
Sustainable Disaster Prevention Measures around the Kirishima Volcano

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Abstract

The Kirishima volcano group famous for active volcano in Japan is located around the border between Miyazaki and Kagoshima Prefecture. The relatively young volcano of about 20 erupted on the old volcano basement which exists near southern part of Kakuto caldera.

According to the record, among the Kirishima volcano group, Ohachi and Shinmoedake erupted intermittently in the past. Even in recent, the volcanic activity with volcanic tremor and a volcanic earthquake continued at the Ohachi in December 2003 and at Shinmoedake in February 2006.

Studying of the emergency counter measures experienced in case of the eruption of Usuzan and Miyakejima in 2000, it is recognized to establish the mutual cooperation system throughout the agency concerned across the border of prefectural government around the Kirishima volcano group.

Aiming to establish such system, the investigation committee in which the agencies concerned gathered was organized, and the actual action of crisis management in case of other volcanoes was studied over two years. The fundamental directivity and the integrated volcanic disaster prevention measure on the Kirishima volcano group is going to become clear from the teachings of other volcanoes studied by this committee. In this paper, such contents and scope of further steps are to introduce.

Keywords: volcano, emergency countermeasures, sustainable disaster prevention

Introduction

The Kirishima volcano group consists of more than 20 big and small volcanoes that lay on the border of Miyazaki and Kagoshima Prefecture (Fig. 1). Active volcanic activity of this group has been confirmed in historical times. On the other hand, the importance of establishing a hazard map and sharing disaster information as well as development of volcano monitoring/observation systems for implementing volcanic disaster prevention measures was reacknowledged as a result of the successive eruption of Usuzan (Hokkaido) and Miyakejima (Tokyo) in 2000. In view of this need, the country, prefectures, cities and towns related to the Kirishima volcano group have decided to mutually cooperate and work on the enhancement of a wide-area disaster prevention system.

Volcanic activities of Kirishima volcano group

Kirishima volcano group has been active for more than 100,000 years and has formed more than 20 volcanoes up to this day. However, the volcanic activities ascertained in historical times are only with three volcanoes; Shinmoedake, Ohachi and Ioyama. Shinmoedake, particularly, had a relatively major eruption in 1716 to 1717, which claimed 5 lives and caused considerable damage in surrounding areas with ash fall and debris flow.

As far as recent volcanic activities are concerned, Ohachi frequently erupted through Meiji era (1868–1912) and Taisho era (1912–1926) which took 8 lives mainly because of volcanic bombs (Table 1). Furthermore, Shinmoedake erupted in 1959 causing damage to forests and farm crops as well as contributed to traffic congestion due to ash fall. In more recent years, although no human casualty was reported, volcanic activities have been active continuously, such as: Shinmoedake erupted in 1991, abnormal fume was observed at Ohachi on December 2003 and an increase in volcanic earthquakes/tremors were reported at Shinmoedake on February 2006.

For this reason, Japan Meteorological Agency (JMA) designated the Kirishima volcano group to rank B,



Fig. 1. Location of Kirishima volcano group and its major volcanoes

Table 1. Human casualties due to volcanic activities of the Kirishima volcano group

Year	Location	Phenomenon (observed ones only)	Casualties
1716 to 1717	Shinmoedake	Ash fall, volcanic bombs, pyroclastic flow, debris flow	5 killed
1895	Ohachi	Ash fall, volcanic bombs	3 killed
1896	Ohachi	Ash fall, volcanic bombs	1 killed, 1 wounded
Around 1896	Ohachi	Ash fall, volcanic bombs	1 killed
1900	Ohachi	Ash fall	2 killed, 3 wounded
1923	Ohachi	Ash fall	1 killed
1942	South-west mountain base	Landslide	16 killed
1949	South-west mountain base	Landslide	34 killed
1954	South-west mountain base	Landslide	9 killed

the middle rank of the volcanic activity degree. JMA also classified the Kirishima volcano group as a “Constant Observation Volcano” and has begun continuous observation of volcanic activities. JMA is now providing a criterion called “Volcanic Activity Level” since February 2005, which numerically shows the volcanic activity degree and necessity of disaster prevention measures.

Actual condition of disaster prevention measures of Kirishima volcano group and its surroundings

Through 1990 to 1997, the country and prefectures took a pivotal role in preparing a volcanic disaster forecast map and focused on two measures, namely; basic plans of erosion control facility and monitoring/observation measures of sediment movement phenomena. Also in 1992, in response to the eruption of Shinmoedake in 1991, the town of Takaharu located on the north-east of the Kirishima volcano group solely prepared the “Poster of Kirishima volcanic disaster prevention aid” (Fig. 2). Furthermore, on March 1996, 8 cities and towns neighboring the Kirishima volcano group jointly prepared the “Kirishima volcanic disaster prevention map” (Fig. 3).



Fig. 2. Poster of Kirishima volcanic disaster prevention aid

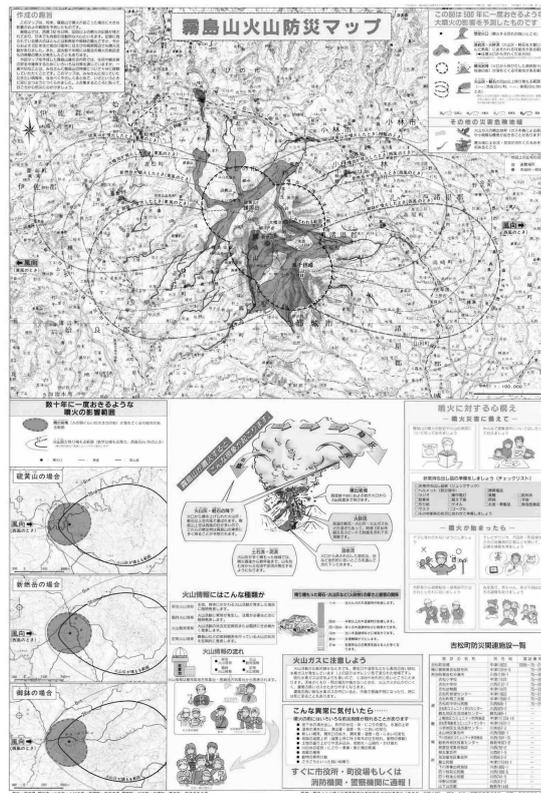


Fig. 3. Kirishima volcanic disaster prevention map

Characteristics of the volcanic disaster and issues posed to disaster prevention measures of Kirishima volcano group

Generally, the volcanic disaster is difficult to countermeasure when compared to other kinds of disasters because of these 5 characteristics:

- 1) Low frequency in occurrence compared to other kinds of disasters,
- 2) Has possibility to be severe and affects a wide range of area,
- 3) Causes various kinds of phenomenon,
- 4) Long-term, not transient like earthquake and typhoon, and
- 5) The volcanic activity changes momentarily and is difficult to predict movement.

Interprefectural cooperation needs to be considered for disaster prevention measures of the Kirishima volcano group as well, since, the volcano group is located across the border of Miyazaki Prefecture and Kagoshima Prefecture.

When considering disaster prevention responses at the time of eruption, problems such as delay in issuing climbing restrictions, disregard of the restrictions of governmental officers and news reporters approaching the crater area arose at the time of eruption in 1959. Similar problems were observed in 1991 when Shinmoedake erupted. The emergency warning was announced several times at the time eruption, but mountain climbers were still found around the crater. Also when abnormal fume was observed at Ohachi on December 2003, prefectures and adjacent cities and towns had trouble reaching an agreement on the commencing time of the climbing restriction.

Furthermore, issues arose with the disaster prevention map presented in 1996, such as:

- 1) Insufficient consideration to the residents or no follow-up after the preparation of the map due to lack of continuous educational activity,
- 2) Unclear description e.g. lava flow and pyroclastic flow were printed with same color,
- 3) Emergency evacuation centers were located inside the potential hazard area, and
- 4) Insufficient description with the sequence of the volcanic activity movement.

In this manner, various issues have arose with the volcanic disaster prevention measures of the Kirishima volcano group, which necessitates a reevaluation of present volcanic disaster prevention measures.

Efforts in dealing with the issues of Kirishima volcano group

As it was mentioned in the previous chapter, it was confirmed that the volcanic disaster countermeasure of the Kirishima volcano group has various issues to be solved. The successive eruption of Usuzan (Hokkaido) and Miyakejima (Tokyo) in 2000 has also lead us to realize that the establishing a hazard map, thorough notification and sharing of disaster information, development of a volcano monitoring/observation system and the establishment of a mutual communication/cooperation system among governmental bodies are critical for volcanic disaster prevention. Taking this situation into account, the following efforts have been implemented in Kirishima volcano group.

(1) Implementation of the Study Meeting Concerning The Volcanic Disaster Prevention of Kirishima Volcano and the Kirishima Volcanic Disaster Prevention Liaison Meeting

Through the fiscal year 2003 and 2004, institutions of the country, prefectures, cities and towns held the “Study Meeting Concerning The Volcanic Disaster Prevention of Kirishima Volcano” 7 times to examine necessary items and measures to prepare from now in order to countermeasure the possible eruption of Kirishima volcano. The disaster prevention measures conducted during the eruption of Usuzan and Miyakejima in 2000 has provided precious lessons that contributed to these study meetings. 10 academic experts were invited to the study meetings to give lectures based on topics such as the activity condition of Kirishima volcano group and volcanic prevention examples of other volcanoes. With total of 16 lectures delivered and accumulated studies on the method of volcanic prevention for Kirishima volcano group (Table 2), the following factors were considered important:

- 1) Live with volcanoes by learning about the eruption phenomenon and the bounty of volcanoes,

Table 2. Number of lectures by topics delivered at the Study Meeting Concerning The Volcanic Disaster Prevention of Kirishima Volcano

Topic	Number of times
Volcanic activity of the Kirishima volcano group	7
Necessary matters for volcanic disaster prevention measures	5
Examples of volcanic disaster prevention of other volcanoes	4
Total	16

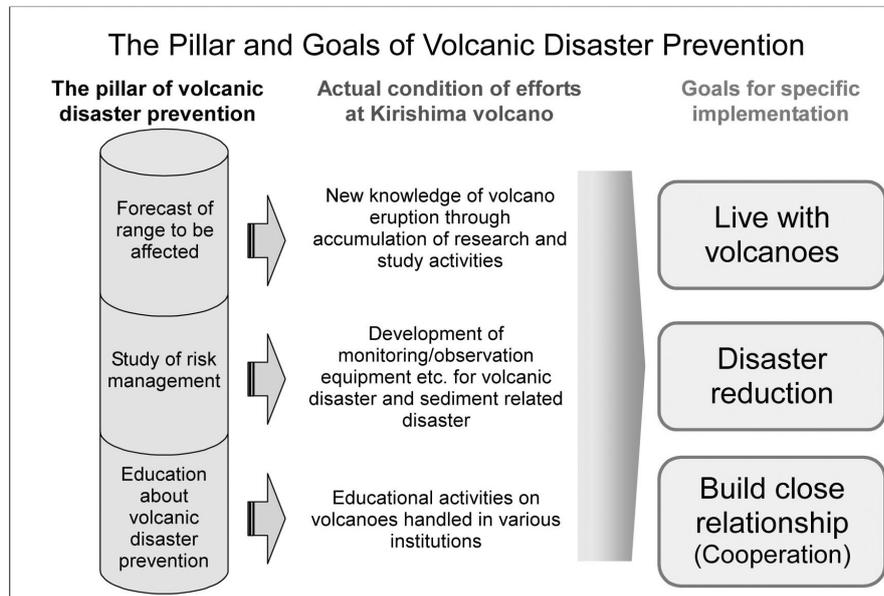


Fig. 4. The pillar and three goals of volcanic disaster prevention

- 2) Take “disaster reduction” measures which focus on reducing the disaster as much as possible rather than trying to completely prevent disasters, since disasters are long-termed and diversified, and
- 3) The public administration, researchers, news agencies and the residents should cooperation in preventing volcanic disasters.

Moreover, the “Kirishima Volcanic Disaster Prevention Liaison Meeting” will be held continuously from the fiscal year 2006 to share information regarding the activity condition of Kirishima volcano and the volcanic disaster prevention measures of the public administration and others. Fire departments and the Self Defense Force will newly attend the liaison meeting with the participants of the “Study Meeting Concerning The Volcanic Disaster Prevention of Kirishima Volcano.”

(2) Implementation of the Kirishima Volcanic Disaster Prevention Study Committee

The “Kirishima Volcanic Disaster Prevention Study Committee” formed with academic experts and people in charge of various disaster prevention related institutions was organized starting from the fiscal year 2005. The committee studies the direction of volcanic disaster prevention with the Kirishima volcano group and the comprehensive measures for the volcanic disaster.

The committee has set three goals, namely; “Live with volcanoes”, “Disaster reduction” and “Building close relationship (Cooperation)”, and have established a specialty division (sectional committee) to study the following three items to realize the aforementioned three goals (Fig. 4 and 5):

- 1) Prepare a volcanic disaster forecast map which is fundamental for volcanic disaster prevention,
- 2) Development of specific volcanic disaster prevention measures including matters such as the clarification of the positioning of volcanic sabo plans, the development and operation of volcano monitoring/observation systems and reflection of measures to regional disaster prevention plans, and

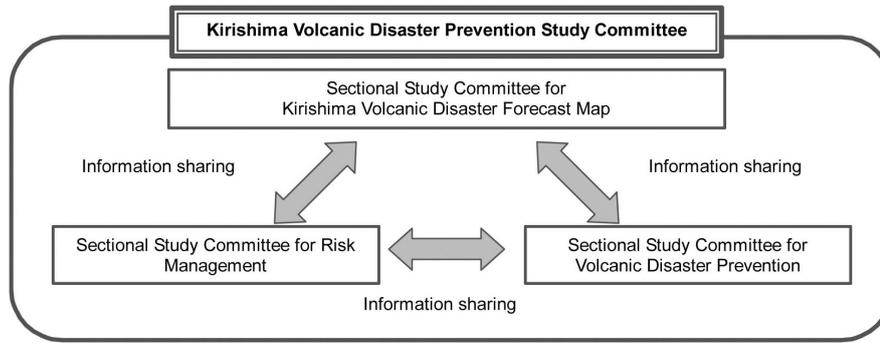


Fig. 5. Constitution of Kirishima Volcanic Disaster Prevention Study Committee

- 3) Implement informing and educational activity to the residents.

(3) Implementation of educational activity for disaster prevention

In Japan, residents have growing interest in disaster prevention recently because of increasing cases of bank rip and sediment related disasters caused by localized torrential downpour and the disaster caused by earthquakes. Educational activities for disaster prevention were implemented to residents and children living in the Kirishima volcano group area since volcanic microtremor/abnormal fume were observed at Shinmoedake and Ohachi in addition to cases of heavy rain disaster within the region of the volcano group (Fig. 6).

- 1) Holding the “Considering the volcanic disaster prevention of Southern Kyusyu” symposium (2004)
- 2) Schoolchildren’s Summer Course of Seismology and Volcanology (2005)
- 3) Kirishima volcano Sabo Expedition Team (2005 onward)

Issues to be solved and future plans

The Kirishima Volcanic Disaster Prevention Study Committee is planning to study on the following items:

- 1) Preparation of volcanic disaster prevention map created with residents,
- 2) Implementation of continuous educational activity for disaster prevention,
- 3) Cooperation with related institutions and information sharing, and
- 4) Promotion of sabo measures.

The study term of the Kirishima Volcanic Disaster Prevention Study Committee is planned to continue until fiscal year 2007, and after the term, each institution will advance the measures on their own based on the suggestion given by the Committee. The implementation of the “Kirishima Volcanic Disaster Prevention Liaison Meeting” will be necessary in order to maintain cooperation and information sharing among the related institutions. Based on those measures, there is a necessity to further improve the disaster prevention capability in Kirishima volcano group area by means of implementing continuous educational activities for volcanic disaster prevention to the local residents.

Summary

We have studied in “Study Meeting Concerning The Volcanic Disaster Prevention of Kirishima Volcano”; through this study meeting, the following factors were considered important:

- 1) Live with volcanoes by learning about the eruption phenomenon and the bounty of volcanoes,
- 2) Take “disaster reduction” measures which focus on reducing the disaster as much as possible rather than trying to completely prevent disasters, since disasters are long-termed and diversified, and
- 3) The public administration, researchers, news agencies and the residents should cooperation in preventing volcanic disasters.

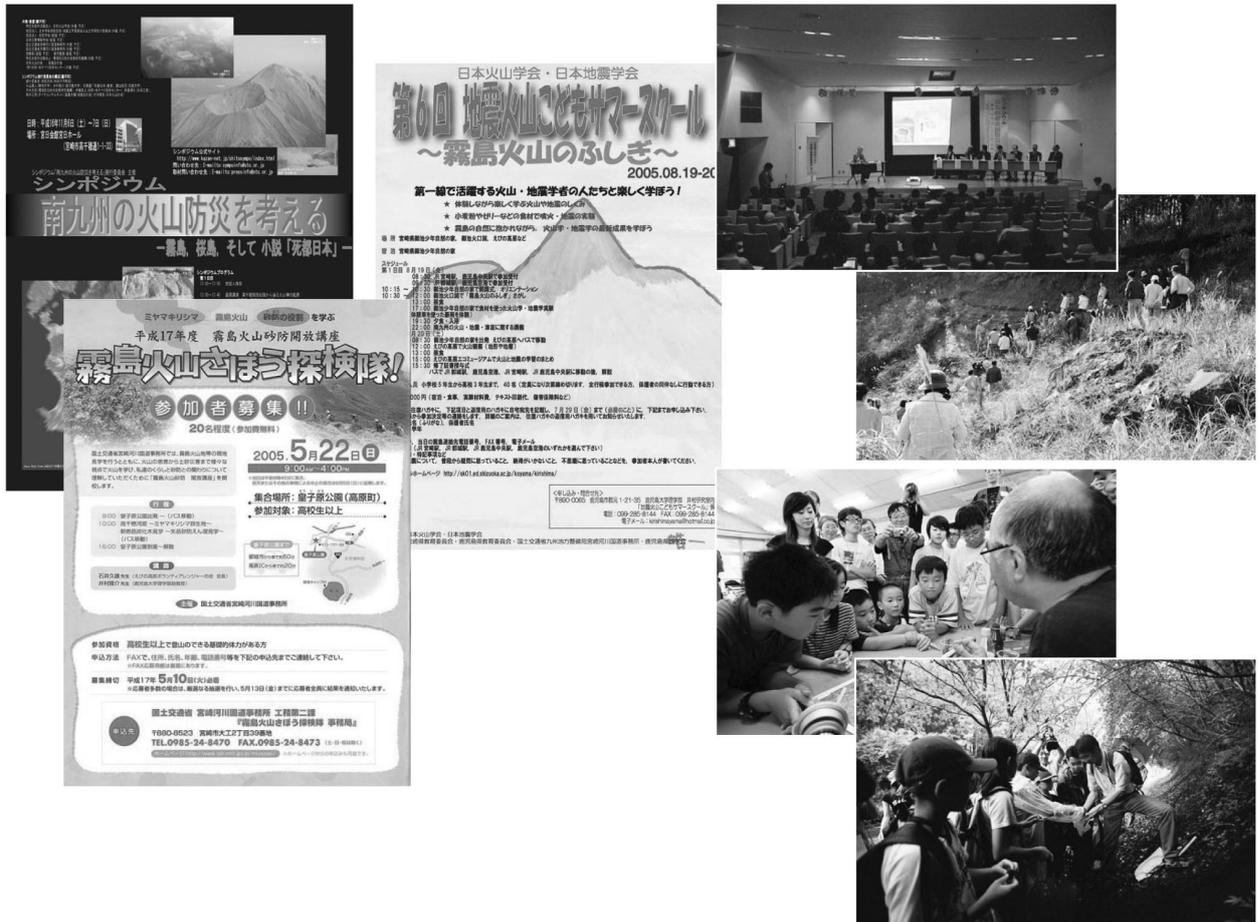


Fig. 6. Examples of the educational activity for disaster prevention in Kirishima volcano group

The “Kirishima Volcanic Disaster Prevention Study Committee” has set three goals, namely; “Live with volcanoes”, “Disaster reduction” and “Building close relationship (Cooperation)”, and have started to study the following three items to realize the aforementioned three goals:

- 1) Prepare a volcanic disaster forecast map which is fundamental for volcanic disaster prevention,
- 2) Development of specific volcanic disaster prevention measures including matters such as the formulation of volcanic sabo plans, the development and operation of volcano monitoring/observation systems and reflection of measures to regional disaster prevention plans, and
- 3) Implement informing and educational activity to the residents.

We are going to implement the following items; further improve the disaster prevention capability and the community planning, in Kirishima volcano group area.

- 1) Implementation of educational activities for volcanic disaster prevention to the local residents, and
- 2) Cooperation with related institutions and information sharing.

References

Ryusuke Imura and Tetsuo Kobayashi (1991): Eruptions of Shinmoedake Volcano, Kirishima Volcano Group, in the Last 300 years; *Volcano Volume* 36, No. 2, p. 135 to 148.
 Japan Meteorological Agency (2005), *National Catalogue of the Active Volcanoes in Japan (third edition)*, p 525 to 536.
 Website of Miyazaki Office of River and National Highway (<http://www.qsr.mlit.go.jp/miyazaki/>).
 Takaharu town, Miyazaki Prefecture (1992), Poster of Kirishima volcanic disaster prevention aid.

Miyakonojo city / Kobayashi city / Ebino city / Takaharu town, Miyazaki Prefecture; Kurino town / Yoshimatsu town / Makizono town / Kirishima town, Kagoshima Prefecture, Kirishima volcanic disaster prevention map.