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IMPACT OF TOURISM ACTIVITY IN CILETUH-PALABUHANRATU GEOPARK (CPG), SUKABUMI, WEST JAVA

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ABSTRACT

Ciletuh-Palabuhanratu Geopark (CPG) is designated by UNESCO as a geopark area and has become a tourist destination. Most of Ciletuh is used for mass tourism, so this research is carried out to determine the impact of tourism. According to the concept of CPG development, the main concept is conservation so the preservation of geological and biological diversity needs to be maintained and managed properly to avoid damage. This study aims to identify the impact of tourism activities on the physical, biological, socio-economic, and sociocultural aspects of CPG. Interviews and field observations have been done to collect data at research sites (tourism sites) and the determined comparison sites. Data were analyzed descriptively with qualitative and quantitative by comparing the results at the two study sites and the Mann-Whitney Test to determine differences in community income. Tourism activities impact physical changes in water, soil compaction, landfill, temperature increase, and humidity decrease. Biological impacts are changes in the composition of plant species, the composition of encounters of animal species with a decrease in the value of H '(1.4) and Dmg (4.2), and the destruction of wildlife. The socio-economic impact was identified from the availability of livelihoods, business opportunities, and increased income. Another impact is giving opportunities for the public to contribute and opening access to technological and information developments.

Key words: *ecotourism, geo-tourism, impact, mass tourism*

INTRODUCTION

Ciletuh-Palabuhanratu Geopark (CPG) is a geologically protected area that has been designated as a geological reserve (Regional Regulation No. 22 of 2010 on the Spatial Plan of West Java Province 2009-2029). CPG is located within the world's tectonic active zone's boundaries, the subduction zone between the Eurasian and Indo-Australian (Indian Ocean) plates (Sukabumi Regency 2016). The southwestern part of the geopark is covered by ophiolite, metamorphic, and melange complexes resulting from subduction processes during the Cretaceous era. That is the first land on Java Island's western side (Rosana and Agusta 2017). On December 22, 2015, the National Committee of Indonesian Geoparks and the Indonesian National Commission for UNESCO officially designated CPG as a National Geopark. They became part of the world geopark network at the 204th UNESCO Executive Board session by the Programme and External Relations Commission in Paris, France, on April 17, 2018 (Sukabumi Provincial Government 2016).

Tourism activities are rising due to geoparks being established as tourism destinations, which can have a positive and negative influence on geological and biological diversity. Utama (2016) described tourism's influence as one of the world economy's drivers, demonstrating that it may contribute to a country's prosperity. Another beneficial consequence of tourism, according to Yoeti (2008) is the increase in employment possibilities, income, and the acceleration of economic equality. However, according to Qodriyatun (2018), activities carried out by tourists, directly and indirectly, cause garbage at tourist sites. If these conditions are not controlled, then it has the potential to cause pollution or environmental degradation. Environmental degradation includes landscapes, vegetation communities, wildlife, and scrap heaps (Butarbutar and Soemarno 2013).

The Ciletuh-Palabuhanratu Geopark was developed with a strong emphasis on conservation to protect the area's geological and biological diversity. Because the changes that may occur will not recover, the value of geological components as a historical trace of an earth formation in the geopark must be maintained. To identify the changes that occur, research on the impact of tourist activities in Geopark Ciletuh-Palabuhanratu is required. The findings of this study are expected to provide data and information on the impact of tourism activities, which will be used to prepare sustainable tourism planning at CPG.

RESEARCH METHOD

The research took place from January to February 2020. The Cimarinjung Curug region is used as a tourist-affected location, and the Manintin Curug area is an identical location but without tourist activities or

as a comparison location. A map of the location of the study is presented in Figure 1.

The impacts identified in this study use the definition of impact according to (Soemarwoto 2009), which is the difference between a tourist-affected location, and an identical location but without tourist activities as a comparison location. The impact identified was caused by the existence of tourist activities based on existing tourism development plans. In general, the impact is expected to be determined before the project begins, so the alleged impact is based on the project's planning. However, according to Soemarwoto (2009), the findings of identifying the impact on already-running projects can enhance the value of the project by reducing the negative impact and strengthening the positive impact.

The components identified were based on grouping, according to Suratmo (2004). The data collected included physical impacts (physical water, physical soil, temperature, humidity, and vandalism), biological impacts (composition and spread of plant species, composition and spread of species of animals and types of endangered animals), socio-economic impacts (absorption of labor, livelihoods, income), and socio-cultural impacts (cooperation, trust).

The data collection techniques used were field observations and interviews. The physical impact of the soil can be seen from the physical compaction of the soil caused by development. The impact is also seen in the presence of garbage. The physical impact of water is observed visually to see the visible color of the water. use a thermometer to measure the temperature of the water, and a secchi plate to measure the brightness of the water. Temperature and humidity were measured using a dry wet thermometer in the morning and evening with 3 repetitions. Field observations were also carried out to see whether or not there was vandalism around the study site, including in rock formations. Vegetation analysis was for plant data, line transects, and Visual Encounter Survey (VES) for animal data.

Respondent characteristic data were analyzed descriptively in the form of frequency values presented in percentages (%) and the Mann-Whitney test to determine differences in people's income variables. Vegetation analysis was carried out to obtain data on the density and frequency of species encounters. Meanwhile, species richness is calculated based on the number of species found in a community.

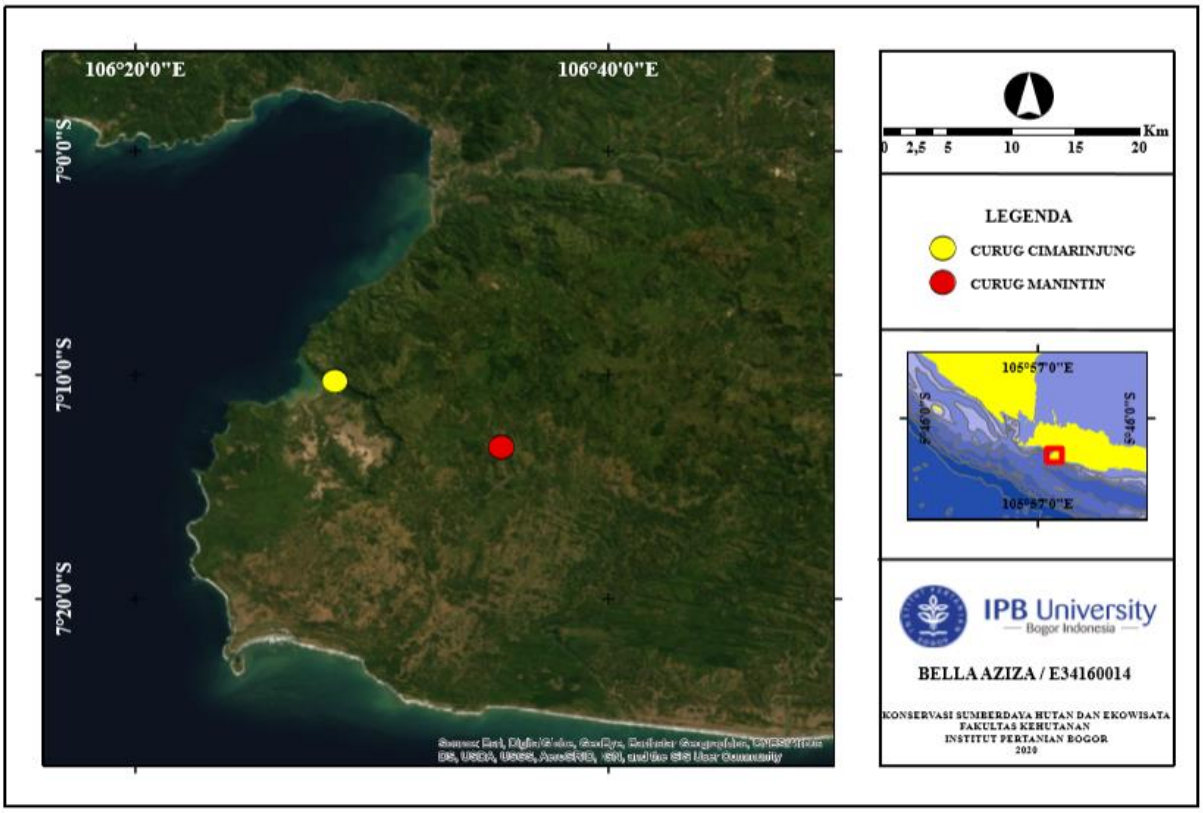

Figure 1 Map of the research location

RESULT AND DISCUSSION

1. Condition of Impacted Locations

a. Physical Impact

The results of data collection at impacted locations show conditions that are no longer natural and indicate pollution. The results of measuring the physical parameters of the waters at tourist sites are presented in Table 1. The physical aspect impact was identified as an increase in air temperature of 1.21 C and a humidity decrease of 0.66%. The increase in temperature also occurs in water, which is equal to 4 C. Changes also occur in the visible color of the water, and the brightness of the water. There is also physical soil compaction and the disposal and processing of garbage, which is not ecologically acceptable.

The average temperature in the impacted location was 28.04 C with a humidity of 87.67%. Referring to the results of Kotta's research (2008), the comfortable temperature range of humans in Indonesia is between 22.5 C and 26 C. According to Rayamajhi (2012), activities carried out by tourists affect natural temperatures in an area.

Water parameters in impacted locations were still within the quality standard threshold because the deviation was less than 5 C. According to Sudinno et al. (2015), the measured water temperature is still in the normal range, 20-32 C or between 28 and 31 C (Nontji 2005). The high water temperature in the impacted location is caused by the sun's intensity entering the water and the openness of surrounding vegetation.

Changes or signals in the state of the water that might be seen are indicators of polluted water (Suryani 2018). Curug Cimarinjung is extremely murky during the rainy season and just slightly murky during the dry season. However, turbidity in the impacted location is also produced by the community's growing diverse activities in creating waste in organic and inorganic materials (sludge and fine sand) and the buildup of conventional mining waste disposal in the river headwaters.

Tourist activities such as the influence of the trampling effect and construction of tourist facilities cause soil compaction that will reduce soil infiltration and increase erosion (Sitania et al. 2018). The study results by Hardini et al. (2018) showed that 52.45% of the landscape of Ciletuh is moderate, with 46.44% sensitive erosion. Meanwhile, river flow patterns and rock types show that 57.06% of the Ciletuh area is not resistant to erosion because it is formed from igneous rock structures forming a tight dendritic river flow pattern (Hardini et al. 2018). According to Nurmansyah et al. (2007), one of the impacts beyond erosion (off-site) is increased surface flow. A high concentration of sediment will cause water to murkiness. The brightness of the waters in the impacted location only reaches a depth of 0.15 m.

As the number of tourists grew, so did the amount of rubbish produced. Garbage heaps in the impacted locations were either burnt, stored, or left behind. The most widely encountered garbage was food and beverage packaging, plastic bags, cigarette butts, plastic bottles, and organic waste produced by local stalls. According to Sasetyaningtyas (2019), unprocessed waste produces a toxic liquid called leachate. The liquid can flow into rivers, seep into the soil, and cause river, soil, and groundwater pollution. Unprocessed organic waste also causes the formation of methane gas and carbon dioxide gas. The United States Environmental Protection Agency (US-EPA) states methane has a 30-fold influence and contribution and a 30 times higher contribution than carbon dioxide gas to the greenhouse effect and global warming.

b. Biological Impact

The biological impact is identified by changes in the composition of plant types and the emergence of several types of plants. The highest frequency is presented in Table 2.

Table 1 Pengukuran parameter fisik perairan lokasi wisata

		Result
Water temperature	^{o}C	28
Water color	-	Muddy
Brightness	m	0.15

Table 2 F dan FR tertinggi pada semua tingkat pertumbuhan

Growth rate	Local name	Scientific name	Parameter	
			F	FR (%)
Seedling	Jambu kopo	*Syzygium densiflorum*	0.43	33.33
Stake	Mahoni	*Swietenia mahagoni*	0.43	25.00
Pole	Mangga	*Mangifera indica*	0.57	50.00
Tree	Mangga	*Mangifera indica*	2.29	66.67

The results of vegetation analysis in the impacted location were obtained from as many as 31 species originating from 9 families. The mango type (M. indica) was the highest frequency at 50.00% at the stake growth rate and 66.67% in tree growth. The highest density of tree growth rate was also found in the mango type (M. indica) at 57 or 59.26% (Table 3).

Mango (M. indica) is a type grown by the community. Other types are teak (T. grandis), jabon (Neolamarckia cadamba), coconut (Cocos nucifera), clove (Syzygium aromaticum), ketapang (Terminalia catappa), banana (Musa paradisiaca), and guava kopo (Syzygium densiflorum). Logging is also done in the building of tourist facilities. Environmental changes result in increased light, temperature, and wind speed so that sensitive types do not survive (de Avila et al., 2015). According to Sitania et al. (2018), tourist activities contribute to changes in vegetation at the site.

The results of data processing showed a moderate bird species diversity index (1.43) with 1.25 species richness, moderate mammal species diversity index (1.14) with 1.36 species richness and moderate herpetofauna species diversity index (1.48) and 1.59 species richness. The diversity of species found at tourist sites is presented in Table 4.

Trachypithecus auratus is a primate endemic to Java, Bali and Lombok whose population and habitat are increasingly concerning (Santono et al. 2016). According to Indriyati et al. (2017), grouping is a strategy for T. auratus to survive. Generally, this species lives in groups with an individual number of between 6-20 individuals (Indriyati et al. 2017) or 8-17 individuals (Mustari and Pasaribu 2019).

Based on observations and interviews conducted, there was 1 individual of T. auratus in tourist sites. This indicates the occurrence of population disturbances or disturbances to their habitat. According to Sulistyadi (2013), population decline and changes in spatial distribution caused by anthropogenic disturbances such as human activities and habitat fragmentation have caused T. auratus to live isolated.

Table 3 The highest K and KR at all growth levels

Growth rate	Local name	Scientific name	Parameters	
			K	KR (%)
Seedling	Jambu kopo	*Syzygium densiflorum*	1786	29.41
Stake	Mahoni	*Swietenia mahagoni*	743	46.43
Pole	Jati	*Tectona grandis*	86	50.00
Tree	Mangga	*Mangifera indica*	57	59.26

Table 4 Diversity of bird species in tourist sites

Local name	Scientific name	Family	Total
Birds			
Cekakak sungai	*Todiramphus chloris*	Alcedinidae	5
Perenjak	*Prinia familiaris*	Cisticolidae	7
Cabe jawa	*Dicaeum trochileum*	Dicaeidae	2
Layang-layang	*Hirundo rustica*	Hirundinidae	25
Madu sriganti	*Nectarinia jugularis*	Nectariniidae	2
Gereja	*Passer montanus*	Passeridae	13
Mammals			
Lutung budeng	*Trachypithecus auratus*	Cercopithecidae	1
Monyet ekor panjnag	*Macaca fascicularis*	Cercopithecidae	2
Bajing	*Callosciurus notatus*	Sciuridae	1
Tupai	*Tupaia javanica*	Tupaiidae	5
Herpetofauna			
Ular pucuk	*Ahaetulla prasina*	Colubridae	1
Tokek	*Gekko gecko*	Gekkonidae	2
Cicak rumah	*Hemidatylus platyurus*	Gekkonidae	5
Cicak batu	*Cyrtodactylus marmoratus*	Gekkonidae	10
Kadal kebun	*Eutropis multifasciata*	Scincidae	1
Biawak air	*Varanus salvator*	Varanidae	4

The long-tailed macaque (Macaca fascicularis) is a primate with a relatively even distribution on the island of Java (Anggraeni et al. 2013). Only 2 individuals of M. fascicularis were found at tourist sites. However, based on the results of interviews conducted, 10 individuals of M. fascicularis had been observed. According to Surya (2010), one group of M. fascicularis in the primary forest can consist of 10 individuals, and more than 40 individuals in disturbed habitats. The existence of M. fascicularis in tourist sites is supported by the presence of food trees cultivated by the community, namely mango (Mangifera indica). Other plant species that have the potential to be used as food for M. fascicularis include Ficus sp., teak (T. grandis), ketapang (T. catappa), bayur (Pterospermum javanicum), mahogany (S. mahagoni), and banana (Musa sp) (Santoso 1996).

Opening and widening access in the form of paving blocks and concrete roads at tourist sites can reduce the presence of amphibians and reptiles. Following the statement of Wanger et al. (2010), human activities such as development and changes in forest land have an impact on tropical herpetofauna communities by reducing the level of richness and abundance of their species. This is what causes a decrease in the index of diversity and richness of herpetofauna species found in tourist sites.

V. salvator is a widely distributed species (Setyawatiningsih 2016). Disturbance to these species is generally pelted with food. According to Alikodra (2019), wild animals have ethical values for conservation and beauty. Tourists are only allowed to see, take pictures, hear, and study their behavior.

Observations of animals at tourist sites obtained a different number from observations at comparison sites. This is following Widodo's statement (2009), that in habitats that are in good condition and away from human disturbance, it is possible to have more species.

c. Socio-Economic Impact

The availability of livelihoods, business possibilities, and increased community income were all indicators of a positive socio-economic impact. Positive socio-economic impacts are identified by the availability of livelihoods, business opportunities, and increased community income. Community business opportunities can be seen from the presence of food and beverage kiosks, homestays, pom mini, and souvenirs. Absorption of labor at tourist sites includes tour guide leaders, scavengers, managers, garbage collectors, janitors, parking attendants, and souvenir stall attendants. According to Surwiyanta (2003), tourism also creates workers in other sectors that are indirectly related to tourism, namely in the field of building and road construction such as unskilled laborers who are tasked with improving tourist facilities. Tourism provides an alternative livelihood field for the community besides agriculture. Meanwhile, the Mann-Whitney test shows that there is a significant difference between people's income in the two study locations. The average total income of the community around the comparison location is IDR 613,666 per month. The average income at tourist sites is IDR 3,160,000 per month.

d. Socio Cultural Impact

The positive socio-cultural impact identified was to provide opportunities for the community to participate in a revenue-sharing system, community empowerment, and leading sector through the distribution of tourists who need companionship or lodging to the community who have homestays. Also, It provided the formation of the KOMPEPAR community, the control of open water source closures, and open access to information technology. Self-adjustment ability is a significant characteristic of a well-functioning community group on social change (Kistanto 2016). That is seen from changes in behavior in a positive direction, especially in the ethics and art of society in communicating.

Human lifestyles are constantly evolving. The presence of technology is closely connected with human life. Increasingly open access to information due to technical advancements also causes social changes in the community surrounding the impacted location (Nugraha et al., 2015). However, the public needs to understand that technology is a tool that assists humans in achieving their needs and that it must be used wisely

2. ***Identical Location Conditions but without Tourism***

a. **Physical Parameters**

The waters at the comparison location were colorless, the temperature was 24 C, and the brightness was 0.32 m. It follows Effendi's statement (2003) that natural waters are colorless. The average temperature was 25.83oC, with a humidity of 88.33%. Environmental conditions showed natural conditions, and there was no function of land into physical buildings or vandalism. There was only organic waste such as dried leaves, twigs, and various other vegetation remnants.

b. **Biological Parameters**

The results of vegetation analysis obtained 33 types from 16 families. The highest frequency of plant species was mahogany (S. macrophylla) at 23.53%, which was the growth rate of stakes and the 23.08% growth rate of trees. The highest density of tree growth rate was also found in mahogany (S. macrophylla) at 50 or 46.67%.

The results of animal observations varied for each taxon. The results of data processing showed a moderate bird species diversity index (2.44) with a species richness of 3.13, a moderate mammalian species diversity index (1.51) with a species richness of 1.8 and a moderate herpetofauna species diversity

index (1.5) and a species richness of 1.59. The diversity of species found at the comparison sites is presented in Table 5.

c. Socio-Economic Parameters

Respondents in the interview were primarily female (86.67%) aged 26-35 years (43.33%). Most work in the agricultural sector (40%). The acceptance of community respondents mostly ranges from Rp 100,000-400,000, with an average overall income of Rp 613,666.

d. Socio-Cultural Parameters

The people of Waluran village are influenced by Sundanese culture. People live side by side with the distance between close houses so that relations between communities are maintained well. In general, public education only finished elementary school (60%) or did not finish elementary school (23.33%). Low education led to an understanding of the terms, substance, and low geopark objectives. 83.3% of the public did not understand the geopark concept, while 16.7% thought that geopark was the same as Palangpang Beach. Inadequate education and lack of skills caused people to expect the existence of adequate livelihoods. Nevertheless, the hereditary beliefs of the people's ancestors gave a set of rules and beliefs not to exploit the forest.

Table 5 Keanekaragaman jenis satwa di lokasi pembanding.

Local name	Scientific name	Family	Total
Bird			
Elang brontok	*Nisaetus cirrhatus*	Accipitridae	1
Cekakak sungai	*Todiramphus chloris*	Alcedinidae	6
Cekakak jawa	*Halcyon cyanoventris*	Alcedinidae	5
Raja udang	*Alcedo coerulescens*	Alcedinidae	10
Walet	*Collokalia linchi*	Apodidae	20
Sepah kecil	*Pericrocotus cinnamomeus*	Campephagidae	2
Perenjak	*Prinia familiaris*	Cisticolidae	8
Tekukur	*Spilopelia chinensis*	Columbidae	4
Wiwik	*Cacomantis merulinus*	Cuculidae	5
Kedasi hutan	*Surniculus lugubris*	Cuculidae	2
Cabe jawa	*Dicaeum trochileum*	Dicaeidae	8
Bondol jawa	*Lonchura leucogastroides*	Estrildidae	8
Bentet kelabu	*Lanius schach*	Laniidae	4
Paok pancawarna	*Pitta guajana*	Pittidae	2
Beluk ketupa	*Ketupa ketupu*	Strigidae	2
Mammals			
Kucing kuwuk	*Prionailurus bengalensis*	Felidae	1
Tupai	*Tupaia javanica*	Tupaiidae	6
Bajing tanah	*Lariscus insignis*	Sciuridae	2
Bajing	*Callosciurus notatus*	Sciuridae	5
Babi hutan	*Sus scrofa*	Suidae	1
Musang	*Paradoxurus hermaphroditus*	Viverridae	1
Herpetofauna			
Bunglon surai	*Bronchocela jubata*	Agamidae	7
Bufo asper	*Phrynoidis aspera*	Bufonidae	1
Cicak batu	*Cyrtodactylus marmoratus*	Gekkonidae	7
Ular air pelangi	*Enhydris enhydris*	Homalopsidae	1
Katak sawah	*Fejervarya cancrivora*	Ranidae	2
Kadal kebun	*Eutropis multifasciata*	Scincidae	4

3. **Impact of Tourism Activities in Ciletuh-Palabuhanratu Geopark**

The impact of tourist activities in CPG consisted of positive and negative impacts that impacted society's physical, biological, socio-economic, and socio-cultural aspects. The impact on the physical aspect was the increase in air temperature and the decrease in humidity. The increase in temperature also occurred in water, changes in watercolour, and a decrease in water brightness. The impact on the physical aspects of the soil was the occurrence of physical compaction of the soil and the disposal and processing of waste that was not environmentally friendly.

The impact of biologicals was identified from changes in the composition of plant types and the emergence of cultivation of several types of plants. Meanwhile, the impact on wildlife was seen from changes in the composition of animal encounters, decreases in H' value, and decreases in Dmg values throughout equivocal (except for Dmg for herpetofauna). Tourist activities also indicated the type of T. auratus of isolated living and provided an opportunity to disrupt V. salvator type. The positive socio-economic impact was identified from the availability of livelihoods and business opportunities to increase the community's income around tourist sites. The resulting labor absorption included tour guide leaders, managers, janitors, parking attendants, stand attendants, scavengers, and collectors. Meanwhile, tourist activities also opened business opportunities through food and beverage stands, homestays, mini poms, souvenir stands, and the establishment of homestays with an average revenue increase of Rp 2,546,334. Another positive impact was to provide opportunities for the community to participate in a revenue-sharing system, community empowerment, and leading sector through the distribution of tourists who need assistance or lodging to the community who had homestays. Also, it was the formation of the KOMPEPAR community and the control of open water source closures and open access to information technology.

CONCLUSION

Tourist activities in CPG impact physical changes in water, physical compaction of soil, garbage hoarding, increase in average air temperature and decreased humidity. Those are the changes in the composition of plant species, and the composition of animal species encounters decreased H' and Dmg all equivocal except Dmg herpetofauna. It also disruption of wildlife, such as the availability of new livelihoods, and business opportunities. The last is increased community income, providing opportunities for people who live in tourist areas to participate and open access to technology and information developments.

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