

COURSE : DISASTER MANAGEMENT (MA/ MSc PART I)

Paper : III

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Topic : Volcanic Eruptions

Introduction

A volcanic eruption occurs when molten rock, ash and steam pour through a vent in the earth's crust.

Volcanoes are described as active (in eruption), dormant (not erupting at the present time), or extinct (having ceased eruption; no longer active). Some volcanoes explode. Others are slow-flowing fountains of lava, which is hot fluid rock.

About 550 volcanoes have erupted on Earth's surface since recorded history; about 60 are active each year. Far more have erupted unobserved on the ocean floor. Most volcanoes exist at the boundaries of Earth's crustal plates, such as the famous Ring of Fire that surrounds the Pacific Ocean plate.

The Nature of Volcanoes

Volcanoes are built by the accumulation of their own eruptive products—lava, bombs (crusted over ash flows), and tephra (airborne ash and dust). A volcano is most commonly a conical hill or mountain built around a vent that connects with reservoirs of molten rock below the surface of Earth. The term *volcano* also refers to the opening or vent through which molten rock and gases are expelled.

Driven by buoyancy and gas pressure, the molten rock, which is lighter than the surrounding solid rock, forces its way upward and may ultimately break through zones of weaknesses in Earth's crust. If so, an eruption begins, and the molten rock may pour from the vent as nonexplosive lava flows, or it may shoot violently into the air as dense clouds of lava fragments. Larger fragments fall back around the vent, and accumulations of fall-back fragments may move downslope as ash flows under the force of gravity. Some of the finer ejected materials may be carried by the wind and fall to the ground many miles away. The finest ash particles may be injected miles into the atmosphere and carried many times around the world by stratospheric winds before settling out.

Molten rock below the surface of Earth that rises in volcanic vents is known as **magma**, but after it erupts from a volcano it is called lava. Originating many tens of miles beneath the ground, the ascending magma commonly contains some crystals, fragments of surrounding (unmelted) rocks, and dissolved gases, but it is primarily a liquid composed of oxygen, silicon, aluminum, iron, magnesium, calcium, sodium, potassium, titanium, and manganese. Upon cooling, the liquid magma solidifies to form an igneous or magmatic rock.

Lava is red-hot when it pours or blasts out of a vent but soon changes to dark red, gray, black, or some other color as it cools and solidifies. Very hot, gas-rich lava containing abundant iron and magnesium is fluid and flows like hot tar, whereas cooler, gas-poor lava high in silicon, sodium, and potassium flows sluggishly, like thick honey, or in other cases, like pasty, blocky masses.

All magmas contain dissolved gases, and as they rise to the surface to erupt, the confining pressures are reduced and the dissolved gases are liberated either quietly or explosively. If the lava is a thin fluid (not viscous), the gases may escape easily. But if the lava is thick and pasty (highly viscous), the gases will not move freely but will build up tremendous pressure and ultimately escape with explosive violence, throwing out great masses of solid rock as well as lava, dust, and ashes.

The violent separation of gas from lava may produce rock froth called **pumice**. Some of this froth is so light—because of the many gas bubbles—that it floats on water.

Types of Volcanic Eruptions

During an episode of activity, a volcano commonly displays a distinctive **pattern of behavior**. Some mild eruptions merely discharge steam and other gases, whereas other eruptions extrude quantities of lava. The most spectacular eruptions consist of violent explosions that blast great clouds of gas-laden debris into the atmosphere.

The **type of volcanic eruption** is often labeled with the name of a well-known volcano where characteristic behavior is similar—hence the use of such terms as “Strombolian,” “Vulcanian,” “Vesuvian,” “Peleian,” “Hawaiian,” and others. Some volcanoes may exhibit only one characteristic type of eruption during an interval of activity—others may display an entire sequence of types.

In a “**Strombolian**”-type eruption observed during the 1965 activity of Irazu Volcano in Costa Rica, huge clots of molten lava burst from the summit crater to form luminous arcs through the sky. Collecting on the flanks of the cone, lava clots combined to stream down the slopes in fiery rivulets.

In contrast, the eruptive activity of Parícutin Volcano in 1947 demonstrated a “**Vulcanian**”-type eruption, in which a dense cloud of ash-laden gas explodes from the crater and rises high above the peak. Steaming ash forms a whitish cloud near the upper level of the cone.

In a “**Vesuvian**” eruption, as typified by the eruption of Mount Vesuvius in Italy in A.D. 79, great quantities of ash-laden gas are violently discharged to form cauliflower-shaped cloud high above the volcano.

In a “**Peléan**” or “**Nuée Ardente**” (glowing cloud) eruption, such as occurred on the Mayon Volcano in the Philippines in 1968, a large quantity of gas, dust, ash, and

incandescent lava fragments are blown out of a central crater, fall back, and form tongue-like, glowing avalanches that move downslope at velocities as great as 100 miles per hour. Such eruptive activity can cause great destruction and loss of life if it occurs in populated areas, as demonstrated by the devastation of St. Pierre during the 1902 eruption of Mont Pelée on Martinique, Lesser Antilles.

“**Hawaiian**” eruptions may occur along fissures or fractures that serve as linear vents, such as during the eruption of Mauna Loa Volcano in Hawaii in 1950; or they may occur at a central vent such as during the 1959 eruption in Kilauea Iki Crater of Kilauea Volcano, Hawaii. In fissure-type eruptions, molten, incandescent lava spurts from a fissure on the volcano's rift zone and feeds lava streams that flow downslope. In central-vent eruptions, a fountain of fiery lava spurts to a height of several hundred feet or more. Such lava may collect in old pit craters to form lava lakes, or form cones, or feed radiating flows.

“**Phreatic**” (or “**steam-blast**”) eruptions are driven by explosive expanding steam resulting from cold ground or surface water coming into contact with hot rock or magma. The distinguishing feature of phreatic explosions is that they only blast out fragments of preexisting solid rock from the volcanic conduit; no new magma is erupted. Phreatic activity is generally weak, but can be quite violent in some cases, such as the 1965 eruption of Taal Volcano, Philippines, and the 1975-76 activity at La Soufrière, Guadeloupe (Lesser Antilles).

The most powerful eruptions are called “**Plinian**” and involve the explosive ejection of relatively viscous lava. Large plinian eruptions—such as during 18 May 1980 at Mount St. Helens or, more recently, during 15 June 1991 at Pinatubo in the Philippines—can send ash and volcanic gas tens of miles into the air. The resulting ash fallout can affect large areas hundreds of miles downwind. Fast-moving deadly pyroclastic flows (“**nuées ardentes**”) are also commonly associated with plinian eruptions.

Volcanic eruptions in India

There are altogether seven extinct and active volcanoes in India. Barren Island in the Andaman and Nicobar islands has India's only live volcano, erupting once again in 2017.

Sr. No.	Volcano Name	State	Type	Last Eruption
1.	Barren Island	Andaman Islands	Stratovolcano	Active 2017
2.	Narcondam	Andaman Islands	Stratovolcano	
3.	Baratang	Andaman Islands	Mud Volcano	Active since 2003
4.	Deccan Traps	Maharashtra		
5.	Dhinodhar Hills	Gujarat	Extinct	Inactive Volcano
6.	Dhosi Hill	Haryana	Extinct	
7.	Tosham Hills	Haryana	Extinct	

Its first recorded eruption dates back to 1787. Since then, the volcano has erupted more than ten times, including the one this year.