

## **RGS-IBG Tectonic Hazards downloadable introduction for students**

Tectonic hazards (relating to the forces that move the earth's crust) include natural events such as volcanic eruptions, earthquakes and tsunamis. Understanding the earth processes that lead to these kinds of natural disasters give us the best chance at being able to avoid the death tolls that sometimes result from such devastating natural events. However, understanding these processes alone is not enough, because these disasters strike human settlements of all different kinds, shapes and sizes and at different times. Knowing how to deal with the warning signs and preparing for the worst is often a delicate balancing act between seeming to be too concerned and being concerned enough.

Evacuations of cities have happened in some occasions when, in the end, no disaster occurred and people then become complacent and mistrustful of national advice, especially when shutting up and leaving might have a big cost for those who have to move. This is particularly so where people in the area involved have low incomes and depend on the land for their sustenance. If a country compels people to leave when no disaster ensues, the authorities can appear heavy handed. If they fail to evacuate then they appear to have not been taking due care.

### **Continental Plate Boundaries**

Continental plate boundaries are the key to understanding the forces at play leading to tectonic events. Plate boundaries are the boundaries between large masses of the earth's crust. These large crustal masses, the size of continents, float on the asthenosphere and move according to the direction of flow of the underlying mantle (rock that is in a state which is partially liquid and partially solid). When these plates move underneath one another, or beside each other or into one another, this causes the release of pressure at a massive scale. These forces make volcanoes erupt, mountains form, earthquakes occur and tsunamis form. The movement of these plates involves the release of energy thousands of times greater than any atomic explosion.

### **Volcanic events**

Volcanic eruptions occur mainly when two plates run into one another, and one is pushed beneath the other. When one plate is driven underneath the other (subducts), it creates pressure, descends (plunges) into the mantle, melts, expands and 'looks for' a means of escape. This escape, when it is found, forms a volcanic eruption. Volcanic eruptions are able to expel cubic kilometres of molten rock.

## **Earthquake events**

Earthquakes occur when movements of the tectonic plates occur. Typically pressure builds up between two plates and eventually the pressure is released. When this happens it constitutes an earthquake. The exact place where an earthquake occurs, the point at which the pressure is released, is called the origin of the earthquake. Right above this point, on the surface of the earth is the point where the earthquake has its greatest intensity. This point is called the epicentre of the earthquake. Earthquakes cause the greatest damage if they hit a city. They have the highest death toll when people are at home, asleep especially where people are crowded in poorly built buildings. Great loss of life can also occur during peak hour when people can be trapped in means of transport. The quality of buildings plays a big role in mortality as poorer buildings collapse causing significant loss of life.

Geographers studying earthquakes look at how to interpret warning signals in the form of smaller tremors that might indicate the coming of an earthquake. Unfortunately, however, it is often not easy to predict earthquakes, because, unlike volcanoes that give evidence of an impending eruption, earthquakes can occur without any warning. Sometimes, however, a relatively small earthquake can trigger another earthquake or other tectonic movement further along the fault line.

Earthquakes do not only lead to loss of life because of the earth's movement, but also as a result of earthquakes there are often widespread fires which may spread uncontrollably because fire fighting equipment, water mains etc can be burst, and road access can be compromised.

## **Tsunami**

Like earthquakes, tsunamis can affect areas without any warning at all. Although a tsunami is caused by an earthquake, waves can travel across very large bodies of water at very great speed wreaking havoc in areas far away from the source of the earthquake. Also, depending on the nature of the earthquake, a tsunami may affect areas seemingly randomly, as some areas of coastline might be heavily affected and others less affected depending on aspect, coastal protection, beach orientation etc.

Although waves can travel quickly across bodies of water, there is still time for some warning to be given if enough information is provided to potentially affected areas quickly. Moving to higher ground quickly is critical for reducing loss of life in tsunami affected areas. This was certainly the case with the 2004 Indian Ocean tsunami, and is something that the governments of countries with coasts in the Indian Ocean have been recently addressing after the catastrophic loss of life in 2004.

## Overview

In order to have a good understanding of this topic you will need to know some of the causes of tectonic events. You will also need to know the circumstances in one or two case studies, as an example of what can happen, and how preparations for such a natural disaster are aimed to reduce loss of life. In some instances, there is little that can be done to protect property, because the energy that is involved is so great, and in such cases the only real safety procedure is timely evacuation.

## Sources

There are many good websites that provide support information which might be over and above what is in your textbook. Some are listed below:

<http://www.volcanolive.com>

<http://volcano.und.edu>

<http://www.geographypages.co.uk/tectonic.htm>