

The Analysis of Mountaineer's Behavior at Talang Mountain Threatening Environmental Sustainability

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Abstract:- The highlighted problem in this study is how the behavior of Talang mountain climbers intimates the preservation of Talang mountain environment. The threat to the existence of edelweiss plants on Talang Mountain as well as the waste produced during climbing Talang Mountain. The purpose of this study was to analyze the behavior of climbers related to edelweiss and trash plants on Talang Mountain. The source of the data in this study were 100 Talang mountain climbers aged 15 years and over, data were collected by filling out questionnaires, interviewing directly and documenting result. The results of the study showed that 85% of mountaineer's behavior on Talang mountain are Pro climbers' to preserve edelweiss flowers, while 15% performed that threatened edelweiss on Talang mountain such as picking, breaking twigs and removing edelweiss stems. On waste problems, the result showed that mountaineers have positive behavior around 74% for waste management. On the other hand, there is 20.6% for non-pro with the waste management disposing of garbage along the climbing path, disposing of garbage in the resort / post and disposing of garbage at the top of Talang Mountain.

Keywords:- *environmental behavior, environmental sustainability, threat of environmental sustainability.*

I. INTRODUCTION

Indonesia has a landscape with beautiful and diverse cultures, tourist destinations can be in the form of natural tourism. According to PP No. 36 of 2010 concerning Natural Tourism Business, natural tourism is a travel activity or part of the activity that is done voluntarily and temporarily to enjoy the symptoms of uniqueness and natural beauty. Nature tourism is a form of tourism that is very close to the principles of conservation so that natural tourism is very appropriate and effective in maintaining the integrity and authenticity of natural ecosystems (Suratno, 2015).

Nature tourism activities that are currently developing are mountain climbing tours, one of the mountains that is in demand to climb is Talang mountain. Talang mountain is administratively included in Solok Regency, West Sumatra Province, with an altitude above 2,597 masl. Easy hiking trails, relatively low mountains, close distance from the city center, alluring scenery along the way (stretch of tea gardens, and amazing views from the summit) make Talang mountain as favorite for climbers both beginners and professional climbers.

The enhancement in climbing activities on Talang mountain influences the existence of edelweiss plants (*Anaphalis javanica*), currently edelweiss fall into the category of in threatened or threatened as rare plants and are listed on the International Union for Conservation of Nature (IUCN Redlist, 2008) with critical status (critically endangered-CR). In some mountains in Indonesia edelweiss plants are in great demand by mountain climbers to be picked as evidence of having done mountain climbing activities, over time the edelweiss population can decline like the population of edelweiss in Mount Gede Pangrango, West Java (Taufiq et al, 2013). Similarly, the garbage produced by climbers while climbing activities on Talang mountain can reduce the environmental quality of Talang mountain, as it is known that some of the ingredients contained in waste ecologically are not able to be digested and destroyed by decomposing organisms the longer the waste will accumulate in the environment without being able to be described.

There are some previous studies that also discuss the problem of edelweiss and garbage in the mountains such as research on edelweiss damage due to climbing activities on the official ascent of Semeru mountain route, aiming to see how much damage to edelweiss at climbing points and what factors affect damage (Kayowuan, 2014). Some trash bag community on Talang Mountain did the research for the practice of the persuasive campaign that encouraged changes each individual behavior. The researchers themselves were very motivated to find out how climbers behaved towards the existence of edelweiss and garbage when climbing Talang Mountain. The result of this research could be useful for many people, especially for the management of Talang Mountain in improving facilities and infrastructure for the sustainability of Talang mountain environment.

II. EDELWEISS ANALYSIS

Edelweiss plants are included in the Family *Asteraceae* and the *Compositae* Clan, the word edelweiss comes from the German word "Edel" which means noble and "Weiss" which means white. Edelweiss can reach more than 100 years old that is called eternal flower. Edelweiss is suitable for growing in sweltering conditions in open areas on mountain peaks, cannot grow in dark and humid forests, because edelweiss need more sunlight (Aliadi, 1990). In Southeast Asia including New Guinea, there are only 6 types of *Anaphalis* such as *Anaphalis Javanica*, *Anaphalis Longifolia*, *Anaphalis Maxima*, *Anaphalis Viscida*, *Anaphalis Helwigii* and *Anaphalis Arfakensis* (Taufiq et al, 2013).

Flowers that usually appear between April and August are food sources for certain insects. There are approximately 300 species of insects originating from the Order of *Hemiptera*, *Thysanoptera*, *Lepidoptera*, *Diptera* and *Hymenoptera* (fleas, butterflies, flies and bees) found in edelweiss flowers. The stem skin has a lot of water, so it can be a place of life for certain types of fungus and lichens, such as *Cladonia calycantha*, *Cetraria sanguinea*, and so on. Likewise with the roots that appear on the surface of the ground, is a living place for certain fungus that forms *mycorrhizae*. The fungus gets oxygen and a place to live, while edelweiss gets nutrients from the fungus (Maulidah, 2015).

In ecological studies, edelweiss has an important role as a pioneer plant in vegetation and land succession (plants that are able to penetrate vacant land as the first plants present and open up life for other organisms). Edelweiss becomes the first plant to grow and produce nutrients as a medium to grow other plants. In addition to pioneering plants, edelweiss is also a cover crop that can withstand rain and surface runoff, thereby minimizing the risk of erosion and landslides in mountainous areas. Edelweiss is a pioneer plant for volcanic soil in mountain forests and is able to maintain its survival on barren land, because it is able to symbiosis with certain *mycorrhizae* or soil fungi that effectively expand the area reached by its roots and increase efficiency in searching for nutrients (Maulidah , 2015).

III. GARBAGE ANALYSIS

Waste is the remnants of material that has undergone good treatments because it has taken its main part and there are already no benefits. In economical point of view that there is no price and it can cause health problems or disruption of sustainability from the environmental side (Hadiwiyoto, 1983). The definition of waste is also contained in Law No.18 2008 concerning Waste Management, waste is the rest of human daily activities and / or natural processes that are solid.

Waste is one of the causes of environmental damage that ultimately impacts on many things such as uncertain climate change, natural disasters, and the emergence of various diseases. The rate of waste production continues to increase, not only in line with the rate of population growth but also in line with the increasing consumption patterns of the people. On the other hand the handling of waste has not been optimal, unmanaged waste has an effect on the environment and the health of the surrounding community (Riswan et al, 2011).

Environmental behavior is an action that contributes to environmental sustainability or conservation, it can be concluded that environmental behavior is a behavior carried out to protect, improve and minimize the negative impact of human activities on the environment. One of them is by increasing community participation in environmental behavior by paying attention to the quality and availability of service facilities in the environment (Yolandari and Umar, 2017).

IV. TOOLS AND METHODS

The study was conducted at Talang mountain in Solok Regency, West Sumatra Province, Indonesia. The time of the research was from August 2017 to January 2018. The research was carried out from the entry point of Talang mountain to the summit of Talang mountain on 16 to 18 August 2017, 24 to 25 November 2017 and on 30 December 2017 to 2 January 2018.

A. Tools

GPS (Global Positioning System), camera, laptop, questionnaire, writing equipment, rope, meteran, scales and plastic bags.

B. Edelweiss damage analysis

Sampling is used by making a plot and done by a systematic method at the location of the activity. Plots were installed at several 2 x 2 m. The number of plots used in this study was 10 plots. Observations were performed with elevation from ± 2,500 masl, the observation of edelweiss plants damage is categorized as undamaged, slightly damaged, damaged and severely damaged. The criteria for measuring edelweiss damage can be seen in the table below:

No	Classification	Condition	Valuation (%)
1.	Undamaged	Undamaged stems, green leaves, and uninterrupted growths	0-25%
2.	Slightly damaged	Undamaged stems, broken branches, and uninterrupted growths	26-50%
3.	Damaged	Damaged stems, broken branches, picked flowers, and interrupted growths	51-75%
4.	Severely damaged	Picked and cutted branches	76-100%

Table 1:- Edelweiss Criteria (Source:- Kayowuan, 2014)

From the physical observation of the edelweiss plant population that has been done, the level of edelweiss damage can be calculated using the following formula:

$$\frac{\Sigma \text{damaged individuals}}{\Sigma \text{whole samples}} \times 100\%$$

C. Garbage existence analysis

The analysis was did by using observation and documentation, observations were made along the hiking trail (Batumbuk Water Climbing Trail) at the place of the resting place and the summit of Talang mountain. The average garbage for each person was obtained by distributing plastic bags when starting the climb to several respondents

and asking the respondents to bring down the waste produced to collect. Calculation of the weight of waste using a scale. Garbage mountaineers can be known by using the following formula:

$$\frac{\Sigma \text{Garbage weight}(kg)}{\Sigma \text{individual samples}}$$

The data used in this study are data on the type of waste and the average waste for each person. The data you want to get is data on the type of waste and the average waste generation per person. Sampling is done by distributing plastic bags to several respondents before climbing and asking the respondent to bring down a plastic bag containing the garbage produced during the climb to the researcher.

The type of garbage is obtained by looking at any garbage in the plastic bag collected by mountaineers, while the average waste for each person is obtained by using a scale for weighing the weight of the waste. After getting the total weight of the waste, the waste for each person can be known by using the following formula:

$$\frac{\Sigma \text{ Heavy trash (Kg)}}{\Sigma \text{ Individual sample}}$$

D. Mountaineers behavior analysis of Talang mountain

Data collection using questionnaires (contents related to treatment of edelweiss and waste plants and views on the environment of Talang mountain) and interviews directly with 100 mountain climbers. The measuring instrument used in this study uses NEP (New Ecological Paradigm). This study chose NEP as a measuring tool because it was in accordance with the research conducted to look at the pro-environmental behavior of Talang mountain climbers. The NEP measuring instrument is used with four (4) answer choices, namely strongly disagree (STS), disagree (TS), agree (S), and strongly agree (SS).

V. RESULTS AND DISCUSSIONS

E. The Characteristics of The Talang Mount

The characteristics of mountaineers in Talang mount based on the results of filling out questionnaires by 100 respondents as follows:

- Gender
The main respondents are 81 male and 19 female. In this study, the population of male mountaineers is greater than female mountaineers.
- Formal Education
The main visitors in Talang Mountain are 51 highly educated people (diploma, bachelor, and master degrees). There are 28 visitors with middle education (Senior high school students) and 21 visitors with low education (elementary school students and junior high school students).
- Respondent's Employment
The employment status of respondents showed that 57 people did not work and 43 people worked. The visitors of Talang mount who don't work are students of both junior and senior high school students and college

students. While, the visitors who works are civil servants, employees, traders, farmers and others.

- Reason's Mountaineers
The reasons for mountaineers to climb Talang Mountain showed that 82 people for recreation, 11 people for educational tour, 6 people for research purposes, and 1 person for another purpose. The beautiful view of the tea stretch at the foot of Talang Mountain and the beautiful natural scenery from the top of Talang Mountain are some attraction for climbers to recreation in Talang mountain.
- Climbing Frequency on Talang mountain
The climbing frequency of mountaineers on Talang mountain as many as 56 people answered sometimes (1-2 times), 28 people answered often (2-3 times) and 16 people answered very often climbing Talang mountain (> 3 times).
- Duration of respondents climbed on Talang mount
32 visitors answered the time spent climbing Talang Mountain for 1 day, 42 people answered 2 days, 23 people answered 3 days and the remaining 3 people for more than 3 days.

F. Damaged edelweiss levels

From the observations, there were 28.13% edelweiss which were slightly damaged as much as 32.8% and edelweiss which was classified as a total damage of 39.06%. From these results as much as 60.93% (28.13 + 32.8) of edelweiss plants in conditions that are still considered good plants are still developing. Whereas 39.06% of edelweiss under damaged conditions have been disturbed. The density of edelweiss plants in Talang mountain is 1.6 edelweiss / m².

When the edelweiss flower is taken, the chances of edelweiss to breed become smaller because the flower is a breeding tool, edelweiss takes at least five years for edelweiss plants to grow and flower (Taufiq, 2013). Edelweiss life spots are found in open areas and mountain slopes, edelweiss habitat is an area of flat topography. Edelweiss can grow on the border between the forest and open areas, because the most important need of this plant is light. Edelweiss at the location of Talang mountain can only be found after passing through the forest, namely on the slope area before reaching the peak and in the flat area (the location which is usually used as a place to set up tents for climbers of Talang mountain), the flower dominance is still buds and not blooming.

G. Garbage

The waste produced by the climbers of Talang Mountain is divided into two (2) types, namely waste classified as inorganic waste and organic class waste. As for items of inorganic waste found include plastic packaging beverage bottles, plastic wrap instant noodles, plastic dishwashing packaging, and plastic packaging for snacks, plastic raffia ropes, plastic used raincoat and canned fish packaging. While items of organic waste found include leftover vegetables, fruit skins, paper and cardboard. The average waste produced by each person is 0.5 Kg (for all

types of waste produced by Talang mountain climbers both organic and inorganic waste).

H. Mountaineers behavior to edelweiss plant

The results of filling out a questionnaire by 100 Talang mountain climber respondents containing 4 items of statements related to edelweiss, among others:

- I have never picked an edelweiss flower,
- I have broken an edelweiss branch,
- I once pulled an edelweiss stem, I don't care if someone reprimands when I pluck break branches or pull out edelweiss plants
- I reprimand when I see friends / people around me picking or damaging edelweiss plants.

The average value of the behavior of the climber of Talang mountain who is pro or caring about edelweiss is 85%, while the average value of the behavior of Talang mountain climbers who are not pro or care about edelweiss is 15%, meaning that in this study the behavior of mountaineers is the dominant pro against the edelweiss in Talang mountain.

The results of interviews showed that 15% of Talang mountain climbers carried out behavioral activities that damaged edelweiss by picking flowers, breaking twigs, or pulling edelweiss stems. These behaviors included climbers wanting to make edelweiss flowers as souvenirs for nature tourism as evidence of mountaineering, climbers accidentally stepped on edelweiss plants, climbers using edelweiss stems for fireplaces for reasons of not finding other logs.

Edelweiss is a plant whose status is protected by the government and includes rare species in the category of rare. Although the dominant behavior of climbers is still pro to the edelweiss plants need to be anticipated so that in the future the edelweiss plant is not extinct. The methods that can be carried out by the management of Talang Mountain for the protection of edelweiss plants that collaborate with various other institutions include:

- Conservation efforts are carrying out coaching activities in the original habitat (restoring) as done in Gede Pangrango mountain, West Java.
- Strengthen regulations, sanctions and penalties for violations committed by Talang mountain climbers regarding edelweiss plants.
- Information dissemination orally to climbers of Talang mountain about why edelweiss plants should not be taken.
- Tightening checks on climbers of Talang mountain in this case those who have to work extra are the managers of Talang mountain by checking whether there are edelweiss flowers brought by the climbers.
- Increase the manufacture and installation of warning boards to not pick edelweiss plants, so climbers think again to pick the plants.

I. Mountaineers behavior of waste in Talang mountain

The results of filling out a questionnaire by 100 Talang mountain climbers respondents which contained 5 items of statements related to the existence of garbage in Talang mountain, among others: The waste I produced I disposed of

along the climbing route, the waste I produced I disposed of at the resting place on the hiking trail, I throw away the waste I produce at the top of Talang mountain, the waste I produce is stored first when there is a landfill provided, in the garbage disposal place I dispose of the waste according to the type of organic waste and inorganic waste. Obtained the average value of the behavior of climbers of Talang mountain who are pro or care about waste is 79.4%, while the average value of the behavior of Talang mountain climbers who are not pro or care about waste is 20.6% meaning that in this study the behavior of climbers the mountain is the dominant pro for the garbage in Talang mountain.

The interviews conducted as many as 20.6% of Talang mountain climbers carried out behavioral activities to dispose of trash along the hiking trail, to dispose of garbage at resting places / posts and to dispose of garbage at the top of Talang mountain. One of the reasons why some Talang mountain climbers throw garbage is not in place because the location of the garbage disposal facilities provided by the management is still lacking, so it takes up space and becomes a burden when taken down the mountain. At the time of the research, the only means of garbage disposal provided by the management was made manually by digging a hole in the mountain foot.

The results of the research in Talang mountain dominantly the behavior of climbers is still pro waste, but there are still ways to anticipate the increase in garbage in Talang mountain, among others:

- Increase the number of facilities and infrastructures of trash cans along the climbing route, not only at one point but at many points so that climbers of Talang mountain can dispose of trash in their place.
- Increase the socialization of the dangers of throwing trash out of place because in the waste there are hazardous materials which some cannot be broken down by nature.
- Increase the installation of prohibited banners to dispose of trash along the climbing route.
- Providing bags / plastic bags to be distributed to mountain climbers so that climbers can enter the generated waste and bring it back down from the top of the mountain.

VI. CONCLUSION

- The behavior of climbers of Talang Mountain on the existence of edelweiss plants and garbage in Talang Mountain is classified as a Pro-Environment behavior.
- The view of mountaineers towards the environment of Talang Mountain shows a pro-environment view.
- Talang Mountain has pro behavior towards edelweiss while 15% of climbers perform behaviors that threaten edelweiss in Talang Mountain such as picking, breaking twigs and pulling out edelweiss stems.
- the behavior of Talang mountain pro climbers as much as 79.4% for waste management while 20.6% of climbers behaved non-pro on waste management such as disposing of garbage along climbing routes, disposing of garbage in

resorts / garbage dumps or dumping garbage at the top of Talang mountain .

- Talang mountain climber's behavior towards the existence of edelweiss plants and garbage in Talang Mountain is still dominantly behaving Pro-environment. It is not yet classified as a behavior that threatens sustainability, but for the sustainability of Talang mountain ecosystem all facilities and infrastructure need to be improved.

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