

The role of coastal biodiversity conservation on sustainability and environmental awareness in mangrove ecosystem of southern Malang, Indonesia

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Abstract. *Abidin Z, Setiawan B, Muhaimin AW, Shinta A. 2021. The role of coastal biodiversity conservation on sustainability and environmental awareness in mangrove ecosystem of southern Malang, Indonesia. Biodiversitas 22: 648-658.* Southern coast of Malang, East Java, Indonesia has several mangrove ecosystems used for ecotourism, such as Clungup Mangrove Conservation Tiga Warna (CMC Tiga Warna). This area has consistently implemented ecotourism principles. Previously, it was assumed to be vulnerable from the damage due to differences in environmental awareness of ecotourists and local communities. This study aims to (i) describe the strategy of coastal biodiversity conservation to enhance environmental awareness and its sustainability; (ii) analyze the role of conservation on sustainability and environmental awareness, with sustainability as a mediating variable between conservation and environmental awareness. Data analysis was conducted with descriptive and Warp Partial Least Square (WarpPLS). The results indicate that empirical facts of conservation, sustainability, and environmental awareness in CMC Tiga Warna are relevant to the result of statistical analysis. Conservation is believed to form the environmental awareness of ecotourists and local communities and to maintain the sustainability of ecotourism destinations. In addition, the sustainability of ecotourism destinations serves as an effective mediator between conservation and environmental awareness, along with the modeling of environmental awareness enhancement in conservation-based coastal ecotourism. The proposed model explains that sustainability and environmental awareness variances are 23% and 25%, respectively. In summary, Destination Marketing and Management Organization of CMC Tiga Warna ecotourism is believed to improve environmental awareness of ecotourist and local communities by strengthening coastal biodiversity conservation programs in ecotourism areas and in maintaining sustainability.

Keywords: Coastal biodiversity, conservation, environmental awareness, WarpPLS, sustainable ecotourism

INTRODUCTION

The total length of Indonesia's coastline in 2018 was 91,363.65 km (Sui et al. 2020). Coastal area becomes home to an ecosystem of mangrove forests, coral reefs, and seagrass beds. Vibrant coastal properties are deemed pivotal for life, attractive for direct utilization, and advantageous for sustainable tourism management. Coastal zone particularly in Malang District of East Java Province, Indonesia has been managed as a tourist destination. Commonly, coastal tourism management practices have been devoted to economic merit rather than to ecological and social aspects generally acknowledged as mass tourism. However, there is coastal ecotourism in Malang District consistently practicing the ecotourism principles in a balanced way, sustaining several aspects including ecology, economy, and even social, acknowledged as Clungup Mangrove Conservation Tiga Warna (CMC Tiga Warna) ecotourism, acknowledged as the best ecotourism management according to the Ministry of Marine Affairs and Fisheries (Riniwati et al. 2019). Mangrove ecotourism has high economic potential for coastal communities in Java, given the limited economic resources of this region (Setyawan and Winarno 2006).

Ecotourism is defined as a tourism development strategy applying the ecotourism principles of environmental protection from negative impact (Noriega et al. 2020) and environmental awareness application, providing experiences for visitors and hosts, empowerment, and economic incentive potentials for local people. Further, ecotourism is the form of responsible tourism defined as a tool to minimize the negative social, economic, and environmental impacts; and to maximize the positive impacts of tourism development (Frey and George 2010). Thus, it serves as the main form of sustainable tourism (Phelan et al. 2020), as an incentive for ecological conservation and as a more sustainable approach (Ren et al. 2020). Ecotourism also serves as a strategy to conserve biodiversity by providing economic benefits to the local communities in and around the protected areas (Zarghi and Hosseini 2014; Das and Chatterjee 2015; Noriega et al. 2020). In addition, the development of ecotourism will contribute to ecosystem conservation (Karani and Failler 2020) and to ensure the existence of economic value in relation to tourism activities (Anna and Saputra 2017). To generate added value for coastal tourism, environmental commitment is required (Merlia et al. 2019). In a more specific definition, coastal biodiversity conservation

focuses on sustaining and protecting coastal biodiversities as part of natural resources and the environment in coastal areas from the damage, affecting biodiversity indices (Zarghi and Hosseini 2014).

Management of ecotourism at CMC Tiga Warna is consistent with the current trend of tourism destination management, limited use of natural resources by prioritizing natural protection to ensure sustainable ecotourism existence. In the future, it offers the choice of an environmentally friendly tourism model generating economic benefits by promoting conservation (CON) to improve environmental awareness (EA) and sustainability (SUS) of environment. As a model of ecotourism that is regarded conservative towards coastal ecosystems, engaging sustainable ecotourism (Eunike et al. 2018), the fact however portrays that the coastal environment in CMC Tiga Warna has been prone to environmental degradation, particularly due to differences in EA of ecotourists and local communities.

Therefore, the Marketing and Management Organization (DMO) is believed to contribute a significant role in educating the ecotourists when interacting with local communities around the tourism destination sites (Dubin and Durham 2008) in Martínez et al. (2018). Additionally, a previous study points out that coastal biodiversity conservation in CMC Tiga Warna ecotourism focused on sustaining the number of coral reefs and mangroves as its main resources to prevent damage and support sustainable ecotourism (Riniwati et al. 2019). Upon responding to the actuality of CMC Tiga Warna ecotourism, the problems of this study are: (i). How is CON implementation strategy in encouraging EA and SUS of CMC Tiga Warna ecotourism? (ii). How is to model the role of CON in ensuring SUS and improving EA of ecotourists and local communities? and (iii) Are SUS of ecotourism destinations potentially effective in mediating the role of CON towards EA?

Currently, empirical evidence of the effect of coastal biodiversity CON in shaping EA and maintaining the SUS of ecotourism destinations has been inadequate. Previous studies have merely highlighted the impact of EA on behavioral intentions (Gao et al. 2016) and the role of EA in strengthening the relationship of revisit intention and Word of Mouth (WOM) intention (Kusumawati et al. 2019). Therefore, this research is significant to provide empirical evidence of CON's role in enhancing EA and maintaining SUS, with SUS as an effective mediator to examine the relationship between CON and EA. The author further proposes the appropriate model for EA in CON-based coastal ecotourism as the target of this study. In practical terms, the findings are expected to convince the importance of the DMO in maintaining and strengthening biodiversity CON programs in coastal ecotourism areas to improve EA and prioritize SUS for the ecotourism environment assisting the local communities for the long-term economic benefits. Therefore, this study aims to: (i) describe the coastal biodiversity CON strategy, and condition of SUS and EA in CMC Tiga Warna ecotourism; and (ii) analyze the role of coastal biodiversity CON on

SUS and EA, with SUS as a mediating variable between CON and EA.

MATERIALS AND METHODS

Study area

This research was conducted in the coastal ecotourism area in Malang District, East Java Province of Indonesia, acknowledged as Clungup Mangrove Conservation Tiga Warna (CMC Tiga Warna) ecotourism. There are six tourist beaches managed by the Marketing and Management Organization (DMO) of CMC Tiga Warna, which include: Clungup Beach, Tiga Warna Beach, Gatra Beach, Sapana Beach, Mini Beach, and Batu Pecah Beach. The map of research location is illustrated in Figure 1.

Procedures

The judgment sampling technique was undertaken to determine domestic ecotourists in CMC Tiga Warna as respondents. Further, purposive sampling method was performed to determine 6 persons as the DMO and some local communities. Data were also gathered from interviews, observations, and documentation related to the condition of conservation, sustainability, and environmental awareness of visitors and local communities in CMC Tiga Warna ecotourism. Data from domestic ecotourists were collected through online surveys from June to July 2020. Several pre-questions filtered the respondents to meet the sample criteria, including domestic tourists aged ≥ 17 years visiting the CMC Tiga Warna Ecotourism in 2019 to the early of 2020. A total of 540 responses were obtained from 660 questionnaires sent via private message to their social media accounts, resulting in a response rate of 81.9%. In total, there were 385 qualified responses (71.3%) for further data analysis after discarding the incomplete responses. Hence, the effectiveness of this survey response was 58.3%. The majority of respondents were female (59%) from Malang City, Surabaya, Sidoarjo, Bekasi, Jakarta, and Malang District (53.5%), 17-24 years old (74%), with unmarried marital status (79%), and their last education was senior high school (63.6%), with the type of occupation as a student (59%), with an income of < IDR 2,500,000 per month (64.2%), with spending of < IDR 2,500,000 per month (75%), with once visit frequency (74%), and navigating the travel information through social media (76%).

Promoting conservation (CON) was measured by 6 items modified from Husamah and Hudha (2018). Further, SUS was analyzed by 18 items from some previous studies (Ashok et al. 2017; Iniesta-Bonillo et al. 2016; Mathew and Sreejesh 2017; Ocampo et al. 2018). Four items were adapted from Kusumawati et al. (2019) to measure EA. Measurement research items of each variable was recorded by five-point Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree). The indicators and items, validity, and reliability of the questionnaire are illustrated in Table 1.



Figure 1. Research location map in Clungup Mangrove Conservation (CMC) Tiga Warna coastal ecotourism, southern Malang, East Java Province, Indonesia (Source: YBAS 2020) modified

Data analysis

Data on coastal biodiversity conservation, sustainability, and environmental awareness were analyzed using descriptive analysis. In addition, the role of coastal biodiversity conservation on sustainable ecotourism and environmental awareness was analyzed by Warp Partial Least Square (WarpPLS). After confirmatory factor analysis (CFA) was performed to test the reliability; convergent, discriminant validity of questionnaires and a fitness test were performed for the proposed research model. The hypotheses are structured as follows: (i) H1: Coastal biodiversity conservation has a positive effect on the sustainability of ecotourism destinations. (ii) H2: Coastal biodiversity conservation has a positive effect on the environmental awareness of ecotourists and local communities. (iii) H3: Sustainability of ecotourism destinations has a positive effect on improving the environmental awareness of ecotourists and local communities. (iv) H4: Sustainability of ecotourism destinations plays an effective role in mediating the conservation effect to enhance the environmental awareness of ecotourists and local communities.

RESULTS AND DISCUSSION

Coastal biodiversity conservation strategy in CMC Tiga Warna ecotourism

The total area of coastal ecotourism management in CMC Tiga Warna reaches 117.59 ha comprising the areas of mangrove forest (74.59 ha), coral reefs (10 ha), and protected forest (33 ha) (Saptoyo 2020 pers. com). The types of mangrove plants in the area include *Rhizophora* spp. (*R. mucronata*, *R. apiculata*, *R. stylosa*), *Bruguiera gymnorrhiza*, and *Acanthus* sp, while the coral reefs consist of *Acropoda microthalma*, *Acropora mumilis*, and *Montipora aquituberculata* (YBAS 2020, unpubl. data).

The conservation range in CMC Tiga Warna ecotourism is determined based on the conserved area. Currently, the acquisition of 6 fishponds has been successfully implemented into mangrove conservation areas, independently acquiring 26 ha of coastal forest, 74.59 ha of mangrove rehabilitation and restoration, 5 ha from the planned 10 ha of a marine protected area. The progress of biodiversity conservation efforts in the coastal area of Malang District was inseparable from the conservation movement by individuals and volunteers (2005-2011), strengthened by the formation of *Pokmaswas GOAL* (Community Supervisory Group: *Gatra Olah Alam Lestari*) in 2012, along with the formation of *Yayasan*

Bhakti Alam Sendangbiru (YBAS) in 2014 as a foundation engaged in conservation and community empowerment.

The implemented strategy to sustain coastal biodiversity as a part of natural resource conservation has been ongoing in CMC Tiga Warna ecotourism, which includes a balance between preservation of natural abilities and limited use of the natural resource and environment.

Preservation of natural abilities

The preservation of natural abilities in CMC Tiga Warna ecotourism utilizes the three strategies. Firstly, by providing environmental education to ecotourists and local communities, in which the ecotourists gained experience about the importance of environmental protection during the tour. Furthermore, the forms of environmental education for ecotourists include: (i) Involvement of *mutual care*, by providing checklist of luggage when entering and exiting CMC locations, where the ecotourists are required to be responsible for their waste to prevent littering (preventing pollution to the environment); (ii) Implementation of *mutual attentiveness*, where the ecotourists must be accompanied by a local guide during traveling (in land and sea) to protect the environment; (iii) Socialization of the slogan entitled *my waste is my responsibility*; (iv) Application of reservation and booking quotas to educate ecotourists about the importance of visit limitation and nature protection; and (v) Explanation for preservation of mangrove plants and coral reefs for human life. The form of environmental education for local communities and members of CMC Tiga Warna ecotourism management consists of: (i) Specific task or *kerja bhakti* for ecotourism environment on Thursdays (during tourist holidays), (ii) Plantation of mangrove seeds, and (iii) Provision of regular CMC managers meeting, concerning the environmental themes.

Secondly, by minimizing the negative impacts of ecotourism (Noriega et al. 2020), ecotourism managers at CMC Tiga Warna ecotourism are committed to reducing the negative impacts of ecotourism by prohibiting littering at tourism sites, checking the number of plastic luggage at the entrances and exits of CMC, providing cigarette butts that are always provided by tour guides, imposing a fine of IDR 100,000 per item waste that is lost or for those who violate the incurred rules or finding other existing plastic at the tourism sites.

Thirdly, the preservation of natural abilities is managed by implementing zoning policy into two zones, including: (i). Emission-free zone, by providing pedestrian paths and motorized vehicle lanes and (ii). Limited use of natural resources and environment in conserved and protected areas as ecotourism zoning.

Limited use of natural resource and environment

The limited use of nature and environment at CMC Tiga Warna ecotourism is further divided into two sub-zones, which convey marine protected area as a coral reefs' conservation area on Tiga Warna Beach, Mini Beach, Batu Pecah Beach; and mangrove conservation areas in Clungup Beach, Kondang Buntung Beach, and Gatra Beach. This strategy aims to provide opportunities for nature to recover,

undertaken through several strategies: Firstly, the strategy is conducted by carrying capacity (CC) in coastal ecotourism zoning through arranging the number of visitors to avoid crowding at destination (Ashok et al. 2017). Specifically, CMC Tiga Warna ecotourism limits the number of visits to Tiga Warna Beach, Clungup Beach, and Gatra Beach for the sake of protecting nature. Further, CC limits the visits to the conservation ecotourism zone, including CC of 100 ecotourists for 2 hours in Tiga Warna Beach area, CC of 300 ecotourists at Clungup Beach area, and 300 ecotourists at Gatra Beach area.

Secondly, the strategy is performed by providing tourism facilities prioritizing the CC of the environment, such as (i) The transportation for the motorbike from Post 1 (the main entrance to CMC Tiga Warna) to Post 2, continued to Gatra Beach considered as an emission-free zone, where the ecotourists are encouraged to do tracking on foot, (ii) The tourist checkpoint at Post 2, crafted from wooden material, (iii) The *musholla* or praying area at Gatra Beach, crafted from bamboo, holding the capacity of 5 users, (iv) The two canteens provided for food and soft drinks on Tiga Warna Beach, and 1 canteen on Gatra Beach, (v) The location of public toilets provided around the car parking area, Post 1, Post 2, in Gatra Beach, and before Tiga Warna Beach, (vi) The pavilion crafted from wooden material as a rest area for tourists throughout CMC Tiga Warna ecotourism, and (vii) The rental of tourist attraction tools (tents, canoes, and buoys) to support tourist attraction activities on Gatra Beach. Thirdly, the strategy is conducted by developing the ecotourism site leading to a healthy tourism business (economically). CMC Tiga Warna ecotourism is aimed to provide economic benefits for local communities, while prioritizing environmental sustainability. The development of CMC Tiga Warna ecotourism is marked by: (i) The numbers of visits in the last 4 years (2016-2019) regarding the CC, with a total visit of 61,485 visitors (2016), 55,360 visitors (2017), 56,395 visitors (2018), and 61,574 visitors (2019); (ii) The numbers of certified local guides are 61 people until 2020, comprising 11 local divers' certification and 4 rescue crew certifications; (iii) The performance of economic businesses around CMC Tiga Warna ecotourism, creating jobs for 108 local people around the ecotourism area (including stalls, 23 homestays or inns, dozens of motorbike taxis, alternative jobs for local fishermen by providing tourist boat rental, toilet services, parking services, and fish retailers); (iv) The number of tourist facilities adjusted to the capacity of nature, through environmentally friendly building materials for facilities to sustain the CC of nature.

Sustainability of environment, economic, culture, and social aspects in CMC Tiga Warna ecotourism

Environmental sustainability

An increase in tourism directly influences the environmental sustainability of tourist destinations. If tourism increases, it affects the environment (Pulido-Fernández et al. 2019). Several efforts indicate efforts to achieve environmental sustainability in CMC Tiga Warna ecotourism. Firstly, CMC Tiga Warna ecotourism has been

protected from various air, water, soil, and noise pollution by implementing: (i) Policy on emission-free zone starting from Post 2 (about 2 km towards Gatra Beach); (ii) Position of toilets and food stalls to avoid disruption in the coastal ecosystems; (iii) Placement of parking for tourist vehicles which is about 3-4 km from the first beach (Gatra); (iv) Prevention of waste pollution policy by checking visitors' luggage having potential for non-organic waste at Post 2; and (v) Obligation for the official tour guides to provide a specific place for cigarette butts. In summary, the positive impacts of such arrangements are apparent to maintain environmental sustainability.

Secondly, the level of a crowd at CMC Tiga Warna ecotourism has been under control to protect the environment, performed by maintaining the control of CC of visits in the conservation zone of Tiga Warna Beach through: environmental education for visitors, placement of toilets and vehicle parking to prevent pollution, provision of emission-free zones, and visitors' luggage checkpoint for potential waste. Thirdly, the attempt is conducted through the activeness of the manager along with residents in clearing the tourism site on Thursdays when CMC Tiga Warna is off from visitors. However, the ongoing activities only include mangrove planting, compliance with waste regulations, and consistency in limiting the visitors in the conservation zone. Lastly, the effort is conducted by preserving the mangrove ecosystem in Clungup Beach and the coral reefs at Tiga Warna Beach from garbage and littering, classified as dirt-free beach from human activity waste.

Although the preservation strategy is conducted to minimize the negative impacts of ecotourism (Noriega et al. 2020), it is necessary to consider suggestion from Canteiro et al. (2018) to implement the tourism impact assessment as a practical tool to assess, monitor, and prevent ecotourism impacts in natural protected area.

Economic sustainability

CMC Tiga Warna coastal ecotourism is reported in an economically sustainable condition, evidenced by: (i) Community businesses around CMC Tiga Warna ecotourism such as: stalls, 23 homestays, dozens of motorcycle taxis, tourist boat businesses in addition to local fishing businesses, toilet services, parking and fish retailers; (ii) Better life-quality of local communities in terms of education, health, vehicles, and homes due to the positive impact of employment for 108 people around the ecotourism area, providing additional income for local communities; (iii) Improvement in local communities certified as official tour guides (61 people), local divers' certification (11 people), rescue crew (4 people); (iv) Income benefits of local communities as tour guides, motorcycle taxi drivers, lodging services, food sellers, outfit sellers, boat rentals, and cleaning supervisors. This fact was evident during the emergence of the Covid 19 pandemic as the local communities were encouraged to prepare a health protocol to ensure that CMC Tiga Warna ecotourism was eligible and safe to be reopened. It was reopened on 8 August 2020 after being completely closed since mid-March 2020.

In sum, the total economic benefits received by local communities are worth of IDR 2.7 billion in 2019 (Saptoyo 2020, pers. com). The existence of economic sustainability was inseparable from CON programs in CMC Tiga Warna which maintain a balance between natural preservation and limited use of natural resources. The DMO and local communities believe that this economic incentive will continue if the CON programs are performed to maintain the SUS of biodiversity in this coastal ecotourism ecosystem. It means that local communities, visitors, and DMO have similar economic perceptions that ecotourism will ensure an increase in EA and resource SUS. This finding is in line with Ren et al. (2020) asserting that economic perception improves the communities' EA. In addition to carrying out CON consistently, efforts to maximize the economic incentive are encouraged to accommodate the aspirations of key stakeholders in ecotourism (Lafreniere et al. 2013).

Cultural sustainability

In addition to environmental and economic sustainability, CMC Tiga Warna ecotourism is also deemed culturally sustainable. This is evident in the following conditions: (i) CMC Tiga Warna helps preserve local indigenous culture, such as the celebration of *ambalwarso*, as an annual celebration of CMC, and *grebeg ngupadi tirta wening*; (ii) Ecotourism development in CMC is adjusted to local conditions, marked by the nurtured culture of mutual care (togetherness) in the management of Clungup Beach, Tiga Warna Beach, and Gatra Beach. Therefore, the conserved culture of *grebeg ngupadi tirta wening* and *ambalwarso* have been continuously practiced and packaged as a support to achieve environmental SUS.

Social sustainability

Several conditions evidence the implementation of social sustainability at CMC Tiga Warna ecotourism. Firstly, the local communities in CMC Tiga Warna and its surroundings could obtain social benefits from the ecotourist visits, such as the addition of acquaintances, new knowledge, and others. Tour guides from the local community exchange information when guiding tourists, improving the confidence of local guides in reaching the GOAL missions (*Gatra Olah Alam Lestari*). Secondly, the existence of CMC Tiga Warna ecotourism increasingly empowers local communities in maintaining the hygiene of future tourism environment. Local communities are increasingly attentive to protect the environment, generating economic benefits. The cohesiveness of local communities is depicted from their devotion for the ecotourism environment on Thursdays to protect the environment despite the off-visiting times during the Covid 19 pandemic. Thirdly, local communities play a role in building ecotourism facilities in CMC Tiga Warna, by building: a pavilion for tourist rest area and meetings for CMC Tiga Warna ecotourism management, cleaning facilities (such as toilets) and praying spaces as well as regular maintenance for the roads to CMC Tiga Warna. Fourthly, the tourist facilities at CMC Tiga Warna are also beneficial, particularly for cultural activities such as *ambal*

warso and grebeg ngupadi tirto wening. Lastly, the level of tourist crowds at CMC Tiga Warna has been supportive for the surrounding community, due to the parking arrangements, where the number of visits to Tiga Warna Beach, Clungup Beach, and Gatra Beach is under the control.

Moreover, social sustainability is also proven by the controlled social issues related to conflict management of tourism at CMC Tiga Warna. Thus far, the community leaders and various elements in society across religions and different economic interests are pivotal to be involved in managing CMC Tiga Warna ecotourism. However, exciting evidence was navigated, indicating a behavioral shift in people who destroy forests and coral reefs to become the actors in conservative ecotourism.

Environmental awareness in CMC Tiga Warna ecotourism

The impact of biodiversity conservation education in the coastal ecotourism environment is manifested in two indicators and several items. Firstly, the indicator of environmental knowledge is explained through 2 items, including: (i) willingness of ecotourists to learn about environmental knowledge such as environmental preservation, seen from the initiative to be involved in planting mangroves, to be responsible for their own waste, to read posters/photos of environmental education at CMC Tiga Warna ecotourism post and pavilion; (ii) enthusiasm of ecotourists to inquire about knowledge related to the environment, indicated by visitors’ efforts to search for information or news about environmental CON, by browsing on various media.

Secondly, the indicator of environmental attitudes is portrayed in two items, which include (i). Pro-environmental attitude, marked by ecotourists’ awareness to declare their support and to protect the environment, particularly during the on-site visit at CMC Tiga Warna by taking care of littering until the tourist exit and willing to pay for the tourist entrance ticket intended for environmental CON. (ii). Respect for environmental CON attitude, in which ecotourists also respect the environmental CON efforts in CMC Tiga Warna area by willing to take part in environmental CON programs such as: obeying waste regulations through sanctions, respecting tourist holiday schedules at CMC Tiga Warna to protect the tourist environment for the opportunity to recover, respecting efforts to limit visits through reservation method by booking a visit quota, and nurturing the culture to protect the environment.

Result of WarpPLS analysis

Measurement of environmental awareness model

The validity and reliability of the questionnaire were examined by using Confirmatory Factor Analysis (CFA). The CFA analysis result indicated that the three-factor model fits the data, and all the loading factors criteria were fulfilled and significant at 0.001. Based on Table 1, the convergent validity test fulfilled criteria for a reflective indicator model with a loading-factor value of ≥ 0.30 or significant (Solimun et al. 2017). The discriminant validity test of the questionnaire was also fulfilled because the

square root value of average variances (Sq. roots AVE) was greater than the correlation of the variable concerned (Solimun et al. 2017). The result of reliability test through the composite reliability value of > 0.7 and alpha Cronbach’s value of > 0.6 (Solimun et al. 2017) was achieved indicating that the questionnaire was valid and reliable.

Structural model: model fit and hypotheses testing

The model fit test was performed to find out whether the proposed structural model fitted the data by applying several fit indicators to measure the *correctness* of the proposed model (Solimun et al. 2017). Measurement of the goodness of fit (GoF) is illustrated in Table 2.

Table 2 indicates that the p -value for APC, ARS, and AARS is significant at 0.001, with an APC value of = 0.361, ARS of = 0.240 and AARS of = 0.237. Then, the results of AVIF and AFVIF values are less than 3.3 indicating that there is no multicollinearity problem between indicators and between exogenous variables. The GoF index has a medium index ≥ 0.25 . In addition, SPR, RSCR, SSR, and NLBCDR indicators also depict a fit measure, meaning that there is no causality problem in the research model. The proposed model is explained by 23 and 25 percent of the variance in SUS and EA, respectively. The result of the goodness of fit test concludes that the overall research model has a good fit value and is eligible to predict the model of EA development. The structural model is presented in Fig. 2.

The hypothesis testing was conducted by utilizing the t -test with alpha level of 1%. The standardized path coefficients depicting the direct and indirect effects are presented in Table 3. It is apparent that CON and SUS were found to significantly influence EA at 0.001 level. The direct effect of CON on SUS is also significant at 0.001 level. In line with the expectations, the indirect effect of CON to EA mediated by SUS is significant at 0.001 level. Thus, all hypotheses are accepted. The results of the hypotheses testing are summarized in Table 3.

The most effective path in determining EA

Based on the results of hypotheses testing, the path priority of effectiveness is feasible between variables, through direct effects, indirect effects, and total effects as depicted in Table 4.

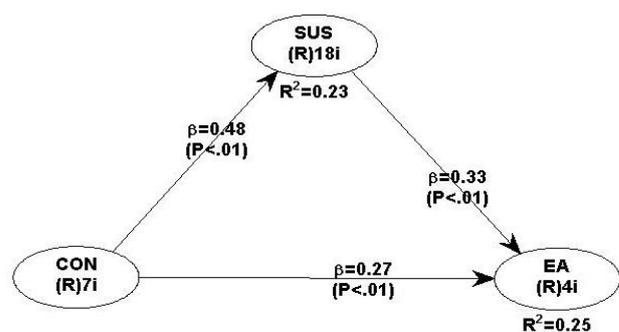


Figure 2. Result of structural model. Notes: *** Significant at 0.001 level

Table 1. Questionnaire validity and reliability

Variables, indicators, and items	Factor loadings	Sq. roots AVE	Composite reliability	Cronbach's alpha
Coastal Biodiversity Conservation (CON)		0.641	0.829	0.758
Preservation of natural abilities				
CMC ecotourism provides environmental education to ecotourists and local communities	0.685***			
Ecotourism arrangements in the CMC are committed to reducing the negative impact of tourism	0.652***			
CMC ecotourism sites implement zoning policy, include emission-free zone, and limited use of ecotourism zoning in conserved and protected areas	0.666***			
Limited use of natural resource and environment				
CMC ecotourism implements carrying capacity in coastal ecotourism zoning by arranging the number of visitors	0.526***			
CMC ecotourism managers provide tourist facilities according to environmental carrying capacity	0.583***			
By prioritizing preservation of natural resource and environment, development of the CMC ecotourism sustains economic benefits for local communities	0.663***			
Sustainability (SUS)		0.672	0.936	0.928
Environmental sustainability				
CMC ecotourism has been protected from various air, water, soil, and noise pollution	0.554***			
The level of a crowd at CMC ecotourism has been under control to protect the environment	0.649***			
Ecotourist and local communities are consistent and committed to preserving nature	0.669***			
The natural environment in CMC ecotourism is preserved and protected particularly in the mangrove and coral reefs ecosystem	0.578***			
The negative environmental impact due to tourism and business around CMC ecotourism has been under control	0.714***			
Cultural sustainability				
CMC ecotourism helps preserve local indigenous culture	0.643***			
Ecotourism development in CMC is adjusted to local conditions	0.652***			
Economical sustainability				
Community businesses around the CMC ecotourism are classified as developing	0.630***			
Better life-quality of local communities due to the positive impact of the CMC ecotourism development	0.737***			
The number of local communities who are certified as official tour guides are increased	0.705***			
Income of local communities depends on the CMC ecotourism	0.679***			
CMC ecotourism provides real economic benefits for local communities	0.741***			
Social sustainability				
Local communities in CMC <i>ecotourism</i> and its surroundings could obtain social benefits from the ecotourist visits	0.675***			
The existence of CMC ecotourism increasingly empowers local communities in maintaining the hygiene of future tourism environment	0.711***			
Local communities play a role in building the CMC ecotourism facilities	0.690***			
Level of tourist crowds at the CMC ecotourism has never disturbed the surrounding community	0.693***			
Potential conflict in terms of management and utilization of natural potential in CMC ecotourism area has been controlled	0.635***			
Tourist facilities at CMC ecotourism are also beneficial for cultural activities	0.704***			
Environmental Awareness (EA)		0.818	0.890	0.835
Environmental knowledge				
Enthusiasm of ecotourists to learn about environmental knowledge, including environmental preservation	0.823***			
Enthusiasm of ecotourists to inquire about knowledge related to the environment	0.825***			
Attitude to the environment				
Pro-environmental attitude	0.852***			
Respect for environmental conservation attitude	0.770***			

Notes: ***p < 0.001

Table 2. Goodness of fit (GoF)

Model fit and quality indices	Fit criteria	Result	Outcome
Average Path Coefficient (APC)	$\rho < 0.05$	0.361 $\rho < 0.001$	Achieved
Average R-Squared (ARS)	$\rho < 0.05$	0.240 $\rho < 0.001$	Achieved
Average Adjusted R-Squared (AARS)	$\rho < 0.05$	0.237 $\rho < 0.001$	Achieved
Average Block VIF (AVIF)	Acceptable if ≤ 5 ; ideally ≤ 3.3	1.143	Ideal
Average Full Collinearity VIF (AFVIF)	Acceptable if ≤ 5 ; ideally ≤ 3.3	1.312	Ideal
Tenenhaus GoF (GoF)	Small ≥ 0.1 ; medium ≥ 0.25 ; large ≥ 0.36	0.350	Medium
Sympson’s paradox ratio (SPR)	Acceptable if ≥ 0.7 ; ideally = 1	1.000	Ideal
R-Squared Contribution Ratio (RSCR)	Acceptable if ≥ 0.9 ; ideally = 1	1.000	Accepted
Statistical Suppression Ratio (SSR)	Acceptable if ≥ 0.7	1.000	Accepted
Nonlinear Bivariate Causality Direction Ratio (NLBCDR)	Acceptable if ≥ 0.7	1.000	Accepted

Table 3. Hypotheses testing for direct and indirect relationship

Hypotheses	Paths	β Coefficient	p-value	Relationship
H1	CON-SUS	0.483	$<0,001^{***}$	Supported
H2	CON-EA	0.268	$<0,001^{***}$	Supported
H3	SUS-EA	0.333	$<0,001^{***}$	Supported
H4	CON-SUS-EA	0.161	$<0,001^{***}$	Supported

Note: CON: Conservation; SUS: Sustainability; EA: Environmental Awareness. *** The coefficient is significant at 0.001 levels. H1: H2, H3: Direct Effect; while H4: Indirect Effect

Table 4. Effectiveness priority for all path

Variable type			Type of effect				Effectiveness priority of paths		
P	M	R	Direct Effect (DE)		Indirect Effect (IE)		Total Effect (TE)	All path to EA	CON-SUS
			β coeff.	p-value	β coeff.	p-value	β coeff. (p-value)		
CON	-	SUS	0.483	<0.001	-	-	0.483 (<0.001)	-	1
SUS	-	EA	0.333	<0.001	-	-	0.333 (<0.001)	2	-
CON	-	EA	0.268	<0.001	-	-	0.429 (<0.001)	1	-
	SUS	EA	-	-	0.161	<0.001			

Note: P: Predictor variable; M: Mediating variable; R: Response variable

Discussion related to relationship between CON, SUS, and EA

Consistent efforts in implementing the biodiversity CON strategies for CMC Tiga Warna ecotourism has been proven to ensure the SUS and EA, which are in accordance with the findings of these empirical studies, emphasizing the important role of CON to obtain EA by ensuring the environmental SUS of natural resources and the environment of coastal ecotourism. Furthermore, it is evident that the SUS of coastal environment effectively mediates the conservation efforts to enhance the EA of ecotourists and local communities.

The concept of EA has been formerly researched by Kusumawati et al. (2019) as a moderating variable in examining the relationship between sustainability and revisit intention. Meanwhile, according to Gao et al. (2016), the concept of EA serves as an input of behavioral intentions. Correspondingly, Sharma and Bansal (2013) assert that EA plays a critical role in the field of green consumer segments. This research is successful in finding a novel concept regarding the role of EA as the output variable on coastal ecotourism research object, where EA is directly and significantly determined by biodiversity CON

efforts performed by DMO in CMC Tiga Warna with an effect of 0.268 (<0.001). This finding affirms that this study is consistent with the research conducted by Sharma and Bansal (2013) regarding the coastal ecotourism. In addition, CON has an effect of 0.483 (<0.001) on the SUS of coastal ecotourism; further, the SUS of coastal ecotourism determines EA of 0.333 (<0.001). Moreover, the SUS of coastal ecotourism plays an effectual role in partial mediating the relationship between CON and EA of 0.161 ($p < 0.001$). Thus, models of increasing EA of ecotourists and local communities in CON-based coastal ecotourism are proposed, in which the variances increase SUS and EA by 23% and 25%, respectively.

The findings of this study are consistent with the existence of stakeholder theory by providing empirical evidence through a model of increasing EA of ecotourists and local communities in CMC Tiga Warna ecotourism. According to the stakeholder theory, tourists as part of the tourism industry stakeholders are not only expected to have a concern for the consumption activity of traveling experiences, but also to have a concern about current and future environmental conditions in preserving the environment for social, economic and cultural benefits, as

well as for the potential for future visits (Colombo and Delmastro in Kusumawati et al. 2019).

The role of coastal biodiversity CON on SUS and EA of ecotourists and local communities

The strategy to sustain coastal biodiversity CON has been ongoing in CMC Tiga Warna ecotourism to create a balance between preserving natural capabilities and limited use of the natural resource. Thus, CMC Tiga Warna is claimed as the best ecotourism management according to the Ministry of Marine Affairs and Fisheries (Riniwati et al. 2019). The success of the limited use of natural resource strategy in CMC Tiga Warna ecotourism development is indicated by the CC of visit, which has not yet been exceeded. In contrast to other ecotourism sites, for example in Mountain Rinjani Park Ecotourism, the number of visits has exceeded the CC within one year (Sadikin et al. 2017).

Maintaining the SUS of coral reefs and mangrove forests as part of coastal biodiversity in CMC Tiga Warna ecotourism is achieved by applying the CON management strategy. Development of the coastal area as ecotourism in CMC Tiga Warna has been less vulnerable (Harahab et al. 2018), while coral reefs have been quite vulnerable (Riniwati et al. 2019). This condition is in line with tourism area development in South East Asia and East Asia, for example, the widespread industrial and tourism development in coastal and marine tourism (CMT) cities in Vietnam causing environmental pollution due to the absence of regulations on marine and coastal-waste management (Tsai et al. 2020). Similar conditions also occur in Eastern Thailand, in which rapid urbanization from tourism development becomes the main driver of environmental changes making the coastal area vulnerable to climate change-related risks (Nitivattananon and Srinonil 2019). Another sample includes tourism development in Malaysia, which significantly affects environmental pollution. However, an inverse relationship between tourism and environmental pollution is observed in Thailand and Singapore (Azam et al. 2018). Besides, pollution has caused a loss of local marine biodiversity and decreased the quality of seawater, affecting the attractiveness of local tourism in coastal city of Dalian, China (Lu et al. 2019). For this reason, a conservation management strategy is required to reduce the negative impact of tourism development in the coastal and sea environment including in marine protected areas.

Based on the results of data analysis, CON significantly affects EA and SUS by 0.268 ($p < 0.001$) and 0.483 ($p < 0.001$), respectively. The effect of CON on SUS is greater than that of CON on EA. This result signifies that the role of CON is pivotal in ensuring the existence of SUS in CMC Tiga Warna ecotourism and in maintaining EA of ecotourists and local communities.

However, empirical evidence emphasizing the SUS and EA of ecotourists and local communities has been limited. Hence, this study aims to navigate the empirical facts that EA of ecotourists and local communities improves through CON activities in CMC Tiga Warna ecotourism. In addition, the empirical facts on the SUS of CMC Tiga Warna are proved to be determined by coastal CON efforts,

accomplished since 2005 by individual movements and volunteers until 2011. Later in 2012, the CON efforts have been reinforced by the formation of *Pokmaswas*. In 2014, YBAS was formed as a coastal ecotourism manager that consistently performs the CON in CMC Tiga Warna area. Prior to that, the condition of the coastal environment in South Malang was deserted. Since the conservation movement involving local communities was carried out, the damage to the coastal environment has gradually recovered and returned to an ecologically stable, while the social dimension is in dynamic conditions (Eunike et al. 2018). The coastal biodiversity CON strategy performed in CMC Tiga Warna ecotourism has been emphasized to maintain a balance between the ability of nature and the limited use of nature through ecotourism.

Effect of SUS on EA of ecotourists and local communities

CON has been empirically proven to maintain the SUS of natural resources and the environment in CMC Tiga Warna ecotourism area, indicating that the existence of SUS is inseparable from the consistent conservation activities by ecotourism managers along with the ecotourists and local communities. According to Kusumawati et al. (2019), tourists who experience SUS in the visited destination will intend to revisit in the future. This allegation is explainable since tourists (as the tourism stakeholders) have EA, considering the current and future of natural and environmental circumstances by engaging with activities to preserve the environment. This empirical fact was also navigated in CMC Tiga Warna ecotourism, where the ecotourists were also willing to comply with the rules when traveling to maintain cleanliness by not leaving plastic waste and cigarette butts at the ecotourism location. Such ecotourists' action reflects the unlimited role of tourists as stakeholders, regarding the concerns about the consumptive activities of traveling experiences to conserve nature and the environment. In other words, ecotourists also have EA by understanding the importance of the environment for a better life (Kusumawati et al. 2019).

To date, the SUS condition of CMC Tiga Warna ecotourism in terms of ecology and management is considered stable (Eunike et al. 2018). The findings are in accordance with this study. In fact, SUS of coastal ecotourism improves EA of ecotourists and local communities, which is inseparable from the instrumental role of CMC Tiga Warna ecotourism manager in educating ecotourists and the community (to preserve the natural resources and environment and to ensure the existence of natural and environmental SUS).

The role of SUS as a mediating variable between CON and EA

Existence of sustainability of natural resources and environment in CMC Tiga Warna ecotourism site is inseparable from the role of the DMO in empowering local communities and ecotourists as stakeholder to participate in the CON programs. This finding is in line with Shafieisabet and Haratifard (2020) that empowering local stakeholders is important for sustainable development of tourism.

Interactions and collaborations among ecotourism stakeholder is important to prevent natural resource damage (Wondirad et al. 2020). In addition, the economic incentive for local stakeholders could manage natural conservation and encourage participation of local communities in ecotourism area (Pornprasit and Rurkkhum 2019).

This study navigates a novel concept that SUS plays an effective role in mediating the effect of CON on EA in coastal ecotourism, in which prior study (Kusumawati et al. 2019) affirms that SUS becomes an input variable for revisit intention and WOM intention. The degree of CON influences on EA reaching 0.268 ($p < 0.001$). When added to the indirect effect of CON on EA through SUS, an additional effect of 0.161 (< 0.001) is achieved, thus the total effect of CON on EA involving SUS as the mediator variable is confirmed to have a greater effect (0.429 or $p < 0.001$). If CMC Tiga Warna ecotourism manager maintains to consistently conserve the coastal biodiversity, the ecological SUS status of coastal ecotourism is achieved, and the EA of ecotourists and local communities is also achieved. Otherwise, if the condition of CMC Tiga Warna ecotourism has decreased the ecological SUS status, subsequently the EA of local communities is threatened to decline because they will no longer obtain the economic benefits of tourism. Thus, the role of SUS is instrumental to increase the effectiveness of CON on EA. In addition, DMO of CMC Tiga Warna coastal ecotourism is encouraged to reinforce the CON to maintain SUS, and hence the CON influence on EA is more effective with the existence of SUS.

In sum, this study provides a theoretical contribution in terms of modeling for EA enhancement based on coastal biodiversity CON, where SUS plays an effective role in mediating the effect of CON on EA. In practical, the findings of this study are expected to convince the DMO in maintaining or strengthening biodiversity CON programs in CMC Tiga Warna ecotourism areas, to encourage improvement of EA, and to prioritize SUS of ecotourism environment, providing a long-term economic benefit for local communities.

The following conclusions are supported by the empirical facts regarding CON, SUS, and EA in CMC Tiga Warna ecotourism that CON of coastal biodiversity is capable of forming the EA of ecotourists and local communities, as well as maintaining the SUS of ecotourism destinations in terms of environmental, economic, cultural, and social dimensions. In addition, the SUS of ecotourism destinations has been established as an effective mediator between CON and EA, along with the improved modeling of EA in CON-based coastal ecotourism.

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REFERENCES

- Anna Z, Saputra DS. 2017. Economic valuation of whale shark tourism in Cenderawasih Bay National Park, Papua, Indonesia. *Biodiversitas* 18 (3): 1026-1034.
- Ashok S, Tewari HR, Behera MD, Majumdar A. 2017. Development of ecotourism sustainability assessment framework employing Delphi, C & I and participatory methods: A case study of KBR, West Sikkim, India. *Tour Manag Perspect* 21: 24-41.
- Azam M, Alam MM, Hafeez MH. 2018. Effect of tourism on environmental pollution: Further evidence from Malaysia, Singapore and Thailand. *J Clean Prod* 190: 330-338. DOI: 10.1016/j.jclepro.2018.04.168.
- Canteiro M, Córdova-Tapia C, Brazeiro A. 2018. Tourism impact assessment: a tool to evaluate the environmental impacts of touristic activities in natural protected areas. *Tour Manag Perspect* 28: 220-227.
- Das M, Chatterjee B. 2015. Ecotourism: a panacea or a predicament? *Tour Manag Perspect* 14: 3-16. DOI: 10.1016/j.tmp.2015.01.002.
- Eunike A, Hardiningtyas D, Kartika SI, Andronicus. 2018. Sustainability analysis of beach and mangrove tourism in Clungup Beach, Malang Regency of East Java. *ECSOFiM Econ Soc Fish* 6 (1): 1-13. [Indonesian].
- Frey N, George R. 2010. Responsible tourism management: The missing link between business owners' attitudes and behaviour in the Cape Town Tourism Industry. *Tour Manag* 31 (5): 621-628. DOI: 10.1016/j.tourman.2009.06.017.
- Gao Y, Mattila A, Lee S. 2016. A meta-analysis of behavioral intentions for environment-friendly initiatives in hospitality research. *Intl J Hosp. Manag* 54: 107-115.
- Harahab N, Riniwati H, Abidin Z. 2018. The vulnerability analysis of mangrove forest status as a tourism area. *Ecol Environ Conserv* 24 (2): 968-975.
- Husamah, Hudha AM. 2018. Evaluasi implementasi prinsip ekowisata berbasis masyarakat dalam pengelolaan Clungup Mangrove Conservation Sumbermanjing Wetan, Malang. *J Nat Resour Environ Manag* 8 (1): 86-95. [Indonesian].
- Iniesta-Bonillo MA, Sánchez-Fernández R, Jiménez-Castillo D. 2016. Sustainability, value, and satisfaction: model testing and cross-validation in tourist destinations. *J Bus Res* 69 (11): 5002-5007.
- Karani P, Failler P. 2020. Comparative coastal and marine tourism, climate change, and the blue economy in African large marine ecosystems. *Environ Dev* 36: 100572. DOI: 10.1016/j.envdev.2020.100572.
- Kusumawati A, Utomo HS, Suharyono, Sunarti. 2019. Effects of sustainability on WoM intention and revisit intention, with environmental awareness as a moderator. *Manag Environ Qual* 31 (1): 273-288.
- Lafreniere KC, Deshpande S, Bjornlund H, Hunter MG. 2013. Extending stakeholder theory to promote resource management initiatives to key stakeholders: A case study of water transfers in Alberta, Canada. *J Environ Manag* 129: 81-91.
- Lu X, Yao S, Fu G, Xiaofei Lv, Mao Y. 2019. Dynamic simulation test of a model of ecological system security for a coastal tourist city. *J Destin Mark Manag* 13: 73-82. DOI: 10.1016/j.jdmm.2019.05.004.
- Martínez YC, Baños MR, Monroy HC. 2018. Ecotourism as a path to sustainable development in an isolated magic town. *J Tour Anal* 25 (1): 23-38.
- Mathew PV, Sreejesh S. 2017. Impact of responsible tourism on destination sustainability and quality of life of community in tourism destinations. *J Hosp Tour Manag* 31: 83-89.
- Merlia R, Preziosia M, Acampora A, Lucchettia MC, Alib F. 2019. The impact of green practices in coastal tourism: An empirical investigation on an eco-labelled beach club. *Intl J Hosp Manag* 77: 471-482. DOI: 10.1016/j.ijhm.2018.08.011.
- Nitivattananon V, Srinonil S. 2019. Enhancing coastal areas governance for sustainable tourism in the context of urbanization and climate change in Eastern Thailand. *Adv Clim Chang Res* 10 (1): 47-58. DOI: 10.1016/j.accre.2019.03.003.

- Noriega JA, Zapata-Prisco C, García H, Hernández E, Hernández J, Martínez R, Santos-Santos JH, Pablo-Cea JD, Calatayud J. 2020. Does ecotourism impact biodiversity? An assessment using Dung beetles (Coleoptera: Scarabaeinae) as bioindicators in a tropical dry forest natural park. *Ecol Indic* 117: 106580. DOI: 10.1016/j.ecolind.2020.106580.
- Ocampo L, Ebisa JA, Ombe J, Escoto MG. 2018. Sustainable ecotourism indicators with fuzzy Delphi method – a Philippine perspective. *Ecol Indic* 93: 874-888.
- Phelan A, Ruhanen L, Mair J. 2020. Ecosystem services approach for community-based ecotourism: towards an equitable and sustainable blue economy. *J Sustain Tour* 28 (10): 1665-1685. DOI: 10.1080/09669582.2020.1747475.
- Pornprasit P, Rurkkhum S. 2019. Performance evaluation of community-based ecotourism: a case study in Satun Province, Thailand. *J Ecotour* 18 (1): 42-59. DOI: 10.1080/14724049.2017.1379529.
- Pulido-Fernández JI, Cárdenas-García PD, Espinosa-Pulido JA. 2019. Does environmental sustainability contribute to tourism growth? An analysis at the country level. *J Clean Prod* 213: 309-319.
- Ren L, Li J, Li C, Dang P. 2020. Can ecotourism contribute to ecosystem? Evidence from local residents' ecological behaviors. *Sci Total Environ* 757: 143814. DOI: 10.1016/j.scitotenv.2020.143814.
- Riniwati H, Harahab N, Abidin Z. 2019. A vulnerability analysis of coral reefs in coastal ecotourism areas for conservation management. *Diversity* 11 (7): 107-121.
- Sadikin PN, Arifin HS, Pramudya B, Mulatsih S. 2017. Carrying capacity to preserve biodiversity on ecotourism in Mount Rinjani National Park, Indonesia. *Biodiversitas* 18 (3): 978-989.
- Setyawan AD, Winarno K. 2006. The direct exploitation in the mangrove ecosystem in Central Java and the land use in its surrounding; degradation and its restoration effort. *Biodiversitas* 7 (3): 282-291. [Indonesian]
- Shafieisabet N, Haratifard S. 2020. The empowerment of local tourism stakeholders and their perceived environmental effects for participation in sustainable development of tourism. *J Hosp Tour Manag* 45: 486-498. DOI: 10.1016/j.jhtm.2020.10.007.
- Sharma K, Bansal M. 2013. Environmental consciousness, its antecedents and behavioural outcomes. *J Indian Bus Res* 5 (3): 198-214.
- Solimun, Fernandes AAR, Nurjannah. 2017. *Metode Stastika Multivariat: Permodelan Persamaan Structural (SEM) Pendekatan WarpPLS*. UB Press, Malang. [Indonesian]
- Sui L, Wang J, Yang X, Wang Z. 2020. Spatial-temporal characteristics of coastline changes in Indonesia from 1990 to 2018. *Sustain* 12 (8): 1-28.
- Tsai FM, Bui TD, Tseng ML, Lim MK, Tan RR. 2020. Sustainable solid-waste management in coastal and marine tourism cities in Vietnam: A hierarchical-level approach. *Resour Conserv Recycl* 7: 105266. DOI: 10.1016/j.resconrec.2020.105266.
- Wondirad A, Tolkach D, King B. 2020. Stakeholder collaboration as a major factor for sustainable ecotourism development in developing countries. *Tour Manag* 78: 104024. DOI: 10.1016/j.tourman.2019.104024.
- YBAS. 2020. *Map of Coastal Ecotourism Destination CMC Tiga Warna*. Yayasan Bhakti Alam Sendangbiru, Malang.
- Zarghi A, Hosseini SM. 2014. Effect of ecotourism on plant biodiversity in chelmir zone of Tandoureh National Park, Khorasan Razavi Province, Iran. *Biodiversitas* 15 (2): 224-228.