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The Community Development Process in the Climate Village Programme through the Biopore Programme in Blawi Village, Lamongan

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A B S T R A C T

Development activities always cause environmental damage and/or pollution. This development triggers the acceleration of the phenomenon of climate change which should be a natural phenomenon. This research aims to empower the community with a community development process which consists of the stages of program planning, planning, implementation, evaluation & results of changes, and termination. The community development process was carried out using a qualitative approach and case studies in the field involving 3 informants consisting of the Blawi Village government, Karang Taruna, and the Blawi Village community who were directly involved in the Biopori Program and the Clean Village Program. The selection of informants was carried out to dig deeper into community development in the Biopori Program and the Clean Village Program. Biopori is a simple technology that can increase rainwater absorption and the amount of clean water reserves in the ground during flood control efforts. Clean Village is a simple tool to increase public awareness of the importance of clean houses for public health and flood control efforts in Blawi village. The result of this activity was the planting of biopori, the installation of 40 biopori holes in each community unit in Blawi Village was carried out as a pilot to be developed and carried out by the residents themselves.

1. Introduction

Increasing environmental problems are a result of population growth in the Lamongan Regency. In addition, there are people who build new houses or buildings but do not care about water disposal and absorption. Water absorption functions to store water reserves for future use.

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Blawi Village is located in the Bengawan Jero area which is lower than the area around the Bengawan Solo river. Whenever it rains with high intensity, Bengawan Jero, which has a low topography, often experiences flooding. So there is a need for efforts to overcome the problem of flooding in Blawi Village, Karangbinangun District, Lamongan Regency. In this case, the use of biopori has been widely studied as an effort to prevent flooding. Each biopore has an infiltration rate of 180 liters/hour [1]. The purpose of this study was to determine the effectiveness of installing biopori in dealing with flooding in Blawi Village and community participation in implementing the Climate Village Program through the Biopori Program in Blawi Village, Karangbinangun District, Lamongan Regency.

Biopore infiltration holes are one of the best solutions because they are suitable to be applied in the Blawi Village area, can be made side by side with the green open space expansion project, require little funding to make, are easy to make, are very effective at absorbing water and biopore infiltration holes can reduce organic waste that is wasted in landfills [2].

Flooding is an event that occurs due to the accumulation of water that falls and cannot be accommodated by the soil [3]. This event occurs because the water that falls to the plains has no catchment area or in other words, urban soils are saturated with water. For this reason, in overcoming the problem of flooding not only through drainage ditches, but also increasing water catchment areas (water reservoirs). So the flood problem can be overcome by making effective biopore infiltration holes and can become a water reservoir [4]. Not only can flooding be mitigated, but groundwater can also be conserved. The most effective method to be used in urban areas is biopore infiltration holes.

Community empowerment in the climate village programme is through the activities of making, planting, and maintaining biopores as a form of responsibility for the surrounding environment and efforts to handle flood disasters. This community activity uses the community development method. Community development is carried out through organized efforts to empower communities to improve living conditions and increase community integrity and independence so that sustainable development can be carried out [5]. This method is a suitable method to be used in the climate village programme through the biopore programme in Blawi Village, Karangbinangun District, Lamongan Regency.

2. Research Method

The Community Development process is carried out by means of a qualitative approach and case study research in the field. Data collection techniques are participatory observation, literature study, and documentation study. This research involved 3 informants consisting of the Blawi Village government, Youth Organization, and the Blawi Village community who were directly involved in the biopori program and the clean village program. And using quantitative methods in determining the number of biopore placement points.

3. Description and Technical

The activity of utilizing biopori as a means of composting as well as being useful for controlling floods and droughts in Blawi Village was carried out from July to December 2022. The activities carried out included counseling regarding the explanation of biopori and its benefits in efforts to overcome floods and droughts. Then planting biopori and carrying out village cleaning as an effort to prevent floods and droughts in Blawi Village, Lamongan. Activities regarding the introduction, manufacture, and planting of biopori to the Blawi Village community are carried out through the following stages:

a. Counseling about biopore
   Counseling on the explanation of biopore, the benefits of biopore, and making biopore.

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Source: field documentation
Figure 1. Socialization of biopore to the public

b. Production of biopores
The production of biopores is carried out at the Blawi Village Hall, the main material for making biopore is a pipe that has a diameter of 4 inches which is equivalent to 114 mm.

Source: field documentation
Figure 2. Production of biopores using a drill

c. Biopore installation
Installation of biopore at 40 points, installation spread throughout the village. The 40 points are only a pioneer with the hope that the community can continue it themselves so that the benefits can be optimized. Into the biopore hole, compostable organic waste is placed, such as dry leaves, leftover food, rotten fruit and vegetables, etc. After that, EM4 is poured which functions as a starter to speed up the decomposition process of organic matter so that the composting process can take place more quickly.

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Source: field documentation
Figure 3. Biopore installation and poured EM4

d. The clean village program
Village cleaning is carried out in all villages with the help of local residents and youth organizations. The main clean-up is carried out in the Blawi Village river which aims to reduce waste and parasites (algae) in the river and can minimize the occurrence of floods and fish which can develop properly.

Source: field documentation
Figure 4. Cleaning up the river

3.1 Theoretical Basis

The biopore infiltration hole method is a hole with a diameter of 10 to 30 cm with a length of 30 to 100 cm covered with organic waste that serves to trap water flowing around it so that it can become a source of water reserves for underground water, surrounding plants and can also help weathering organic waste into compost that can be used for plant fertilizer [6][7]. Biopores are small pores (small tunnels) made by the activity of soil fauna or plant roots. The holes are called biopores, because the holes are filled with organic material (waste), then

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entered by worms and no pollution occurs [8]. With this technology, we create a place for living things to absorb water by utilising what we throw away (waste). Therefore, what we need most in the application of this technology is the awareness not to throw away waste, because waste is a resource, especially organic waste [9].

Biopore infiltration pits can prevent flooding by utilising organic waste [10], [11]. Water is something that is very much needed and its existence can be very dangerous when flooding occurs. While waste is a resource that can be processed into useful products, sometimes waste becomes a source of pollution and even a cause of flooding if disposed of carelessly.

Water is a part of living things, absorbing almost 50% of their body [12]. Without water, living things would die. Besides needing water, living things need oxygen and food. Plants need food and energy that is absorbed through the roots in the soil. This absorption process will be perfect if the water content in the soil is sufficient and not excessive. If the groundwater is still intact, then the work of creatures in the soil will replace the water lost due to evaporation by plants and humans, and slowly appear new water sources that will flow into rivers or lakes and can encourage salt water not to enter the land [13]. This can happen if enough water is absorbed by the soil.

Making biopore holes is an environmentally friendly and inexpensive technology [14]. The main capital is the willingness and awareness of humans themselves in an effort to save the environment from water availability and environmental pollution due to waste. Everyone can take advantage of this technology by utilising rainwater, because rainfall is everywhere. Water is a basic human need. So it is necessary to instil awareness of the importance of the availability of groundwater which is the source of livelihood for living things, including humans, plants and animals.

3.2 Equipment and Materials

Equipment

1. Soil drill 2 (two) units 2mm bortebal length, 1m length Ø ½ inch.
2. Light hoe 1 (one) unit and kape 2 (two) units.
3. Machete 1 (one) to help make holes
4. Bucket and dipper 1 unit each.
5. Bamboo serves to remove soil from the drill bit when making biopores, designed with a sharp end.
6. Plengki 2 (two) units
7. PVC pipe (paralon Ø 4") length of 30 cm (two) units

Source : google 2022

Figure 5. Soil Dril

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Materials

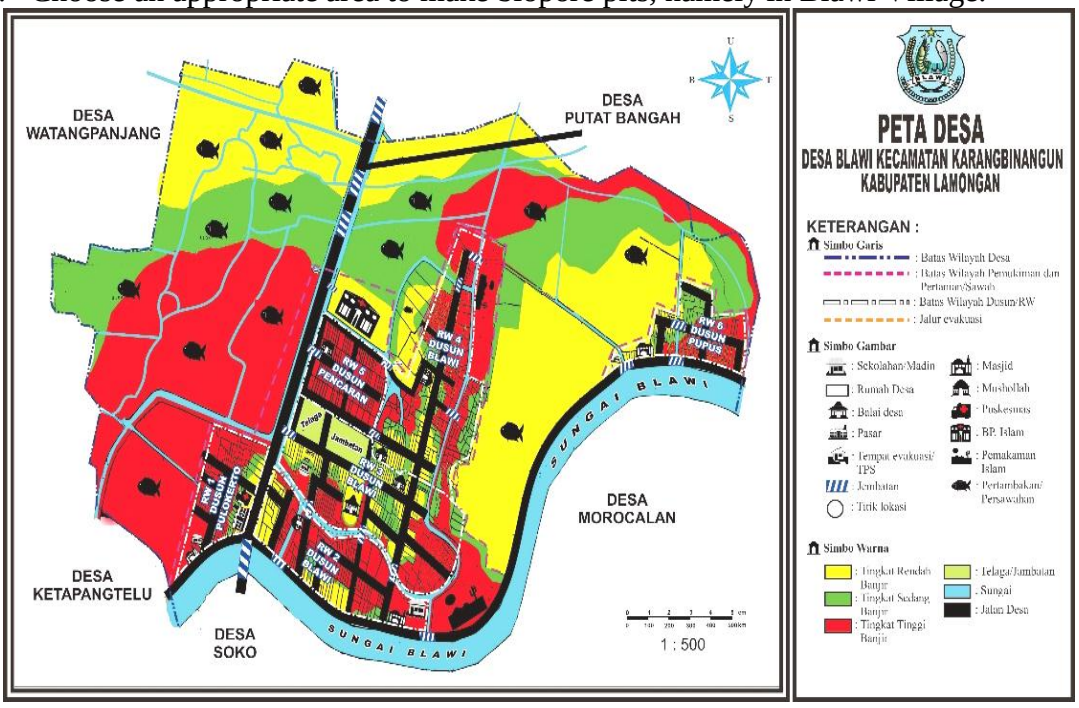
1. Round-shaped cover made of paralon
2. Water is used to soften the soil where the biopore is made.
3. Organic waste is used as filling material. In the form of dry waste, grass, leaves and others 1 small sack of rice.

Technique for making biopore infiltration holes:

1. Make cylindrical holes in the ground with a diameter of 10-30 cm and a depth of 30-100 cm and a distance of 50-100 cm between holes.
2. The mouth of the hole can be reinforced with cement 2 cm thick and 2-3 centimetres wide and provided with a safety barrier to prevent small children or people from falling in.
3. The pit is filled with organic waste such as leaves, kitchen waste, tree branches, non-chemical kitchen food waste, etc. The waste in the pit will shrink so that it needs to be filled with organic waste. The waste in the pit will shrink so it needs to be refilled and at the end of the dry season it can be drained as natural compost fertiliser.
4. The compost fertiliser formed in the infiltration pit serves to fertilise plants.
5. To strengthen the walls of the pit from collapsing, the base of the pit needs to be anchored by making a 2 - 3 cm wide and 2 cm thick cement mortar around the pit.
6. The number of biopore infiltration holes is determined based on the land area. For every 50 m2 of land area, 10 holes are made. Consider the calculation example below:
   - Land area of 0 - 50m^2 requires 10 holes.
   - Land area 50 - 100 m^2 requires 20 holes.
   - Land area of 100 - 150 m^2 requires 30 holes.

Location of Biopore Hole Creation

1. Choose an appropriate area to make biopore pits, namely in Blawi Village.



Source : Author's Preparation

Figure 6. Map of Blawi Village

2. Make a hole in the soil with a diameter of 10-30 cm and a depth of 80-100 cm using a crowbar, bamboo, or biopore drill (see picture).

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Source : field documentation
Figure 7. Making holes for biopores

3. Fill the pit with kitchen waste, leaves, plant or grass clippings, garden waste.

Source : Google 2022
Figure 8. Biopore Holes

4. If the volume of waste decreases, refill it with the waste as mentioned above.
5. Compost is collected at the end of the dry season along with the maintenance of the biopore infiltration pits.

4. Results and Discussions

The activity "Climate Village Programme through Biopore Programme in Blawi Village, Lamongan" generally ran smoothly. The research team and the Blawi village government prepared the venue and coordinated the village community as participants in the counselling. The participants were residents of Blawi Village, Karangbinangun Sub-district. The place used

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in this activity was located at the Blawi Village Hall. The making of biopore infiltration holes, requires high ability and awareness of efforts to save the environment from the lack of water availability in the dry season and the abundance of rainwater during the rainy season [15][16][17]. This hole is filled with organic waste left over from households which is then left to rot and become a place for soil microbes to develop to make pores in the soil as a place to trap rainwater, so that the process of absorbing rainwater in the soil is maximized [18][19].

The making of biopore infiltration holes is very important, especially in densely populated areas, and the location of the water absorption soil is very minimal, so that these locations often have problems with rainwater, such as puddles, floods and even the emergence of various diseases caused by them, such as dengue fever, malaria and so on. The advantage of biopore infiltration holes is the minimal land used to plant organic waste, because it only requires 10-30 cm^2 of soil with a depth of 10-30 cm. The hole that is made can accommodate organic waste with a volume of approximately 5-10 L without causing a bad smell because of the narrow surface area where the waste decomposes and the hole can be closed to reduce the spread of odours [2][20][21].

Table 1. Planning of Activity Programmes

No	Name	Description
1.	Socialisation of the importance of biopores to the people of Blawi village	The socialisation of the importance of biopores will be conducted at the village hall by inviting village officials, supervising lecturers, and presenters from engineering faculty lecturers as speakers, and attended by at least 80% of the target community.
2.	Preparation for making biopores	This preparation is used to buy the materials and tools needed, such as drills, pvc pipes, and so on.
3.	Making Biopores	a. Before starting to make biopores, first determine the location that will be used as a manufacturing site.
		b. After determining the place, water the soil that will be used as a place to make biopores with water so that the soil becomes softer and easier to perforate.
		c. Make a hole in the ground using a soil drill, try to make it perpendicular.
		d. Make a hole approximately 1 metre deep with a diameter of 10-30 cm.
		e. After that, line the hole using a PVC pipe that is the same size as the diameter of the hole.
		f. Then, fill the hole with organic waste such as leaves, grass, fruit peels, and other plant-based waste.
		g. After that, close the hole using iron wire, or you can also use a PVC pipe cap that has been punched first.
4.	Evaluation of the results of the biopore programme implementation	This evaluation is carried out at the end of each month, related to obstacles in making biopores and their application.

Source: Author's data processing (2022).

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5. Conclusion and Suggestion

5.1 Conclusion

The activity "Climate Village Program through Biopore Program in Blawi Village, Lamongan Regency" was carried out well, even the participants seemed enthusiastic and hoped that proklim activities could be continued by providing other materials, especially related to the making and use of biopores in flood and drought prevention.

5.2 Suggestion

Based on the above conclusions, we suggest:

- Similar activities should be conducted on an ongoing basis to increase community knowledge on the efforts that can be made to reduce flood risks.
- Furthermore, cooperation in monitoring or fostering villages in utilising biopores as composting media and flood and drought prevention efforts in Blawi Village.

The obstacle faced during the activity process was the difficulty in gathering application participants due to the clash of schedules of each community.

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