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Developing an indicator framework for assessing sustainable tourism: Evidence from a Taiwan ecological resort

Tsung Hung Lee [a,*], Fen-Hauh Jan [b], Jui-Tu Liu [c]

[a] Graduate School of Leisure and Exercise Studies, National Yunlin University of Science and Technology, Taiwan
[b] Department of Tourism and Hospitality, TransWorld University, Taiwan
[c] Sun-Link-Sea Forest Ecological Resort, Taiwan

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ABSTRACT

Scientific understanding of the sustainability indicators of existing nature-based tourism businesses is limited. This study aims to explore a sustainability indicator framework, evaluate the indicator weights and assess performance using a case of a forest ecological resort through three studies. Study 1 explores sustainability indicators for ecological resorts, study 2 calculates the relative weights of each sustainability indicator, and study 3 evaluates the sustainability performance of a forest ecological resort. The analysis revealed 89 indicators classified into six categories: environmental managements, economic management, socio-cultural management, science and technology, human resource management, and government policy. The weights of each indicator were calculated via the analytic hierarchy process with 21 participants. At the first level, the weight of environmental management (0.362) was higher than the weights of the other dimensions (range: 0.192–0.097). The resort's performance was assessed in terms of importance and performance. The present study's findings effectively develop a sustainability indicator framework for assessing sustainable tourism that provides valuable theoretical and managerial references, extends our knowledge of sustainable resort development and significantly contributes to the literature.

1. Introduction

As an important strategy for poverty alleviation, tourism provides economic benefits and job opportunities for local residents (Lee & Jan, 2019; UNWTO, 2017). However, due to an increase in tourism's negative impacts, the sustainability of tourism development has been widely discussed (Agyeiwaah, McKercher, & Suntikul, 2017; Lee, 2013; Lee & Jan, 2019). The World Tourism Organization (UNWTO) asserts that sustainable tourism should include economic, socio-cultural, and environmental aspects for all types of tourism and destinations (UNWTO, 2019). The UNWTO suggests that the development of sustainable tourism is the responsibility of all policy makers and businesses in the tourism sector (UNWTO, 2017). In nature-based tourism, natural resources are fragile and need to be protected (Lee & Jan 2018). As destination managers deal with complex information, sustainability indicators can help them assess tourism impacts and take actions to promote recovery from these impacts (Kristjánsdóttir, Ólafsdóttir, & Ragnarsdóttir, 2018). Therefore, developing sustainability indicators allows managers to monitor and assess the sustainability of a destination (Lee & Hsieh, 2016).

Scholars have developed sustainability indicators for different contexts, such as urbanization (Verma & Raghubanshi, 2018) and marine ecosystems (D'Lima, Everingham, Diedrich, Mustika, Hamann, & Marsh, 2018), and of different types, such as weighted and aggregated sustainability indicators (Gan et al., 2017), sustainable ecotourism indicators (Ocampo, Ebisa, Ombe, & Escoto, 2018), and eco-efficiency indicators (Huang, Xia, Yu, & Zhang, 2018). Sustainability indicators for tourism, as a fast-growing sector, have been developed for several decades and include static and dynamic indicators for sustainable tourism evaluation on a national level (Blancas, Lozano-Oyola, González, & Caballero, 2016), community-based tourism (Agyeiwaah et al., 2017), aboriginal tourism (Tsaur, Lin, & Lin, 2006), wetland tourism (Lee & Hsieh, 2016), and eco-innovation indicators for ecological resorts (Lee, Jan, Liu, & Lei, 2017). Obviously, sustainability issues have drawn much attention (Agyeiwaah et al., 2017; Lee & Hsieh, 2016; Lee et al., 2017; Tsaur et al., 2006).

* Corresponding author at: Graduate School of Leisure and Exercise Studies, National Yunlin University of Science and Technology, 123, Section 3, University Road, Touliu, Yunlin 640, Taiwan.
E-mail address: thlee@yuntech.edu.tw (T.H. Lee).

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As the basis of sustainability for nature-based tourism destinations, the three pillars of economic, socio-cultural, and environmental sustainability have been the most frequently assessed (Mihalič, Žabkar, & Cvelbar, 2012). However, the sustainability indicators of a tourism business may differ from those of a nature-based tourism destination. Moreover, nature-based tourism businesses are uniquely tasked with identifying the interrelationships among stakeholders for sustainable development purposes (Goffi, Masiero, & Pencarelli, 2018). The stakeholders of nature-based tourism may be owners, employees, local residents, tourists or those involved in government policy, and new technology (Choi & Sirakaya, 2006; Goffi et al., 2018). Therefore, the sustainability indicators of nature-based tourism businesses include not only the local economy, local resident perceptions, and the conservation of natural resources but also the performance of operating businesses, human resources, regulations, and new technology (Choi & Sirakaya, 2006; Goffi et al., 2018; Roberts & Tribe, 2008). As the main stakeholders in the tourism sector, tourism businesses provide critical services that allow tourists to have memorable experiences (Hosany & Witham, 2010). As such, in developing sustainability indicators, the major differences between tourism businesses and resorts are mainly determined by operating performance. Tourism businesses pay more attention to the management of tourists, local residents, governments, and employees (Roberts & Tribe, 2008). On the other hand, a nature-based tourism destination should focus on environmental management for sustainability (Lee & Hsieh, 2016).

Sustainability indicators enable tourism businesses to identify the indicators and the weights of these indicators by using different stakeholders' perspectives, which may help in achieving sustainability (Lee & Hsieh, 2016; Mihalič et al., 2012). Moreover, tourism businesses can effectively identify the importance of each indicator for planning, managing, and monitoring sustainable nature-based tourism businesses (Lee & Hsieh, 2016; Roberts & Tribe, 2008). Thus, developing a sustainability indicator framework and weights is crucial for sustainable tourism by providing theoretical and practical implications.

Although the sustainability of a tourism business contributes to sustainable tourism development, few studies focus on exploring sustainability indicators with evidence from nature-based tourism businesses (e.g., a nature-based resort; Roberts & Tribe, 2008). Evaluations of the sustainability indicators of existing nature-based tourism businesses are lacking. Therefore, the development and evaluation of sustainability indicators based on nature-based tourism businesses are warranted.

This study explores and evaluates the sustainability indicators of nature-based tourism businesses. Three studies were conducted. Study 1 explores the sustainability indicators of nature-based tourism businesses, study 2 assesses and calculates the relative weights of each sustainability indicator, and study 3 evaluates the sustainability of an ecological resort.

2. Literature review

2.1. Sustainability indicators

According to the definition of sustainable development of tourism proposed by the UNWTO, sustainability indicators should encompass environmental, economic, socio-cultural, and tourism development for all tourism types and destinations (UNWTO, 2004). Several scholars have developed sustainability indicators for community-based tourism, rural tourism, and protection areas (Boley, McGehee, & Hammett, 2017; Marzo-Navarro, Pedraja-Iglesias, & Vinzón, 2015; Poudel, Nyaupane, & Budruk, 2016). Thus, different attributes of destinations, stakeholders, and tourism types will affect the specifics of sustainability indicators (Roberts & Tribe, 2008).

Sustainability indicators can be one-dimensional or multi-dimensional. Some scholars have developed sustainability indicators in a single dimension for a specific purpose, such as assessing the sustainability of eco-environmental innovation (i.e., innovation to reduce environmental impacts from product/service provision, product/service marketing, and organizational operations; Lee et al., 2017), ecotourism (Ocampo et al., 2018), and tourism destinations (Schianetz & Kavanagh, 2008; Vučetić, 2018). Several other sustainability indicators have been developed in multiple dimensions for specific purposes (Choi & Sirakaya, 2006; Lee & Hsieh, 2016).

The dimensions of sustainability indicators can differ from the stakeholders of tourism. For example, resident perceptions are a crucial factor in sustainable development in community-based tourism (Boley et al., 2017; Choi & Sirakaya, 2006; Lee & Jan, 2019), rural tourism (Marzo-Navarro et al., 2015), and nature-based tourism (Huang & Coelho, 2017; Ng, Chia, Ho, & Ramachandran, 2017; Poudel et al., 2016). The dimensions of sustainability indicators in these tourism destinations have been developed based on resident perspectives. In accordance with the UNWTO's definition of sustainable tourism, economic, socio-cultural, and environmental sustainability were introduced as dimensions of sustainability indicators (Choi & Sirakaya, 2006; Lee & Jan, 2019; Marzo-Navarro et al., 2015; Ng et al., 2017; Poudel et al., 2016). Based on the social exchange theory (Ap, 1992), residents' support for tourism development will be based on the economic, socio-cultural, and environmental impacts of tourism. In community-based tourism, community resources and resident empowerment are also included as sustainability indicators (Choi & Sirakaya, 2006; Kunasekaran et al., 2017). In addition, several scholars have addressed the life satisfaction of residents as an important factor in sustainable tourism development (Choi & Sirakaya, 2006; Lee & Jan, 2019).

From the perspective of tourism destination management, service quality (Park & Yoon, 2011), management relationships among stakeholders (Lee & Hsieh, 2016; Park & Yoon, 2011), governance (Fernández-Tabales, Foronda-Robles, Galindo-Pérez-de-Azpillaga, & García-López, 2017; Martin & Assenov, 2014), policy (Choi & Sirakaya, 2006; Fernández-Tabales et al., 2017; Wang et al., 2016a), tourism resource management (Law, DeLacy, & McGrath, 2017; Lee & Hsieh, 2016; Wang et al., 2016), environmental management (Law et al., 2017; Lee & Hsieh, 2016), science and technology management (Choi & Sirakaya, 2006), and local economic development (Choi & Sirakaya, 2006; Lee & Hsieh, 2016; Wang et al., 2016) are among the dimensions of sustainability indicators. From the business operator perspective, the dimensions of sustainability indicators may include guest satisfaction (Blackstock, White, McCrum, Scott, & Hunter, 2008), profitability (Mihalič et al., 2012; Roberts & Tribe, 2008), natural resource management (Mihalič et al., 2012), human resource management (Mihalič et al., 2012; Roberts & Tribe, 2008), environmental management (Blackstock et al., 2008; Gössling, 2015; Roberts & Tribe, 2008), and resident reaction (Blackstock et al., 2008; Roberts & Tribe, 2008).

Additionally, in developing countries, tourism development accompanies economic development and poverty alleviation (Lepp, 2007). Tourism provides job opportunities, business opportunities, demand for local products, and demand for local agricultures, which improves the local agriculture market for local residents (Lee & Jan, 2019; Lepp, 2007). Through these economic benefits, residents' standard of living may be improved (Liang & Bao, 2018). However, economic leakage of tourism is an important issue in developing countries (Lepp, 2007; Liang & Bao, 2018; Scheyvens & Russell, 2012). Based on operating cost considerations, small-scale businesses may use more local products and hire more local people than large-scale businesses (Scheyvens & Russell, 2012). As such, small-scale tourism businesses cause less economic leakage than large-scale ones (Lepp, 2007; Scheyvens & Russell, 2012). To measure economic leakage, indicators must include providing job opportunities for local residents (Boley et al., 2017; Roberts & Tribe, 2008) and buying local products (Mutana & Mukwada, 2017; Roberts & Tribe, 2008), which represent local sustainable economic development and poverty alleviation resulting from tourism.

2.2. Sustainable development for a resort

The balance between profitability and corporate social responsibility has been introduced to measure sustainability as it relates to tourism operators (Goffi et al., 2018). Regarding sustainability indicators in the accommodation industry, Gössling (2015) focused on water management, specifically direct and indirect water consumption management, which can provide holistic savings on water used to meet operational requirements. However, water management is only one of the accommodation industry sustainability indicators. From the business point of view, Mihalič et al. (2012) suggested that sustainability indicators for accommodations should encompass economic, social, and environmental sustainability. The profitability and marketing of accommodations provide economic sustainability, human capital, cultural capital, and participation related to social sustainability. Natural resources and environmental education are aspects of environmental sustainability (Mihalič et al., 2012). Mihalič et al. (2012) developed sustainability indicators from the business point of view and provided less discussion of the relationship among residents, government policy, and technology. However, the relationship between different stakeholders will affect the sustainable development of tourism (Lee & Hsieh, 2016). Previous studies have argued that the relationship between tourism stakeholders, such as residents (Lee & Hsieh, 2016; Poudel et al., 2016; Roberts & Tribe, 2008) and governments (Choi & Sirakaya, 2006; Lee & Hsieh, 2016) is crucial for developing sustainable tourism. Therefore, the relationship between such stakeholders should be included among the sustainability indicators.

At present, new technology may improve the effectiveness and efficiency of resort management (Choi & Sirakaya, 2006; Hyman, 2014). New technology development has been applied in destination management through Facebook marketing (Park, Lee, Yoo, & Nam, 2016), virtual tourism experiences, and mobile applications (Wang et al., 2016b).

In terms of sustainability, ecological resorts, which have plentiful natural resources, should pay more attention to environmental sustainability than general accommodations (Lee et al., 2017); for example, the sustainability indicators for such resorts should focus more on assessing natural resource management than on hotel management. Moreover, ecological resorts provide tourists opportunities to experience natural resources and learn about the environment, encouraging environmentally responsible behavior (Lee & Jan 2015), which may be helpful for sustainable tourism development. However, to date, no research has developed sustainability indicators for ecological resorts. Comprehensive development of sustainability indicators for ecological resorts is needed.

3. The survey

3.1. Study 1: Sustainable tourism indicators of a resort

3.1.1. Study area

The Sun-Link-Sea Forest Ecological Resort (SLSFER) (120°47′18″ E, 23°38′21″ N) is located on a medium-altitude mountain in central Taiwan. It is a famous ecological resort due to its biodiversity, recreation experiences, and eco-environmental innovation (Lee et al., 2017). An ecological and environmental education center was established to offer ecological interpretation services in Taiwan in 2011, and in 2012 the SLSFER was the first authenticated by the Environmental Protection Administration. In terms of sustainable tourism implementation, the resort follows water- and energy-saving practices and encourages tourists to bring reusable personal belongings. All the staff are encouraged to receive environmental education so that they can assist in the practice of sustainable tourism.

3.1.2. Identifying the sustainable tourism indicators

The aim of this multistage study was to develop indicators for sustainability development. Previous studies have suggested that deductive approaches can be applied to identify appropriate indicators from the existing literature (Lee & Hsieh, 2016, Choi & Sirakaya, 2006). Consequently, sustainability indicators were obtained from the literature using various databases, such as Web of Science, ScienceDirect, SCOPUS, EBSCOhost, and Google Scholar. Relevant articles were identified using such keywords as “sustainability indicator”, “sustainability”, “nature-based tourism,”, “ecological resort,”, “environmental impacts,” “socio-cultural impact”, “economic impact”, “technology”, “government policy”, and “human resources” (also see Table 1).

Next, the literature was screened and filtered by the authors. By means of a deductive approach, suitable items were obtained. Sustainability indicators from questionnaires originally written in English were translated into Chinese by the authors. Translation bias was minimized by two native English speakers who were familiar with Chinese back-translating the items into English. The authors then designed the Chinese versions of the items by comparing the meanings of the translated items with those of the items in the English papers. Any inconsistencies between the original and back-translated sustainability indicators were detected by iterating the process until the wording was finalized.

The Delphi method is an effective survey approach involving structured expert surveys (Choi & Sirakaya, 2006; Lee & Hsieh, 2016; Lee et al., 2017; Park & Yoon, 2011). Both Lee and Hsieh (2016) and Tsaur et al. (2006) introduced the Delphi method to analyze experts’ opinions to develop destination sustainability indicators. Moreover, analytic hierarchy process (AHP) provides hierarchical structures of these sustainability indicators to evaluate the relative importance of these indicators (Lee & Hsieh, 2016). Although the Delphi survey technique has merit, ambiguity and uncertainty may nevertheless be present (Miller, 2001). Fuzzy set theory could overcome the limitations of the method by decreasing questionnaire survey frequency, avoiding distortion in individual expert opinions, clearly presenting the semantic structure of the proposed items, and considering the fuzzy nature of the expert questionnaire survey process; the fuzzy Delphi method has been successfully used to achieve expert consensus by using fuzzy numbers (Cheng & Lin, 2002; Lee & Hsieh, 2016). Thus, this study employed a fuzzy Delphi method to assess the sustainability indicators. Generally, a sample size of 7 to 26 is surveys using the Delphi method (Hallowell & Gambatese, 2010). Accordingly, 25 experts (13 scholars interested in sustainable tourism, seven government officers in charge of tourism affairs, and five tourism business operators) were chosen to complete the fuzzy Delphi survey in September 2018, responding to two-round surveys performed via e-mail, Line, or mail. The panel members appeared to be unbiased and representative because they included scholars, practice managers, and officers in sustainable tourism areas. The minimum, maximum, and geometric mean were calculated, and consensus values were assessed using two triangular fuzzy numbers (Cheng & Lin, 2002).

3.1.3. Focus group

The focus group has been widely adopted in the tourism context and is helpful for gathering detailed opinions about a specific topic from selected participants (Cater, Low, & Keirle, 2018). To ensure that the sustainability indicators were suitable for nature-based tourism businesses, the focus group technique was applied. Nine participants were recruited from among the SLSFER managers and were invited to participate in the focus group on November 11, 2018. The group met for approximately 90 min, discussing and sharing their management and practice opinions regarding the sustainability indicators for each dimension and indicator.

3.1.4. Results

In total, 185 indicators were obtained from 45 academic papers. After the removal of indicators with similar meanings or those related to cultural factors, 105 indicators remained. The 105 indicators were classified into six categories: environmental management, economic management, socio-cultural management, science and technology,

Table 1
The keywords and references.

Keywords	Literature
Sustainable indicator	Blackstock et al. (2008), Blancas et al. (2011), Blancas et al. (2016), Blancas et al. (2018), Blanco-Cerradelo et al. (2018), Boley et al. (2017), Cernat & Gourdon (2012), Choi & Sirakaya (2005, 2006), Cucculelli & Goffi (2016), European Union (2016), Fernández-Tabales et al. (2017), Ferraz & Gallardo-Vázquez (2016), Goffi et al. (2018), Gössling (2015), Huang & Coelho (2017), Hyman (2014), Kožić & Mikulić (2014), Kunasekaran et al. (2017), Larson & Poudyal (2012), Law et al. (2017), Lee & Hsieh (2016), Lee et al. (2017), Lupoli & Morse (2015), Lupoli et al. (2015), Martin & Assenov (2014), Marzo-Navarro et al. (2015), Mihalič et al. (2012), Mutana & Mukwada (2017), Ng et al. (2017), Ocampo et al. (2018), Park & Yoon (2011), Pérez et al. (2013), Pomering et al. (2011), Poudel et al. (2016), Qian et al. (2017), Roberts & Tribe (2008), Schianetz & Kavanagh (2008), Tanguay et al. (2013), Torres-Delgado & Palomeque, (2014), Vučetić (2018), Wang et al. (2016)
Nature-based tourism & sustainability	Blackstock et al. (2008), Blancas et al. (2011), Blanco-Cerradelo et al. (2018), Boley et al. (2017), Choi & Sirakaya (2005, 2006), Huang & Coelho (2017), Hyman (2014), Fernández-Tabales et al. (2017), Kožić & Mikulić (2014), Kunasekaran et al. (2017), Lee & Hsieh (2016), Lee et al. (2017), Martin & Assenov (2014), Marzo-Navarro et al. (2015), Ng et al. (2017), Ocampo et al. (2018), Park & Yoon (2011), Pérez et al. (2013), Poudel et al. (2016), Qian et al. (2017), Schianetz & Kavanagh (2008), Wang et al. (2016)
Environmental impacts & Sustainable indicator	Blackstock et al. (2008), Blancas et al. (2011), Blancas et al. (2016), Blancas et al. (2018), Blanco-Cerradelo et al. (2018), Boley et al. (2017), Cernat & Gourdon (2012), Choi & Sirakaya (2005, 2006), Cucculelli & Goffi (2016), European Union (2016), Fernández-Tabales et al. (2017), Goffi et al. (2018), Gössling (2015), Huang & Coelho (2017), Hyman (2014), Kožić & Mikulić (2014), Kunasekaran et al. (2017), Larson & Poudyal (2012), Law et al. (2017), Lee & Hsieh (2016), Lee et al. (2017), Lupoli & Morse (2015), Lupoli et al. (2015), Martin & Assenov (2014), Marzo-Navarro et al. (2015), Mihalič et al. (2012), Mutana & Mukwada (2017), Ng et al. (2017), Ocampo et al. (2018), Park & Yoon (2011), Pérez et al. (2013), Pomering et al. (2011), Poudel et al. (2016), Qian et al. (2017), Roberts & Tribe (2008), Schianetz & Kavanagh (2008), Tanguay et al. (2013), Torres-Delgado & Palomeque, (2014), Vučetić (2018), Wang et al. (2016),
Socio-cultural impact &Sustainable indicator	Blackstock et al. (2008), Blancas et al. (2011), Blancas et al. (2016), Blancas et al. (2018), Blanco-Cerradelo et al. (2018), Boley et al. (2017), Cernat & Gourdon (2012), Choi & Sirakaya (2005, 2006), Cucculelli & Goffi (2016), European Union (2016), Ferraz & Gallardo-Vázquez (2016), Goffi et al. (2018), Huang & Coelho (2017), Kožić & Mikulić (2014), Kunasekaran et al. (2017), Larson & Poudyal (2012), Lupoli et al. (2015), Lupoli & Morse (2015), Martin & Assenov (2014), Marzo-Navarro et al. (2015), Mihalič et al. (2012), Mutana & Mukwada (2017), Ng et al. (2017), Pérez et al. (2013), Pomering et al. (2011), Poudel et al. (2016), Qian et al. (2017), Roberts & Tribe (2008), Schianetz & Kavanagh (2008), Tanguay et al. (2013), Torres-Delgado & Palomeque, (2014), Wang et al. (2016),
Economic impact & Sustainable indicator	Blancas et al. (2011), Blancas et al. (2016), Blancas et al. (2018), Blanco-Cerradelo et al. (2018), Boley et al. (2017), Cernat & Gourdon (2012), Choi & Sirakaya (2005, 2006), European Union (2016), , Goffi et al. (2018), Huang & Coelho (2017), Hyman (2014), Kožić & Mikulić (2014), Kunasekaran et al. (2017), Larson & Poudyal (2012), , Lupoli & Morse (2015), Lupoli et al. (2015), Qian et al. (2017), Martin & Assenov (2014), Marzo-Navarro et al. (2015), Mihalič et al. (2012), Mutana & Mukwada (2017), Ng et al. (2017), Ocampo et al. (2018), Park & Yoon (2011), Pérez et al. (2013), Pomering et al. (2011), Poudel et al. (2016), Roberts & Tribe (2008), Schianetz & Kavanagh (2008), Tanguay et al. (2013), Torres-Delgado & Palomeque, (2014), Wang et al. (2016)
Technology & Sustainable indicator	Choi & Sirakaya (2006), Hyman (2014)
Government policy & Sustainable indicator	Choi & Sirakaya (2005, 2006), Cucculelli & Goffi (2016), Fernández-Tabales et al. (2017), Ferraz & Gallardo-Vázquez (2016), Kunasekaran et al. (2017), Lee & Hsieh (2016), Martin & Assenov (2014), Mutana & Mukwada (2017), Wang et al. (2016),
Human resources & Sustainable indicator	Ferraz & Gallardo-Vázquez (2016), Ocampo et al. (2018), Roberts & Tribe (2008)
Ecological resort & Sustainable indicator	Lee et al. (2017)

human resource management, and government policy. Based on the analytical results of the first round of the fuzzy Delphi survey, four indicators were deleted, and one indicator was added based on the suggestions of the experts. Because consensus did not exist for 38 indicators, a second fuzzy Delphi survey was carried out. After the second round, consensus was achieved. Ultimately, 22 items were modified, 13 items were deleted, and one item was added based on suggestions from the experts.

The above 93 indicators were assessed by the SLSFER focus group to obtain a practical perspective. The category of environmental management was removed, and four items were revised for comprehensibility. In the economic management category, three items were removed and 12 items were revised. In the socio-cultural management category, one item was removed, one item was revised, and one item was added. In the government policy category, two items were revised. None of the human resource management items was modified. One science and technology item was revised.

3.2. Study 2: Assessment of the weight of the indicators

3.2.1. Weights of the sustainable tourism indicators

Twenty-three panel members were invited from three groups: tourism scholars (10), tourism managers (6), and officers in tourism-related government bureaus (7). Totally, 23 experts were recruited, all of whom agreed to participate in the survey. The expert questionnaire survey was carried out between January and February 2019. Following the AHP, we constructed a matrix by using a proportional scale from 1 to 9 to compare pairs of indicators. The weights for each pair were assessed by using Expert Choice 11.5 (Expert Choice, 2004). The data from two respondents were invalid because they were incomplete, leaving 21 valid questionnaires.

The relative weights of these indicators were screened and determined by using consistency tests to ensure the reliability of the results. Finally, the relative weight of each indicator in the hierarchical structure was calculated using pairwise comparisons.

3.2.2. Results

The weight of each sustainable tourism indicator was determined using the AHP with 21 participants (Table 2). At the first level, the weight of the dimension of environmental management (0.362) was higher than the weights of the other dimensions (range: 0.192–0.097).

At the second level, for environmental management, the percentage

Table 2
Analytic hierarchy process (AHP) of sustainability indicators.

Level 1	Level 2
Environmental management (0.362)	Percentage of tourism enterprises that take actions to reduce energy consumption (0.075)
	Protecting local water quality (0.070)
	Quantity of solid waste/waste management (0.066)
	Wastewater management (0.059)
	Promotion and teaching of tangible wildlife conservation concepts (0.059)
	This ecological resort provides signs to remind customers when to save resources (0.058)
	Building and infrastructure compliance with zoning requirements (0.055)
	The ecological resort uses hybrid vehicles as shuttle buses (0.054)
	Conserving the local natural environment (0.054)
	Protecting local air quality (0.052)
	Environmental impact of tourism activity (0.052)
	Number of establishments that participate in water conservation (0.049)
	Environmental activities for the employees (0.046)
	Percentage of tourism enterprises involved in climate change mitigation schemes (0.045)
	Environmental activities for guests (0.045)
	Number of other ecological quality labels (0.044)
	Consumption of energy from renewable sources (0.042)
	Water recycling (0.040)
	Noise control (0.033)
Economic management (0.192)	Have a sustainable management plan (0.038)
	Profitability of assets (ROA) is growing on a long-term basis (0.037)
	Adequate money to run tourism (0.037)
	Providing tourists with a quality visitor experience (0.037)
	Net profits on sales are positive (0.036)
	Have short-, mid-, and long-term plans (0.036)
	Profitability of capital is growing (0.032)
	Profit margin is stable (0.032)
	Share of returning guests (0.032)
	Entertainment, sports and culture (0.031)
	Increasing rate of the number of visitors is stable (0.031)
	Our ROI is stable (0.031)
	Our selling cost is reducing (0.030)
	Number of service firms with complementary ecotourism offers (0.029)
	Tourism enterprises inspected for safety per year (0.029)
	Share of guests who would recommend the resort to friends and acquaintances (0.029)
	Total revenue per employee is stable (0.028)
	Average occupancy rate is stable (0.028)
	Insurance coverage against natural disasters (e.g., hurricanes, flooding, serious infectious disease) (0.027)
	Tourist spending is growing (0.027)
	The variable environment is used in marketing strategies and campaigns in this ecological resort. (0.026)
	Degree of match of the destination marketing and branding values with those of the green economy (0.026)
	Effective market segmentation (0.026)
	Environmental friendliness of accommodations (0.026)
	Natural beauty and scenery satisfaction (0.025)
	Return on equity is growing (0.025)
	Limiting tourism development to the appropriate scale for locals (0.024)
	Environmentally preferable purchasing (0.023)
	Innovation for tourism resources (0.023)
	Accommodation - value for money (0.023)
	Economic value added is growing (0.022)
	Constructing a customer database (0.021)
	Existence of a website that provides information about the destination (0.021)
	Gastronomy - value for money (0.021)
	Provide a directional sign to the village within 5 km (0.016)
	Reservation system on homepage (0.014)
Socio-cultural management (0.141)	Our company cultivates a close relationship with the local community (0.101)
	Our company seeks to comply with all laws regulating employee benefits (0.081)
	The rural tourism activities that exist in the region increase the ecological awareness of society (0.080)
	Increase flow of tourism profits to local communities (0.079)
	Number of local employees in tourism/Increasing tourism jobs among locals (0.079)
	Disabled-accessible tourism products (0.077)
	"Buy local" policy (0.077)
	Perception by the local population that an improvement in public services is because of tourism (0.071)
	Company promotes social welfare activities (0.069)
	Our company adopts policies of nondiscrimination with employees and other compensation and promotion policies (0.064)
	We seek to disclose ethical, social and ecological information about our services (0.062)
	To implement an organizational culture that is against commercial and sexual exploitation, especially of children, teenagers, women and minority groups (0.059)
	To opt for suppliers aware of their environmental responsibilities (0.056)
	To increase leisure opportunities for residents in nearby areas (0.044)
Government policy (0.11)	Relationships with local administration (0.419)
	Tourism support at all levels of government (0.260)
	Local planning policy (0.204)
	Technological support from the government (0.117)
Human resource management (0.098)	Employee satisfaction (0.157)
	Decent work (safe and secure work environment) (0.139)
	Employee salaries are higher than at other companies (0.118)
	Level of professional skills in tourism (0.105)
	Our company promotes training of employees in the reduction of electricity consumption, water consumption, and solid waste production (0.102)
	Training of employees every year (0.099)
	Attitude of the tour guide toward service, quality, and training mechanisms (0.092)
	Older generation is willing to teach heritage to the youngsters (0.068)
	Percentage of seasonal employees in tourism (0.060)
	Percentage of women employed in the company (0.060)
Science and technology (0.097)	Adopting new and low-impact technologies (0.243)
	Tourism information update (0.208)
	Monitoring information security (0.171)
	Invest for smart tourism (artificial intelligence and the Internet of things) (0.165)
	Industry-academia cooperation/collaboration participation (0.121)
	Acquisition of patents, trademarks, and copyrights (0.092)

of tourism enterprises that take actions to reduce energy consumption (0.075) had the highest weight, and noise control (0.033) had the lowest weight. For economic management (0.192), having a sustainable management plan (0.038) had the highest weight, followed by profitability of assets growing on a long-term basis (0.037), adequate money to run tourism (0.037), and providing tourists with a quality visitor experience (0.037). Reservation systems on homepages (0.014) had the lowest weight. For socio-cultural management (0.141), our company cultivates a close relationship with the local community (0.101) had the highest weight, and increasing leisure opportunities for residents in nearby areas (0.044) had the lowest weight.

For government policy (0.11), relationships with local administration (0.419) had the highest weight, and technological support from the government (0.117) had the lowest weight. For human resource management (0.098), employee satisfaction (0.157) had the highest weight, and the percentage of women employed in the company (0.060) had the lowest weight. For science and technology (0.097), adopting new and low-impact technologies (0.243) had the highest weight, and acquisition of patents, trademarks and copyrights (0.092) had the lowest weight.

3.3. Study 3: Importance-performance analysis of the sustainability indicators

3.3.1. Questionnaire survey

The questionnaire comprised six sections: environmental management (19 items), economic management (36 items), socio-cultural management (14 items), science and technology (4 items), human resource management (10 items), and government policy (6 items). The item responses were scored on a 5-point Likert scale ranging from 1 for "strongly disagree" to 5 for "strongly agree." Thus, an 89-item scale was developed to measure the importance and performance of sustainability. The questionnaire survey was conducted on 16 April 2019 at the SLSFER using a purposive sampling method (i.e., the chairman, general manager, vice general manager, and all of the managers were sampled). In total, 20 usable questionnaires were collected. The Cronbach's alpha for importance and performance were respectively 0.95 and 0.93 environmental management, 0.93 and 0.93 for economic management, 0.97 and 0.95 for socio-cultural management, 0.91 and 0.89 for science and technology, 0.92 and 0.88 for human resource management, and 0.84 and 0.81for government policy. These statistics indicated that the instrument had good internal consistency (Nunnally & Bernstein, 1994).

3.3.2. Results

Table 3 lists the differences between the importance and performance values. Except for *environmental activities for guests*, *number of other ecological quality labels*, *degree of match of the destinations marketing and branding values with those of the green economy*, *share of returning guests*, *our company adopts policies of nondiscrimination with employees and other compensation and promotion policies, number of local employees in tourism*, *increase flow of tourism profits to local communities*, *'buy local' policy, increasing leisure opportunities for residents in nearby areas*, and *attitude of the tour guide toward service, quality, and training mechanisms*, the differences between importance and performance were not significant. The other sustainability indicators' importance scores were significantly higher than their performance scores confirmed by the paired-sample t-tests.

To understand the differences between performance and importance, a scatter plot using the importance-performance concept was developed (Martilla & James, 1977). Figs. 1–6 show the sustainability indicator values in two-dimensional grids, with importance on the *y*-axis, performance on the *x*-axis and mean score as the quadrant divider (Martilla & James, 1977). This matrix can help resort managers and marketers identify priorities and strategies for adoption. Indicators in quadrant I, denoting "Keep up the good work", have above-average scores on importance and performance, indicating that managers must at least maintain them. Indicators in quadrant II, denoting "Concentrate here", exhibit lower performance and higher importance scores. Indicators in quadrant III, denoting "Low priority", have below-average scores, and managers may give the improvement of these indicators low priority for sustainable tourism development. Finally, variables in quadrant IV, denoting "Potential overkill", have lower importance and higher performance scores, and managers can direct effort away from these indicators.

Most of the environmental management, economic management, socio-cultural management, human resource management, and government policy indicators were located in quadrant I, indicating that managers must simply maintain them; the second highest number of indicators was located in quadrant III, and managers may consider improving these a low priority in terms of sustainable tourism development. The science and technology indicators *adopting new and low-impact technologies*, *investing in smart tourism*, and *acquisition of patents, trademarks and copyrights* were located in quadrant III, and managers may consider them low priority. However, *monitoring information security* was located in quadrant II, which indicated that management should concentrate their efforts on this indicator for sustainable development.

Table 3
Comparisons of sustainability indicators between importance and performance.

	Importance (Mean ± SD)	Satisfaction (Mean ± SD)	Difference	T-value
Environmental management	**4.75 ± 0.44**	**4.05 ± 0.89**	**0.70**	**3.91*****
Percentage of tourism enterprises that take actions to reduce energy consumption	4.60 ± 0.75	3.75 ± 0.64	0.85	5.67***
This ecological resort provides signs to remind customers when to save resources	4.45 ± 0.76	3.75 ± 0.97	0.70	3.62***
Consumption of energy from renewable sources	3.80 ± 1.01	3.00 ± 0.92	0.80	3.56***
Protecting local water quality	4.55 ± 1.00	3.85 ± 1.09	0.70	3.91***
Number of establishments that participate in water conservation	4.60 ± 0.60	4.25 ± 0.85	0.35	2.67**
Water recycling	3.53 ± 1.17	3.05 ± 1.03	0.48	2.67**
Wastewater management	4.75 ± 0.44	4.25 ± 0.79	0.50	4.36***
Protecting local air quality	4.15 ± 0.99	3.25 ± 0.97	0.90	4.16***
Noise control	3.55 ± 1.19	3.00 ± 1.12	0.55	2.34*
Quantity of solid waste/ waste management	4.40 ± 0.82	3.90 ± 0.72	0.50	4.36***
Environmental impact of tourism activity	4.00 ± 0.97	3.40 ± 1.10	0.60	3.27**
Percentage of tourism enterprises involved in climate change mitigation schemes	3.95 ± 0.78	3.47 ± 0.84	0.48	2.67**
The ecological resort uses hybrid vehicles as shuttle buses	4.80 ± 0.41	4.10 ± 0.64	0.70	4.77***
Environmental activities for the employees	4.10 ± 0.97	3.45 ± 1.00	0.65	4.33***
Promotion and teaching of tangible wildlife conservation concepts	4.20 ± 0.62	3.75 ± 0.79	0.45	3.33***
Environmental activities for guests	4.60 ± 0.50	4.35 ± 0.81	0.25	1.42
Conserving the local natural environment	4.40 ± 0.60	4.00 ± 0.73	0.40	2.37*
Building and infrastructure compliance with zoning requirements	4.10 ± 0.91	3.65 ± 0.93	0.45	2.44*
Number of other ecological quality labels	4.55 ± 0.76	4.40 ± 0.68	0.15	1.14
Economic management	**4.74 ± 0.81**	**4.05 ± 0.91**	**0.69**	**5.12*****
Profitability of assets (ROA) is growing on a long-term basis	4.45 ± 0.61	4.00 ± 0.65	0.45	3.94***
Profitability of capital is growing	4.55 ± 0.61	4.00 ± 0.56	0.55	4.82***
Profit margin is stable	4.65 ± 0.59	4.15 ± 0.67	0.50	4.36***
Net profits on sales are positive	4.60 ± 0.60	4.30 ± 0.57	0.30	2.35*
Our selling cost is reducing	4.60 ± 0.75	3.75 ± 0.85	0.85	4.34***
Our ROI is stable	4.40 ± 0.75	4.05 ± 0.76	0.35	2.67**
Return on equity is growing	4.70 ± 0.47	4.45 ± 0.69	0.25	2.03*
Economic value added is growing	4.15 ± 0.75	3.90 ± 0.79	0.25	2.03*
Total revenue per employee is stable	4.20 ± 1.15	3.85 ± 1.04	0.35	2.67**
Average occupancy rate is stable	4.55 ± 0.51	4.05 ± 0.51	0.50	3.68***
Insurance coverage against natural disasters e.g., hurricanes, flooding, serious infectious disease	3.95 ± 1.00	3.35 ± 0.93	0.60	3.56***
	4.63 ± 0.50	3.84 ± 0.60	0.79	4.83***

(*continued on next page*)

Table 3 (*continued*)

	Importance (Mean ± SD)	Satisfaction (Mean ± SD)	Difference	T-value
Increasing rate of the number of visitors is stable				
Tourist spending is growing	4.50 ± 0.83	3.65 ± 0.81	0.85	4.68***
Adequate money to run tourism	4.80 ± 0.41	4.40 ± 0.60	0.40	3.56***
Constructing a customer database	3.70 ± 0.98	3.30 ± 0.87	0.40	2.63**
Existence of a website that provides information about the destination	4.65 ± 0.59	4.20 ± 0.70	0.45	3.33***
Degree of match of the destination marketing and branding values with those of the green economy	4.05 ± 0.95	3.90 ± 0.79	0.15	1.14
The variable environment is used in marketing strategies and campaigns in this ecological resort	4.05 ± 0.69	3.75 ± 0.72	0.30	2.04*
Effective market segmentation	4.55 ± 0.61	4.10 ± 0.72	0.45	3.94***
Have short-, mid-, and long-term plans	4.45 ± 0.61	3.85 ± 0.49	0.60	5.34***
Number of service firms with complementary ecotourism offers	4.65 ± 0.49	4.35 ± 0.67	0.30	2.04*
Limiting tourism development to the appropriate scale for locals	4.20 ± 0.70	3.70 ± 0.66	0.50	3.68***
Providing tourists with a quality visitor experience	4.30 ± 1.03	3.55 ± 0.95	0.75	6.10***
Tourism enterprises inspected for safety per year	4.85 ± 0.37	4.60 ± 0.50	0.25	2.03*
Have a sustainable Management plan	4.60 ± 0.68	3.95 ± 0.83	0.65	4.33***
Environmentally preferable purchasing	3.90 ± 0.85	3.60 ± 0.82	0.30	2.35*
Innovation for tourism resources	4.35 ± 0.88	3.65 ± 0.93	0.70	4.77***
Share of returning guests	4.75 ± 0.72	4.55 ± 0.61	0.20	1.45
Share of guests who would recommend the resort to friends and acquaintances	4.70 ± 0.73	4.05 ± 0.89	0.65	3.58***
Provide a directional sign to the village within 5 km	4.65 ± 0.49	4.00 ± 0.73	0.65	3.90***
Reservation system on homepage	4.70 ± 0.47	4.25 ± 0.55	0.45	3.94***
Entertainment, sports and culture	4.50 ± 1.10	3.65 ± 0.75	0.85	5.10***
Natural beauty and scenery satisfaction	4.89 ± 0.32	4.47 ± 0.51	0.42	3.62***
Accommodation - value for money	4.37 ± 0.90	3.58 ± 0.77	0.79	4.37***
Gastronomy - value for money	4.26 ± 1.15	3.05 ± 1.08	1.21	5.75***
Environmental friendliness of accommodations	4.37 ± 1.01	3.58 ± 0.96	0.79	5.46***
Socio-cultural management	**4.30 ± 0.80**	**3.95 ± 0.76**	**0.35**	**3.20****
Disabled-accessible tourism products	4.65 ± 0.67	3.90 ± 0.79	0.75	5.25***
Our company cultivates a close relationship with the local community	4.21 ± 0.79	3.68 ± 0.75	0.53	3.75***
To opt for suppliers aware of their environmental responsibilities	4.26 ± 0.93	3.58 ± 0.84	0.68	6.25***
We seek to disclose ethical, social and ecological information about our services	4.20 ± 0.89	3.80 ± 0.89	0.40	2.99**
Our company seeks to comply with all laws regulating employee benefits	4.50 ± 0.83	4.10 ± 0.79	0.40	3.56***
Our company adopts policies of nondiscrimination with employees and other compensation and promotion policies	4.40 ± 0.82	4.20 ± 0.83	0.20	1.71
To implement an organizational culture that is against commercial and sexual exploitation	4.60 ± 0.82	4.20 ± 0.83	0.40	2.99**
Company promotes social welfare activities	4.15 ± 1.04	3.80 ± 1.15	0.35	2.67**
Perception by the local population that an improvement in public services is because of tourism	4.25 ± 0.85	3.85 ± 0.81	0.40	3.56***
Number of local employees in tourism/Increasing tourism jobs among locals	4.60 ± 0.68	4.55 ± 0.69	0.05	0.44
Increase flow of tourism profits to local communities	4.25 ± 0.72	4.05 ± 0.89	0.20	1.45
"Buy local" policy	4.30 ± 0.66	4.05 ± 0.76	0.25	1.75
To increase leisure opportunities for residents in nearby areas	4.10 ± 0.79	4.00 ± 0.80	0.10	1.00
The rural tourism activities that exist in the region increase the ecological awareness of society	4.05 ± 0.83	3.70 ± 0.80	0.35	2.67**
Science and Technology	**3.80 ± 1.11**	**3.20 ± 1.01**	**0.60**	**3.56*****
Tourism information update	3.95 ± 0.95	3.65 ± 0.81	0.30	2.35*
Adopting new and low-impact technologies	3.80 ± 0.83	3.40 ± 1.00	0.40	2.99**
Invest for smart tourism (artificial intelligence and the Internet of things)	3.65 ± 1.14	3.20 ± 1.01	0.45	2.93**
Industry-academia cooperation/ collaboration participation	4.10 ± 0.85	3.70 ± 0.80	0.40	3.56***
Acquisition of patents, trademarks, and copyrights	3.60 ± 1.10	3.35 ± 1.04	0.25	2.03*
Monitoring information security	3.85 ± 1.18	3.35 ± 1.09	0.50	4.36***
Human resource management	**4.30 ± 0.98**	**3.65 ± 0.88**	**0.65**	**4.33*****
Employee satisfaction	4.20 ± 0.95	3.75 ± 0.91	0.45	2.44*
Employee salaries are higher than at other companies	4.55 ± 0.83	3.95 ± 1.05	0.60	3.94***
Percentage of seasonal employees in tourism	4.20 ± 1.06	3.75 ± 0.97	0.45	3.94***
Percentage of women employed in the company	4.45 ± 0.76	4.15 ± 0.67	0.30	2.85*
Level of professional skills in tourism	4.25 ± 0.79	3.80 ± 0.89	0.45	2.44*
	4.35 ± 0.75	4.05 ± 0.76	0.30	2.85**

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Table 3 (*continued*)

	Importance (Mean ± SD)	Satisfaction (Mean ± SD)	Difference	T-value
Training of employees every year				
Our company promotes training of employees in the reduction of electricity consumption, water consumption, and solid waste production	4.25 ± 0.79	3.65 ± 0.93	0.60	4.49***
Attitude of the tour guide toward service, quality, and training mechanisms	4.55 ± 0.76	4.50 ± 0.76	0.05	0.44
Older generation is willing to teach heritage to the youngsters	4.35 ± 0.75	4.00 ± 0.80	0.35	3.20**
Decent work (safe and secure work environment)	4.60 ± 0.82	4.20 ± 0.77	0.40	2.63**
Government policy	**4.45 ± 0.69**	**3.85 ± 0.81**	**0.60**	**3.94*****
Relationships with local administration	4.90 ± 0.31	4.55 ± 0.51	0.35	3.20**
Local planning policy	4.65 ± 0.59	4.35 ± 0.59	0.30	2.85**
Tourism support at all levels of government	4.70 ± 0.57	4.35 ± 0.67	0.35	3.20**
Technological support from government	4.10 ± 0.79	3.40 ± 0.75	0.70	3.91***

*: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$.

4. Discussion and conclusions

The sustainability indicators of tourism destination development have been developed based on the triple bottom line (TBL) approach (i.e., economic sustainability, socio-cultural sustainability, and environmental sustainability; Blancas et al., 2016; Boley et al., 2017; Goffi et al., 2018; Kožić & Mikulić, 2014; Mihalič et al., 2012; Poudel et al., 2016). Choi and Sirakaya (2006) applied TBL and added technological and political dimensions to assess community-based tourism development. Lee and Hsieh (2016) developed two dimensions of stakeholders and the environment to assess indicators of sustainable wetland development in Taiwan. From the perspective of ecological resort management, the sustainability indicators of ecological resorts may differ from those of public nature-based destinations or community-based tourism destinations. For ecological resorts, it is necessary to balance sustainability and business performance (Mihalič et al., 2012). Moreover, the support of tourism stakeholders ensures sustainable tourism development, which indicates that stakeholders are also crucial to tourism development (Lee, 2013; Lee & Jan, 2019). However, the tourism literature seldom identifies the stakeholders of a tourism business or develops sustainability indicators based on tourism businesses' stakeholders. This study represents the first attempt to explore and evaluate the sustainability of an ecological resort from the perspectives of different stakeholders, such as the environment (i.e., destination attractions), investors, tourists, local residents, employees, and the government. By filling the research gaps, this study thus potentially contributes to the literature.

As for other nature-based tourism destinations, natural resources are the major attraction of ecological resorts, and their protection needs to be a priority. This study also includes environmental management as a sustainability indicator; this indicator is similar to those for wetland sustainability (Lee & Hsieh, 2016), surfing resource sustainability (Martin & Assenov, 2014), aboriginal tourism (Kunasekaran et al., 2017), coastal destinations (Huang & Coelho, 2017; Kožić & Mikulić, 2014; Wang et al., 2016), national parks (Ocampo et al., 2018; Poudel et al., 2016; Schianetz & Kavanagh, 2008), and rural tourism (Blancas et al., 2016; Boley et al., 2017).

Choi and Sirakaya (2006) indicated that government policy, technology, and residents' attitudes contribute to sustainable community-based tourism. This study also argues that relationships with local residents, government policy, science and technology, and the public foster or hinder the development of a tourism business, and these are similar to the sustainability indicators of community-based tourism and wetland tourism (Choi & Sirakaya, 2006; Lee & Hsieh, 2016). However, operational performance (i.e., financial, marketing, and human resource performance) is also important for an ecological resort (Mihalič et al., 2012; Roberts & Tribe, 2008), unlike for community-based tourism (Choi & Sirakaya, 2006; Lee & Hsieh, 2016). Thus, this study contributes to developing holistic sustainability indicators from different stakeholder perspectives.

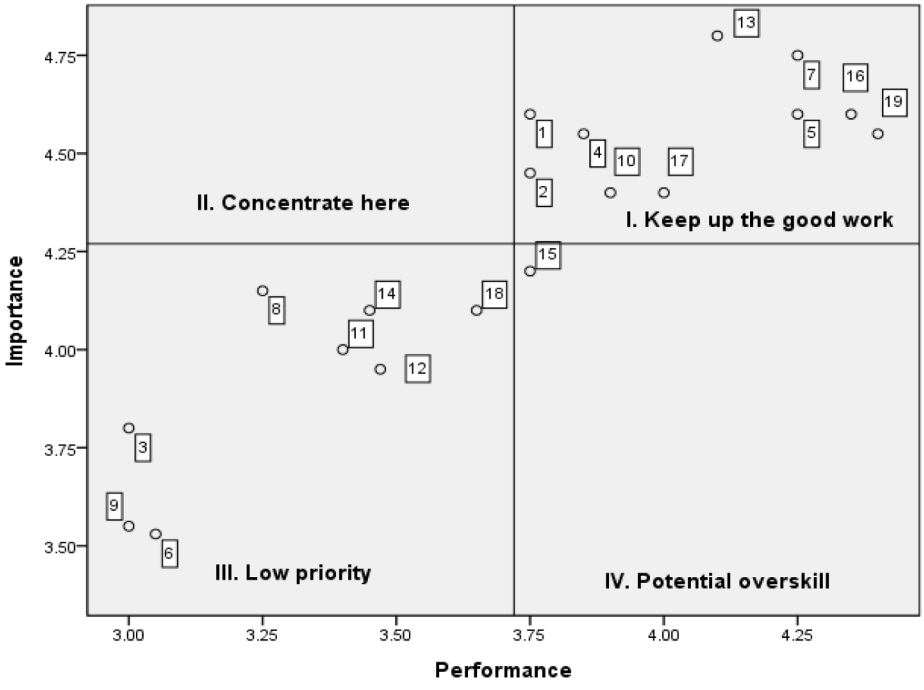

Fig. 1. Environment management. 1. Percentage of tourism enterprises that take actions to reduce energy consumption. 2. This ecological resort provides signs to remind customers when to save resources. 3. Consumption of energy from renewable sources. 4. Protecting local water quality. 5. Number of establishments that participate in water conservation. 6. Water recycling. 7. wastewater management. 8. Protecting local air quality. 9. Noise control. 10. Quantity of solid waste/waste management. 11. Environmental impact of tourism activity. 12. Percentage of tourism enterprises involved in climate change mitigation schemes. 13. The ecological resort uses hybrid vehicles as shuttle buses. 14. Environmental activities for the employees. 15. Promotion and teaching of tangible wildlife conservation concepts. 16. Environmental activities for guests. 17. Conserving the local natural environment. 18. Building and infrastructure compliance with zoning requirements. 19. Number of other ecological quality labe.

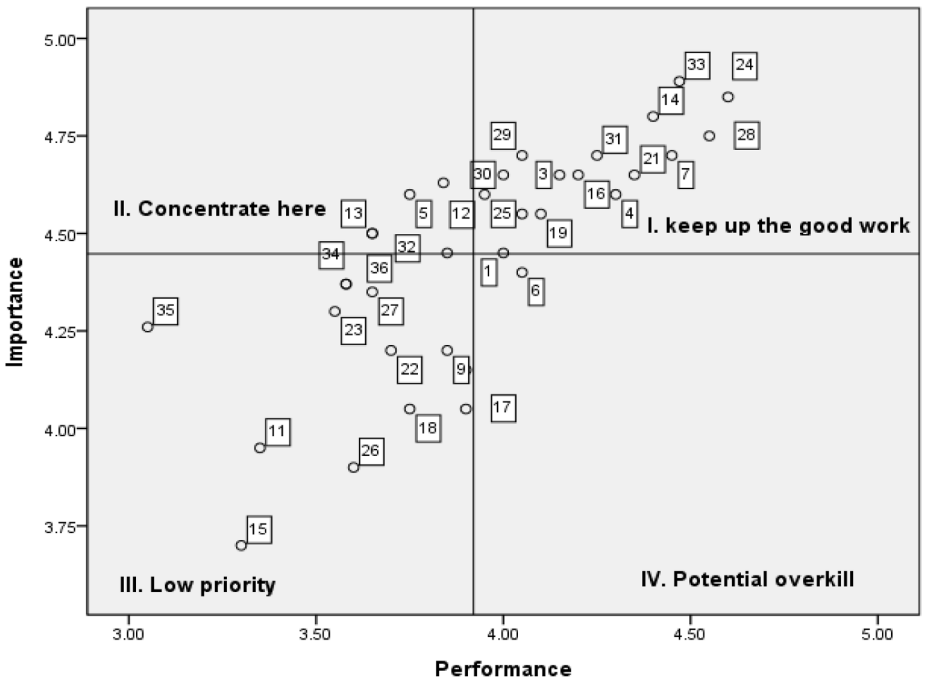

Fig. 2. Economic management. 1. Profitability of assets (ROA) is growing on a long-term basis. 2. Profitability of capital is growing 3. Profit margin is stable. 4. Net profits on sales are positive. 5. Our selling cost is reducing. 6. Our ROI is stable. 7. Return on equity is growing. 8. Economic value added is growing. 9. Total revenue per employee is stable. 10. Average occupancy rate is stable. 11. Insurance coverage against natural disasters e.g., flooding, serious infectious disease. 12. Increasing rate of the number of visitors is stable. 13. Tourist spending is growing. 14. Adequate money to run tourism. 15. Constructing a customer database. 16. Existence of a website that provides information about the destination. 17. The variable environment is used in marketing strategies and campaigns in this ecological resort. 18. Degree of match of the destination marketing and branding values with those of the green economy. 19. Effective market segmentation. 20. Have short-, mid-, and long-term plans. 21. Number of service firms with complementary ecotourism offers. 22. Limiting tourism development to the appropriate scale for locals. 23. Providing tourists with a quality visitor experience. 24. Tourism enterprises inspected for safety per year. 25. Have a sustainable Management plan. 26. Environmentally preferable purchasing. 27. Innovation for tourism resources. 28. Share of returning guests. 29. Share of guests who would recommend the resort to friends and acquaintances. 30. Provide a directional sign to the village within 5 km. 31. Reservation system on homepage. 32. Entertainment, sports and culture. 33. Natural beauty and scenery satisfaction 34. Accommodation – value for money. 35. Gastronomy – value for money. 36. Environmental friendliness of accommodations.

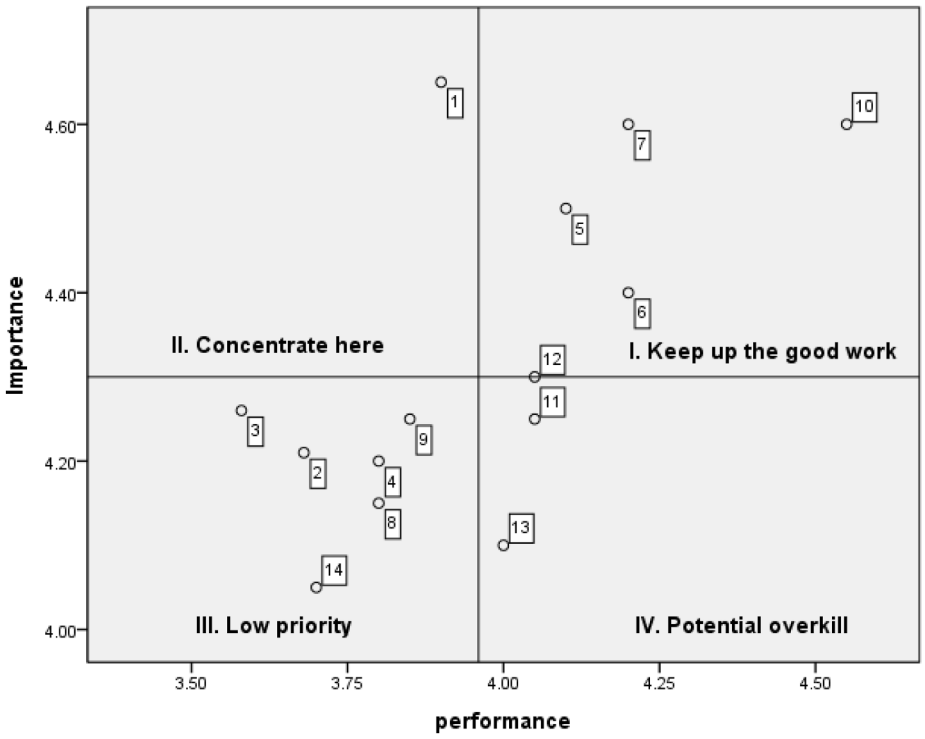

Fig. 3. Socio-cultural management. 1. Disabled-accessible tourism products. 2. Our company cultivates a close relationship with the local community. 3. To opt for suppliers aware of their environmental responsibilities. 4. We seek to disclose ethical, social and ecological information about our services. 5. Our company seeks to comply with all laws regulating employee benefits. 6. Our company adopts policies of nondiscrimination with employees and other compensation and promotion policies. 7. To implement an organizational culture that is against commercial and sexual exploitation, especially of children, teenagers, women and minority groups. 8. Company promotes social welfare activities. 9. Perception by the local population that an improvement in public services is because of tourism. 10. Number of local employees in tourism/ Increasing tourism jobs among locals. 11. Increase flow of tourism profits to local communities. 12. 'Buy local' policy. 13. To increase leisure opportunities for residents in nearby areas. 14. The rural tourism activities that exist in the region increase the ecological awareness of society.

As stated above, these indicators have been developed from the nature-based resort business perspective and are an important reference for tourism businesses to evaluate the sustainability of businesses operations because the stakeholders of general tourism businesses are the same as those of nature-based resort businesses (e.g., tourists, government, employees, investors, local residents, the public, and science and technology). The constructs of the sustainability indicators have included these stakeholders' perspectives. As such, these sustainability indicators can be generalized to tourism businesses. However, the weights of the indicators may differ between tourism business and

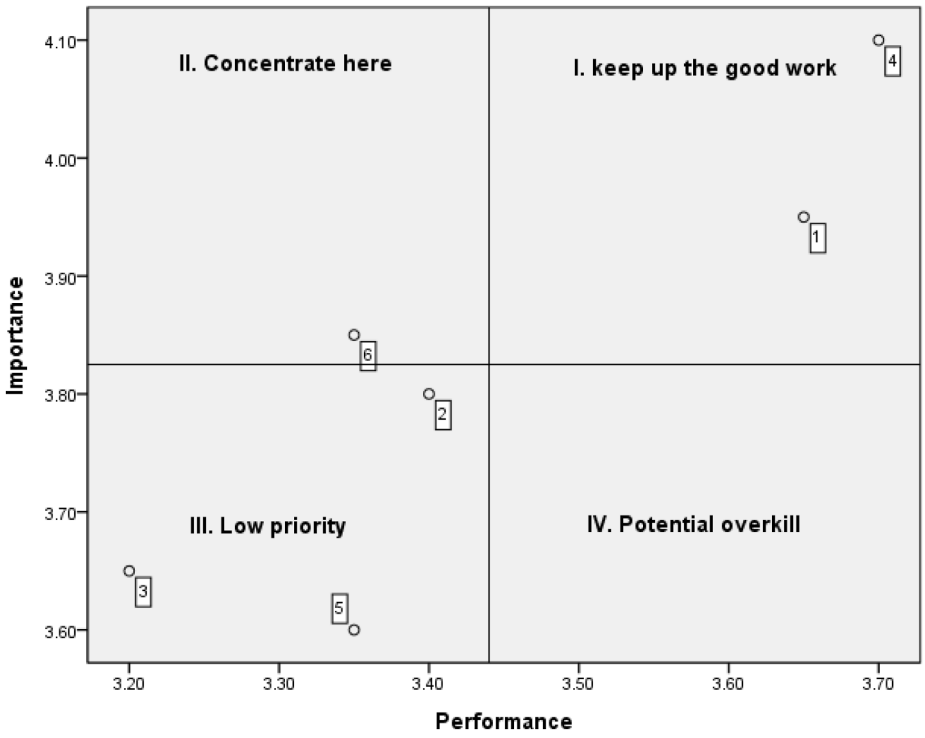

Fig. 4. Science and technology. 1. Tourism information update. 2. Adopting new and low-impact technologies. 3. Invest for smart tourism (Artificial intelligence and the Internet of things). 4. Industry-academia cooperation/collaboration participation. 5. Acquisition of patents, trademarks and copyrights. 6. Monitoring information security.

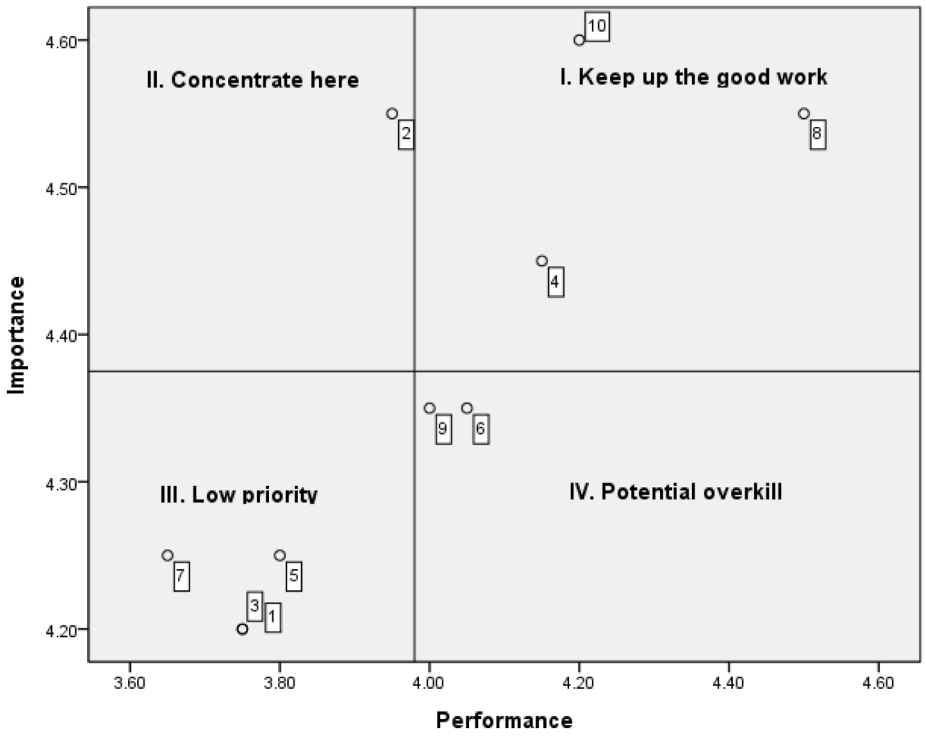

Fig. 5. Human resource management. 1. Employee satisfaction. 2. Employee salaries are higher than at other companies. 3. Percentage of seasonal employees in tourism. 4. Percentage of women employed in the company. 5. Level of professional skills in tourism. 6. Training of employees every year. 7. Our company promotes training of employees in the reduction of electricity consumption, water consumption, and solid waste production. 8. Attitude of the tour guide toward service, quality, and training mechanisms. 9. Older generation is willing to teach heritage to the youngsters. 10. Decent work (safe and secure work environment).

resorts because resorts are generally developed in relatively nature-based destinations and pay more attention to environmental perspectives, such as "percentage of tourism enterprises that take actions to reduce energy consumption" and "protecting local water quality". Assessing the sustainability indicators could benefit from application in a large-scale area as well as an ecological resort, thus contributing to the literature on sustainable tourism and applying the use of its theoretical frameworks by researchers in nature-based tourism.

Based on the AHP results, environmental management has the highest value of the six dimensions, which is consistent with the sustainability indicators of wetlands (Lee & Hsieh, 2016) and coastal zones (Wang et al., 2016); thus, environmental management is the most

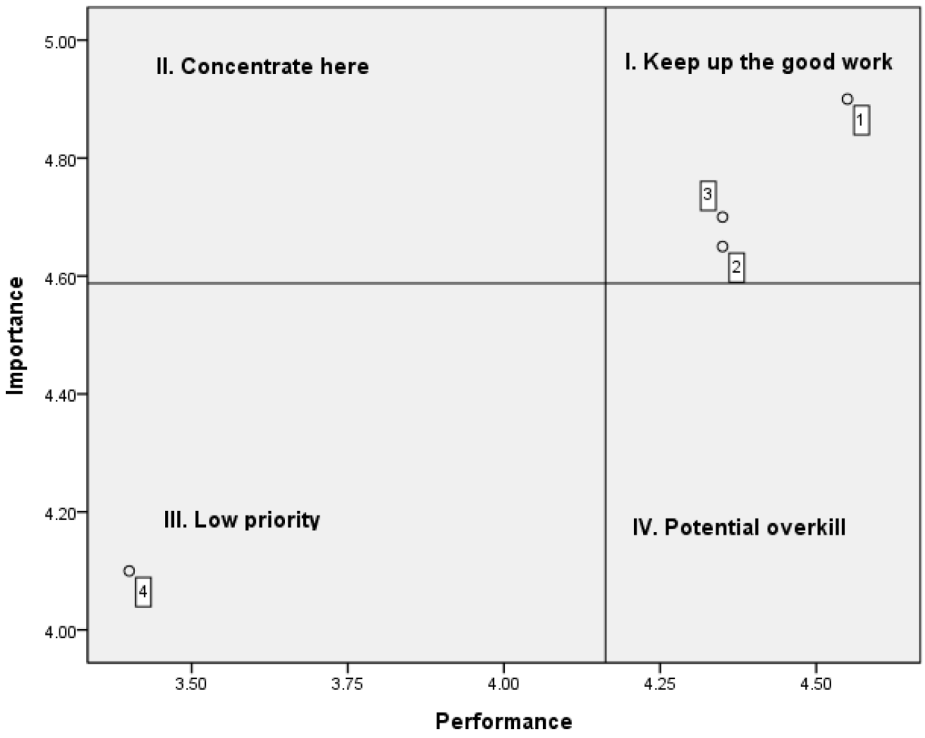

Fig. 6. Government policy. 1. Relationships with local administration. 2. Local planning policy. 3. Tourism support at all levels of government. 4. Technological support from the government.

important sustainability indicator of nature-based tourism destinations and is also part of resort sustainable development. This study also identifies economic and socio-cultural management as important for the sustainability of an ecological resort, which is in line with previous studies using the concept of TBL (Blancas et al., 2016; Boley et al., 2017; Goffi et al., 2018; Kožić & Mikulić, 2014; Mihalič et al., 2012; Poudel et al., 2016; Wang et al., 2016). Moreover, this study identified government policy, and science and technology as two external factors, followed by environmental management, economic management, and socio-cultural management, that affect the sustainability of an ecological resort. As Choi and Sirakya (2006) indicated, establishing efficient government policies can be beneficial for sustainable community-based tourism. Moreover, resorts are affected by technological advances that can contribute to the monitoring/management of tourism impacts.

Additionally, this study argues that human resource is an important internal factor for tourism business operations. Since tourism is a labor-intensive industry, human resource affects the development of tourism businesses (Mihalič et al., 2012); thus, human resource is identified as a sustainability indicator in this study. This indicator is also important for sustainable community-based tourism and wetland development (Choi & Sirakya, 2006; Lee & Heish, 2016).

Resorts are energy- and water-intensive businesses because of the need to maintain high accommodation quality, creating resource pressures (Gössling, 2015). In the resort or hotel realm, energy and water management are the most important environmental sustainability indicators (Gössling, 2015; Mihalič et al., 2012). For example, because spring water is used at the SLSFER, protecting spring water quality allows safety and health maintenance with respect to the use of water. In addition, the solid waste produced by resorts increases their environmental impact; thus, waste management is crucial for a resort. Previous studies have also suggested that energy and water consumption and waste management improve hotels' performance by reducing direct costs (Gössling, 2015; Mihalič et al., 2012). This study thus suggests that energy and water consumption and waste management are important sustainability indicators in the environmental management dimension.

To promote economic sustainability, having a sustainable management plan is the most important issue for tourism management (Mutana & Mukwada, 2017). In addition, profitability and customer satisfaction support economic sustainability and sustainable management plans (Mihalič et al., 2012). These financial indicators also provide performance indexes for investors and create comparative advantages (Mihalič et al., 2012).

For example, the location of the SLSFER in a mid-altitude mountainous area makes the resort vulnerable to natural and human disasters, such as earthquakes, typhoons, and mudslides, which can influence tourists' visit intentions. Currently, in most leisure industries, the number of tourists is dropping rapidly due to restrictions put in place to prevent the spread of COVID-19 (Hall et al., 2020). Insurance coverage is one means to compensate for revenue loss due to natural and human disasters or a pandemic. Thus, *insurance coverage against natural disasters* is also posited as an important indicator for economic sustainability.

Corporate social responsibility (CSR) encourages businesses to take actions to meet the needs of internal and external stakeholders, and businesses can gain comparative advantages through CSR strategies (Ferraz and Gallardo-Vázquez, 2016). Ecological resorts adopt CSR strategies that ensure the welfare of internal and external stakeholders and teach stakeholders to live in harmony with natural resources (Ferraz and Gallardo-Vázquez, 2016; Marzo-Navarro et al., 2015; Ng et al., 2017).

Holistic government policy provides support and governance for tourism businesses, leading tourism businesses to participate in sustainable development (Fernández-Tabales et al., 2017; Lee & Hsieh, 2016). Thus, to better achieve the sustainability of a resort, it is necessary to cooperate with government policy.

Employees are important human capital in the hotel industry (Mihalič et al., 2012). In ecological resorts, employees also provide environmental education to tourists, which reduces tourists' environmental impacts (Lee & Jan, 2018; Lee et al., 2017). Therefore, providing a satisfactory working environment and rewards will improve the sustainability of a resort (Mihalič et al., 2012; Mutana & Mukwada, 2017; Roberts & Tribe, 2008).

Advanced technologies increase the efficiency of business operations

and affect the growth of a business (Choi & Sirakaya, 2006; Ocampo et al., 2018). In the ecological resort context, new technology provides a means to monitor or reduce environmental impacts, which fosters a resort's sustainable development. In addition, information security issues raise privacy concerns, which affect customer trust (Cottrill & Derrible, 2015). To gain tourists' trust, information security must be guaranteed.

The managers of ecological resorts can evaluate sustainability via these six dimensions and ensure the resorts' sustainable development. Regarding environmental management, managers need to improve the efficiency of water and energy use, reduce the quantity of solid waste, conserve natural resources, provide environmental education for employees and tourists, and engage in environmental protection practices. With respect to economic management, managers need to ensure sufficient cash flow to support holistic long-term sustainability plans. Managers must therefore pay more attention to financial management, draw up marketing strategies to attract tourists, and provide positive experiences for tourists to increase tourists' satisfaction and loyalty. For socio-cultural management, managers should adopt CSR strategies targeting internal and external stakeholders to increase positive perceptions of their resorts. Regarding government policy, managers should make efforts to obtain support from the government, which can lead to smoother operation. In terms of human resource management, managers need to develop strategies related to salary, working environment, and training to encourage employees. Finally, in science and technology, managers should stay abreast of new technology that may reduce tourism impacts and provide accurate information for management purposes.

Regarding the assessment of the sustainability indicators, taking the SLSFER as an example and based on the Importance-performance analysis findings, there are no environmental management and government policy indicators in the "Concentrate here" quadrant, which indicates that environmental management and government policy are on the right track. In terms of economic management, managers need to examine operating costs in detail to prevent inefficient spending. Various activities and promotional programs should be conducted to attract more tourists during off seasons to stabilize the tourist flow. To increase tourists' spending, managers can offer creative and high-quality souvenirs, as well as memorable activities and specialty cuisine and accommodations. Regarding socio-cultural management, managers need to improve infrastructure to accommodate people with disabilities. Additionally, managers can provide shuttle buses and gentle trails to allow those with disabilities to appreciate the resorts' natural resources. Regarding science and technology, strengthening employees' information security awareness to mitigate information security risks is suggested. For human resource management, managers can raise salaries or give bonuses to employees as financially feasible.

By using these sustainability indicators, tourism businesses may better understand the relative weights of sustainability in terms of scoring these indicators. Through examining the sustainability indicators' weights, opportunities, threats, strengths, and weaknesses can be identified. A quantified SWOT can be effectively used to formulate a strategy for sustainable development (Lee & Liu, 2011). Moreover, tourism businesses can introduce importance-satisfaction analysis, which will enable managers to monitor managerial sustainability from tourists' perspective.

Using a fuzzy Delphi and AHP approach, this study effectively developed a sustainability indicator framework from experts' perspective. On the other hand, the method using exploratory factor analysis (EFA) to identify factors/indicators is mainly customer oriented. Assessing sustainability indicators via customer perspectives by using EFA is thus recommended.

As the sustainability indicators were rigorously developed for a resort, the findings are limited to a specific tourism sector in Taiwan. Based on our findings, further studies could assess the application of diverse developmental models with respect to different tourism policies and the natural environment in various regions to capture international and multicultural perspectives. Moreover, to actually assess the sustainability indicators of a resort, future research is recommended to develop a monitoring system to assess sustainable tourism using a long-term approach.

Finally, this study concludes that sustainability indicators are useful tools for achieving better sustainable resort development. Although a variety of developed indicators for assessing sustainable tourism exist, satisfactory sustainability indicators for resorts are limited. Bridging the research gap in sustainable tourism knowledge, this study identified sustainability indicators, calculated the weights for seven dimensions including 89 indicators and analyzed the importance-performance of an ecological resort using three empirical studies. The present study's findings have managerial implications for resort sustainable development, providing valuable theoretical and managerial references as well as suggestions for future study directions. Thus, this study thus extends our knowledge of sustainable resort development and significantly contributes to the literature.

Author contributions

All listed authors have contributed directly to this paper. Tsung Hung LEE was responsible for the study conception and design. Tsung Hung LEE, Fen-Hauh JAN, and Jui-Tu LIU performed the data collection, data analysis and writing of the manuscript. All authors were responsible for carrying out critical revisions of the paper for content.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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