Economics
2019; 8(1): 35-43
http://www.sciencepublishinggroup.com/j/eco
doi: 10.11648/j.eco.20190801.15
ISSN: 2376-659X (Print); ISSN: 2376-6603 (Online)

Integrated Carrying Capacity of the Marine Tourism Area and Small Island of Mandeh Region and Their Impact on Economic Growth

Ansofino[1], Sari Lenggogeni[2], Zusmelia[3]

[1]Economic Education Department, STKIP PGRI West Sumatra, Padang, Indonesia
[2]Economic Department, Economic Faculty, Andalas University, Padang, Indonesia
[3]Sociology Education Department, STKIP PGRI West Sumatra, Padang, Indonesia

Email address:
ansofino@stkip-pgri-sumbar.ac.id (Ansofino), lenggogeni_sari@yahoo.com (S. Lenggogeni), zusmelia@stkip-pgri-sumbar.ac.id (Zusmelia)

To cite this article:
Ansofino, Sari Lenggogeni, Zusmelia. Integrated Carrying Capacity of the Marine Tourism Area and Small Island of Mandeh Region and Their Impact on Economic Growth. *Economics.* Vol. 8, No. 1, 2019, pp. 35-43. doi: 10.11648/j.eco.20190801.15

Received: January 24, 2019; **Accepted**: March 12, 2019; **Published**: April 1, 2019

Abstract: Mandeh marine tourism area is one of the most exotic tourist destination in the West coast of Sumatra with increasing numbers of visits from time to time. The balance and carrying capacity of the environment need to be observed since this area is a fishing ground for source of income of local fishermen. The condition of natural resources, environment and the carrying capacity of the Mandeh tourism area become the focus of this study. This study uses regional and environmental economic approaches with an analysis of integrated carrying capacities. The pressure on land resources in the Mandeh Tourism area is still lower than its carrying capacity which is shown by the positive value of 3.20. The carrying capacity for food supply and beverages is categorized as low. This will lead to high pressure on the ecosystem capacity in this destination area. The high pressure on the Mandeh watershed is one of the consequence in order to pursuing economic growth from the tourism sector. This is lead to increasing of the pollution and environmental degradation as an acceptable side (side effect of economic growth) from the desired economic growth of tourism.

Keywords: Carrying Capacity, Marine and Small Island Tourism, Economic Growth

1. Introduction

There is an increase of global awareness on the sustainable development, but in some aspects that the availability of natural resources and environment continues to decline due to tourist activities in the tourism area generally [1, 2]. An awareness of the conditional volatility inherent in monthly international tourist arrivals and techniques for modelling such volatility are vital for a critical analysis of small Island tourism economics, [3] which depend heavily on tourism for their macroeconomic stability. This global phenomenon has also occurred in Indonesia's tourist areas, especially in Mandeh as small island tourism destination. The primary focus of many bioeconomic models is the negative consequence of conservation for economic activities adjacent to coastal fishing ground and tourism. [4]. However, increases in the number of tourists at environmental attractions can put pressure on that environment [5], the environment often possesses the characteristics of a public good or a common access resource. This has caused concerns about compliance costs within the tourism activity, [6].

Mandeh tourism area is located in Koto XI Tarusan sub-district and one of the main destination for tourism in South Pesisir regency. South Pesisir Regency has a strategic tourism areas consisting beautiful small islands, root bridges and waterfalls located in Bayang and Nort Bayang sub-districts, [7] Mandeh tourism area is covering of 18,000 ha including destination islands such as Kapo-kapo, Sironjong, Setan Kecil and Setan Besar island, (see map Mandeh area, figure 1).

The area of South Pesisir Regency is 5,794.95 km^2 or 13.70% of the area of West Sumatra Province. The costal area of this regency is 84,312 km^2 with 47 islands with 23 of them belongs to Koto XI Tarusan sub-district. Some of them are part of Mandeh tourism areas and have a coastline

of 234 km and 19 rivers that feed into the West coast of Sumatera.

Land use type in the South Pesisir regency is still dominated by protected forests which reaches 54.80% while the use for cultivation and other use areas reaches 45.20%. The forest usage is divided into limited production forests (HPT) and forests conversion production (HPK). The pressure on protected forest areas will be very high in the future given the rapid development in the agricultural sector and the tourism sub-sector in the South Pesisir Regency.

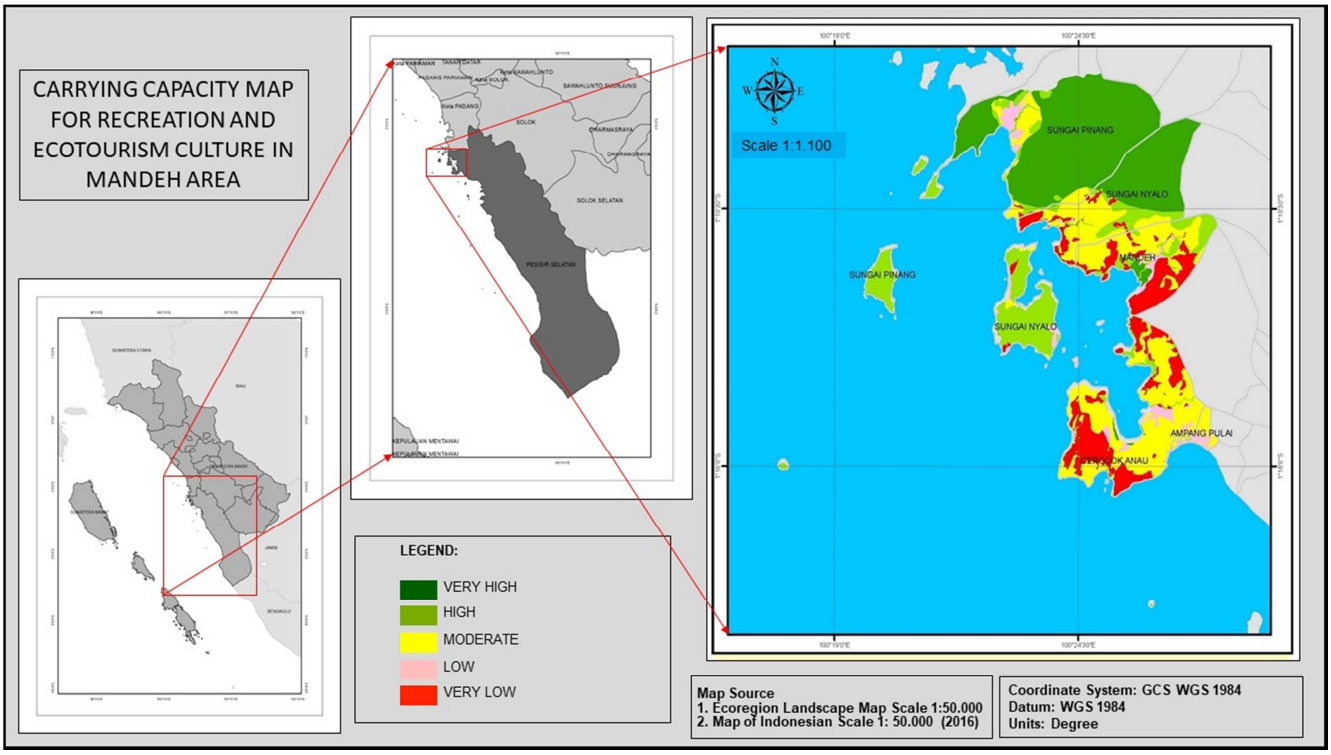


Figure 1. *Carrying capacity map for recreation and ecotourism culture in Mandeh Area.*

The composition of non-paddy agricultural land use in the South Pesisir regency itself is also large which reaches 618.32 km^2 or 11.23% of the agricultural land use. The largest portion of the non-paddy agricultural land is more dominant in Mandeh area that mainly used for community forests and state forests as protected forests. This pressure on forest resources will be even higher with population growth. This will lead to the opening of forest land for community forests in the future. Mandeh area which is located in Koto XI Tarusan sub-district has a population density of 114 people/km^2 which has exceeded the average population density of the South Pesisir Regency

The high population density in South Pesisir regency and specially Mandeh tourism areas will suppress the availability of land resources for the living space in the future. If the occupation of the population is dominated by the agricultural sector then the pressure on land resources especially the use of land for community and state forests will be increasing in the future. Therefore there is a need to study of the environmental carrying capacity of land use in Mandeh tourism areas.

This study perhaps will help the pressure on non-agricultural land use in the form of community forests will not expand to protected forests. Protected forest has function as a counterweight to the ecosystem in Mandeh tourism area in particular. In order to study the situation above than the research questions can be arrange as: 1) Is the potential of natural resources and the environment able to accommodate increasing tourism activities in the Mandeh tourist area? 2) How is the carrying capacity provide tourism ecosystem services in this area? 3) How can the control be carried out in this area in order to balance the carrying capacity?

2. Method

This study uses a environmental and regional economic approach. The types of data used are primary and secondary data. Primary data collection is carried out through interviews with various tourism actors, while secondary data is collected through ground check to the field and data supply agencies such as the environmental office and the South Pesisir regency statistics agency. Measurement of renewable natural resource availability using carrying capacity [8-11], and an analysis of the carrying and assimilative capacity for tourism ecosystem services [12].

Table 1. *Evaluating indicator system of integrated carrying capacity of Marine Tourism Area and Small Island in Mandeh Tourism Region.*

Level 1 Indicators	Level 2 Indicator	Indicator of reflecting supply-demand	Level 3 indicators
Carrying capacity of natural resourec's	Carrying capacity of land	pressures	Population density
		Supporting capacity	Percapita residential area Percapita industrial area Percapita tourism area Rensidential area Percapita area of building land Regional land area Percapita agricultural land Percentage of land not used
	Carrying capacity of water resources	Pressures	The amount of water consumption per capita Amount of water for irrigation purposes
		Supporting capacity	Amount of water consumption per unit of GDP The amount of fresh water per capita availability annual rainfall amount
	Carrying capacity of eco-environment and energy sources	Pressures	Numbers of household that have not been electrified The amount of water consumption per business unit
		Supporting capacity	The amount of energy consumption per household Cultivation land area Forest cover land area Percentage of waste treated Percentage of household that have rubbis bin
Carrying capacity of artificial environment	Carrying capacity of infrastructures	Pressures	The numbers of passengers per public vehicle
	Carrying capacity of social facilities	Supporting capacity pressures Supporting capacity	Distance of centre activity to the city Numbers of student per thousand residents Numbers of arable land per household Numbers of medical personal per thousand population

Sources: Modified from Wen and Zhu, (2015).

3. Result and Discussion

Sustainable tourism development in an economic perspective is related to the concepts of weak and strong sustainability. Weak sustainability in environmental economics measurement is a carrying capacity of economic assets derived from natural resources, while strong sustainability emphasizes the decreasing the limit of the carrying capacity of ecological assets. [2]

The indicator for this measurement is mainly the measurement of the ability level to have rapid recovery due to degradation. For instance is the ability to quickly recover after experiencing a decrease in providing environmental services.

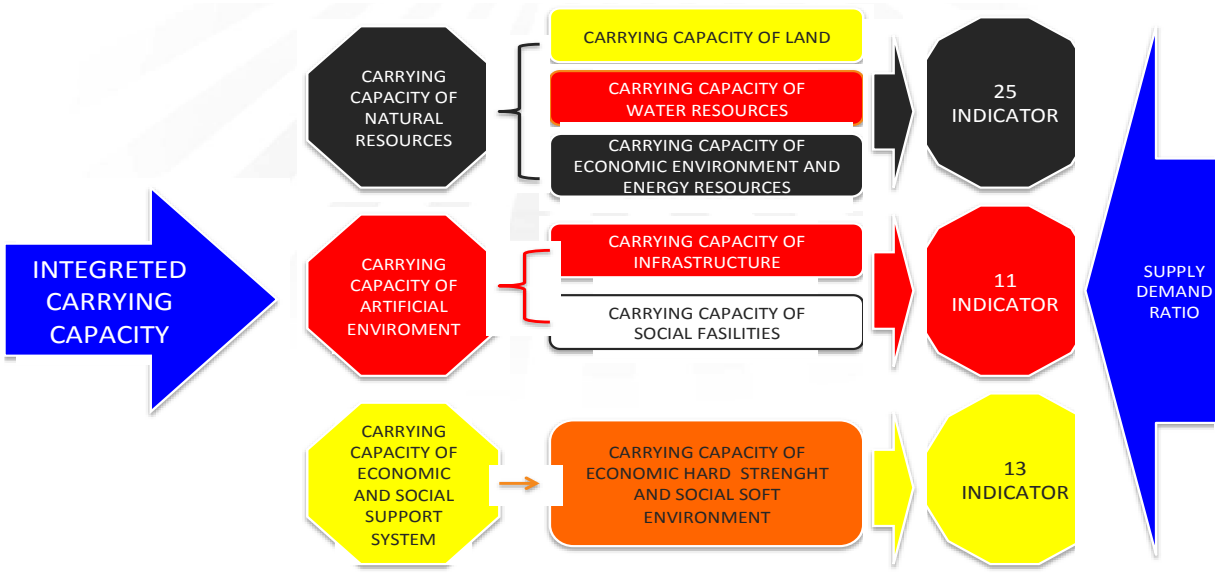


Figure 2. *Indicators for carrying capacity Measurement of Mandeh tourist area.*

Figure 2 shows that the analysis of carrying capacities was carried out by an integrated carrying capacity analysis between carrying capacity of natural resources and environment, carrying capacity of artificial environment and carrying capacity of economic and social systems.

Resilience is related to indicators of biological diversity because it is considered as a function of diversity. In a systems that depend on agriculture it means the ability and variability of the results obtained [13]. In addition, strong sustainability is a measurement of carrying capacity that is related to the ratio of supply with the demand of natural resources. In this study we used the ratio between the supply of natural and environmental resources that support tourism activities in Mandeh tourism areas with the use of natural and environmental resources carried out by tourist visitors.

Weak Sustainability analyzes the substitution ability of natural and manufacturing resources with measurement focus on green national income and genuine saving. The environmentally friendly national income means that economic benefits generated after deducting the costs of environmental degradation that occur in the exploitation of natural resources and environment. This means that the measurement of national income that has taken into account the social costs due to the decline in environmental functions and degradation of the ecosystems in development sites that have produced economic benefits.

3.1. Carrying Capacity for Economic Resource's and Socio-Cultural Environment

Carrying capacity for economic resources and socio-cultural environment includes population size, per capita income, percentage of the working population age on the total population, the number of workers available at the end of the year, and the number of technologies and patents produced each year. All of these have become indicators for carrying capacity in economic and socio-cultural resources in the area of tourist destinations.

Table 2. *The result of carrying capacity measurement in Mandeh Area.*

Level Indicators carrying Capacity	Pressure	Supporting Capacity	Integrated carrying capacity
carrying capacity of land	34,07	1694,34	3,20(0,22)
carrying capacity of water	144,70	19,157	32,24(1,24)
carrying capacity eco-environment and energy sources	18,24	726,62	169,06(5,60)
carrying capacity of infrastructure	420,7	10	0,29(0,18)
carrying capacity of social fasilities	177,62	10,48	26,30(4,03)
Carrying capacity of economic hard strenght and social soft environmnet	Economic growth:5,3 GDP percapita: IDR 2,35 million Open unemployment rate : 11,69%/year		

Source: Research result, 2017

Table 2 shows that the carrying capacity of land resources in Mandeh tourism area is far greater than the pressure, therefore the integrated land carrying capacity is still have a positive value with reaching 3.20. However, in the watershed area of Mandeh that the pressure on carrying capacity (ratio of use) has begun to be high with the value of integrated carrying capacity is positively approaching 1.00. The high pressure is the carrying capacity of infrastructure indicator, social facilities and the availability of clean water for drinking and sanitation. While the greatest support capacity for sustainable tourism development in the Mandeh area comes from the carrying capacity of energy and land resources.

Table 3. *Types of ecosystem services in Mandeh tourism area.*

No	Ecosystem services	Type	CC *	C**
1	*PROVISIONING*	1. Food 2. Clean water 3. Fiber 4. Fuel, wood 5. Genetic resources		
2	REGULATING	1. Climate regulator 2. Regulating water and flood 3. Natural hazard prevention 4. Water purifying 5. Processing dan decomposition of waste 6. Air quality maintance 7. Regulating natural pollination 8. Pest and disease control		
3	CULTURAL	1. Living space *(sense of place)* 2. Recreation and ecotourism 3. Natural beauty 4. Knowledge and education 5. Culture, custom and style 6. Spiritual and heritage		

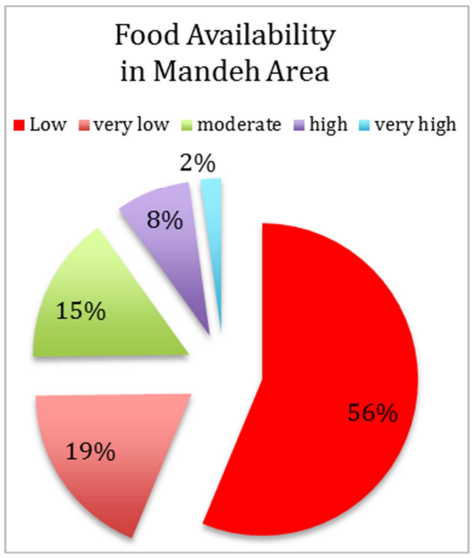
No	Ecosystem services	Type	CC *	C**
4	SUPPORTING	1. Soil farmation and fertility 2. Nutrient cycle 3. Primary production 4. Biodiversity 5. Flora and fauna habitat		

Source: P3ES Sumatera (2017). * CC (Carrying Capacity), C (Capacity)

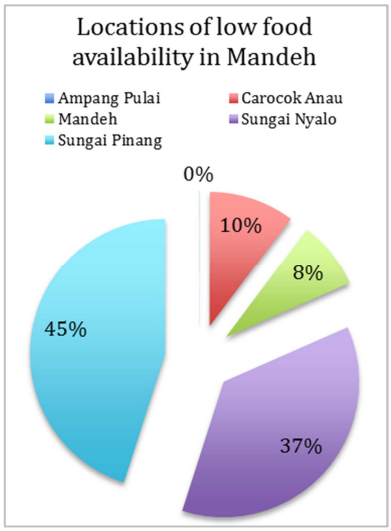
There are four types of ecosystem services that will affect the carrying capacity in Mandeh tourism areas namely: provisioning, regulatory, cultural and support services. The most sensitive one in this area is a cultural and provision service since they are related to the ability of the environment to accommodate increasing tourism activities. Whereas the supporting services such as biodiversity and primary products such as fishermen haul are the indicators of environmental carrying capacity that are the most sensitive to the sustainability of tourism activities in Mandeh tourism areas.

The type of ecosystem for regulatory services is an important indicators for the sustainability of tourism activities including climate regulation and disaster prevention since this area is a protected and forest conservation area. Some of the indicators on ecosystem services are an absolute requirement for the Mandeh area in order to regulate the ecosystem services needed in carrying out tourism activities. The following will discuss each important indicator that influences the carrying capacity of the environment in tourism service activities in the mandeh region.

Figure 3a shows that food availability in the Mandeh area is in the low and very low category which reaches 56% and 19% respectively, while the rest is medium, high and very high. This condition will be more difficult and severe if there is a surge of domestic and foreign tourist arrivals to the Mandeh tourist destination. In Figure 3b shows that the area that affected on the heavy pressure for food supply was in the Nagari Nyalo River and the Nagari Pinang River. While these two locations are one of the tourism destination.



(a)



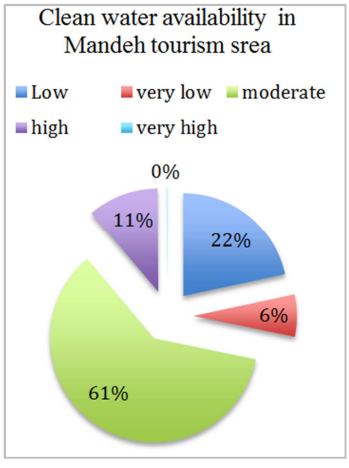
(b)

Figure 3. *(a) Food availibity in Mandeh area (b) locations of low food availibity in Mandeh.*

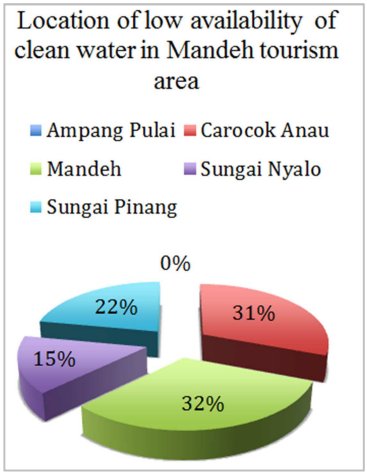
3.2. Carrying Capacity of Water

The pressure on the water resources availability has been seen to be higher than its carrying capacity since the total availability of water is still much greater and the groundwater availibity has not taken into account. This condition will still able to be offset by the availability of ground water as clean water source for domestic purposes.

In Figure 4a illustrates the availability of clean water for drinking and sanitation is in the medium and low category which reaches 61% and 22% respectively. Figure 4b explains that the lowest water supply is in the Mandeh, Pinang and Nyalo Rivers.



(a)



(b)

Figure 4. *(a) Water availabity in Mandeh tourism area (b) locations of low availabity of water in Mandeh tourism area.*

Carrying capacity for energy resources and environmental economics also still shows a positive value of 169.06 while its usage ratio is much smaller which only reaches 5.60. This means that the supply of energy resources such as electricity and fuel is still available. The pressure on environmental and energy resources in the Mandeh region is much lower than the carrying capacity (18.24) while the its carrying capacity reaches 762.62. This means that the high level of water and energy consumption (such as electricity) can still be supported by its availability.

3.3. Carrying Capacity of Infrastructure and Social Facilities

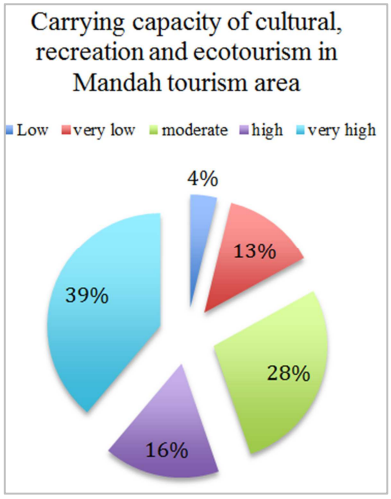
Carrying capacity of infrastructure in Mandeh tourism areas has a low value since the pressure is higher than the supply. It means that the demand for infrastructure needs such as roads, vehicle modes and sea transportation is higher than the provision. Therefore, the sustainability of transportation services and supporting facilities is still lower compared to the needs of tourists who come to the area. It need to increase the access to Mandeh tourist destinations. Accessibility is not just transportation, road facilities and infrastructure but also includes sea transportation facilities to the Mandeh area.

The West Sumatra provincial government is building a highway to connects Padang coastal tourist destinations with the Mandeh area. The road will interconnected the Mandeh area to Muaro Padang, Muaro Lasak Beach and Air Manih Beach. This interconnection is important since Padang City, South Pesisir Regency, Padang Pariaman Regency and Pariaman City are pointed as the main tourist destinations of West Sumatra Province. [14]

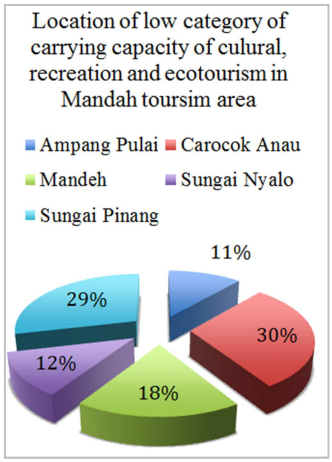
The demand for infrastructure needs especially public transport infrastructure and road facilities is much higher at point of 4207 compared to the ability to supply it with a carrying capacity of 10. This means that in the future that the economic sector of tourism in the Mandeh area needs the existence of public infrastructure for land and sea transportation systems will be higher. In the initial phase, this infrastructure development is needed to support tourism activities in the Mandeh area.

Carrying capacity of social facilities has much higher pressure where the demand for the number of skilled workers in tourism services such as tourist operators, craftsmen for souvenirs represented by the number of people who attend school and have skills as well as health services is much higher than the provision. This is lead to the pressure on the supply is far greater than the demand. With the increasing number of visits, there is the need for social facilities such as skilled workers with the number of people attending school and medical personnel in hospitals will increase while the provision is much smaller than the demand. This is in turn will lead to a decline in social service functions in the area as the increasing of tourist activity in this area.

Figures 5a and 5b illustrate that the carrying capacity of recreational, cultural and ecotourism services in the Mandeh area is very high which reached 39% and the medium category reached 28%. This means that the recreational culture and ecotourism services have a high potential for carrying capacity, especially in the Carocok anau and Pinang River villages.



(a)



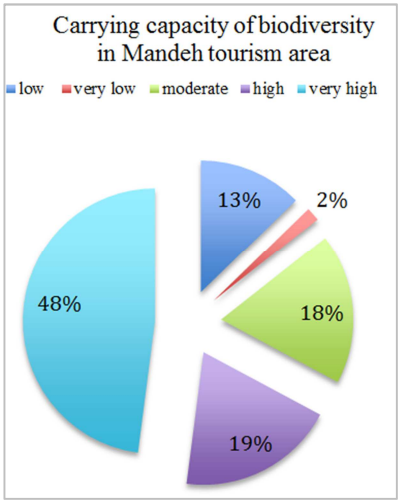
(b)

Figure 5. *(a) Carrying capacity of cultural, recreation and ecotourism in Mandeh tourism area (b) locations of low category of carrying capacity of cultural, recreation and ecotourism in Mandeh tourism area.*

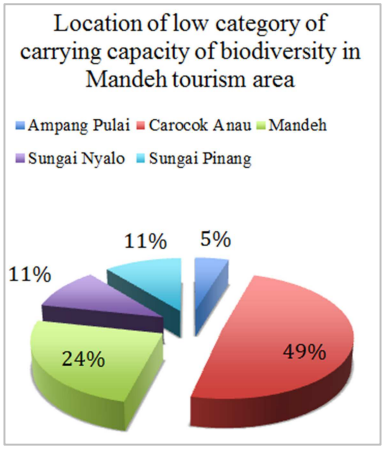
3.4. Carrying Capacity of Eco-Environment and Energi Source's

Carrying capacity of economic and social environment that supports increasing of tourist arrivals in the Mandeh area is relatively moderate. It shows that the economic growth of South Pesisir regency reaches 5.3% with an unemployment rate of 11.69% and per capita income of the population is Rp 2.35 million. These condition has not been able to encourage and mobilize tourism sector from internal factors.

The creative economy to support tourism services has not been well developed. This lead to low expenditure level of visitors and most of them only spend their touristic activity less than 24 hours. Most of visitors is the youth who normally still in school and do not have a permanent job yet. The implication of this is that the demand for creative industrial goods is relatively low with the average expenditure of tourists in area is less than Rp 685,714/ day.



(a)

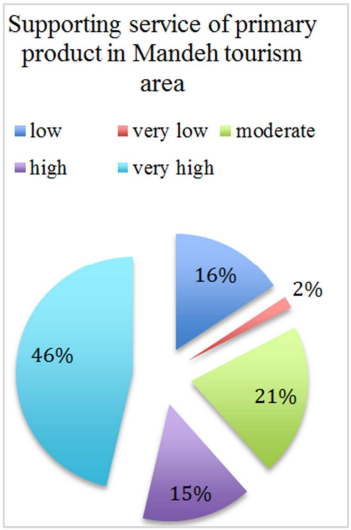


(b)

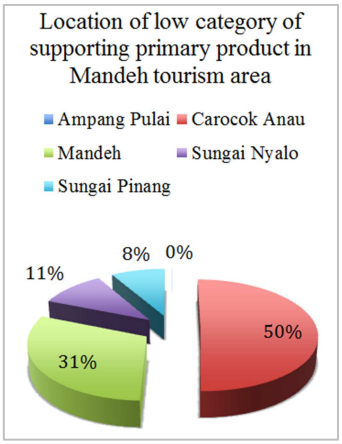
Figure 6. *(a) Carrying capacity of biodiversity in Mandeh tourism area (b) locations of low category of carrying capacity of biodiversity in Mandeh tourism area.*

Biodiversity support services in the Mandeh tourism area is dominated by very high and high categories, see figure 6. This is because of the area is a mountainous land and coastal stretch over grown with mangrove forests that is a valuable source of biodiversity, fishing area and climate stability. There is a big pressure on the threat of biodiversity in the Carocok Anau Nagari and Mandeh Nagari with respectively reach 49% and 24%. Therefore, the preservation of mangrove forests in Mandeh and Carocok Anau needs a great attention.

Supporting services of primary products especially in marine products is one of the most important indicators for sustainability since this area is the source of livelihood of most fishing communities such as the Nyalo River, Pinang River, Mandeh. Figures 7a and 7b show that for supporting services of primary products is in the very high, medium and medium category while the lowest carrying capacity of primary products is found in the Carocok Anau and Mandeh villages. The total production of fish by fishermen in the Mandeh region in 2016 reached 1.47 tons that equal to 760 kg per household and this number was categorized as low. This condition still lead the poverty of the population whose livelihood is fishermen in the area.



(a)



(b)

Figure 7. *(a) Supporting service of primary product in Mandeh area (b) locations of low category of supporting service of primary product in Mandeh tourism area.*

Figure 7b shows that the Carocok Anau and Mandeh are the nagari which provide the lowest primary products both for fish and food production. This is due to the decline in mangrove forests which is a place for source of fishermen's income.

Table 4. *Ecosystem service provision in Mandeh tourism area.*

Ecosystem service	Indicator	Ecosystem service group	Availability
Provisioning	Food supply	Carrying capacity	Low and very low
	Clean water (Surface Water and Groundwater)	Carrying capacity	Very low
	Fiber (marine, agricultural, forest product)	Carrying capacity	High and very high
	Fuel, Wood and fossil fuel	Carrying capacity	High and very high
	Genetic resource	Carrying capacity	High and very high

Source: Research result (2018)

Table 4 provides information that from the five indicators of provision ecosystem services that the provision of food and clean water services area still low, while in other types of supply categorized as high and very high. Therefore, the preservation of this very high indicator of supply services needs to be maintained.

Table 5. *Ecosystem services for regulating in Mandeh tourism area.*

Ecosystem services	Indicator	Ecosystem service group	Availability
Regulating	Regulating climate (temperature, moisture, rainfall, carbon sequestration)	Assimilative capacity	High and very high
	Water system and Flood prevention Pengaturan (hydrological cycle, groundwater)	Assimilative capacity	High and very high
	Hazard prevention (infrastructure)	Assimilative capacity	High and very high
	Water purifying	Assimilative capacity	High and very high
	Waste treatment and decomposition	Assimilative capacity	High and very high
	Air quality	Assimilative capacity	High and very high
	Natural pollination and pest & disease control	Assimilative capacity	High and very high

Source: Research result (2018)

Table 5 shows that all the indicators of ecosystem regulation services in Mandeh tourism areas are in the very high. This is because of the region is part of protected forest area and but still prone to coastal and seawater pollution. Therefore, in pursuit of economy's size and growth rate are constrained by the carrying capacity of the earth, the sustainable yield / flow of renewable resources and the assimilative capacity of the environment.[15].

Table 6. *Ecosistem Services for cultural in Mandeh toursim area.*

Ecosystem services	Indicator	Ecosystem service group	Availability
Cultural	Sence of place	Carrying capacity	Very low and moderate
	Recreational & Ecotourism	Carrying capacity	High and very high
	Natural beautiness	Carrying capacity	High and very high
	Knowledge and education	Carrying capacity	High and very high
	Cultural, custonm, spritual life and local heritage	Carrying capacity	High and very high

Table 6 above shows that the measurement of indicators for living space as part of cultural ecosystem services are in the very low and medium category. This means that the living space in area is very low in carrying and assimilative capacity. Therefore that this area is carried out residential development and hotel facilities that some how will disturb the sustainability of its ecosystem services. While other indicators are in the high and very high category.

Table 7. *Supporting ecosystem services in Mandeh tourism area.*

Ecosystem services	Indicator	Ecosystem service group	Availability
Supporting	Soil formation and fertility	Carrying capacity	Very low and low
	Nutrient cycle for agricultural	Carrying capacity	High and very high
	Primary production	Carrying capacity	High and very high
	Biodiversity	Carrying capacity	High and very high
	Flora and fauna habitat	Carrying capacity	High and very high

Soutce: Research result (2018)

Based on table 7 that only indicators of soil formation and soil fertility are in the very low and medium categories while the rest are in the very high category. This shows the degree of importance of indicator of the ecosystem in Mandeh tourism area's is very necessary to get high attention from decision makers who is responsible for managing the use of

ecosystem services in Mandeh tourism destination area.

4. Conclusions

Based on the study we would like to point out several conclusions as:

1) The potential of natural and environmental resources in Mandeh tourism areas is still largely able to provide ecosystem services for regulation, support services and cultural services, while for provisioning services begin towards an imbalance between pressure and supply.
2) The carrying and assimilative capacity for all ecosystem services related to tourism services in general is still far greater than the pressure. The increasing number of tourist visit that the provision of infrastructure, public services for tourism activities will lead to the imbalance of ecosystem services in the future, especially for biodiversity and primary production support services.
3) The high pressure on the Mandeh watershed area is part of consequence of pursuing economic growth from the tourism sector will lead to increased pollution and degradation of natural resources. This is part of a side effect of economic growth from the desired economic growth of tourism sector. However, when the area has reached a high standard of living, then the community will pay attention to environmental attractiveness.

5. Implication

Based on the findings and conclusions, the implication of the result of the research for the contribution of the progress of methodology is the need to analyzed carrying capacity using efficient measurement from environment economics, such as the measurement of bio-diversity index to determine the ability to support and accommodate tourist area.

Acknowledgements

This research was successfully carried out with the help of several parties. Thanks you to control-centre for the development of west Sumatra eco region (P3E) Sumatra's which has funded and facilitated data collection for this research. To head of the environmental services of West Sumatra province and south coastal district who provided data and critical correction. Thanks also to tourism operator in Mandeh tourism area, who have been willing to take time to interview in sharping the subject matter that was discussed in the result seminar.

References

[1] World Economic Forum-WEF, *The Travel & Tourism Competitiviness Report 2017: Paving the way for a more sustainable and inclusive future*, Insight Re. Geneva, Swiss: World Economic Forum, Geneva, 2017.

[2] X. Wang, "Notice of Retraction The Research of Ecotourism Carrying Capacity," *Manag. Serv. Sci. 2009. IMASS'09. Int. Conf. on. IEEE, 2009*, pp. 1–4, 2009.

[3] R. Shareef and M. Mcaleer, "Volatility in International Tourism Demand for Small Island Tourism Economies," *Sites J. 20Th Century Contemp. French Stud.*, 2016.

[4] B. Bednar-Friedl, D. a. Behrens, and M. Getzner, "Optimal Dynamic Control of Visitors and Endangered Species in a National Park," *Environ. Resour. Econ.*, vol. 52, no. 1, pp. 1–22, 2012.

[5] T. Huybers and J. Bennet, " Environmental management and the competitiveness of nature-based tourism destinations," *Environ. Resour. Econ.*, vol. 24, pp. 213–233, 2003.

[6] M. I. Eraqi, "Ecotourism Resources Management as a Way for Sustainable Tourism Development in Egypt," *Tour. Anal.*, vol. 12, no. 1, pp. 39–49, 2007.

[7] Ansofino, "Potential Attraction of Tourism in the Economic Development of West Sumatra," *Econ. STKIP PGRI West Sumatra*, vol. 1, no. 1, pp. 1–15, 2012.

[8] D. Pearce, K. Hamilton, and G. Atkinson, "Measuring sustainable development: progress on indicators," *Environ. Dev. Econ.*, vol. 1, no. 01, pp. 85–101, 1996.

[9] A. M. O'Reilly, "Tourism carrying capacity. Concept and issues," *Tour. Manag.*, vol. 7, no. 4, pp. 254–258, 1986.

[10] M. D. Needham, R. L. Ceurvorst, and J. F. Tynon, "Toward an Approach for Measuring Indicators of Facility Carrying Capacity in Outdoor Recreation Areas," *J. Leis. Res.*, vol. 45, no. 3, pp. 345–366, 2013.

[11] J. C. Hallo and R. E. Manning, "Analysis of the social carrying capacity of a national park scenic road," *Int. J. Sustain. Transp.*, vol. 4, no. 2, pp. 75–94, 2010.

[12] K. Arrow, B. Bolin, R. Costanza, P. Dasgupta, C. Folke, and C. S. Holling, "Economic growth, carrying capacity, and the environment," *Environ. Dev. Econ.*, vol. 1, no. 1, pp. 104–110, 1996.

[13] K. Wen and E. Zhu, *Report on Development of Beijing, Tianjin, and Hebei Province (2013)*. 2015.

[14] Ansofino, "The Development of the West Sumatra Economic Corridor as a Strategy to Strenghten Connectivity with the Economic of ASEAN Countries," *Econ. STKIP PGRI West Sumatra*, vol. 4, no. 2, 2016.

[15] E. Bailey and R. Richardson, "A new economic framework for tourism decision making," *Tour. Hosp. Res.*, vol. 10, no. 4, pp. 367–376, 2010.