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Study on the Feasibility of Construction of Logung Dam in Kudus Regency

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Abstract- The availability of water in the increasingly rare dry season and the tendency of floods in the rainy season, is a problem that can not be solved completely in various regions in Indonesia. The construction of reservoirs is generally aimed at helping to overcome the problem of increasing water resources needs from time to time. The area of Kudus Regency is an area with relatively limited water resources. Therefore it is necessary to plan the construction of Logung dam in the hope that the surrounding ground water can be maintained, the forest can be grown, and in the end can preserve the existing water source. The aim of this research is to get an overview of Logung Dam plans that are economically feasible both from cost aspect and benefit aspect. To find out the feasibility of Construction of Logung Dam in Kudus Regency, Net Present Value (NPV), Internal Rate of Return (IRR) and Net Benefit Cost Ratio (Net B / C) will be performed.

Keywords**:** economic feasibility, Logung dam, Kudus regency

1. Introduction

The availability of water in the increasingly rare dry season and the tendency of floods in the rainy season, is a problem that can not be solved completely in various regions in Indonesia. The area of Kudus Regency is an area with relatively limited water resources. To overcome these conditions need a strategy how to accommodate water during the rainy season with the hope that during the dry season can still be reused. Besides, with the dam, it is expected that the surrounding ground water can be maintained, the forest can be grown, and in the end can preserve the existing water source.

In relation to this matter, it is necessary to conduct a feasibility study, especially engineering for Dam Logung located in Kudus Regency. The results of this study is intended to determine the cost and benefit principle in the construction of reservoirs, so that the problem of limited water resources in the area of Kudus Regency and surrounding is expected to be overcome.

Based on the description on the background above, the authors can formulate various problems in this study. First, is Logung Dam Construction worthy to be economic? Second, what is the impact of increasing water availability from Construction of Logung Dam to the surrounding environment?

Based on the subject matter that has been described above, this research has a purpose to: Obtain an overview of Logung Dam plans that are economically feasible both from the cost of construction, O & M costs and depreciation costs as well as from the benefits aspect to fulfill the need for clean water, especially raw water, irrigation, flood

control, fishery, tourism and hydroelectricity (Hydroelectric Power Plant), and get comparison of construction of Logung Dam in Kudus Regency between variable cost and benefit variable is more than 1 (BCR> 1).

2. Literature Review

Reservoir is a building that serves to collect excess water at high discharge and release it when needed. The decisive factors in the selection of the type of reservoir are:

a) Local climatological state
b) Local hydrological state
c) Local geological situation
d) Availability of building materials
e) Local environmental conditions

To determine the location of the reservoir must consider several factors, namely:

1) The reservoir is a basin sufficient to hold water, especially in locations where the geotechnical state does not escape water, resulting in a small water loss.
2) The location is located in the area of benefits that require water so that the distribution network is not so long and not much energy loss.
3) The location of the reservoir is located near the road, so the access road (access road) is not so long and more easily taken (Soedibyo, 1993).

Some of the most important aspects that need to be learned in order to realize the idea of building a dam are: topography, engineering geology, foundations, reservoir materials, spillway buildings, tapping buildings.

Reservoir has several types, among others:

- Earthfill Dams
  The earthfill dams is a reservoir that is more than half the volume of soil or clay.
- Rockfill Dams
  It is the fill dams whose construction strength is based on the urugan stone and as an impermeable layer using clay, clay mixed with sand / gravel, asphalt layer, reinforced concrete or geotextile.
- Concrete Reservoir
  Concrete Reservoir is a reservoir made with concrete construction with reinforcement or not.

To obtain a comprehensive measure as the basis for the feasibility assessment of the project has developed various ways called investment criteria. The commonly used and recommended criteria for use in project evaluation are:

1. Net Present Value (NPV)
   Net Present Value (NPV*)* is the difference between the present value of the benefit and the present value of the cost. Where the steps to do for this calculation is not much different from the step for NPV calculations. In general the formula for calculating present value value is as follows: (Kuiper, 1971:45):

$$P = \frac{F}{(1+i)^n}$$

(1)

information :
p: current value (present value)
F: value in year n

I: interest rate

In the project evaluation the NPV value at the prevailing loan rate must have a price> 0. If NPV = 0 means the project returns exactly as the value of the investment. If NPV <0 means the project is economically unfeasible to build.

2. Benefit Cost Ratio (BCR)

Benefit Cost Ratio (BCR) is the ratio between the present value of the benefit and the present value of the cost.

In general the formula for this BCR calculation is:

$$BCR = \frac{\text{PV of benefit}}{\text{PV of cost}} \quad (2)$$

Source : Pujawan (1995:259)

information :

P V = *present value*

BCR = *benefit cost ratio*

There are three possible values of B / C that occur, namely:

If the value of B / C <1, the project is not eligible

If the value of B / C = 1, the project is marginal (marginal project)

When the value of B / C> 1, the project deserves to be accepted Internal Rate of Return (IRR)

3. The Internal Rate of Return (IRR)

Internal Rate of Return is the interest rate obtained if the Benefit Cost Ratio (BCR) is equal to 1 or the interest rate value if the NPV is equal to 0. The Internal Rate of Return (IRR) is calculated on the basis of net receipts and total value for investment purposes. The value of Internal Rate of Return (IRR) is very important to see to what extent the ability of this project can be financed by looking at the value of the prevailing loan rate. Calculation of this IRR value can be obtained by the following formula: (Kuiper, 1971:16) :

$$IRR = I' + \frac{NPV}{NPV'-NPV''} \quad (3)$$

Source: Kuiper (1971:16)

Information :

F: interest rate gives positive NPV value

I ': interest rate gives negative NPV value

NPV: the difference between the present value of the benefits of the cost

NPV ': NPV positive

NPV ": NPV Negative

4. Break Even Point

Every business has risks and uncertainties. With the break-even analysis the magnitude of risk can be known in the context of a disconnection process. The break-even point is reached when the business has earned revenue that can cover all expenses.

The lower the occupancy factor, the lower the investment risk of the project. Also on a hotel project, what percentage of the number of rooms should be rented for the costs to be closed. In an apartment project, what percentage of the number of

apartments should be leased or rented out so that all costs can be covered. (Poerbo, 1989:17)

5. Sensitivity Analysis

   According to Giatman (2006), sensitivity analysis is needed in order to know the extent to which the effects of predetermined investment parameters may change due to the factors of the situation and conditions over the life of the investment, so that the changes will have a significant effect on the decisions taken.

   Sensitivity analysis generally assumes that only one parameter is changed, while the other parameters are assumed to be relatively constant in one analytical equation. The investment parameters that require sensitivity analysis include: a. investment b. benefit or income c. cost or expenditure d. interest rate (i). Some of the circumstances usually carried out in the irrigation project sensitivity analysis are as follows:

1) There was a 10% decrease in the estimated benefit value.
2) There was a 10% increase in estimated project cost.
3) Delays in project completion for two years.
4) And some other conditions based on economic judgment will or have occurred.

3. Research Methodes

This research is a quantitative research with descriptive approach. The respondents of this study are all the people who live in the vicinity of Logung Dam directly affected by the construction of the dam, and the parties involved in the development process, by taking samples from each element of the interested parties.

The variables used in this research are:

1) Capital Cost
2) Annual Fee (Operation and Maintenance)
3) Benefits gained (Benefit)

Benefits gained in the construction of the Logung dam are as follows:

- As a source of raw water

  The real benefit of this project is obtained from the sale of raw water from the manager of Logung Dam to local water company of Kudus Regency which is obtained from the calculation of the total requirement of raw water multiplied by the price of water.

- Irrigation

  The construction of irrigation can increase the utilization of land throughout the year so that the intensity of planting is achieved higher. Mathematically formulated as follows:

$$IT = \sum_{i=1}^{n} \frac{Pi}{T} \times 100\% \qquad (4)$$

Information:

IT = Intensity of Planting

Pi = Planted area in season i (hectare)

T = Area of raw land (hectare)

i = Plant type in the planting season to i

n = Number of planting season in 1 year

- Flood Control

  The benefits gained from the construction of the Logung dam as a flood control are very profitable for agriculture. This flood-free condition as a benefit considering losses due to flooding on agricultural land is very detrimental to farmers.

- Perikanan

  Mathematically formulated as follows: :

$$\pi = PyY \sum_{i=1}^{n} PxiXi$$

  Information:

  π = profit (Rp per season)

  Y = total production (kg per hectare / season)

  X = number of inputs used (unit)

  Py = price per product unit (Rp)

  Pxi = price per input unit (Rp)

  Py.Y = Total revenue = TR (Rp)

  Pxi.Xi = Total Spending = TC (Rp)

- Pariwisata

  The benefits of the construction of dams for tourism are economically derived from the sale of admission tickets imposed by tourists, parking and also rent kiosks from traders around the dam.

- Hydroelectricity (Hydroelectric Power Plant)

  According to Dandekar (1991:7), in general, Hydroelectric Power Plant is built by utilizing the shelter, which is a reservoir or dam with a formula:

$$P = \frac{Q \times H \times E \times 9{,}807}{1000}$$

  (5)

  Information :

  P = power raised (kW)

  H = effective falling height available for generating power (m)

  Q = power plant discharge (m3 / sec)

  E = efficiency of power plant (%)

The types and sources of data used to support the analysis in this study are as follows.

1) Data type by nature

a. Qualitative Data

Qualitative data is a data that is not in the form of numbers but in the form of information about the variables to be studied obtained from various relevant institutions.

b. Quantitative Data

Quantitative data is a data in the form of numbers and can be measured. In this study quantitative data in the form of project costs obtained from the River Region Main Office of Pemali Juana.

2) Data type by source

a. Primary data

Primary data is data that besumber on the results of structured interviews of respondents by using questionnaires that is about the area of arable land, types of plants, irrigation systems, and so forth.

b. Secondary Data

Secondary data is data from some related instances of the River Region Main Office of Pemali Juana, Public Works Department, State Electricity Company and Central Bureau of Statistics.

Methods of data collection using the method of direct observation to the research location by using questionnaires to obtain primary data. To obtain secondary data, data collection is done by non participant observation by reading, copying and processing documents and written records (Sugiyono: 2008). The data collected through the literature or journals obtained from relevant agencies are River Region Main Office, Public Works Department of Kudus Regency, State Electricity Company Working Area of Kudus Regency and Central Bureau of Statistics of Kudus Regency.

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