Limits of acceptable change for sustainable management of the Pelawan Biodiversity Park, Bangka Belitung Islands

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Abstract. Indonesia is a country of immense biodiversity, however the natural environment is under pressure because of competing economic needs of the large population. Limits of Acceptable Change is a management strategy which acknowledges that any use of an area brings environmental change and best outcomes are achieved if all stakeholders are involved in the process. LAC was applied to develop a management strategy for Pelawan Biodiversity Park, Bangka Belitung. This reserve exists for the preservation of endemic flora and fauna and is also utilised by local communities so there exists the potential for conflict of interests. This research was conducted March - April 2021. Through direct observation and interviews with all stakeholders, the LAC process was used to identify the reserve’s environmental and cultural values, and the goals held by each of the stakeholders. The results obtained indicate that the primary values assigned to the park are culture and economy, ecology and conservation, education and research, as well as tourism and ecotourism. Some activities of the communities both within and in the surrounding area have direct negative impacts on the environment in the park, including horticulture, tin mining, palm oil, poaching, over-exploitation of pelawan mushroom and honey, as well as tourist activities. After analysing the potential zoning for all activities, three usage zones were proposed to maximise conservation and facilitate economic sustainability for local communities. Specific management strategies for each zone are proposed together with indicators and standards of environmental change. Practical next steps are proposed for community wide consultation and implementation of management practices.

1. Introduction
Conservation and sustainable management of the natural environment is an increasingly difficult goal as the impact of global population, deforestation and climate change escalates [1,2,3]. This is particularly a problem in Indonesia as agriculture and economic needs often conflict with conserving natural ecosystems and endemic flora and fauna[3]. There is a need for appropriate management strategies which preserve the biological diversity and function of ecosystems and are willingly applied by all stakeholders. A common strategy is to protect strategic areas through the creation of conservation zones. Indonesia has established a diverse range of reserve types for the in-situ conservation of endemic species including national parks, nature reserves, wildlife reserves, national recreation parks and protected forest reserves [4]. In 2012 the Department of Environment established a new type of reserve labelled biodiversity parks (Taman KeanakaragamanHayati or Taman Kehati) [5]. According to the government edict, these zones are established for smaller areas of significant biodiversity with ecological importance which are isolated from larger wilderness areas and may be threatened by current uses. In particular, biodiversity parks are established for the conservation of vulnerable plant and animal species and to facilitate establishment of those species back into surrounding areas. Management of these biodiversity parks is the responsibility of the local government environment agency (Dinas Lingkungan Hidup). Management includes establishing strategies and protocols for the use of the area, determining permitted local community use and also monitoring, although only annual monitoring is required[5]. The focus of this research is the management of Pelawan Biodiversity Park, located at Namang Village, Central Bangka Regency, Bangka Belitung Islands Province. Akbariniet al. [6], Utami [7] and Syatutra [8] detail the history of the park, its ecological significance, its role for conservation and economic importance, Akbarini et al. [9] identify ecotourism, education and research as three additional functions. Despite this, pressures from human activities within and outside the park have lead to degradation [6]. Effective management of conservation areas requires the involvement of all stakeholders from
planning through to ongoing management. Whilst this is a commonly held goal, in practice many planning processes and methodologies struggle to realise this in a meaningful way. Therefore planning and management decisions are often perceived to be unilateral by disaffected parties, which consequently reduces compliance and limits achievement of the management goals.

One effective method that has been designed specifically to incorporate and address the goals of all stakeholders is Limits of Acceptable Change (LAC). LAC was first created for the management needs of wilderness reserves in the United States and to address the limitations of Carrying Capacity (CC) [10]. CC limitations include focusing on a single management strategy, ignoring the impact of visitor behaviour and assuming that use without negative environmental change is possible[10,11]. In contrast, LAC acknowledges that any use creates change and therefore asks the questions: i) What level of environmental change caused by humans can still be considered acceptable? ii) What are the management and monitoring strategies needed to maintain change below that threshold? [13]. Involvement of all stakeholders, including interested members of the public with no direct role in the area, has been critical for the LAC process since its conception as it facilitates greater awareness of the differing, and often conflicting, values and usage goals assigned to the area by each stakeholder[14]. Facilitating openness and discussion about these values and goals and their relationship to the environment leads to finding a common management solution where each stakeholder is willing to compromise some of their goals in order to achieve sustainability[15]. The original LAC process details 9 practical steps to determine management practises for wilderness areas[13]. These steps have subsequently been developed and applied in a range of settings where there is need to manage human and environment interaction, including tourism [10, 11, 15, 16].

Journal database searches in both English and Indonesian revealed limited published applications of the LAC process in Indonesia [17, 18] and no research was found applying LAC to biodiversity parks. The goal of this research is therefore to apply the LAC process to evaluate the existing management plans and practices of the Pelawan Biodiversity Park and to design a sustainably management strategy which incorporates the needs and desires of all stakeholders.

2. Methods

2.1. Location

This research was conducted at the Pelawan Biodiversity Park(Taman Kehati Pelawan) Namang District, Central Bangka Regency, Bangka Belitung Islands, Indonesia (2°19'18"S, 106°09'51"E) over a period of two months from March – April 2021. The Pelawan Biodiversity Park has an area 47.4 ha.

2.2. Data sampling

Initial semi-structured interviews were conducted with operational managers of the park to obtain permission for the research, to obtain information on the park’s history and purpose, and to determine the various stakeholders for in-depth interviews. In-depth semi-structured interviews were conducted with representatives of each of the following stakeholders: operational managers of the park, apiarists, local handicraft producers, mushroom harvesters, caterers, and also a researcher who has previously published on and continues to study the park[6, 8]. The focus of these interviews was to determine the intrinsic and extrinsic value of Pelawan Biodiversity Park, problems and issues, as well as goals for its use by each of the stakeholders. Throughout the research period, additional information was obtained and recorded through casual conversation with visitors and those working in and around the park.

Structured observation was conducted both individually and with operational managers through the use of a rapid environmental impact assessment screening tool. The tool provides a systematic assessment of geographical, environmental and social conditions and changes. Particular attention was paid to issues and conflicts identified by the in-depth interviews. Different environmental zones, potential activity zones and ecosystems were also identified.

Secondary information was obtained through the existing management plan of Bangka Tengah Environment Agency and well as their data on the flora and fauna of the park. Google Earth was used for analysis of changes in the park and surrounding area observable by satellite imagery.
2.3. Limits of Acceptable Change
The nine steps of the Limits of Acceptable Change process as modified by McCool [11, 15] for application in designing management plans for natural tourism areas were followed.

3. Results and Discussion
Comparison of satellite imagery obtained from Google Earth in 2014 and 2019 shows dramatic changes in the region surrounding the Pelawan Biodiversity Park and changes within the park as well (Figure 1). In 2014, a year after the establishment of the park, there was full forest cover within the park boundaries with contiguous forest cover to the east and west. By 2019 the extent of native forest outside the boundaries of the Kehati Parkis greatly reduced and is no longer contiguous to the east. These changes have been driven by land clearing for plantations of oil palm, horticulture, pepper and recently porang. These plantations are beneficial for the income of the surrounding community, but directly impact the environmental quality of the region and the park through habitat loss and crowding of fauna in remaining forest pockets, loss of forest travel corridors, decrease in water quality, increase in water runoff and erosion, weed incursion and contamination and direct damage through herbicide and pesticide drift. Even within the park there has been loss of forest cover in both the north due to clearing for village gardens and the south for a public area to receive guests, hold events, and the selling of local foods and handicrafts. No active tin mining was observed which directly threatened the park, though those located to the west of the park (Figure 1) are within the catchment of the stream passing through the park, so there exists the potential for contamination from mine tailings. The impact of these concerns on stakeholders and implications for management are discussed below through the LAC process.

3.1. Intrinsic and extrinsic value of the Pelawan Biodiversity Park.
The following summary of the values assigned to the Pelawan Biodiversity Park is largely derived from stakeholder interviews supplemented by casual conversations and direct observation.

3.1.1. Cultural and economic value. There are a number of significant cultural practices and economic benefits realised by the local community from the park. Traditional apiary practices (MusungMadu), Pelawan mushroom harvesting, collection of ingredients for herbal medicines, traditional fishing methods, and the use of Kekembat plant roots for local handicraft are practices with rich traditions,
local wisdom and beliefs, as well as direct economic benefit through sales. The traditions and beliefs connected with these practices also provide a rich foundation for the development of ecotourism. In particular, Nanggung Sepintu Sedulang, a well-known traditional ceremony, is closely associated with pelawan forests as the pelawan mushroom is one of key foods cooked for this ceremony. Nanggung Sepintu Sedulang is already a tourist icon for Bangka Belitung [19] and has the potential to be developed as an attraction at the park. Celebrating this ceremony at the park could be used as a platform to promote conservation of the Pelawan forests of Bangka Belitung and the park itself.

3.1.2. Ecological and conservation value. Heath forests dominate the park with a swamp forest ecotone in low lying areas close to the stream. The heath forest soils have low pH and low nutrient content [9]. Some of the key components of the heath forest ecosystem are summarised in Figure 2. The forest tree pelawan (Tristaniopsis merguensis) is central to the pelawan forest ecosystem as it interacts with several other species, including pelawan fungi (Hemiporus sp.), Mentilin and native bees. Pelawan fungi are an ectomycorrhizae with a mutual symbiotic relationship with pelawan tree root systems enabling pelawan trees to grow in the nutrient poor soils and become the dominant tree species of the heath forest ecosystem [20]. Pelawan tree nectar and pollen is a key food for wild bees Apis dorsata and Apis tristis as well as providing a framework for wild bee nests. The bees are essential for pollination within the forest ecosystem and the surrounding area. The nectar and pollen of the pelawan tree produces a characteristically bitter honey which is highly valued as a medicine. Local communities have developed important traditions and local wisdom in the management of the wild bee populations, particularly Sunggau to support nest formation of Apis dorsata [21]. Apis tristis will populate conventional hives. Several bird species and also slow lorises (Nycticebus bancanus) are dependent of fruit from other plant species in the forest and subsequently promote spread and germination through seed dispersal. Mentilin (Cephalopachus bancanus) play an important role in suppressing pest insect species including locusts and grasshoppers and pelawan trees provide shelter for them. Fallen leaves are degraded by detrivores creating a thin nutrient rich surface layer which supports the growth of other plant species.

Mentilin, slow lorises, three species of pitcher plant and several bird species are listed in CITES Appendix II, meaning that although not immediately threatened with extinction, active management is required to avoid overexploitation and potential extinction [9, 22, 23]. Feral and domesticated cats pose an immediate and significant threat to small mammal, amphibian and bird species in the park [24, 25].

Figure 2. Local species and their interactions in the heath forest ecosystem of Pelawan Biodiversity Park. (1) Pelawan tree; (2) Apis dorsata; (3) Apis tristis; (4) Bird species; (5) Pelawan fungi fruiting body; (6) Tungguk fungi fruiting body; (7) Mentilin; (8) Pitcher plants; (9) other forest species; (10) Sunggau and Apis dorsata nest; (11) honey farmer harvesting; (12) Apis tristis hive; (13) leaf litter.
3.1.3. Education and research value. The rich cultural heritage and environmental value outlined above highlights the potential and value of the Pelawan Biodiversity Park becoming a centre of education teaching the importance of conservation of pelawan forests and conservation in general. As anthropogenic deforestation continues this function will only become more important. The park is also of significant value to researchers for the purpose of understanding the ecosystems and species within, conservation planning and ensuring sustainable use by local communities.

3.1.4. Recreational and ecotourism value. The conservation goal, environmental value, presence of iconic and endangered species, long and rich traditions of human interaction with the park, local culture and educational potential make the Pelawan Biodiversity Park eminently suitable for ecotourism. Current offerings for tourists include ordering food from the Sedulang ceremony, participating in honey harvesting, and night tours searching for Mentilin, slow loris, and other nocturnal species. However, based on interviews, and confirmed by observation, visitor numbers have steadily been decreasing, caused probably in part because of damage to visitor facilities and interpretive signage and in the last year due to Covid-19 restrictions. Without action to maintain and develop the site Pelawan Biodiversity Park is at risk of further degradation and neglect. It is hoped that the development of ecotourism, and the economic benefits that can be realised through it, will support the ongoing function of the park.

3.2. Activity and goals of stakeholders and their environmental impact. All the stakeholders who interact directly with the park (Environment Agency, operational managers, researchers, apiarists, mushroom harvesters, caterers, handicraft makers, and local communities) identified that conservation of the park was important both intrinsically and for the realisation of sustainable income from the park. However loss of habitat and decreasing yields of mushrooms and honey were reported. This may be linked to overharvesting and impact from farms surrounding the area. Fruit, rice and pepper farmers have a vested interest in the development of the park as they boost their sales by direct sales to visitors. Fruit growers also receive a direct benefit through improved pollination because of the bee populations within the park. In contrast oil palm, rubber and porang farmer sales are contracted and thereby unaffected by the development of the park. Despite this, most are favourable towards the development of the park. Farmers in the surrounding area inadvertently cause negative impact through deforestation in the surrounding area, weed incursion, and contamination due to pesticide and herbicide drift. The recent development of farming porang will have an impact on honey yields as bees avoid the pungent aroma of porang flowers which attract flies, and are forced to cover greater distances to collect nectar and pollen when there are insufficient flowers in the park alone.

The forest that became the Pelawan Biodiversity Park was first protected because of the advocacy of the local community [9]. However some community members utilise the stream to bathe or wash clothes and plastic rubbish was also found in the stream. Despite poaching being banned in the park, managers occasionally apprehend people hunting and illegal pet trade is a significant threat. Whilst most visitors desire the continued conservation of the park, behaviour of individuals such as littering, damaging vegetation unintentionally or through vandalism, disturbing wildlife and moving outside permitted areas has negative impacts. The Bangka Tengah Environment Agency has produced a management plan, however it does not yet address the presence of feral cats or overexploitation of honey and mushrooms. Other steps have not been implemented, particularly monitoring and evaluation of changes in environmental quality, flora and fauna.

3.3. Recommended zonation and management strategies
The final zonation and management plan needs to carefully consider the interactions and overlap between different environmental sensitivity, activity zones, environmental impact from proposed activities, and potential visitor loads[11]. After determining the zones, specific management strategies are required to maximise potential and minimise environmental impact. It is important to consider not only direct management of environmental impacts, but also visitor experience and education, as reciprocity and transformation of worldview towards the environment are essential to altering peoples’
actions and therefore their environmental impact both whilst visiting the Pelawan Biodiversity Park and in the rest of their life[26, 27]. The Bangka Tengah Environment Agency has an existing action plan for the management and development of the Pelawan Biodiversity Park with 5 broad focuses: 1) site planning; 2) program planning; 3) maintenance and development of vegetation; 4) infrastructure development; 5) cooperation and capacity building[7]. The latest iteration of this plan was 2019, however several aspects are still being developed and implemented. Three management zones with corresponding strategies are proposed (Figure 3).

3.3.1. Zone 1: General use and education. Zone 1 incorporates the access point to the park in the south where the forest has already been opened and infrastructure such as car park, kiosks, open meeting space, viewing platform, camping ground, homestay, and prayer space have been built (Figure 3). This zone is already highly modified and also resistant to further degradation so suitable for larger scale events including seminars, outbound activities, camping and cultural ceremonies. The Environment

![Figure 3](image-url)
Agency and park managers have already invested significant effort in removal of non-endemic plant species and planting of local endemic species in this area. Economic activity in the form of catering, manufacturing and selling of handicrafts, workshops for visitors is encouraged in zone 1.

**Specific management strategies are proposed as follows.**

1. Inventory and monitoring of plant species, replacement of non-endemic plantspecies with endemic species.
2. Installation of environmental interpretation signage so that visitors can learn about the environmental and cultural importance of conservation of the park and conservation in general. This interpretation should be visually compelling and include basic biological information of key species and ecosystems with the goal of instilling responsibility towards the area and giving visitors the knowledge and skills to recognise plant and animal species as they move into zone 2. Basic information about appropriate behaviour and minimising negative impacts should also be communicated.
3. All goods and service providers (park managers, caterers, handicraft manufacturers, guides) and those accessing the park for commercial benefit (honey and mushroom harvesters) should receive training to understand the importance, value and goals of Pelawan Biodiversity Park, the major environmental threats, key behaviours for conservation and also basic interpretation skills. It is hoped this will both ensure appropriate behaviour by those gaining employment through the park and also enhance visitor experience leading to appropriate behaviour and transformed beliefs.
4. Cat traps should be set in prominent locations together with interpretive signage to educate visitors to the park about the threat of domestic and feral cats to native wildlife. This should also include clear communication about the rules surrounding cats in the park. Community consultation should be conducted with the purpose of educating the local community about cats, the importance of the park and establishing agreed rules about cats. The following rules are proposed as a starting point for that dialogue. i) Domesticated cats should wear identification collars and are banned from the park. ii) Euthanizing of cats captured within the park without identification. iii) Cats with collars will be returned to their owners, but will be euthanized if they are captured three times. iv) All cats trapped will be recorded as part of a monitoring program.
5. Monitoring of surface run off and soil erosion.
6. Provision of segregated rubbish bins which facilitates management of organic, recyclable and non-recyclable waste. Interpretation about waste management, signage and rubbish bins to be located at the entrance to zone 2 so rubbish is not brought or disposed of within zone 2.

3.3.2. **Zone 2: Recreation and education.** Zone 2 is located in the western portion of the park (Figure 3). This region is dominated by heath forest and so is natural habitat for the key iconic species of the park. The focuses of this area should be conservation, maximising visitor experience and interaction with the natural environment, and sustainable use by honey and mushroom harvesters. In the dry season there is potential for fish trapping using traditional methods both for income generation and as a tourism activity, however a detailed environmental assessment and management plan is needed for this. There is existing infrastructure in zone 2 including tracks, toilet and seats for resting, though some are in a state of disrepair. The objective of renovation and development of infrastructure in zone 2 should be to enable access to the area for observation and education whilst minimising environmental impact, disturbance to native fauna and visual pollution. A few areas already degraded were observed within zone 2 and should be the focus of restoration, replanting and can even be utilised as a tourist activity if led by a park manager or guide. It is suggested that one of the degraded areas, preferably near the entrance of zone 2 and adjacent to the track, could be used as a nursery to propagate native species used for revegetation and serve for education and tourism.

**Specific management strategies are proposed as follows.**

1. Inventory of plant species, removal on non-endemics and planting of endemic species.
2. Regular monitoring of fauna.
3. Creation of an educational plant nursery where visitors can learn and participate in conservation.
4. Selective development of infrastructure to support interaction with nature, observation and education.
5. Monitoring of visitor experience and density so that wilderness experience is not compromised.
6. Discrete interpretive signage to promote education and signage, designed specifically for a variety of target groups. For example a ‘discovery trail’ with accompanying worksheet could be created for children to
promote enjoyment of discovery and learning from nature, skills to find and identify flora and fauna, as well as desire and behaviour to protect the environment.

7. Development of a sustainable management system for honey and mushroom harvesting in collaboration with harvesters, the Environment Agency and researchers to ensure that harvesting is sustainable. This plan should ideally include harvesting guidelines, limits and reporting procedures as well as registration of approved harvesters. Specific to zone 2 this plan should maximise the opportunities of visitors to observe bee hives and mushroom fruiting bodies, so may restrict harvesting in the area observable from tourist paths. Harvesters should receive training in environmental interpretation so they can effectively communicate about the values and goals of the park, the ecosystems within the park, the biology of bees and mushrooms and their interactions with other species and the importance of conservation and sustainable living.

8. Trapping, euthanizing and monitoring of cats should be conducted as with zone 1, however the location of the traps hidden so they don’t create visual pollution for visitors.

9. Stream health monitoring.

3.3.3. Zone 3: Conservation and sustainable use. Zone 3 is the largest of the zones and comprises the eastern part of the park where there is no existing infrastructure (Figure 3). The priority of this area is conservation so that the purposes of the Pelawan Biodiversity Park to preserve ecosystems and biodiversity is achieved. Sustainable use by honey and mushroom harvesters is permitted, but requires ongoing monitoring to ensure degradation of the environment does not occur. All other community activities, including access by researchers, should be restricted without special permission from the Environment Agency. Anyone given permission to access zone three should be accompanied by the park managers. Because of the size of the area, and the impossibility of monitoring all access points, there is a significant risk of illegal access and hunting or poaching. Therefore community involvement in the establishment of the management strategy is essential to maximise compliance.

Specific management strategies are proposed as follows.
1. Regular monitoring of flora and fauna through the use of transects and plots.
2. Development of a collaborative, sustainable management plan for honey and mushroom harvesting.
3. Regular socialisation and consultation of the goals, rules and benefit of Pelawan Biodiversity Park with the community.
4. Trapping, euthanizing and monitoring of cats should be conducted at strategic locations.
5. Stream health monitoring.

3.4. Environmental indicators, standards and monitoring
A key distinctive of the LAC process is acknowledging that environmental change always occurs if humans access or influence an area, and that the key to sustainable use is ongoing monitoring of selected indicators and adjusting management strategies if changes occur that exceed a defined threshold, referred to as the indicator standard[11, 12, 15]. Where a clearly defined and verified standard is not available we propose that observation of an ongoing negative trend in the indicator may be used to initiate review of management practices. This will contribute to ongoing research to determine the standards specific to the park. Ideally the indicators chosen should represent early negative changes before irreversible change occurs and can be measured quantitatively, cheaply and simply in the field[10]. The indicators, standards and monitoring regimes proposed for the park are as follows.

3.4.1. Population monitoring of pelawan(Tristaniopsismerenguensis), pelawan fungi (Heimioporus sp.) and pitcher plants (Nepenthesspp.). Monitoring and evaluation of these species is proposed by the use of line transects and plots. Line transects in zone 2 and 3 can be used to conduct population counts of each of the indicator species with a distance to 1m either side of the transect every six months. In addition to count, approximate size and life stage should be recorded. For the pitcher plants phenotypic details including number of leaves, pouches, stems and tendrils should ideally be recorded because this is reflective of soil fertility[28]. Because pelawan fungi and other fungi fruiting bodies appear seasonally, it is suggested that additional population monitoring focussing on fruiting bodies be conducted in 3x3m plots in fixed locations, at a fixed time after initial fruiting body appearance. Clearly the timing of this needs to be before fruiting bodies are harvested, but are large enough to be
counted. Basic environmental parameters such as atmospheric temperature and humidity, soil pH and moisture content, radiation intensity and litter depth could be measured at the time of plot and transect monitoring, as changes in population may be related to changes in environmental parameters. Lastly measurement of biodiversity with the Shannon-Wiener index could be considered, however the time required to complete the survey may make it impractical for regular monitoring.[29]. As there are no established standards for population density of these species it is proposed that monitoring should focus on trends over time with sustained decline being the trigger for review of management practices.

3.4.2. Forest cover: Changes in forest cover can analysed through the use of Landsat satellite imagery. It is suggested that analysis is carried out six monthly with one of those times towards the end of dry season where natural leaf loss due to water stress shows clearer demarcation between individual trees. Manual scanning should focus on boundaries of the pelawan forest where deforestation is more likely to occur. The standard for this indicator is commonly 75% coverage [26, 27].

3.4.3. Population density and distribution surveys of Apis dorsata, Apis tringona, mentilin (Cephalopachus bancanus) and kukang (Nycticebus bancanus). Survey of the indicator species wild bees, mentilin and kukang should be conducted according to the methodology of Syafutra et al. at least once per year[32]. Proposed transects have been indicated in figure 3. An additional transect can be monitored by using the recreational track in zone 2. The results of Syafutra et al.[32] can be used as a reference point for mentilin populations, however, as there is no clearly established threshold for the populations of these indicator species, a sustained decline in population should be used as the trigger for review of management practises.

3.4.4. Cat trapping: The presence of cats, feral or domestic, in the park pose a major threat so trapping and subsequent euthanizing are key strategies both for monitoring changes in the level of threat and reducing numbers[24, 25, 33]. Again an increase in numbers indicates a need to revise management plans. The specific details of trap number, location and frequency needs to be determined in combination with park managers, however some guidelines have been suggested in the management strategy.

4. Conclusion
The LAC process provided a robust framework for engaging with the various stakeholders of Pelawan Biodiversity Park, analysis of the intrinsic and extrinsic values of the park and goals of stakeholders, as well as clear and practical management and monitoring plans. The process identified several management practices which had not appeared in existing management plans. We therefore recommend the application the LAC process in other regions of Indonesia for the development of management plans and practices, particularly in wildlife reserves and sustainable tourism ventures.

In terms of application of the findings in the Pelawan Biodiversity Park, it is hoped that further work will take this foundation and invite active participation of stakeholders and the general population through first focussed group discussions (FGD) and then public forums which do not simply present the results of this study, but rather use these findings to facilitate discussion and refinement of the findings of each step of the LAC process with the goal of achieving a consensus plan. This process is critical for achieving compliance and self-regulation within the local communities. We also identify the need for specific research investigating the reported decline in pelawan mushroom yields. We hope that further research combined with the implementation of the management plan derived through the LAC process will contribute significantly to the preservation and full function of the Pelawan Biodiversity Park.

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