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# Marine ecotourism development in South Sulawesi, Indonesia

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**Abstract.** Ecotourism is a fast-growing tourism industry. Ecotourism is superior to other tourism because it can give economic benefits and preserve natural resources. The potential of Indonesian ecotourism, especially South Sulawesi has not been optimally utilized; therefore, it is necessary to study its development potential. This study aims to analyze the potential and problems in marine ecotourism development in South Sulawesi. The study was done at Selayar Regency, Takalar Regency, Makassar City, and Pangkep Regency. The area of mangrove, coral reefs and sea grass ecosystem was estimated by using Landsat 7 Image and ArcView program. Other data were collected by using survey, census, interviews, and questionnaire. The parameters observed were coastal ecosystem resources; socio-economic; infrastructure; policy; and micro, small, medium business and co-operative. SWOT analysis was used to analyze the strategic condition; and Analysis Hierarchy Process was used to analyze the interaction between the priorities level. The study revealed that marine ecotourism development problems were low-capacity resources management, low local community participation, limited infrastructure availability, weak capacity of local community institutions, and insufficient local community support or contribution. Marine ecotourism development in South Sulawesi should be focused on tools improvement of sustainable use, infrastructure development, socio-economic strengthening, and consistent policy implementation.

## 1. Introduction

Tourism industry grew beyond global economic growth by a margin of 4.6% in 2018 [1]. Tourism is a labour-intensive industry which accounts for 10.4% of global GDP. Over the last 30 years, tourism has grown as the largest economic sectors in the world, supporting one in ten jobs (330 million) worldwide, generating US\$ 8.9 trillion or 10.3% of global GDP, generated US\$ 1.7 trillion in visitor exports (6.8% of total exports) and US\$ 948 billion in investment (4.3% of total investment) [2]. Tourism activity increased rapidly, in 1950, the world tourists was around 25 million; and 50 years later, increased to 689 million [3], then increased to 1.5 billion in 2019 [4].

Ecotourism concept was first introduced by Keton Miller in 1978 [5]. The International Union of Conservation and Nature defines ecotourism as “environmentally responsible travel to relatively undisturbed natural areas to enjoy and appreciate nature, including cultural features [6]. An estimated



eight billion visits are made by ecotourists to protected areas with direct expenditures of up to US\$ 600 billion per year [7]. Visits to ecotourism sites were highest in North America and lowest in Africa. In the United States there are 2.5 billion visits per year, and in China there are one billion per year [7].

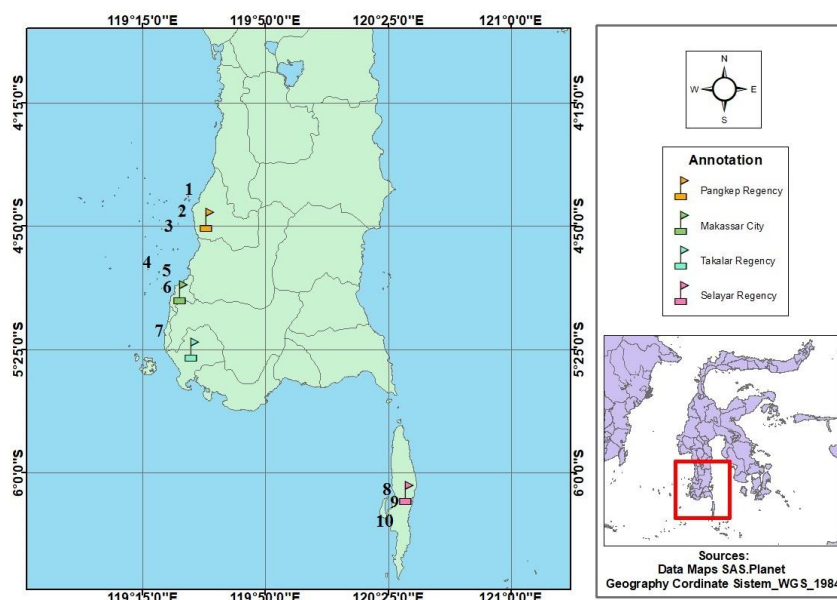
Ecotourism is better than mass tourism because ecotourism supports the protection of cultural values that live in society and the preservation of the environment. The ecotourism approach is sustainability. Therefore, ecotourism activities must: (1) be able to contribute to conservation activities and maintain biodiversity; (2) can improve the local community welfare; (3) can provide experience and knowledge to tourists; (4) can increase the active participation of local communities in tourism activities [8].

As an archipelago country, Indonesia has more than 17,500 islands with a sea surface area of over 5.8 million km<sup>2</sup>, and 81,000 coastlines. Indonesian marine and coastal areas have natural resources and environmental services that have a high potential for marine ecotourism development. Compared to mainland ecotourism, Indonesian marine ecotourism is under developed [9].

Coastal communities have many socioeconomic problems, such as low income and limited job opportunities, minimum education facilities, and few health care facilities. This socioeconomic problems are due not only to the failure of government development policy, but also to the lack of effectiveness of regulation systems, centralistic, top-down planning processes, poor policies, and a lack of human resources [9, 10]. The other problem affecting marine and coastal areas is the unsustainable use of resources; many marine and coastal areas have become degraded [11]. Previous research has shown that Indonesian ecotourism, especially South Sulawesi has not been optimally utilized, therefore it is necessary to study its development potential. This study aims to analyze the potential and problems in the development of marine ecotourism in South Sulawesi.

## 2. Materials and Methods

The study was done in three regencies and one city in South Sulawesi, namely: Pangkep Regency (Langkadea Island, Pannambungan Island, and Camba-cambang Island), Makassar City (Samalona Island, Bonetambung Island, and Barranglompo Island), Takalar District (Sanrobengi Island); and Selayar Regency (Pasi Island, Gusung Island and coastal areas Benteng Town) (Figure 1).



**Figure 1.** Research area in Pangkep Regency, Makassar City, Takalar Regency and Selayar Regency. 1: Camba-cambang Island, 2: Langkadea Island, 3: Pannambungan Island, 4: Bonetambung Island, 5: Barranglompo Island, 6: Samalona Island, 7: Sanrobengi Island, 8: Gusung Island, 9: Benteng Town Coastal Area, 10: Pasi Island.

The study locations were selected based on areas representation (South and West Coast, urban and rural, and coastal and island). Image analysis was used to calculate the area of coastal ecosystems, namely mangrove, coral reefs and sea grass ecosystems. The area of the three ecosystems was analyzed using Landsat 7 imagery. The image was processed using the ArcView program. Other data were collected using: (1) observation, survey, census and questionnaire to obtain general data, condition of natural resources, environment services, socioeconomic, infrastructure conditions, conditions of micro, small and medium enterprises, and cooperatives [9, 11, 12]; and (2) interviews to obtain data that was non statistical and qualitative or subjective [13]. The respondents were chosen by using key informants or a semi-random (random in the restricted group that had been determined such as community leaders, youth leaders, environmentalists, local economic actors, and non-governmental organizations. The parameters observed were: (1) natural resources and services of coastal ecosystem; (2) socioeconomic condition; (3) regional infrastructure condition; (4) development policy concerning small island and coastal area; and (5) condition of micro, small, medium business and co-operative [9]. Sampling unit for socioeconomic parameter was fishermen, merchants and non-formal leaders. Purposive method was used to collect primary data for about five percent of relevant population [14].

SWOT analysis [15] was used to analyze the strategic condition (strength, weakness, opportunity and threats) of coastal and marine areas in South Sulawesi. To facilitate the SWOT analysis process, qualitative scores were made, namely: (1) Score 1 for the average value <10; (2) Score 2 for 10 - <20; (3) Score 3 for 20 - <30; (4) Score 4 for 30 - <40; (5) Score 5 for 40 - <50; (6) Score 6 for 50 - <60; (7) Score 7 for 60 - <70; (8) Score 8 for 70 - <80; (9) Score 9 for 80 - <90; and (10) Score 10 for > 90 [16].

Analysis Hierarchy Process (AHP) was used to analyze the interaction between the priorities level [17]. AHP was performed to obtain an alternative public policy on development of marine ecotourism in South Sulawesi. AHP was used to analyze the effect of priority at a higher level that can affect the priority at a lower level. AHP was carried out to obtain alternative general policies for ecotourism development in South Sulawesi. AHP's objective or objective was to analyze various criteria and alternatives in increasing regional economic resilience, particularly in the development of ecotourism in South Sulawesi.

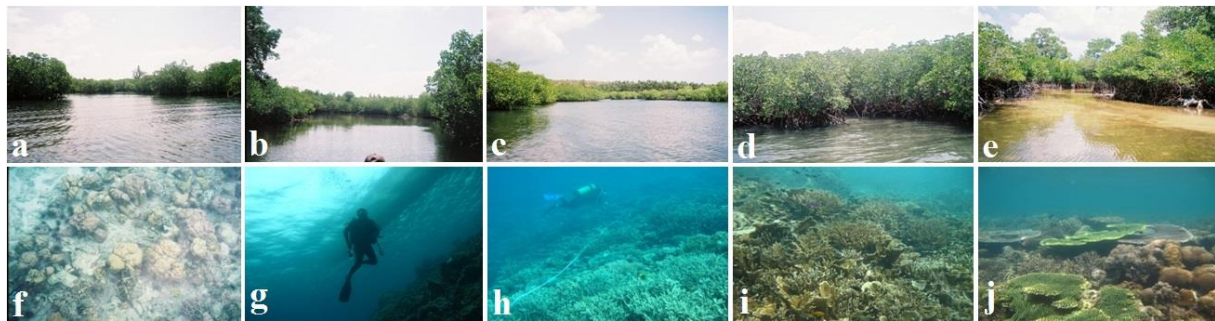
### 3. Results

#### 3.1. Coastal ecosystems

The existing coastal ecosystems were mangrove, coral reefs, sea grass (Table 1). The coral reefs and sea grass were found in almost all locations. Coral reef and mangrove condition were already poor. Good conditions of mangrove forests were found only in Gusung Island, Selayar Regency (Figure 2).

**Table 1.** The area of coral reef ecosystems, seagrass beds and mangrove ecosystems at the study areas

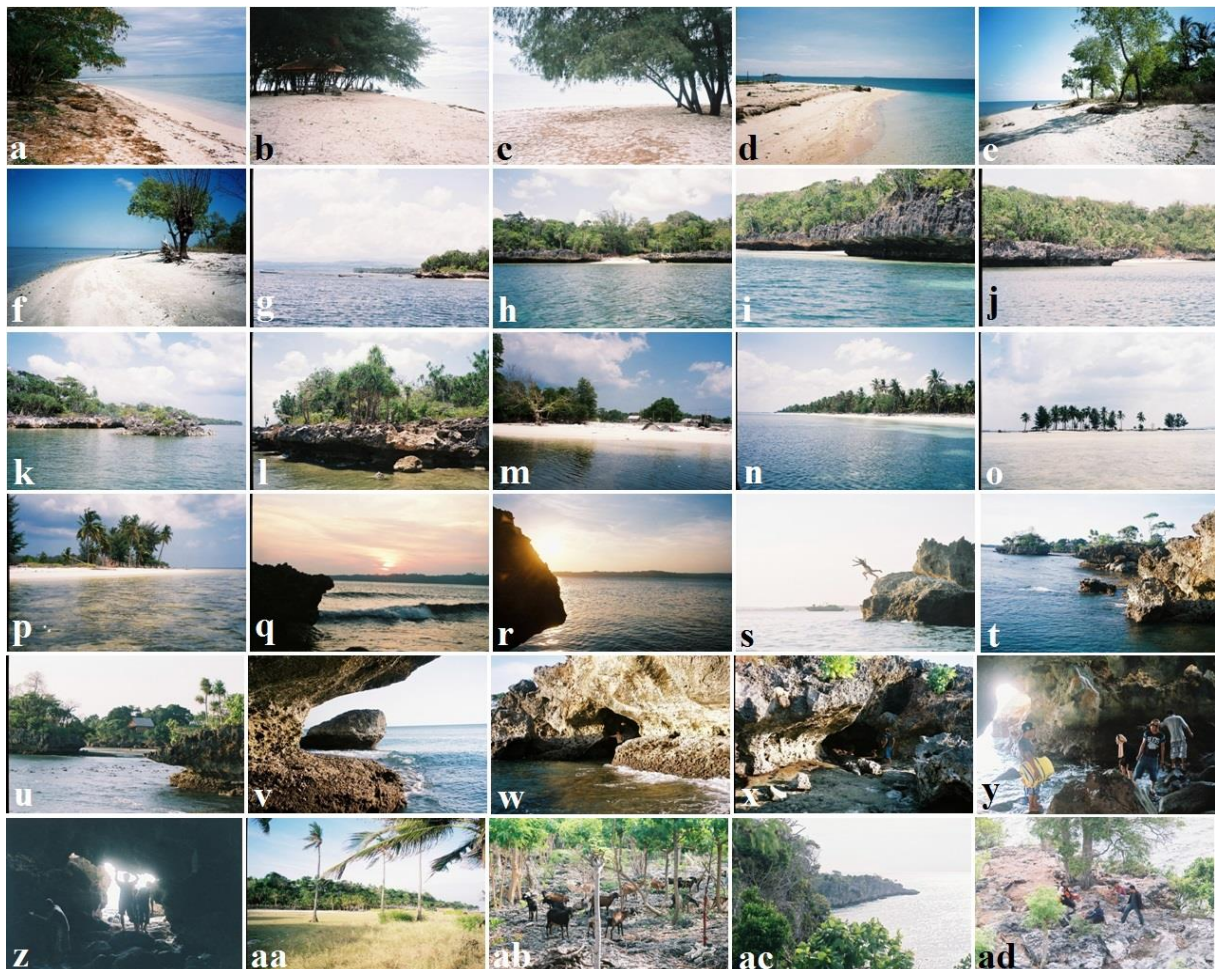
Regencies/City	Location	Ecosystem Area (Ha)		
		Coral Reef	Sea Grass	Mangrove
Pangkep Regency	[1] Camba-cambang Island	0.565	0.012	-
	[2] Langkadea Island	0.837	0.315	-
	[3] Pannambungan Island	0.249	0.091	-
Makassar City	[4] Bonetambung Island	8.741	0.681	-
	[5] Barranglompo Island	2.193	0.803	-
	[6] Samalona Island	0.539	0.109	-
Takalar Regency	[7] Sanrobengi Island	1.708	0.112	-
Selayar Regency	[8] Gusung Island	26.852	13.108	1.498
	[9] Benteng Town Coastal Area	8.987	-	-
	[10] Pasi Island	2.418	0.535	-



**Figure 2.** Condition of mangrove (a-e) and coral reef ecosystem (f-j) at the study areas

*3.2. Potential ecotourism tourism site*

The potential areas to be developed as ecotourism locations were the islands that have white sand beaches, rocky coast, caves, and tropical coastal ecosystem, such as coral reef and mangrove ecosystem (Figure 3).



**Figure 3.** Condition of the beaches of Langkadea Island, Pangkep Regency (a-c), Samalona Island, Makassar City (d), Sanrobengi Island, Takalar Regency (e-f), Jeneiya Beach at Gusung Island, Selayar Regency (g-n), Gusung Tallang Beach at Gusung Island, Selayar Regency (o-p), Beach Buloiya at Selayar Island, Selayar Regency (q-z), and Rocky Beach at Pasi Island, Selayar Regency (aa-ad)

### 3.3. Tourist facilities

Existing tourist facilities are gazebos, cottages and home stays. Some of the existing facilities are still quite good, but some are poorly maintained, such as those on Langkadea Island, Pangkep Regency. The existing tourist facilities in Selayar Regency are generally better (Figure 4).



**Figure 4.** Existing tourist facilities in Langkadea Island, Pangkep Regency (a-c), Pannambungan Island, Pangkep Regency (d-e), Buloiya Beach at Selayar Island, Selayar Regency (f-j)

### 3.4. Socio-economic facilities

Social facilities were schools; health centres; economic and trade facilities. Communities have built many facilities, which exist in a variety of conditions, from poor to good. School conditions vary from poor to good, but generally in poor and fair condition (Figure 5); and schools was lack teachers and textbooks. Apart from educational facilities, there are also research facilities belonging to Hasanuddin University (Figure 5). There were health facilities (Figure 6) but lack of health facilities and medical personnel.



**Figure 5.** School conditions (a-c) and marine station (d-e) of Hasanuddin University at Barranglombo Island, Makassar City



**Figure 6.** Condition of health facilities at Bonetambu Island, Makassar City (a), Barranglombo Island, Makassar City (b), and Pasi Island, Selayar Regency

Housing and environmental sanitation conditions varied from poor to good condition (Figure 7); some family already have toilet. There were still many people used the beach or coastal areas to discard sewage effluent and household waste. In some locations, there were public toilets, but toilets were not used. Environmental health conditions were poor to fair, crowded housing conditions that cause slums that often in health problems. A family generally lives in semi-permanent houses which were generally privately owned; some of which live in permanent houses. The house surface is generally 20-59 m<sup>2</sup>. The lighting use electricity and kerosene lamp.



**Figure 7.** Housing condition at Bonetambung Island, Makassar City (a-c) and Barranglompo Island, Makassar City (d-e)

Commercial facilities, such as canteen, small shop and small markets could be found, but generally in poor or fair condition (Figure 8). Poor condition means that the market does not function as commercial facility.



**Figure 8.** Conditions of canteens and home stays at Samalona Island, Makassar City (a), small shop at Bonetambu Island, Makassar City (b-c), and small shop at Barranglompo Island Makassar City (d-e)

The main occupations of the community were fishermen, fish cultivators and fish processors (Figure 9). The sources of income came from fish fishing, with family income generally less than one million rupiah per month. Generally, monthly family income was equal to monthly expenditure, so the family certainly did not have money for saving. The community generally works as fishermen. Fishing gear used by fishermen generally own property, which consists of a boat with or without motor powered, with fishing gear generally was fishing rods, nets, and light fishing. Fish catch production were generally fish and sea cucumber. The operational costs of fishing activities were ranging from 20,000 to 300,000 rupiah per trip. Based on this production cost, the business scale was classified micro and small scale. The product marketing was directly to the market by price bargaining system, and paid in cash. Cooperatives have not important role in the production and marketing process. Post-harvest processing was still very limited, only fish drying processing performed by women. The product sold directly to the market. Cooperatives have not played a role in the post-harvest processing



**Figure 9.** Condition of fishing boats at Barranglompo Island, Makassar City (a), floating nets at Bonetambu Island, Makassar City (b), fish trap maker at Bonetambu Island, Makassar City (c), and fish drying at Pasi Island, Selayar Regency (d)

### 3.5. Infrastructure

The infrastructures found in the study areas were water sources, power plants, jetty and roads. The condition of clean water sources varied from poor to good condition (Figure 10). Clean water was generally come from the rainwater collection. Problems of sanitation and clean water needed serious attention. On a small island, electricity generally was provided by the local community. On the other hand, on a rather large island, electricity was provided by state electricity company in sufficient

quantities (Figure 11). The jetty (Figure 12) and road (Figure 13) conditions were generally fair to good. Jetty generally made of wood.



**Figure 10.** Water distillation at Pasi Island, Selayar Regency (a) and wells at Samalona Island, Makassar City (b)



**Figure 11.** Generator set at Langkadea Island, Pangkep Regency (a), the generator set at Pulau Pannambungan, Pangkep Regency (b), State electricity company at Barranglompo, Makassar City, and generator set at Pulau Pasi, Selayar Regency



**Figure 12.** Jetty condition at Langkadea Island, Pangkep Regency (a), Pannambungan Island, Pangkep Regency (b), Barranglompo Island, Makassar City (c-d), and Samalona Island, Makassar City (e)



**Figure 13.** Road conditions on the Panambung Island, Pangkep Regency (a), Barranglompo Island, Makassar City (b), Pasi Island, Selayar Regency (c-d), and Benteng Beach, Selayar Island, Selayar Regency (e)

### 3.6. Strategic Conditions

Strategic condition was formulated and divided using SWOT classification; i.e., strength, weakness, opportunity, and threats. Five strengths have been identified for developing marine ecotourism in South Sulawesi, namely: (1) high potential of coral reefs and mangrove forests; (2) available potential labour, (3) availability transportation facilities, (4) potential micro, small and medium business; and (5) government good political will.

Seventeen weaknesses of marine ecotourism development in South Sulawesi, namely: (1) limited community capital venture, (2) low skills of the community to develop marine ecotourism activities; (3) limited facilities and infrastructure to support marine ecotourism activities; (4) less promotion of marine ecotourism site; (5) poor availability of fresh and drinking water; (6) poor business information and technology development; (7) existing illegal fishing activities and reef stone mining, (8) non-functioning of community economic institutions, especially cooperative in supporting small and medium enterprise development; (9) low capacity and participation of local community to formal



institutions; (10) degradation of water quality and low environmental and legal awareness of local community; (11) coastal pollution by domestic wastes; (12) facilities and the quality of community health services is still limited; (13) less coordination and cooperation between relevant agencies; (14) low-income communities and the level of poverty was still high; (15) low quality and level of education, and (16) sanitation and environmental health were poor; and (17) law enforcement against violations of regulations and the use of fishing gear (bomb/cyanide).

Six opportunities to develop marine ecotourism in South Sulawesi, namely: (a) capital/revolving fund from the government, (2) government development policy support for small islands and coastal areas; (3) government priority on coastal development issue; (4) increase attention in marine ecotourism; (5) global awareness increase in sustainable development, and (6) Law No. 32 of 2004 on Regional Autonomy.

Five threats in developing marine ecotourism in South Sulawesi, namely: (a) intensifying of coastal environment degradation, (2) coral reefs and mangrove forests degradation; (3) increased of housing land that cause slums area and decreased the environment carrying capacity and slums; (4) increased demands environmentally friendly products, and (5) decrease wood supply capacity for small boat manufacture.

### 3.7. Development Strategy

Three top score for S-O development strategy were: (1) site development for marine ecotourism (5.00); (2) development of tools and infrastructure for marine ecotourism (4.25), and (3) development of infrastructure transport (4.00). Three top scores W-O development strategy is: (1) improvement of human resources quality (7.25); (2) venture capital development (7.00); and (3) environmental awareness development (5.25). Three top scores for S-T development strategy were: (1) coral reefs conservation (6.75); (2) community-based ecosystem rehabilitation (5.00); and (3) mangrove forests conservation (4.75). Three top scores for W-T development strategy weights were: (1) mangrove ecosystem rehabilitation and development of marine protected areas (4.75); (2) Formal education program development related to coastal and marine resource management (3.25); and improving quality of human resources to support marine ecotourism activities (3.00).

### 3.8. Policy Strategy

Base on hierarchy process analysis by using strategic policies criteria and the five alternatives, namely natural and marine resources, socioeconomic, infrastructure, institutional, and micro-small-medium scale business and cooperative, it was formulated some alternative policies. There were three strategies which were nearly equal in value, namely S-O, W-O and W-T development strategy (Table 2). The three developments strategic policy should be given more priority to optimize the natural and marine resources utilization in marine ecotourism development in South Sulawesi.

**Table 2.** Development Strategy Interaction

Strategy			
S - O	W - O	S - T	W - T
0.344	0.292	0.114	0.249

Base on hierarchy process analysis for each alternative development criteria, it revealed that: (1) natural and marine resource management, and infrastructure should be the priority for S-O development strategy (using the strength to seize opportunity), (2) natural and marine resources development, and micro, small and medium scale business and cooperatives should be the priority for W-O development strategy (overcome weakness to seize opportunity), (3) natural and marine resource management, and institutional strategy development should be the priority for S-T development strategy (using the strength to face the challenges), and (4) natural and marine resource management, and socioeconomic should be the priority for W-T development strategy (overcome weakness to face

the challenge) (Table 3). These indicate that the key point for marine ecotourism development was optimizing the utilization of natural and marine resources.

**Table 3.** Development Strategy Interaction Based on Group Alternative

Alternative	Strategy			
	S - O	W - O	S - T	W - T
Natural and marine resources	0.434	0.406	0.545	0.404
socioeconomics	0.057	0.160	0.071	0.276
Infrastructures	0.280	0.063	0.071	0.073
Institution	0.170	0.097	0.241	0.173
Micro, small and medium scale business and cooperatives	0.059	0.275	0.071	0.173

#### 4. Discussion

Marine ecotourism development in South Sulawesi, Indonesia can be optimized through expansion strategy (S-O) and consolidations strategies (W-O, S-T and W-T). The S-O strategy should be focused on optimum utilization of natural and marine resources [18-21]. The government must contribute in promoting existing ecotourism objects to attract tourists. Meanwhile, the community must be actively involved in preserving the ecosystem of coral reefs, mangroves and sea grass beds [22-25]. One of the effective ways to promote tourist objects during the Covid-19 outbreak is virtual tourism.

The W-O consolidation strategy should be focused on improvement tools for natural and marine resource utilization [11, 16, 26, 27]. This strategy is very important because many natural and marine resources were under pressure due to over-exploitation. In addition, conservation efforts also need to be improved to ensure that natural and marine resources as ecotourism objects can be used sustainably. To improve service and comfort to tourists, the role of economic institutions needs to be increased. The government and society must jointly develop micro, small, medium and cooperative business institutions [9, 11, 16, 28].

The S-T strategy should be focused on sustainable use of natural and marine resources [18-20, 29-33]. The increasing awareness of the world community about the importance of sustainable development can be a threat to ecotourism if ecotourism managers do not pay attention to the aspects of natural and marine resource sustainability. The S-T strategy should be focused on economic institutional strengthening based on local business characteristics [28, 34]. One of the important aspects in ecotourism is the use of local resources. Therefore, the use of local resources, such as labor and food raw materials, should be prioritized locally available. The S-T strategy should be also focused on infrastructure development [11, 16]. The existing infrastructure in the water area has its own characteristics, namely whether it is used or not, it will be damaged quickly. Therefore, maintenance and development of infrastructure need to be carried out continuously to support the smooth running of ecotourism activities.

The W-T consolidation strategy should be focused on rational use of natural and marine resources [35], policies and sustainable principle and policy implementation [20, 36-38]. Low ability in managing natural and marine resources, limitations in implementing ecotourism management regulations and policies [9] can be a serious threat to the sustainability of ecotourism management.

#### 5. Conclusions

The study revealed that marine ecotourism development problem was: (1) low capacity in natural and marine resources management; (2) low local community participation caused by low social economic condition; (3) limited infrastructure availability; (4) weak capacity of local community institutional, and (5) insufficient local community support or contribution on marine ecotourism activities caused by poor local community ability in managing local business opportunity. Marine ecotourism development should be focused on tools improvement of sustainable use, infrastructure development, socio-economic strengthening, and consistent policy implementation.

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