

Complex surveys for monitoring climbers in Mt.Fuji, Japan

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Introduction

Mt Fuji boasts the Japan's highest mountain. The mountain is one of the symbols of Japan and it is a cone shaped stratovolcano. It has been serving as a source of Japanese art and culture as well as Japanese way of worshipping the nature since ancient times. In 2013, such values were recognized and Mt Fuji was listed as one of the UNESCO's world cultural heritage sites. But, the World Heritage Committee advised the Japanese government improve the conservation efforts for the future when the resolution was reached. Also the Japanese government is required to submit "a State of Conservation Report" by February, 2016. The one of the reasons for such requirements mentioned above is the large number of the climbers. Mt Fuji opens only during the summer. During just two months, nearly 300,000 people visit Mt Fuji. During the peak time, as many as 10,000 people visit the mountain in a single day. The main purpose of the climbers is to see the sunrise from the top of the mountain. The extremely crowded mountain top before the dawn is ordinary scene of Mt Fuji during summer. Such a situation could potentially damage the value of Mt Fuji as the world cultural heritage site. The World Heritage Committee pointed out that "Visitor Management Strategy" should be laid out in order to limit the burden on the mountain for the future. The Japanese government listened to the advice and decided to lay out Visitor Management Strategy that includes the process of determining carrying capacities for the upper access routes that will help realizing the desirable style of Mt Fuji accents. In order to do that, the government needs to investigate and research the current state of the mountain by collecting and analyzing objective data. Laying out strategy is done mainly by Shizuoka prefecture and Yamanashi prefecture where the mountain is located in. This research was conducted in order to collect and analyze necessary data for strategy mentioned above.

Methodology

This investigative research used the following methods:

- 1) Questionnaire Survey
- 2) GPS Logger Survey
- 3) Count Survey
- 4) Camera Shooting at Certain Locations

Questionnaire Survey: We conducted face to face random sampling surveys with adult climbers who just climbed down the mountain. At surveys were conducted at the every 5th station, which is a starting point where all the main 4 trails begin. The samples collected are the followings: 2812 (10days) in 2015, 3130 (10days) in 2016, and 2755 (6days) in 2017. **GPS Logger Survey:** We asked adult climbers that were about to begin ascending at the beginning of the each of the 4 trails that begins at the 5th station to take a small portable GPS logger with them. The logger recorded the location information at 5 second interval. We collected the loggers when they got back down to the 5th station. The samples collected are the followings: 535 (5days) in 2015, 585 (5days) in 2016, and 587 (4days) in 2017. **Count Survey:** We counted the number of visitors by placing an infrared counter device at the 8th stations of each of the 4 trails. This was conducted for 24 hours a day about 2 months between 2015 and 2017. **Camera Shooting at Certain Locations:** Yoshida trail and Fujinomiya trail have relatively more climbers. We placed 2 weather proof and also night

time cameras at each of the 2 trails mentioned above. The cameras photographed climbers passing through at certain intervals. This was conducted for about 1 month between 2015 and 2016.

We designed an investigation section to each trail based on the area. We measured and speculated the climber density, climber speed, and the time it took for a climber to walk through a certain section by using the results from GPS Logger Survey and Count Survey. Such information mentioned above was measured and speculated for each investigation date, time, and section. We also analyzed the results from Questionnaire Survey and Camera Shooting in order to determine the levels of standards for safe and comfortable climber density when climbing Mt Fuji.

Results

The investigations revealed that only under a certain condition, a climber density rose to the level where climbers crash and fall or get injured. Specifically, such an event only occurred in only 2 trails. Also, a dangerous situation was occurring at a certain section at a several hours before the dawn on a day when the number of climbers were relatively higher. After that, we found out the causes of such “Bottlenecks” in each trail. In Yoshida trail, bottleneck was being caused by a narrow trail. In Fujinomiya trail, bottleneck was being caused by climbers ascending and descending were going through there at the same time. Based on the 3 years of accumulate data, we also were able to speculate the number of climbers per day that is needed in order to cause traffic outside bottlenecks because of the traffic in bottlenecks lasting longer than 1 hour. Such number is about 4000 climbers for Yoshida trail and about 2000 climbers for Fujinomiya trail. The result of this investigation is included as desirable numbers of climbers in the “Visitor Management Strategy” which is to be presented to the World Heritage Committee. Also each measure for dealing with the traffic in bottlenecks (e.g. creating a crowdedness calendar showing which date, place and time would be crowded) was determined based on the results of this investigation.

This investigation is a rare large scale investigation in Japan. This investigation utilized various methods to find out climbers’ behaviors and awareness and monitored this single mountain for 3 years. Also, we did not just collect the data, but also we used the results of this investigation to come up with strategies and measures for improving the situation. In that sense, this survey can serve as a reference for other monitoring investigations for popular mountains in Japan and even in foreign countries.