

MANAGEMENT STRATEGY OF ELEPHANT RIDING AT THE ZOO

Sata Yoshida Srie Rahayu^{1*}, Dolly Priatna², Rosadi², and Suryanto³

¹Biology Program Study, Faculty of Mathematics and Natural Science, Pakuan University
Jl. Pakuan PO. Box 452 Bogor, West Java, Indonesia

²Study Programme of Environmental Management, Postgraduate School of Pakuan University,
Pakuan University, Jl. Pakuan PO. Box 452 Bogor, West Java, Indonesia

³Agency for Standardization of Environment and Forestry Instruments
Jl. Soekarno-Hatta KM 38, Samboja, East Kalimantan, Indonesia

Received: 16 September 2020, Revised: 6 February 2022, Accepted: 14 April 2022

MANAGEMENT STRATEGY OF ELEPHANT RIDING AT THE ZOO. Elephant Riding (ER) in zoos has become a matter of public interest, raising debates among experts regarding animal ethics, elephants' welfare, and human safety. Through the submission of the Middle Hypothesis that ER tends to enhance human knowledge about conservation, this study's aim is to provide strategies to help zoo managements in their works based on the basic principles of wildlife conservation and protection, especially Sumatran elephants. The participants' knowledge was measured using questionnaires distributed to two groups of respondents: people who have and people who have not utilized ER services. Meanwhile, the strategy was recommended through the Analytical Hierarchy Process of 17 expert respondents. According to the independent sample t-test performed with 95% confidence level, human knowledge of elephant conservation increased significantly through ER. Furthermore, experts with consistency ratios (CR) ≤ 0.1 selected a strategy where environmental quality was prioritized as a recommended strategy in ER management. This strategy is to put forward the principles guaranteeing the elephants' welfare, which has a criterion weight of 0.40717. The other recommended strategies include conducting conservation education (0.23973), ensuring the safety of visitors (0.22972), and improving the welfare of the community around zoo (0.12338).

Keywords: Elephant riding, Sumatran elephant, zoo, and analytical hierarchy process

MANAJEMEN STRATEGI WISATA MENUNGGANG GAJAH DI KEBUN BINATANG. Atraksi Wisata Menunggang Gajah (WMG) di Kebun Binatang telah menjadi perhatian publik dan perdebatan para ahli terkait etika, kesejahteraan gajah dan keselamatan manusia. Melalui pengajuan hipotesis antara bahwa WMG dapat meningkatkan pengetahuan manusia tentang konservasi, penelitian ini bertujuan untuk menyediakan rekomendasi strategi yang dapat diadopsi oleh Kebun Binatang berdasarkan prinsip dasar konservasi dan perlindungan satwa liar, khususnya gajah Sumatera. Pengetahuan diukur melalui kuesioner yang dibagikan kepada dua kelompok responden, yaitu yang sudah dan yang belum pernah memanfaatkan layanan WMG. Strategi dihasilkan melalui Proses Analisis Bertingkat (AHP) dari 17 responden ahli. Berdasarkan uji-t test dengan tingkat kepercayaan 95% dapat diketahui bahwa pengetahuan manusia tentang konservasi gajah meningkat secara signifikan melalui atraksi WMG. Selanjutnya para ahli dengan rasio konsistensi (CR) $\leq 0,1$ memilih strategi yang mengutamakan kualitas lingkungan sebagai strategi yang direkomendasikan dalam pengelolaan WMG, yaitu strategi yang mengedepankan kesejahteraan gajah, dengan bobot kriteria sebesar 0,40717. Selanjutnya secara berturut-turut: sebagai sarana edukasi konservasi (0,23973), menjamin keselamatan pengunjung (0,22972) dan meningkatkan kesejahteraan masyarakat sekitar Kebun Binatang (0,12338).

Kata kunci: Wisata menunggang gajah, gajah sumatera, kebun binatang, AHP

*Corresponding author: sata_rahayu@unpak.ac.id

I. INTRODUCTION

The Sumatran elephant (*Elephas maximus sumatranus*) is a protected wildlife species (Appendix I) with a critically endangered status (Gopala et al., 2011; Hankinson, Nijman, & Abdullah, 2020). Based on a survey carried out in 2017, the Sumatran elephant population in Indonesia reduced from 1,694 - 2,038 to 928 - 1379 in 2019 (DBC, 2020). The majority of these species live in natural habitats of 36 habitat pouches in the seven provinces within Sumatra island: Aceh, North Sumatra, Riau, Jambi, South Sumatra, Bengkulu, and Lampung (Nofinska, Sumayyah, Andayani, Maryanto, Kheng, & Sugiharti, 2019; Sitompul, Griffin, & Fuller, 2013; Sukmantoro et al., 2019; Tohir, Mustari, & Masy'ud, 2016). According to previous studies, a total of 483 Sumatran elephants, which were moved from their native habitat and due to a history of conflict with humans, now live in the conservation area created in the existing protection and conservation program (Armanda & Abdullah, 2018; Qomariah, Rahmi, Said, & Wijaya, 2019). The Elephant Training Center (*Pusat Latihan Gajah*, PLG) or Elephant Conservation Center is a rescuing center specifically focused on protection and rehabilitation program (*Pusat Konservasi Gajah*, PKG or Elephant Rescue Unit/ERU, Flying Squad, or Conservation Response Unit/CRU). Based on related records, 231 elephants are under Indonesian government management, while 252 elephants are controlled by private zoos and aquarium management known as *Taman Safari* (Safari Park), as well as animal parks, and ex-situ conservation managements (Braverman, 2014). However, only 26 out of 81 zoos have received permits to exhibit the Sumatran elephant, distributed across Sumatra and Java, including *Taman Safari Indonesia*, Bali Zoo, Gembira Loka, Medan Zoo, Bandung Zoo, and Lagoi Bintan Safari Park.

Generally, the presence of Sumatran elephants in zoos has become a priority as a genetic reserve (Febryano et al., 2019; Rustiati et al., 2020). Besides being rescued and

rehabilitated, these elephants are also used for educational and ecotourism purposes (Pirotta & Lusseau, 2015), in this case, Elephant Riding (ER) activities, where the animals are introduced and exhibited. Several experts and observers have discussed the pros and cons of these activities (Taylor, Hurst, Stinson, & Grimwood, 2020), for instance, some claim ER prioritizes business aspects (Duffy & Moore, 2011), rather than the ethics and principles of conservation (Gunaryadi, Sugiyo, & Hedges, 2017; Kaffashi, Yacob, Clark, Radam, & Mamat, 2015; Wahyu, 2019). However, others have claimed these activities are ethical and consider the welfare of wildlife (Kuswanda, Situmorang, Berliani, Barus, & Silalahi, 2018; MoEF, 2019; Polyapipat & Loh, 2015). This study, therefore, aims to evaluate the current opinion of experts in support of ER, starting from the middle hypothesis where ER was postulated to increase human knowledge on the Sumatran elephant and the species' conservation aspects (Mellish, Ryan, Pearson, & Tuckey, 2019; Moss et al., 2017). Furthermore, this study aims to provide zoos with strategies for handling the Sumatran elephant based on the basic principles of wildlife conservation and protection (*Elephas maximus sumatranus*).

II. MATERIAL AND METHODS

A. Scope of the Study

The object of research is Elephant Riding (ER) in zoos, while the scopes of study are perception and improvement of public knowledge about elephants and related conservation efforts, and ER management strategies. Data collection was performed using the questionnaire method with a minimum number of 30 respondents (Kerlinger & Lee, 2000). The form A questionnaire was used to obtain the perceptions of the public and measure the difference in knowledge between people with experiences in using ER services and people with no experience in using these services. Meanwhile, the form B questionnaire was distributed to expert respondents and

contained several questions on the criteria (level 1) and strategies (level 2) mapped based on literature studies and interviews. Subsequently, the data obtained were processed through the *Analytical Hierarchy Process* to measure the consistency of expert respondents in making pairwise comparisons between alternative criteria and alternative strategies. The analysis was then enriched through in-depth interviews with several consistent expert respondents or respondents with a consistency ratio ≤ 0.1 (Saaty & Vargas, 2012).

B. Procedures

1. Public Perception and Knowledge About ER and Elephant Conservation

Due to the Covid-19 pandemic restrictions, the distribution questionnaire was carried out online using Google Forms with the link address <https://bit.ly/FormA-Elephant-Riding>. The A form questionnaires were distributed purposively to the public respondents through WhatsApp. Data collection was carried out for 4 weeks: April to May 2020, and the respondents were verified based on the telephone numbers provided. Subsequently, the data obtained from verified respondents were further processed.

2. Determination of Criteria and Strategy Alternatives

According to Figure 1, the hierarchy was built on three levels: objectives, criteria, and choices. The aim was the same as the research objective: to recommend an improved ER management strategy for zoo managements based on basic conservation principles. In a hierarchical structure, elephant conservation principles were identified as criteria and strategy choices. These criteria and strategy choices were determined through analysis of references from ER-related literature and regulations, which was further strengthened by expert interviews who have knowledge, experience and/or authority related to elephant, conservation and ER (Saaty, 1993, 2012).

The questionnaires were based on the hierarchical structure in Figure 1, containing 1 pair of comparison questions for the criteria and several pairwise comparison questions for the strategy, where n is the number of elements. Meanwhile, Table 2 shows the number of paired comparisons (cn) for n elements on each criterion, and the strategy question was several n $[(n-1) / 2]$. Therefore, in total, the questionnaires for nk criteria elements and

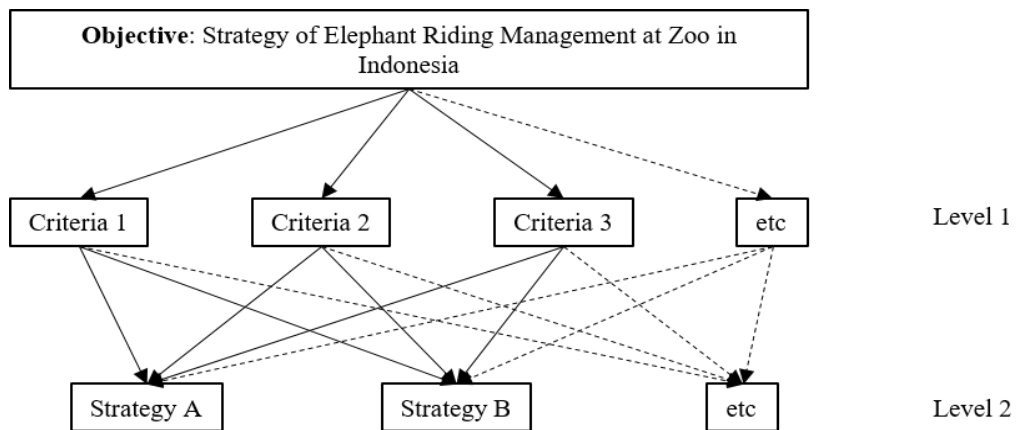


Figure 1. The hierarchical structure of questionnaires

Table 1. Number of comparison questions based on element amounts per questions group

\sum element (n)	1	2	3	4	5	6	7	8	N
\sum comparison (cn)	0	1	3	6	10	15	21	28	$n[(n-1)/2]$

Source: Saaty and Vargas (2012)

ns strategy elements are bound to contain a total of $(nk \lfloor (nk-1)/2 \rfloor) + (nk \lfloor (ns-1)/2 \rfloor)$ pairwise comparisons (Saaty & Vargas, 2012).

Table 2 shows the Pairwise comparisons performed using 9 scale comparisons between elements. Table 3 shows the sample question format used for all the questions on criteria and strategies for 3 elements samples, while Table 4 shows the $n \times n$ matrix format used to tabulate the data contents. Based on these two tables, element A is more important, compared to element B (9), element A is a little more important, compared to element C (3), while element B is a little less important, compared to element C (1/3).

All comparison questions between elements were formulated in the Form B questionnaire and distributed to expert respondents selected using a purposive sampling technique, with the inclusion criteria of experts who fulfilled competencies related to elephant conservation and ER and expressed willingness to become

respondents. Due to the Covid-19 pandemic restrictions, the form B questionnaires were distributed by email. Further information was acquired through in-depth discussions with the experts after the forms had been filled, submitted, and accepted by the researchers. The time for data collection and in-depth interviews were performed during a period of 3 weeks, from April 14, 2020, to May 5, 2020.

C. Data Analysis

1. Public Knowledge About ER and Elephant Conservation

Respondent characteristics data were tabulated, while the knowledge data was analyzed using the Statistical Package for the Social Science Program for window version 20 (SPSS 20), which includes validity, reliability, normality, and homogeneity analyses, as well as a t-test. The validity and reliability tests were conducted to test the accuracy and consistency of the A form questionnaire which comprised

Table 2. Scale comparison between elements; an example of a comparison between elements X and Y

The scale of importance between elements	Comparison Scale
Element X is as important as element Y	1
Element X is a little more important than Element Y	3
Element X is a little <i>not</i> more important than Element Y	1/3
Element X is clearly more important than element Y	5
Element X is clearly <i>not</i> more important than element Y	1/5
Element X is very clearly more important than element Y	7
Element X is very clearly <i>not</i> more important than element Y	1/7
Element X is absolutely more important than element Y	9
Element X absolutely <i>not</i> more important than element Y	1/9
Given if there is a little difference with the above benchmark	2,4,6,8, or 1/2,1/4,1/6,1/8


Source: Saaty and Vargas (2012)

Table 3. An example of a question format with 3 elements compared

Left Element	Importance scale in left element	Equally important	Importance scale in right element	Right Element
A	⑨ 8 7 6 5 4 3 2	1	2 3 4 5 6 7 8 9	B
A	9 8 7 6 5 4 ③ 2	1	2 3 4 5 6 7 8 9	C
B	9 8 7 6 5 4 3 2	1	2 ③ 4 5 6 7 8 9	C

Table 4: An example of a matrix with 3 elements, before and after filling

Element / Element	A	B	C
A	A vs A	A vs B	A vs C
B	B vs A	B vs B	B vs C
C	C vs A	C vs B	C vs C



Element / Element	A	B	C
A	1	9	3
B	1/9	1	1/3
C	1/3	3	1

18 questions. These questions are deemed valid in cases where the calculated r-value is greater than the value of r in the product-moment table at a significance level (α) of 5%. Meanwhile, the questionnaire is said to be reliable in cases where the value of Cronbach's Alpha ($C\alpha$) is greater than the critical r-value at a significance level of 5% and the degree of freedom (df) on two sides ($df = n-2$) (Kogar, Demirduzen, Gelball, & Inal, 2016).

Subsequently, normality and homogeneity tests were conducted to test the distribution and uniformity of respondents' data knowledge. The respondents with and without experience in using ER services were identified using the Kolmogorov-Smirnov normality test and the Levene homogeneity test. In cases where these tests fulfill the significance requirements, an *Independent Sample t-test* is to be performed (Kim, 2015).

2. Criteria and Strategy Choices

The significance level is with a consistency ratio (CR) value below or equal to 1, meaning $CR \leq 0.1$ (Saaty and Vargas, 2012). The CR was calculated for all pairwise comparisons per respondent, per group of respondents, and combined, using the excel program following equation 1. Subsequently, the *eigen* values were calculated using equation 2, and the highest weighted *eigen* value was selected as the chosen strategy (Csató, 2017; Xu & Wang, 2013). Equations 1 and 2 are given below.

$$CR = \frac{CI}{IR}, \text{ Where } CI = \frac{\lambda_{max}-n}{(n-1)} \text{ dan } Ax = \lambda_{max}x \dots\dots\dots(1)$$

$$|A - \lambda I| = 0 \dots\dots\dots(2)$$

Where:

CR= consistency ratio; CI=consistency index;
 IR =random index (Table 5); λ_{max} = maximum eigen value; n =amount of element; A =matrix n x n;
 λI =matrix of eigen identity; λ = eigen value; x =eigen vector

III.RESULT AND DISCUSSION

A. Knowledge Enhancement

1. Respondents' Characteristics

A total of 50 A forms were received from respondents with or without experience in using ER services. The majority (54%) of the respondents were men, while 46% were women. The Majority of the respondents were below 43 years (87%) and 76% ranged from 20 to 43 years . Furthermore, most respondents had acquired university graduate education (83%) and were currently employed (74%), while 4% were house wives. Based on sample data, the majority (56%) of the respondents with experience in using ER services were female, while 44% were male.

2. Data Validity, Reliability, Normality, and Homogeneity

Based on the results, the 18 questions on the A form questionnaire are all valid research measurement tools. The questionnaires can also be repeatedly marked with Cronbach's Alpha values of 67% and 71%. These values are above 60%, therefore, the six indicators asked through the questionnaire are valid and reliable to measure public knowledge about elephants and related conservation efforts (Table 6).

Furthermore, the respondent's knowledge data variable is spread normally, and the diversity of data from the two data groups is homogeneous or the same. This is indicated by the significance values of 0.469 and 0.104, respectively. These two values are above 0.05, and have, therefore, fulfilled the significance to test the difference between the two samples through the independent t-test sample.

3. Acceptance of the Intermediate/Middle Hypothesis

With each n sample of 50 people, public knowledge on elephants and related

Table 5. Number Random Index (IR) based on amount of elements (n)

N	1	0	3	4	5	6	7	8	9	10	11	12	13	14	15
IR	0	0	0.58	0.9	1.12	1.24	1.37	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Table 6. Themes and indicators of knowledge on elephants and related conservation efforts

Theme	Indicator of question	Question
Knowledge of Wildlife Conservation, Especially Elephants	Sumatran Elephant	Knowledge of elephants
	Conservation	Knowledge about Conservation
	Environment	Knowledge about Environmental Conservation
Knowledge of ER at Zoo	Elephant Riding	Knowledge about Elephant Riding
	Animal welfare	Knowledge about elephant utilization by paying attention to the animal welfare
Knowledge of conservation / Zoo functions as a means of education	General zoo	Knowledge of zoo functions
		Knowledge of Visitor Comfort and Improvement of Community Welfare

conservation efforts gained due to the use of ER services amounted to 14.92. This value is higher, compared to the counterparts without experience in using ER services, which amounted to 12.88 (Table 7).

According to Table 8, the *Asymp.sig (2 tailed)* value is about 0.002, which is below 0.05, therefore, H0 is rejected, and H1 is accepted. This test explains the differences in the average value of knowledge about elephants and related conservation efforts. At a 95% confidence level, ER can be said to significantly influence an increase in public knowledge about elephants and their conservation efforts. Therefore, ER managers can optimize the function of zoo as an educational tool. However, materials and messages need to be conveyed in appropriate manners as required, to grow public awareness of wildlife conservation through direct interaction between visitors and keepers or mahout, both before and during the attraction. The zoo's animal exhibition activities provide opportunities for the community to receive knowledge about wildlife directly from the keepers. Table 6 shows the keepers are able to explain the details of elephants and their interactions with humans, the history of the elephant exhibited, and whether the attraction exhibited is in accordance with animal welfare. At this stage, information in the form of pictures, symbols, or instructions will also play a good role (Kuswanda et al., 2018). Subsequently, managers need to maintain a linked interaction between the management unit and visitors, to ensure the zoo's function as a means of

education and knowledge development and fulfill the requirements of ethical management.

C. Criteria

In wildlife exhibitions, zoos must be guided by certain management and animal welfare ethics. Based on the analysis from several literary sources as well as in-depth interviews, 4 criteria were proposed. These criteria are the welfare of the elephants, security of humans as users of ER services, conservation education, and community welfare improvement around zoos.

1. Criteria of Elephant Welfare

Humans control captive animals in existing conservation programs, therefore, all needs related to the animals' life and welfare must be properly fulfilled (McGowan, Traylor-Holzer, & Leus, 2017). These needs are closely related to the quality of the environment in new habitats because a good environmental quality implies a guarantee of adequate food, resistance to disease (nature provides medicine), comfort of socializing, as well as improved reproduction cycle in elephants (Gusset & Dick, 2015). In this study, elephant welfare was measured based on five criteria (Demartoto, Soemanto, & Zunariyah, 2017; Williams, Carter, Hall, & Bremner-Harrison, 2019; Wolfensohn, Shotton, Bowley, Davies, Thompson, & Justice, 2018): freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury, and disease, freedom to express normal behavior, as well as freedom from fear and distress (MoF, 2011). These criteria are based on certain

principles which are explained below.

a. Freedom from hunger and thirst

Elephants spend most (41%) of their time eating, while 34%, 9%, and 2% of their time is spent resting, bathing or wallowing, and drinking, respectively. According to Kuswanda et al., (2018) and Sitompul et al., (2013), the proportions of mealtime, drinking, walking and resting activities are 82.2%, 1.7%, 9.5%, and 6.6%, respectively. This highlights a need for the amount of feed in the ex-situ area to be similar to the amount of feed eaten in the wild. Generally, elephants require about 10% of body weight in feed, per day. Therefore, the Sumatran elephant with an average body weight of 2,378 kg, requires about 200-237 kg of feed, daily. The species of elephant feed in the wild are more varied, with at least 273 plant species belonging to 69 plant families, particularly Poaceae, Cyperaceae, Moraceae, and Fabaceae which comprise 29 grass species, while the common non-grass species include twigs, tubers, certain fruits, and various kinds of palm, and vines (Sitompul et al., 2013). In the dry season, additional species of feed, for instance, bran, rice, rice dregs, green beans, brown sugar, sugar cane, pineapple, papaya, banana leaves, coconut leaves, and banana stems, are often consumed by elephants (Tohir et al., 2016). However, banana stems as feed ought to be given in moderation, due to the high risk of ventral edema, a fluid retention condition that leads to the formation of lumps. Also, elephant feed must not be placed on the ground to avoid contamination with pathogens. Therefore, zoo managers must consider the animals' species, frequency, age factors, and present. Elephants also require about 100-300 liters of water per day (Tohir, 2016; Kuswanda, 2018). Besides drinking, elephants need water for wallowing, which is necessary to reduce dehydration and fulfill the mineral salts requirements, for instance, calcium, magnesium, and potassium (Kuswanda et al., 2018). The zoo must, therefore, provide water tanks within the cages to meet these water needs. Also, the floor of

the cage can be covered with sand to increase the elephant's comfort.

b. Freedom from discomfort

This is fulfilled by providing the animals with comfortable cages by considering certain requirements (Tohir et al., 2016). Based on these requirements, the minimal number of elephants per cage is 3, and open cages must have a minimum area of 500 to 2000 m², while the minimal area of the enclosures is 6 to 12 m², and the quarantine enclosures must have a minimum area of 200-577 m². Other requirements include the construction of wooden poles and iron pipe barriers, concrete cement material, minimal roofs of non-zinc roof tiles (Tohir et al., 2016), equipment, carrying capacity, temperature, and cage humidity (Tohir et al., 2016; Wahyu, 2019). For the maintenance aspects of the cage, it is necessary to pay attention to the floor, protective conditions, cleanliness of the cage, and the condition of the drainage canal (Tohir et al., 2016; Wahyu, 2019).

c. Freedom from pain, injury, and disease

Zoo managers need to ensure adequate medical services are constantly available for the animals. For instance, the physical conditions of elephants must be checked every 3 to 6 months, the bodyweight/Body Correction Index must be measured regularly, periodic internal parasite restrictions must be performed every 3 to 4 months. Furthermore, electronic records must be created to document every disease and disorder, as well as the treatments performed for each animal. Also, appropriate elephant health must be identified through testing of diagnostic schemes that affect elephant health, provision of vitamins, as well as carrying out periodic feces examinations every 3 months (Zemek et al., 2016). Therefore, all the zoo's medical/veterinary and paramedical staff must be competent in handling new diseases, administering the required drugs at the proper dosage, as well as collecting blood samples and ulas samples from respiratory holes (blowhole

swabs) (Wahyu, 2019). Zoo managers must also openly provide the government with information about diseases arising in the management of animals.

d. Freedom from fear and distress

Fear and stress tend to have a negative effect on elephant health, growth, and reproductive capacity (Kuswanda et al., 2018; Wahyu, 2019). However, this can be prevented by establishing interaction between mahout and the elephant, for instance, being invited to talk, walk, exercise, and socialize with other elephants in the camp. This can influence the concentration of salivary cortisol production and, consequently, reduce stress (Bansiddhi et al., 2019; Plotnik & de Waal, 2014). To increase the sense of security and comfort of elephants used for wildlife attractions, there is a need for an agreement in the use of working tools, for instance, the eccentric tool, *ankus*, and *howdah* (saddle). Managers must ensure the howdah is attached to a thick, soft cloth before being worn on the elephant, to avoid discomfort. Subsequently, the howdah is then bound to the bottom using a strong ratchet tie-down. The *gancu* and *ankus* are suitable for controlling animals, however, animal welfare must always be prioritized in the use of this tool.

e. Freedom to express normal, natural behavior

These criteria are required to ensure optimum reproduction rates. According to the Indonesian Government Regulation, the main program of most zoos is to increase the populations of rare and endangered animals through breeding (MoF, 2011). Zoo managers must prioritize breeding programs based on the reproductive power of elephants, through adequate planning, for instance, optimizing genetic diversity, maintaining collections for attractions, providing the appropriate number of mahouts, and expertise regarding elephant reproduction (Nofinska et al., 2019). Gusset & Dick (2015) showed a quality relationship between mahout and elephant tends to have

a positive effect on elephant reproduction, therefore, managers need to recruit experienced mahouts, for instance, PLG/PKG trainees. Zoo management must also provide adequate space, facilities, and same-species friends for animals, to provide animals with the freedom to behave normally (Tohir et al., 2016).

2. Criteria of Conservation Education

Apart from being recreation, zoos also serve as a means of education, scientific development, research, and genetic reserves. In this instance, education emphasizes the environment of elephants in their habitat (Demartoto et al., 2017; Moss et al., 2017; Schultz & Joordens, 2014). The delivery method must be packaged attractively to arouse the interest of individuals and community groups towards the conservation of natural resources. Furthermore, the Delivery Method must provide opportunities to gain awareness, knowledge, and expertise, form environmentally-friendly behavioral patterns, develop conservation ethics, eradicate conservation blindness, and improve attitudes, as well as skills, consequently, instilling visitor satisfaction. The seven sciences which can be studied in zoos are basic observational, reproductive-physiological, veterinary, genetics, behavior, and productivity sciences.

Conservation education/environmental education can be implemented in zoos through several delivery methods, including exhibition, experiments, inquiry, field trips, project teaching, discussions, case studies, role-playing, simulation, brainstorming, and learning contracts. A report by McGowan et al. (2017) showed information also ought to be dissipated through journals, print, and electronic media. This aims to build support for zoo activities within the whole community regarding fulfilling administrative and legal aspects. Managers can also deliver educational materials through direct interactions with zookeepers/mahout, film/slide exhibitions before elephant riding, visiting schools, or indirectly through symbols/ornaments.

3. Criteria for Improving Community Welfare

The relationship between zoo managers and the surrounding community must be built with mutual openness and mutual respect. Febryano et al., (2019) showed both attitudes tend to create opportunities to improve the economy of the community, consequently, raising a sense of sympathy and consciously safeguarding the security of the tourist area, maintaining order and the location's cleanliness, as well as providing appropriate/comfortable accommodation. Therefore, managers must provide employees with skill training programs on safety, security, making traditional food, providing tourist souvenirs, building groups of observers, building tourism service cooperatives to open community involvement in tourism operations, and providing other supporting facilities (Berliani et al., 2018; Gunaryadi et al., 2017; Polyapipat & Loh, 2015; Pratiwi et al., 2020).

4. Visitor Safety Criteria

Febryano et al., (2019) explained zoos must always guarantee visitor safety, indirect interactions with elephants because this affects visitor satisfaction. This can be achieved through strengthening the promotion, by providing complete information to the public on the services provided to fulfill visitor satisfaction, resulting in a good perception. In addition to the safety of visitors, zoos must also pay attention to animals safety by refusing to exhibit animals in heat or musth period, providing animal companions and nurses to supervise visitors and prevent any harassment, humiliation, or abusive treatments to the animals (Plotnik & de Waal, 2014; Williams et al., 2019; Zemek et al., 2016). These four criteria listed above were presented in a random hierarchical structure to produce a sequence: Elephant Welfare, Visitor Safety, Conservation Education, and Improvement of community welfare.

D. Alternative Strategy

The advanced content analysis based on the principles manifested as the criteria

above produced 4 strategic choices which are explained below.

1. Environmental Quality Management

The environment plays a crucial role in the survival of animals. According to the principle model of modern captive animal management, there are four physical domains: environment, nutrition, physical health, and behavior, and the fifth domain is mental health. This implies the need for a quality and comfortable environment which mimics the conditions of the animals' natural habitat (Braverman, 2014; Gunaryadi et al., 2017; Gusset & Dick, 2015; Holden, 2019; Wahyu, 2019).

2. Aesthetics Improvement

This is fulfilled by improving visitor comfort and animal comfort, for instance, through improved cage infrastructures and visitor facilities (Kuswanda et al., 2018).

3. Travel Segmentation Regulation

To avoid overload of visitors and ensure the welfare of the elephants, there is a need to implement tourism segmentation, through diversification of activities, as this is the most appropriate solution to increase tourist satisfaction with various choices of tourism activities (Duffy & Moore, 2011; Febryano et al., 2019; Kaffashi et al., 2015).

4. Imposition of competitive Ticket Prices

The ticket prices offered by business units are based on the uniqueness and superiority of each attraction. Therefore, zoo managers need to create unique attractions -tours that are in demand by visitors but do not seem to exploit elephants (Bennett & Dearden, 2014). The options above use the eco-tourism approach, which is based on the principles of nature and environmental sustainability (Kuswanda et al., 2018). The natural resources in this case, which are elephants, are sustainable and must be developed in terms of the cultural value of elephants and conservation programs, to improve the community's economy. Furthermore, the use of elephants with

consideration for welfare aspects using the principle of ecotourism is very appropriate. Therefore, the ER development strategy research in zoos is expected to become a model for achieving sustainable management of the natural resource, in this case, elephants, to increase the opportunities for breeding, genetic preservation, research objects, and eco-tourism purposes.

E. Hierarchical Structure

Figure 2 shows the hierarchical structure built to formulate a strategy for improved ER management based on the basic principles (criteria) of conservation in the zoo. Based on the structure above, a form B questionnaire was created. This questionnaire contained 1 group of level 1 questions related to the achievement of objectives and 4 groups of level 2 questions related to each element of the criteria. Each level comprised 4 elements, and each question group comprised 6 comparison questions between elements, therefore, the total number of comparison questions is 30.

F. Suggested Strategy

1. Consistency

Consistency is measured by the consistency ratio for each question group per expert respondent. In level 1, 12 expert respondents obtained perfect consistency, which fulfilled

the consistency ratio ≤ 0.1 for all questions. However, 7 expert respondents obtained a consistency ratio > 0.1 for 1 to 3 question groups. After verification was conducted, the Form B questionnaires were resent to the 7 expert respondents with inconsistent pairwise answers and only 5 forms were returned. The second verification and refill produced consistent results for all groups of questions. Subsequently, data processing was continued and the eigen vector (weight), as well as the eigen value of the criteria and strategies, were calculated.

2. Criteria Weight/Eigen Vector

Of the 17 expert respondents in this study, 4 are from the regulator group (government), 5 are from the researcher group (BRIN, Forestry Research and Development Agency, and university), and 8 belong to the operator group (zoo, veterinary associations, NGOs and zoos associations). Table 9 and Figure 2 show the criteria weights per each group of expert respondents.

Based on Table 9, the expert groups selected welfare as the main criteria in the management of ER within zoos. This option is bound to assist managers in prioritizing the interests of elephant’s welfare compared to human aspects and business interests. Elephant ethics and needs must be arranged following the

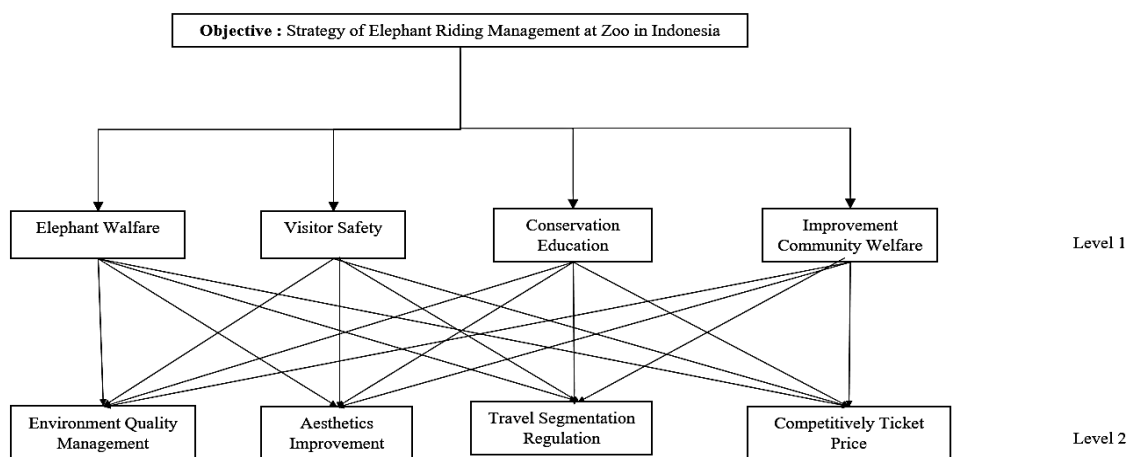


Figure 2. The hierarchical structure of achieving improved ER Management at the zoo

Table 9. The single and combined Eigen vector/weight of the criteria for the respondent groups

Criteria	Criteria Weight from Expert Group/ ^{priority}			Combined / ^{priority}
	Regulator	Researcher	Operator	
Welfare of elephant	0.37336 ¹	0.43505 ¹	0.39795 ¹	0.40717 ¹
Visitor Safety	0.19717 ⁴	0.26236 ²	0.22254 ³	0.22972 ³
Conservation Education	0.22561 ²	0.18922 ³	0.28043 ²	0.23973 ²
Improvement of Community welfare	0.20386 ³	0.11336 ⁴	0.09908 ⁴	0.12338 ⁴

Remarks: 0,32273: 1 Means the first order

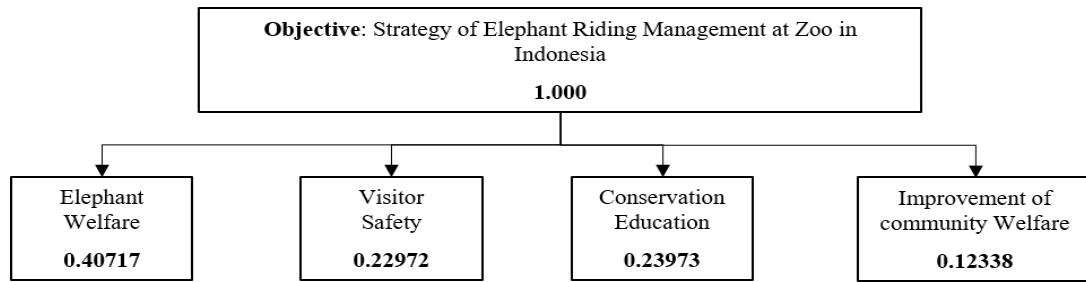
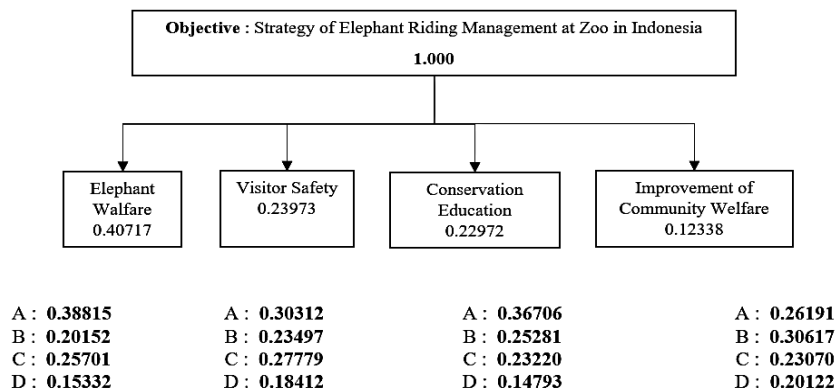


Figure 3. The weight of the criteria in a hierarchical structure



Remarks: A= Environment Quality management B= Travel Segmentation Regulation C= Aesthetic Improvement D= Competitively Ticket Price

Figure 4. The hierarchical arrangement of the weight of strategy choices (eigen values)

standards for use of animals, as appropriate and acceptable tourism guidelines. In addition, several choices were selected by the expert groups for the 2nd, 3rd, and 4th priorities, with visitor safety and conservation education as the second and third priorities, respectively, albeit with fairly thin weight differences. Therefore, this option needs to be implemented into ER management programs because a sense of security and comfort of ER service users is bound to instill positive perceptions (Curtin, 2010; Kuswanda et al., 2018) and influence

public knowledge (Clayton et al., 2017) on animals and related conservation efforts. Also, welfare improvement was selected as the 4th criterion, thus, the eigen vector can be arranged hierarchically (Figure 2).

3. Weight/Eigen Strategy

Figure 3 shows the eigen values produced from pairwise comparisons at the second level, while Figure 4 shows the arrangement of these eigen values into a priority matrix. Meanwhile, Figure 5 and Table 10 shows the eigen values

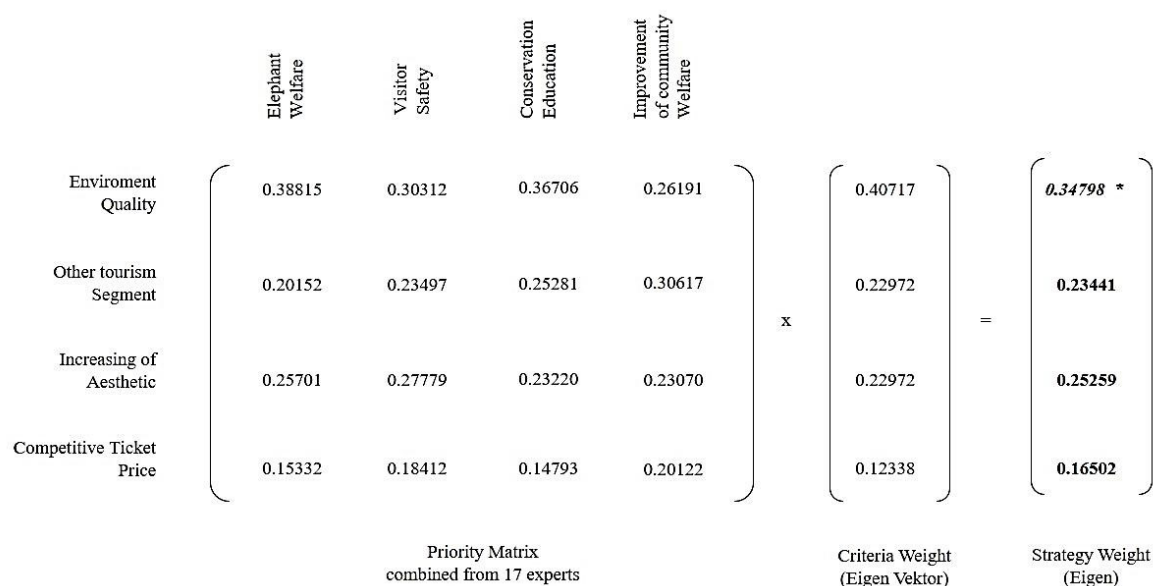


Figure 5. The priority matrix, eigen vector, and eigen vectors in achieving the goals

Table 10. The single and combined eigen vector/weight criteria for the respondent groups

Strategy	Strategy Weight from Expert Group/ ^{priority}			Combined / ^{priority}
	Regulator	Researcher	Operator	
Environmental Quality Management	0.32273 ¹	0.32350 ¹	0.32350 ¹	0.34798 ¹
Travel Segmentation Regulation	0.26936 ²	0.22357 ³	0.22357 ³	0.23441 ³
Improve Aesthetics	0.22183 ³	0.29200 ²	0.29200 ²	0.25259 ²
Competitive Ticket Prices Imposition	0.18608 ⁴	0.16093 ⁴	0.16093 ⁴	0.16502 ⁴

Remarks: 0,32273 ; 1 means the first order

or weights obtained for each strategy choice, by multiplying the priority and eigen vector matrices. In this table, information on strategy weights per expert group is added to review the attention for each expert group.

Based on Table 10, the experts undoubtedly selected environmental quality as the priority strategy 1 in managing ER within Zoos. The experts also determined the pricing strategy for the final choice of tickets. This explained the choice of pricing strategy is very sensitive and has the capacity to strengthen the ER requirements in business aspects, compared to conservation (Lötter et al., 2018). Despite the different views for options 2 and 3, the choice of strategies aesthetics improvement and travel segmentation regulation were selected as the second and third priorities, with a thin difference in weight number.

4. Priority Strategy: Environmental Quality Management

Animals are bound to be comfortable in environments that simulate the conditions of their natural habitat, and this has a significant influence on the health of wild animals. The Indonesian government, through the Minister of Environment and Forestry Regulation Number:P.22/Menlhk/Setjen/Kum.1/5/2019, has implemented regulations that require certain commitment documents to be readily available, including the Environmental Management Actions and Environmental Monitoring Efforts (UKL and UPL), as well as environmental permits. This section recommended the following programs as suitable techniques for ER managers to meet elephant welfare requirements.

a. *Providing UKL-UPL documents as a reference in EC development*

The tourism environment comprises the physical environment, including landscape, certain features such as rivers, rock outcrops, beaches, as well as flora and fauna. To reduce the environmental damage caused by ecotourism activities, the UKL-UPL document is required. This document aids the identification of susceptible environmental components around the zoos, estimation, and evaluation of possible impacts of zoo infrastructure development, as well as provision of certainty and compulsory commitments/obligations which must be implemented to achieve sustainable development and a sound environment.

b. *Providing of Environment Permit documents*

The environmental permit contains the identity of zoos, planned business activities, possible environmental impacts, as well as environmental management and monitoring programs, including wastewater disposal permits and B3 waste temporary storage permits.

c. *Fulfillment of regional targets as Green Open Space*

Under Law Number: 26 of 2007, the existence of zoos as open green spaces can be assessed based on the diversity of vegetation, aesthetics, and usefulness, to determine the capacity to provide comfort to visitors, surrounding communities, and animals. Zoo managers can optimize green space by grouping animals, circulation, cages, and enclosures, as well as the transition space between the zoo and the surrounding environment, as well as supporting facilities and vegetation.

d. *Environment*

The environment comprises biotic aspects, including flora and fauna, as well as abiotic aspects, including temperature, water, and shade. All wildlife in a tourist environment must be identified and assessed for potential benefits and threats in the region (Kuswanda

et al., 2018). The suitable temperature range for elephants is 26–37°C, while the temperature in a closed enclosure is above 15–21°C (Tohir et al., 2016). Therefore, tree canopies need to be filled to regulate the temperature and humidity and protect the animals from extreme weather conditions. The zoo must also have an installation and clean water network to fulfill all water needs in the elephant nursery for drinking and wallowing, as well as for caring and bathing of elephants. A clean environment is bound to give a sense of comfort to both the animals and visitors.

5. Secondary Strategy

The secondary strategies include aesthetics improvement, travel segmentation regulation, and competitive ticket price imposition.

a. Aesthetics Improvement

Kuswanda (2018) showed the aesthetics and the beauty of tourism sites have the capacity to provide satisfaction and comfort to customers, in cases where the environment is in quality tourism. This study recommended the following three programs/activities to achieve improved aesthetics.

1) Arrangement of an ecotourism business management plan

The ecotourism business management plan must be adjusted to the carrying capacity of the area, management of animal collections, cage placement, cage size, cage shape, visitor facilities as well as the information on the species' biology, scarcity status, required breeding space, and freedom to exhibit natural behavior.

2) Visitor Facility Design

According to Kuswanda (2018), the design of visitor facilities can provide knowledge on the importance of wildlife conservation. For instance, the creation of an elephant gallery, a dining area that doubles as a waiting room decorated with elephant knick-knacks, and is equipped with a series of information about the species' history, current issues,

and reasons for exhibition. Another suitable example is designing a place for animals/cages/exhibition/display space in the wild to sensitize the imagination of visitors to the behavior of animals within natural habitats, for instance, providing fallen tree trunks which are usually used by elephants to reach fruit or twigs in higher positions, and providing tree trunks to support the natural habits of elephants who like to rub their bodies against trees, wallow, ropes, rocks, as well as providing hiding places and cages to sleep.

3) Increasing the diversity of potential tree species

In addition to developing the physical sector, aesthetics for the comfort of visitors can also be improved by increasing the diversity of potential tree species (Fant et al., 2016; Parker, 2020). This is bound to support the reduction of air pollution and fulfill certain environmental commitments. The zoo management is advised to pay particular attention to (*Ficus benjamina*), white teak (*Gmelina arborea*), angkana (*Pterocarpus indicus*), trembesi (*Samanea saman*), and red dadap (*Erythrina cristagalli*) species which can be planted in the zoo area (Kuswanda et al., 2018).

b. Travel Segmentation Regulation

The occurrence of excess visitors can be mitigated by grouping visitors into several attraction categories. This is in line with the report by Febryano et al., (2019), where the diversification of attractions was reported to be the most appropriate solution to increase tourist satisfaction while reducing the risk of threats to animals. The availability of multiple choices of tourist attractions will provide space and time for wildlife to rest. These variations of attractions can be packaged uniquely with creative marketing, for instance, accompanied by information stating the purpose of attraction is to maintain a balance between business and animal welfare, as a means of increasing income whilst improving wildlife sustainability. In this study, four main programs/activities

were recommended to increase tourism segmentation.

1) Ensuring the carrying capacity of elephants is fulfilled

According to Febryano et al., (2019), the carrying capacity of elephants at the Way Kambas National Park Office is 20 minutes for two people per round and each elephant should not be used for more than one hour every day, except for old, pregnant, and disabled elephants which must not be used. This carrying capacity is often determined at a level where there is a balance between protection and utilization of elephants, by maintaining the pattern of elephant activity in the wild (Febryano et al., 2019). The carrying capacity of elephants can also be calculated through the elephant's estimated Body Correction Index / BCI measurements. A report by Wahyu (2018), showed the BCI is used as a reference in analyzing other health parameters, and the trend in its value implies whether an elephant is suitable for attraction or not.

2) Increasing creativity and innovation for zoo managers.

In elephant-based tourism areas, training in the knowledge of elephant behavior ensures the safety of visitors and mental training for mahouts/keepers to manage emotions when training elephants. Mahout's closeness to elephants can be increased through more engaging activities such as running, walking, and training (Demartoto et al., 2017; Ward and Melfi, 2015; Williams et al., 2019). Zoos must increase the knowledge of mahout/keepers and other technical staff by providing training programs to improve the zoo's service/number/visitor safety and animal welfare. These programs include elephant-based tourist scout training, training to analyze tourist market trends, training to provide services based on tourists' desires, training to arrange simple scouting programs following elephant-based dynamics and specialties, training in appropriate guiding techniques to increase

tourist flow and length of stay within the area, as well as training in the knowledge of elephant behavior to ensure visitor safety, and mental training for mahouts/keepers to manage emotions while training elephants.

3) Determination of visitor quota

In cases of excess visitors, the manager must restrict visitors by implementing a quota system. This implementation can be performed online, which is supported by strengthening promotions and information. The implementation mechanism for determining quotas can also be stated in the zoo's SOP, which can also contain standards for animal welfare and educating visitors on elephant riding in tourist areas (Duffy and Moore, 2011).

4) Attraction type of elephant specific tour

The management of elephant-based tourism must consider necessary morals and ethics (Duffy and Moore, 2011). The community must be educated on the importance of elephant conservation to ensure protection and tourism are achieved simultaneously. According to Kuswanda (2018), elephant-based ecotourism activities are interactions between elephants and visitors, for instance, tracking with elephants into the forest, elephants bathing, and herding elephants into the forest, as well as observing the educational anatomy and behavior of elephants, in addition to enjoying natural or artificial conditions in the elephant tourism area, for instance, exploring rivers and mountains, observing natural plants of elephant feed, making elephant feed (elephant cake), and camping. Duffy and Moore (2011) reported the Elephant Conservation Center in Thailand offers numerous tourism services using elephants that cannot be released back to nature, for instance, elephant riding, shows, selling of elephant paintings, or other activities, to meet the welfare requirements of elephant tourism.

Examples of potential attractions for the development of elephant-based ecotourism services include the Green Valley Wildlife Park (Taman Satwa Lembah Hijau), which offers elephant care exhibition activities including cutting elephant nails, as well as bathing and herding elephants in their natural/artificial habitat in KHDTK (Forest Area with Special Purposes) Aek Nauli, as well as the Way Kambas National Park Office. Tours with special interests like these need to be developed by zoo managers in addition to tours where visitors interact directly with elephants. Think Elephants International has also developed educational-based tourism in Thailand, where students are invited to interact directly with elephants either through skype or visit conservation centers. These activities are aimed at increasing empathy and motivating students to learn about ecosystems and conservation issues through elephants.

c. Competitive ticket Prices Imposition

Ticket prices are one of the main factors determining the number of tourists. Kuswanda (2018) suggested offering products with the same quality but relatively lower prices to provide increased value. In this study, two programs/activities were recommended to achieve a competitive ticket price, as explained below.

1) Unique tours which favored visitors but did not seem to exploit elephants usually took longer time at higher costs, for instance, tourist activities involving direct interactions with elephants. A report by Febryano et al., (2019) showed these types of tours were not popularly demanded by local visitors, as these visitors often selected packages with lower prices, compared to foreign tourists. This challenge can be overcome by determining prices in the tourism sector, for instance, through price discrimination. The determination of tourist entrance ticket price in a tour/price discrimination is highly

beneficial for zoo managers. Therefore, offering competitive ticket prices to visitors by providing a large selection of attractions, each with unique benefits, is bound to result in additional acceptance for managers and fulfill aspects of elephant welfare.

- 2) Zoo managements must always demonstrate consideration for the local community, to ensure the sustainability of natural resources, in this case, the elephant in the wild. This is achievable by donating additional revenue in the form of Corporate Social Responsibility programs to the communities where the elephants come from.

IV. CONCLUSION

The pros and cons of Elephant Riding (ER) ought not to be a long debate. Apart from increasing human knowledge and awareness, ER can help fulfill elephant welfare properly in zoos. This can help zoo managers optimize both opportunities with environmental quality management as an ER priority strategy, for example, restoring the natural habitat to improve elephant health and visitors' comfort. Other recommended strategies: improving zoo aesthetics, regulating travel segmentation, and imposing competitive ticket prices.

ACKNOWLEDGEMENT

This article is dedicated to Ms. Fitty Machmudah, who conducted this research diligently with us. All authors contributed equally to the success of this study and the writing of this article. The authors are grateful to Riskan Effendi and Lenny Hapsari for partaking in the discussions. Furthermore, the authors are thankful to Prof. Gono Semiadi, Prof. Rosichon Ubaidillah, Prof. Garsetiasih, Dr. Donni Gunaryadi, Dr. Wilson Novari, Dr. Kuswanda, drh. Dedy Chandra, Sri Mulyani, SE, Krismanko, Irzal Azhar, MSi, drh. Wien Indarti, drh. Muhamad Wahyu, drh. Wisnu Subrata, Taman Safari Indonesia, Gembira Loka, Kandih Zoo, Semarang Zoo, Medan Zoo, for participating in the interviews.

REFERENCES

- Armanda, F., & Abdullah. (2018). Analysis of human conflict with sumatran elephant (*Elephas maximus sumatranus*) in Peunaron East Aceh regency. *Jurnal Edubio Tropika*, 6(1),6-9.
- Bansiddhi, P., Brown, J. L., Khonmee, J., Norkaew, T., Nganvongpanit, K., Punyapornwithaya, V., Angkawanish, T., Somgird, C., & Thitaram, C. (2019). Management factors affecting adrenal glucocorticoid activity of tourist camp elephants in Thailand and implications for elephant welfare. *PLoS ONE*, 14(10), 1-18. doi://10.1371/journal.pone.0221537.
- Bennett, N. J., & Dearden, P. (2014). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy*. 44(February),107-116. doi://10.1016/j.marpol.2013.08.017.
- Berliani, K., Alikodra, H. S., Masy'Ud, B., & Kusrini, M. D. (2018). Food preference of Sumatran elephant (*Elephas maximus sumatranus*) to commodity crops in human-elephant conflict area of Aceh, Indonesia. *Journal of Physics: Conference Series*, 1116(5), 1-10. doi://10.1088/1742-6596/1116/5/052015.
- Braverman, I. (2014). Conservation without nature: The trouble with in situ versus ex situ conservation. *Geoforum*, 51(January), 47-57. doi://10.1016/j.geoforum.2013.09.018.
- Clayton, S., Prevot, A. C., Germain, L., & Saint-Jalme, M. (2017). Public support for biodiversity after a zoo visit: Environmental concern, conservation knowledge, and self-efficacy. *Curator*, 60(1)87-100. doi://10.1111/cura.12188.
- Csató, L. (2017). Eigenvector method and rank reversal in group decision making revisited. *Fundamenta Informaticae*, 156(2), 169-178. doi://10.3233/FI-2017-1602.
- Curtin, S. (2010). Managing the wildlife tourism experience: The importance of tour leaders. *International Journal of Tourism Research*. 12, 219-236 doi://10.1002/jtr.747.
- Directorate of Biodiversity Conservation. (2020). Rencana tindakan mendesak penyelamatan populasi gajah Sumatera (*Elephas maximus sumatranus*) 2020-2023 (A. Rahmadetiassani, Sunarto, D. Gunaryadi, M. J. Imansyah, R. Budhiana, F. Rangga, D. S. Chandradewi, & K. Padang (eds.)). DBC - Ministry

- of Environment and Forestry (MoEF), Republic of Indonesia. http://tfcasumatera.org/wp-content/uploads/2020/04/rtm-final_07042020.pdf.
- Demartoto, A., Soemanto, R. B., & Zunariyah, S. (2017). Zoo agent's measure in applying the five freedoms principles for animal welfare. *Veterinary World*, *10*(9), 1026-1034. doi://10.14202/vetworld.2017.1026-1034.
- Duffy, R., & Moore, L. (2011). Global regulations and local practices: the politics and governance of animal welfare in elephant tourism. *Journal of Sustainable Tourism*, *19*(4-5), 589-604. doi://10.1080/09669582.2011.566927.
- Fant, J. B., Havens, K., Kramer, A. T., Walsh, S. K., Callicrate, T., Lacy, R. C., Maunder, M., Meyer, A. H., & Smith, P. P. (2016). What to do when we can't bank on seeds: What botanic gardens can learn from the zoo community about conserving plants in living collections. *American Journal of Botany*, *103*(9), 1541-1543. doi://10.3732/ajb.1600247.
- Febryano, I. G., Rusita, Banuwa, I. S., Setiawan, A., Yuwono, S. B., Marcelina, S. D., Subakir, & Krismurniati, E. D. (2019). Determining the sumatran elephant (*Elephas maximus sumatranus*) carrying capacity in elephant training centre, Way Kambas National Park, Indonesia. *Forestry Ideas*, *25*(1), 10-19.
- Gopala, A., Hadian, O., Sunarto, Sitompul, A., Williams, A., Leimgruber, P., Chambliss, S. E., & Gunaryadi, D. (2011). *Elephas maximus ssp. sumatranus*. The IUCN Red List of Threatened Species: E.T199856A9129626. Download from <https://doi.org/http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T199856A9129626.en>. at 09 May 2017
- Gunaryadi, D., Sugiyo, & Hedges, S. (2017). Community-based human-elephant conflict mitigation: The value of an evidence-based approach in promoting the uptake of effective methods. *PLoS ONE*, *12*(5)1-13. doi://10.1371/journal.pone.0173742.
- Gusset, M., & Dick, G. (2015). Toward positive animal welfare. In M. Gusset & G. Dick (Eds.), *WAZA Magazine: Toward s Positive Animal Welfare* (16th ed., p. Editorial). World Association of Zoos and Aquariums - WAZA United for Conservation. www.waza.org
- Hankinson, E., Nijman, V., & Abdullah. (2020). Asian Elephants: 15 years of research and conservation. *Journal of Physics: Conference Series*, *1460*(1)1-6. doi://10.1088/1742-6596/1460/1/012055.
- Holden, A. (2019). Environmental ethics for tourism- the state of the art. *Tourism Review*, *74*(3), 694-703. doi://10.1108/TR-03-2017-0066.
- Kaffashi, S., Yacob, M. R., Clark, M. S., Radam, A., & Mamat, M. F. (2015). Exploring visitors' willingness to pay to generate revenues for managing the National Elephant Conservation Center in Malaysia. *Forest Policy and Economics*, *56*(July), 9-19. doi://10.1016/j.forpol.2015.03.004.
- Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of behavioural research* (4th edition). Holt, NY. In Harcourt College Publishers.
- Kim, T. K. (2015). T test as a parametric statistic. *Korean Journal of Anesthesiology*, *68*(6), 540-546. doi://10.4097/kjae.2015.68.6.540.
- Kogar, E. Y., Demirduzen, E., Gelball, S., & İnal, H. (2016). Cronbachs coefficient alpha: A meta-analysis study. *Hacettepe University Journal of Education*, *32*(1), 18-32. doi://10.16986/huje.2016017219.
- Kuswanda, W., Situmorang, R. O. P., Berliani, K., Barus, S. P., & Silalahi, J. (2018). *Konservasi dan ekowisata gajah, sebuah model dari KHDTK Aek Nauli* (A. Hadi S. & S. Puj. Bogor: IPB Press Printing.
- Lötter, H. (Hennie), Henley, M., Fakir, S., Pickover, M., & Ramose, M. (2018). Ethical considerations in elephant management. In *Elephant management*. doi://10.18772/22008034792.20.
- McGowan, P. J. K., Traylor-Holzer, K., & Leus, K. (2017). IUCN Guidelines for determining when and how ex situ management should be used in species conservation. *Conservation Letters*, *10*(3), 361-366. doi://10.1111/conl.12285.
- Mellish, S., Ryan, J. C., Pearson, E. L., & Tuckey, M. R. (2019). Research methods and reporting practices in zoo and aquarium conservation-education evaluation. In *Conservation Biology*, *33*(1), 40-52. doi://10.1111/cobi.13177.
- MoEF. (2019). Lembaga konservasi. Regulation of Minister of Environment and Forestry (MoEF) No. P.22/MENLHK/SETJEN/KUM.1/5/2019).
- MoF. (2011). Pedoman, etika dan kesejahteraan satwa di lembaga konservasi. Regulation of Director General of Nature Resource Conservation and Ecosystem; Ministry of Forestry (MoF) No. P.09 / IV-Set / 2011.
- Moss, A. G., Littlehales, C., Moon, A., Smith, C., & Sainsbury, C. (2017). Measuring the impact of an in-school zoo education programme.

- Journal of Zoo and Aquarium Research*, 5(1), 33–37. doi://10.19227/jzar.v5i1.217.
- Nofinska, B. A., Sumayyah, S., Andayani, N., Maryanto, A. E., Kheng, V., & Sugiharti, T. (2019). Determination of sex, age, and spatial distribution of sumatran elephant (*Elephas maximus sumatranus*) in Bukit Barisan Selatan National Park. *AIP Conference Proceedings*, 2168. doi://10.1063/1.5132500.
- Parker, M. (2020). *The genealogy of the zoo: Collection, park and carnival*. Organization. doi://10.1177/1350508420910573.
- Pirota, E., & Lusseau, D. (2015). Managing the wildlife tourism commons. *Ecological Applications*, 25, 729–741. doi://10.1890/14-0986.1.sm.
- Plotnik, J. M., & de Waal, F. B. M. (2014). Asian elephants (*elephas maximus*) reassure others in distress. *PeerJ*, 2014(1), 1–17. doi://10.7717/peerj.278.
- Polyapipat, P., & Loh, A. (2015). Tourists' understanding of the elephant business in the tourism industry: A study of international tourists in Chiang Mai Province, Thailand. *ABAC ODI Journal Vision. Action. Outcome*, 2(2). doi://10.1145/3132847.3132886.
- Pratiwi, P., Rahayu, P. S., Rizaldi, A., Iswandar, D., & Winarno, G. D. (2020). Community perception on the conflict between human and sumatran elephant (*Elephas maximus sumatranus* Temminck 1847) in Way Kambas National Park. *Jurnal Sylva Lestari*, 8(1), 98–108. doi://10.23960/jsl1898-108.
- Qomariah, I. N., Rahmi, T., Said, Z., & Wijaya, A. (2019). Conflict between human and wild Sumatran Elephant (*Elephas maximus sumatranus* Temminck, 1847) in Aceh Province, Indonesia. *Biodiversitas*, 20(1), 77–84. doi://10.13057/biodiv/d200110.
- Rustiati, E. L., Priyambodo, P., Yulianti, Y., Srihanto, E. A., Pratiwi, D. N., Virnarenata, E., Novianasari, T., Krismuniarti, E. D., & Saswiyanti, E. (2020). The essential contribution of captive sumatran elephant in elephant training center, Way Kambas National Park for wildlife genetics conservation. *BIOVALENTIA: Biological Research Journal*, 6(1), 38–41. doi://10.24233/biov.6.1.2020.173.
- Saaty, T. L. (1993). *Pengambilan keputusan bagi para pemimpin*. Jakarta: PT. Pustaka Binaman Pressindo.
- Saaty, T. L. (2012). Decision making for leaders. *IEEE Transactions on Systems, Man, and Cybernetics, SMC*, 15(3), 450–452. doi://10.1109/tsmc.1985.6313384.
- Saaty, T., & Vargas, L. (2012). Models, methods, concepts & applications of the analytic hierarchy process. Springer. doi://10.1007/978-1-4614-3597-6.
- Schultz, J. G. W., & Joordens, S. (2014). The effect of visitor motivation on the success of environmental education at the Toronto Zoo. *Environmental Education Research*, 20(6), 753–775. doi://10.1080/13504622.2013.843646.
- Sitompul, a. F., Griffin, C. R., & Fuller, T. K. (2013). Sumatran elephant ranging behavior in a fragmented rainforest landscape. *International Journal of Biodiversity and Conservation*, 5(2), 66–72. doi://10.5897/IJBC12.040.
- Sukmanto, Y. W., Alikodra, H. S., Kartono, A. P., & Efransjah. (2019). Distribution and habitat preferences of Sumatran elephant (*Elephas maximus sumatranus*) in Riau, Indonesia. *Biodiversitas*, 20(1), 226–235. doi://10.13057/biodiv/d200126.
- Taylor, M., Hurst, C. E., Stinson, M. J., & Grimwood, B. S. R. (2020). Becoming careful: Contextualizing moral development among captive elephant volunteer tourists to Thailand. *Journal of Ecotourism*, 19(2), 113–131. doi://10.1080/14724049.2019.1657125.
- Tohir, R. K., Mustari, A. H., & Masy'ud, B. (2016). Pengelolaan dan tingkat kesejahteraan gajah sumatera (*Elephas maximus sumatranus* temminck, 1847) di flying squad WWF Taman Nasional Tesso Nilo, Riau. *Media Konservasi*, 21(2), 152–158. doi://10.29244/medkon.21.2.152-158.
- Wahyu, M. (2019). *Panduan perawatan medis gajah sumatera (First Edition)*. Praninta Aksara for the VESSWIC Consortium - Veterinary Society for Sumatran Wildlife Conservation. Fakultas Kedokteran Hewan UGM; Yogyakarta.
- Williams, E., Carter, A., Hall, C., & Bremner-Harrison, S. (2019). Exploring the relationship between personality and social interactions in zoo-housed elephants: Incorporation of keeper expertise. *Applied Animal Behaviour Science*, 221(December). doi://10.1016/j.applanim.2019.104876.
- Wolfensohn, S., Shotton, J., Bowley, H., Davies, S., Thompson, S., & Justice, W. S. M. (2018). Assessment of welfare in zoo animals: Towards optimum quality of life. In *Animals*, 8(7), 1–16. doi://10.3390/ani8070110.

- Xu, Y., & Wang, H. (2013). Eigenvector method, consistency test and inconsistency repairing for an incomplete fuzzy preference relation. *Applied Mathematical Modelling*, 37(7), 5171-5183. doi://10.1016/j.apm.2012.10.008.
- Zemek, A., Khodosh, R., & Banaei, N. (2016). Infectious rash after riding elephants. *Journal of the American Academy of Dermatology*, 75(5), 175–176. doi://10.1016/j.jaad.2016.01.041.