

RESEARCH ARTICLE



Community Perspectives in Developing Bat-Cave Tourism in Leang Londrong, Bantimurung-Bulusaraung National Park: Comparing The Locals and Visitors

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Abstract

Maros-Pangkep karst formation in South Sulawesi is one of the largest karst environments in the world. One of the caves located in the area is Leang Londrong, which is a part of the management of Bantimurung-Bulusaraung National Park. The Leang Londrong area is known as a tourism spot with water-based tourism as the main attraction and it is also known as the main ecosystem service provider, in particular, as water sources for many areas. This cave is inhabited by some species of bats. Eventhough the area is now designated for water-based tourism, other potential tourism objects, such as bats roosting inside the cave, has not been explored for tourism development. Therefore, this study attempts to examine the knowledge, perceptions, and attitudes of the local community and visitors visiting the area towards nature, caves, bats and its conservation, as well as bat-cave tourism development. The study was conducted in January–April 2022 by distributing questionnaires to 86 respondents consisted of the local community, visitors, and government representatives. The results indicated that in general, the respondents had limited knowledge of nature, caves, bats, and their conservation. In particular with bats, the majority of the respondents had not yet been familiar with bats, understood the roles of bats in the environment, and tended to ignore the existence of bats. However, in relation to nature and conservation, bat conservation, and the development of cave and bat tourism in Leang Londrong, most of visitor respondents agreed to support (>85%) and for the locals, the number was even higher (>90%). Therefore, such support from the locals and visitors could make bat-cave conservation through tourism development in Leang Londrong possible.

Keywords: attitudes and behavior, bat conservation, bat-cave tourism development, knowledge and perceptions, Leang Londrong

1. Introduction

South Sulawesi is a province with the second-largest karst formation in the world. Leang Londrong is located in Pangkep Regency (South Sulawesi Province) and is a part of Maros-Pangkep Karst Formation [1]. The area is known to be part of Bantimurung-Bulusaraung National Park and is designated as a nature-based tourism area known as one of the seven wonders [2,3]. The area has been used as a tourism site with karstic caves and river as its main attractions. 'Leang' in Bugisnese-Makassarese language means 'cave', while Londrong is known as a local wood tree species grown in the area. Thus, Leang Londrong is translated as Londrong Cave. Leang Londrong is a horizontal riverine karst cave with a length of 5.9 km [4,2]. The people living adjacent to the cave and its surrounding environment have used environmental services not only for tourism but also as a water source with an average demand of 89 million m³ per year [5,6,2]. The rivers in the karst area of Maros-Pangkep served as the main water sources used not only for agricultural purposes but also for the cement industry [6,7].

Leang Londrong is also a habitat for bats [8]. Some studies in the area have revealed that in terms of bat diversity, there are at least four species inhabiting Leang Londrong. In one report, the species found were *Hipposideros diadema* and *Miniopterus schreibersii* [9]; while another study published in 2021 reported *H. diadema*, *Rhinolopus arcuatus*, and *Myotis* sp.

roosting in the cave [10]. All the species found were Microchiropteran, which are mostly categorized as insectivore bats. The species trapped during the study were classified as Least Concern according to IUCN [11].

At present, attention on bats as animals with high conservation value is very low. Not many people are aware of the services given by these animals to humans and ecosystems [12]. Bats play crucial roles in the dispersal and pollination of some important plant species, which are also critical in maintaining gene flow within ecosystems, as well as in the energy cycle as bats transferring nutrients into the cave ecosystems [13-16]. In the agricultural sector, insectivore bats have a positive contribution in reducing insect pests, thus minimizing the use of pesticides [17-18]. However, negative perceptions and opinions of bats have also developed in communities due to a lack of knowledge and understanding of these animals [19-20].

Bantimurung-Bulusaraung National Park with its nature-based tourism has many potential objects for tourism. The national park also has seven wonders of tourism spots, which are classified as the main tourism hotspots. The seven wonders are Bantimurung, Leang-leang, Pattunuang, Karaenta, Gunung Bulusaraung, Leang Pute, and Leang Londrong. However, the number of visitors to each area is still considered low and not well distributed [3]. This is likely due to limited marketing and promotion to the wider community. Leang Londrong was also identified as one of the spots with lack of visitation by visitors [4,3]. One way of increasing the number of visitors was through diversification of tourism objects.

Bat-cave tourism could become an option not only to provide alternatives in nature-based tourism but also to improve human behavior, attitudes, and awareness related to wildlife species and in particular to change some misconception and perception on uncharismatic species such as bats [19,12]. From the economic perspectives, this type of tourism has created 6.5 million dollars in consumer surplus and invited over 242,000 visitors to only watch Mexican free-tailed bats in the US [21]. In other places, bat-cave tourism has been estimated to generate 100 million annually worldwide and positively contributed to the local communities' economic [19,22].

As the area is part of a conservation area, it is very important to protect the resources as well as provide economic sustainability for the local people. One way to achieve this goal is through regulated ecotourism. The concept of contemporary ecotourism is defined as not merely focusing on responsible traveling to nature but also preservation/conservation, education, sustainability, distribution of benefits, and ethics/responsibility/awareness [23]. This also means involving more human context. Many studies have revealed that the main drivers of success in wildlife conservation and management are public perceptions, attitudes, and awareness [24,25]. Therefore, to bring bat-cave tourism into Leang Londrong, further social context of both the local community and visitors needs to be taken into consideration.

The development of bat-cave tourism in Leang Londrong will not only provide alternatives for the visitors but also for the conservation of the cave and bats in the area. Additionally, these alternatives could also become a source of income for the local community and bring much needed job opportunities. Therefore, to assess possibilities of a potential ecotourism program in Leang Londrong, a study on the community perceptions needs to be conducted prior to the development. This study aimed to examine the knowledge, perceptions, and attitudes of people living nearby Leang Londrong, as well as those of visitors to the site, towards nature, cave, and bats. It also examined bats conservation as well as potential development of bat-cave tourism in the area. The knowledge deriving from this study could be used as guidance for the authorities in planning and developing this potential program.

2. Research Methodology

2.1. Study Area

The study was conducted from May to June 2021 in Leang Londrong Nature-based Tourism Area of Bantimurung-Bulusaraung National Park. The cave is a part of Maros-Pangkep Karst Formation. Administratively, this area is located in Panaikang Village, Minasate'ne District, Pangkep Regency (South Sulawesi) at the western part of the national park (latitude of 4° 51' 43" S, longitude of 119° 38' 12" E) with an elevation between 1–50 m above sea level and a

size of 51.57 ha (Figure 1). The cave is approximately 49 km from Makassar City, the capital of South Sulawesi Province and accessible through the provincial main roads (around 1.5h by car).

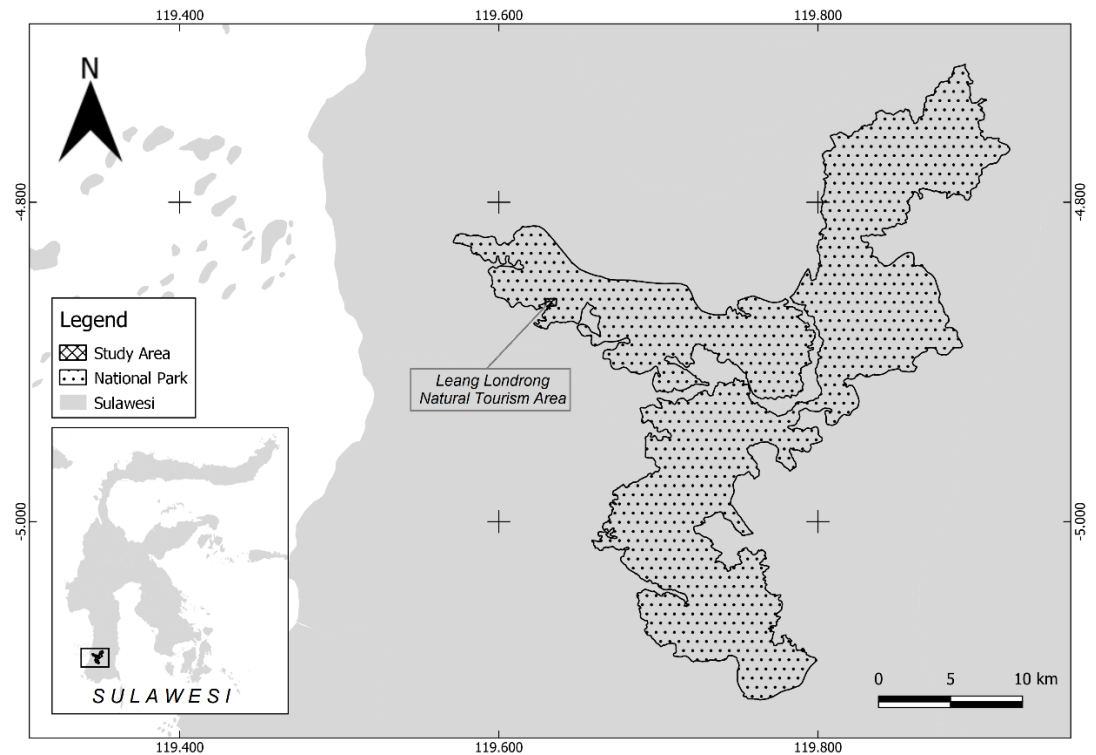


Figure 1. Map of the Study Area, Leang Londrong Natural Tourism Area, Bantimurung-Bulusaraung National Park, Pangkep Regency, South Sulawesi

2.2. Data Collection and Analysis

To obtain the required data for the study, a set of questionnaires was used as guidance. The data collection focused on 4 main streams consisted of 1) Demographic profiles of respondents; 2) Knowledge and Perceptions on nature conservation, cave, bats and bats' conservation; 3) Attitude and awareness towards bats in particular as tourism object and also conservation of bats; and 4) Perceptions towards the development of a bat-cave tourism program in Leang Londrong. Participant recruitment focused on local communities living adjacent to the tourism area, including community leaders (n=30 respondents), and visitors to Leang Londrong (n=50 respondents). The data were processed using *Microsoft Excel* and analyzed descriptively.

3. Results

3.1. Demographic Profiles

When examining the perceptions of the community towards the development of bat-cave tourism in Leang Londrong natural tourism area of Bantimurung-Bulusaraung National Park, Pangkep (South Sulawesi), two groups of respondents were interviewed by employing a set of questionnaires. Demographic profiles of respondents are illustrated in Table 1. The majority of participants, both locals and visitors, interviewed were females (>50%) (Table 1). For local participants, most of the females interviewed were housewives (30%). Local participants of Leang Londrong had various occupations, with around 36% having completed senior high school level and mainly working as entrepreneurs/sellers/traders (30%). Most of the respondents from this category were between 31-50 years old (>50%). There were 4 community leaders interviewed. They were all males with the age >41 years old. Only the head of the village worked as civil servants, while others had no permanent jobs. Leang

Londrong Tourism Area was mostly visited by students (54%) with the majority being high school students (65%) and therefore, most of the respondents were <30 years old.

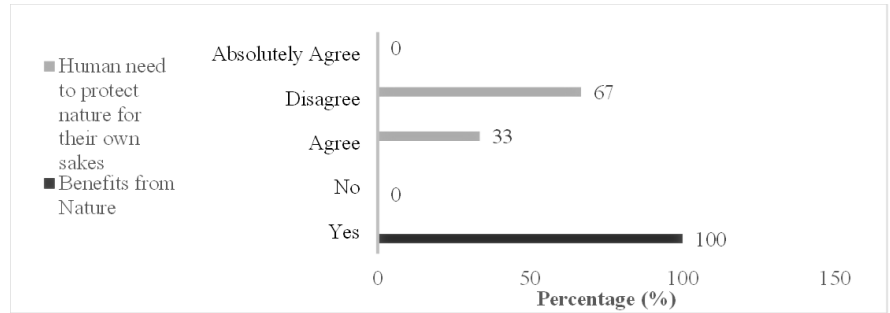
Table 1. Respondent's Demographic in Leang Londrong, Bantimurung-Bulusaraung National Park, Pangkep (South Sulawesi)

Demographic	Category of Respondents (%)	
	Local people nearby Leang Londrong (n= 30 respondents)	Visitors (n=50 respondents)
Gender		
• Males	27	40
• Females	73	60
Occupation		
• Students	13	54
• Entrepreneurs/ Sellers/traders	30	4
• Farmers	7	4
• Labours	7	8
• Homemaker	30	4
• Others	13	4
• Unemployment	0	13
Education		
• Elementary School	27	4
• Junior High School	20	14
• Senior High School	36	65
• Bachelor's degree	10	4
• No formal education	7	13
Age		
• < 20 years old	13	42
• 21-30 years old	13	42
• 31-40 years old	37	8
• 41-50 years old	27	4
• >50 years old	10	4

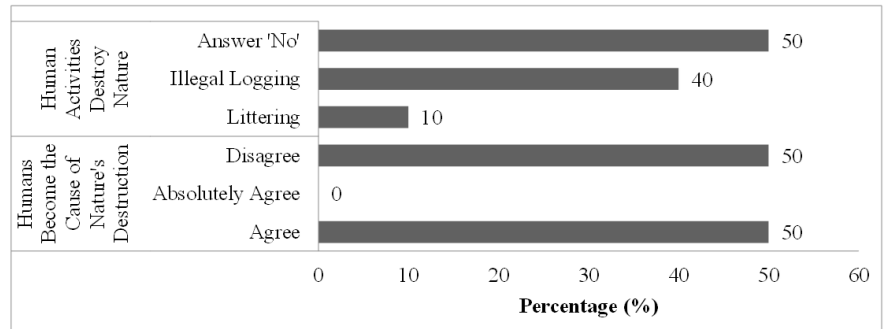
3.2. Perceptions on Nature Conservation

To capture perceptions on nature conservation, several related questions were asked to both the locals of Leang Londrong and visitors. All respondents living adjacent to the area agreed that nature provides benefits to humans (100%), but not all agreed that the protection of nature has only benefited humans (67%) (Figure 2a). The locals mentioned that nature provides access towards natural resources utilization (38%) and has a positive impact on climate (42%). Other local respondents revealed that nature provides water sources (12%) and tourism area (4%). Half of the respondents stated that humans have caused destruction to nature, while the other half had opposite opinions. The largest cause of destruction mentioned was illegal logging (40%), and littering (10%) being the second most common cause (Figure 3b). Only 27% of respondents understood the concept of nature conservation. However, 90% correctly answered its definition. Many of the respondents living nearby Leang Londrong had been involved in some conservation activities such as tourism management (3%), programs to clean the environment (3%), tree planting (10%), and beach cleaning action (7%) (Figure 3b).

In comparison, in relation to the need of humans to protect nature for human's benefit, most visitors to Leang Londrong disagree (77%), as they thought that this effort was supposed to be for all living creatures on earth not only for humans. Almost all (99%) agreed that nature provides benefits to humans (Figure 5a). In contrast with the local participants, some visitors stated that humans have contributed to nature's destruction (74%) and provided various answers to the causes. Many believed that illegal logging (38%) and littering (40%) were the main stressors.

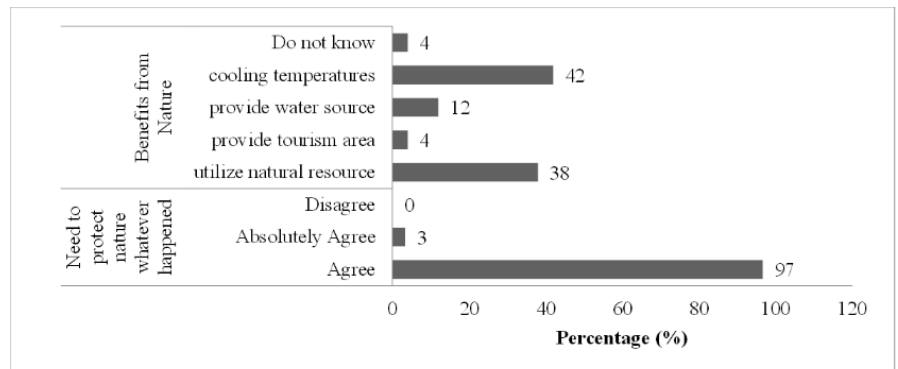


(a)

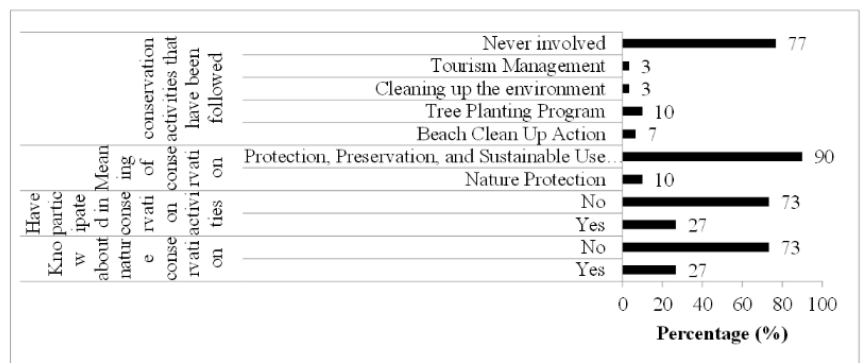


(b)

Figure 2. Perceptions of local community nearby Leang Londrong towards (a) nature; (b) human and threats to the nature

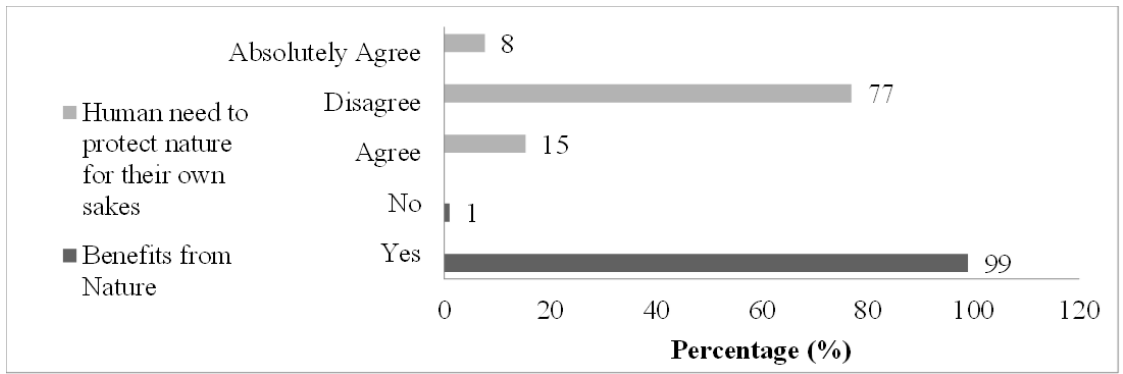


(a)

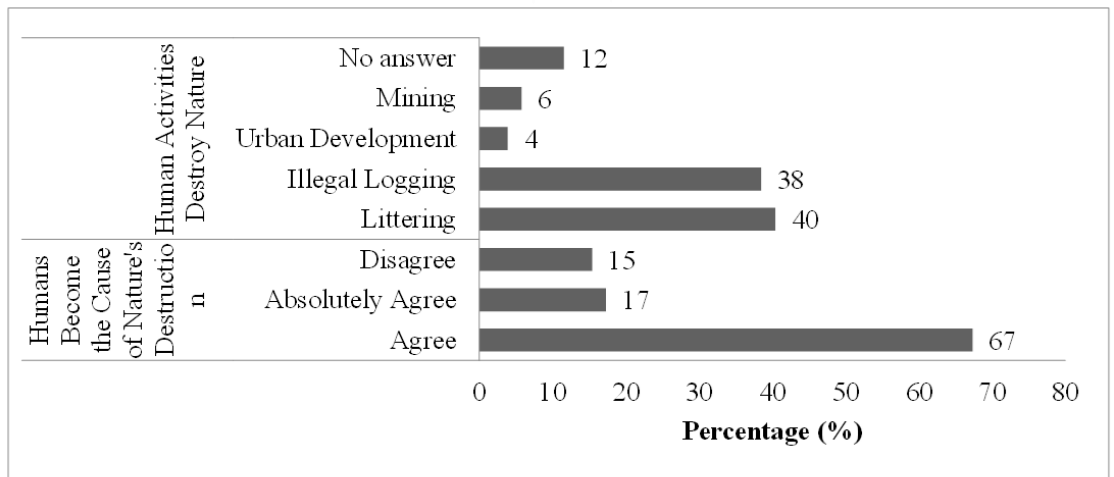


(b)

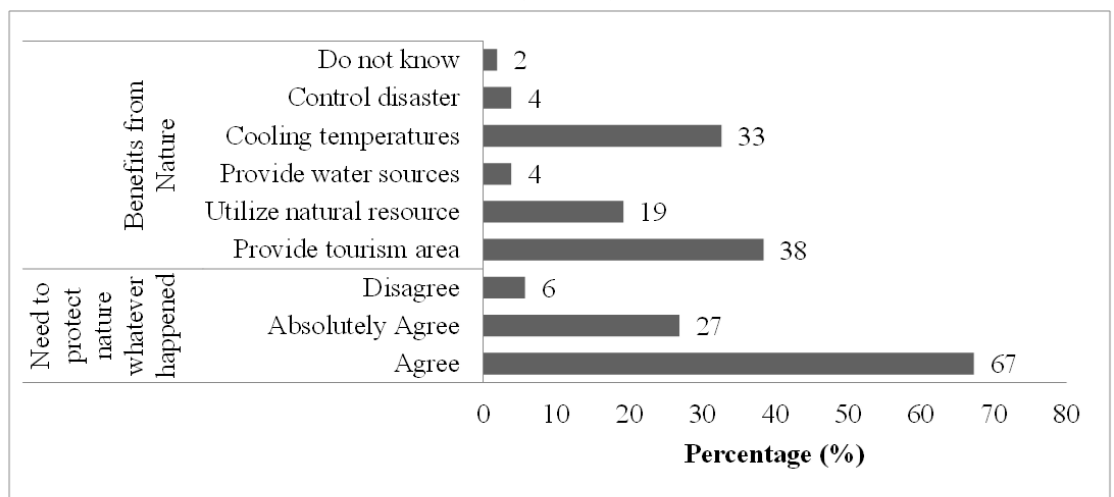
Figure 3. Perceptions of local community nearby Leang Londrong towards (a) benefits from nature and nature protection, (b) involvement in nature conservation activities



(a)

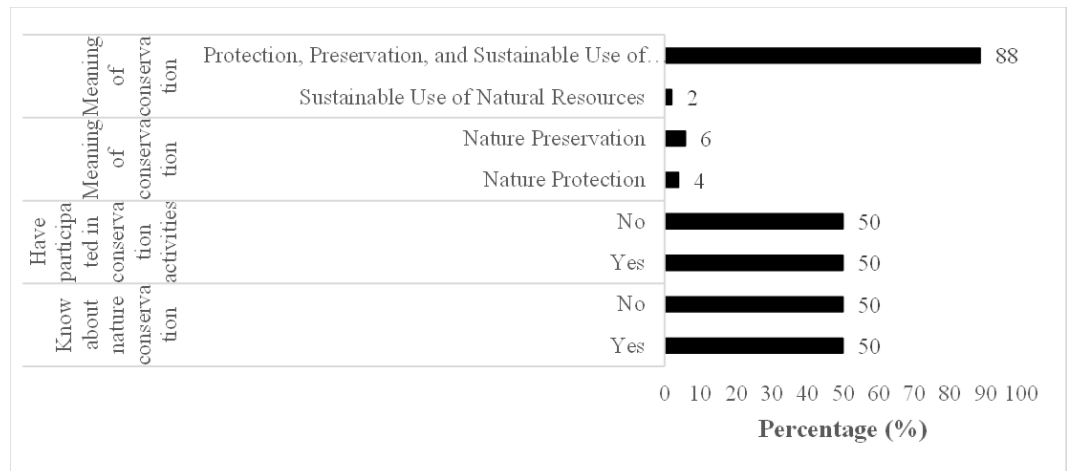


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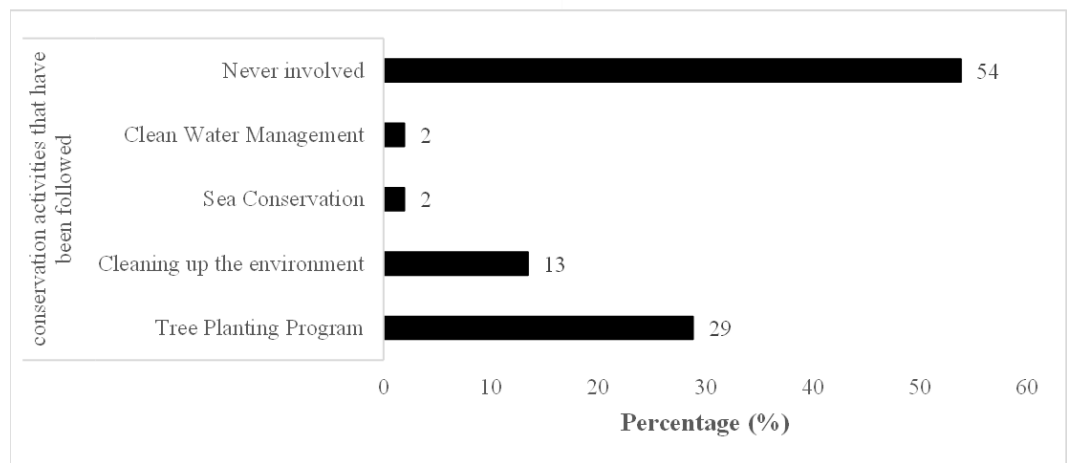


(c)

Figure 4. Perceptions of the visitors of Leang Londrong towards (a) nature; (b) human and threats to the nature; (c) benefits from nature and needs for protection



(a)



(b)

Figure 5. Perceptions of the visitors of Leang Londrong towards (a) nature conservation, and (b) involvement in nature conservation efforts

A few mentioned that the destruction was due to urban development (4%) and mining (6%) (Figure 4b). Most visitors (94%) agreed that nature needs to be protected from any causes of destruction. The visitors had wider responses towards the benefits of nature than the local participants. They answered that the benefits of nature were provision of tourism area (38%), climate stability (33%), utilization of natural resources (19%), controlling disaster (4%) and water provision (4%). Only 2% had no response towards the matter (Figure 5c). In terms of protection, only 94% of visitor responders were willing to protect nature. Only half knew about conservation and less than 50% of the respondents had been involved in conservation activities such as tree planting program, cleaning up actions, sea conservation and clean water management. While the rest of participants had never been involved in any conservation efforts. Most visitors (88%) correctly answered the meaning of conservation (Figure 5).

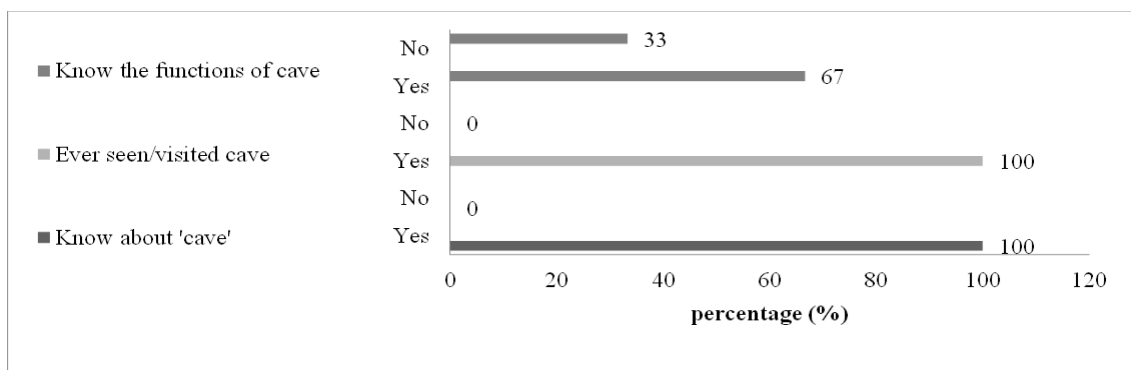
In relation to the needs of humans to protect nature for their own benefit, the majority of visitors in Leang Londrong (77%) disagree as they thought that this effort should be aimed for all living creatures on earth, not only for human. Almost all (99%) agreed that nature

provides benefits to humans (Figure 4a). In contrast with the local participants, some visitors stated that humans have contributed to nature's destruction (74%). Many believed that illegal logging (38%) and littering (40%) were the main issues, with only a few mentioning that the destruction of nature was due to urban development (4%) or mining (6%) (Figure 5b). Most visitors (94%) agreed that nature needs to be protected from any causes of destruction. The visitors gave a wider range of responses towards the benefits of nature than the local participants. They answered that the benefits of nature were provision of tourism area (38%), climate stability (33%), utilization of natural resources (19%), controlling disaster (4%) and water provision (4%). Only 2 % had no response towards this matter (Figure 5c). In terms of protection, only 94% were willing to protect the nature. Only half of the participants knew about the idea of conservation. Less than 50% of the respondents have been involved in conservation activities such as tree planting program, cleaning up actions, sea conservation and clean water management. While the rest had never been involved in any conservation efforts. There were 88% of the visitors correctly answered the question about the meaning of conservation (Figure 5).

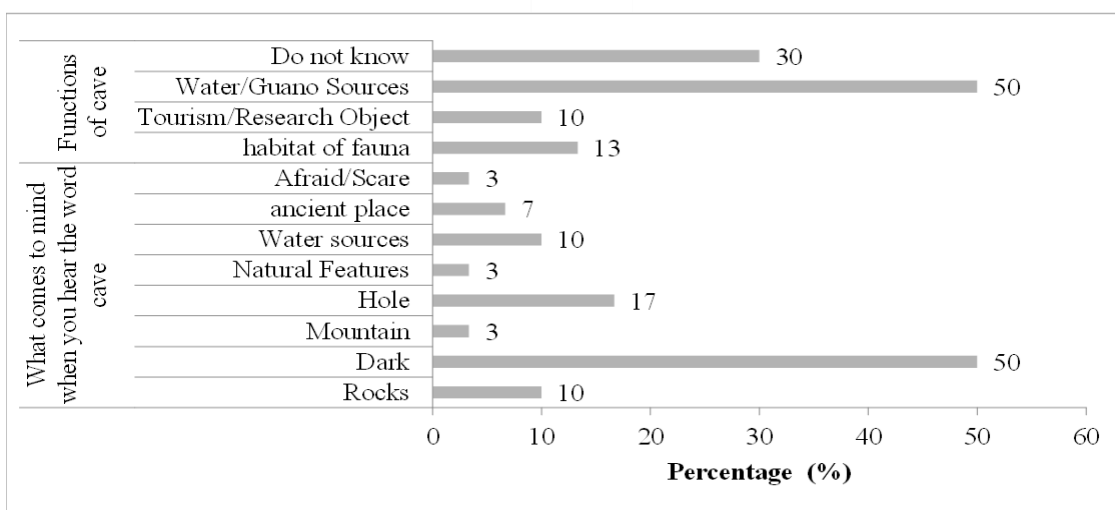
3.3. Knowledge and Perceptions on Cave

In this study, the knowledge and perceptions of the local community towards the cave and its conservation were also analyzed. All local respondents knew about caves and had seen or visited one (100%). However, only 67% of the local community surveyed understood the ecological functions of caves (Figure 6a). In contrast with their understanding on the ecological functions of caves, local participants mostly related the word 'cave' with 'darkness' (50%), compared to other things, and more than 50% of them knew the functions of caves (Figure 6b). According to the participants living nearby Leang Londrong, caves were used mainly as guano resources (87%) and tourism object (13%). They all agreed that Leang Londrong had benefited the community (100%). They also were aware that there were stories/myths developed in Leang Londrong. However, the number of respondents who knew about this was relatively low (Figure 6c). Not many local participants were aware that Leang Londrong was used as habitat for bats (77%), but 100% of them agreed that the cave must be protected. However, only 56% mentioned that regulation or rules were required (Figure 7a). With regards to regulating entrance to Leang Londrong, 62% have suggested some actions such as no touching/damaging the cave ornaments, no improper/disgraceful behaviour should be allowed, no littering, no entrance to the cave, and prohibitions in taking pictures/photographs.

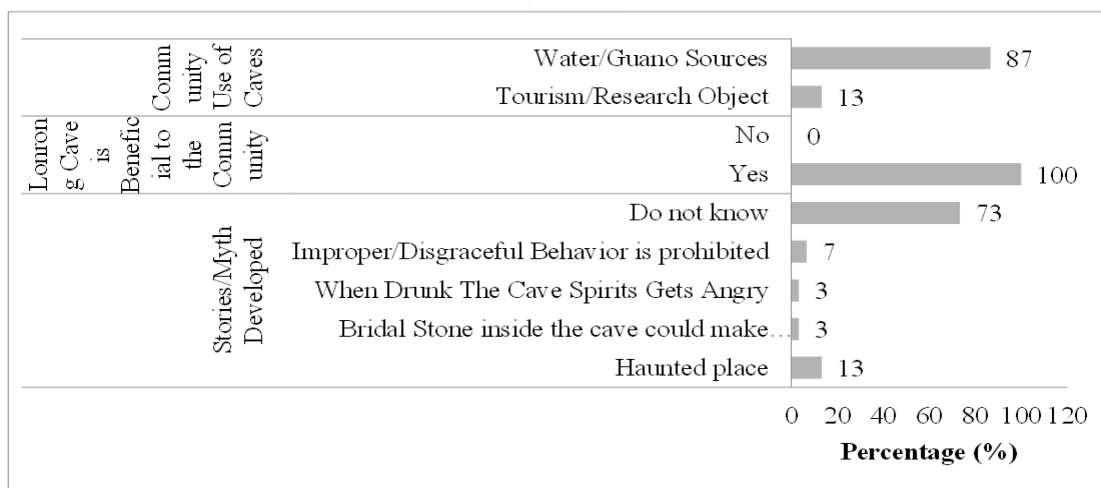
Similar to the local participants, all visitors (100%) to Leang Londrong were familiar with caves and had seen or visited a cave. However, they did not have sufficient knowledge about the functions of caves, as only 69% answered (Figure 8a). Similar to the local participants, most of the visitor respondents related the word 'cave' with 'darkness' and 'hole' (>40%). The visitors mostly knew the cave as a tourism object (48%), water/guano sources (33%), and habitat of fauna (21%) (Figure 8c). Some even considered the cave as a scary place (21%) or a place for traditional ceremonies/rituals (4%). They were also familiar with Leang Londrong and enjoyed the scenery surrounding the cave (98%). Furthermore, most visitors knew of the existence of bats in Leang Londrong (94%) and agreed that the cave must be protected (98%). Most of the visitors also stated that they were interested in both plants and animals (98%) (Figure 8b). The majority of the visitors had no information related to the current regulation applied in the area (90%) and they assumed that the regulations related with Leang Londrong were in written form (60%). Some mentioned that the rules in Leang Londrong were maintaining good manners and prohibitions on littering (8%).



(a)

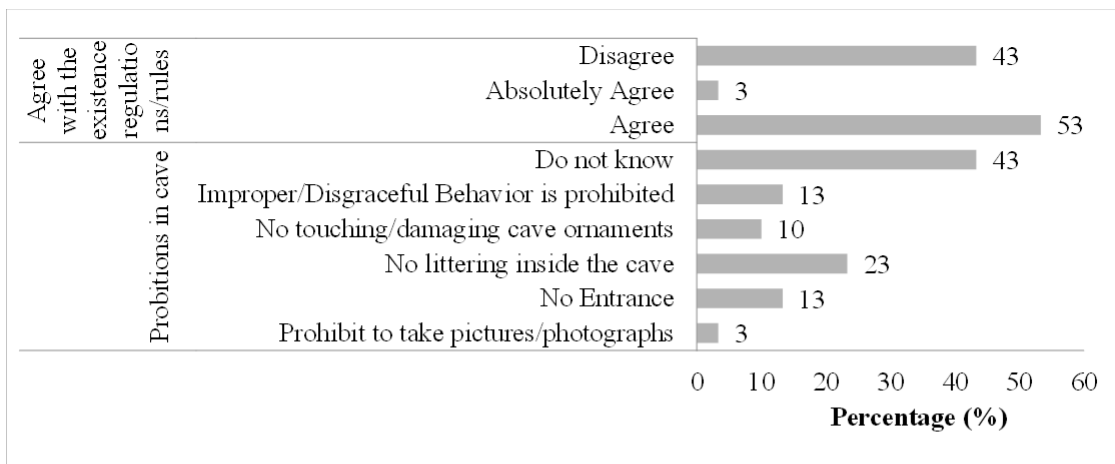


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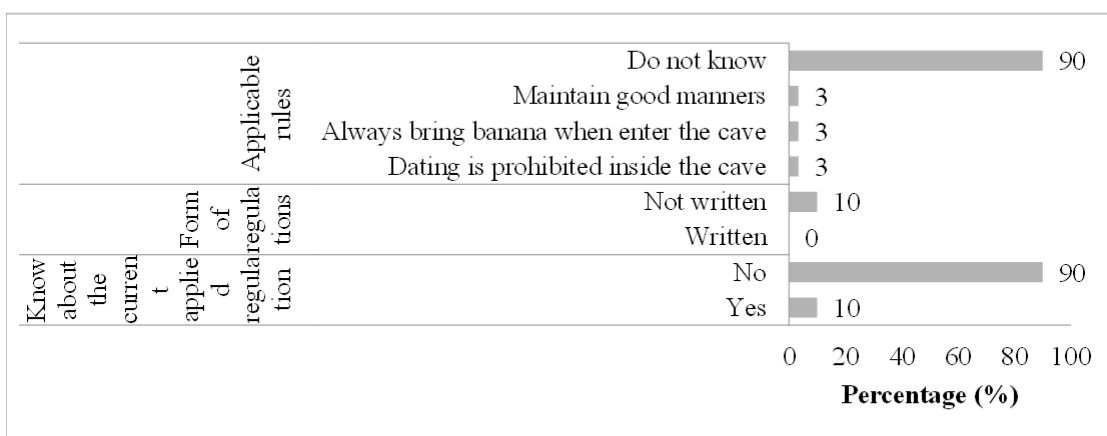


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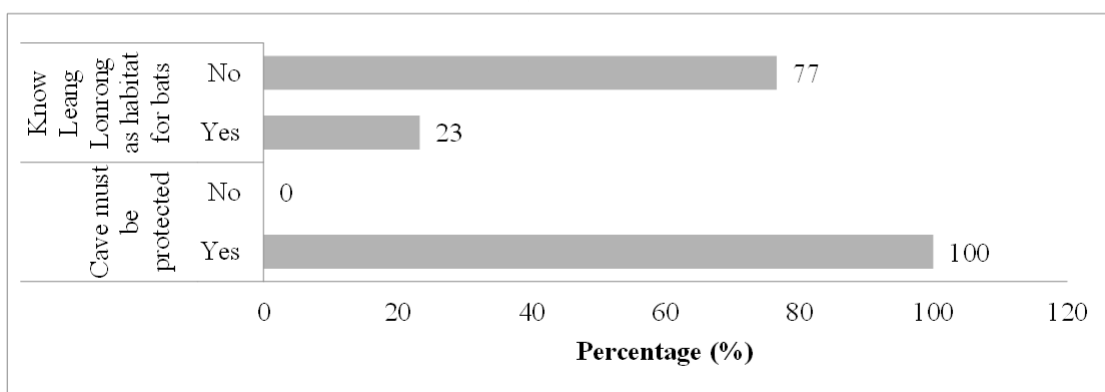
Figure 6. Knowledge of local people nearby Leang Londrong related to cave: (a) Knowledge, (b) functions, and (c) myths & community use of Leang Londrong



(a)

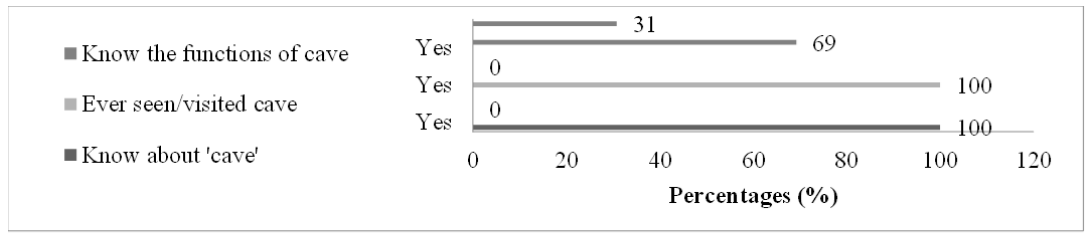


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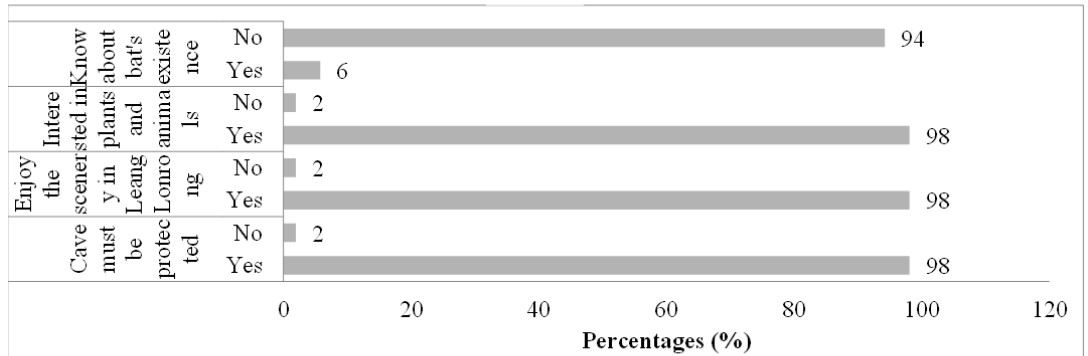


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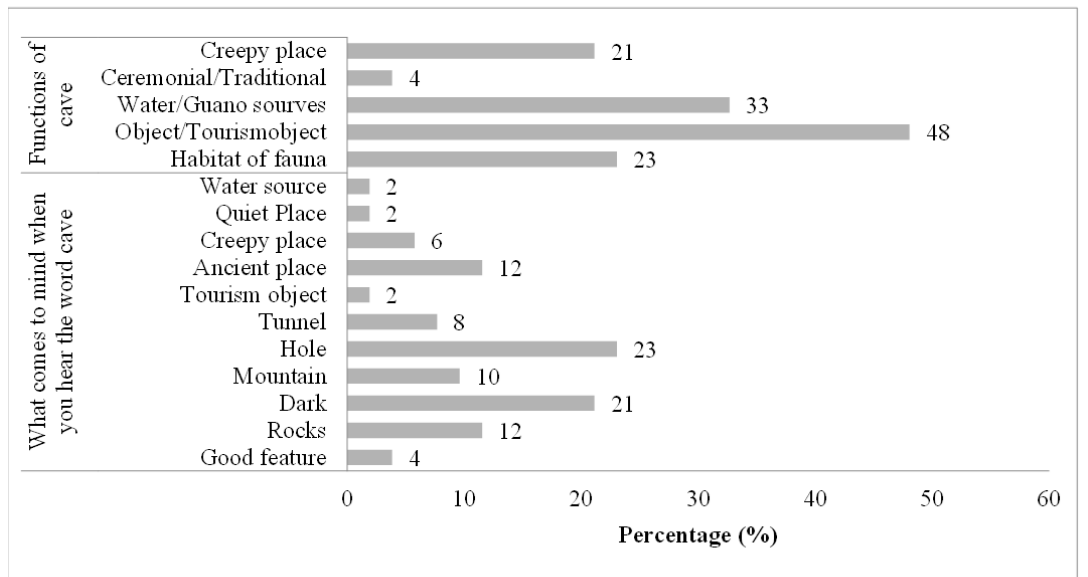
Figure 7. Knowledge of local people nearby Leang Londrong related to cave: (a) prohibitions, (b) rules/regulations related to cave, (d) conservation of cave and bats



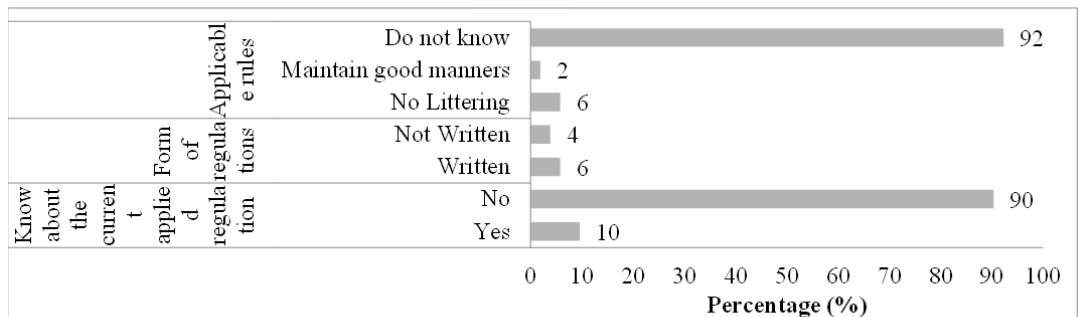
(a)



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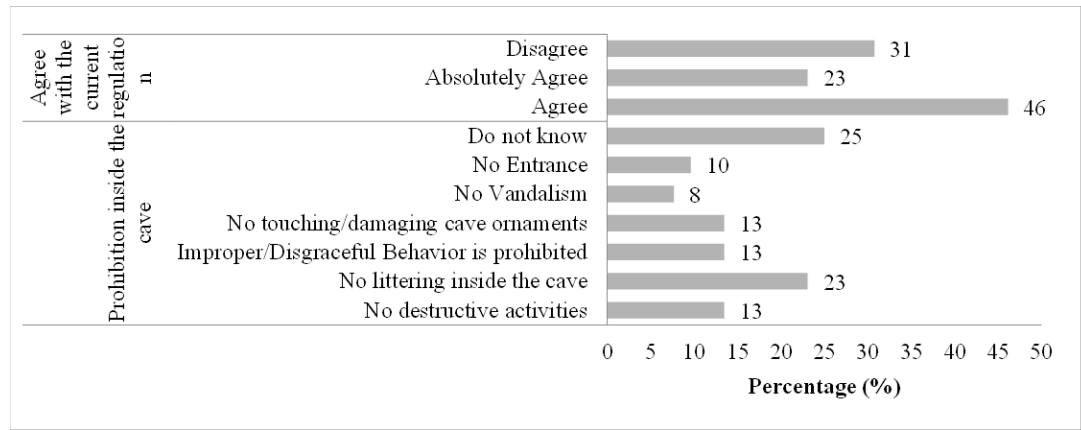


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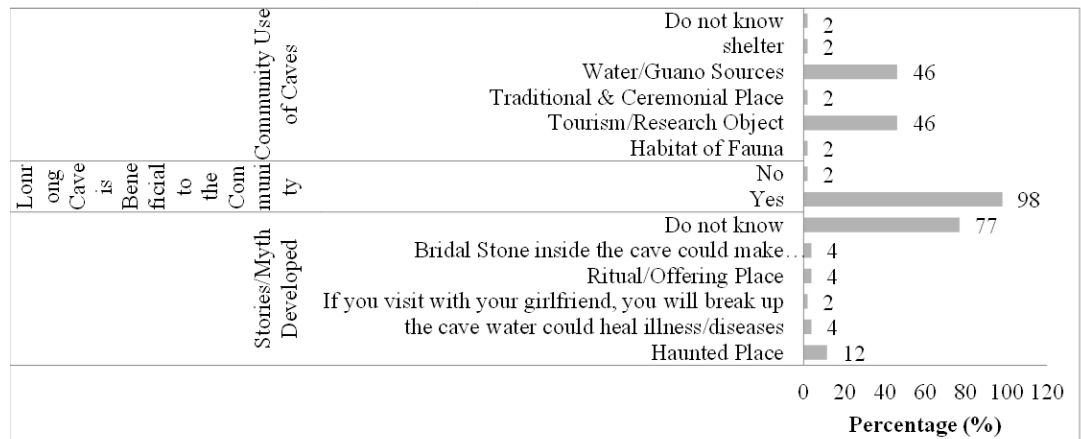


(d)

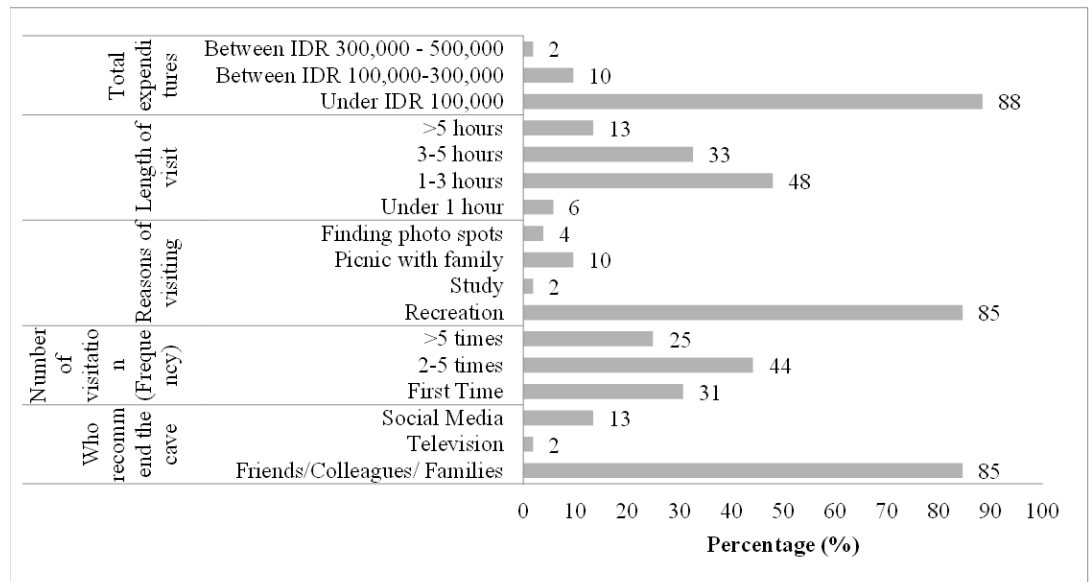
Figure 8. Knowledge of visitors related with: (a) Leang Londrong, (b) environment of the cave, (c) Functions of the cave, and (d) rules related to Leang Londrong



(a)



(b)



(c)

Figure 9. Knowledge of visitors related with: (a) prohibitions in cave, (b) Stories/myths, & community use of cave, (c) tourist's and cave visits

However, in general they had no information related to rules/regulations in the area (92%) (Figure 8d). Only 25% had no information as regard to the existence of rules or regulation in Leang Londrong. Most of the visitors (98%) were aware of the benefit of the Leang Londrong and the majority answered water/guano sources and tourism object as the common use of the cave (92%). The visitors had different views related to developed stories/myths about Leang Londrong compared to the locals. However, 77% of the respondents had no information about the matters (Figure 9b). Leang Londrong was recommended to visitors mostly by friends/colleagues/families (85%) and some of the visitors obtained information about the place through social media (13%). The highest frequency of visits to Leang Londrong was between 2–5 times (44%). The main motive behind the visits was recreational activities (85%), and about 81% spent between 1–5 hours in the area. However, most visitors (88%) only spent a relatively small total expenditure of less than IDR100,000 (Figure 9c).

3.4. Knowledge, Perceptions, Attitude and Awareness towards Bats and its Conservation

Apart from examining cave and Leang Londrong, some questions addressed knowledge and perceptions of bats and its conservation from the local community living nearby Leang Londrong and visitors (Figure 10-15). All the locals and visitors knew bats as animal. The number of people scared of bats was slightly higher for visitors (54%) than for locals (37%). However, only less than 5% of all respondents associated bats to Corona Virus. Despite the knowledge, not many of the visitors or locals were aware of the existence of bats nearby. Even most of both groups of respondents admitted to had seen bats in their neighborhood (>70%).

More than 80% of the respondents had no interests in bats and mostly ignored them when they encountered one (>90%) (Figure 13d & 15). Less than 15% of the respondents had consumed bats, which in all cases were for medication purposes. In relation to health issues, some of the respondents mentioned bats as asthma's medication and only a few knew that bats are Covid-19 hosts, with some participants realizing that the animals might spread some viruses. Compared to the locals, the visitors had a higher percentage (13%) of knowing the bats as hosts for the virus. In terms of their attitude and awareness of bats, around 50% of the respondents agreed that bats had caused disturbances to human. Local participants had never heard of any hunting issues with bats. Meanwhile 6% of the visitors had heard that bats are hunted for health purposes.

3.5. Perceptions of the potential and development of bat-cave tourism in Leang Londrong

Overall, perceptions of developing an ecotourism program in the cave were mostly positive (> 80%) (Figure 16 and 17). In relation to the involvement of the locals in the development of ecotourism, only 43% agreed to join, whereas for the visitors, around 60% were willing to be involved in the development of such program. The types of involvement chosen by local participants were protection (33%) and management (10%). On the other hand, visitors would mainly get involved in the development of cave and bat ecotourism as a form of protecting the area (40%), followed by becoming tourist guides (12%), becoming parts of institution who will manage the tourism (2%), financial (6%), and management (4%). Visitors responded that they would be willing to pay for entering the cave and observe the bats, but only < IDR 10,000 (less than a dollar). Considering that only less than 15% of both respondents had ever heard about bat conservation, it was not surprising that the willingness to pay for bat tourism was predicted to be low. However, most of the respondents were keen to participate in conservation actions (69%), although the local participants had a higher percentage of willingness compared to the visitors.

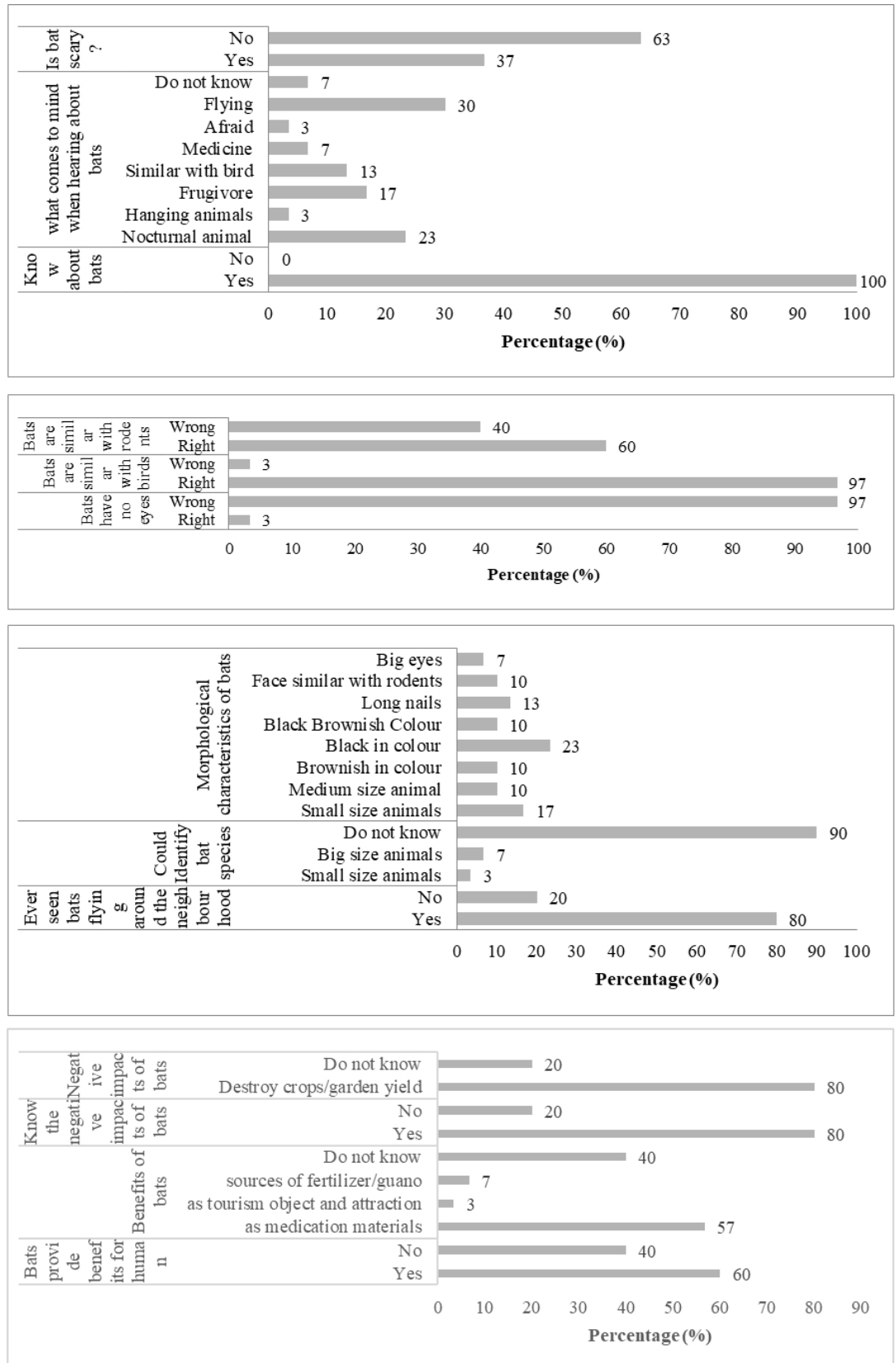
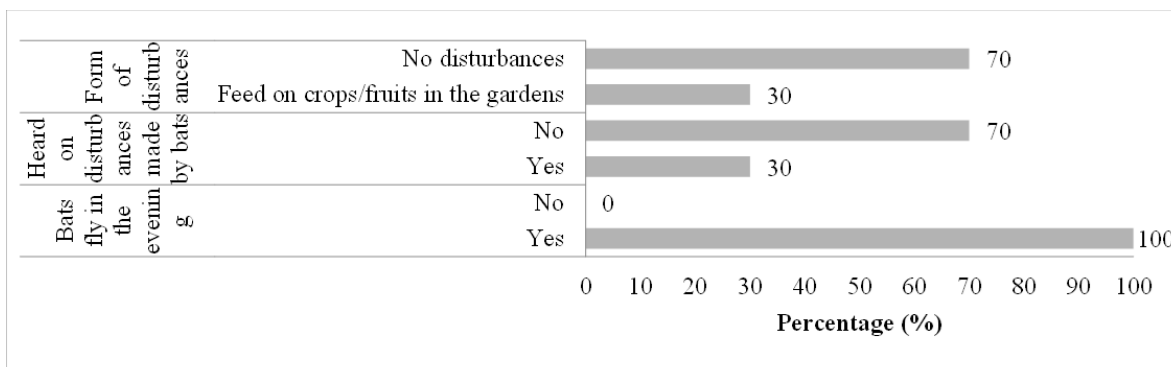
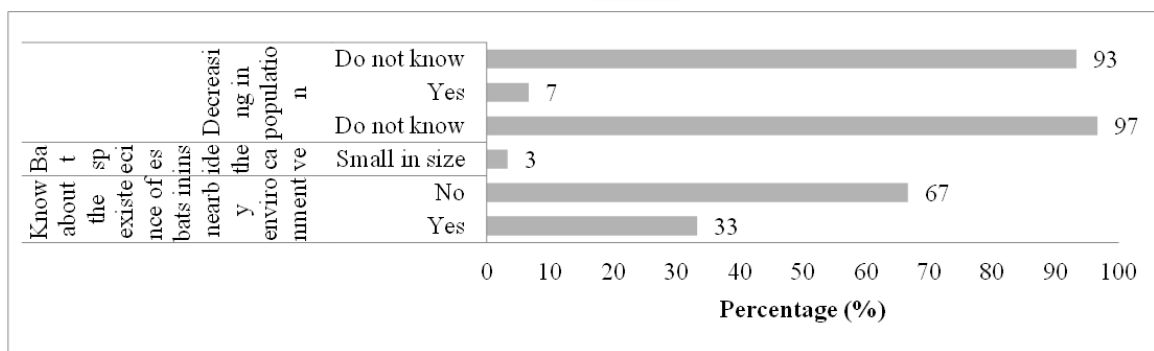


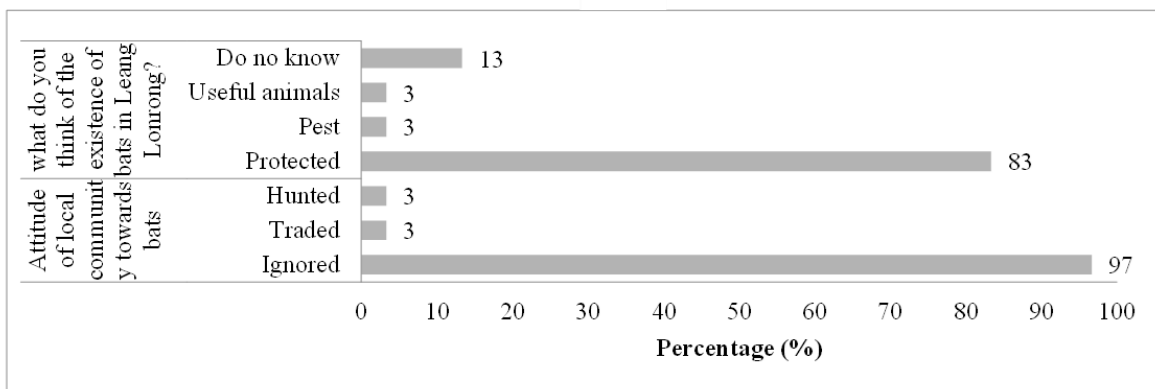
Figure 10. General Knowledge and perception of local community living adjacent to Leang Londrong about bats



(a)



(b)



(c)

Figure 11. Knowledge and perception of local community living adjacent to Leang Londrong related to: (a) disturbances by bats, (b) benefits and impacts of bats, and (c) attitude towards bats in Leang Londrong

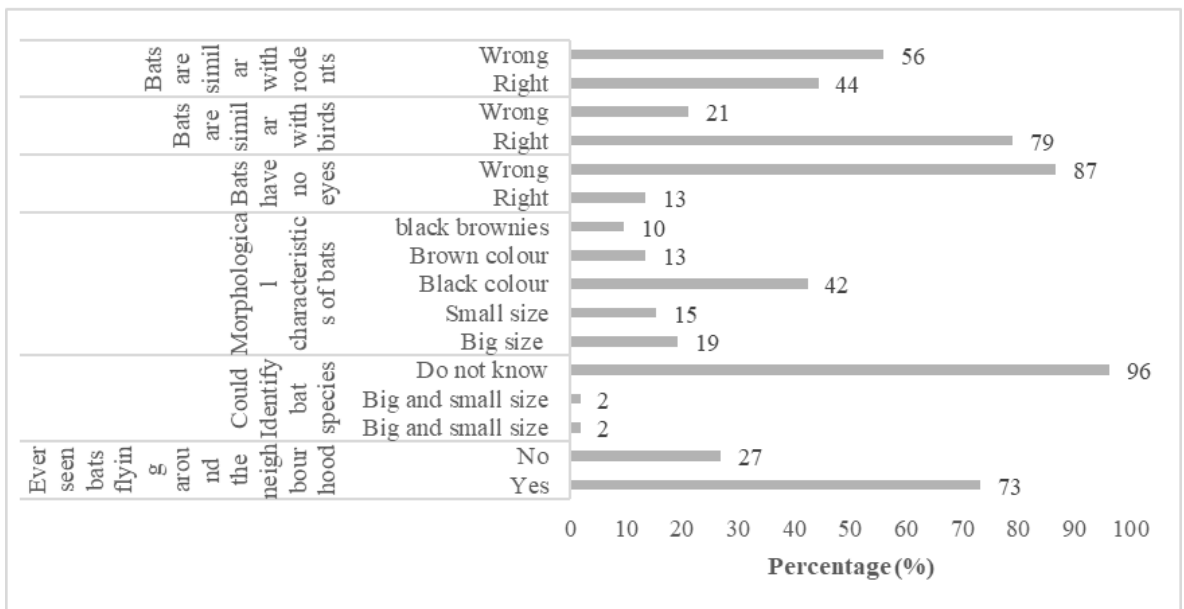
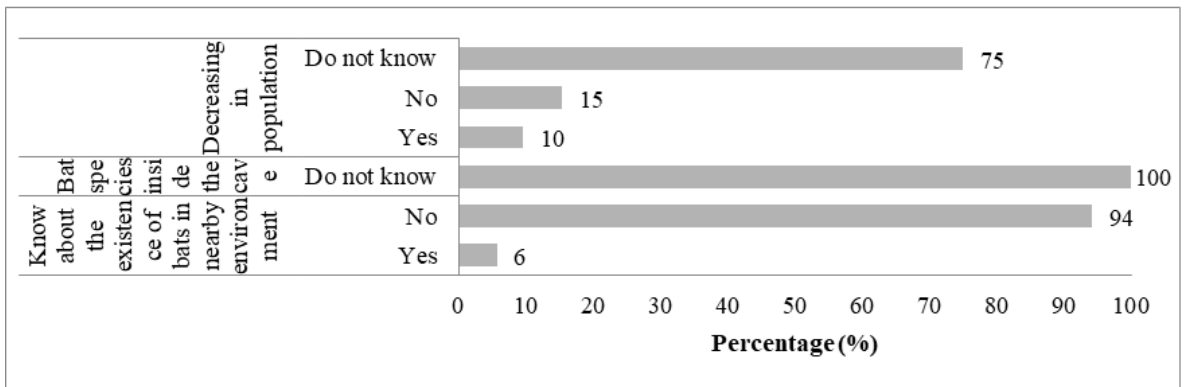
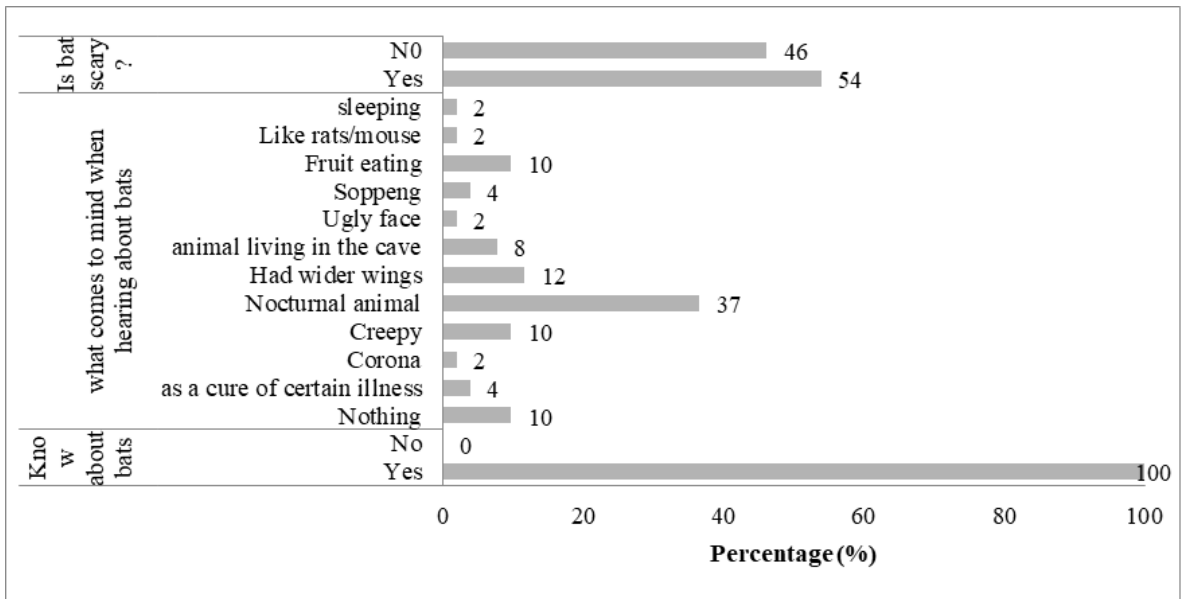
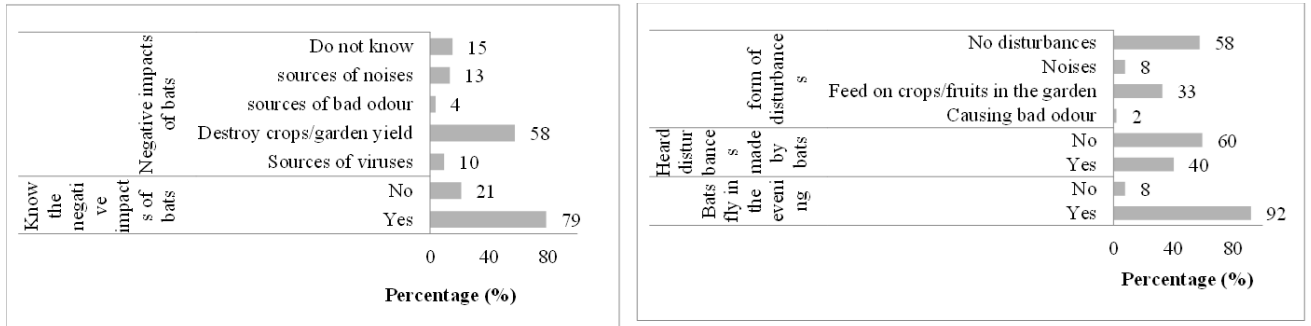
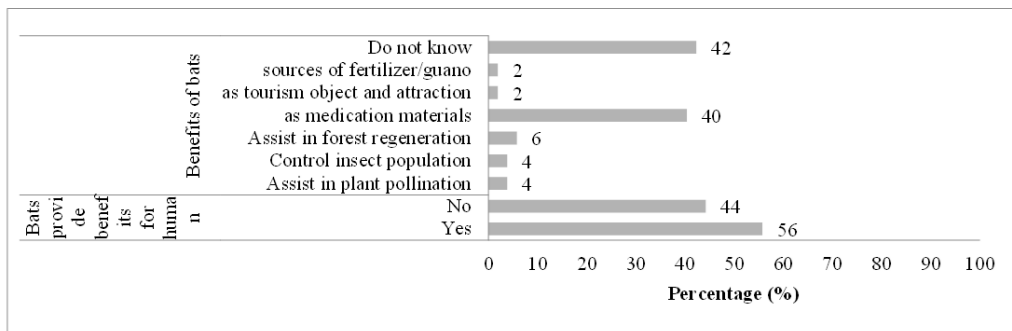


Figure 12. General knowledge and perception of visitors in Leang Londrong about bats

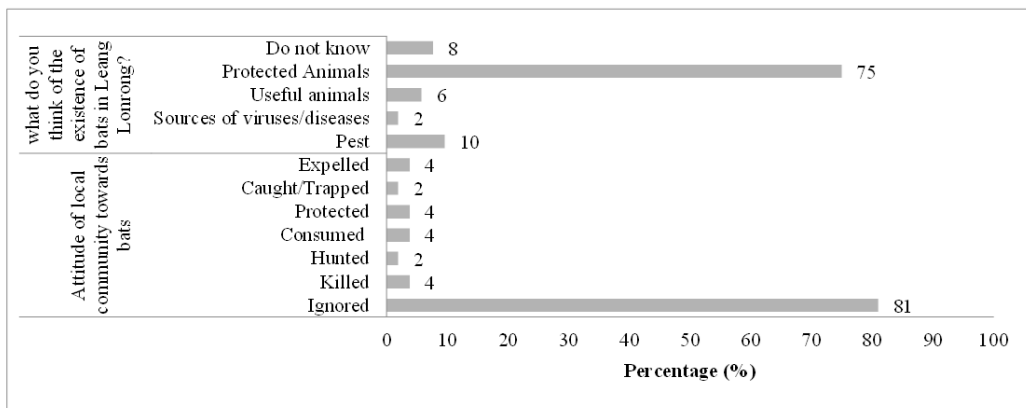


(a)

(b)

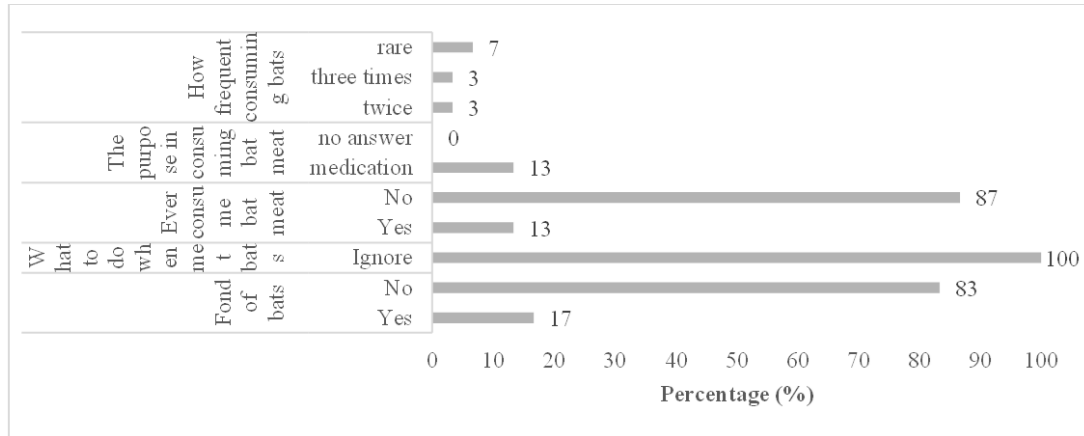


(c)

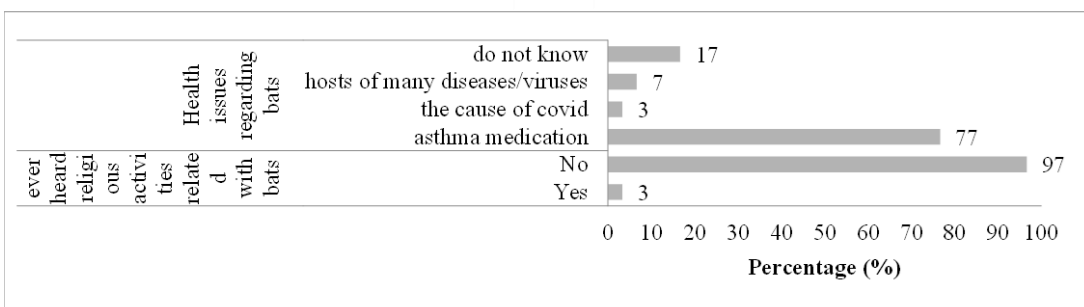


(d)

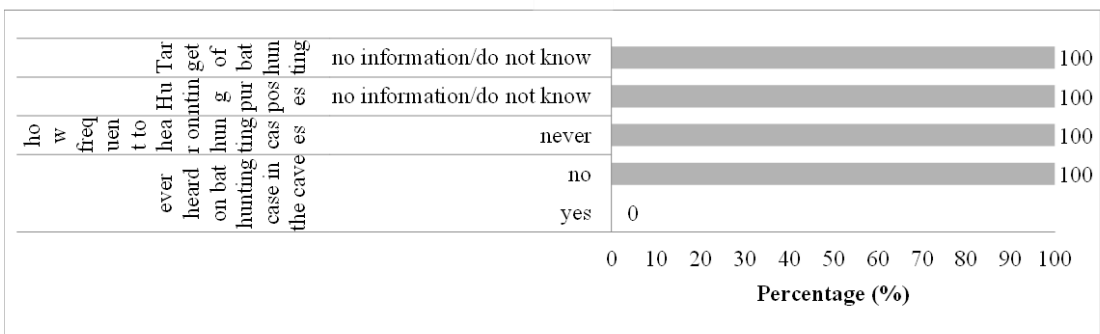
Figure 13. Knowledge and perception of visitors in Leang Londrong related to: (a) negative impacts of bats, (b) bats disturbances, (c) benefits of bats, and (d) attitude towards bats in Leang Londrong



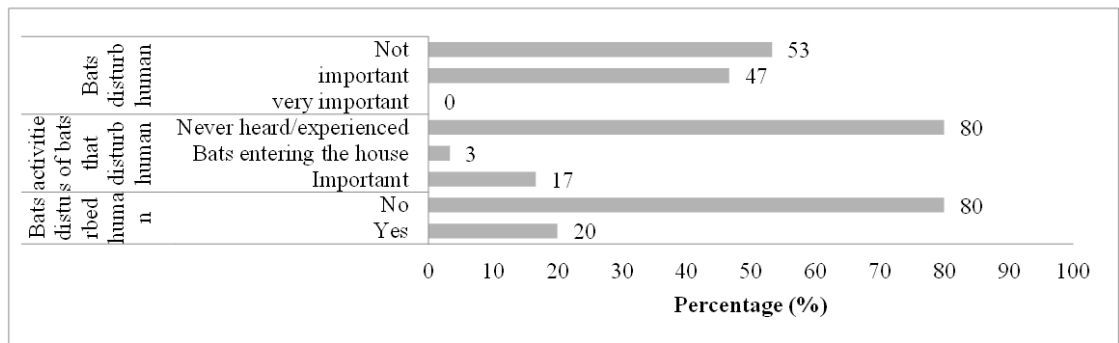
(a)



(b)



(c)



(d)

Figure 14. Attitudes and awareness of local people nearby Leang Londrong towards bats (a-d)

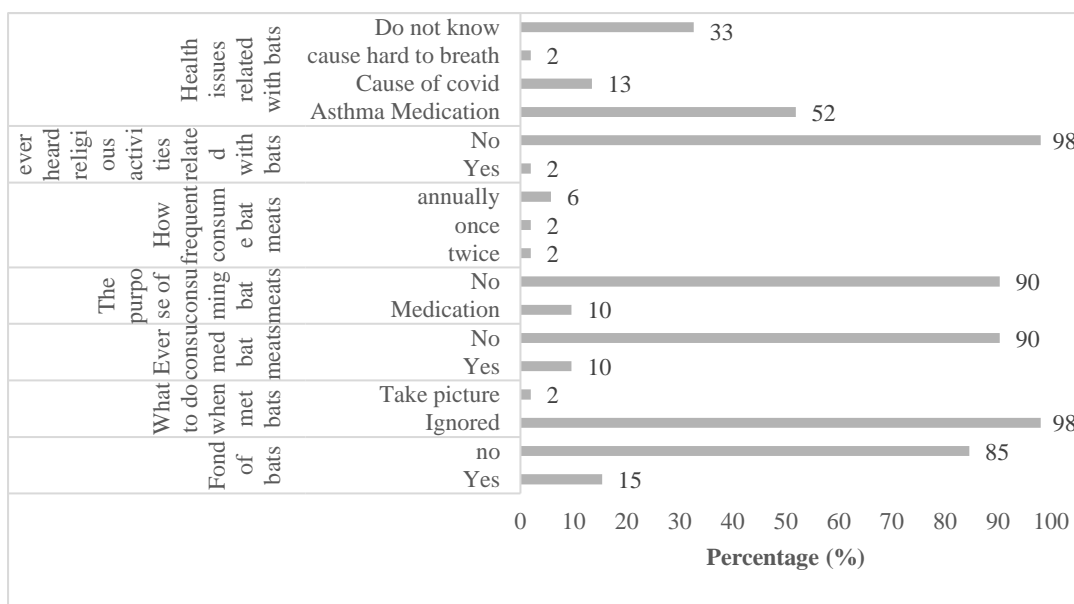


Figure 15. Attitudes and awareness of visitors in Leang Londrong towards bats

4. Discussion

Leang Londrong in Pangkep Regency (South Sulawesi, Indonesia), has become an option for tourism destination in South Sulawesi. This area is situated in Maros-Pangkep Karst Formation, which not only offers water-based recreation, but also fantastic sceneries of tower of karst landscape surrounded by lines of rain forests. As part of Bantimurung-Bulusaraung National Park, the site has been used by domestic visitors for water-based tourism activities only. The idea of developing an ecotourism program that includes the cave and their bats may offer different activities for the visitors visiting Leang Londrong and at the same time educating and increasing awareness of people for bat-cave conservation. However, it is important to obtain perspectives of both local communities surrounding the area and visitors towards the development. Perceptions of stakeholders on both bat-cave tourism and conservation may potentially affect participation in current and future development plan [26].

Based on the results, there is a potential market for Leang Londrong if cave and bat tourism would be offered as an option by looking at the characteristics of visitors who in majority were young people (<30 years old (84%) and mostly were Junior and Senior High School students (79%). This coincides with many studies, which revealed that youth would serve as valuable players not only as visitors but also as important stakeholders in both tourism and conservation programs in the future [27,28]. Nevertheless, many youths had limited knowledge and awareness on nature tourism and preservation [29,30,31]. This was similar with what have been found in this study where the majority of young visitors as well as young locals showed limited understanding in conservation, which might become impediments for developing the bat-cave tourism in Leang Londrong. For example, all participants agreed to protect the nature, but not many, in particular the visitors, understood the benefits gained from the nature. Moreover, visitors who were mostly in the educated (high school level) category had poor understanding on the benefit of nature. Therefore, some efforts to equip both the locals and visitors are required to fill these gaps by integrating tourism activities with education and awareness promotion. Increase knowledge on the matters may indirectly shape the eco-friendly behavior of visitors [32].

Understanding the characteristics of visitors would provide a foundation for the management to plan and design suitable direction for the development of an ecotourism area. It was highlighted by Cini et al. [33] that segmentation of visitors is crucial in the planning process of tourism, and hence, different approaches in communicating and promoting knowledge in ecotourism activities for young people should be implemented.

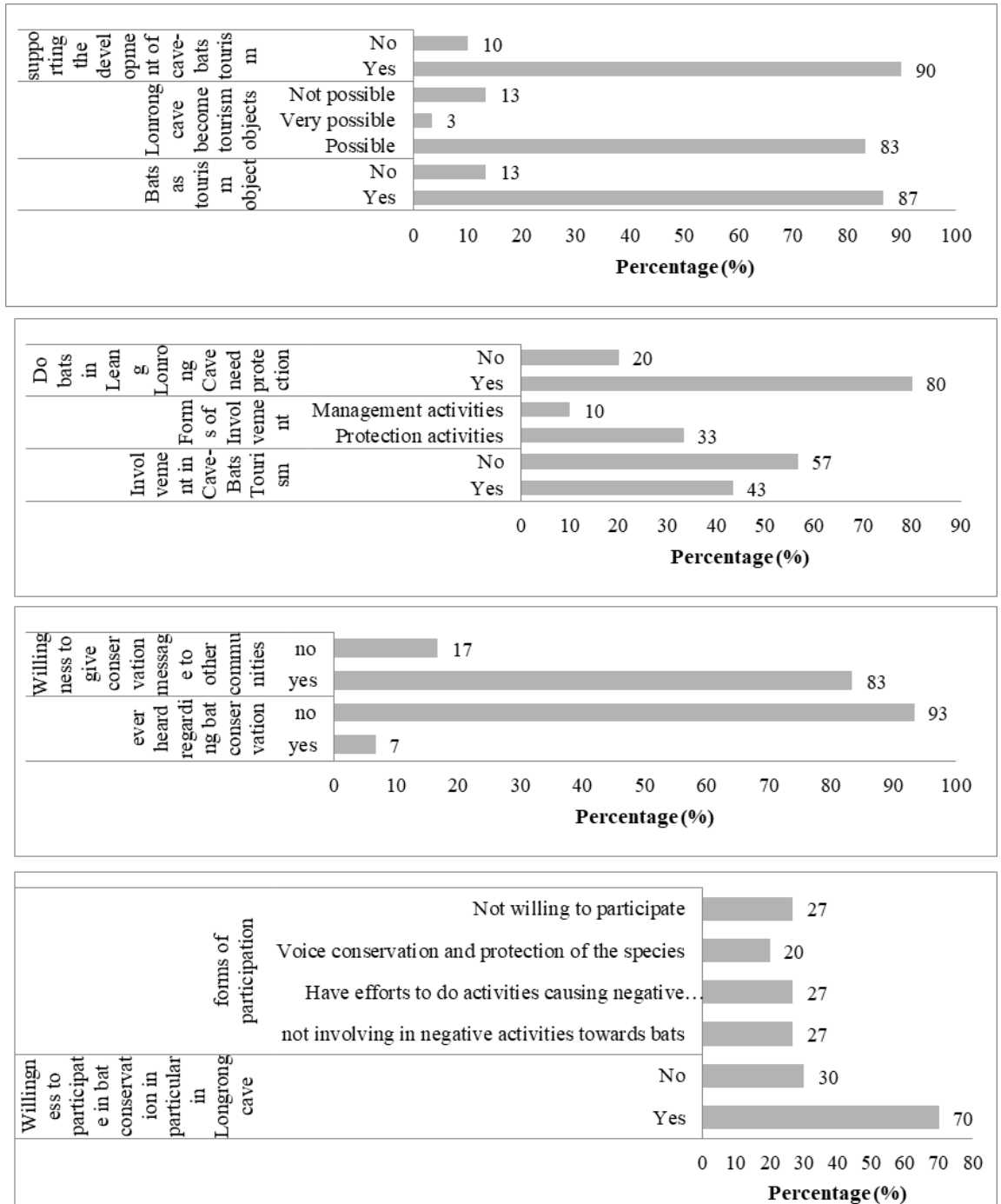


Figure 16. Opinions from local people of Leang Londrong on the potential and development of cave and bat ecotourism in the area

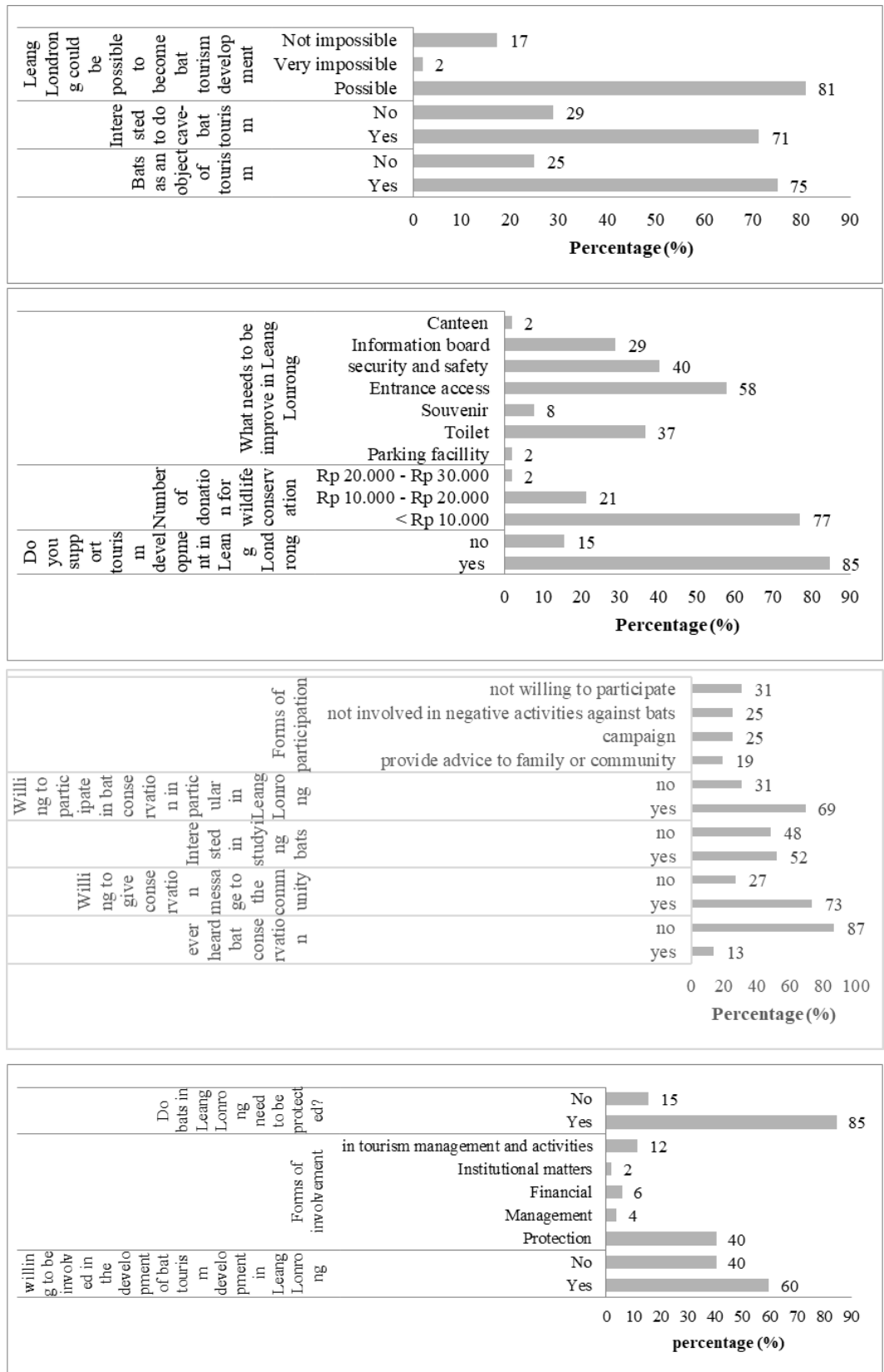


Figure 17. Perceptions of the visitors in Leang Londrong as regard to the potential and development of bat-cave tourism in the area

The results had also shown that both respondents had limited knowledge and perceptions particularly in relation to functions of the cave as important habitat for bats and bat's existence in Leang Londrong. This might create issues, particularly in building environmental apathy or disinterest in conservation of resources, which might influence the development of bat-cave tourism and conservation in the area. On the other hand, this can be viewed as opportunities to introduce bat-cave tourism in Leang Londrong, which not only offers options for tourism activities but also may provide ways to educate everyone on the importance of cave as a part of nature features and bats for its environmental services through ecotourism as one of the purposes. Environmental education is a key point in supporting a successful ecotourism program [34]. As part of ecotourism component, environmental education could gain and improve the level of awareness so that people involved in the activity could also value nature and contribute to the preservation of nature (Ramirez and Santana 2019). However, environmental knowledge itself is not enough to encourage and guarantee the establishment of conservation behavior [20]. There should be a series of social context understanding embedded to the process of providing the educational program in order to effectively achieve the conservation goals [35,20].

One of the integral parts in projecting the potential of cave and bat tourism development in Leang Londrong is by determining people's knowledge and perceptions towards bats and its conservation. In general, both local participants and visitors had limited knowledge with regards to bats. Most questions related to morphological and other common features of bats were incorrectly answered. This suggests that even if the majority of the respondents knew about bats, these particular animals were beyond their radars. This was supported by the fact mentioned by the two groups of respondents that only less than 30% for the locals and 6% of the visitors knew about the existence of bats in the nearby environment. Low awareness of bats may be related to insufficient knowledge of people towards the benefits of bats [36,24, 37], which was shown by higher percentage of respondents answered '*do not know*' on the question related with the benefits of bats.

Many negative public perceptions historically related to bats were raised due to vampire folklore, fear of diseases carried by the animals, including bad experiences with bats in the past [38,39]. Misperceptions and misconceptions on bats also occurred within the respondents. Most of the respondents in this study agreed that bats had caused disturbances to humans by mostly destroying crops/garden yield. Complaints on bats in fruit raiding were actually very common across the world [36,40,41]. Less interactions with bats and no negative experiences in the past had contributed to attitude towards bats in the area where the majority of respondents from the locals and visitors tended to ignore the bats when they encountered the animals. No attention towards bats might induce some problems, in particular, for the conservation efforts of bat species. Animal species that are perceived to have no value for people were tended to be unnoticed, ignored, and later might be disappeared without anyone realizing of the loss [41]. There is a need to inform the public on the benefits of bats for the environment and human [42-43]. Many studies revealed that to combat public misperception and misconceptions is through the increase of positive perceptions of the species [44,38,45]. Therefore, to expose more about bats and its conservation in relation with their support for the development of bat-cave tourism, positive views on bats are required. This can be achieved through providing public education [38,46]. Initial steps that could be taken is to promote the existence of cave, bats, and conservation to all stakeholders through deploying information banners/boards in the area, which then is followed by the involvement of various stakeholders in the initiation of bat-cave tourism in Leang Londrong.

Concerns on the relationships between bats and human health were also investigated in this study. A low percentage of respondents were aware of bats as hosts for various viruses, including Covid-19, and the majority of those who knew the matters were visitors. This gap of knowledge needs to be addressed in order to justify the existence of bats, increase commitment for conservation, and prevent disease transmission as well open the opportunities for the development of cave and bats tourism. Again, environmental education has become the key strategy in filling the gaps [47]. The education will improve public

awareness, and public awareness is required to avoid potential risks in human-animal interactions [48,49]. This indirectly will benefit conservation efforts.

Leang Londrong has various tourism potential that can be developed into high value attractions for visitors. Potential activities would include enjoying scenery, trekking, water-based recreation, camping, wildlife watching, and caving. To attract young age people as a potential market segment for tourism in this area, the use of more stimulating, innovative and interactive media may provide channeling for active participation of young visitors [31]. Hugo [50] mentioned that social media, TV shows, and other interactive media might be used as a tool in delivering education for the youth. Successful in recognizing this, is believed to have positive contribution in raising the awareness of the youth as well as the sense of belonging of the community through future active participation in bat-cave tourism and conservation programs [51].

Overall, the results have shown that both people living nearby Leang Londrong and visitors of the tourism object had high interests in the development of cave and bat tourism in the area. However, it is highlighted that insufficient knowledge on nature, cave, bats, and its conservation could halt the process of forming perception, awareness, and attitude of involved stakeholders in the future. There should be some efforts in improving people's knowledge on the matter.

Knowledge, in order to be able to influence perceptions in various ways, needs to be formed into visual experience, which stimulates recognition and interpretation to be occurred as well as leads to perceptual enrichment [52]. This is very crucial in shaping their perceptions on the development of cave and bat tourism. In contrast to their current knowledge on nature, cave, bats and its conservation, future willingness to participate in bat conservation were quite high. This can act as social capital for future potential and development of tourism in the area. Therefore, to change and stimulate positive perceptions of the people, community participation and involvement in any forms of initiation of cave and bat tourism are necessary. This might provide access for people to gain more experiences and changes in their perceptions. The management of Leang Londrong should start to initiate a set of both education and promotion materials which involve the use of social medias to attract the young age people to visit the area as well as providing interactive education materials on and off site. Direct involvement of young people in designing required materials and programs suitable for this segment may provide insights to the management on how to best approach the targeted group.

As mentioned above, exposures towards education on nature, caves, bats, and conservation are important if changes in perceptions of the locals and visitors are to be achieved. For effective environmental education, three main targets of populations need to be addressed and those are visitors of the site, local community, and future generations [53]. Some approaches might be implemented to achieve environmental education and raise awareness of both the local people of Leang Londrong and visitors through the use of media, awareness campaign, public participation in conservation programs, and integration of conservation into formal education [48]. However, of course, in establishing the concept of wildlife tourism in Leang Londrong, a careful plan needs to be put in place and supported by a series of proper research studies to guarantee that the activities of ecotourism did not jeopardize the population of the wildlife and generate negative impacts to the environment [19,54].

5. Conclusion

The study's findings demonstrated that both locals and visitors in Leang Londrong had insufficient knowledge on cave, bats, and conservation. Less experiences and exposures, in particular to cave, bats, and its conservation, may have contributed to a low awareness level and to the perceptions of the respondents. Educating people on the urgency of the subjects would effectively provide knowledge required in forming perceptions. This can be achieved by providing more channels for people to be more exposed towards caves, bats and its conservation. This includes more involvement of the locals and visitors in related conservation programs. High acceptance towards the concept of bat-cave tourism of both groups of respondents can be perceived as vital foundation for the government and the

management of the site in developing bat-cave tourism, which could support both bat and cave conservation in the area.

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