

THE ENVIRONMENTAL IMPACT OF NATURE BASED TOURISM IN GUNUNG MERAPI NATIONAL PARK

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ABSTRACT

The goal of this research is to find out some impacts of tourism activities to the environmental mainly to the biotic and non-biotic components. The research also focuses in finding out importance and performance of the products offered by Gunung Merapi National Park to the tourists. This research is done in four locations, consisted of the undisturbed location for controlling (Plawangan) and the disturbed locations caused by the tourists, which are Kalikuning, Tlogonirmolo and Tlogomuncar. The result shows that the impacts of tourist activities in some locations show that the number of microbial in the controlling location is the highest (54.56 cfu/gram) compared with others location. The impact to the number of actinomycetes in the controlling location is 32.84 cfu/gram, which is the highest. The infiltration rate with the model Horton in the controlling location is higher (0.983 cm/min) than the infiltration rates of the others. The voice frequency describes crowd level that at the controlling location has the lowest voice frequency (10.15 dB). Some kinds of tree destruction as the impact of tourist activities show that the destructions happen mostly in Tlogomuncar, followed with Kalikuning and Tlogonirmolo. The most severe destruction of all locations is vandalism, and then scratch, spike prickling, branch breaking, and waste burning. The importance and performance of the products of the tourism objects offered describe that the attractions and tourism facilities like waterfall, musholla, shelter, dustbin, and observer tower have a considerable perception and good performance. However, some other facilities/attractions such as operational office, security center, gate, health clinique and bridge are not very important and not in a good condition.

Keywords: impact, nature-based tourism, Gunung Merapi National Park

INTRODUCTION

Gunung Merapi has been declared as national park based on The Forestry Ministry's decree No.134/Kpts-II/2004. The existence of Gunung Merapi National Park becomes significant to keep environmental preservation among the

environmental destructions at the time being. This national park possibly encourages the construction of nature-based tourism for a limited utilization. Part of the areas utilized for the nature-based tourism is the forested area Plawangan-Turgo, of which the research has been done and is a part of GMNP in the south.

There are significant changes happen to the patterns and motivations of the tourists. It means that there is an orientation change and tourism products preference. Before, tourists tend to choose conventional tourism products. However, now, they choose tourism products that emphasize the experience, uniqueness, and quality (of the travel). This kind of tourism is known as special interest tourism. Tourists no longer try to find out cheap products as the destinations, but dare to spend high expenses to achieve good quality travels [Hall and Weiler, 1992].

The forested area Plawangan Turgo keeps big potencies to be a developed special interest tourism. This area has some attractions of nature such as components of geosystem, biosystem, and sociosystem which are connected with the ecosystem of Gunung Merapi. The geosystem component is connected with the tourism product of Gunung Merapi, as one of the most active volcano in the world. Biosystem aspect is also connected with living pattern, which is influenced by the ecosystem of Gunung Merapi.

Attraction factors of nature-based tourisms such as many types of flora and fauna and beautiful landscape encourage tourists to visit Gunung Merapi National Park. The numbers of tourist wanting to visit GMNP cause the pressure upon the national park's ecosystem. The aim of this research is to find out some scholarly information regarding the environmental impacts caused by tourist activities, mainly to the biotic and nonbiotic components.

The goals of this study are: 1) To identify types of activity of nature-based tourisms, which possibly raise a number of impacts to the environment; 2) To identify types of impact of nature-based tourisms to the environment, mainly to the biotic (flora and fauna) and nonbiotic components; and 3) To find out importance and performance of the nature-based tourism products offered to the tourists.

THE METHODS

The research is done in four locations. Location of control, Plawangan Turgo, is in still undisturbed nature forest without tourists. The other sides are in nature forests but in disturbed area caused by tourists (80–90 tourists/day). Tlogomuncar and Tlogonirmolo are about 20–30 tourists/day. Kalikuning are about 10–15 tourists/day. The area of Gunung Merapi National Park is on Figure 1.

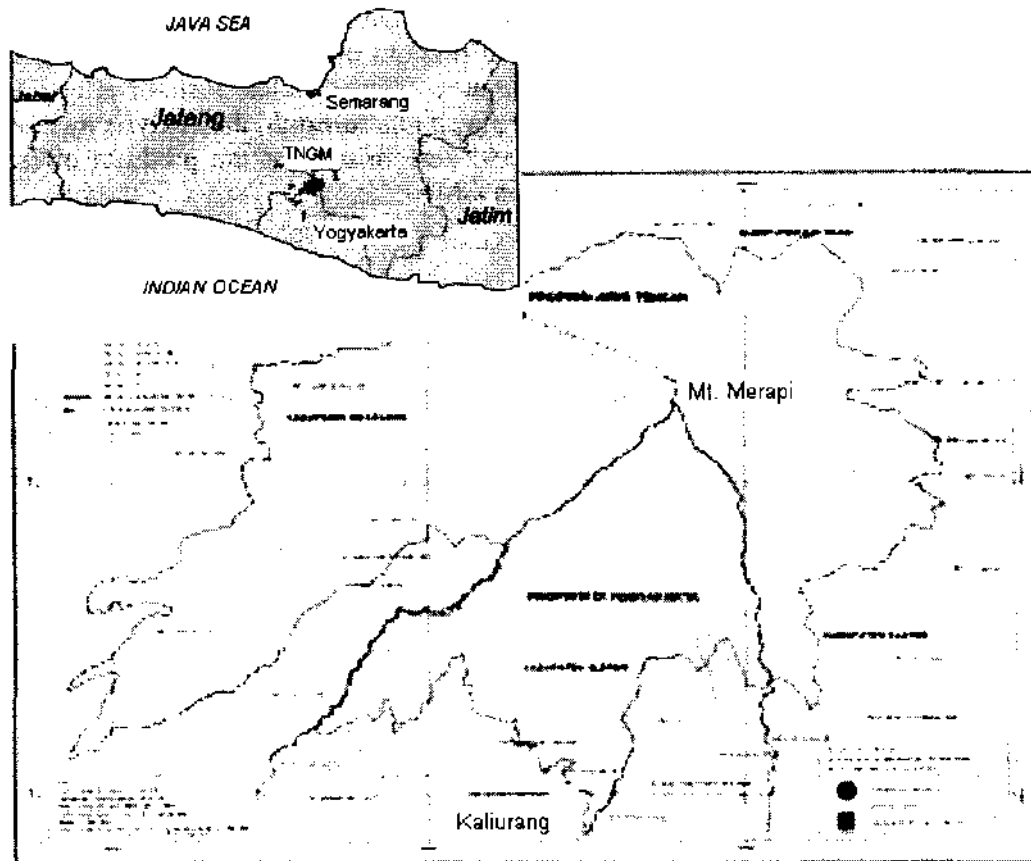


Figure 1. The area extend of Gunung Merapi National Park (TNGM)

The data used in this research are primary and secondary data. The methods applied include data collecting, data analysis, and result testing. The secondary data are collected from various governmental and nongovernmental institutions. Furthermore, the primary data are obtained from observations, interviews, and direct measurement of the field. The geophysics are water sample taking (rain and surface water, also soil water), air and soil aspects in the field and impacts of the spread concerning the situations taking the samples. These samples are tested in the laboratory. The vegetation analysis is executed to find out the structure and compositions of the community and vegetation types, the dominance, and some species of plants grow in several location. The parameter used in this vegetation analysis includes density, frequency, dominance, and important values. The measurement is done in an intensive used zone. This area is allocated for nature-based tourism activities.

Generally, tourists will be analyzed with IPA (Important Perform Analysis) approach. The Important Perform Analysis approach is a method mostly used in marketing researches. The purpose is to find out the ways to modify products and services with some tests on the attributes. It contributes positive effects to the customers' satisfactory. In the relations with this research, the analysis method will be used to measure the importance and performance of the products offered by nature-based tourism utilization zone in GMNP.

RESULT AND DISCUSSION

The Impacts to the Number of Bacteria and Actinomycetes

Based on the analysis, it is shown that the number of bacteria microbia in this control location is the highest with 54.56 cfu/gram, compared to the other areas. In fact, the number in Kalikuning is 26.2 cfu/gram, a little bigger compared to Tlogonirmolo with 11.55 cfu/gram and Tlogomuncar with 5.22 cfu/gram (see Table 1).

Table 1. Number of Bacteria and Actinomycetes in The Utilization Zone

Location and tourist density	Bacteria (cfu/gram)	Actinomycetes (cfu/gram)
Tlogomuncar (80-90 ppl/day)	5.22	1.37
Tlogonirmolo (20-30 ppl/day)	11.55	10.8
Kalikuning (10-15 ppl/day)	26.2	15.3
Control Location (Plawangan)	54.56	32.84

The measurements for this research are done three times on the crowd center location. Based on the observation on the field, the condition in Kalikuning is relatively more natural compared to the other locations (Tlogonirmolo and Tlogomuncar). The average and intensity of tourist utilization in Kalikuning are the lowest, with the sum of average visit is only about 10-15 tourists per day. Furthermore, the number of visitors in Tlogonirmolo is about 20-30 tourists per day, and Tlogomuncar has 80-90 tourists per day. Kalikuning is more restricted to some certain types of activity compared to the other places so that bacteria easily multiply. In Kalikuning, the activities done by the tourists usually are walking, photography, camping, and sightseeing on Saturdays and Sundays. On the other hand, on the other objects, many tourism activities done like sightseeing, hiking (to the peak of Pronojiwo), walking, relaxing, and playing are done with more intensity because the tourists visits are more often and more in number.

Moreover, the number of actinomycetes in the controlling location is 32.84 cfu/gram. In Kalikuning is a little more with 15.3 in number, compared to Tlogonirmolo with 10.8 cfu/gram and Tlogomuncar with 1.37 cfu/gram. Similar to bacteria, this thing happens possibly due to the average and intensity of the tourist utilization in Kalikuning is lower than the ones in Tlogonirmolo and Tlogomuncar.

From the information above, it is clearly seen that nature-based tourism activities in some locations decrease for the number of bacteria and actinomycetes. Nature-based tourism activities can arouse some changes on the physical soil. The figure above conveys that the higher level of tourist density, the less number of bacteria and actinomycetes. This information is necessary to notice by tourism managements to limit the intensity of tourist number and activities in all locations.

The Impacts to the Infiltration Rate

The infiltration rate with the model Horton in the natural forest of Plawangan Turgo (undisturbed area) to be controlling location is the highest with 0.983 cm/ minute. And then the disturbed area, Kalikuning, only 0.22 cm/ minute, compared to Tlogonirmolo 0.120 which is lower and the lowest infiltration is in Tlogomuncar 0.040. This shows that infiltration rate is connected to the average and intensity of the tourist utilization. To build facilities in Tlogomuncar is the most intensive activities, followed with Tlogonirmolo and Kalikuning.

The data on Tabel 2 indicates that nature-base tourism activities in some locations cause the degradation of infiltration rate. The higher tourist density existed causes soil impact which has the lower infiltration rate.

Table 2. The Average of Infiltration Rate

Location and tourist density	Infiltration rate (cm/min)
Tlogomuncar (80-90 ppl/day)	0.04
Tlogonirmolo (20-30 ppl/day)	0.12
Kalikuning (10-15 ppl/day)	0.22
Control Location (Plawangan)	0.983

The Impacts of Tourists to Noise

The number of tourist activities has direct impacts on noise can be seen on Table 3. The Table 3, describes that the number of tourist is closely related to noise. It indicates that the control location has the lowest noise reaching to 10.15 dB.

Table 3. The Average Noise in Utilization Zone

Location and tourist density	Noise (dB)
Tlogomuncar (80-90 ppl/day)	61.16
Tlogonirmolo 920-30 ppl/day)	43.8
Kalikuning (10-15 ppl/day)	54.3
Control Location	10.5

Tlogomuncar has a higher noise of 61.16 dB compared to Tlogonirmolo with 43.8 dB and Kalikuning 54.3 dB. The measurements are executed five times when the objects are very crowded with visits, at noons. consequently, Tlogomuncar is the most crowded. This is because Tlogomuncar is the central for tourist activities, easily accessed, near to the terminal/ parking area, close to the market and provides many facilities. On the other hand, Tlogonirmolo and Kalikuning are relatively less visited due to fewer facilities and harder to access. In Kalikuning, the tourists have to get ready with extra physic to walk from the parking area. Therefore, only young people in groups come and visit those places.

The Impact to the Tree Destruction

The tree destruction has been observed in four locations. The data of observation can be seen in Table 4 as follow:

Tabel 4. The Impact of the tree destruction

Location and tourist density	Spike Prickling	Scratching	Vandalism	Branch Breaking	Trees Burning
Tlogomuncar (80-90 ppl/day)	4	15	28	4	2
Tlogonirmolo (20-30 ppl/day)	1	4	7	1	1
Kalikuning (10-15 ppl/day)	12	9	12	6	3

From the Table 4, it is seen that mostly destruction happened in Tlogomuncar with 54 accidents, followed with Kalikuning with 42 and Tlogonirmolo with 14 cases. The biggest destruction of all is vandalism (47), scratch (28), spike prickling (17), branch breaking (11), and waste burning (6 accidents).

The Tourist Impact to Vandalism

Playground area located inside Tlogomuncar is 1 ha playing ground and divided into some parts. Some facilities and utilities are provided to give the best service to the tourists. One of the facilities, the playground, provides swings, benches, and shelters to relax and enjoy the beautiful landscape. Besides, the

tourism management also provides permanent dustbin made from cement construction. What happen in the location is not like what is expected. The visitors misuse, scratch the public facilities, destroy the trees and plants around. Besides, many of them throw their garbages in any places, not in the proper containers provided. It makes dirty and vile the environment.

The scratching media used are various. They can be a tipe-x, colorful paintbrush, ballpoint or even marker. From the image above, it is described that the media used are tipe-x and marker. The writings left are varied. They can be initials, full names, words or emotional expressions poured in texts. Every space or empty room must be full with scratches. The image conveys that there are many scratches on the shelters' roof, fulfilling the empty spaces. The pillars even get scratched. The media used are relatively similar, using tipe-x.

One type of vandalism is writing initials of name and certain group's name. they usually use paint brush as the medium. It seems that the scratch is newly made due to the bright color. The medium paintbrush used to make scratches is predicted intentionally brought. The desire to express the existence is showed by the variations of the media used. Based on the observation, the closest trees to the walking paths are risky of any vandalism and scratching.

Analysis of Importance and Performance Analysis

The importance and performance analysis or usually called IPA is a method mostly used in marketing researches. The purpose is to find out the ways to modify products and services with some tests on the attributes. It contributes positive effects to the customers' satisfactory. In the relations with this research, the analysis method will be used to measure the importance and performance of the products offered by natural tourism utilization zone, GMNP. This diagram describes the method as below (Fig. 2):

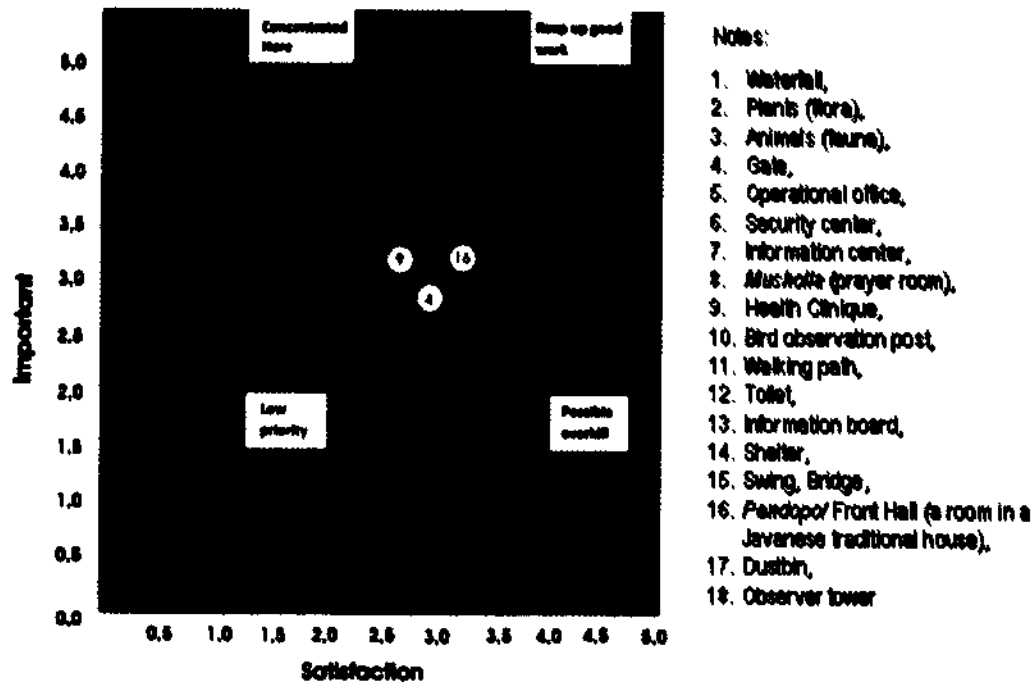


Figure 2. The importance Satisfaction Analysis of Attraction and Facilities

As mentioned on Figure 2 that tourism attractions and facilities like waterfall, *musholla*, shelter, dustbin, and observer tower are on quadrant 2 named “keep up good work.” This shows that those facilities or attractions are important and have good performances. However, operational office, security center, gate, health Clinique, and bridge come in a quadrant called “low priority” and “possible overkill.” The respondents say that those facilities are not very important and not in a good condition.

CONCLUSION

Base on the discussion above, some conclusion can be drawn as:

- 1) The impact of nature-based tourism activities towards some locations shows that the number of bacteria in the controlling location, that is natural and free from tourism activities, is the highest with 54.56 cfu/gram. In disturbed areas, the number of bacteria in Kalikuning is 26.2 cfu/gram, a little bigger compared to Tlogonirmolo with 11.55 cfu/gram and Tlogomuncar with 5.22 cfu/gram. The difference number of bacteria depends on a number of visitor.
- 2) The impact to the number of actinomycetes in the controlling location is 32.84 cfu/gram. The disturbed area, Kalikuning, decreases until 15.3 cfu/gram. This area is a little higer compared to Tlogonirmolo with 10.8 cfu/gram and Tlogomuncar with 1.37 cfu/gram. The difference number of actinomycetes pendends on a number of visitor.

- 3) The infiltration rate with the model Horton in the natural area, which has no visitors, Plawangan Turgo, shows that the controlling location is the highest infiltration rate of water is 0.983 cm/minute. In the area with crowded visitors like Kalikuning, it has the highest infiltration rate with 0.22 cm/minute. Tlogonirmolo is 0.120 cm/min. In addition, Tlogomuncar which has the highest number of visitor, has the lowest infiltration rate with 0.040 cm/minute.
- 4) The crowd level of tourist is portrayed through the level of noise in tourism objects. The control location has the lowest noise level or only 10.15 dB. Tlogomuncar, which has a higher dense visitor, is 61.16 dB, compared to Tlogonirmolo with the lowest visitors is 43.8 dB and Kalikuning is 54.3 dB.
- 5) Various types of tree destruction caused by tourist activities happened in Tlogomuncar, Tlogonirmolo and Kalikuning. It is seen that mostly destruction happened in Tlogomuncar with 54 accidents, followed with Kalikuning with 42 cases and Tlogonirmolo with 14 cases. The biggest destruction of all is vandalism (47 cases), scratch (28 cases), spike prickling (17 cases), branch breaking (11 cases), and waste burning (6 cases).
- 6) According to the respondents, the importance and performance of the products of the tourism objects offered describe that the attractions and tourism facilities like waterfall, musholla (prayer room), shelter, dustbin, and observer tower have a considerable perception and good performance. However, the respondents say that some other facilities/ attractions such as operational office, security center, gate, health clinique and bridge are not very important and not in a good condition.

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