Indeks Kesesuaian Wisata dan Daya Dukung Ekowisata Pantai Pasir Putih di Kota Manokwari Papua Barat

Carrying Capacity and Suitability Indexs of Pasir Putih Beach for Ecotourism designation in Manokwari West Papua

Sahirudin[1], Wahyudi[1,2*], Paulus Boli[1,3]

[1]Magister Ilmu Lingkungan, Program Pasca sarjana UNIPA, Jalan Gunung Salju, Amban, Manokwari, 98314, Indonesia
[2]Jurusan Kehutanan, Fakultas Kehutanan UNIPA, Jalan Gunung Salju, Amban, Manokwari, 98314, Indonesia
[3]Jurusan Perikanan, Fakultas Perikanan dan Ilmu Kelautan, UNIPA, Jalan Gunung Salju, Amban, Manokwari, 98314, Indonesia
*Korespondensi: w.sayutipono@unipa.ac.id

ABSTRAK

Pantai Pasir Putih adalah salah satu pantai di kota Manokwari dan merupakan pilihan wisata favorit bagi penduduk lokal maupun pengunjung dari luar kota Manokwari. Sampai saat ini indek kesesuaian wisata, daya dukung kawasan, dan daya dukung rill wisata dari pantai Pasir Putih belum diketahui. Penelitian ini dirancang untuk mengetahui indek kesesuaian wisata, mengukur kualitas air perairan, menghitung daya dukung kawasan ekowisata dan daya dukung riil (real carrying capacity) pantai Pasir Putih ekosiwasata, serta mengetahui persepsi pengunjung terhadap objek wisata ini. Hasil penelitian menunjukkan bahwa pantai Pasir Putih memiliki indek kesuaian wisata sangat sesuai (90%), dan kualitas air perairan masih memenuhi mutu baku mutu air laut untuk wisata bahari menurut KEP-51/MENKLH/2004. Selanjutnya, daya dukung riil kawasan adalah 626 pengunjung perhari dan daya dukung kawasan adalah 1.486 orang untuk enam kegiatan wisata bahari (rekreasi pantai, olahraga pantai, berenang, snorkeling, dan berperahu), dan berenang adalah wisata favorit (44%) dari pengunjung. Sebagian besar (54%) responden memiliki pengalaman yang sangat menyenangkan terhadap pantai Pasir Putih akan tetapi mayoritas (67%) respoden berpendapat bahwa sarana dan prasarana perlu ditingkatkan.

Kata kunci: daya dukung kawasan; daya dukung riil; indek kesesuaian wisata; Manokwari; pantai Pasir Putih;

ABSTRACT

Pasir Putih is popular beach and favorable destination for local and domestic tourists in Manokwari. Since becoming the capital city of Papua Barat province in 2000, numbers of tourists have grown significantly. However, tourist suitability index and real carrying capacity as well as physical carrying capacity of this area were not determined yet. This research is designed to determine tourist suitability index, examine sea water quality, determine physical carrying capacity of area, real carrying capacity, and to investigate the tourist perception on management and nature for future development and promotion. Survey and questionare were used to collect the data and analysed using Microsoft excel and presented in Figures and Tables. The results indicate that Pasir Putih

beach has a tourist suitability index of 90% for highly suitable. Sea water qualities are in fufillment to the Ministry of Environment and Forestry Regulation, 51/MENKLH/2004 for standard for sea water quality for beach tourism activity. The real carrying capacity for Pasir Putih beach is 626 visitor per day and physical carrying capacity of area is 1.486 visitors, which can be divided into five tourism activity of beach recreation, beach sport, swimming, snorkeling, and boat cycling. Beach swimming is the most favorable activity (44%). In addition, major tourists (54%) have a great experience with the highest satisfaction, but the majority (67%) demanding for improving public facilities.

Keywords: domestic leisure destination; favorable local; physical and real tourist capacity;

INTRODUCTION

Indonesia has approximately 17.504 of a small to large islands and scattered along 108.000 km coastal region (Pushidrosal, 2019), this means that Indonesia archipelago undoubtedly is the heaven of ecotourism, mainly for its tropical rain forest with rich biodiversity, native species, cultures, coastal and ocean regions (Rintelen et al., 2017). Recently, tourism is one of the national targeted-generating incomes to fulfill declining revenue from the two main natural resources-based extractions of forest harvesting and petroleum or mining. By 2019 Indonesian tourism sector is highly expected to be a core economy and targeted to earn US $ 20 billion, as this sector could provide significant impact to all levels of community directly and heterogeneously.

Manokwari town is the capital city of West Papua province fulfillment with natural beauty of beaches, coastal and mountainous areas, as well as indigenous cultures, that is suitable for ecotourism destinations. One famous tourist destination and closed to Manokwari town is Pasir Putih beach, covering with white sand (Figure 1). It is popular destination for local, domestic or international visitors at any seasons, and has an area of 10.978 m², and one km alongside main road (BPS, 2017). Preliminary survey indicated that this beach has three natural characteristics, such as an area close to the freshwater, an area fulfills with white sand beach, and rocky beach. Tourist activities range from swimming, sports (volleyball, beach ball), snorkeling, boating, culinary (food and beverage), to scenery view of Manokwari (leisure times).

Recently, ecotourism is gaining enormous attention worldwide, as it has two dimensional of philosophy, as a concept and as an activity (Libosada, 2009). It has a concept that both environment and tourism have a low impact on environment and socio-culture, an ethical and equitable distribution of economic benefit, while ecotourism as an activity is to visit to the nature areas. Ecotourism has another term, such as alternative tourism, nature tourism, low impact tourism, where mainly is concerned on the continued use of natural areas for recreation (Libosada, 2009).

To achieve goals for sustainable utilization of natural resources for ecotourism destination or purposes, physio-ecological and spatial-temporal characteristics of natural areas such carrying capacity, and index of suitability have to be determined accordingly (Daneshvar et al., 2017). With respect to ecotourism destination, three variables are investigated, namely index of suitability (IoS), physical carrying capacity (PCC), and real carrying capacity (RCC). Perception and delightness of the visitors are also important variable used for assessment for future development, management and promotion.

Index of suitability is variable used to evaluate the suitability of nature areas for ecotourism activity or

destination. It is evaluated with various physical and chemical variables sea water quality. The physical variables consist of sea water temperature, stream velocity, odorness, water clearness, and so on, while pH, sea water salinity, dissolved oxygen (DO), and Biological oxygen demand (BOD) are grouped into chemical variables. The PCC is basic terms to describe a minimum area used for specific tourism activities or leisure comfortable. While RCC is similar to PCC with correction factors such as number of rainy days per month, frequently of visitor visiting per period of time.

Even though Pasir Putih Beach has been popularly visited mostly by the local tourist, suitability index, physical carrying capacity and real carrying capacity are not determined yet. Therefore, this research is designed to determine index of suitability for ecotourism, its real carrying capacity, and physical carrying capacity. In order to support future development, management, promotion and involvement of the local community.

RESEARCH METHOD

Field survey and questionare were used to collect the data. Intensive interview with relevant stakeholders or respondents were conducted using questionnaire. Experimental tools are ranging from pH meter, thermometer, refractometer, and DO meter. Field survey were conducted to collect all information and data. Sea water quality was analyzed quantitatively (Menlhk, 2004) at the laboratory of environment, University of Papua. Sea water quality consists of physical and chemical characteristic, likes temperature (ºC), salinity, pH, water brightness (m), dissolved oxygen (DO), biochemical oxygen demand (BOD), odorness, and persistence of garbage. Water samples were collected in sealed bottles from the three different zones or spot (SP) of Pasir Putih beach in accordance to the natural characteristics of this beach are easily

described in preliminary survey. The collected samples were analyzed directly in laboratory. SPI is located in the western part, with coordinate 00°52′22,61″ LS - 00°52′17,39″ LS and 134°06′18,04″ BT -134°06′20,60″ BT. It is a favorite spot for swimming, sun beach, fishing, and snorkeling. SPII is in the middle part, with coordinates 00°52′17,39″ LS-00°52′15,04″LS and 134°06′20,60″BT-134°06′24,59″BT. It is location for swimming, sightseeing, and beach sports. SPIII is on the eastern part, with coordinates 00°52′15,04″LS-00°52′12,95″LS dan 134°06′24,59″BT-134°06′29,10″BT. This is location for boating, swimming, and sight-seeing as well as snorkeling Index of suitability (IoS) was determined with formula used in reference (Yulianda, 2007) $IoS= N_i/N_{max}$ x 100%, where: IoS = Index of suitability (%), N_i = total value (weight x score), dan N_{max}= maximum value of certain tourism. Physical Carrying Capacity (PCC) is calculated with formula (Yulianda et al., 2010) $PCC= K (Lp/Lx)$ x (Wt/Wp), where: PCC=physical carrying capacity, K= potency of visitor for each activity (*person*), Lp= estimated area available for each activity (m^2); Lt= area for each activity (m^2), Wt= time allocated by management for visitor a day (hours), dan Wp=time spend by visitor each visit (hour).

Real Carrying Capacity/(RCC) is another variables used to describe maximum visitor per tourist activities for period of time, and calculated with considering factors, like frequently rainy day and visiting for period of time. RCC could be determined using formula as follow *RCC: PCC x (1-Rcf) x (1-Dvf)* where RCC= real carrying capacity, PCC= person carrying capacity, Rcf=Rainy correction factor, Dvf= number of day visiting factor. Number of respondents (n) was determined with using Slovin (Setiawan, 2007), $n= N/(1+N._{(e2)})$, where : n= respondents, N= total of visitors for period of time (2015=20.142 visitors), and numbers of respondents were 94 respondents. Data

were analyzed with Microsoft-excel, and presented into tables and figures.

RESULTS AND DISCUSSION

Sea water quality

Water quality is important variable in examining biological, chemical and physical variables of the water to fulfill the standard of utilization or condition. For ecotourism, water quality is concerning to the safety and health risks both for people and ecosystems, mainly marine organism. It is because poor sea water quality is bad for tourist and marine ecosystem (Daneshvar et al., 2017).

Means for sea water quality variables, based on the regulation No. 51 Ministry of Environment and Forestry 2004 (Kepmenlhk, 2004) were summarized in Table 1. As been illustrated by Tabel 1, it could be concluded that Pasir Putih Beach has indexes of suitability for ecotourism with S1 category, meaning highly suitable, where majority of the variable belong to S1. However, variable for brightness of the sea water is failed to gain S1 (at least > 6 m) as its has an average of 3.04 m indicating that it is classified into S3 (*not suitable*). Similarly, the sea water current velocity has an average of 0.22 m/sec, belonging to (S2) for suitable. Physically, pasir putih beach has 22 m in wide fully covered with white sand, 3.44 m in deep, and less 10° slope, it makes this beach suitable for swimming, and other beach activities. Shorten in sea water clearness (less than 6 m) possibly is related to the stream velocity, which is moderate or 0.22 m/sec in average. It is also supported with the dominance of white sand underneath beach. SI category has stream velocity less than 0.17 m/sec. Pasir Putih beach is surrounded with coconut trees and opened field, and laid to the next main road to the suburb areas of Manokwari town. Furthermore, biota grouped as dangerous are not recorded in this beach which is safe for marine tourism, and tourist could get fresh water for cleaning and washing for less than 0.5 km. From the physical variables, Pasir Putih beach has low risk and could be recommended as destination for beach ecotourism.

Chemical variables of sea water at Pasir Putih beach such as pH and salinity are also normal, which are 7.8 for pH and 28.89 ppt for salinity, respectively (as indicated in Table 1). Marine organisms or biota in general require pH 6.5-8.0 for their living environment (Odum, 1971) and salinity for 32-32 ppt (Dahuri et al., 1996). The lower seawater salinity is probably due to the existence of fresh stream water with the distance 0.5 km from the SP1. Concentration of dissolved oxygen (DO) is higher than the minimum concentration recommended (an average of 6.81 mg/l is higher than 5 mg/l). DO level in seawater is very important for marine organisms respiration, decomposition and various chemical reactions, which is mainly gained from the atmosphere and from marine plants as the results of photosynthesis (EPA, 2020). In contrast, biochemical oxygen demand is higher when seawater is fulfilled with residual material or waste, it is because marine organisms consume enormous oxygen to decompose or breaking down organic material (residual waste), where at this condition BOD concentration is high (higher than 10 mg/l according to reference (Kemenlhk, 2004). Pasir Putih beach has biochemical oxygen demand (BOD_5), 1,28 mg/l in average, meaning that the seawater contains less residual waste or non-polluted seawater

Tabel 1. An average for variable of sea water quality in Pasir Putih Beach

Variable	Spot			Average	Kemenlhk/ 51 thn 2004	IoS
	I	II	III			
Temperature (ºC)	29	30,33	29,67	29,7	Natural	-
Stream velocity (m/sec.)	0,21	0,22	0,23	0,22	-	0,17-0,34/(S2)
Odor	odorless	odorless	Odorless	-	odorless	-
Deepth (m)	3,45	3,43	3,45	3,44	-	0-3 /(S1)
Width (m)	16	38,33	14,33	22,89	-	>15/ (S1)
Slope (º)	4,9	4,8	4,7	4,8	-	< 10 /(S1)
Brightness (m)	3,03	3,04	3,04	3,04	>6	3-5/ (S3)
Cover area	coconut, open field	coconut, open field	coconut, open field		-	coconut, open field/ (S1)
Dangerous biota	absent	absent	Absent	-	-	Not specifically mentioned /(S1)
Fresh water availabilty (km)	0,5	0,5	0,5	-	-	0,5/ (S1)
pH	7,61	7,73	7,69	7,68	7-8,5	-
Salinity (ppt)	28,67	29,67	28,33	28,89	Natural	-
DO (mg/l)	6,83	6,91	6,69	6,81	>5	-
BOD$_5$ (mg/l)	1,3	1,33	1,2	1,28	10	-

IoS : Index of Suitability, DO : dissolved oxygen, BOD : Biological Oxygen Demand

Index of Suitability

Index of suitability (IoS) is tool developed in order to help in decision making of tourist destination for ecotourism. This IoS can be determined using ten-natural parameters, mainly physical and non-physical parameters. It is determined based on the multiplication of weights and score of each environmental parameters measured, and then multiplication is divided by the maximum value and expressed in percent (Triyanto, 2014). Results for IoS of ten environmental parameters used, the scores, weights and their multiplication were presented in Table 2.

As been highlighted by Table 2, an average of bathymetry recorded from three spot sample is 3.44 m, this condition is the most suitable for swimming. It is also supported by the beach type, which is mostly dominated by white sand beach with wide sea water area ranging from 22.89 - 38.33 m, with gently sloping 4.8º at average. Other supporting parameter for ecotourism destination are absence of dangerous animal or marine biota, and an availability of fresh water that is less than 0.5 km. However, single parameter which less preferable is water clearness, and it is probably related to the sea bottom material that mostly dominated with white sand and current velocity with relatively moderate of 0.22 m/sec at average. The beach land used of Pasir Putih is mostly covered or surrounded with coconut open lands, where is suitable for all beach tourist activities.

Table 2 indicates that the maximum value of IoS theoretically is 84, with assumption that weight and score had maximum for each parameter. IoS is determined by dividing the weight and score of each sample plot (SP) with the maximum value and expressed in percentage. All spot samples are fallen into similar category SI, and had an average of IoS of 90.07%. This is highlighted that Pasir Putih beach is very suitable for beach based-ecotourism destination.

Tabel 2. Weights and scores of parameters used to determine the Index of suitability for ecotourism destination

Parameter	Weight x Score (max)	SP1			SPII			SPIII		
		charact.	score	Mult.	charact.	score	Mult.	charact.	score	Mult.
1. Bathymetry (m)	5 x 3 (15)	3.45	3	15	3.43	3	15	3.45	3	15
2. Beach type	5 x 3 (15)	White sand, tree trash	3	10	white sand	3	15	white sand	3	15
3. Beach witdh (m)	5 x 3 (15)	16	3	15	38.33	3	15	14.33	2	10
4. Sea bottom material	3 x 3 (9)	sand	3	9	Sand	3	9	sand	3	9
5. Current velocity (m/sec)	3 x 3 (9)	0.21	3	6	0.22	2	6	0.23	2	6
6. Beach Slope (o)	3 x 3 (9)	4.9	3	9	4.8	3	9	4.7	3	9
7. Water brightness (%)	1 x 3 (3)	50-20	1	1	50-20	1	1	50-20	1	1
8. Beach land use	1 x 3 (3)	coconut open lands	3	3	coconut open lands	3	3	coconut open lands	3	3
9. Dangerous biota	1 x 3 (3)	none	3	3	None	3	3	none	3	3
10. Fresh water availability (km)	1 x 3 (3)	0.5	3	3	0.5	3	3	0.5	3	3
Total	(84)			74			79			74

- Maximum value = 84
- Index of Suitability (%)
- (mult./max) x 100%
- Classification
- IoS in average

	SP1	SPII	SPIII
Index of Suitability (%)	74/84	79/84	74/84
(mult./max) x 100%	(88.09)	(94.04)	(88.09)
Classification	S1	S1	S1
IoS in average		90.07%/ S1	

Physical Carrying Capacity

Physical Carrying Capacity (PCC) is the maximum number of tourists who can physically fit into a specific area with specific activity for over a given time with full of pleasure and satisfaction. When the number of tourists exceeds the PCC, it is could generate negative effects not only to the environment but also to the tourists. Therefore, balance and proportion the number of visitors or tourists to the physical capacity is important in ecotourism planning to assures a good level of conservation of natural resources and mitigates the impacts (Pasir Putih beach has an area of $88.363,14 m^2$ in total and maximum area used for ecotourism is 10%, equal to yaitu $8.8366,314 \ m^2$ (Triyanto, 2014). A minimum area of tourist for ecotourism is $10 \ m^2$ (Zacarias et al., 2011), time allocated in full day service is maximum 9 hours, from 08.00–17.00, and each visitor or tourist spent an average of 3 hours for each ecotourism activity. Therefore, the rotation time is 3 hours a day. The maximum visitor or real PCC is $8.836,314 /10 \times 3 = 2.651$ tourist a day for five ecotourism activity.

When each tourist spends less than 3 hours, an option 3 and 2, and each tourist activity require a minimum area for pleasure and convenience, an average of physical carrying capacity for five-dominant tourist activities, beach recreation, beach sport, swimming, snorkeling, and boating, were summarized and presented in Table 3. This table indicates that PCC Pasir Putih beach is 1.486 visitor per day, and beach recreation has the biggest number of visitor per day equal to 1.150 visitors. the PCC for other tourist activity that has the second preference is swimming, which could sustain 184 visitor per day, while boating has the lowest PCC of 23 visitors per day.

Table 3. Physical Carrying capacity for five-dominant tourism activities at Pasir Putih beach

No.	Tourist activity	Minimum area required (m)		Lp (m²)	K	Lx (m²)	Wp (hours)	Wt (hours)	PCC per day (visitor)
		Length	Width						
1.	Beach recreation	250	23	5.750	1	10	3	6	1.150
2.	Beach sport	100	23	2.300	1	50	2	4	92
3.	Swimming	200	23	4.600	1	50	2	4	184
4.	Snorkling	200	23	4.600	1	250	3	6	37
5.	Boating	250	23	5.750	1	500	2	4	23
	Total tourists								1.486

Legend: Lp=Estimated area available for each activity (m^2), K = potent visitor for each activity, Lt= Area for each activity (m^2), Wt = Time allocated by management for each activity per day (hours), Wp=an average time spent for each activity (hours)

Real Carrying Capacity

Similar to PCC, real carrying capacity (RCC) is variable to determine the maximum number of visitors in taking tourist activity for period of time allowed by the management with satisfaction. Nonetheless, the RCC is considering two correction factors, namely rainy day and visiting frequent in a month, respectively, where these two correction factors are absent in PCC. An average of RCC for Pasir Putih beach is presented in Tabel 4.

This table highlights that total carrying capacity Pasir Putih beach for ecotourism is 79.502 visitors per year. When RCC is determined with the two correction factor, total visitor per day is 626 visitor/day, which could be divided into one to five ecotourism activities. If this number is calculating for thirty day or a month, the number of visitor could be 18.780 tourists. Compared to the existing visitors recorded in 2015, which is 57 visitor/day, or 1.701 visitor per month in 2015, the RCC is still higher

than that previously mention. It highlights that the tourist number could be boosted into ten times bigger than today.

Visitor perceptions

Visitor perceptions on public facilities, beauty, ecological quality, as well as the future development of Pasir Putih beach for ecotourism designation are varied. Majority (71%) of visitors is young generation or under 35 year old, consisting 42% for less than 24 year old and 29% is 25-34 year old. They are mostly well-established occupation (79%) with monthly salary or income ranging from IDR 1–2 million (48%) and higher that IDR 2 million (39%). Their educational backgrounds are mostly senior high school (48%), diploma (29%) and undergraduate (23%).

Respondents have more than one visit in a month (53%), and coming with friends (35%), family member (24%), group (28%) or personal (13%), and they have spent an average of 4 hours when visit (43%), 2 hours (21%), 3 hours (11%), and more than five 5 hours (25%). Tourist activities range from swimming (44%), sight-seeing (20%), refreshment (14%), sitting and relaxing (10%), culliner (8%), and fotograph (4%). Impression of the respondents of their visit are mostly highly enjoying, (54%), enjoying (44%), and less enjoying (2%), and impression of respondent to the local land owner mostly are well acceptance (59%), acceptance (24%), acceptance enough (16%) and not accepted (1%).

Table 4. An average for Real Carrying Capacity of Pasir Putih beach

No	Month	Rainy day (day)	Visiting frequent (day)	Number of Visitor (person)	
				Real Carrying Capacity	Existing (2015)
1	January	20	10	6.260	1.610
2	February	20	10	6.250	2.689
3	March	21	9	5.634	1.580
4	April	22	8	5.008	1.483
5	May	18	12	7.512	1.928
6	Juni	20	10	6.260	1.442
7	July	19	11	6.886	1.625
8	August	18	12	7.512	1.562
9	September	17	13	8.138	1.535
10	October	19	11	6.886	1.806
11	November	17	13	8.138	1.642
12	December	22	8	5.008	1.510
Total		233	127	79.502	20.412

Rainy day correction factor   *0,638*
Visiting correction factor   *0,348*
RCC = 2.651 x (1-0,683) x (1-0,348), 626 visitor/day
RCC per month = 626 visitors x 30 day, 18.780 visitor/month
RCC per year = 18.780 visitor x 12 month, 225.360 visitor/year
An average of visitor/month (existing in 2015)   *1.701*
An average of visitor/day (existing in 2015)   *57*

Perception for public facility and ecological quality of Pasir Putih beach summarize that majority respondent (67%) argue that public facility is limited and need to be established, even for minimal requirement. However, the fresh water (61%) and electricity (85%) are available. Accessibility is highly accepted by respondents (52%), and road quality is good condition (63%) Figure 2

indicated that visitor acknowledge The Pasir Putih beach for its sea water (62%) and exotic-white snad beach (82%), water clearness (50%), comfortable (82%), and awareness of the local community is very good (90).

CONCLUSION

It could be concluded that pasir putih beach has potential variables to be developed for beach based-ecotourism destination, and it has been supported by its index of suitability for ecotourism of 90,07%, meaning highly suitable. Real carrying capacity for pasir putih beach is 626 visitors per day and physical carrying capacity is 1.486 visitor per day, which could be divided into five tourist activities, likes beach recreation, beach sport, swimming, snorkeling, and boating. The most favorable tourist activity in Pasir Putih beach is swimming. However, majority of the tourists are demanding for improving the quality and quantity of the public facilities in the future development.

REFERENCES

BPS. (2017). Kabupaten Manokwari Dalam Angka 2017. *in Indonesian*.

Dahuri, R., Rais, J., Ginting, S. P., & Sitepu, M. J. (1996). *Pengelolaan Suberdaya Wilayah pesisir dan Lautan Secara Terpadu.* Jakarta: PT. Pradnya Paramita.

Daneshvar, M. R. M., Khatami, F., & Zahed, F. (2017). Ecological carrying capacity of public green space as a sustainability index of urban population: a case study of Marshad city in Iran. *Journal of Modelling Earth System Environment*, *3,* 1161-1170. http://doi:10.100/s40808-017-0364.2

Kepmenlhk. (2004). Keputusan Menteri Lingkungan Hidup No. 51 Tahun 2004 Tentang Baku Mutu Air Laut Untuk Wisata Bahari.

Libosada, Jr. C. M. (2009). Business or Leisure? Economic development and resoruces protection-Concepts and Practices in Sustainable ecotourism. *Journal of Ocean & Coastal Management, 52,* 390-394. https://doi:10.1016/j.ocecoaman.2009.04.004

Odum, E. P. (1971). *Fundamental of ecology*, Philadelphia: W.B. Sounders Company.

Pushidrosal. (2019) Rujukan nasional Data Kewilyahan Republik Indonesia. http://www.pushidrosal.id (acccessed in December 2nd, 2019), *in Indonesian*.

Setiawan, N. (2007). Penentuan ukuran Sampel memakai rumus Slovin dan Tabel Krecjie-Morgan. http://www.pustaka.unpad.ac.id (accessed March 2nd, 2020).

Triyanto, M.A. (2014). Kajian Pengembangan Ekowisata Pantai di Kabupaten Manokwari (Studi kasus di pantai Yen-Beba) [Thesis]. Institut Pertanian Bogor, (*in Indonesian*).

EPA. (2020). *Dissolved Oxygen and Biocehmical Oxygen Demand*. https://archive.epa.gov/water/archive/web/html/vms52.html

Rintelen, V.,K., Arida, E., & Häuser, C. (2017). A review of biodiversity-related issues and challenges in megadiverse Indonesia and other Southeast Asian countries. *Research Ideas and Outcomes, 3*, e20860. https://doi.org/10.3897/rio.3.e20860.

Yulianda, F. (2007). Ekowisata Bahari sebagai Alternatif Pemanfaatan Sumberdaya Pesisir Berbasis Konservasi. Disampaikan pada Seminar Sains 21 Februari 2007 pada Departemen Manajemen Sumberdaya Perairan, Fakultas Perikanan dan Ilmu Kelautan. Institut Pertanian Bogor.

Yulianda, F., Fahrudin, A., Adrianto, L., Hutabarat, A. A., Harteti, S., Kusharjani., & Kang, H. S. (2010).

Book 3 Pengelolaaan Pesisir dan secara Terpadu. Pusdiklat Kehutanan – Departemen Kehutanan RI dan SECEM – Korea International Cooperation Agency. Cetakan Ketiga. Bogor. Jawa Barat.

Zacarias, D. A., William, A. T, & Newton, A. (2011). Recreation Carrying Estimation to Support Beach Management at Pria de Faro, *Portugal Applied Geography, 31*, 1075-1081.