

Environment Law and Natural Sustainability resources: case of Pawon Cave Area Conservation Gunung Masigit Village, Cipatat District, West Bandung

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Abstract

This study aims to examine the sustainability of the conservation of the Pawon Cave area and the factors that influence it. Sustainable development includes ecology, the region's social and economic benefits, and mining potential. The method used is a mixture of qualitative and quantitative. Herein, the community access to the Pawon Cave area is gardening, taking firewood, and taking grass. Processing and minimization of soil erosion are well managed, including a terracing system. Plants and animals in the area are maintained with no logging or hunting. The site provides benefits such as water, rice, vegetables, and fruits, as well as fertilizer for agriculture. Moreover, factors that affect the sustainability of the conservation of the Pawon Cave area are policy support from the government and having adequate human resources to manage the place. The implementation of the policy has shown that it is appropriate to support conservation efforts such as prevention of mining, preservation of springs, and protection of plants and animals in the area. Several construction facilities have also been built to support tourism. The coaching and training program for the caretaker of the Pawon Cave area is an effort to keep the area manager's human resources professionals. The incentives given by the government to the Provincial Jupel are 500,000/month, and the Regency Jupel is 450,000/month.

I. Introduction

The karst area in Indonesia covers an area of about 15.4 million hectares and is spread almost all over Indonesia. The estimated age starts from 470 million years ago to the most recent, about 700,000 years ¹. The existence of this area shows that

¹ Widodo Ismanto, 'Manajemen Pengembangan Ekowisata Kawasan Kars (Karbonat) Dengan Analisis Micro-Ros Dan Integrasi Kelembagaan Pada Wediombo Kabupaten Gunungkidul Yogyakarta', *JURNAL DIMENSI*, 7.1 (2018) <<https://doi.org/10.33373/dms.v7i1.1642>>; Renny Kurnia Hadiaty, 'Ikti fauna Di Kawasan Karst Menoreh, Jawa Tengah Dan Upaya Konservasinya [Ichthyofauna of Menoreh Karst Area, Jawa Tengah and the Conservations Efforts]', *Jurnal Iktiologi Indonesia*, 16.2 (2017); Muliana Djafar and Muh Faisal Mappiasse, 'Strategi Pengembangan Ekowisata Karst Di Dusun Rammang-Rammang Kabupaten Maros', *Gorontalo Journal of Forestry Research*, 2.1 (2019) <<https://doi.org/10.32662/gjfr.v2i1.498>>.

many Indonesian islands were once seabed but were later uplifted and hardened. One of the karst areas in West Java is the Citatah-Rajamandala Karst area which stretches from Rajamandala (border of West Bandung-Cianjur Regency) to Padalarang with a length of approximately 27 Km. Administratively the Citatah karst area is included in the Kec. Cipatat Kab. West Bandung.

According to Brahmantyo and Bachtiar ², in the Citatah area, the hills are dominated by limestone (limestone), forming hills with steep morphology and erecting rock walls. Among these hills are Pabeasan Sand, Balukbuk Sand, Panganten Karang Sand, Pawon Sand, Masigit Mountain, Bancana Sand, etc. In Pasir Pawon, there is a cave known as Pawon Cave. The Pawon cave area, with its unique rock structure, is a beautiful sight. So that this area can be used as a natural, cultural, and scientific tourist spot, sports can also be developed in this area, including cave trekking, rock climbing, cross-country, and cross-country running.

According to Brahmantyo and Bachtiar, ³ there is potential for natural resource extraction, which threatens the preservation of the unique karst ecosystem, namely the landscape, clean water reserves, the possibility of ancient sites, and "homes" for flora and fauna. Etc. The destruction of the cave can drive away hundreds of thousands of bats. If insect-eating bats are expelled, the balance of the ecosystem will be disturbed.

Conservation is one way to save an area with a very high value⁴. The general purpose of conservation is to (1) realize the preservation of living natural resources and the balance of their ecosystems so that they can better support efforts to improve the welfare and quality of human life and (2) to preserve the ability and use of living natural resources and their ecosystems in a harmonious and balanced manner ⁵. In addition, conservation is one of the efforts to maintain the

² T Bachtiar, *Wisata Bumi Cekungan Bandung* (Bandung: Truedee Pustaka Sejati, 2009).

³ Bachtiar.

⁴ Sandra Ajaps and Marcellus Forh Mbah, 'Towards a Critical Pedagogy of Place for Environmental Conservation', *Environmental Education Research*, 28.4 (2022) <<https://doi.org/10.1080/13504622.2022.2050889>>; Erin O. Sills and Kelly Jones, 'Causal Inference in Environmental Conservation: The Role of Institutions *', *Handbook of Environmental Economics*, 4 (2018) <<https://doi.org/10.1016/bs.hesenv.2018.09.001>>; Ju Hee Kim, Chang Min Kim, and Seung Hoon Yoo, 'Environmental Conservation Value of an Endangered Species: The Case of *Cypripedium Japonicum*', *Environmental Science and Pollution Research*, 28.27 (2021) <<https://doi.org/10.1007/s11356-021-14771-z>>; Ch B. Minnegalieva and others, 'Development of Environmental Conservation in Digital Era', *Procedia Environmental Science, Engineering and Management*, 7.3 (2020).

⁵ Julissar An-Naf, 'Pembangunan Berkelanjutan Dan Relevansinya Untuk Indonesia', *Jurnal Madani*, 2 (2005); Asma Luthfi and Atika Wijaya, 'Persepsi Masyarakat Sekaran Tentang Konservasi Lingkungan', *KOMUNITAS: International Journal of Indonesian Society and Culture*, 3.1 (2013) <<https://doi.org/10.15294/komunitas.v3i1.2290>>; Alviano Ottohan Octavianus Rumimpunu, 'Kajian Hukum Konservasi Sumber Daya Alam Hayati Dan Ekosistemnya Di Indonesia', *LEX ET SOCIETATIS*, 8.4 (2020) <<https://doi.org/10.35796/les.v8i4.30905>>.

preservation of animals. Without conservation, it will cause damage to the natural habitat of animals.

The thing that underlies the importance of the conservation of Pawon Cave is its very high strategic value which is beneficial for science, economy, and human culture. The discovery of archaeological sites in the form of stone tools, earthenware, andesite chunks as crushing tools and animal bones (teeth, nails, jaws) in the Pawon Cave environment is a spectacular archaeological find in West Java. The large objects (flakes and stone tools of red jaspir, green jaspir, translucent chalcedony, and mountain glass) show how intensively prehistoric humans used Pawon Cave as shelter.

Sustainable development is a development that can meet the needs of the present generation without compromising future generations' ability to meet their needs⁶. The development and management of an area must, of course, comply with environmental principles by paying attention to environmental aspects⁷. Development must also be carried out in a participatory process and provide economic benefits for the people living around the area⁸. Development that pays attention to these three aspects is the core of sustainable development⁹.

2. Research Method

Quantitative Method

Data analysis was used to describe each of the variables studied, namely: physical and social conditions in the Pawon Cave area, Gunung Masigit village, Cipatat district, West Bandung regency, and the sustainability of the Pawon Cave

⁶ Raras Endarto, Totok Gunawan, and Eko Haryono, 'Kajian Kerusakan Lingkungan Karst Sebagai Dasar Pelestarian Sumberdaya Air (Kasus Di Das Bribin Hulu Kabupaten Gunungkidul Daerah Istimewa Yogyakarta)', *Majalah Geografi Indonesia*, 29.1 (2016) <<https://doi.org/10.22146/mgi.13099>>; Charles Kapioru, 'Identifikasi Objek Wisata Potensial Dan Strategi Pengelolaan Dalam Mendukung Pendapatan Asli Daerah Pemerintah Kota Kupang', *Jurnal Inovasi Kebijakan*, 4.1 (2019) <<https://doi.org/10.37182/jik.v4i1.29>>; An-Naf; Rumimpunu.

⁷ Davide Tonini and others, 'Quantitative Sustainability Assessment of Household Food Waste Management in the Amsterdam Metropolitan Area', *Resources, Conservation and Recycling*, 160 (2020) <<https://doi.org/10.1016/j.resconrec.2020.104854>>; Seul Ye Lim, So Yeon Park, and Seung Hoon Yoo, 'The Environmental Conservation Value of the Saemangeum Open Sea in Korea', *Sustainability (Switzerland)*, 9.11 (2017) <<https://doi.org/10.3390/su9112036>>; Lasse Loft and others, 'Fair Payments for Effective Environmental Conservation', *Proceedings of the National Academy of Sciences of the United States of America*, 117.25 (2020) <<https://doi.org/10.1073/pnas.1919783117>>.

⁸ Grégoire Meylan, 'Solid Waste Management of Small Island Developing States — the Case of the Seychelles : A Systemic and Collaborative Study of Swiss and Seychellois Students to Support Policy', 2018; Eleni Iacovidou, 'A Multi-Criteria Sustainability Assessment Framework : Development and Application in Comparing Two Food Waste Management Options Using a UK Region as a Case Study', 2025.Wrap 2016 (2018); Ismanto.

⁹ ICSU, 'Sustainable Development Goals and Targets', *International Council for Science*, 2015.

conservation area from the ecological, social and economic aspects and the factors that influence the sustainability of the Pawon Cave conservation area.

Qualitative data, namely data from interview guides, were analyzed using descriptive analysis. In the descriptive analysis, the data are interpreted as narratives and visuals in the form of photos or images. So that the data is under the conditions of the object of research in the field, the data that has been obtained is then recapitulated and analyzed in three stages, namely: data reduction, data presentation, and conclusion drawing. The data analysis was carried out using a triangulation technique to dig deeper into the benefits of the Pawon Cave area from the ecological, social, and economic aspects as a support for the sustainability of the cave. Moreover, the factors that affect its sustainability.

The data collected from each informant is recorded in a field notebook and then processed in line with data collection by conducting data reduction, which is a process of selecting linkages with research objectives. Then the data is concluded and presented in a form that is easier to read and understand. Likewise, on other topics, the same thing is done as illustrated in the following qualitative research analysis steps:

Qualitative Method

Analysis of research data obtained from surveys and answers to questionnaires from respondents were then processed with the help of Microsoft Excel software, displayed in tables and graphs, and then analyzed descriptively. In this analysis, the data in the questionnaire is in the form of information about community assessments of the sustainability of the Pawon Cave conservation area from the ecological, social, and economic aspects were compiled systematically based on the question variables contained in the questionnaire to be included in the program. The input data (input) of various variables are then connected so that the desired output data can be known. Furthermore, the data is poured in the form of data tabulation, and the last step is to interpret the output data descriptively.

3. Results and Discussion

Ecological Condition of Pawon Cave Conservation Area Condition of Water Resources

Based on research, almost half (45.43%) of residents use water from the Pawon Cave conservation area throughout the year. The people who use water from the Pawon Cave spring are around 50 families and those who use water from the Kp. Giri Mulya about 20 Family Heads. Residents highly conserve water resources originating from the Pawon Cave conservation area. In protecting springs,

residents do not have special rituals. However, residents protect springs by not cutting down trees in the Pawon Cave area, including around the springs, and prohibiting their use directly from the canal or springs.

Conditions around the springs are planted with thorny trees after tree planting. The ban on cutting down trees is intended so that the condition of the water, both debit, and channel, is not disturbed. Before being designated as a conservation area, the Pawon Cave area, including around the springs, was barren because there was no tree planting, and no tree cutting was allowed. The eastern part of the area was also a mining area.

Soil Erosion Treatment and Minimization

The conservation area of the core zone is maintained due to the planting of thousands of thorny trees for reforestation and the stipulation of rules prohibiting tree cutting¹⁰. Trees planted in the core zone area are thorny trees that are characteristically suitable for forest areas, have strong roots, and absorb water. Some of the trees planted in the core zone area are teak trees (*Tectona grandis*), Mahogany (*Swietenia mahagoni*), Manglid (*Manglieta glauca*), Akasia (*Acacia auriculiformis*), and several types of bamboo.

Meanwhile, the buffer zone is planted with palawija by residents. Residents cultivate the land in the buffer zone by hoeing with a terrace or swale system. The activity of hoeing the soil with a terracing system can hold loose soil so that it will be restrained and not eroded when exposed to rainwater. The land management system by residents around the area with the terracing system is local wisdom that they have learned from generation to generation and adapted.

Land in the Pawon Cave area includes rice fields planted with rice, the rice fields in the Pawon Cave area are partly rainfed rice fields with a harvest once a year. Meanwhile, two crops are harvested yearly for paddy fields close to springs. In the rice fields where the mounds are unstable, residents deal with it by planting banana trees. The banana tree that residents usually plant for mounds is the

¹⁰ Edith M. Maldonado-Oré and María Custodio, 'Visitor Environmental Impact on Protected Natural Areas: An Evaluation of the Huaytapallana Regional Conservation Area in Peru', *Journal of Outdoor Recreation and Tourism*, 31 (2020) <<https://doi.org/10.1016/j.jort.2020.100298>>; Lucky ZAMZAMI, Muhammad ALIMAN, and AZWAR, 'The Effect of Ecotourism Development on Marine Conservation Area in West Sumatera, Indonesia', *Geojournal of Tourism and Geosites*, 38.4 (2021) <<https://doi.org/10.30892/gtg.38423-757>>; Salwa Nadhira and Sambas Basuni, 'Implementation of the Concept of Conservation Area Buffer Zone in Indonesia', *Jurnal Manajemen Hutan Tropika*, 27.1 (2021) <<https://doi.org/10.7226/JTFM.27.1.32>>.

Manggala banana tree. According to residents, the mangola banana tree has strong roots, and the leaves are often used for wrapping processed foods.

Protected Types of Plants and Animals

Plant

Some of the plants found in the Pawon Cave conservation area that is planted for conservation purposes are Teak trees (*Tectona grandis*), Mahogany (*Swietenia mahagoni*), and Manglid (*Manglieta glauca*), Akasia (*Acacia auriculiformis*), white butterfly (*Sygonium*) and several types of Bamboo trees. Guava trees grow in the Pawon Cave area, although residents have cut them down a lot because it diverts plants for secondary crops. Many felling of guava trees in 2021 because people switched to planting cassava. According to residents' information, there are currently around + 10,000 guava trees remaining in the Pawon Cave area. Some residents use guava fruit as raw material for making guava lunkhead.

Other plants that grow in the Pawon Cave area are bamboo trees planted in collaboration with the Saung Angklung Udjo Foundation and the Pawon Cave area manager by planting 6,000 bamboo trees scattered throughout the Pawon Cave conservation area. The bamboo tree will be the raw material for the manufacture of angklung.

An understanding of the existence of taboos related to plants that are still adhered to by the community around Pawon Cave, such as on Mondays, they are not allowed to plant rice, Wednesdays are not allowed to plow or hoe fields and Saturdays are not allowed to cut down trees. According to one resident, on Mondays, they are not allowed to grind rice, and on Fridays, they are not allowed to cut down bamboo trees. This statement was also expressed by Syukrii Hamzah; Iskandar; Bachtiar¹¹ *teu meunang nuar awi dina poe salasa jeung juma'ah.*

Animal

Animals found in the Pawon Cave conservation area are monkeys, bats, and kapinis. These animals are protected by residents, although not in writing. According to one resident, the monkey population reached + 400 tails. The population continues to grow and becomes the main attraction for visitors. However, some residents who work as farmers are disturbed by the number of monkeys because they often become pests that damage plants around the area.

¹¹ Syukrii Hamzah, *Pendidikan Lingkungan Hidup: Sekelumit Wawasan Pengantar* (Bandung: PT Refika Aditama, 2013); Jusman Iskandar, *Strategi Dasar Membangun Kekuatan Masyarakat* (Bandung: STKS Bandung, 1994) T Bachtiar and Dewi Syafriani, *Bandung Purba*, 2nd edn (Bandung: Pustaka Jaya, 2012).

The increasing population of monkeys in the Pawon Cave area is monkeys transferred from Pasir Bancana, which are currently still being mined. The distance from Pasir Bancana to the Pawon Cave conservation buffer zone is + 500 meters. Three informants also said that the increasing population of monkeys in Pawon Cave was a move from the Karang Panganten sand area to the east of Pawon Cave, which is currently still being mined. The distance from Pawon Cave to the Karang Panganten sand is + 1 km.

Plants and animals are contained in the protected area so that there is no felling of trees and hunting for these animals, even though there are no detailed rules on the kinds of animals and plants that are protected in the Pawon Cave area. Community members are also aware of the importance of conserving plants and animals in the Pawon Cave area so that the area remains sustainable, provides benefits from tourism, and knows that regulations protect the area.

Community Participation in the Conservation of the Pawon Cave Area

Participation in planning, management, and supervision

Community involvement based on research results in planning is 50.57%. The community's involvement in planning matters other than their participation in the planning deliberation for the determination of the conservation area is their participation in the deliberation on the development plan stipulated in the area. The research on community involvement in the implementation of conservation reached 59.43%. Community involvement also includes development, conservation goals, and overall regulations such as reforestation, tree planting, no hunting, no mining, etc.

Community involvement in monitoring the Pawon Cave area as a conservation area is 67.71%. In this supervision, residents complain that there is still a limestone burning factory in the Pawon Cave area, which pollutes the area and surrounding residents and is very worrying about health and disrupts the preservation of the karst area in Pawon Cave in particular.

Community Participation in Pawon Cave Management

The management of the Pawon Cave conservation area is depicted in Figure 1 as follows:



Figure 1 Organizational Structure of Pawon Cave Conservation Area Management

Source: Interview Results

The West Java Provincial Government manages the Pawon Cave conservation area through the Antiquities Service and the West Bandung Regency Government through the Culture and Tourism Office. The government partners with Kalang Budaya as a Community Organization in its development and management. The Village Government, Karang Taruna, and Kompepar (Tourism Drive Community) as organizations located in Gunung Masigit Village, together with RT, RW, and the community, also participate in the implementation and monitoring of area conservation.

Furthermore, Pawon Cave, after being designated as a conservation area, the government formed a Jupel (caretaker) who came from residents around the area as field officers in collaboration with Disbudpar and Kalangkultur officers. The Jupel consisted of 6 people, three on duty for the Pawon Cave area and three on duty for the Museum area. Jupel is directly responsible for visitors' maintenance, supervision, and service. Jupel is also tasked with reporting visitors who visit the area to the Provincial Government and Regency Governments every two months.

Community Access to Regional Resources

Community needs for the area include water, grass, bamboo, wood, and plant land¹². Community access to the area is free, and there are no restrictions. Residents who own land in the Pawon Cave conservation area are free to

¹² Mia Nurhilmiah, Dadi Dadi, and Awang Kustiawan, 'Identifikasi Persepsi Masyarakat Kuta Tentang Konservasi Lingkungan', *Bioed: Jurnal Pendidikan Biologi*, 9.1 (2021) <<https://doi.org/10.25157/jpb.v9i1.5331>>; Imam Habibi Elhaq and Arif Satria, 'Persepsi Pesanggem Mengenai Hutan Mangrove Dan Partisipasi Pesanggem Dalam Pengelolaan Tambak Mangrove Ramah Lingkungan Model Empang Parit', *Jurnal Transdisiplin Sosiologi, Komunikasi, Dan Ekologi Manusia*, 05.01 (2011), 97–103; Endarto, Gunawan, and Haryono.

cultivate their land. Community access to the area is for gardening and taking firewood and grass for animal feed. Visitors enter the core area to see the Stone garden, which has the top of Pawon sand. The core zone area located on the hill of the conservation area tends to be left unplanted. The most basic reason the land is not planted is the disturbance of the apes to the plants.

The Economic Benefits of Pawon Cave Area

The community's economic interest in the area is indicated by the utilization of regional resources that play an essential role in the household economy¹³. Residents widely use the Pawon Cave area to plant plants that can be directly utilized, such as fruits which are spread into the core zone and buffer zone of the conservation area. Some of the economic resources generated from the Pawon Cave area are shown in the following figure 2.

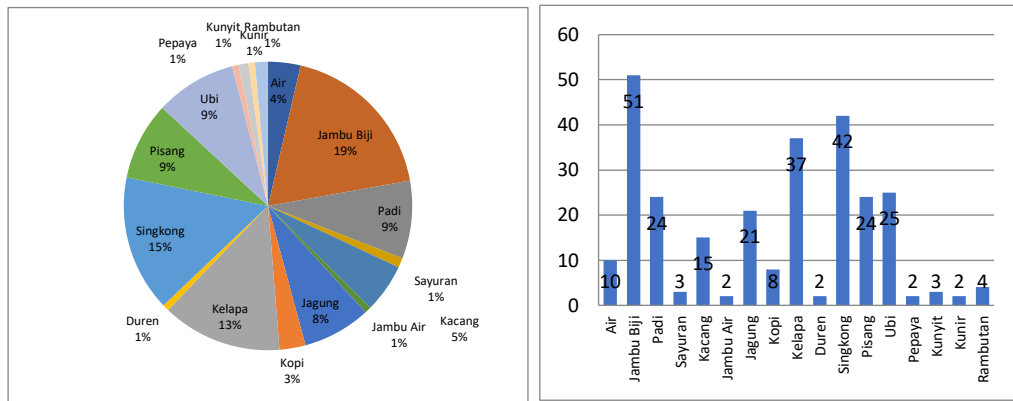


Figure 2 Product Charts that can be Used Directly from the Region

The following are the economic values of several types of resources found in the Pawon Cave area, which can be seen in table 1. below:

Table 1 The Economic Value of Several Types of Resources Found in the Pawon Cave Area

No	Type	Price/Kg
1	Paddy	5,000
2	Guava	4,000
3	Water apple	2,500
4	Jackfruit	4,000

¹³ Samuel Popkin, 'The Rational Peasant - The Political Economy of Peasant Society', *Theory and Society*, 1980 <<https://doi.org/10.1007/BF00158397>>.

No	Type	Price/Kg
5	Corn	4,000
6	Coffee	14,000
7	Coconut	2,500
8	Durian	30,000
9	Cassava	700
10	Banana	4,000
11	Sweet potato	1,500
12	Pawpaw	2,500
13	Turmeric	3,000
14	Cucumber	2,000
15	Tomatoes	5,000
16	Taro	2,000
17	Peanut	4,000

In addition to resources that can be used directly, there are also resources from the area used as agricultural inputs, including water and bat droppings (guano). Some people are farmers and some own livestock. About 26% of the people of the Pawon Cave area use water from the Pawon Cave area for agricultural input, the water used as agricultural input is spring water that comes out of Kp. Cibukur is north of the Pawon Cave area. In their agricultural input, 35% of the community uses bat dung (Guano) fertilizer for their agriculture.

Residents use guano fertilizer for agriculture as a substitute or a mixture of inorganic fertilizers. Also, they aim to clean the cave, so it does not smell like bat droppings. If there is too much dirt in the mouth of the cave, the pungent smell can reach residents' homes, and visitors are reluctant to enter the cave ¹⁴.

For some people, the Pawon Cave conservation area can provide activities that produce jobs. Based on research on the determination of the Pawon Cave area after being designated a conservation area capable of providing employment, three existing jobs were obtained: Caretaker (Jupel), trade, and Labor. The results of a survey of community members, as many as 7% of them think that the Pawon Cave area employs a Caretaker (Jupel), and 29% of them think that the Pawon Cave area employs Labor (the worker is employed when there is a development

¹⁴ Destha Titi Raharjana and Pade Made Kutanegara, 'Pemberdayaan Masyarakat Di Kawasan Cagar Budaya', *JURNAL TATA KELOLA SENI*, 5.1 (2019) <<https://doi.org/10.24821/jtks.v5i1.3145>>; RONY IRAWANTO, 'Kajian Pustaka Keanekaragaman Tumbuhan Di Cagar Alam Pulau Sempu, Jawa Timur', 2017 <<https://doi.org/10.13057/psnmbi/m030123>>; Ida Bagus Putu Prajna Yogi, 'Pelestarian Gua-Gua Prasejarah Di Kawasan Karst Sangkulirang-Mangkalihat (Berbasis Pemberdayaan Masyarakat Lokal)', *Forum Arkeologi*, 33.1 (2020) <<https://doi.org/10.24832/fa.v33i1.597>>; Kapioru.

project. Such as: making Bale riung, tajug (mushola), museums, roads, etc.) and 64% of them think that the Pawon Cave area employs traders.

After being designated as a Pawon Cave conservation area, the survey results showed that six residents became traders in the Pawon Cave area, as can be seen in table 4. 8 below:

Table 2. Traders in the Pawon Cave Area

No	Name	Type of merchandise/service	Income/month (+)
1	Tarya	Small Shop	Rp. 400,000
2	Hada	Replica Craft	Rp. 500,000
3	Enek	Small Shop	Rp. 500,000
4	Hamdan	Small Shop	Rp. 800,000
5	Cicih	Small Shop	Rp. 800,000
6	Ayep	Food	Rp. 700,000
7	Asep	Dodol Guava	Rp. 1,000,000

Source: Primary Data 2022

The Pawon Cave and Museum Keepers have different honors. The guardians of the cave area are three people and receive an honorarium from the provincial government of Rp. 500,000/month and three people who maintain the Museum area get an honorarium from the West Bandung Regency Government of Rp. 450,000/month. The work of residents as construction workers in the Pawon Cave area is not a daily routine activity, and they earn between 80,000 – 100,000/per day. The economic income of the residents as Jupel, traders, or laborers is a side activity apart from agricultural products, gardening, and animal husbandry.

Policies and legislation and Factors Affecting the Sustainability of Conservation Areas

What is contained in the 1945 Constitution article 33 paragraph (3) reads, "Earth, water and the wealth contained therein are controlled by the state and used as much as possible for the prosperity of the people."¹⁵ Laws and policies are necessary to support the carrying capacity of the environment, it is necessary to include Law of the Republic of Indonesia Number 32 of 2009

¹⁵ Republik Indonesia, UUD 1945 Republik Indonesia, 1945 <<https://webcache.googleusercontent.com/search?q=cache:BDsuQOHoCi4J:https://media.neliti.com/media/publications/9138-ID-perlindungan-hukum-terhadap-anak-dari-konten-berbahaya-dalam-media-cetak-dan-ele.pdf+&cd=3&hl=id&ct=clnk&gl=id>>.

concerning the Environment. Thus, control and manage natural resources by the community so as not to cause the impact of reducing the carrying capacity and carrying capacity of the environment.

As a follow-up t, it provides an understanding of conservation, namely preservation or protection, which aims to care for, maintain and enrich natural ecosystems¹⁶. Article 3 of the Law of the Republic of Indonesia Number 32 of 2009 letter a. guarantees the survival of living things and the sustainability of ecosystems; d. maintaining the sustainability of environmental functions; e. achieving harmony, harmony, and balance of the environment; f. ensuring the fulfillment of justice for present and future generations;

Article 68 of the Law of the Republic of Indonesia Number 32 of 2009 letter b. maintaining the sustainability of environmental functions;

The development of living natural resources and their ecosystems is essentially a form of sustainable national development as the practice of Pancasila. In connection with these matters, it is also necessary to stipulate provisions regarding the conservation of living natural resources and their ecosystems in the law.

The legal basis of the law is: Article 5 paragraph (1), Article 20 paragraph (1), Article 33 of the 1945 Constitution, and Law No. Law No. 32 of 2009 concerning Environmental Protection and Management. Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning the Implementation of Environmental Protection and Management

¹⁷.

What are the sanctions or punishments given to environmental destroyers by the rules: Regional Regulation of West Java Province Number 2 of 2002 criminal provisions Article 18 (1) Whoever violates the provisions of Article 11 Paragraph (2) and Article 14 of this Regional Regulation is threatened with imprisonment for a maximum of 3 (Three) months fine or a maximum fine of Rp. 5,000,000.00 (five million rupiah). (2) The fine as referred to in Paragraph (1) of this article shall be deposited in the Regional Treasury. (3) In addition to criminal acts as referred to in Paragraph (1) of this article, criminal acts of crimes and or acts that cause destruction and pollution of the geological environment as referred to in this Regional Regulation, are threatened with criminal punishment in accordance with applicable laws and regulations.

¹⁶ Sri Mujiarti Ulfah, 'Mencermati Arah Pendidikan Indonesia', *Journal Ilmu Sosial, Politik Dan Pemerintahan*, 2021 <<https://doi.org/10.37304/jispar.v1i2.346>>.

¹⁷ Indonesia, *UUD 1945 Republik Indonesia*; Republik Indonesia, *Undang-Undang Republik Indonesia Nomor 4 Tahun 1982 Tentang Ketentuan-Ketentuan Pokok Pengelolaan Lingkungan Hidup*, 1982.

Article 76 of Law No. 32 of 2009 (2) Administrative sanctions consist of: a. written reprimand; b. coercive government; c. freezing of environmental permits; or d. revocation of environmental permits.

The Pawon Cave area is included in the management of the Citatah-Rajamandala Karst Area. It has been regulated by laws and government regulations, both central and local government regulations regarding the management and protection of Karst areas and other protected areas. The regulations governing the management of the Citatah Karst area, including the Pawon Cave area, are the Pawon Cave Site Area and its Environment. Regional Regulation of West Java Province Number 2 of 2006 concerning Management of Protected Areas. Paragraph 2 Kars Area Article 43 Protection of the kars area is carried out to protect hydroorological functions and areas that have a unique geological formation.

The conditions concerning West Bandung Regent's Regulation No. 7 of 2010 about the protection of different from before the regulation stipulates the Pawon Cave area as a protected area¹⁸. With this regulation, according to residents, there is currently no environmental damage caused by mining in the Pawon Cave area. However, mining is still happening around the Pawon Cave area, which is feared to affect the Pawon Cave area. According to some residents, the effect felt was the smoke pollution from burning limestone. Article 4 of the West Bandung Regent Regulation Number 7 of 2010 The purpose of protecting the Pawon Cave Site area, namely: a. Utilizing the Pawon Cave Site area as a cultural heritage area and site so that there is a need for protection and maintenance by means of rescue, security, maintenance and restoration; b. Ensuring the sustainability of natural resources, cultural heritage objects, biodiversity and spatial planning; c. Prevent environmental damage; d. Ensuring the availability and safety of natural resources, flora and fauna both for the present and in the future.

Regulations for protecting the Pawon Cave area as a protected area also affect the protection of natural resources, flora, and fauna in the Pawon Cave area. Flora and fauna in the Pawon Cave area are preserved both from illegal logging of plants in the area and hunting for animals in the area as previously described regarding protected plant and animal species.







Based on the description of the regulations above, it is clear that the Pawon Cave area is a protected area. For this reason, all management of the Pawon Cave area must refer to these regulations. The regulation is significant for the surrounding





¹⁸ Pemerintahan Kabupaten Bandung Barat, *Peraturan Bupati Bandung Barat No 7 Tahun 2010*, 2010.

community in treating the Pawon Cave area. The results of the study reached 81.14%. The Regent's Regulation on managing the Pawon Cave conservation area has a significant role.

The government's program in supporting the protection of the Pawon Cave conservation area is proven by implementing various activities and fostering the development of human resources for area managers who support these conservation activities, including directing to the tourism sector. The development of infrastructure in the Pawon Cave area has something to do with the sustainability of the Pawon Cave area conservation, especially the economic aspect. The following presents some of the construction of facilities and infrastructure that the government has carried out around the Pawon Cave area.

Table 3 Construction of Facilities around the Pawon Cave Area

No	Development	Year	Photo
1	<i>Bale Riung</i>	2020	
2	<i>Tajug</i> (musholla)	2020	
3	MCK place	2020	
4	Museum	2011-present	
5	Vehicle yard	2009-present	
6	TIC (Tourism Information Center)	2021	

No	Development	Year	Photo
7	The path to the springs and the museum	2021	
8	Retribution Post/Guest Registration	2021	
9	Vehicle road	2012-2021	
10	Gate	2021	

Source: Primary Data, 2022

After the Pawon Cave area was designated as a conservation area, residents felt the benefits of the policy so that the Pawon Cave area became partly green and shady. The Pawon Cave area is also crowded with visitors who come to travel from various circles, both children, adults, and parents of students, students, and researchers.

Pawon Cave Area Management Human Resources

Based on the research that 76.29% of the management structure of the Pawon Cave conservation area is good. The indicators that form the basis that the management of the Pawon Cave area is good, according to several informants, are the various facilities that have been built that support the objectives of area conservation, especially the tourism aspect, as shown in table 4.9 above, the preservation and security of natural resources, flora, and fauna, and prevent environmental damage due to mining in the Pawon Cave area. Several informants said that the management of the area around Pawon Cave, which is still less than optimal, is due to cleanliness and the need for additional caretakers because the Pawon Cave area is enormous.

The development of the Pawon Cave area from the tourism aspect is one of the strategies for diverting regional development from mining areas to tourism areas that are economically useful for increasing residents' income around the area as a livelihood. Meanwhile, in terms of the environment, tourism activities aim to

help improve the quality of the environment, especially by protecting the environment's art ecosystem conditions to remain good ¹⁹.

Table 4 Training that has been attended by the Pawon Cave Keepers

No	Destination	Area	Year
1	Ullen Sentalu Museum	Yogyakarta	2021
2	Pawon Temple	Yogyakarta	2021
3	Sewu Temple	Klaten	2021
4	Borobudur temple	Yogyakarta	2021
5	Cipari Archaeological Park	Cirebon	2020
6	Linggar Jati Tourism Park	Cirebon	2020
7	Sunyaragi Cave	Cirebon	2020

Source: Primary Data, 2022

Jupel is also routinely responsible for providing monthly visit report data to the West Bandung Regency Tourism and Culture Office and the West Java Antiquities Service. The caretaker also actively plays a role in collaborating with other parties, including facilitating activities and maintenance of the Pawon Cave conservation area. The caretaker of the Pawon Cave and Museum has a different salary between the Provincial Jupel and the KBB Jupel. The guardians of the cave area are three people and receive an honorarium from the provincial government of Rp. 500,000/month and three people who maintain the Museum area get an honorarium from the West Bandung Regency Government of Rp. 450,000/month.

4. Conclusion

Based on the results of research and discussion, it can be concluded several things as follows: from the ecological aspect, the Pawon Cave conservation area has two good springs in the rainy season and dry season, but there are still obstacles to distribution. Processing and minimization of soil erosion are well managed, including a terracing system. Plants and animals in the area are maintained with no logging or hunting. From the social aspect, most of the community actively participates in planning, implementing, monitoring, and managing the Pawon Cave conservation area. Community access to the area includes gardening and taking firewood and grass. The community manages the area in the buffer zone

¹⁹ Raharjana and Kutanegara; Yadi Mulyadi, 'Kajian Keterawatan Lukisan Gua Prasejarah Di Kawasan Karst Maros Pangkep Sulawesi Selatan', *Jurnal Konservasi Cagar Budaya*, 10.1 (2016) <<https://doi.org/10.33374/jurnalkonservasicagarbudaya.v10i1.144>>; Prajna Yogi.

area. From the economic benefits, the Pawon Cave area provides benefits such as water, rice, vegetables and fruits, and fertilizer for agriculture. The Pawon Cave area has not provided benefits as a provider of adequate employment opportunities. Only a small number of residents are directly absorbed into workers, and a small number become traders in the Pawon Cave area.

Factors that influence the sustainability of the conservation of the Pawon Cave area are policy support from the government, and local governments have adequate human resources to manage the area. The implementation of the policy has shown that it is appropriate to support conservation efforts such as prevention of mining, preservation of springs, and protection of plants and animals in the area. Several construction facilities have also been built to support tourism. The coaching and training program for the caretaker of the Pawon Cave area is an effort to support the area manager's human resources professionals. Incentives given by the government to provincial caretakers are 500,000/month, and Regency caretakers are 450,000/month.

All existing regulations for implementing existing laws and regulations in the conservation of living natural resources and their ecosystems, as long as they are not in conflict with this law, remain in effect until the issuance of the implementation of new regulations based on the law.

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