# Active Volcanoes in the Izu Islands

~How to Stay Safe during a Volcanic Eruption~

















# About this pamphlet

This pamphlet was created to protect tourists and residents of the Izu Islands from the dangers of volcanic eruptions. Aside from offering a brief description of the volcanoes in the Izu Islands\*, this pamphlet discusses disaster response measures in the event of a volcanic eruption.

\* Seven inhabited islands among the Izu Islands, including Izu-Oshima, Niijima, Shikinejima, Kozushima, Miyakejima, Hachijojima, and Aogashima, are high-risk zones for volcanic eruptions. Shikinejima falls within the danger zone of Niijima; therefore, an eruption at Niijima can affect Shikinejima.

#### Origin of the Izu Islands

The Pacific Plate is subducted beneath the Philippine Sea Plate along the Izu-Ogasawara Trench, east of the Izu Islands. When the subducting plate reaches a depth of 100 km, water is discharged. This water rises into the mantle beneath the Philippine Sea Plate, generating magma that rises and spouts, creating a submarine volcano. As this submarine volcano grew, it rose above sea level and formed the Izu Islands.

#### Is a volcano active if it has not been erupting?

The lifespan of a volcano is so long that a dormant period of a few hundred years is like only a short nap. Accordingly, all volcanoes with recorded eruptions and those that show the possibility of eruption are classified as active volcanoes. This concept has become internationally accepted, and in Japan, all volcanoes with recorded eruptions have been considered as active volcanoes since the 1960s. In 2003, the Coordinating Committee for Prediction of Volcanic Eruptions redefined an active volcano as "a volcano that erupted in the past 10,000 years or a volcano that is currently exhibiting fumarolic activity." As of January 2020, Japan has 111 active volcanoes.

#### **Volcanic Phenomena**

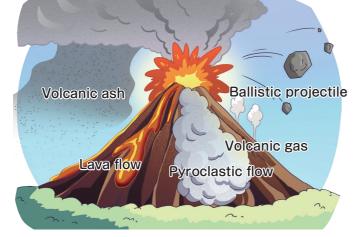


#### Volcanic gas

Most volcanic gases are invisible; however, some have a pungent or "rotten-egg" odor. The toxic components in volcanic gas can be fatal if inhaled and can also cause nearby trees to wither. Because these gases are heavier than air, they can accumulate in basins and valleys.

#### Lapilli

Lapilli include rock fragments a few centimeters in diameter that are carried by the eruption cloud and then fall to the ground. They can be carried by wind to fall more than 10 km from the volcano. Some lapilli, particularly those around the crater, can travel and fall at high speeds. People hit by these fragments can be severely or fatally injured.



#### Volcanic ballistic projectiles (VBPs)

Volcanic projectiles are approximately 20-30 cm or more in diameter and follow a ballistic trajectory with almost no wind resistance. Such volcanic phenomena are extremely dangerous and potentially life-threatening.



#### Lava flows

Magma is formed by the melting of rocks at high temperatures. Lava flows consist of magma that rises from underground and generally moves slowly enough to enable safe evacuation.



#### Volcanic ash

**American** 

**Pacific** 

Plate

Sea Plate

**Eurasia Plate** 

Eruptions can include magma and rock fragments less than 2 mm in diameter known as called volcanic ash. The inhalation of hot ash and gases can trigger asthmatic attacks and is harmful to the eyes and respiratory organs (i.e., the nose and mouth) even in healthy individuals.



#### Pyroclastic flow and surge

A pyroclastic flow refers to various fast-moving materials (e.g., rock, ash, air, and water) that are explosively ejected from a volcano down its flank. This condition is highly dangerous. Because such flows reach several hundreds of degrees in temperature and can move at speeds of tens to hundreds of kilometers per hour, they are impossible to outrun.

#### When visiting a volcanic island.

#### Before climbing

#### Take note of the nearest evacuation centers.

It is important to read about the evacuation centers on the Volcanic Alert Level page in this pamphlet before climbing and to check the latest status of the volcanoes.

#### Important tips when climbing

#### Stay updated on the situation of the volcano.

Keep your mobile phone turned on to receive emergency alerts from the emergency broadcast system. Because certain areas have poor signals, please ensure that your device has good reception.

#### Do not stray from the designated walking path.

As mentioned previously, volcanic gas is heavier than air and can accumulate in areas such as basins and valleys. Therefore, it is imperative to remain on the designated walking path.

#### Turn back immediately if you feel that something is wrong!

If you notice anything out of the ordinary (e.g., fumarolic activity), evacuate to a safe place or descend the mountain and notify the local authorities or the police. The volcano could erupt without warning, so always be attentive of the crater

#### During an eruption

#### Run away if you are near the crater!

If the volcano erupts, immediately move away from the crater and seek shelter in a nearby building or in the lee of a rock while protecting your head from VBPs.

#### Evacuate even if you are far from the crater!

Even if you are far from the crater, leave the eruption area immediately. Pay attention to the information provided by the emergency broadcast system and head to a nearby evacuation center.





#### Be careful even at Volcanic Alert Level 1

The JMA monitors and observes volcanoes 24 hours a day. When alerts regarding an eruption should be issued, a volcanic warning is announced. However, depending on the behavior of the volcano, it is possible that no warnings will be announced before an eruption. It is important to know what to do when a volcano shows signs of imminent eruption or when an actual eruption occurs.

Classi- fication	Abbre- viated Term	Target area	Levels & Keywords	Action to be taken by residents	Action to be taken by climbers
Emergency Warning	Volcanic warning (Residential area)	Residential areas and non-residential areas nearer the crater	Level 5 (Evacuate)	Evacuate from the danger zone.	
			Level 4 (Evacuation of the elderly, etc.)	Have the elderly, etc. evacuate from alert areas and others prepare to evacuate.	
Warning	Volcanic warning (Near the crater)	Non-residential areas near the crater	Level 3 (Do not approach the volcano)	Stand by and pay attention to changes in volcanic activity. Have the elderly, etc. prepare to evacuate in line with current volcanic activity.	Refrain from entering the danger zone.
		Around the crater	Level 2 (Do not approach the crater)	No action required.	Refrain from approaching the crater.
Forecast	Forecast	Inside the crater	Level 1 (Potential for increased activity)	No action required.	In some cases, it may be necessary to refrain from approaching the crater.

<sup>\*</sup>The volcanic alert level can change depending on the volcanic activity.

## Latest status of the volcanoes (Volcano information page of the JMA)







https://www.data.jma.go.jp/svd/vois/data/tokyo/STOCK/activity\_info/map\_4.html

# Izu-Oshima Oshima Town

Oshima is just a short distance from downtown Tokyo and has the largest volcano in the Izu Islands. Aside from the caldera\* in the center of the island and Mt. Mihara (758 m), the area includes terrain formed by the eruptions of lateral volcanoes aligning north-northwest to south-southeast of the island. In 1986, Mt. Mihara erupted at the summit crater, on the northern part inside the caldera and on the northwestern mountainside area outside of it. Lava flowed to Motomachi, and suspected fissure eruptions in certain areas (e.g., the southern part of the island) triggered the evacuation of about 10,000 people from the island. The Volcano Museum allows visitors to learn about volcanoes and to observe samples of parts of the stratum sections that were extracted.

\*Caldera: A depression larger than the crater of a volcano, which is often formed by the destruction or collapse of the structure around the crater.

#### **Tourist Spots**





This is the first headrace against lava flows in the world. It was designed to divert lava flow into the sea and away from the residential area in the case of lava flowing from the





This section is a portion of striped stratum formed from overlapping eruptions over a period of 20,000 years. The dark gray part consists of lapilli pieces (scoria); the dark brown part is volcanic ash; and the brownish-yellow part is soil with no eruption products.





Learn about active volcanoes in Japan and the world, and the disasters caused by eruptions of the volcanoes in the Izu Islands and Izu-Oshima. Included are abundant records of Izu-Oshima eruption from 1986. This is one of the few museums in the world that specializes in volcanoes.

## \*The number refers to the location on the map on the right.

Mt. Mihara and the Godzilla Rock



Mt. Mihara is the symbol of Oshima. In the movies, the fictional monster Godzilla was revived here. Hike around the crater path on Mt. Mihara, and you just might encounter lava Godzilla!





This is the only official desert in Japan. Although this wasteland contains lava and scoria as far as the eye can see, it is home to some vegetation because it has been more 30 years since the last eruption.





The 1703 Genroku earthquake and the resulting tsunami linked a crater from the ninth-century eruption to the sea, and the residents installed crushed rocks to transform the area into a port. It was temporarily used as an evacuation and standby port for ships headed to Edo and was a very busy port until the early Showa Era.

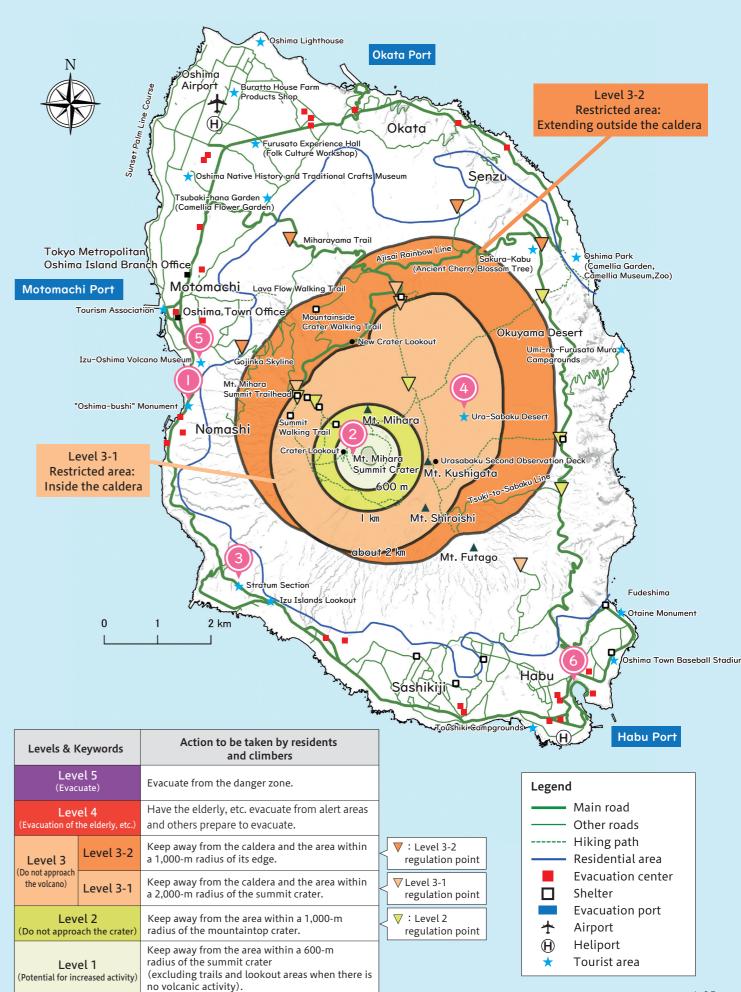
#### Izu-Oshima Geopark http://www.izu-oshima.or.ip/geopark/index.html



Latest status of the volcanoes (Izu-Oshima) (Volcano information page of the JMA



## Izu-Oshima Volcanic Alert Levels



04

# Niijima Niijima Village

This elongated island running north to south includes a group of lava domes such as Mt. Miyatsukayama and Mt. Atchiyama to the north and Mt. Mukaiyama to the south. Mt. Mukaiyama (301 m) was formed by eruptive activity from 886 to 887. The depression in the center of the island at the current location of village was formed through the accumulation of eruptive products. Niijima includes a volcano that is prone to pyroclastic flows and surges. In addition, this area includes series of monogenetic volcanoes that do not have fixed volcanic vents, which makes it difficult to predict their behavior. Transparent olive-colored "Niijima Glass" is composed of white rhyolite quarried from Mt. Mukaiyama.

### **Tourist Spots**



#### Habushiura Coast



This is a popular surfing destination on the east coast. Niijima's famous white sand was formed through a long period of wind and rain erosion of the deposits of pyroclastic flow (pyroclastic surge) behind the beach.



#### Cityscape of Anti-Fire Stone (Koga Stone)



Koga Stone, which is a term used to describe the volcanic products of Mt. Mukaiyama eruptions, is commonly used as heat-resistant building material. The Moyai Statues are also composed of this material.

\*The number refers to the location on the map on the right.

**Fujimitoge Pass** 



Enjoy the view of the two villages, Shikinejima and Kozushima, and one lava dome of Mt. Mukaiyama. Visitors can see the deposits formed from volcanic ash, pyroclastic surge, and lava formed on the roadsides from the eruptions of Mt. Mukaiyama and the Wakago volcano.



#### 4) Shiromama Cliffs



The strata of pyroclastic flows and surges from Mt. Mukaiyama eruptions completely covered the island and formed a massive cliff. It is aptly named Shiromama, with "Shiro" and "mama" as a Japanese word for "white" and a dialectal term for "cliff," respectively.

\*The cliffs are constantly subjected to wind and rain erosion, causing rocks to fall and large portions of the cliff to collapse; therefore, we recommend viewing the cliffs from a safe distance.

## Shikinejima Niijima Village

Shikinejima is located approximately 4 km southwest of Niijima and similarly consists of white rhyolitic lava covered by pyroclastic material. Visitors can view traces of the explosions on the coast where lava flowed into the shallow areas of the ocean.

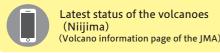
#### **Tourist Spots**



#### Kanbiki Scenic Overlook



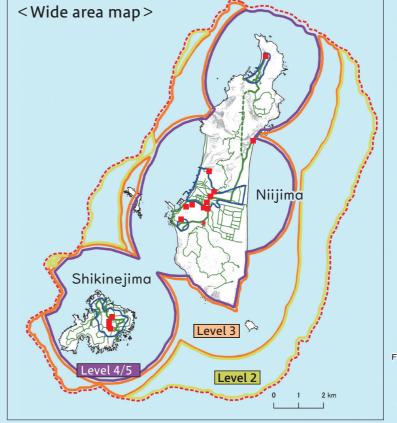
On a clear day, both Izu
Peninsula and Mt. Fuji are
visible. Kanbiki Bay is
believed to be a crater
formed by an explosion that
occurred when lava from
Shikinejima came into
contact with the ocean water.

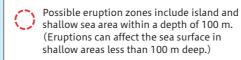


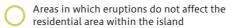




## Niijima/Shikinejima Volcanic Alert Levels







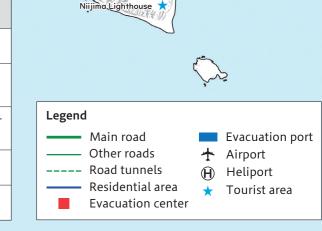
Areas in which eruptions could affect the residential area within the island

Areas in which eruptions are more likely to affect the residential area within the island

iura Campground ropolitan Habushiura Park (Mt. Ishiyama) Tangoyama

\*It is also possible to erupt in the surrounding seas, which makes it difficult to forecast the erupting spot.

Levels & Keywords	Action to be taken by residents and climbers.	
Level 5 (Evacuate)	Evacuate from the danger zone. Visitors should evacuate from the island.	
Level 4 (Evacuation of the elderly, etc.)	Have the elderly, etc. evacuate from alert areas and others prepare to evacuate. Visitors should evacuate from the island.	
Level 3 (Do not approach the volcano)	Keep away from the danger zone. Have the elderly, etc. prepare to evacuate. Visitors should evacuate from the island.	
Level 2 (Do not approach the crater)	Refrain from approaching the crater.	
Level 1 (Potential for increased activity)	No restrictions.	



 $6 \mid$  0

## Kozushima Kozushima Village

Kozushima is practically located in the center of the Izu Islands and consists of more than 18 rhyolite monogenetic volcanoes including those in the surrounding islands. These volcanoes sometimes erupt calmly and produce lava flows, whereas others erupt violently and produce pyroclastic flows or surges. Monogenetic volcanoes, which make up Kozushima, do not have fixed volcanic vents, which makes it difficult to determine the exact location of the eruption. Formed during an eruption in 838, Mt. Tenjo (572 m) is the newest mountain on Kozushima.



#### **Tourist Spots**





Mt. Tenjo is the symbol of Kozushima and includes a lava dome that formed during an eruption in 838. Its spacious mountaintop features a natural pond and white sand composed of crushed lava. Various alpine plants can be found along the hiking trail.



#### Obsidian Rock Sign (Tako Bay Lookout)

\*The number refers to the location on the map on the right.



Obsidian lava forms a black belt around the peninsula in front of the lookout. Obsidian, which is commonly used in making stone tools, is only available in Kozushima in the Izu Islands and was shipped to the mainland. Genuine obsidian rock fragments can be observed next to the lookout.



#### Tako Bay



Enjoy the view of the massive white cliffs and sandy beach composed of lava and pyroclastic flow from which Mt. Tenjo was formed. Some volcanic ash from the 838 eruption reached as far as Izu-Oshima and Izu Peninsula.





Near Maehama beach, there is a rock shaped like a whirlpool. High-viscosity rhyolite lava flowed at a slow pace, cooled down, and solidified to form this unique design.



Kozushima volcanic ash in the Japan mainland (Ito City, Shizuoka)

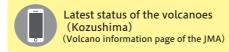
Some volcanic ash from the 838 eruption landed across the sea in the Shizuoka and Kinki regions, on the Japan mainland. The white volcanic ash of Kozushima can be seen in the black volcanic products of Mt. Omuro in Ito City.



### Akasaki Walking Path

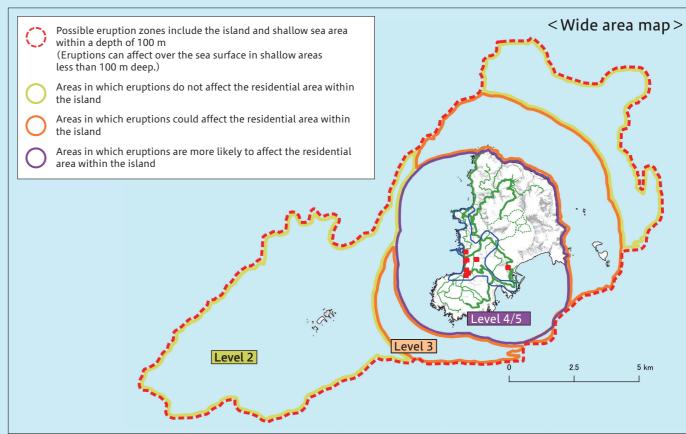


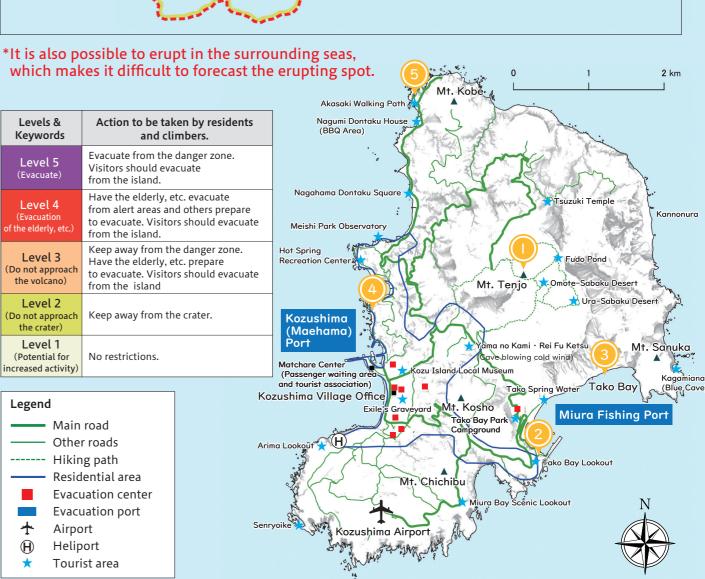
This 500 m wooden walking path was constructed along the northwest coast of the island. Lava flows on the coastline can be viewed, and visitors can also enjoy diving and snorkeling activities in this area.





## Kozushima Volcanic Alert Levels





 $^{18}$ 

# Miyake Jima Miyake Village

Miyakejima is round in shape, with Mt. Oyama (775 m) located at its center. Mt. Oyama has often erupted from a fissure vent on the mountain slope and also has occasionally erupted at the summit. In October 1983, most of the village of Ako was buried in lava flow by the eruption. From July to August 2000, Mt. Oyama repeatedly erupted at the summit, to form a caldera. After these eruptions, volcanic gas containing highly concentrated sulfur dioxide was continually emitted, which forced approximately 3,800 residents to evacuate from the island. The evacuation lasted until February 2005, when the residents were finally able to return home.



(Photo) Caldera formed at the top of Mt. Oyama owing to the 2000 eruption.

\*The number refers to the location on the map on the right.

#### **Tourist Spots**





The largest village in Miyakejima and a bustling hot springs area, Ako, was buried under lava during the 1983 eruption. The remains of the former Ako Elementary and Junior High School were left untouched to show the extent of the damage caused by the





This lake is an eruption crater that was formed roughly 2000 years ago. This is the largest freshwater lake in the Izu Islands and Miyakejima's largest water source. Rare wild birds inhabit the glossy-leafed trees in the surrounding forests, making the island ideal for bird watching.





This small mountain was formed during a fissure eruption in 1962. Lava fountaining from the fissure reached 200 m in height. Visitors can view the accumulation of black volcanic rock (scoria).

## Shiitori Shrine



This shrine pays homage to Shiritaki no Mikoto, the child of Sakitama Hime no Mikoto. This shrine was buried by mudflows\* following the 2000 eruption. Visitors can see the buried torii gate as well as the laurel forest withered by volcanic gas.

\*Mudflows (Lahars): Debris flows consisting of rocks, pyroclastic material, and rocky debris mixed with water.



### Mt. Nippana-Shinzan



This dissected cinder cone was formed overnight during the 1983 eruption. The vivid black and red striped pattern of the stratum can be observed when looking up from the coast.

Miyakejima Geo Trekking Route https://www.miyakejima.gr.jp/map/







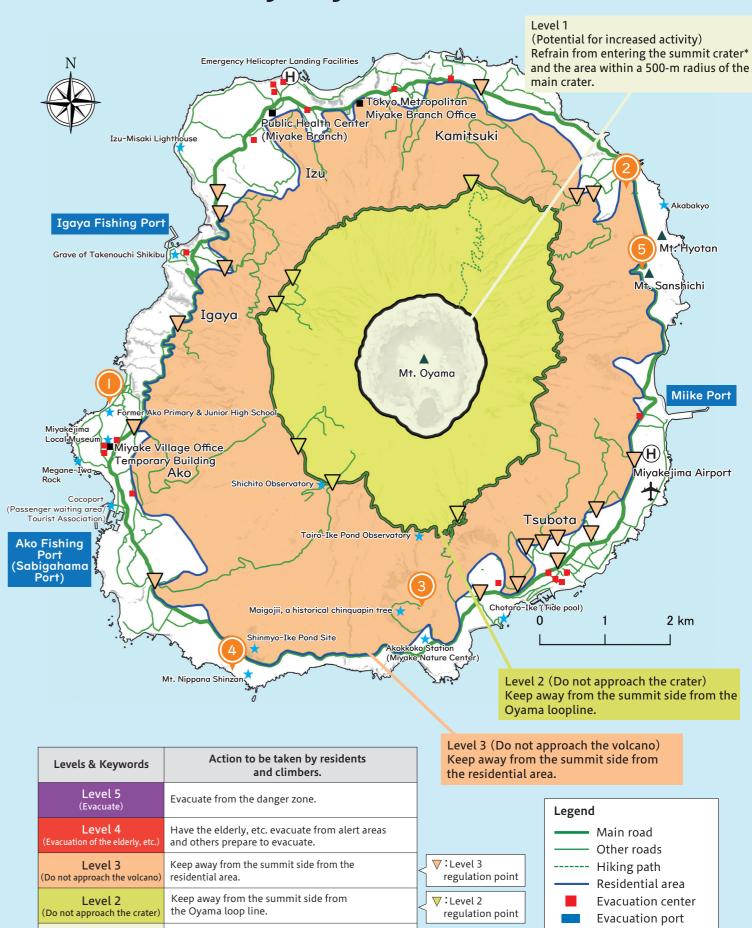
## Miyakejima Volcanic Alert Levels

+

Airport

Heliport

Tourist area



Refrain from entering the summit crater\* and the

area within a 500-m radius of the main crater.

※Inside the Oyama summit crater and the area

within a 100-m radius from the edge of the crater.

Level 1

(Potential for

increased activity)

## Hachijo jima Hachijo Town

Hachijojima, located in the southern part of the Izu Islands, is a gourd-shaped island that connects two mountains, Mt. Hachijo-Fuji (Mt. Nishiyama) and Mt. Miharayama (Mt. Higashiyama). Both mountains are stratovolcanoes composed mainly of basalt. Mt. Hachijo-Fuji (854 m) is a young volcano that has been active for 10,000 years. Its last eruption was in 1605 during the Edo period. There are more than 20 lateral volcanoes in the area, and many crater chains have been discovered in the seas of the northern mountain. Mt. Miharayama (701 m) was active from 100,000 to approximately 3,700 years ago. It is currently undergoing erosion, which has created its jagged shape.

#### **Tourist Spots**





Mt. Hachijo-Fuji is the highest point in the Izu Islands at 854.3 m above sea level. It has a crater with a diameter of 500 m at the top, where visitors can stroll and enjoy the view of the lava dome formed by the eruption.





This stone wall in Hachijojima was built from lava and natural round cobblestones, and a windbreak forest with common camellia and chinquapin trees was installed at the top to protect homes from wind and rain damage. This wall provides a view that is unique to Hachijojima.





Hachijojima promotes the use of renewable energy. This museum provides information about the origin of Hachijojima through a volcanic eruption and explains how geothermal energy is generated through exhibitions and videos.

\*The number refers to the location on the map on the right.





This lava plateau was formed by lava flowing from an eruption of Mt. Hachijo-Fuji into the ocean. The black lava extends to an area that 500 m long by 100 m wide. Visitors can actually stroll on top of the lava. This spot is also very popular for its spectacular



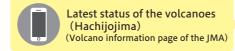


A pothole pertains to a depression formed on a streambed. Small rocks that accumulated in small holes were continually rotated by the current and gradually formed large and deep holes over a long period of time. This feature has been designated as a national natural treasure.





Many natural hot springs occur in Hachijojima. Uramigataki hot springs are in a prime location because they overlook a waterfall and are surrounded by subtropical plants. The Uramigataki Waterfall is located nearby; visitors are also able to see the back side of the waterfall.





## Hachijojima Volcanic Alert Levels



Levels & Keywords	Action to be taken by residents and climbers.		Legend
Level 5 (Evacuate)	Evacuate from the danger zone.	V:Level 3 regulation point  V:Level 2 regulation point	— Main road — Other roads
Level 4 (Evacuation of the elderly, etc.)	Have the elderly, etc. evacuate from alert areas and others prepare to evacuate.		Hiking path  Possible eruption zone
Level 3 (Do not approach the volcano)	Keep away from the summit side from the residential area.		Residential area  Evacuation center
Level 2 (Do not approach the crater)	Refrain from approaching the area within a 1,000-m radius of the Mt. Hachijo-Fuji (Mt. Nishiyama) summit crater.		Evacuation port  Airport  Heliport
Level 1 (Potential for increased activity)	No restrictions.		★ Tourist area

## Aogashima Aogashima Village

This village is an inhabited volcanic island located at the southernmost part of the Izu Islands on top of a large volcano 1100 m above the sea floor. The island was formed by basaltic magmas that solidified to black lavas. The entire island is a caldera (Ikenosawa crater), within which lies the central volcanic cone,

Mt. Maruyama. The Ikenosawa crater was formed by a phreatomagmatic eruption approximately 2,000 to 3,000 years ago. After the Mt. Maruyama eruption between 1780 and 1785, approximately 200 island residents were evacuated, and the island became uninhabited. People returned to the island in 1832. Presently, a high-temperature fumarolic area lies within the Ikenosawa crater and around the northernmost point of the island.



#### **Tourist Spots**





This central cone of Mt. Maruyama with two craters of different sizes was formed by a giant eruption in 1785. Two ponds, Oike and Koike, were formerly present in Ikenosawa. Camellia trees have been planted in a striped pattern in the lower area.





In Ikenosawa, food can be cooked in pots using natural heat from the ground. Visitors can enjoy a picnic of steamed dishes while being surrounded by the grand nature of Aogashima.





This statue pays homage to Jiro Sasaki, a hero heralded as the "Moses of Aogashima." It was built to commemorate the return of the inhabitants to Aogashima for the first time in 50 years and the subsequent restoration of the island.





The Ikenosawa area at the foot of Mt. Maruyama features volcanic steam from fumaroles caused by the ground heat of the volcano. The locals refer to this stream as "Hingya," which is used to produce Aogashima's famous Hingya salt.

\*The number refers to the location on the map on the right.



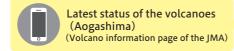


This port serves as the gateway for ships to Aogashima. Because fishing boats cannot moor at the port, they are lifted and lowered during departure and arrival, respectively.

## Community Sauna

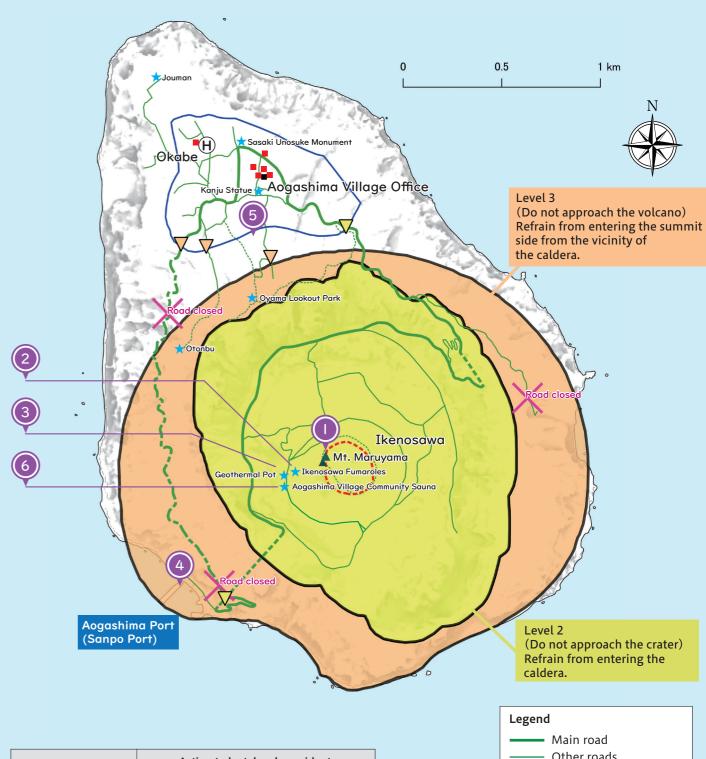


This natural sauna utilizes the ground heat emitted from the Ikenosawa area. This is a popular location for both locals and tourists.





## **Aogashima Volcanic Alert Levels**



Levels & Keywords	Action to be taken by residents and climbers.	
Level 5 (Evacuate)	Evacuate from the danger zone.	
Level 4 (Evacuation of the elderly, etc.)	Have the elderly, etc. evacuate from alert areas and others prepare to evacuate.	
Level 3 (Do not approach the volcano)	Refrain from entering the summit side from the vicinity of the caldera.	V:Level 3 regulation point
Level 2 (Do not approach the crater)	Refrain from entering the caldera.	V:Level 2 regulation point
Level 1 (Potential for increased activity)	No restrictions.	

Other roads ---- Road tunnels **— • —** Some sections of the roads are closed (as of April 2020) ----- Hiking path Mt. Maruyama Residential area Evacuation center

Heliport

Tourist area

**Evacuation port** 



Izu-Oshima ····· 109 km
Niijima151 km
Miyakejima ······ 172 km
Kozushima ····· 180 km
Hachijojima ····· 287 km
Aogashima ····· 358 km

## **Emergency Contact**



**Police Station** 110



Fire Department

#### Town/Village Office

Oshima Town Office TEL: 04992-2-1443

Niijima Village Office TEL: 04992-5-0240

Kozushima Village Office TEL: 04992-8-0011

Miyake Village Office TEL: 04994-5-0981

Hachijo Town Office

TEL: 04996-2-1121 Aogashima Village Office

TEL: 04996-9-0111

Japan Meteorological Agency (JMA), **Volcanic Disaster Mitigation Office** 

If you notice any unusual volcanic activity, please call

TEL: 0570-015-024

IMA

Seismology and Volcanology Department Volcanology Division

Volcanic Observations and Warning Center

Izu-Oshima Resident Office for Volcanic Disaster Mitigation

TEL: 04992-2-1166

Miyakejima Resident Office for Volcanic Disaster Mitigation

TEL: 04994-5-0980

#### **Active Volcanoes in** the Izu Islands

#### ~How to Stay Safe during a Volcanic Eruption~

First edition published March 2021 Edited/Published by

Planning Section, Disaster Prevention Division,

Bureau of General Affairs, Tokyo Metropolitan Government

2-8-1 Nishishinjuku, Shinjuku-ku, Tokyo 163-8001

TEL: 03-5320-7892

Printed by Daishin Printing, Inc.

- \*Supervision: Six Volcanoes in Izu Island: Disaster Management Council/JMA
- \*Overview of Niijima, Shikinejima, Kozushima, and Hachijojima by Tokyo Prefecture Bureau of Port and Harbor

Lava flow photographs provided by National Institute of Advanced Industrial Science and Technology.

Other photographs provided by Six Volcanoes in Izu Island: Disaster

Management Council and Asia Air Survey Co., Ltd.

\*This information is accurate as of January 2020.

- \*This pamphlet contain information only on natural disaster prepared-
- \*Copyright laws prohibit the reproduction, copying, renting, and other uses of the illustrations and graphics in this pamphlet without permission, with certain exceptions.

#### Contact information concerning this pamphlet:

Planning Section, Disaster Prevention Division, Bureau of General Affairs, Tokyo Metropolitan Government

TEL: 03-5320-7892

General Affairs Department, Tokyo Regional Headquarters, JMA TEL: 042-497-7198

Disaster Preparedness Tokyo App available for download at

Passenger Vessel Departure and Arrival at Shimoda

Vessel for Transit Passengers

between Hachijojima and

Niijima Village Ferry

Arrival at Haneda

Arrival at Chofu

Helicommuter

Aircraft Departure and

Aircraft Departure and

Aogashima



Scan the QR code!



