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Environmental Perspectives to the Rejection of Javanese Karst Mining in Systematic Literature Reviews

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ABSTRACT

The study presented in this literature review aims to ascertain community perspectives on the rejection of mining in the Javanese karst regions, guided by the question, "Is the population in Javanese karst regions more ecocentric?" The methodology employed is a Systematic Literature Review (SLR), which includes 29 literature reviews following the preferred reporting items for SPAR-4-SLR. Sources for the literature review were retrieved from several databases, including Scopus, ProQuest, Web of Science, the Directory of Open Access Journals (DOAJ), and GARUDA. An analysis of the perspectives adopted by Javanese karst communities, as discussed in each article, reveals a majority adherence to ecocentrism (13 manuscripts), followed by anthropocentrism (9 manuscripts). This dichotomy highlights the sources of conflict, such as in the Pangandaran karst in West Java, or manifest conflicts, as in the Pati and Rembang karsts in Central Java. For anthropocentric communities, the supporting factors include the backing of village officials, economic necessities, traditional livelihoods, and the presence of pre-existing mines. In contrast, ecocentric communities base their arguments on reliance on the agricultural sector, environmental awareness or activism, support from pro-environment networks, and the presence of indigenous peoples. The recommendation put forward here is specifically directed at local governments that have yet to designate karst landscapes as protected areas within their jurisdictions.

1. INTRODUCTION

Indonesia's geographical location makes it a country rich in mineral and energy resources. The country is a major producer and exporter of minerals on the world stage, contributing a significant value to the Gross Domestic Product (GDP). In 2021, the national mining and quarrying sector added IDR 1.52 quadrillion to the GDP, accounting for 8.98% of the total national economy, which amounted to IDR 16.97 quadrillion. The mineral mining materials consist of metals and nonmetals [1], with nonmetals including limestone, clay, and quartz sand from karst mountains. These minerals are important for ensuring the supply of the cement industry [2].

Limestone mining for the cement industry holds a significant position in the country's dynamics. There have been several cases that have made headlines in Indonesia's national media. Typically, the mass media report on the rejection of the establishment of cement factories or the opening of mining areas in karst regions, which has led to open conflicts [3-6]. Conflicts usually arise at mining sites because companies do not prioritize social and environmental issues [7]. Conversely, traditional mining is one of the livelihoods for the local population to make ends meet [8, 9].

This phenomenon is interesting to study from the perspectives of environmental justice and environmental management. By examining previous research on mining and the karst population, it can be determined whether industry and mining are targets of local community rejection of certain land uses (Locally Unwanted Land Uses, or LULUs) in the areas. The environmental perspectives held by communities have been linked to LULUs. Lipschitz [10] explains LULUs as a phenomenon explored in the field of regional planning. Meanwhile, Blowers [11] describes the rejection by communities of prospective sites for certain building projects, such as power plants, industrial areas, hazardous and toxic waste processing plants, nuclear facilities, and radioactive waste. According to Lipschitz [10], this rejection is assumed to be based on the social, health, and environmental impacts of a factory establishment, which are presumed to outweigh the economic benefits for the surrounding community of the location. Locations categorized as LULUs are typically in rural areas or distant from urban centers.

The company's strategy often includes proposing construction near existing similar facilities and communities with peripheral characteristics (suburban communities) [12]. Blowers [11] characterizes peripheral communities as being remote or difficult to access, having a small economy, being politically weak, maintaining a defensive culture (working hard to achieve goals), and experiencing environmental damage within the community area. Whereas

anthropocentrism centers on human interests, ecocentrism values the intrinsic values of living beings and their ecosystems [13-15].

There are not many scientific publications on the topic of environmental perspectives in karst regions. This is due to several things. First, the karst ecosystem is not yet known to the public. Secondly, the determination of the area is still partial, and prone to conflict [3, 9, 16, 17], and third, the issues raised are local. However, this topic is interesting to be further reviewed about the issue of damage and environmental pollution caused. The scope is restricted to Java Island (the regions of East Java, Central Java, West Java, and DIY Yogyakarta) based on the dominant research locus. karst criteria refer to the karst landscape area that has been determined by the government with valid status.

The study in this literature review aims to find out the community views on the rejection of Javanese karst mining in the question "Is the population of Javanese karst more ecocentric than anthropocentric in maintaining the preservation of its territory?". The expected result is input for stakeholders to conduct a study of LULUs and the environmental perspectives of communities before planning and reorganizing development [18]. The systematic literature review (SLR) study is specifically aimed at local governments that have not designated karst landscape area as protected areas in their areas. The expected impact is the avoidance of social conflicts and the implementation of economic development fairly and sustainably for parties who have lives, as well as interests in karst regions, spread throughout Indonesia.

2. METHOD

The method used is the Systematic Literature Review (SLR), a form of research that assists in providing robust synthesis outcomes for policymakers and practitioners [19, 20], and presents current evidence in a particular field of science [21]. An SLR can summarize hundreds, even thousands of articles using scientific methods. Additionally, Siswanto [20] notes that the SLR is a form of meta-synthesis (qualitative data synthesis) through meta-aggregation, responding to research questions by summarizing various scientific manuscripts.

Protocols are necessary for guiding the research and ensuring its integrity when conducting an SLR. These include the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) [22-24]. We (the authors) tend to refer to the SPAR-4-SLR protocol because PRISMA is more commonly used for quantitative SLRs (meta-analysis).

The sources for the literature review were drawn from several databases [25]. The first source was journal databases such as Scopus, ProQuest, Web of Science/WOS, Directory of Open Access Journals/DOAJ, and Garba Rujukan Digital (GARUDA). The second source was grey literature from higher education repositories, and finally, hand searching from the collection of the National Library of Indonesia. All data were processed through systematic review steps, namely: 1) determining the database; 2) determining keywords; 3) sorting manuscripts based on specified criteria; and 4) applying the Population, Intervention, Comparison, and Outcome measures (PICO logic grid) [26]. Based on the references, the study of mines in karst areas was viewed from an environmental perspective [27], through the grouping of anthropocentric and ecocentric paradigms. The qualitative approach was carried out because the object being assessed (perspective/outlook on life) is difficult to quantify. Thus, qualitative studies are about the criteria for sorting literature and the language used [26], and also involve setting data recall time limits to prevent data from evolving during processing and analysis [28]. This study was conducted manually by theoretical review.

Based on PICO, we collected and stored all final articles in the database using the search “title, abstract, keywords” with the following keywords: *karst; karst and Java; karst and sustainability; limestone and Java; limestone And Java and sustainability*. The keywords: *ecocentric, ecocentrism, biocentric, biocentrism, anthropocentric, and anthropocentrism* did not match any findings. We considered the type of data (qualitative), type of study (qualitative and mixed methods), and language (English and Bahasa Indonesia) to filter articles. The initial search efforts yielded a total of 266 articles. The organization codes included data, method, journal title, article type, and year. This step resulted in 73 articles. Finally, after the refinement process, we included 29 articles and excluded 44 articles.

3. RESULT

Environmental planning demands two things, namely carrying out development and maintaining natural balance (sustainability) [29]. Development is aimed at human welfare by fulfilling the rules of pollution control and environmental damage. However, not all types of development are acceptable in some communities. Examples are limestone mines and the establishment of cement factories in karst regions. The mine requires karst of a certain quality according to industry criteria. The karst needed is generally the main quality and is still actively processing naturally. In it are stored water sources that are the mainstay of the surrounding population to meet the needs of life. The two opposing needs are one of the sources of conflict. One of the prominent cases is the construction of a cement plant in the karst of North Kendeng [30]. Another example occurs in the karst of Citatah [17], the karst of Gunung Sewu [9], and the karst of Gombong [8]. Where the publication discusses mining conditions and/or socio-economic conditions of the population according to the scope of the study.

The number of karst regions in Java have been designated either as Protected Areas or referred to as the karst landscape area. The areas that have been designated as the karst landscape area [31] are Sukolilo in 2014, Gombong in 2014, Gunung Sewu in 2014, Pangkalan in 2015, Citatah in 2018, Pangandaran in 2019, and Bogor in 2020. Karst landscape area as a zoning instrument can mediate the parties to the conflict. Zoning is desired by them for the certainty of their respective working areas [17]. The amount of literature summarized in the SLR meta-synthesis was 44 manuscripts (as of August 2022). Of the 44 manuscripts, advanced screening was performed for data outside the specified topic (PICO). The number of final articles studied was 29. The process of collecting and sorting data using the help of Publish or Perish software. Data processing using Microsoft Excel. The protocol performed in Figure 1 refers to the SPAR-4 SLR [24], and the PICO research question guide in Table 1 [26] below.

Table 1. Logic-grid PICO

Population (P)	Intervention (I)	Intervention (C)	Measures (O)
Java Karst	Ecocentrism	Anthropocentrism	Sustainability
Karst	Biocentrism		Reliable
Limestone	Ecocentric	Anthropocentric	Feasible
Java	Biocentric		Viable

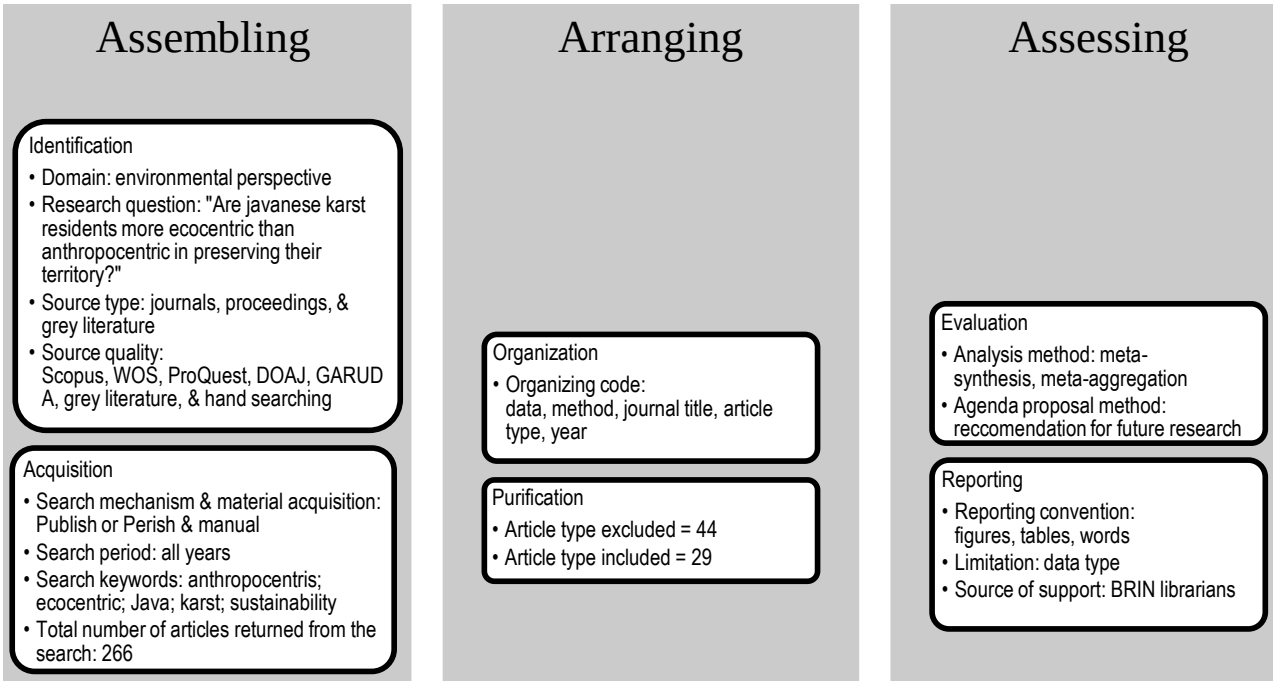

Figure 1. The SPAR-4-SLR protocol

3.1 Manuscript review results

The findings of the review based on the predetermined organizing code provide an overview of the distribution of publications on the topic under study. The 29 final articles make full use of qualitative data, with a note that one article used quantified qualitative data [32]. As many as 79% of the methods used were qualitative studies and 21% used mixed methods (Figure 2). Mixed methods are not further described as complementary or concurrence.

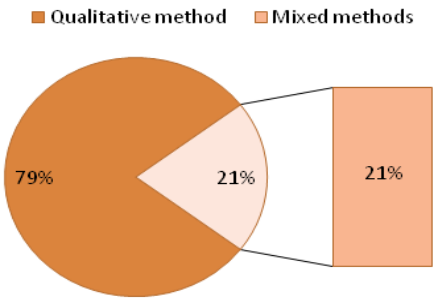

Figure 2. Methods in articles

Scientific publication media is spread across 19 journals and proceedings coupled with 1 grey literature (Figure 3). The media that accommodates the most articles with related topics is the IOP Conference Series: Earth and Environmental Science (5 manuscripts) and E3S Web of Conferences (5 manuscripts), followed by the UGM Journal of Social and Political Sciences (2 manuscripts). While others have only published one manuscript on this topic. Grey literature is a scientific work that is not/has not been published. From this review, grey literature is a dissertation work from [33].

Based on 29 publications, the proportion of article types is shown in Figure 4. Scientific journals occupy the first position (80%), scientific proceedings in the second position (15%), and grey literature in the last (5%). Although the results of the study position the proceedings under the journal, from the previous diagram (see Figure 3) it can be seen that the proceedings are more widely used as a means of publication.

The scale of the publication is conveyed in Figure 5. 65% of publication media was national and the rest 35% was international. It shows that qualitative studies on the topic of environmental perspectives are acceptable both nationally and globally.

A further review is the spread of publication years. Figure 6 shows that qualitative studies in the Javanese karst Mining concerning social/community perspectives have fluctuated. Before 2000 only 1 manuscript was found [32], then vacuum up to the next 10 years. In 2011 a script appeared on behalf of [34], then vacuum for 1 year. Starting in 2013, qualitative studies began to show improvement, although not linear. The year most published manuscripts were found in 2020 with 5 pieces.

3.2 Environmental perspectives of Javanese karst communities

This study traced the 29 manuscripts to answer the research question: "Are Javanese karst inhabitants more ecocentric than anthropocentric in preserving their territory?". Therefore,

some points in the findings review consist of 1) What karst regions in Java Island are the locus of study; 2) How much understanding the ecocentrism and anthropocentrism of the Javanese karst communities; and 3) The purpose of the communities in behaving/choosing an environmental perspective. The first answer is shown in Figure 7 and Figure 8 for more administrative areas. Based on the diagram, the distribution of studies is in four (4) Provinces on the island of Java, such as East Java, Central Java, West Java, and the DIY Yogyakarta. The provinces that are not included in the study locus are Banten and DKI Jakarta. This corroborates data from the GARUDA database (2021) and information from the Geological Agency (2020) that there is no indication of karst regions in the two provinces.

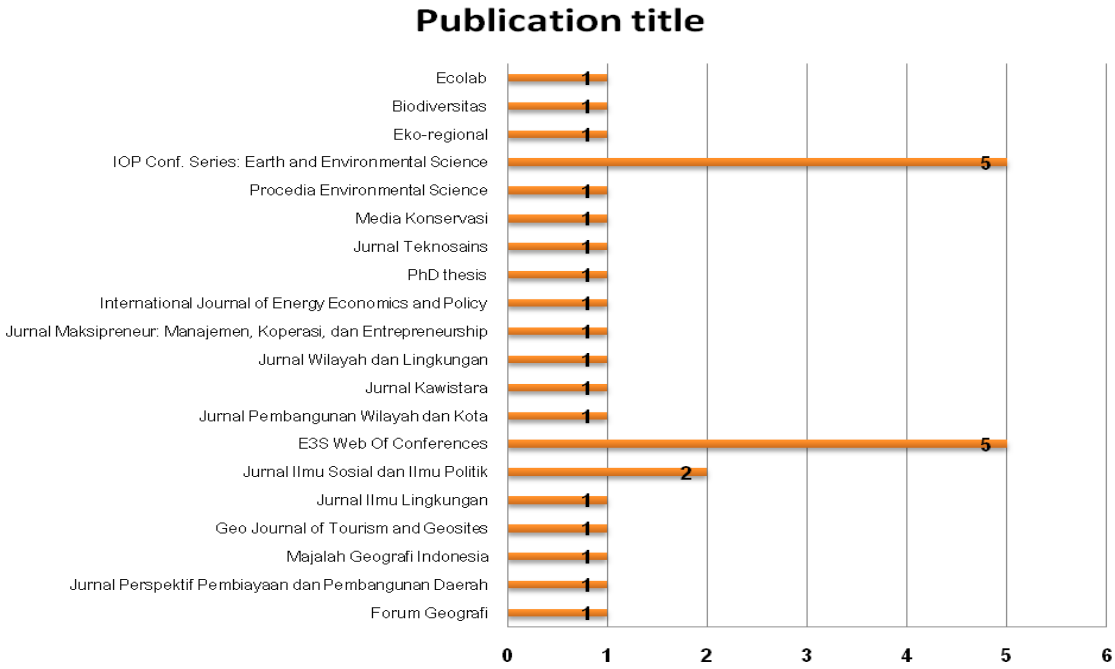

Figure 3. Media scientific publications

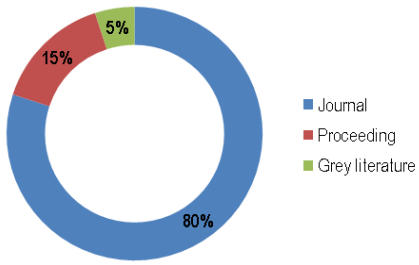

Figure 4. Types of scientific publications

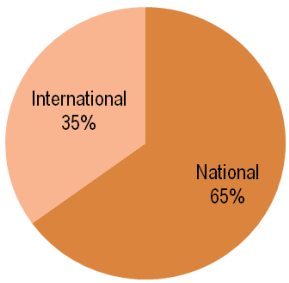

Figure 5. The scale of scientific publications

Central Java is the first rank in the locus of Provincial – level studies with 13 manuscripts. However, at the district level, Gunung Kidul – Yogyakarta is the most location in terms of the number of studies conducted (9 manuscripts) compared to Pati – Central Java (7 manuscripts). Pati Regency stands out because of the cement plant conflict [3, 5, 6, 33, 35, 36].

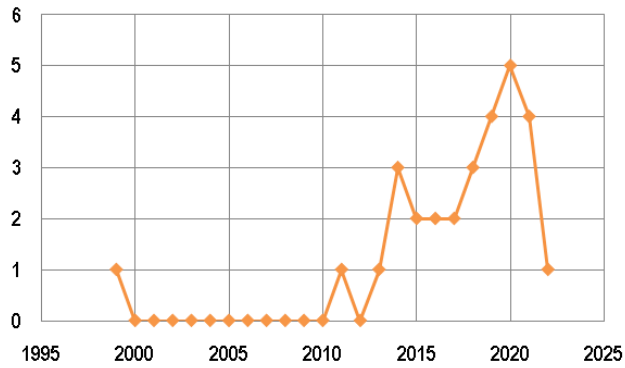

Figure 6. Year of publication of scientific publications

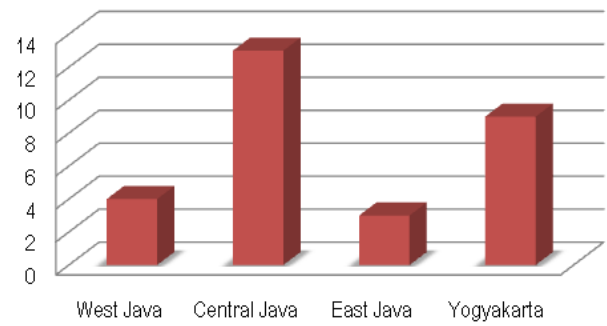

Figure 7. Distribution of study location (Provinces) of scientific publications

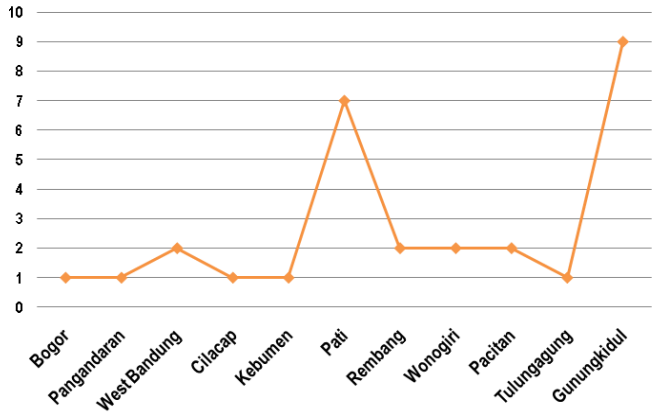

Figure 8. Distribution of study location of scientific publications

The environmental perspective of the Javanese karst communities is dynamic (see Table 2). It can be read based on the order of years of publication. Based on the abstracts and research findings of each manuscript, perspectives are grouped into anthropocentric, ecocentric, and unidentified [3-55].

Table 2. Environmental perspectives of Javanese karst communities

No	References	Perspectives of the Communities		
		A	B	C
1	(Ritohardoyo, 1999) **[32]**		√	
2	(Sudarmadji et al., 2011) **[34]**		√	
3	(Suharko, 2013) **[3]**	√	√	
4	(Yuwono et al., 2014) **[54]**			√
5	(Mijiarto et al., 2014) **[38]**	√		
6	(Widiyanti and Dittmann, 2014) **[52]**			√
7	(Nugroho et al., 2015) **[47]**			√
8	(Prasetya et al., 2015) **[39]**	√		
9	(Anatasari and Pradoto, 2016) **[55]**			√
10	(Suharko, 2016) **[4]**		√	
11	(Reinhart, 2017) **[9]**	√		
12	(Mojo et al., 2017) **[33]**		√	
13	(Hadi et al., 2018) **[35]**		√	
14	(Hadi, 2018) **[42]**		√	
15	(Ayuningrum and Purnaweni, 2018) **[44]**			√
16	(Hadi et al., 2019) **[36]**		√	
17	(Purnaweni et al., 2019) **[5]**	√	√	
18	(Faida & Marhaento, 2019) **[45]**			√
19	(Aryantie and Suhirman, 2019) **[17]**	√		
20	(Hindersah et al., 2020) **[37]**	√	√	
21	(Rokhmad, 2020) **[6]**	√	√	
22	(Kurniawati et al., 2020) **[41]**		√	
23	(Purwanto et al., 2020) **[48]**			√
24	(Soedwiwahjono and Pamardhi-Utomo, 2020) **[51]**		√	
25	(Reinhart et al., 2021) **[49]**			√
26	(Rohaendi et al., 2021) **[40]**	√		
27	(Hertanto, 2021) **[46]**			√
28	(Sari et al., 2021) **[50]**			√
29	(Wisnuaji and Fauzi, 2022) **[53]**			√
	Number of manuscripts	9	13	11

Note: A) Anthropocentric; B) Ecocentric; and C) Unidentified.

A search of the understanding adopted by the Javanese karst communities in the discussion of each article yielded the following findings: the majority adhered to ecocentrism (13 manuscripts) followed by anthropocentrism (9 manuscripts). The notes on these findings are that some of the texts show the existence of two evolving understandings in the community [5, 13, 20, 37]. This dualism shows the sources of conflict (Pangandaran karst - West Java) or manifesto conflict (Pati karst and Rembang karst - Central Java). The second note is that as many as 11 manuscripts do not explain the life views of the people in the communities they study, even though the research is a social qualitative study.

Furthermore, the reasons behind karst communities behaving are found in several statements. For anthropocentric communities, the cause is the support of village officials [3], economic needs [37-39], hereditary livelihoods [6, 9, 17], and the existence of earlier mines [40]. Meanwhile, for ecocentric communities, the argument is based on dependence on the agricultural sector [32], environmental awareness or participation [6, 34, 37, 41], pro-environment network support [3, 35], and the existence of indigenous peoples [17, 33, 35, 42, 44].

Based on the findings, the government as a policyholder needs to put social and environmental issues as a priority in mining sites [43]. The argument that most of the Javanese karst population understands ecocentrism needs to be considered in regional development planning [18], including the zoning designation of the karst regions. Social studies such as environmental perspectives can be one of the aspects of analysis that are explored to prevent new conflicts from emerging or prolonged latent conflicts.

The study has limitations in issues and software use. The environmental issues studied are relatively minor. Nevertheless, the impact of the conflict in Java karst is enormous (hidden/latent conflict). By using software, the chances of the number of articles obtained are getting smaller. Therefore we use manual methods in collecting, sorting, and analyzing data. This is a gap in the development of future research.

4. CONCLUSION

Based on this literature review, the public's view of the rejection of Javanese karst Mining with the SLR method used. Most Javanese karst communities adhere to ecocentric understanding, namely respecting the values of living things and their ecosystems. This perspective is based on some factors, such as the dependence on the agricultural sector, environmental awareness or participation, the support for pro-environment networks, and the existence of indigenous communities. Therefore, it requires social studies (environmental perspectives) and in-depth analysis by local governments before establishing regional development policies such as zoning policies that are prone to conflicts of interest.

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