Location of the Visitor Centers of National Parks of Japan and their Adapt to Climate Change

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1. Introduction

Global warming is not only increasing the number of climate-related disasters, but also triggering complex disasters that affect many people around the world (Mora et al. , 2018), and this has led to calls for action on climate change. The VCs of national parks, which serve as refuge shelter in times of disaster, are also required to adapt to climate change. When the Ministry of the Environment and prefectural governments select sites for VCs, they focus on whether the sites are in location that is not subject to natural disasters. However, there is no existing knowledge that clarifies the potential of location of VCs to fulfill the aforementioned function in the aftermath of disasters. In this study, we focused on the potential of VCs to serve as refuge shelter in a disaster, with the following two objectives: 1) to clarify the differences between each type by classifying VCs of national parks of Japan according to their location, 2) to examine the potential of VCs as refuge shelter.

2. Methods

A total of 101 VCs in national parks of Japan were adopted as case study facilities and the following indicators were selected for analysis: (1) shortest distance from the VCs (highway interchanges, restaurants, stores), (2) land use within a radius of 500 m around the VCs (rice fields, agricultural land other than rice fields, forests, river lands and lakes, sea areas, building sites). Then, in order to prevent the effect of outliers, the distance scale in indicator (1) was replaced by an ordinal one. Finally, The cluster analysis (Ward's method, squared Euclidean distance) using indicator (1) and (2), and the multiple comparison tests (Bonferroni method, $P<.05$) were employed.

3. Results and Discussion

VCs were classified into four types through cluster analysis. Type I (N=48) is close to restaurants and stores, and has many forests and building sites in its vicinity, suggesting that this type is located at densely built-up area in mountainous national park. Type II (N=13) is close to restaurants and stores, and has many sea areas and building sites in its vicinity, suggesting that this is located at densely built-up area in coastal national park. Type III (N=28) is far from highway interchanges, restaurants and stores, and has many forests in the vicinity, suggesting that this is located near core area of mountains national park. Type IV (N=12) is located far from the highway interchange and is surrounded by rivers, lakes and marshes, and agricultural land, suggesting that this is located in a national park of lakes and marshes.

Type I is assumed that people can procure food, beverages and fuel because restaurants, stores, many buildings, forests are located near VCs. Similar to Type I, Type II, is inferred that food and beverages can be secured since there are restaurants, stores and many buildings. This type has also seawater areas and the countermeasures is necessary in order that facilities should not be isolated from surrounding areas in the event of a tsunami disaster. Compared to Type I, II, Type III is far away from restaurants and stores, and the surrounding area is mostly forest. Although fuel can be secured, it is difficult to secure supplies such as food and beverages, so it is important to stockpile supplies in preparation for disasters. Type IV is easy to secure drinking water because there are many rivers and lakes. Taken into consideration that the distance from restaurants and stores, and the small number of building in the area, it is necessary to stockpile food in particular.

In Conclusion, more than half of the VCs were located within walking distance (500m) from restaurants and stores, suggesting that they have the potential to serve as refuge shelter in a disaster. The results indicated that the resilience and vulnerability of VC differs depending on the location type and the planning and management should be proposed by referring the potential of VCs as refuge shelter.

Keywords: climate change, national parks, visitor center, location