ANALYSIS OF POTENTIAL RESOURCES CIBEUTEUNG RIVER FOR RAFT ECO-TOURISM
Case Study: Cibeteung River Putat Nutug Village and Kuripan Village, Ciseeng, Bogor, West Java

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ABSTRACT

Cibeuteung River is one of the rivers that is used as a tourist destination. The Cibeuteung River is a potential natural resource that can be developed as an ecotourism object and attraction. So this study aims to determine the identification of the potential of Cibeuteung river resources for rafting ecotourism, which is focused on knowing the characteristics of the rafting path, river slope, water discharge, river width and accessibility. This research uses survey method. Data was collected by using field observation and documentation techniques. Data analysis with descriptive analysis. The results showed that the river rafting route in Cibeuteung River has a river width of about 68 m to 98 m, a river slope of 0.5% to 0.3%, with a maximum discharge of 169.79 m^3/s and a minimum of 26.03 m^3/s. s in the dry season. Based on time, the starting point of the white water rafting route is 30 km (55 minutes) from downtown Bogor and 19 km (53 minutes) from downtown Depok. As well as from the analysis results Cibeuteung River has a start and finish point location that is easily accessible.

Keywords: *Cibeuteung River, Rafting, Ecotourism*

INTRODUCTION

Tourism activity is one of the sectors that is expected Tourism activity is one of the sectors that is expected to be able to make a significant contribution to the economy, both the state economy and the regional economy. Efforts in developing the tourism sector are supported by the existence of the Act. No. 10 of 2009 which states that the existence of tourist objects in an area will be very profitable, including to improve people's living standards, expand job opportunities, increase Regional Original Income (PAD), then increase love for the environment and preserve nature and local culture.

The tourism sector encourages growth a lot in order to support the achievement of development targets, so it is necessary to implement efforts to develop products that have links with the tourism sector. Development in the tourism sector is expected to be able to provide benefits to the community, this is because the tourism sector is one of the many supporters of the development sector in the economic field.

The river is one of the ecosystems that can potentially be developed as a tourist attraction and attraction, especially in rafting activities (Arnould & Price, 1993; Prideaux & Cooper, 2009). The development of the river ecosystem as an object and attraction is relevant to the growth and performance of the tourism sector in Indonesia, especially natural tourism and ecotourism.

Rafting tourism is growing quite rapidly, especially West Java has many rivers that are large enough that can be used as an ideal place to do white water rafting tours. In The West there are more than 20 rivers and more than half of them can and have been used as rafting tours.

Among the rivers that have been used as rafting tourist sites, the Cibeteung River is one of them. The river contained in putat nutug village in Ciseeng subdistrict, Bogor, West Java is one of the rivers that have heavy currents. Rushing water with some rapids and rocks as obstacles becomes a suitable choice for avonturir for adrenaline. To optimize the management of regional functions, efforts to optimize the potential of Cibeteung River resources need to get stronger interventions. Management interventions carried out must be carried out with the community to ensure the implementation of the program can provide benefits for the community around the region. Therefore, planning the potential resources of the Cibeteung River for white water rafting ecotourism needs to be realized immediately.

It takes a media that can publish the industries in Putat Nutug village in Ciseeng sub-district, Bogor, West Java with attractive visualizations and can be accessed anywhere, while the media that can provide solutions to these problems is a website. With this website-based geographic information system design, it is hoped that locations, maps, coordinates, profiles and satellite photos in Putat Nutug village in Ciseeng sub-district, Bogor, West Java can be designed using a more attractive visualization. The purpose of this study was to identify the potential of Cibeuteung River resources for rafting ecotourism.

METHOD

This research was carried out on November 4, 2021, the research site is the Cibeuteung River in the Cipinang Sub-watershed as a place to carry out research on Planning for Cibeuteung River's Potential Resources for Rafting Ecotourism. In this study, the object of research is the Cibeuteung River from the starting point in the Cisadane Valley to the finish point. The focus of the subject in this study is the rafting route on the Cibeuteung River from the start point on the mine bridge to the finish point, the research instrument being the river slope, river width, water discharge and accessibility. And the technique of data collection is done by means of observation and documentation.

The research method used is using the Spatial Data method. This research begins by building a national digital elevation model (DEMNAS) from Landsat satellite imagery and Google Earth Explore, which is guided by topographic maps of Indonesia in environmental GIS vectors. The use of GIS technology here will help to perform spatial analysis. The next step is the identification and measurement of flow rate and measurement speed, both of which are key factors in white water rafting, followed by field observations and measurements. Detailed portrait channel conditions, identification of rapids, twists, obstacles, and rock distribution were carried out during field measurements. These results were used for channel analysis and risk factors for the rafting route. The DEMNAS data has been constructed via a vector GIS environment using ArcGIS software and functions from a line interpolation system of counter topographic maps. Elevation information from Landsat and Google Earth Pro satellite imagery data is combined with altitude data from a 1:25,000 scale topographic map to generate a new DEMNAS, and visualization of the DEMNAS data using the ArcMap 10.3 application. This topographic map provides information about the river network, elevation, and land use.

DEMNAS is the main source of data derived from Satellite Landsat Imagery, which in this study, provides information on the morphometry of the Cibeuteung River. In the case of rafting, the contribution of morphometric parameters specifically refers to the flow characteristics of the river. The parameters measured in this study include the slope of the river, the winding aspect, and the width of the river. DEMNAS data is integrated with GIS Analysis and field surveys to measure morphometric parameters. (Slamet Suprayogi, 2020). We need a media that can publish industries in Putat Nutug village in Ciseeng sub-district, Bogor, West Java with attractive visualizations and can be accessed anywhere, as for media that can provide solutions to these problems is a website.

Spatial Analysis

Spatial Analysis is a Geographic Information System (GIS)-based software developed by ESRI (Environment Science & Research Institute). The main product of arcgis consists of three main components, namely: ArcView (functions as a comprehensive data manager, mapping and analysis), ArcEditor (functions as an editor of spatial data) and ArcInfo (a feature that provides functions that exist in GIS, which includes the needs of analysis of the Geoprocessing feature).

The benefits of spatial analysis in GIS data processing, spatial analysis can be used to provide solutions to spatial problems. The benefits of this spatial analysis depend on the function performed. A summary of these benefits is as follows: Create, select, map, and analyze cell-based raster data. Perform integrated vector or raster data analysis, obtain new information from existing data, select information from multiple data layers, and integrate raster data sources with vector data.

Spatial Analysis was first launched to the public as commercial software in 1999 with the version (ArcGis 8.0) with the development and demands for the features needed ESRI always provides updates to ArcGIS, at this time the latest 2016 update version has been released, namely (ArcGis 10.3).

Land Cover Analysis

Land cover is the physical material appearance of the earth's surface. Land cover can describe the relationship between natural processes and social processes. Land cover can provide very important information for modeling purposes and for understanding natural phenomena that occur on the earth's surface (Liang, 2008). Land cover is very important information in the agricultural sector. For example in the study of the expansion of new fields. The expansion of new rice fields aims to increase rice production in order to increase food security. This study aims to classify land cover on the Cibeuteung River using Landsat 8 OLI/TRIS Imagery in 2021. The classification results obtained are the latest land cover around the Cibeuteung River (Cipinang Sub-watershed) that can be used for white water rafting, starting from the village of Putat Nutug. to the village of Kuripan.

The analysis phase begins with identifying the image data from the classification results. The image data is converted in the form of numbers. presented in tabular form with column range, average, and average for each class (rivers, forests, fields, settlements, buildings, rice fields, plantations, shrubs, and ponds). The land cover map contains information on the class division on the classification starting from rivers, forests, fields, settlements, buildings, rice fields, plantations, shrubs, and ponds. In addition to the land cover map, a table of the area of each land cover class is also included based on the land cover classification. The accuracy of the unsupervised classification results was tested based on the overall accuracy test. The accuracy test is presented in the form of a confusion matrix table containing accurary users, accurary producers, and overall accuraries. From the day of the accuracy test, it is known how accurate the unsupervised classification method is applied to land cover.

Mapping survey activities carried out using satellite imagery data produce data information as a reference to analyze the potential of the Cibeuteung river as rafting ecotourism. ArcGIS functions to process satellite image data obtained to produce land cover analysis. Image data processing begins with inputting Landsat 8 (OLI) image data that has been downloaded into the ArcGIS application, then satellite image data consisting of 12 bands is combined through a composite band process. The composite band process is carried out with the arctoolbox facility by using the data management tools and then entering the raster.

After that go to the menu raster processing and composite bands. The next step is to cut the Landsat Image. Landsat image cutting is done using the same tools when doing composite bands, namely by using data management tools, raster and raster processing tools, then go to the clip raster menu to cut the merged image. Before doing the clip or raster cutting process, the cutting area boundary is made. Determination of the boundary of the cutting area is determined based on the object to be observed. In this study, the object observed was the village of Putat Nutug. In the final stage of image classification, the raster data from the image classification is converted using conversion tools using the menu from raster, ratser to polygon. The results of the conversion of raster data are obtained from the classification results in vector format. From the results of image conversion in shapefile format, information on land cover class and area for each type of land cover is obtained. Land cover analysis of Cipinang sub-watershed which is the Cibeuteung river is carried out using secondary data obtained by Landsat OLI/TRIS 8 imagery in 2021 which is then interpreted. Interpretation is done digitally using computer facilities and ArcGIS 10.3 software.

RESULT AND DISCUSSION

Morphology

The Cibeutueng River in this study, which is included in the Cipinang sub-watershed, is located in two sub-districts, precisely in Ciseeng and Rumpin sub-districts, specifically located in 4 (four) villages, namely the upstream of the river is in Putatnutung, the middle is in the villages of Cibeutueungmuara and Rumpin, while the downstream of the river is located in Kuripan village. Cibeuteung River which will be studied for planning the potential of rafting ecotourism along 6.5 km, geographically located 6o28'10.34" south latitude and 106o40'02.40" east longitude. Regionally, the river administration administration area of the research area is located in the West Java Province, namely Bogor Regency. Spatial Analysis

Figure 1. Satellite Image Cibeuteung River

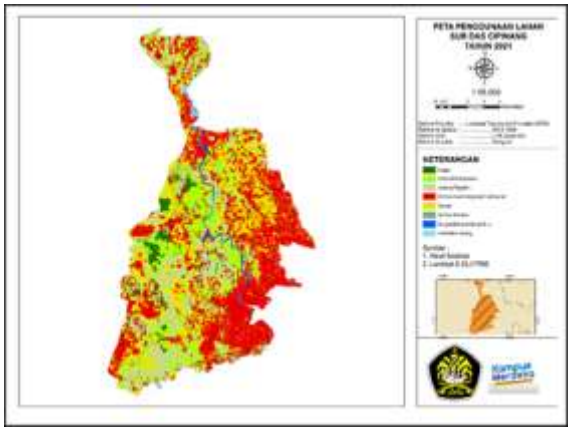

Figure 2. Land Cover Analysis Result

Land Cover Analysis

Mapping survey activities carried out using Landsat 8 OLI/TRIS satellite imagery resulted in data information as a reference for analyzing the potential of the Cibeuteung river as rafting ecotourism. ArcGIS functions to process satellite image data obtained to produce land cover analysis. The land cover map of the Cipinang sub-watershed is presented in Table 1 and spatially presented in Figure 2.

Table 1. Area of land cover

No	Land Cover	Area (Ha)	%
1	Forest	2592.74	19.31%
2	Farm	4040.37	30.09%
3	field/moor	540.39	4.02%
4	Developed land	2412.29	17.96%
5	Paddy field	3011.62	22.43%
6	Shrubs	465.08	3.46%
7	Water bodies	313.69	2.34%
8	Fishpond	53.56	0.40%
	Total	13429.74	100.00%

The land cover analysis of the Cipinang sub-watershed which is the Cibeuteung river was carried out using secondary data obtained by Landsat OLI/TRIS 8 imagery in 2021 which was then interpreted. Interpretation is done digitally using computer facilities and ArcGIS 10.3 software. The results of the interpretation of the Landsat OLI/TRIS 8 imagery in 2021 can be seen in Figure 2. The results of the image interpretation show that the land cover of gardens/plantations and rice fields is the land use that has the largest area. The land cover of the garden/plantation was 30.09% or 4040.37 and the paddy field cover was 22.43% or 2412.29 Ha.

Climate

Rainfall (mm) is the height of rainwater that falls on a flat place with the assumption that it does not evaporate, does not seep and does not flow. Rainfall of 1 (one) mm is rain water as high as 1 (one) mm that falls (accommodates) on a flat area of 1 m2 with the assumption that nothing evaporates, flows and absorbs. Indonesia's maritime islands, which are located in the tropics, have high annual rainfall, and rainfall is higher in mountainous areas. High rainfall in the tropics is generally the result of convection processes and the formation of hot rain clouds. Basically, rainfall results from the upward movement of moist air masses. For upward motion to occur, the atmosphere must be unstable. The following is the rainfall in Ciseeng District in 2021.

Table 2. Ciseeng District Day and Rainfall Data in 2021

Month	Rainy day	Precipitation (mm)
Januari	21	463
Februari	22	527
Maret	25	671
April	16	473
Mei	16	369
Juni	13	122
Juli	12	196
Agustus	9	280
September	16	245
Oktober	19	459
November	55	16
Desember	20	185
Rata-Rata	20	334

Rain that falls from the sky will definitely affect the water quality of the area where it rains or is passed by the rainwater, the influence of rain on water quality in the watershed can be direct and indirect. The direct effect is through the kinetic energy of rainwater, and the indirect effect is determined through its effect on vegetation growth. Meanwhile, the climate parameters collected in this study used a direct climate influence, namely rain. From the table above, the analysis of maximum daily rainfall shows that the maximum daily rainfall tends to

increase from January to April. This shows that climate change has indeed occurred, with the increasing frequency of rainfall intensity greater than 100 mm/day. Increase in rainfall certainly affect the flow rate in the river. The results of the analysis of daily rainfall increased in January to April and June to October, then experienced a drastic decrease in November.

Channel Characteristics and Hydrology of the Cibeuteung River

The main factors that contribute to the formation of rafting are the characteristics of the cross section of the river, namely the slope of the river, flow discharge, and the extreme difference in height at the riverbed. To find out where the rapids points are on the Cibeuteung river using images from Google Earth Pro. From Google Eart Pro, you can find out where the rapids points are by looking at the elevation profile of the Cibeuteung river.

From the image generated by Google Earth Pro, geospatial data is generated, namely the width and length of the Cibeuteung river which will be used as a rafting tourist attraction, slope, and river surface elevation. So from these data, data can be generated as a reference for the potential of the Cibeuteung river as a rafting ecotourism object.

The planning point of the potential Cibeuteung river as rafting ecotourism starts from the start point which is at the point (-6.463166663 Lat, 106.65225 Long) has an elevation of 55 meters above sea level and ends at the end point which is at the point (-6.427194444 Lat, 106.6521611Long) has an elevation of 38 masl. The distance from the start point to the end point is about 6.5 km consisting of 4 rapids points with a river width of about 68 m ± 398 m.

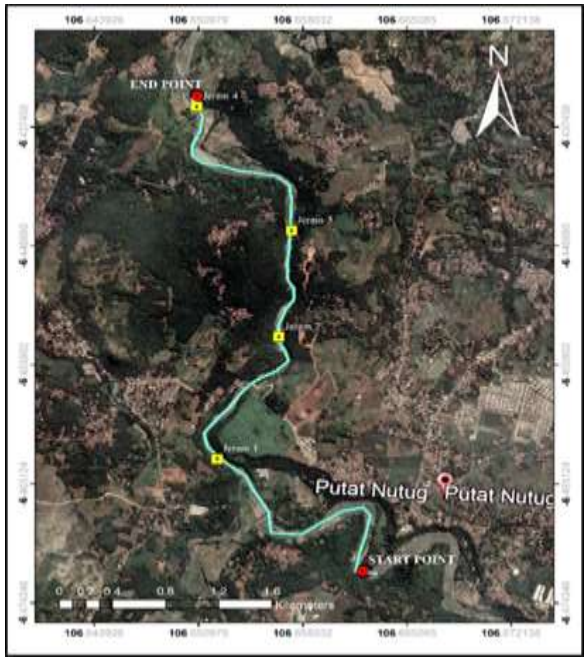

Figure 3. Potential rapids points on the Cibeuteung river

Based on a graph that Google Eart Pro shows, the research location has a maximum river slope of 5.4% to 2.4% with an average slope of 0.5% to 0.3%. The elevation at the starting point is 56 MDPL and has a less heavy current because the elevation tends to be the same. The first rapids point is about 2.3 km from the start point, with an elevation difference of 3 m. The second rapids point is about 1.4 km from the first rapids point, with an elevation difference of 3 m. The third rapids point is about 1 km from the second rapids point, with an elevation difference of 5 m. The fourth rapids point is about 1.6 km from the third rapids point, with an elevation difference of 4 m. So that we found 4 rapids points that can be referenced for German whitewater ecotourism activities on the Cibeuteung river.

Figure 4. Elevation of rapids points on the Cibeuteung river

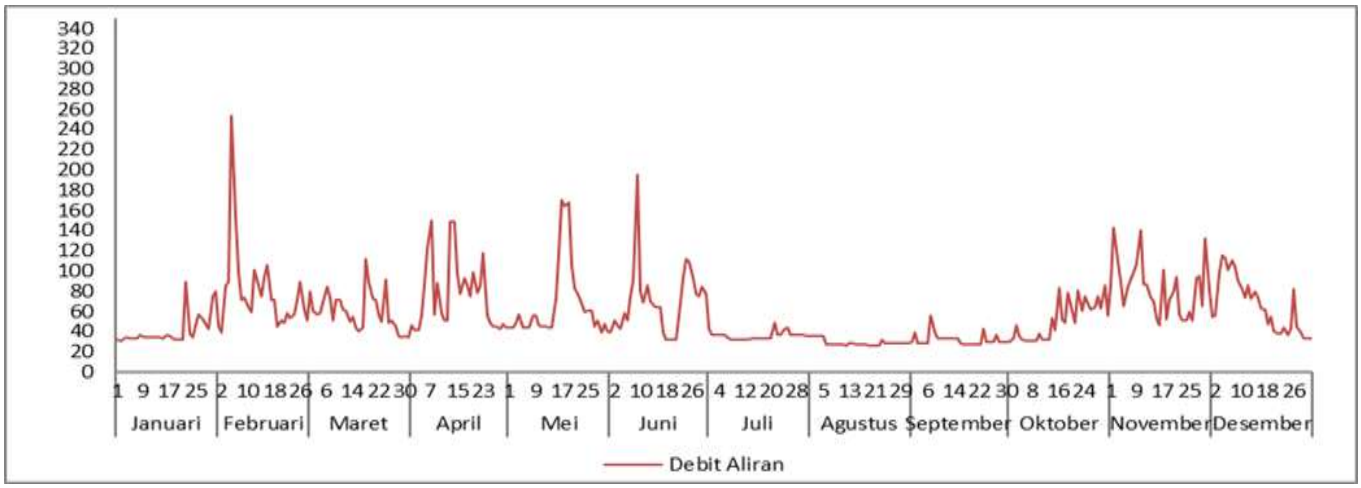

Figure 5. Cibeuteung River Flow Discharge at SPAS Batubeulah

A river is physically characterized by its breadth, linearity, and relief. In this study, the morphometry of the Cisadane watershed plays an important role in identifying and understanding the potential and threats of the Cibeuteung River. The discharge condition of the Cibeuteung river experiences the rainy season with a fairly high flow rate occurring from February to June, while from July to September the discharge of the Cibeuteung river is quite low. From the data of SPAS Batubeulah in the dry season, the Cibeuteung river has a minimum discharge of 26.03 m3/s and a maximum discharge in the rainy season of 169.79 m3/s with a minimum water level of 0.70 m and a maximum water level of 3 m . Conditions for river flow discharge for whitewater activities are in the recommended range of 20–200 m3/s. The flow rate graph in January to December 2018 period can be seen in Figure 4.

Rafting Potential in Cibeuteung River

White water rafting is a category of nature-based tourism, ecotourism, and adventure tourism. This tour offers a variety of challenging activities that nature has to offer. In the case of the Cibeuteung River, the type of tourist attraction offered is the rapids point scattered along the rafting route. The starting point of the white water rafting route is 30 km (55 minutes) from downtown Bogor and 19 km (53 minutes) from downtown Depok. Based on the results of the topographical analysis, the starting point of the rafting route is located at an altitude of 55 MDPL which is surrounded by beautiful hilly views.

The location of the starting point for white water rafting tours can be accessed by footpaths that have been paved with concrete paving the way down slightly. At the end point the topography is relatively gentle with a height of 38 MDPL, where the surrounding conditions are filled with rice fields and local residents' houses. The location of the end point is very easy to access, the road that has been paved with asphalt makes it more comfortable to pass this access and is very strategic to be used as an end point and logistics for tourism purposes.

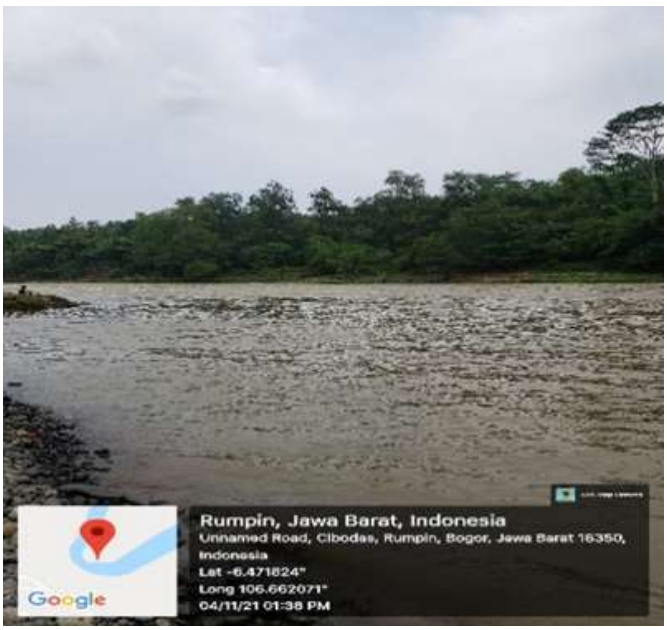

Figure 6. Rafting Starting Point

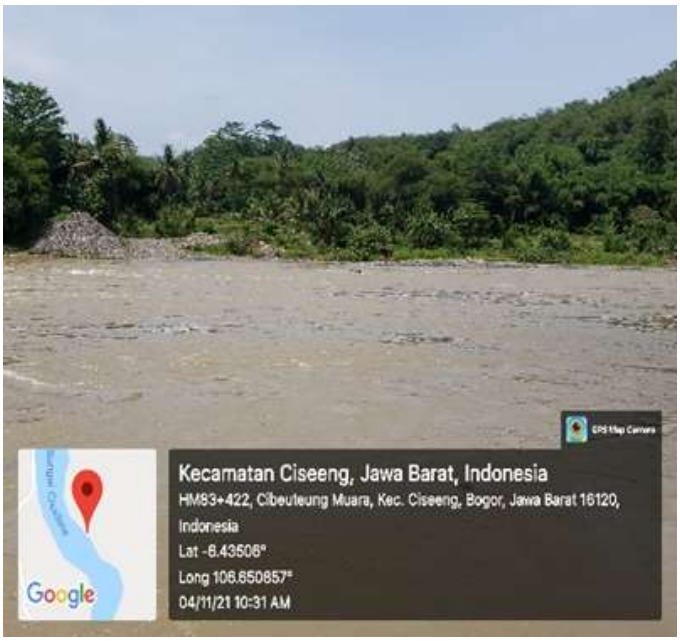

Figure 7. Rafting end point

Figure 8. Access road to the starting point

Figure 9. Access Road to Endpoint

CONCLUSION

Based on the research purpose and results, it can be concluded the potential of Cibeuteung river resources to be developed as rafting ecotourism based on the results of topographical analysis which shows the Cibeuteung River has a river slope of 0.5% to 0.3%. which is included in the river with a moderate slope so that it can be ford, Cibeuteung River Has a maximum water flow of 169.79 m3/s with a water level of 3 m. The width of the Cibeuteung River is between 68 m ± 398 m, this width is suitable for rafting because it exceeds 3.66 m which is the minimum limit for the width of the river to be rafted. The potential of the Cibeuteung River for rafting tourism is also supported by the beauty of the natural scenery obtained from the results of spatial processing, showing that land cover is still dominated by plantations and shrubs around the riverbanks so as to provide a beautiful view. Based on the accessibility, Cibeuteung River has a start and finish location for the rafting route that is easily accessible, the road that has been paved with asphalt makes it more comfortable to pass this access and is very strategic to be used as an end point and logistics for tourism purposes.

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