Sustainability Feasibility Evaluation of Disaster Resilient Village Development in West Java Using Cost-Benefit Analysis

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Abstract. Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management states that Disater Management aims to provide protection to the community from the threat of disasters. Disaster Resilient Villages (Destana) is a policy as a manifestation of the government's responsibility to protect the community from the threat of disasters. The West Java Provincial Government through the Regional Disaster Management Agency (BPBD) continues to carry out Destana development in order to provide protection to the people of West Java from the threat of disasters and to protect the achievement of development results that have been carried out in villages. The purpose of this study is to determine the cost-benefit calculation of the Destana development program in order to determine the feasibility of continuing the policy. This study uses a quantitative approach. Data was collected through interviews, observation, and document review. In conclusion, the Destana development program is acceptable because the Net Present Value is greater than zero. The result of the calculation of Net Benefit/Cost is greater than one, meaning that Destana development program is feasible to continue.

Keywords: Disaster Resilient Village · Cost-Benefit Analysis · Disaster Resilience Culture

1 Introduction

West Java Province has geological, geographical, hydrological, demographic, and sociological conditions that make it vulnerable to natural, non-natural and social disasters. Based on the 2021 Indonesia Disaster Risk Index, out of 27 districts in West Java, 10 districts are included in the high-risk class and 17 other districts are in the medium risk class [1].

The number of disasters continues to increase from 2016 to 2021, according to data from the Disaster Management Operations Control Center (Pusdalops-PB) BPBD of West Java Province. The disasters occurred in West Java Province have resulted in an increase in the number and casualties of people, persons with disabilities, loss and damage to personal belongings, government properties and disruptions of sustainable development (See Fig. 1 and 2).

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Fig. 1. Disaster Risk Index in West Java. BNPB, 2021.

Article 4 of Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management states that the purpose of disaster management is to protect the community from the threat of disasters [2]. Realizing that the largest disaster victims are at the community level, the government continues to develop community-based disaster risk reduction efforts, making the community a key player in building village resilience in dealing with disasters.

There are 5,957 villages in West Java Province. A total of 5,100 villages or about 85.61% of them are disaster-prone villages. The fact that people saved from disasters, 96% is due to himself and their communities know how to react from disasters. Communities who are aware of disasters are very crucial so that community-based empowerment efforts are needed to build their resilience.

The concept of disaster risk reduction (DRR) is implemented by reducing existing disaster risks, preventing new disaster risks and improving people's quality of life through resilience. Based on the lowest administrative level, namely the Village, the DRR concept is implemented through the Disaster Resilient Village (Destana) program. Community participation is no longer an object of disaster, but an object of empowerment.

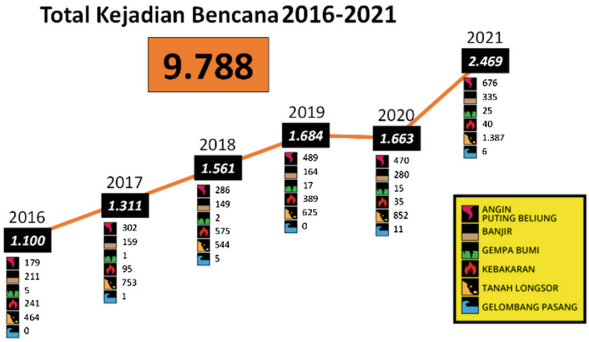

Fig. 2. Disaster incident in West Java. Pusdalops-PB BPBD of West Java Province, 2021.

Destana is a village that has the independent ability to adapt and deal with potential disaster threats, as well as recover quickly from the adverse impacts of disasters [3]. The target for the establishment/development of Destana is stated in West Java Governor Regulation No. 1 of 2020 concerning Cultural Capacity Building for Disaster Resilient Communities in the West Java Province.

For the years 2019–2023, there are 2,883 disaster-prone villages in West Java which are the targets for the establishment/development of the Destana. A total of 521 have formed Destana between 2012–2022. This means that only 18.07% of disaster-prone villages in West Java have been touched by this program for seven years.

In order to accelerate the Destana development program, BPBD allocates additional budget for its implementation. However, as the Destana development program progressed, BPBD never conducted an evaluation using the economic evaluation method. Therefore, this study aims to analyze the calculation of costs and benefits using formulas including Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR), and Net Benefit Cost Ratio (Net B/C) to determine the feasibility of sustainability program and decision making considerations of policy makers.

2 Methodology

The method used in this research is descriptive quantitative method. Descriptive method is used to provide an overview of all the benefits arising from the development of Destana. Descriptive method is a way of examining the status of a group of people, an object, a set of conditions, a system of thought, or a class of events in the present. The purpose of descriptive research is to make a systematic, factual, and accurate description, picture or painting of the facts, characteristics and relationships between the phenomena being investigated [4].

The data collection technique used in this research is using interview techniques, observation and documentation studies. Interviews were conducted with informants, namely the Head of Regional Disaster Management Agency (BPBD) of West Java Province, Head of Prevention and Preparedness BPBD West Java Province, Head of BPBD Subang Regency, Head of Prevention and Preparedness BPBD Subang Regency, Destana Facilitator of Ciater and Head of Ciater Village. From the informants, the benefits obtained from the development of Destana were carried out and the intangible benefits approach became tangible. Observations were carried out in the BPBD of West Java Province, BPBD of Subang Regency and Ciater Village. Meanwhile, secondary data sources obtained from important documents related to the development of Destana in support of this research, including the costs involved in developing Destana. To determine the validity and accuracy of the data, the researchers verified the data by conducting a credibility test by triangulation.

In this study, the author uses source triangulation to check the consistency, depth and accuracy of information by collecting information at different sources, places and/or times. The data in the document study that has been collected is then processed by data processing. This data processing is carried out to make data, facts and information meaningful and useful for research.

3 Result and Discussion

The conceptual framework in this study can be described in the following diagram:

Fig. 3. Cost-benefit analysis is used in this study because it is one of the feasibility analysis techniques based on economic rationality and considers aspects of long-term program efficiency. In other words, if the benefits derived from developing Destana are greater than the costs incurred, the program will be implemented. The same goes the other way around. This method avoids the choice where the benefits obtained are less than or equal to the costs incurred.

The cost-benefit analysis in this study is an analysis that compares the costs of developing Destana with the outputs or benefits of the development program. Meanwhile, costs reflect the costs of program investment, while profits reflect the results of the Destana development program.

Benefit assumptions used in this study are sustainable development, increasing community capacity, especially Destana Facilitators (Fasdes), and increasing Regional Resilience Index (IKD). While the assumption of costs incurred is the costs that must be incurred for the implementation of Destana development.

Based on the results of the research on the Destana development program, the benefits include sustainable development of 100 villages worth IDR 10,000,000,000, capacity building for 100 Fasdes worth IDR 2,209,784,400, and an increase in IKD worth IDR 500,000,000. The total benefit obtained is IDR 12,709,784,400.

There are three methods in analyzing the costs and benefits of a program, namely NPV, IRR, and Net B/C. Before calculating the NPV, IRR, and Net B/C we must explain the Pay Back Period (PBP) of the existing program.

PBP is the time required to return the initial investment [5]. PBP calculation is equipped with the ratio of profit and cost to present value. If the profit-to-cost comparison value is greater than or equal to 1, then the program can be run. The cost of the Destana development program is IDR 1,000,000,000 and procced annually is almost the same,

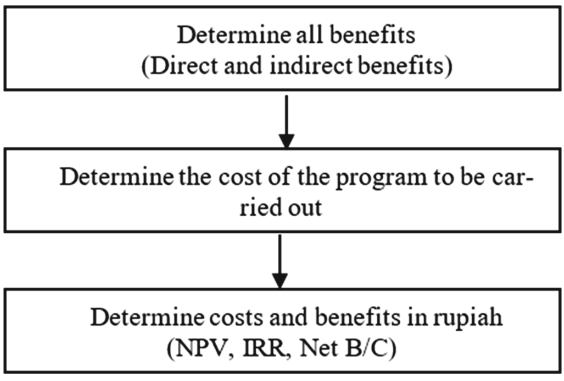

Fig. 3. Cost-benefit analysis framework.

which is approximately IDR 590,840,000.

$$PBP = \frac{1,000,000,000}{590,840,000} = 1.7 = 1 \text{ year } 7 \text{ months} \quad (1)$$

Based on the results of the PBP calculation, it can be seen that the Destana development program can be run. Return of investment of a social nature will be obtained within 1 year 7 months.

Then after calculating the value of the NPV with the discount rate calculated is 10.5%, with the following criteria.

- NPV > 0, then the program provides benefits and is feasible to implement.
- NPV = 0, the program provides few benefits at a large cost so that the implementation of the program is based on the subjective assessment of decision makers.
- NPV < 0, then the program does not provide benefits and it is better not to implement it.

$$\begin{aligned} NPV &= \frac{590,840,000}{(1+0.105)^1} + \frac{590,840,000}{(1+0.105)^2} - 1,000,000,000 \\ &= \frac{590,840,000}{1.105} + \frac{590,840,000}{1.221} - 1,000,000,000 \\ &= 590,840,000 + 483,888,536 - 1,000,000,000 \\ &= 18,585,369 \end{aligned} \quad (2)$$

Based on the calculation results, it is known that the NPV value for the Destana development program is IDR 18,585,369. This shows that the NPV of Destana development is > 0, so the Destana development program is acceptable. This means that the program carried out provides benefits and is feasible to implemented.

The internal rate of return method is also a method that takes into account the time value of money. The IRR indicates the percentage of profit earned from a program, or the discount rate at which the current net income stream (NPV) equals zero. If the IRR value is greater than the discount rate, the program is feasible to be implemented. Meanwhile, if the IRR value is less than the discount rate, the program is not feasible to be continued.

The Destana development program shows an IRR of 10.5% which means the program will generate profits with an interest rate of 10.5%. Earning 10.5% interest is obtained from a positive NPV of IDR 18,585,369 and an initial investment of IDR 1,000,000,000. Then if the value of the interest rate becomes 8.5% then the amount of NPV:

$$\begin{aligned} NPV &= \frac{590,840,000}{(1+0.185)^1} + \frac{590,840,000}{(1+0.185)^2} - 1,000,000,000 \\ &= \frac{590,840,000}{1.085} + \frac{590,840,000}{1.177} - 1,000,000,000 \\ &= 544,552,995 + 501,892,162 - 1,000,000,000 \\ &= 46,445,157 \end{aligned} \quad (3)$$

Then the amount of IRR interpretation is:

$$\begin{aligned} IRR &= 10.5\% + \frac{18,585,369}{(18,585,369 + 46,445,157)} \times (10.5\% - 8.5\%) \\ &= 10.5\% + \frac{18,585,369}{65,030,526} \times 2\% \\ &= 10.5\% + 0.3 \times 2\% \\ &= 10.5\% + 0.6\% \\ &= 11.1\% \end{aligned} \tag{4}$$

So the amount of IRR interpretation is 11.1%. This means that the desired rate of return is greater, and the investment is worth continuing.

The Net B/C method is a method of evaluating a program by comparing the value of program benefits obtained with the value of the program costs. This figure shows the level of additional benefit for each additional cost of 1 unit. If the Net B/C value > 1 is obtained, then the project is feasible to implement. However, if the value of Net B/C < 1, then the project is not feasible to be implemented.

$$\begin{aligned} Net\frac{B}{C} &= \frac{\frac{12,709,784,400}{(1+0.105)^{12}}}{\frac{1,000,000,000}{(1+0.105)^{12}}} \\ &= \frac{\frac{12,709,784,400}{3.31}}{\frac{1,000,000,000}{3.31}} \\ &= \frac{3,835,224,997}{3.1,753,742} \\ &= 12.7 \end{aligned} \tag{5}$$

Based on the calculation of Net B/C, the result of the ratio is 12.7, so Net B/C > 1. Based on the Net B/C criteria, it can be seen that the Destana development program is feasible.

The results of the cost-benefit analysis show that the Destana development program produces greater benefits than the costs incurred. This program deserves to be continued and improved in quality. The policy of the Destana development program implemented at the BPBD of West Java Province provides benefits in increasing community resilience to face disasters, especially those in vulnerable areas. This study provides calculation results in decision making for the sustainability of a disaster management policy program.

4 Conclusion and Recommendation

Based on the results of the cost-benefit analysis, the Destana development program has more benefits than the required costs. This program deserves to be implemented. The Destana development program, which consists of outreach to the Head of Village accompanied by training for Fasdes who local residents are, is an alternative solution in achieving the target of establishing/developing Destana in West Java in order to create West Java community with a disaster-resilient culture.

The condition of West Java which is one of the provinces with varying levels of disaster threat, the local government must be committed to community-based disaster risk reduction efforts. Destana program is the spearhead of disaster management as a form of protection for the community while protecting the achievement of development results that have been achieved and supporting the achievement of development that has been planned in the village.

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