). Sumur resapan ini tidak sinkron dengan sumur air

minum. Sumur resapan adalah lubang which allows water to enter the ground, so the depth of the infiltration well must be above the position of the groundwater.

Blawi Village is mostly rice fields, with only a small area used as a settlement. However, the residential areas are often hit by floods. Therefore, infiltration ponds are made in the yards of residents' houses, schools, mosques, village halls, and so on. Thus, the construction of infiltration ponds in Blawi Village refers to (BSN, 2002) For yard land, the general requirements that must be met include:

- a. Infiltration wells should be located on flat land that is not steep or unstable.
- b. Infiltration wells should be far from landfills and septic tanks (minimum 5 m), and have a distance of 1 m from building foundations.
- c. Excavation can be done up to sandy soil or a maximum of 2 m below groundwater level. The minimum groundwater table depth is 1.5 m during the rainy season.
- d. The soil structure must have the ability to absorb water greater than or equal to 2.0 cm/hour, which means that a puddle of water as high as 2 cm will be absorbed in 1 hour.

For the planning and construction of infiltration ponds in Blawi Village, several efforts need to be made by the program implementers, among others:

- a. Preparation phase

This stage is very important because it is the beginning of the program implementation. The method adopted is the approach method, which provides technical support in the form of consultation and mentoring, and is carried out through the following activities:

- 1) Field surveys were conducted in order to collect preliminary data on site conditions. The village, namely residents and related village officials, also provided information about existing problems.
- 2) Holding a meeting with residents and village officials was given an overview or socialization and discussed related activities to be carried out in the form of practical knowledge for making infiltration ponds.
- 3) Provision of facilities and infrastructure, where in this case the types of equipment and consumables are prioritized.
- 4) Determination of a place or location point that matches the criteria for installing infiltration ponds.
- 5) Calculation of infiltration well construction, which needs to be calculated, namely the price of infiltration well construction, rain intensity, plan discharge, infiltration well depth, infiltration discharge and infiltration volume. (Tumpu et al., 2022).

b. Construction of Infiltration Wells

In making infiltration ponds, there are several stages as follows:

- 1) Excavation of soil at the point where the infiltration well is to be made
- 2) Installation of well walls (in this program using a concrete bong buis model)
- 3) Making water channels for the entry and exit of water because it uses concrete bong buis walls
- 4) Construction of a control basin
- 5) Installation of gutters

Figure 3.
Infiltration Well Digging Process.



Source: Author's Documentation

c. Infiltration Well Maintenance

This is done to control the infiltration well so that the well continues to function properly. Here are the things that need to be maintained:

- 1) Cleaning of dirt in the control basin, water pipes and water inlets and outlets.
- 2) Cleaning the mud in the infiltration well by dredging if it is not cleaned, it will cause the absorption capacity of the infiltration well to decrease.

2. Discussion

From the activities described above, the result is that the people of Blawi Village are very enthusiastic and accept the presence of this PPK Ormawa activity. The attitude of the local community is very accepting and always communicates well so that the activities of planting biopores and making infiltration wells are carried out well and achieve the expected target of reducing the volume of annual flooding that occurs in Blawi Village. As a continuation of this activity, there is good communication

and coordination between the PPK Ormawa implementation team, village officials, community organizations, and the community itself regarding the development and maintenance of biopores and infiltration wells that have been installed.

The PPK Ormawa implementation team from the Civil Engineering department of Lamongan Islamic University manages funds from the government for the purchase of infiltration pond and biopore materials. The design of the infiltration wells and biopores, as well as the supervision of the work in this case was carried out by the Civil Student Association (HMS). So the addition of 50 biopores for the entire village and the making of 7 units of infiltration wells with a diameter of 70 cm and a depth of 1.5 m can run smoothly because of the participation of the Blawi Village community and the HMS of Lamongan Islamic University. This can be seen in the documentation of photos of the results of the activity as follows:

Figure 4. Installation of Biopores and Infiltration Wells in collaboration with the Blawi Village Community.



Source: Author's Documentation

This activity is basically an activity program held by the Ministry of Education and Culture called the Student Organization Creativity Strengthening Program (PPK Ormawa) and was participated in by the Civil Student Association (HMS), which this organization comes from the Civil Engineering Department Student Association of Lamongan Islamic University. HMS proposed the installation of biopores and infiltration wells that aim to reduce the volume and impact of the annual flood disaster that occurs in Blawi Village, Karangbinangun District, Lamongan Regency. This activity is very important because this activity continues the previous year's PPK Ormawa proposal where several biopores have been installed and the impact is quite reduced flood levels in Blawi Village. And this activity program could not have been carried out smoothly if there was no cooperation between the implementers, community organizations, residents and also Blawi Village officials.

A follow-up program after this needs to be held between Blawi Village and also the implementer, namely HMS, in the management of biopores and infiltration wells because maintenance and cleaning of biopores and infiltration wells that have spread in Blawi Village are needed so that they function optimally and optimally.

D. CONCLUSIONS

Based on the results of activities and discussions as well as the results of evaluating the process of implementing PPK Ormawa activities, the following conclusions were obtained, namely, there are 50 biopore infiltration holes and 7 infiltration well units that have been installed. When combined with the previous year, there were 90 biopore infiltration holes throughout Blawi Village. So that when the rainy season comes, Blawi Village already has many points of water infiltration locations that

allow rainwater to collect so that it does not stagnate on the ground surface. Large amounts of rainwater that cannot be accommodated by the infiltration wells will be discharged into the road drainage channel.

The placement of all biopore infiltration pits and infiltration wells was determined by the Blawi Village community after deliberation and consensus, especially in areas that are often hit by flooding due to high rainfall. The village highly appreciates the idea of utilizing rainwater infiltration ponds as a separate drainage system to reduce waterlogging.

The tools and materials for making infiltration ponds and biopores are relatively easy to obtain. These infiltration wells and biopore absorption pits can reduce the risk of flooding due to sustained high rainfall and improve local groundwater conditions.

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