BAREKENG: Jurnal Ilmu Matematika dan Terapan
March 2022 Volume 16 Issue 1 Page 113–120
P-ISSN: 1978-7227 E-ISSN: 2615-3017
https://doi.org/10.30598/barekengvol16iss1pp113-120

VISIT PROFILES AND TOURISM DESTINATION THRESHOLDS USING POLYNOMIAL AND MALTHUSIAN

Mario Nikolaus Dalengkade[1*], Meidy Kaseside[2], Cornelia Dolfina Maatoke[3], Fiktor Imanuel Boleu[4], Oktosea Buka[5], Samsul Bahri Loklomin[6], Jubhar Christian Mangimbulude[7]

[1,2,6]Mathematics Study Program, Department of Natural Sciences and Engineering Technology, Halmahera University
[3,4]Forestry Study Program, Departmentof Natural Sciences and Engineering Technology, Halmahera University
[5]Physics Study Program, Department of Natural Sciences and Engineering Technology, Halmahera University
Jl. Wari Raya, Tobelo, North Halmahera, 97762, Indonesia
[7]Halmahera Perdamaian Polytechnic
Jl. Raya Tobelo Galela, Tobelo, North Halmahera, 97762, Indonesia

Corresponding author e-mail: [1] mariodalengkade@gmail.com*

Abstract. *Kumo, Kupa-Kupa, Pitu, and Luari beaches are tourist destinations that are always crowded with local and foreign tourists. This becomes interesting, because recently the problem of human population density in an area has become a hot topic for study. Using the polynomial method, it resulted in 6th order with R^2 0.950 (Kumo), 0.868 (Kupa-Kupa), 0.799 (Pitu), and 0.399 (Luari) representing the distribution of visits. The highest levels of visits occurred in the twelfth, fifth, fourth, and sixth months, respectively. The analysis by applying the logistics function shows the highest level of visits throughout 2018 which are Kumo 283.95 tourists, Kupa-Kupa 342.12 tourists, Pitu 81.77 tourists and, Luari 1088.35 tourists. Based on the threshold analysis, the threshold value shows 255.56 tourists (Kumo), 297.08 tourists (Kupa-Kupa), 65.58 tourists (Pitu), and 836.42 tourists (Luari). The results of this study inform the level of tourist visits exceeding the threshold value in four tourist destinations. Given that the four tourist destinations carry the concept of ecology as a selling point, the manager needs to reorganize the level of tourist visits. Excess levels of tourist arrivals can have a negative impact on the comfort and sustainability of tourist destinations.*

Keywords: *level, population, visit, threshold*

Article info:
Submitted: 12th November 2021 *Accepted: 4th February 2022*

How to cite this article:
M. N. Dalengkade, M. Kaseside, C. D Maatoke, F. I. Boleu, O. Buka, S. B. Loklomin and J. C. Mangimbulude, "VISIT PROFILES AND TOURISM DESTINATION THRESHOLDS USING POLYNOMIAL AND MALTHUSIAN", *BAREKENG: J. Il. Mat. & Ter.*, vol. 16, iss. 1, pp. 113-120, Mar. 2022.

1. INTRODUCTION

The study of tourist destinations is very interesting to discuss, because it multidisciplinary, including economics and the environment [1,2]. Recorded before the COVID-19 pandemic, the tourism industry was growing rapidly [3] as indicated by tourist visits to Bali in 2001 amounting to 1.38 million and increasing to 3.73 million in 2014, resulting in a 30% increase in Indonesia income. Likewise in the Mediterranean, since 1950 the number of tourist visits was 25 million and increased to 1,239 million in 2016 [4]. But it impact a pressure on the environment [5] caused by anthropization [6,7,8]. This is explained through reports [3] the increase in tourists is followed by changes in land use in Bali. Another case example, land cover change in the Andes mountains [9]. In addition, it causes environmental pollution of plastic waste carried by tourists [10,11]. This impact is because tourist visits are not in accordance with the capacity of tourist destinations [12].

The impact of environmental pressures due to excess tourists is anticipated by determining the maximum level of tourist visits. In order to determine this level, it usually refers to a mathematical model symbolized by *K* (carrying capacity) which is defined as a space limitation at the same time [13,14,15]. The practice uses population density in an area to describe the carrying capacity supported by the environment. Initially, the carrying capacity was used by Verhulst to calculate the human population and determine the maximum limit for space availability [16]. The description in the first paragraph regarding the surge in tourists, refers to [17] locations designated as tourist destinations that are very sensitive to environmental changes. Written by reports [18,19,20] in the form of tourist activities causing soil compaction and changing the chemical-physical properties of the soil. Responding to the findings regarding the pressure on the environment, previous researchers reported the results of studies on the maximum limit of tourist visits in order to prevent landscape changes. For example, the report [21] describes the maximum number of visits in Baluran National Park, which is 151.248 tourists per year. Meanwhile, other researchers emphasized the benefits of threshold studies such as the finding of ecological safety in Wuhan which was initially 5.8023 (sensitive phase) in 2004, and changed to 6.459 (safe phase) in 2010 because of implementing the threshold [22]. As for [11] states, the study of the threshold is a measuring tool in monitoring the pressure on the environment caused by the increasing population of an area.

North Halmahera tourist destinations, including Kumo Beach, Kupa-Kupa, Pitu, and Luari have natural beauty that attracts tourists. In accordance with the guidelines for "Perubahan Rencana Strategis" (P-RENSTRA) 2016 to 2021 Dinas Pariwisata Halmahera Utara carries the concept of ecotourism as sustainable development [23]. Referring to the statement [24,25,26,27] the concept of ecotourism that carries sustainable development, should apply the tourist threshold as environmental control management. However, the P-RENSTRA guidelines only report the number of visits during 2011-2015, while the threshold for tourists in tourist destinations is unknown [23]. Then it will lead the question "What is the tourist threshold value at Kumo, Kupa-Kupa, Pitu, and Luari Beaches?". The argument that can be built in answering this question is to examine the threshold for tourist visits.

2. RESEARCH METHODS

This research uses analytical descriptive method. The method is to analyze data on tourist visits and tourist thresholds on the beaches of Kumo, Kupa-Kupa, Pitu, and Luari.The data source is divided into two categories; which are primary data and secondary data. Secondary data in the form of tourist visit data in 2018 from the Dinas Pariwisata Halmahera Utara, while primary data is the area of tourism.

2.1 Research Procedure

Determine the area and show the research location using GPS, then proceed with data processing by arcGIS. Plots the curve from the secondary data, followed by determining the mathematical equation for the curve. The mathematical equation is intended to provide an overview of tourist visits throughout 2018, and the mathematical equation referring to[28,29] is written into equation (1). The selection of equation (1) refers to the secondary data curve which shows the irregularity of the tourist visit data.

$$y = p_n(x) = a_0 + a_1 x + a_2 x^2 + \ \ldots + a_n x^n \quad (1)$$

With:

$$
\begin{aligned}
a_0 + a_1 x + a_2 x^2 + \ \ldots + a_n x^n \ &= y_0 \\
a_0 + a_1 x_1 + a_2 x^2 + \ \ldots + a_n x^n &= y_1 \\
\ldots \quad \ldots \quad \ldots \quad \ldots \\
a_n + a_n x_n + a_n x^n + \ \ldots + a_n x^n &= y_n
\end{aligned}
$$

The use of equation (1) in its application for each order is close to the secondary data, the calculation is discontinued, as long as the value of R^2 is close to the value of 1. Then determine the threshold value of tourist visits. It begins by analyzing the level of tourist visits using equation (2).

$$\frac{dN}{dT} = rN\frac{(1-N)}{K} \tag{2}$$

Where dN/dT = population density in the interval t (time), r = population increase rate, N = population number, and K = threshold. Differential equation (2) produces a new solution, namely equation (3).

$$N = \frac{K}{1 + [(K - N_0)/N_0]e^{-rt}} \tag{3}$$

Equation (3) is the final formula applied to determine the threshold value of tourist visits in tourist areas in this study [30,31,32,33].

3. RESULTS AND DISCUSSION

3.1. Tourist Visit Profile

The results of the mapping analysis using arc GIS are presented through the research map in Figure 1. While the area of the five tourist destinations is Kumo beach 1.64 ha, Kupa-Kupa 2 ha, Pitu 2.17 ha, and Luari 4.01 ha.

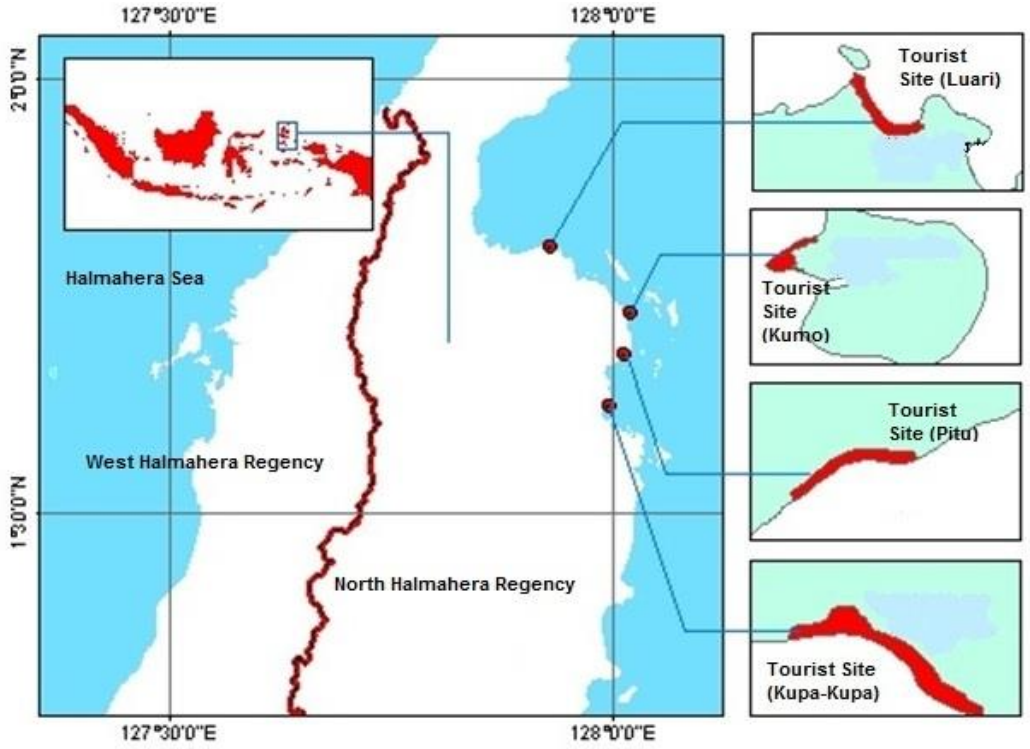

Figure 1. The Four North Halmahera Beach Tourism Destinations.

Based on data from Dinas Pariwisata Halmahera Utara, three locations of Kumo, Kupa-Kupa, and Pitu beach tourist destinations were visited by local tourists. Meanwhile, Luari beach besides local tourists, there

are also foreign tourists. The total tourists for the four tourist destinations in a row are 3.068 tourists, 3.759 tourists, 787 tourists, and 10.036 tourists.

Referring to the description of equation (1), the distribution of tourist visits each month is represented through a function which is summarized in Table 1.

Table 1. Functions Output Equation Analysis (1)

Functions (Kumo Beach)	R^2	**Orde**
$y = 16.08x + 151.1$	0.789	1
$y = 0.824x^2 + 5.363x + 176.1$	0.808	2
$y = -0.339x^3 + 7.445x^2 - 30.45x + 222.4$	0.837	3
$y = -0.018x^4 + 0.148x^3 + 3.252x^2 - 17.15x + 210.7$	0.837	4
$y = -0.001x^5 + 0.031x^4 - 0.449x^3 + 6.369x^2 - 23.96x - 215.3$	0.837	5
$y = 0.033x^6 - 1.291x^5 + 19.49x^4 - 142.9x^3 + 526.5x^2 - 886.5x + 693$	0.950	6
Functions (Kupa-Kupa Beach)	R^2	**Orde**
$y = 8.367x + 258.8$	0.071	1
$y = -2.038x^2 + 34.87x + 197.0$	0.111	2
$y = 2.233x^3 - 45.59x^2 + 270.5x + 107.8$	0.525	3
$y = 0.677x^4 - 15.38x^3 + 105.9x^2 - 210.2x + 314.9$	0.835	4
$y = -0.081x^5 + 3.315x^4 - 46.58x^3 + 268.5x^2 - 565.5x + 314.9$	0.868	5
$y = -0.002x^6 + 0.003x^5 + 2.042x^4 - 37.26x^3 + 234.5x^2 - 509.0x + 522.8$	0.868	6
Functions (Pitu Beach)	R^2	**Orde**
$y = -24.71x + 34.97$	0.251	1
$y = 1.143x^2 - 10.15x + 69.65$	0.389	2
$y = 0.481x^3 - 8.237x^2 + 40.59x + 3.989$	0.601	3
$y = -0.043x^4 + 1.599x^3 - 17.85x^2 + 71.11x - 22.85$	0.615	4
$y = -0.052x^5 + 1.647x^4 - 18.40x^3 + 86.41x^2 - 156.6x + 130.4$	0.766	5
$y = 0.009x^6 - 0.412x^5 + 7.09x^4 - 58.25x^3 + 231.9x^2 - 397.9x + 264.3$	0.799	6
Functions (Luari Beach)	R^2	**Orde**
$y = -24.71x + 996.9$	0.019	1
$y = -26.35x^2 + 10.15x + 69.65$	0.221	2
$y = -1.174x^3 - 3.446x^2 + 193.9x + 258.0$	0.225	3
$y = 1.658x^4 - 44.29x^3 + 367.3x^2 - 982.7x + 1393$	0.281	4
$y = 0.310x^5 - 2.577x^4 + 5.809x^3 + 106.1x^2 - 412.1x + 1008$	0.384	5
$y = -0.331x^6 + 130.7x^5 - 197.7x^4 + 1435x^3 - 5111x^2 + 8239x - 3791$	0.399	6

Referring to the output of equation analysis (1) Table 1, the distribution of tourist visits is represented by order-6 for the four tourist destinations because R^2 is close to 1. Previous researchers [34] reported that the use of equation (1) was able to provide accurate information about the profile of tourist visits. For example, their research results show that tourist visits are represented by $y = 72.953x^2 - 555.68x + 117.56$ for R^2 = 0.957 or is of order-2. In addition, it has similarities from the report [11], the profile of tourist visits where R^2 = 0.793, and the function is $y = -0.179x^6 + 7.086x^5 - 109.0x^4 + 824x^3 - 3176x^2 + 5756x - 2832$ is order-6. The results of Table 1 of order-6 have similarities with [34,11], where a negative value represents a decrease in tourist visits, while a positive value represents an increase in tourist visits. Other researchers [35] informed secondary data matching using equation (1) in the case of population growth resulting in order-3. Similarly, [36] states that human fertilization in various countries uses equation (1) to produce order-3 as a data match. In addition, the profile of tourist visits in table 1 for order-6 is visualized by curves of green (Kumo beach), orange (Kupa-Kupa beach), blue (Pitu beach), and yellow (Luari beach) Figure 2.

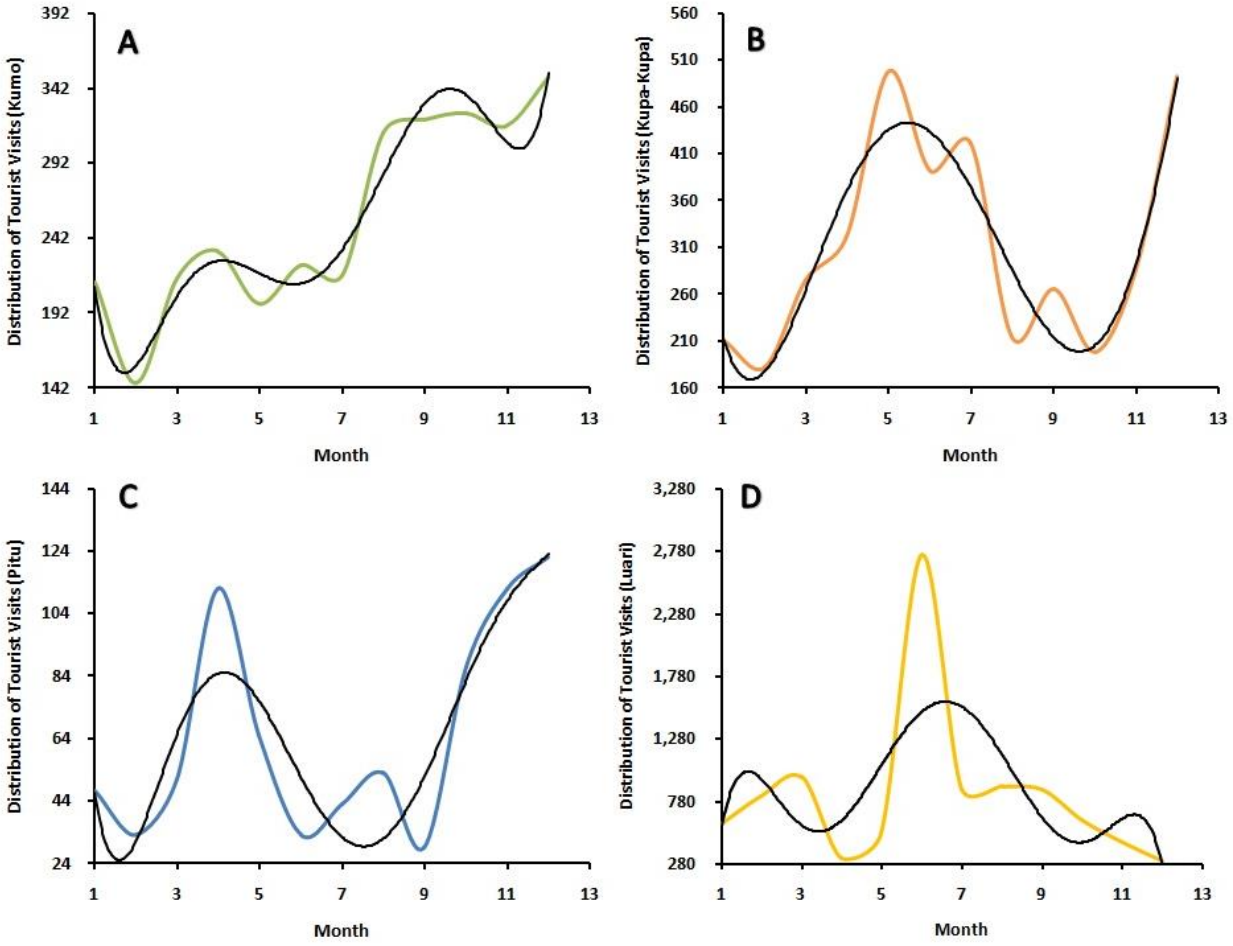

Figure 2. 6th order curve with (A) Kumo Beach; (B) Kupa-Kupa Beach; (C) Pitu Beach; (D) Luari Beach.

As Figure 2 shows, the level of tourist visits in the four tourist destination locations fluctuated throughout 2018. The distribution of tourist visits to Kumo beach (Curve A) tends to increase every month, although there is a decrease in the second month. Meanwhile, the two beach destinations Kupa-Kupa and Pitu (Curves B and C) have similarities when entering the third to fifth month, the number of tourist visits has increased. But entering the sixth to eighth month, the number of tourists decreased, and increased again until the twelfth month. In contrast to the Luari beach destination, the data shows (Curve D), in which the fourth to seventh month there was a surge in tourists, but the eight to twelve month tourist visits decreased more than the second month. The peak point of tourist visits to the four tourist destinations occurred in the twelfth month of 349 tourists (Kumo), 498 tourists in the fifth month (Kupa-Kupa), 122 tourists in the fourth month (Pitu), and the sixth month of 2.750 tourists (Luari). Besides that, overall tourists tend to prefer the tourist destinations of Luari beach with the lowest number of tourists as many as 304 tourists, while Kumo 145 tourists, Kupa-kupa 182 tourists, and as many as 29 tourists in Pitu.

3.2. Tourist Threshold

According to equation (2), the output is poured into the form of a black curve for the four tourist destination locations. Meanwhile, the tourist threshold based on equation (3) is represented by red (Kumo), purple (Kupa-Kupa), pink (Pitu), and brown (Luari) curves (Figure 3).

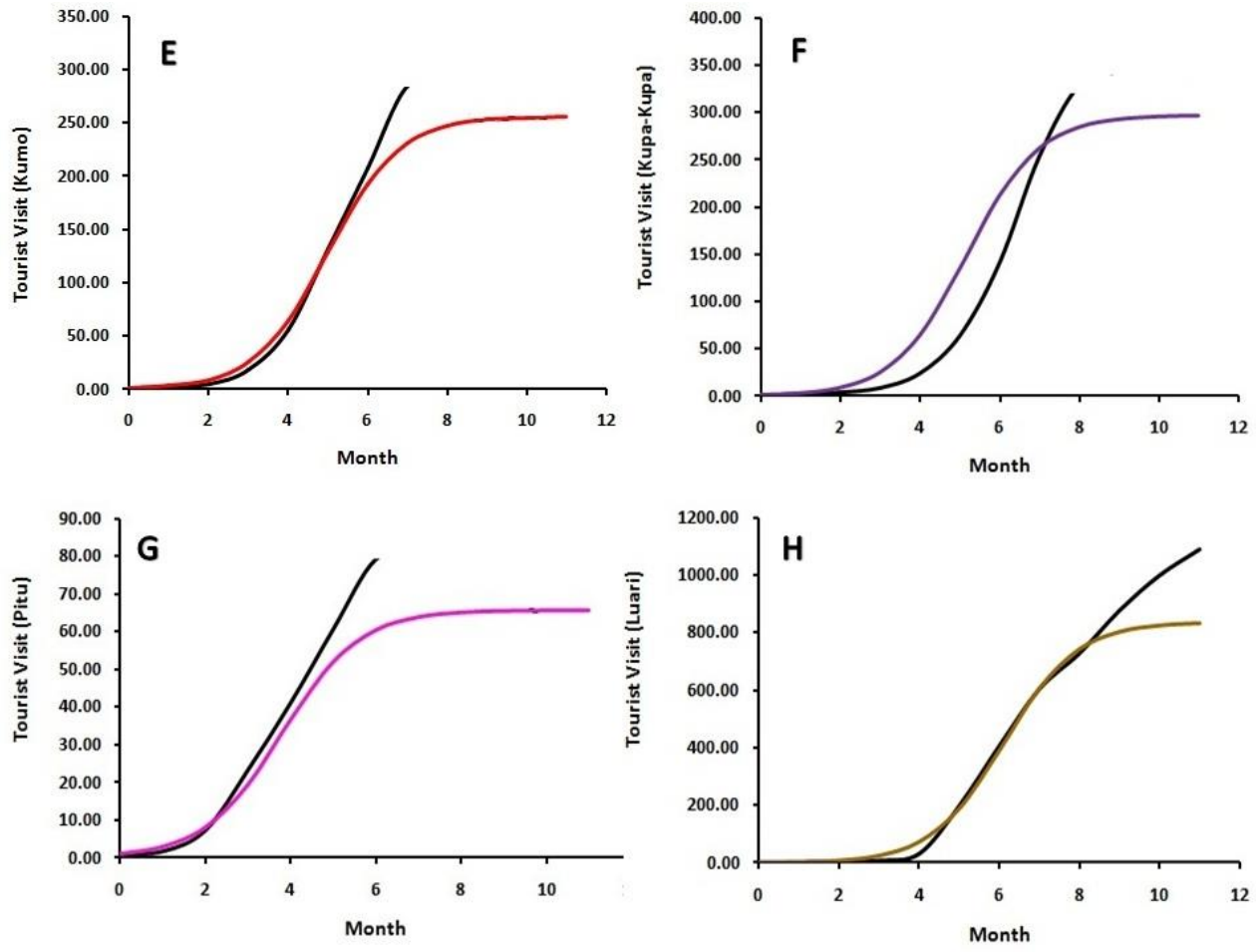

Figure 3. Outcome equations (2 & 3) for four tourist sites, (E) Kumo Beach, (F) Kupa-Kupa Beach (G) Pitu Beach, and (H) Luari Beach.

The analysis of tourist thresholds for the four beach tourism destinations has differences where 255.56 tourists for Kumo beach, 297.08 tourists on Kupa-Kupa beach, 65.58 tourists on Pitu beach, and as many as 836.42 tourists on Luari beach. While the analysis of the number of tourist visits in a year (black curves E, F, G, and H) shows Kumo 283.95 tourists, Kupa-Kupa 342.12 tourists, Pitu 81.77 tourists and, Luari 1088.35 tourists. The results of the analysis of equation (3) confirm that the four tourist destinations exceed the tourist threshold value. The results of this study are in line with [11] which uses equation (2) shows that tourist visits are represented by an exponential curve, with a total visit of 737.15 tourists. While the threshold generated by equation (3), which is 606.25 tourists, means that the level of visits is inversely proportional to the capacity of the area. The other side asserts [21] that equation (3) provides accurate information regarding the limits of tourist visits that are intended to protect from an early stage environmental pressures from increasing tourist visits.

The four tourist destinations studied in this study have an ecological concept background as a tourist attraction, therefore important to maintain environmental conditions for sustainable development in tourist areas. In the report [37] applied the tourist threshold as a solution. This statement is justified by [26], because the perception of tourists 26% and the public 24% stated that they were uncomfortable caused by the tourist threshold of Eastern Costa del Sol urban beach destinations exceeding 19% and 5% for natural beaches. While the economic side experienced an increase in income of 13.6% (community) and 66.6% (tertiary sector), but experienced pressure on the environment, among others, water supply reached 20% and increased plastic waste 13% during 2000-2005. Exposure [38] in the form of the application of thresholds in tourist destination areas is able to control pressure on the environment, because there has been an increase of 0.621 for ecological security in the Yangtze river during 2011-2016. Usually, the concept of ecotourism that is carried as the theme of a tourist destination should use a threshold, thus the goal of the concept of sustainable development is achieved.

4. CONCLUSIONS

The description of the research results and discussion explains several things as follows:

1. The application of equation (1) to the case of the distribution of tourist visits in four tourist destinations resulted in the 6th order as the order of selected for matching secondary data. In addition, order-6 shows a fluctuating tourist visit profile throughout 2018. Fluctuations show from the highest level of visits, which are the twelfth month (Kumo), the fifth month (Kupa-Kupa), the fourth month (Pitu), and the sixth month (Luari).
2. Equation (2) which is used to inform the level of tourist visits throughout 2018 is in the form of an exponential graph, to show the highest level of visits.
3. The study of the threshold of tourist visits analyzed using equation (3) reveals that the output of the analysis of equation (2) exceeds the threshold value for the four tourist destinations.

AKNOWLEDGEMENT

Thanks to all authors Pemerintah Daerah Kabupaten Halmahera Utara, especially Dinas Pariwisata Halmahera Utara for being willing to provide visitor data in 2018 for the purposes of this research.

REFERENCES

[1] D. Getz and S. J. Page, "Progress and prospects for event tourism research," *Tour. Manag.*, vol. 52, pp. 593–631, Feb. 2016, doi: 10.1016/j.tourman.2015.03.007.
[2] S. Joshi and R. Dahal, "Relationship between social carrying capacity and tourism carrying capacity: a case of annapurna conservation area, Nepal," *J. Tour. Hosp. Educ.*, vol. 9, pp. 9–29, Apr. 2019, doi: 10.3126/jthe.v9i0.23677.
[3] Y. Gurtner, "Returning to paradise: investigating issues of tourism crisis and disaster recovery on the island of Bali," *J. Hosp. Tour. Manag.*, vol. 28, no. January, pp. 11–19, Sep. 2016, doi: 10.1016/j.jhtm.2016.04.007.
[4] A. Tovar-Sánchez, D. Sánchez-Quiles, and A. Rodríguez-Romero, "Massive coastal tourism influx to the Mediterranean sea: the environmental risk of sunscreens," *Sci. Total Environ.*, vol. 656, pp. 316–321, Mar. 2019, doi: 10.1016/j.scitotenv.2018.11.399.
[5] A. Rahmani, A. Fakhraee, S. Karami, and Z. Kamari, "A quantitative approach to estimating carrying capacity in determining the ecological capability of urban tourism areas (Case study: Eram Boulevard of Hamadan city)," *Asia Pacific J. Tour. Res.*, vol. 20, no. 7, pp. 807–821, Jul. 2015, doi: 10.1080/10941665.2014.934702.
[6] M. N. Dalengkade, "Pemodelan reaksi suhu udara terhadap penyinaran cahaya matahari dalam hutan bakau," *BAREKENG J. Ilmu Mat. dan Terap.*, vol. 13, no. 2, pp. 061–068, Jul. 2019, doi: 10.30598/barekengvol13iss2pp061-068ar732.
[7] M. N. Dalengkade, "Profil 24 jam kuat penerangan, suhu udara, kelembaban udara di luar dan di dalam hutan mangrove," *BAREKENG J. Ilmu Mat. dan Terap.*, vol. 14, no. 1, p. 047058, Mar. 2020, doi: 10.30598/barekengvol14iss1pp047058.
[8] M. N. Dalengkade, "Fluktuasi temporal kelembaban udara di dalam dan luar ekosistem mangrove," *BAREKENG J. Ilmu Mat. dan Terap.*, vol. 14, no. 2, pp. 159–166, Sep. 2020, doi: 10.30598/barekengvol14iss2pp159-166.
[9] A. Barros, C. Monz, and C. Pickering, "Is tourism damaging ecosystems in the Andes? Current knowledge and an agenda for future research," *Ambio*, vol. 44, no. 2, pp. 82–98, Mar. 2015, doi: 10.1007/s13280-014-0550-7.
[10] O. Garcés-Ordóñez, L. F. Espinosa Díaz, R. Pereira Cardoso, and M. Costa Muniz, "The impact of tourism on marine litter pollution on Santa Marta beaches, Colombian Caribbean," *Mar. Pollut. Bull.*, vol. 160, no. 2, p. 111558, Nov. 2020, doi: 10.1016/j.marpolbul.2020.111558.
[11] M. N. Dalengkade, M. Yusniar, W. Tjape, F. I. Boleu, and O. Buka, "Penerapan polinomial orde-*n* dan Malthusian pada studi kasus kajian daya tampung wisatawan," vol. 10, no. 2, p. 220–229,Oct. 2021, doi: 10.23887/jst-undiksha.v10i2.38969.
[12] H. Padrón-Ávila and R. Hernández-Martín, "Preventing overtourism by identifying the determinants of tourists' choice of attractions," *Sustainability*, vol. 11, no. 19, p. 5177, Sep. 2019, doi: 10.3390/su11195177.
[13] L. M. Abia, O. Angulo, and J. C. López-Marcos, "Age-structured population models and their numerical solution," *Ecol. Modell.*, vol. 188, no. 1, pp. 112–136, Oct. 2005, doi: 10.1016/j.ecolmodel.2005.05.007.
[14] M. Y. Dawed, P. R. Koya, and A. T. Goshu, "Mathematical modelling of population growth: the case of logistic and von bertalanffy models," *Open J. Model. Simul.*, vol. 02, no. 04, pp. 113–126, 2014, doi: 10.4236/ojmsi.2014.24013.
[15] G. Hartvigsen, "Carrying capacity, concept of," in *Reference Module in Life Sciences*, no. June 2016, Elsevier, 2017, pp. 1–8.
[16] V. Castellani, S. Sala, and D. Pitea, "A new method for tourism carrying capacity assessment," in *Ecosytems and Sustainable Development VI*, Aug. 2007, vol. I, pp. 365–374, doi: 10.2495/ECO070341.
[17] R. Sharma, "Evaluating total carrying capacity of tourism using impact indicators," *Glob. J. Environ. Sci. Manag.*, vol. 2, no. 2, pp. 187–196, 2016, doi: 10.7508/GJESM.2016.02.009.
[18] D. N. Cole, "Impacts of hiking and camping on soils and vegetation: a review," in *Environmental impacts of ecotourism*, Ecotourism., D. B. Weaver, Ed. New York. USA: CABI Publishing, 2004, pp. 41–60.
[19] J. M. Arocena, S. K. Nepal, and M. Rutherford, "Visitor-induced changes in the chemical composition of soils in backcountry areas of Mt Robson Provincial Park, British Columbia, Canada," *J. Environ. Manage.*, vol. 79, no. 1, pp. 10–19, Apr. 2006, doi: 10.1016/j.jenvman.2005.05.008.
[20] C. M. Pickering, W. Hill, D. Newsome, and Y.-F. Leung, "Comparing hiking, mountain biking and horse riding impacts on

vegetation and soils in Australia and the United States of America," *J. Environ. Manage.*, vol. 91, no. 3, pp. 551–562, Jan. 2010, doi: 10.1016/j.jenvman.2009.09.025.
[21] H. D. Armono, D. M. Rosyid, and N. I. Nuzula, "Carrying capacity model applied to coastal ecotourism of Baluran National Park, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 79, no. 1, p. 012004, Jul. 2017, doi: 10.1088/1755-1315/79/1/012004.
[22] L. Yajuan, C. Tian, H. Jing, and W. Jing, "Tourism ecological security in Wuhan," *J. Resour. Ecol.*, vol. 4, no. 2, pp. 149–156, Jun. 2013, doi: 10.5814/j.issn.1674-764x.2013.02.007.
[23] D. Pariwisata, *Perubahan Rencana Strategis (P-RENSTRA) Tahun 2016s/d 2021*. Tobelo: Dinas Pariwisata, Kabupaten Halmahera Utara, 2019.
[24] C. Tang, X. Wu, Q. Zheng, and N. Lyu, "Ecological security evaluations of the tourism industry in ecological conservation development areas: a case study of Beijing's ECDA," *J. Clean. Prod.*, vol. 197, pp. 999–1010, Oct. 2018, doi: 10.1016/j.jclepro.2018.06.232.
[25] Y. Pérez Guilarte and D. Barreiro Quintáns, "Using big data to measure tourist sustainability: myth or reality?," *Sustainability*, vol. 11, no. 20, p. 5641, Oct. 2019, doi: 10.3390/su11205641.
[26] E. Navarro Jurado *et al.*, "Carrying capacity assessment for tourist destinations. methodology for the creation of synthetic indicators applied in a coastal area," *Tour. Manag.*, vol. 33, no. 6, pp. 1337–1346, Dec. 2012, doi: 10.1016/j.tourman.2011.12.017.
[27] J. Kennell, *Encyclopedia of Tourism*, no. 1983. Cham: Springer International Publishing, 2014.
[28] R. L. Burden and J. D. Faires, *Numerical Analysis*, Ninth Edit. Boston. USA: Brooks/Cole, 2011.
[29] Y. Wu and P. Yang, "Polynomial methods in statistical inference: theory and practice," *Found. Trends® Commun. Inf. Theory*, vol. 17, no. 4, pp. 402–586, 2020, doi: 10.1561/0100000095.
[30] Y. Wang, S. Yang, W. Qian, and X. Li, "Forecasting new product diffusion using grey time-delayed Verhulst model," *J. Appl. Math.*, vol. 2013, no. 4, pp. 1–6, 2013, doi: 10.1155/2013/625028.
[31] D. Rahmani and M. Saraj, "The logistic modeling population: having harvesting factor," *Yugosl. J. Oper. Res.*, vol. 25, no. 1, pp. 107–115, 2015, doi: 10.2298/YJOR130515038R.
[32] A. A. da Silva, D. Silva e Meirelles, and E. C. Porto, "Development cycle and carrying capacity," *Manag. Res. J. Iberoam. Acad. Manag.*, vol. 13, no. 3, pp. 285–314, Nov. 2015, doi: 10.1108/MRJIAM-06-2014-0554.
[33] M. Z. Abdelrahim, A. Ramiz, and K. Mohammad, "A mathematical and statistical approach for predicting the population growth," *World Wide J. Multidiscip. Res. Dev.*, vol. 3, no. August, pp. 50–59, 2017.
[34] T. Baldigara and M. Koic, "Modelling the international tourism demand in Croatia using a polynomial regression analysis," *Tur. Posl.*, no. 15, pp. 29–38, 2015, doi: 10.5937/TurPos1515029B.
[35] S. Sultana, M. Hasan, and L. S. Andallah, "Age-structured population projection of Bangladesh by using a partial differential model with quadratic polynomial curve fitting," *Open J. Appl. Sci.*, vol. 05, no. 09, pp. 542–551, 2015, doi: 10.4236/ojapps.2015.59052.
[36] W. Brass, "The graduation of fertility distributions by polynomial functions," *Popul. Stud. (NY).*, vol. 14, no. 2, p. 148, Nov. 1960, doi: 10.2307/2172011.
[37] C. Tang, Q. Zheng, and P. Ng, "A study on the coordinative green development of tourist experience and commercialization of tourism at cultural heritage sites," *Sustainability*, vol. 11, no. 17, p. 4732, Aug. 2019, doi: 10.3390/su11174732.
[38] W. Ruan, Y. Li, S. Zhang, and C.-H. Liu, "Evaluation and drive mechanism of tourism ecological security based on the DPSIR-DEA model," *Tour. Manag.*, vol. 75, no. July, pp. 609–625, Dec. 2019, doi: 10.1016/j.tourman.2019.06.021.