



## Local wisdom of the people of Rengel village in maintaining environmental sustainability in the Ngerong Cave ecotourism area

Avivi Nur Aina, Imas Cintamulya\*

Biology Education Department, PGRI Ronggolawe Tuban University, East Java, Indonesia

Email: aavivinur@gmail.com, cintamulya66@gmail.com\*

Article Information	ABSTRACT
Submitted: 2022 – 08 – 04 Accepted: 2022 – 10 – 26 Published: 2022 – 10 – 26	<p>The condition of environmental sustainability in Indonesia is decreasing along with the times. People tend to focus on function without thinking about how to preserve nature. Ngerong Cave is one of the uses of nature as a tourist attraction and an area for meeting the needs of the people of Rengel Village, Tuban. The utilization of the Ngerong Cave creates new problems, such as the amount of garbage and detergent waste that pollutes the Ngerong aquatic environment. Utilizing nature without paying attention to environmental conditions will harm environmental sustainability if it occurs continuously. Therefore, efforts need to be made to maintain an integrated and sustainable environment. This effort can be done by applying the local cultural values of the community. Internalization of local cultural values can build public awareness of environmental conservation awareness. This research is descriptive qualitative and quantitative research. This study aims to explain the relevance of local cultural values to environmental sustainability which is supported by empirical data in the form of the abundance of aquatic biota in Ngerong Cave and plant diversity in Ngerong Cave and direct observations related to environmental conditions. The results of the study conclude that the internalization of local cultural values affects ecological sustainability in the Ngerong Cave area.</p> <p><b>Keywords:</b> Biological diversity; ecotourism; local wisdom</p>
<b>Publisher</b> Biology Education Department IKIP Budi Utomo, Malang, Indonesia	<b>How to Cite</b> Aina, A., & Cintamulya, I. (2022). Local wisdom of the people of Rengel village in maintaining environmental sustainability in the Ngerong Cave ecotourism area. <i>Edubiotik : Jurnal Pendidikan, Biologi Dan Terapan</i> , 7(02), 91-102. <a href="https://doi.org/10.33503/ebio.v7i02.2064">https://doi.org/10.33503/ebio.v7i02.2064</a>
	Copyright © 2022, Aina & Cintamulya This is an open access article under the <a href="https://creativecommons.org/licenses/by-sa/4.0/">CC-BY-SA</a> license 

### INTRODUCTION

The karst landscape is vast, covering almost 15% of the world's land surface (Ren et al., 2021). In Indonesia, karst landscapes have an area of approximately 15.4 million hectares same is 20% of the total area of Indonesia. This area is spread in various regions, one of which is in Tuban (Irianto et al., 2020). Tuban is a karst area located in the north of Java Island. This city has a variety of karst. In general, there are two karst areas, namely in the form of dry caves with generally inactive ornaments. There is also a cave under the foothills, with the characteristics of a watery cave, which has an

extensive trim and is still active. Karst itself is a form of the earth's surface which have characteristics. Namely, there are caves, underground rivers, conical hills, and doline. The dissolution of lime by rainwater rich in CO<sub>2</sub> will settle and form karst areas. This deposition causes karst always to have unique characteristics and drainage and relief. Karst is composed of CaCO<sub>3</sub> or limestone, readily soluble in rainwater with an acidic pH. This dissolution is a chemical reaction to forming carbonic acid (CaCO<sub>3</sub>) from CO<sub>2</sub> gas and rainwater. Chemical reactions cause the existence of landscapes in the form of horizontal and continuous vertical sections called drainage or underground systems or underground systems. These landscapes can be *exokarst* or landscapes on the surface, as well as *endokarst* or landscapes within she (Nugroho et al., 2020).

Based on the Decree of the Minister of Energy and Mineral Resources Number 1456 K/20/MEM/2000 dated November 3, 2000, concerning Guidelines for the Management of Karst Areas, there are three groupings of karst areas in Indonesia, including 1) Karst Area I, is a karst landscape that has characteristics as an underground water storage area, has a variety of speleothems, rivers, and underground cave networks, and can be used as a source of hydrology, geology, biology, and others; 2) Karst II area has the characteristics of functioning as a secondary water source, there is a network of caves, but there are no water caves or caves in Karst II area have dry water type; 3) Karst III area does not have a characteristic, but in Karst III the area is not well developed, does not have a struggling system, and an underground river (Irianto et al., 2020). The Karst I area is widely used by the community as a source of water, especially for those who live in areas with limestone topography. Some communities have local wisdom in protecting water sources in the karst area, including the Rengel Village community, Tuban Regency, and the Gunung Kidul Community, Yogyakarta (Nugroho et al., 2020). This study aims to determine the relationship between the local wisdom of the Rengel village community and environmental sustainability in the Ngerong Cave area.

What is meant by local wisdom is a socio-cultural value in the form of knowledge, norms, and regulations that apply to the community from generation to generation, which is outlined in traditions and myths. Local wisdom is also the result of mindsets and strategies to maintain the balance of life in the universe (Seti & Zen, 2020). The existence of local wisdom is to regulate the order of life and behavior in society (Hidayati, 2017). Local wisdom is also used in some areas to maintain environmental ecosystems (Rahman et al., 2019). Local wisdom is also the result of the behavior of certain community groups in the form of experiences that are not shared by people from other regions. This local wisdom is a characteristic of a community, unique, and has an age that is almost the same as the age of the first resident of a tribe (Pamungkas et al., 2017). The local wisdom of the Rengel village community is in the form of community respect for the living creatures that live in Ngerong Cave. People believe that anyone who takes animals or causes destruction in the Ngerong area will get disaster or death.

Local wisdom slowly weakens people's lives (Hidayati, 2017). The rapid current of globalization has made people begin to organize new lives and forget about their cultures. A decline in humanist values characterizes this change, a shift in the social order, moral poverty, the degradation of natural resources and the environment, and a society that tends to depend on technology (Priyono et al., 2021). This current globalization has brought the world into the third millennial era, where there began to be a destruction of noble cultural values and local wisdom in society. In addition, current capitalism also makes society more dominant in the thinking of gains and losses compared to thinking about the origin of a source of knowledge (Thamrin, 2013). The existence of local wisdom is weakening and ignored by the community. Ignoring this local wisdom is because local wisdom is considered less relevant to the times and technological sophistication. Local knowledge has noble meanings and values that, if

maintained and cared for, and implemented in the community, will significantly impact cultural development in Indonesia (Priyatna, 2016).

Some community groups still consistently maintain and carry out local wisdom that applies to preserving wealth and environmental sustainability. An example is local wisdom in the people of the Rengel area. In Rengel Village, there is an area in the form of a water source for Ngerong Cave. Ngerong Cave is a karst area in the state of a cave at the foot of the hill and has a water source located in Rengel District, Tuban Regency, with the cave length estimated to be 1.8 km. This Cave has a biological wealth because various species use it as a place to live that maintains its habitat and sustainability. The Pisces group and mammals are mainly abundant, such as the Chiroptera family (Handayani, 2017).

The utilization of environmental sustainability in the Ngerong Cave Area as an eco-tourism area has been going on for approximately 35 years (results of personal interviews). Eco-tourism is a responsible journey and nature-based tourism with a learning concept (Asma et al., 2020). Eco-tourism activities are to observe and recognize various objects provided directly by nature (Kurniarum et al., 2015). In its development, eco-tourism is getting closer to economic, socio-cultural, and environmental aspects (Wiharjokusumo, 2020). However, the use of potential areas often causes ecological problems, such as a lack of waste management, the amount of environmental pollution in eco-tourism areas, and the decline in biodiversity (Sari & Ma'rifah, 2020). In the Ngerong Cave eco-tourism area, the highlight aspect is the socio-cultural aspect, namely the local wisdom of the community. The local knowledge still obeyed by the people and tourists of Rengel village is a myth. Myths result from the mindset of a society that contains the value of life and serves as a foundation for social livelihood (Fauzan & Aziz, 2020). In the Rengel area, a myth developed that anyone who eats or takes animals in the Ngerong Cave area will have visited by catastrophe. Until now, most of the people of the Rengel area and tourists still believe in and obey local wisdom, which makes preserving abundance and biodiversity in the Ngerong Cave eco-tourism area. Based on the above background, this study aims to describe the relationship between local wisdom in maintaining abundance and environmental sustainability in the Ngerong Cave ecotourism area.

## RESEARCH METHODS

This research is in the Ngerong Cave area (7° 03'37"LS; 112° 00'19"BT), Rengel District, Tuban Regency. Map of the research location of the Ngerong Cave (Figure 1). The research on Ngerong Cave is for two months, from February-March 2022. Researchers are present every Saturday and Sunday at the end of the week.

This research is a quantitative descriptive study. Data collection uses interview and questionnaire techniques to obtain data on community compliance with local wisdom in the eco-tourism area of Ngerong Cave and data on social and economic aspects of community activity in the Ngerong Cave area's environmental sustainability. Interview instruments are structured interview guidelines and questionnaire sheet instruments guided by the Likert scale. The questionnaire sheet consists of 5 indicators. The determination of research respondents is by *accidental sampling* technique, which is to conduct interviews with anyone in the eco-tourism area for a time, which in this case is a tourist. To determine community respondents was carried out by *random sampling* techniques and by conducting interviews with the caretaker of Ngerong Cave and community leaders (Asma et al., 2020).

Collecting data on the abundance of Bader fish and bat species as endemic in the Ngerong Cave area and data on plant biodiversity in the Ngerong Cave eco-tourism area using observation methods

with instruments in the form of observation sheets. Data collection involves making observations, recording the results, and subsequently tabulating.

Analysis of data from interviews and community responses with quantitative descriptions The frequency of community response results is categorized on a scale of 1 to 5. The answer is said to be very good if it gets a score of 76%-100%, suitable from 51% to 75%, relatively good from 26% to 50%, and not good from 0% to 25% (Pranatawijaya et al., 2019).

Data on the abundance of Bader and batfish species, as well as data on high-level plant biodiversity, were then tabulated. The calculation of the Shannon-Wiener diversity index was carried out (described in equation 1). The formula is as follows:

$$(H') = - \sum_{i=1}^S P_i \ln P_i \quad \frac{ni}{N} \quad (1)$$

Information:

H'= Shannon-Wiener diversity index

Pi= Relative abundance of i-th species

ni= number of individuals of an i-th type

N= total number of individuals of all kinds of species

S= number of classes (individuals)

The measurement of the Shannon-Weiner level of diversity is as follows:

H' < 1= Low level of species diversity

1 < H' < 3= Moderate level of species diversity

H' > 3= High level of breathability

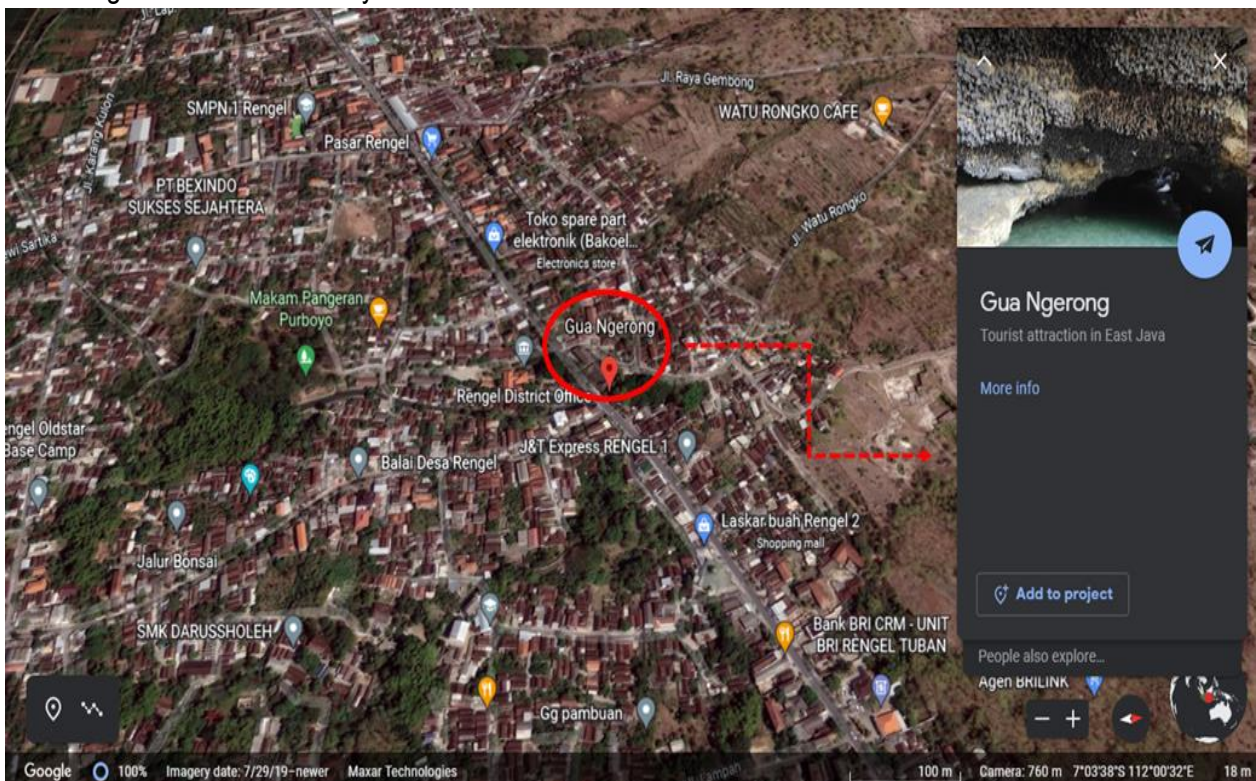


Figure 1. Location of The Ngerong Cave Eco-tourism Area

## FINDING AND DISCUSSION

The data collected in this study include data on 1). Community observance of local wisdom in the Ngerong Cave eco-tourism area (presented in Figure 2); 2) community activities in socio-economic aspects in the Ngerong Cave area towards the environment of sustainability (shown in Figure 3); 3) the abundance of Bader fish and bat species as endemic to the Ngerong Cave area (presented in Table 1); 4) plant biodiversity in the Ngerong Cave eco-tourism area (shown in Table 2).

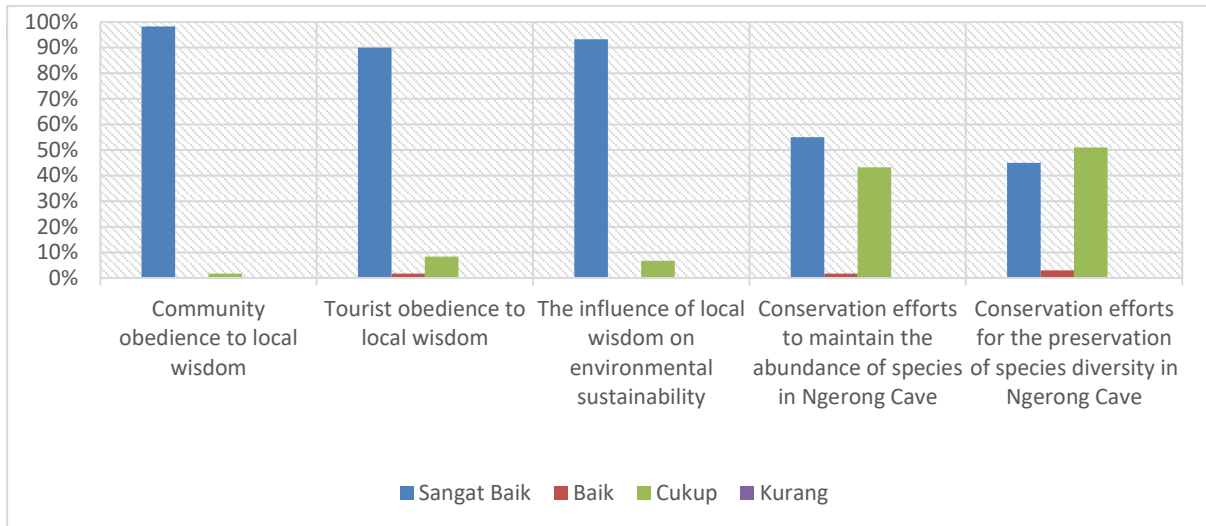


Figure 2. Data on Community Observance of Local Wisdom

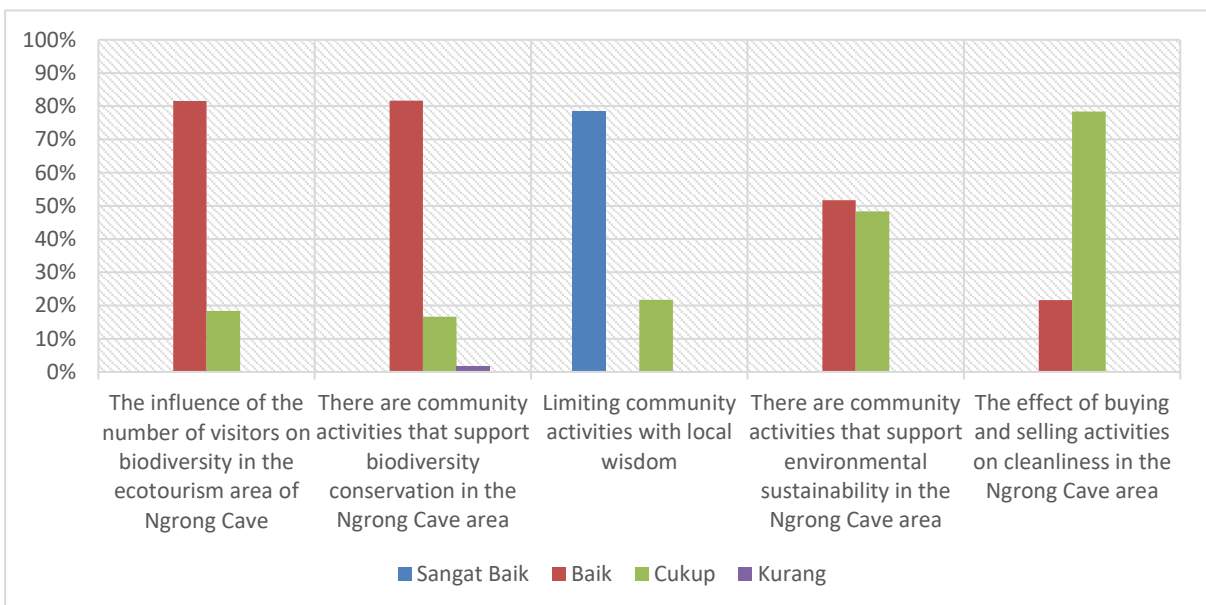


Figure 3. Data on the Effect of Activities on Environmental Sustainability

**Table 1. Water Biota Species Diversity Index**

No.	Family Name	Genus/Species Name	IUCN	Sum	Pi =(N/n)	Ln Pi	Pi In Pi
1.		<i>Barbonymus schwanenfeldii</i>	Safe	300	0,32715376	-1,117325	-0,36553708
2.	Cyprinidae	<i>Barbonymus gonionotus</i>	Safe	600	0,65430752	-0,42417782	-0,27754274
3.		<i>Cyprinus sp</i>	Safe	3	0,00327154	-5,72249518	-0,01872136
4.	Clariidae	<i>Clarias sp.</i>	Safe	12	0,01308615	-4,33620082	-0,05674418
5.	Trionychidae	<i>Amyda sp</i>	Vulnerable	2	0,00218103	-6,12796029	-0,01336524
			Entire	917		H'	<b>0,731910584</b>

**Table 2. Plant Diversity in Ngerong Cave Ecotourism Area**

No	Family Name	Genus/Species Name	Lifestyle	Abundance
1.	Agavaceae	<i>Sansevieria parva</i>	Terrestrial	+++
2.	Anacardiaceae	<i>Mangifera indica</i>	Terrestrial	++
3.		<i>Lannea sp</i>	Terrestrial	+
4.	Annonaceae	<i>Polyaltha longifolia</i>	Terrestrial	++
5.		<i>Annona squamosa</i>	Terrestrial	+
6.		<i>Xanthosoma sagittifolium</i>	Terrestrial	+
7.	Araceae	<i>Aglaonema sp</i>	Terrestrial	++
8.		<i>Dieffenbachia sp</i>	Epiphytes	++++
9.		<i>Monstera sp</i>	Epiphytes	+++
10.	Araliaceae	<i>Hedera sp</i>	Hang	+
11.	Arecaceae	<i>Pritchardia Pacifica</i>	Terrestrial	+
12.		<i>Cordyline sp.</i>	Terrestrial	++
13.	Asparagaceae	<i>Agave americana</i>	Terrestrial	+
14.	Caprifoliaceae	<i>Viburnum dentatum</i>	Terrestrial	+
15.	Celastraceae	<i>Celastrus sp</i>	Terrestrial	+
16.	Commelinaceae	<i>Rheo discoloration</i>	Terrestrial	++++
17.	Euphorbiaceae	<i>Excoecaria sp</i>	Terrestrial	+
18.	Malvaceae	<i>Hibiscus sp</i>	Terrestrial	+
19.		<i>Ceiba pentandra</i>	Terrestrial	+
20.	Moraceae	<i>Ficus benjamina</i>	Terrestrial	++++
21.	Muntingiaceae	<i>Muntingia calabura</i>	Terrestrial	++
22.	Musaceae	<i>Moses sp.</i>	Terrestrial	+
23.	Myrtaceae	<i>Psidium guajava</i>	Terrestrial	+
24.	Phyllanthaceae	<i>Sauous androgynus</i>	Terrestrial	+
25.	Putranjivaceae	<i>Drypetes sp</i>	Terrestrial	+
26.	Zingiberaceae	<i>Curcuma sp</i>	Terrestrial	+

Information

- + = 1 to 5 individuals
- ++ = 6 to 10 individuals
- +++ = 11 to 15 individuals
- ++++ = > 15 individuals

Ngerong Cave is a karst area that has a water source Cave that has been used for eco-tourism for a long time. The existence of Ngerong Cave as a cave with a large category becomes a habitat for various types of endemic karst biodiversity, ranging from multiple species of bats to aquatic biota, and different kinds of plants (Suhardjono et al., 2021). Biological sustainability in the Ngerong Cave area has maintained action until now. The abundance can see for of bat and Bader fish species that inhabit the Ngerong Cave area with hundreds to thousands. The preservation of biodiversity in the Ngerong Cave

area is because the community and tourists who visit the Ngerong Cave area respect the local wisdom by not taking or damaging anything around the Ngerong Cave area. Local knowledge in the form of myths in the area, namely, if someone takes something in Ngerong Cave without permission, it is believed that the person will be a bala' or a catastrophe. The same local wisdom also exists in the Manggarai community, and they think that if anyone takes animals or plants without permission, they will get bala' in the form of the disease (Iswandono et al., 2015).

The observance of the community and tourists to local wisdom in the eco-tourism area is said to be very good based on the data in Figure 1. The existence of adherence to local knowledge has a positive impact on the biodiversity of the Ngerong Cave area. Similar research carried out in the karst water sources in the Tulungagung area and agricultural regions of the Dayak tribe in Kalimantan showed that local wisdom could maintain ecosystems and a sustainable environment (Kurniawati et al., 2020; Murhaini & Achmadi, 2021) Further interviews with caretakers and community leaders, as well as some respondents, said they had heard word-of-mouth or *folklore* stories that there was a past incident that caused someone to die from taking Bader fish and bats in the Ngerong Cave area. These stories further make the community and tourists in the Ngerong Cave area believe that what is in the Ngerong Cave area must be maintained and protected.

Community stories or *folklore* about the existence of Ngerong Cave and the sacredness of the animals in Ngerong Cave are the main attractions for tourists and the community of Ngerong Cave. Apart from being a myth, this local wisdom is crucial in maintaining biological sustainability in the Ngerong Cave area. Conservation of the environment and biodiversity in the Ngerong Cave area is a form of success in internalizing the value of local wisdom in protecting the environment must also be balanced with conservation or maintenance efforts from the local government. From the results of interviews and data on the distribution of questionnaires, conservation efforts for animals and plants in the Ngerong Cave area have not lived carried out correctly. Special maintenance needs to be needed to protect biodiversity in the Gua Ngerong area.

The existence of Ngerong Cave as an eco-tourism in the Rengel area is a commercial field for several people living around Ngerong Cave. Some people depend on trading results in the Ngerong Cave eco-tourism area. The results of interviews with sworders in the Ngerong Cave eco-tourism area vary in the length of trading. There is even a trader who said he has been trading in the Ngerong Cave area for about 35 years. The vendors in the Ngerong Cave area, in addition to providing food for visitors, also provide food for aquatic biota in the Ngerong Cave area in the form of bread, shrines, seeds of randu plants, etc. to be resold to visitors. Many visitors to the Ngerong Cave area influence the sustainability and survival of aquatic biota in Ngerong Cave. Every time visitors come to Ngerong Cave, they interact with marine biota by feeding the fish and turtles food from buying from traders or food brought by themselves from home.

Besides having an impact on biological sustainability, trade activities and tourists also impact environmental cleanliness in the Ngerong Cave eco-tourism area. The cleanliness in the Ngerong Cave area still needs to be improved and needs special attention. From the results of limited observations, researchers still see a large number of tourists who litter, thereby reducing aesthetics and polluting the environment of Ngerong Cave. Temporary Shelters (TPS) in the Ngerong Cave area are not feasible because some traders use cardboard as trash cans. The village government needs to provide proper temporary shelters (TPS) spread overcrowded points for visitors.

Efforts to clean the environment in the eco-tourism area of Ngerong Cave are utilizing a periodic system. However, routine cleaning is still not optimal for maintaining cleanliness because it is only with a

gathering system. The garbage in the Ngerong Cave area is the responsibility of each trader. Merchants must clean up and collect trash scattered around the merchant area. The results of the waste collection will be transported by the village garbage transport car every three times a week, or at least once every two days. Researchers still found a lot of garbage scattered in the Ngerong Cave area, indicating that the site's cleanliness should increase. The amount of waste will also rise dramatically on weekends, Saturdays, and Sundays. The same thing also happened in the new tourist attraction area in the Bantul area, Jogjakarta (Darmawi, 2017), in the coastal tourist area of Bengkulu City, where there was still a lot of garbage scattered (Enggara et al., 2019).

The results of an interview with the Rengel village government said that the availability of temporary dumping grounds for traders is the responsibility of each trader. The village administration's efforts are to transport the waste the traders have collected. The village government has also provided temporary disposal sites in the form of barrels placed at several points in the Ngerong Cave area. In the Ngerong Cave area, there is also a ban on disposing of garbage in the Ngerong Cave flow area in the form of billboards installed on the banks of the Ngerong cave river. However, these efforts have not been optimal in maintaining the cleanliness of the Ngerong Cave tourist area. The village government needs to make efforts to check the tourist area so that it always knows the condition of the preservation of Ngerong Cave as well as a step to determine the cleanup efforts that should promote in the Ngerong Cave area.

The support of the community and tourists in terms of environmental sustainability in the Ngerong Cave area certainly needs to be improved. The results showed that public awareness and tourists to maintain ecological sustainability are still low. Researchers also found a lot of garbage scattered inside the Ngerong Cave eco-tourism area, mainly plastic food wrapping waste and leaf litter. Another activity that can potentially reduce environmental sustainability is that several sellers are still disposing of liquid waste and using detergent chemicals in the Gua Ngerong river area. Over time, this can disrupt the oxygen and ecosystem balance in the waters of Ngerong Cave. Researchers also interviewed visitors who said that tourists were not comfortable being disturbed because of community activities such as washing and defecating activities in the waters of Ngerong Cave.

The existence of caves in an area is a habitat for the various biological diversity of animals and plants. The endemic species that commonly inhabit a Cave is the Chiroptera family or bats. The existence of bats in a cave today has decreased a lot. The decrease in bats in the Cave area is due to mining activities in the Cave area, noise from human activities, hunting, and fishing for consumption and trade. The Chinese state also experiences fears of species extinction in karst areas, that species diversity in karst areas is gradually beginning to be threatened by tourism activities, exploitation of natural resources, and agricultural activities in karst landscape areas (Ren et al., 2021b). Bats that inhabit a cave in Indonesia consist of two types: Megachiroptera or fruit-eating bats, and Microchiroptera, or insectivorous bats (Awalyah et al., 2019). These two bats also inhabit the Ngerong Cave karst area in Tuban Regency.

Ngerong Cave is a habitat for various types of plants and karst animals. The eco-tourism area of Ngerong Cave is the habitat of the Chiroptera family, who live hanging on the Cave dinging, and the Cyprinidae family. They live along the Ngerong Cave river's flow from the Cave's source downstream. The existence of various animals and plants in the Ngerong Cave area makes Ngerong Cave an ecosystem-balancing area in the Tuban area. The results of the Ngerong Cave research found that there were nine species from four families of Chiroptera that lived in Ngerong Cave, including the species *Hipposideros larvatus*; *Hipposideros Diadema*; *Miniopterus schreibersi*; *Miniopterus pusillus*;



*Miniopterus australis*; *Megaderma spasma*; *Ronsettus amplexicaudatus*; *Rousettus leschenaultia*; *Eonicterys spelaea* (Prakarsa, 2013).

This Chiroptera has a very abundant number, with thousands of species hanging along the walls of Cave to the mouth of the Cave. In addition to Chiroptera, many species inhabiting the Ngerong Cave are the bader fish or Cyprinidae. Ecological studies in China show that the family Cyprinidae dominates the karst river area. This species has unique characteristics and is different from other fish species in terms of morphology and physiology. This difference is because species in the family Cyprinidae live in areas with two different light intensities: in caves with low light intensity and outside caves with average light intensity (Xu et al., 2021). This biota lives along the flow of the Gua Ngerong river with a vast number of up to thousands. However, researchers only predicted the number of bader fish in the river in the cave mouth area to the river's upper reaches. In addition to bader fish, in the Ngerong Cave stream, there are also dumbo catfish or *Clarias sp*, estimated to be 12 individuals with a length of *Clarias sp* of approximately 60 cm and a diameter of 15 cm, and a height of 8 cm. The Ngerong Cave stream is also a habitat for koi fish (*Cyprinus sp*) and bulus or *Amyda sp*. Various species of these aquatic biotas coexist in the absence of predation. These different types of aquatic organisms are in a low diversity status because Bader fish species only dominate the aquatic biota that lives in the Ngerong river flow. The marine biota that lives on the Ngerong river is mostly in safe conservation status, while the bulus species, which number 2 individuals, are in threatened conservation status according to the IUCN or *The International Union for Conservation of Nature* (refer to the IUCN website). The abundance of Chiroptera species and Bader fish in Ngerong Cave is the biological wealth of Ngerong Cave which must be maintained and protected for its existence. These various species can also as an indicator of the environmental sustainability of the Ngerong Cave area.

Protecting various types of aquatic biota and Chiroptera in the Ngerong Cave area is necessary. The first step in a protection effort is to know the conservation status of each animal that inhabits the Ngerong Cave. In addition to paying attention to biodiversity, the ecological maintenance of the karst aquifer system also needs attention because it is a habitat for aquatic biota in the karst area. The care of karst aquifers has so far received less attention and is more focused on their utilization alone (Kulaš et al., 2021). The government also needs to maintain the species and protect the species from human activities that cause the threatened existence of the species that inhabit Ngerong Cave.

Plant diversity in the karst area until now is still minimally published. Research on karst areas as habitats for plants is still very minimal. Karst areas can potentially have high plant diversity (Istomo & Dwisutono, 2016; Yang et al., 2021). This potential is because karst has a unique rock structure and topsoil or fertile upper soil. Various plants that live in the karst area also generally have particular morphological and root types. Plants in the karst area affect the diversity of biota and insects or animals that inhabit the karst area (Istomo & Dwisutono, 2016).

Research on plant biodiversity by researchers in the eco-tourism area of Ngerong Cave. Based on the observations, at least 26 species of high-level plants were found that grow in the Ngerong Cave eco-tourism area. These plants range from shrubs and herbs to spermatophyte plants. Researchers also took measurements on abiotic factors in the Ngerong Cave eco-tourism area, including soil pH of 7.5, a temperature of 27°, and air conditions in the Ngerong Cave area that were dry during the day. The high-level plant that dominates in the Ngerong Cave area is *the Ficus sp* species. Research states that *Ficus sp* plants have a high tolerance to extreme environmental conditions, are resistant to stress, generally become stands that dominate tropical forest areas or areas with tropical weather, and are plants that like alkaline soils (Elhawary et al., 2018; Solis et al., 2016). This plant is also a counterweight

to the ecosystem in the Ngerong Cave area because it is a food provider for *Megachiroptera*, who live in Ngerong Cave. Another plant that dominates the Cave area is the *Sansevieria sp* and *Rheo discolor*. This plant can use as an ornamental plant. Researchers have found many of these two species live in groups.

Various plants in the eco-tourism area of Ngerong Cave tend to be left wild without treatment. Efforts are needed to conserve plants in the Ngerong Cave area. The first step in plant conservation is to know the conservation status of plants. Conservation status is a status on a species granted by the *International Union for Conservation of Nature*. The conservation status at IUCN can help the government determine the next conservation steps for the diversity of plants in the Ngerong Cave area.

## CONCLUSION

The local wisdom of the people of Rengel Village influences maintaining biological sustainability in the Ngerong Cave eco-tourism area. The abundance sees natural sustainability in the Ngerong Cave of Bader fish species that live along the Ngerong river flow and the number of bat species or Chiroptera on the walls of the Cave. These two species number up to thousands of individuals. The biodiversity of the Ngerong Cave eco-tourism area can see in the many plants that grow in the Ngerong Cave eco-tourism area, of which there are at least 26 high-level plants. The village government must conduct conservation activities to maintain sustainability and biodiversity in the Ngerong Cave ecowista area.

## ACKNOWLEDGMENT

Thank you, the author, thanks to mom Dr. Imas Cintamulya, M.Si, who has been guiding and directing the author in implementing this research. thank you, Rengel village, for allowing me to do research in the Ngerong Cave area. thank you to friends who always already accompanied my research, Lailatul, and Anisa

## REFERENCE

- Asma, D., Rahmawati, M., & Cintamulya, I. (2020). *Partisipasi Masyarakat Dalam Pengelolaan Lingkungan Ekowisata Di Mangrove Center Kabupaten Tuban Community Participation in Ecotourism Management in the Mangrove Center of Tuban district*. 13, 2–8. <https://doi.org/10.20961/bioedukasi-uns.v13i2.42389>
- Awalyah, S.N, Rumende, R.R.H, Lengkoang, H.J. (2019). Kelimpahan Dan Kekayaan Spesies Kelelawar Di Gunung Tangkoko Sulawesi Utara. *Pharmachon*, 8(3). <https://doi.org/10.35799/%20pha.8.2019.29391>
- Darmawi, A. (2017). Potensi Timbulan Sampah Pada Objek Pariwisata Baru Di Kabupaten Bantul Yogyakarta. *Jurnal Penelitian Teknologi Industri*, 9(1), 61–71. <http://dx.doi.org/10.33749/jpti.v9i1.%202907>
- Elhawary, S. S., Younis, I. Y., El Bishbishy, M. H., & Khattab, A. R. (2018). LC–MS/MS-based chemometric analysis of phytochemical diversity in 13 *Ficus* spp. (Moraceae): Correlation to their in vitro antimicrobial and in silico quorum sensing inhibitory activities. *Industrial Crops and Products*, 126(October), 261–271. <https://doi.org/10.1016/j.indcrop.2018.10.017>
- Enggara, R., Bahrum, Z., & Suherman, D. (2019). Kajian Mekanisme Penyebaran Sampah Di Kawasan Pantai Pariwisata Kota Bengkulu Sebagai Penyebab Degradasi Nilai-Nilai Ekowisata. *Naturalis: Jurnal Penelitian Pengelolaan Sumber Daya Alam dan Lingkungan*, 8(2), 39–48. <https://doi.org/10.31186/naturalis.8.2.9208>
- Fauzan, A., & Aziz, L. A. (2020). Kearifan Lokal Tentang Mitigasi Bencana Di Kabupaten Lombok Utara Dalam Mitos Telaga Lindur. 6(2), 184–190. <https://doi.org/10.23887/jiis.v6i2.29941>

- Handayani, W. (2017). Local Knowledge Analysis for Animal Water Sustainability At Ngerong. *Economic and social of fisheries and marine*, 5(01), 90–103. <https://doi.org/10.21776/ub.ecsofim.2017.005.01.09>
- Hidayati, D. (2017). Memudarnya Nilai Kearifan Lokal Masyarakat Dalam Pengelolaan Sumber Daya Air. *Jurnal Kependudukan Indonesia*, 11(1), 39. <https://doi.org/10.14203/jki.v11i1.36>
- Irianto, S., Solihin, & Nasihin, Z. (2020). Identifikasi bentang alam karst untuk penentuan kawasan konservasi dan budidaya daerah cibarani dan sekitarnya, kecamatan cirinteun, kabupaten lebak, provinsi banten. *Jurnal Teknik*, 21(2), 47–53. <https://doi.org/10.33751/teknik.v21i2.3285>
- Istomo, & Dwisutono, A. N. (2016). Struktur dan Komposisi Tegakan Serta Sistem Perakaran Tumbuhan pada Kawasan KARST Di Taman Nasional Bantimurung-Bulusaraung, Resort Pattunuang-Karaenta. *Jurnal Silvikultur Tropika*, 07(1), 58–67. <http://repository.ipb.ac.id/handle/%20123456789/75582>
- Iswandono, E., Zuhud, E. A. M., Hikmat, A., & Kosmaryandi, N. (2015). Integrating local culture into forest conservation: A case study of the manggarai tribe in Ruteng Mountains, Indonesia. *Jurnal Manajemen Hutan Tropika*, 21(2), 55–64. <https://doi.org/10.7226/jtfm.21.2.55>
- Kulaš, A., Gulin, V., Matoničkin Kepčija, R., Žutinić, P., Sertić Perić, M., Orlić, S., Kajan, K., Stoeck, T., Lentendu, G., Čanjevac, I., Martinić, I., & Gligora Udovič, M. (2021). Ciliates (Alveolata, Ciliophora) as bioindicators of environmental pressure: A karstic river case. *Ecological Indicators*, 124. <https://doi.org/10.1016/j.ecolind.2021.107430>
- Kurniarum, M., Prihanta, W., & Wahyuni, S. (2015). Pengetahuan Dan Sikap Masyarakat Terhadap Konservasi Penyu Dan Ekowisata Di Desa Hadiwarno Kabupaten Pacitan Sebagai Sumber Belajar Biologi. *Jurnal Pendidikan Biologi Indonesia*, 1(2009), 124–137. <https://doi.org/10.22219/%20jpbi.v1i2.3321>
- Kurniawati, E., Sumarmi, S., & Aliman, M. (2020). Participation of green environmental group and ulur-ulur local wisdom on buret lake ecotourism management in karst area of tulungagung, Indonesia. *Geojournal of Tourism and Geosites*, 30(2), 889–895. <https://doi.org/10.30892/gtg.302spl15-519>
- Murhaini, S., & Achmadi. (2021). The farming management of Dayak People's community based on local wisdom ecosystem in Kalimantan Indonesia. *Heliyon*, 7(12), e08578. <https://doi.org/10.1016/j.heliyon.2021.e08578>
- Nugroho, J., Zid, M., & Miarsyah, M. (2020). *Potensi sumber air dan kearifan masyarakat dalam menghadapi risiko kekeringan di wilayah karst ( Kabupaten Gunung Kidul , Provinsi Yogyakarta )*. 4(1), 438–447. <https://doi.org/10.36813/jplb.4.1.438-447>
- Pamungkas, A., Subali, B., & Linuwih, S. (2017). Implementasi model pembelajaran IPA berbasis kearifan lokal untuk meningkatkan kreativitas dan hasil belajar siswa. *Jurnal Inovasi Pendidikan IPA*, 3(2), 118. <https://doi.org/10.21831/jipi.v3i2.14562>
- Prakarsa, T. B. P. (2013). Diversitas Kelelawar (Chiroptera) Penghuni Gua, Studi Gua ngerong di Kawasan Karst Tuban Jawa Timur. *BIOEDUKATIKA*, 1(2), 1–56. <http://dx.doi.org/10.26555/%20bioedukatika.v1i2.4098>
- Pranatawijaya, V. H., Widiatry, W., Priskila, R., & Putra, P. B. A. A. (2019). Penerapan Skala Likert dan Skala Dikotomi Pada Kuesioner Online. *Jurnal Sains dan Informatika*, 5(2), 128–137. <https://doi.org/10.34128/jsi.v5i2.185>
- Priyatna, M. (2016). Pendidikan Karakter Berbasis Kearifan Lokal. *Jurnal Edukasi Islami Jurnal Pendidikan Islam*. 05. <https://jurnal.staialhidayahbogor.ac.id/index.php/ei/article/download/6/1>
- Priyono, C. D., Siregar, I., & Nusantara, U. G. (2021). *Degradasi Nilai-Nilai Kearifan Lokal Dalihan Na Tolu*. 9(4), 346–353. <http://journal.ipts.ac.id/index.php/ED/article/view/3175>
- Rahman, F., Akhmar, A. M., Amir, M., & Tammasse. (2019). The Practice of Local Wisdom of Kajang People to Save Forests and Biodiversity: A Cultural-Based Analysis. *IOP Conference Series: Earth and Environmental Science*, 270(1). <https://doi.org/10.1088/1755-1315/270/1/012038>
- Ren, H., Wang, F., Ye, W., Zhang, Q., Han, T., Huang, Y., Chu, G., Hui, D., & Guo, Q. (2021). Bryophyte diversity is related to vascular plant diversity and microhabitat under disturbance in

- karst caves. *Ecological Indicators*, 120(February 2020), 106947. <https://doi.org/10.1016/j.ecolind.2020.106947>
- Sari, W. P., & Ma'rifah, D. R. (2020). *Jurnal Pendidikan Biologi*. 11, 49–58. <http://etheses.uin-malang.ac.id/10437/>
- Seti, S., & Zen, M. (2020). *Lingkungan Di Desa Cimanggu Kecamatan Ngamprah Bandung Barat*. 5(1). <http://dx.doi.org/10.20527/mc.v5i1.8150>
- Solis, M. J. L., Dela Cruz, T. E., Schnittler, M., & Unterseher, M. (2016). The diverse community of leaf-inhabiting fungal endophytes from Philippine natural forests reflects phylogenetic patterns of their host plant species *Ficus benjamina*, *F. elastica* and *F. religiosa*. *Mycoscience*, 57(2), 96–106. <https://doi.org/10.1016/j.myc.2015.10.002>
- Suhardjono, Y. R., Nugroho, H., Rahmadi, C., & Sidabalok, C. M. (2021). Pedoman Inventarisasi Biota Karst dan Gua. In *Pedoman Inventarisasi Biota Karst dan Gua*. <https://doi.org/10.14203/press.343>
- Thamrin, H. (2013). Kearifan Lokal dalam Pelestarian Lingkungan ( The Lokal Wisdom in Environmental Sustainable ). *Kutubkhanah*, 16(1), 46–59. <http://dx.doi.org/10.24014/kutubkhanah.v16i1.233>
- Wiharjokusumo, P. (2020). Kebijakan Perencanaan Dan Pembangunan Desa Ekowisata Dan Pariwisata Di Indonesia. *Jurnal Ilmiah Akomodasi Agung*, 7(2). <https://doi.org/10.51827/jjaa.v7i2.50>
- Xu, C., Yan, H., & Zhang, S. (2021). Heavy metal enrichment and health risk assessment of karst cave fish in Libo, Guizhou, China. *Alexandria Engineering Journal*, 60(1), 1885–1896. <https://doi.org/10.1016/j.aej.2020.11.036>
- Yang, X., Liu, B., Bussmann, R. W., Guan, X., Xu, W., Xue, T., Xia, C., Li, J., Jiang, H., Wu, L., & Yu, S. (2021). Integrated plant diversity hotspots and long-term stable conservation strategies in the unique karst area of southern China under global climate change. *Forest Ecology and Management*, 498(July), <https://doi.org/10.1016/j.foreco.2021.119540>