



Measuring the Water Surface Speed of the Cikidang River as a Supporting Facility for the Development of Ecotourism Areas

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Abstract

Pangandaran Regency is famous for its natural beauty, especially the beauty of its beaches. In this district there are many famous beaches. Besides the beach, there are also rivers that offer beautiful views. However, not many tourists have made the rivers in Pangandaran as tourist destinations, especially the Cikidang River. Cikidang River has the potential to be used as ecotourism. In building an ecotourism area on the banks of a river, it is necessary to carry out an in-depth analysis of the damage that might occur due to erosion. One of the factors that can increase erosion is the speed of water on the surface. Therefore, in this paper, measurement of river surface velocity is carried out in a simple way and analyzed using the velocity formula. From the results of this measurement, a recommendation was made to direct all parties involved in measuring the surface velocity of the Cikidang River as a means of supporting the development of ecotourism areas. The Recommendations are: 1. The development of ecotourism can provide benefits to the community, be accepted in the social life of the community, especially the people on the outskirts of the Cikidang river, and keep the Cikidang river clean. 2. Development of facilities and infrastructure can create conditions for tourism objects and tourist attractions, both natural tourism, culture and man-made tourism that highlight and maintain local cultural attributes as well as the uniqueness and characteristics of the area.

Keywords: river, erosion, cikidang, speed, surface

1. Introduction

Pangandaran is one of the new autonomous regions in West Java. This district is known to have natural beauty that can attract tourists. This is because Pangandaran has a beach area that has been named the most beautiful beach on the island of Java. Therefore, the attractiveness of tourists, both domestic and foreign, is very high. However, not only the beach can be used as a water tourism object. Examples of other tourist objects are rivers such as the Green Canyon and Citumang which are also located in Pangandaran Regency (Hasibuan et al., 2019).

Apart from the Green Canyon and Citumang, the Cikidang River is a destination that has great potential to be used as ecotourism in Pangandaran if managed properly. Ecotourism is a form of nature-based tourism activity that aims to preserve places and empower the social, economic and cultural local communities so as to increase welfare. In addition, this potential can also support the achievement of Pangandaran Regency's vision, which is to become a world-class tourism area in 2025 (Kastolani et al., 2022).

The river is an open flow with a geometric size that changes over time (Dunne & Jerolmack, 2020). River dynamics are strongly influenced by water discharge, water velocity, slope, sediment load, and the lowest level of the river (Popović et al., 2021). One of the processes that cause a change in the size of a river is erosion. Erosion is the process of transporting soil or parts of land from one place to another by water media. Erosion on the banks of the river is influenced by the speed of the water surface. The impact of water erosion on river banks, among other things, can directly cause damage to conservation buildings and other buildings which indirectly can increase the need for repair of damaged land and buildings (Florsheim et al., 2008).

In carrying out the development of ecotourism areas on the banks of the river, especially on the Cikidang River, it is necessary to analyze the impact of the dynamics of the river on development (Supian et al., 2020). This is very important to determine the level of damage that can occur to buildings erected on the river bank. One of the variables

that must be analyzed is the surface flow velocity of the river which is the biggest factor causing erosion on the river banks. Therefore, in this paper a simple surface flow velocity measurement of the Cikidang River is carried out.

2. Materials and Methods

2.1. Materials

- Meter, serves as a measuring tool at the point of measurement
- Mattress thread, serves as a binder measuring instrument
- Scissors / cutter, serves as a tool for cutting measuring subjects
- Plywood/styrofoam, serves as a measuring instrument subject
- Logs, serves as a sign of the start-end point of measurement
- Stopwatch, functions as a time measuring device during measurement
- Stationery, serves as a record of results

2.2. Methods

- Make sure the measuring tool is in position.
- Determine the measuring point.
- Prepare the measuring instrument in the starting position of the measurement.
- Checking the wind direction at the measuring point.
- Placement of wood as a starting point and end point for calculations along 3 meters.
- Placement of plywood accompanied by removal on the measurement path.
- Measure the time when the plywood is released using a stopwatch.
- Keep track of time.
- Repeat the measurement up to 6 times.

3. Results and Discussion

The results of this study are shown in Tables 1 and 2. Table 1 is the result of measurements at the Cikidang Bridge, while Table 2 is the result of measurements at Bojong Tempel.

Table 1. Measurement Data on the Cikidang Bridge

No	<i>s</i>	<i>t</i> (s)	<i>t mean</i>
1		8.08	
2	1 meter	7.20	6.4125
3		5.85	
4		4.52	

Table 2. Measurement Data on the Bojong Tempel

No	<i>s</i>	<i>t</i> (s)	<i>t mean</i>
1		33.35	
2		37.99	
3	3 meters	36.37	37.335
4		40.23	
5		39.86	
6		36.21	

After measuring the primary data in the form of the time needed by an object floating on the surface of the river to travel a specified distance, the velocity variable can be calculated using the simple formulation of distance versus time. In this measurement, two data collection locations were taken, namely under the Cikidang Bridge and Bojong Tempel. From the existing data it is known that the Bojong Tempel section is located in the upstream part compared

to the bridge. This simple difference explains how the variable differences in water surface velocity are observed at the two points.

The case of the Cikidang Bridge provides an average surface velocity of 0.1637075 m/s where at this location there are several river stones around the data collection point and are able to influence turbulence on the river bank flow. Whereas for the Bojong Tempel case, the average velocity was 0.0806545 m/s where this could occur due to the geographical conditions of the location point which allows a lot of sea breezes to occur in the opposite direction to the current velocity vector at that location thereby reducing the speed of existing objects.

River water moves under the influence of gravity. The speed of river flow varies in different locations because it is influenced by the slope of the slope and the volume of water. From the measurement results it was found that there is a difference between the velocity of the river flow under the Cikidang Bridge and in the Bojong Tempel area. This is due to differences in location so that there are differences in topography that affect the slope. The water flow under the Cikidang Bridge is faster due to the presence of rocks which cause a difference in the slope of the slope so that the surface velocity of the river water is higher than in the Bojong Tempel area.

4. Conclusion

Based on the results of this study it can be concluded that the Cikidang River is one of the destinations that has great potential to be used as ecotourism in Pangandaran. In carrying out the development of ecotourism areas on the banks of the river, especially on the Cikidang River, it is necessary to analyze the impact of the dynamics of the river on development. This is very important to determine the level of damage that can occur to buildings erected on the river bank. One of the variables that must be analyzed is the surface flow velocity of the river which is the biggest factor causing erosion on the river banks.

At the implementation stage, measurements are used to determine the magnitude of the speed by utilizing the simple equation: $v = s/t$ and the results are:

- The case of the Cikidang Bridge gives an average surface velocity of 0.1637075 m/s. at this location there are several river stones around the data collection point and are able to influence turbulence on the river bank flow.
- The case of Bojong Tempel obtained an average speed of 0.0806545 m/s. This can happen because the geographical conditions of the location point allow a lot of sea breezes to occur in the opposite direction to the current velocity vector at that location thereby reducing the speed of existing objects.

The water surface velocity data is used for consideration in the construction of buildings on the banks of the river because this is correlative with the decay/erosion of riverbank areas.

Acknowledgments

We would like to thank the financial support from Directorate of Research and Community Service (DRPM) Universitas Padjadjaran through the Academic Leadership Grant (ALG). We would also like to thank the Dean of the Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran.

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