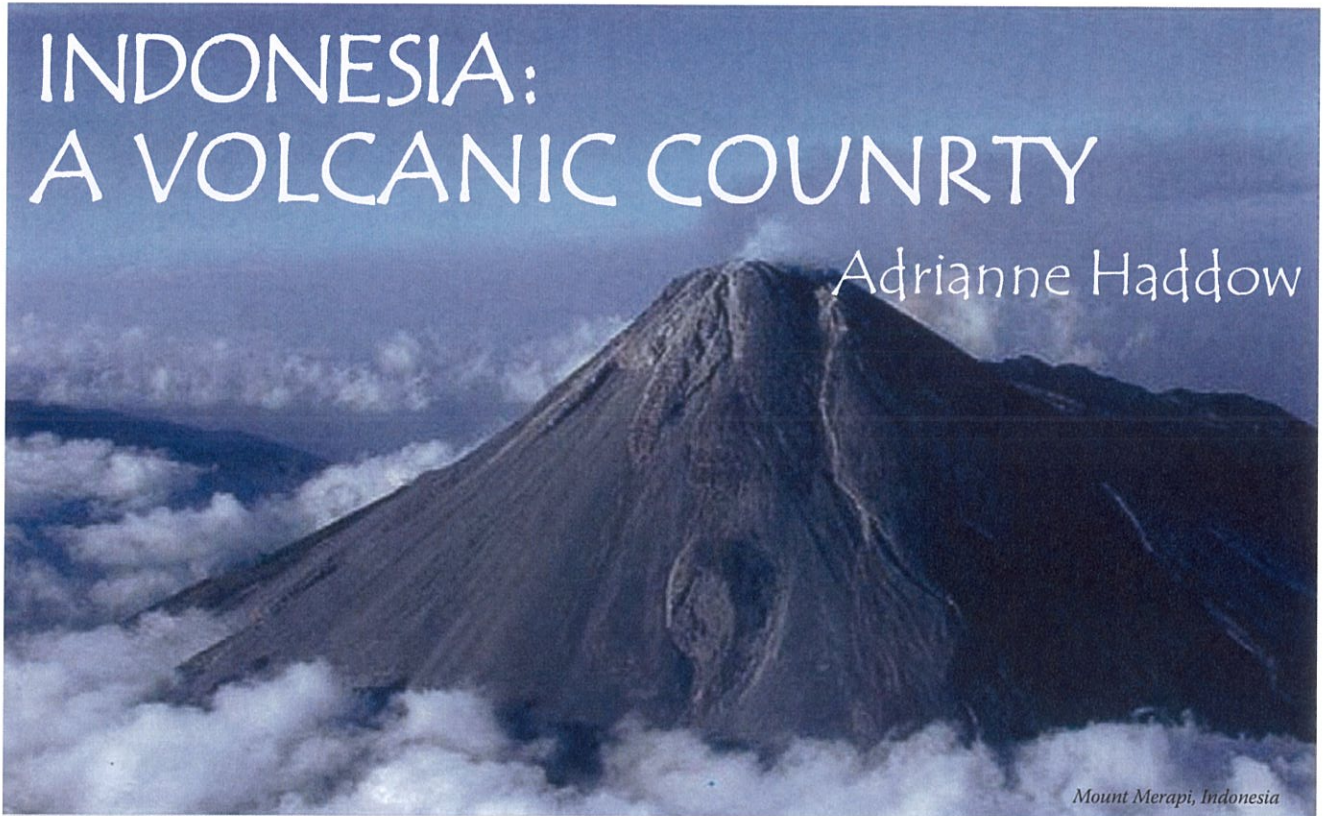


INDONESIA: A VOLCANIC COUNTRY

Adrienne Haddow



This Unit of Work deals with Stage 3 Geography:
Investigate how the natural environment influences people
and places

Contents:

- ◇ How volcanoes are formed
- ◇ How volcanoes are formed: Tectonic plates
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How a volcano is formed
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1. HOW VOLCANOES ARE FORMED

- Read the following factual description.

Around 45 thousand million years ago, the Earth was burning liquid rock. After millions of years, the outer part of the Earth cooled and became a solid crust. Today, it is still very hot in the centre.

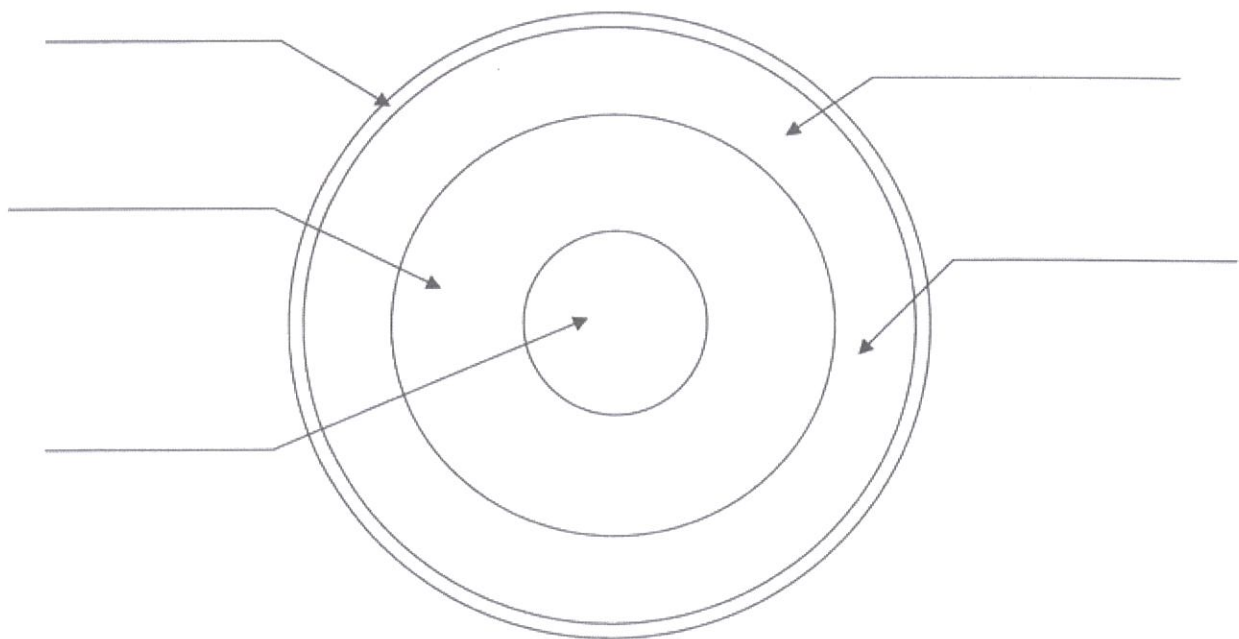
If we could travel deep into the Earth's crust, we would find the temperature rising. At a depth of 6 kilometres, the temperature would be around 160 °C.

Under this solid crust the rocks become so hot they are always liquid. Melted rock is called magma, and it's temperature is about 800 °C. This layer of molten rock is called the mantle. The mantle is divided into two parts, the upper mantle and the lower mantle.

The centre of the earth is called the core. This is the hottest part of all. Scientists estimate that the temperature could be as much as 4000 °C. Some scientists hypothesise that the core is quite solid because of the pressure put upon it of the two outer layers.

- Label the diagram using key words to show what you have learned. Include approximate temperatures of each layer of the earth.
- Use colour to show the variation in heat from the crust to the core.
- Construct a key for the approximate temperature range of each section of the diagram.

CROSS -SECTION OF THE EARTH



2. HOW VOLCANOES ARE FORMED

Tectonic Plates

Study the diagram on the following page, then fill in the blanks below.

The Earth's _____ is not a single solid skin holding molten rock inside it. Instead it floats like a jigsaw pieces over the molten rock. The pieces are very large and are called _____.

These plates are constantly _____, travelling a few centimetres every year. The edges of the tectonic plates are weakened where the plates may be tearing away from each other, rubbing together, or sliding under one other.

Volcanoes are found in these weak areas, where the crust is no longer strong enough to hold back the magma and burning gases beneath. The magma forces its way _____, sometimes as a violent explosion.

Where tectonic plates meet under the ocean a _____ and an _____ is formed.

As the lighter oceanic plate slides under the _____, water and rock from the crust are pushed deeper into the earth. This is called the _____.

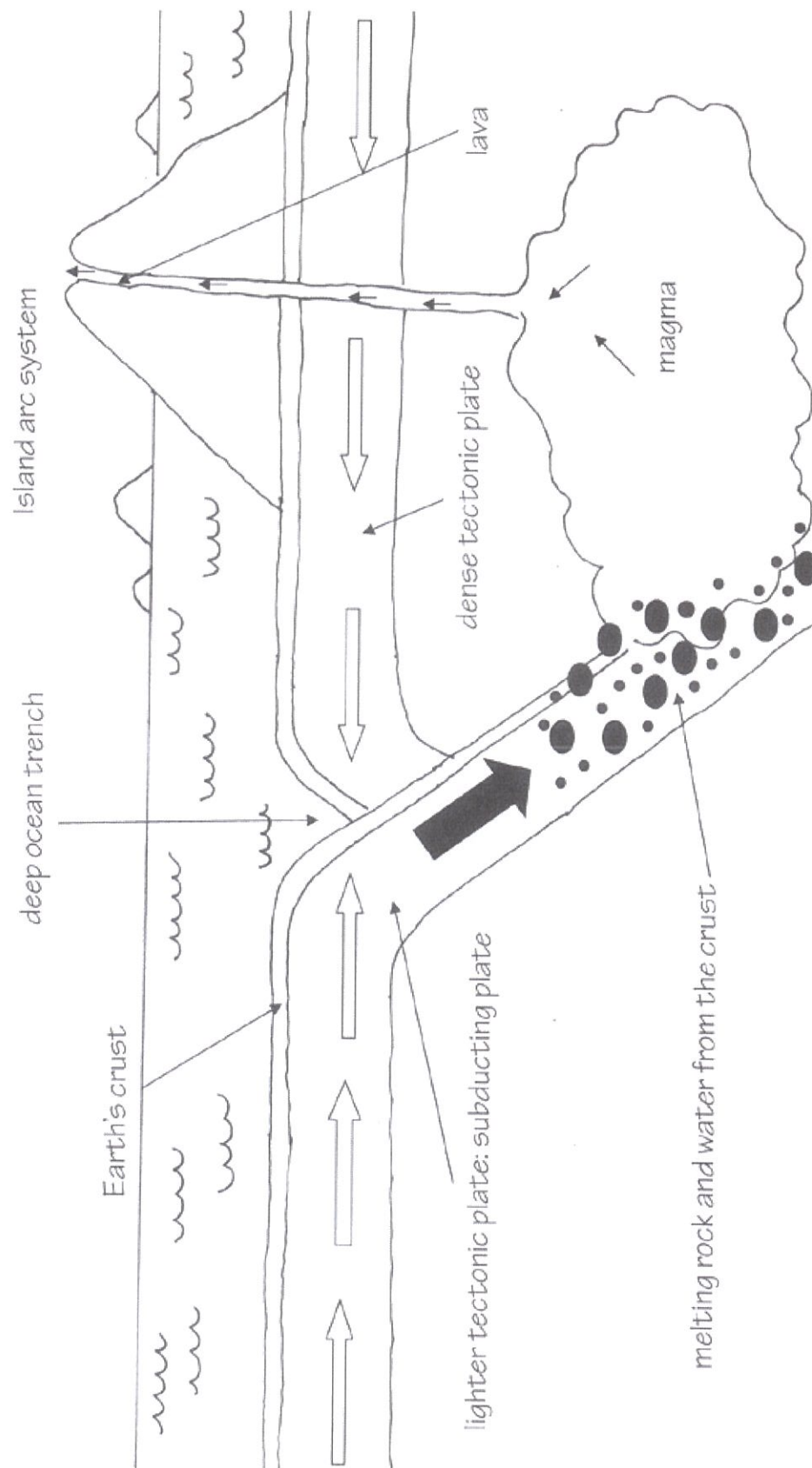
These rocks melt to form _____ as they are pushed deeper into the Earth.

Water is driven off leaving pools of molten rock which then rise toward the surface where they erupt as _____ flows.

Over thousands of years, the lava flows build up to form a _____.

3. HOW VOLCANOES ARE FORMED

Retrieving information from a diagram



4. INDONESIA: A VOLCANIC COUNTRY

Use the facts below to understand the map on the following page.
Create a series of quiz questions to test your classmates.

Indonesia is the world's largest archipelago made up of over 13,700 islands. Many of these islands have volcanoes on or near them under the ocean.

The Indo-Australian plate is moving northwards and sliding under the Eurasian plate. The place under the ocean where the two plates meet is a deep ocean trench, the **Java trench**.

WHEN ?

Indonesia is an arc island system. It is the result of the collision of two tectonic plates – the Indo –Australian Plate and the Eurasian plate.

The land area is generally covered by thick tropical rainforests. The soils are very fertile being constantly replenished by volcanic eruptions

WHERE ?

Gunung Merapi (Mount Merapi) is the most active of Indonesia's volcanoes. It erupts about once every 5.5 years. Gunung Merapi means fire mountain in the Indonesian language.

WHY ?

There are 156 active volcanoes in the Indonesian archipelago. Java and Bali are the most volcanically active islands in the world.

Gunung Batur (Mount Batur) has a dramatic caldera where the peak has blown off leaving a lake with smaller peaks within.

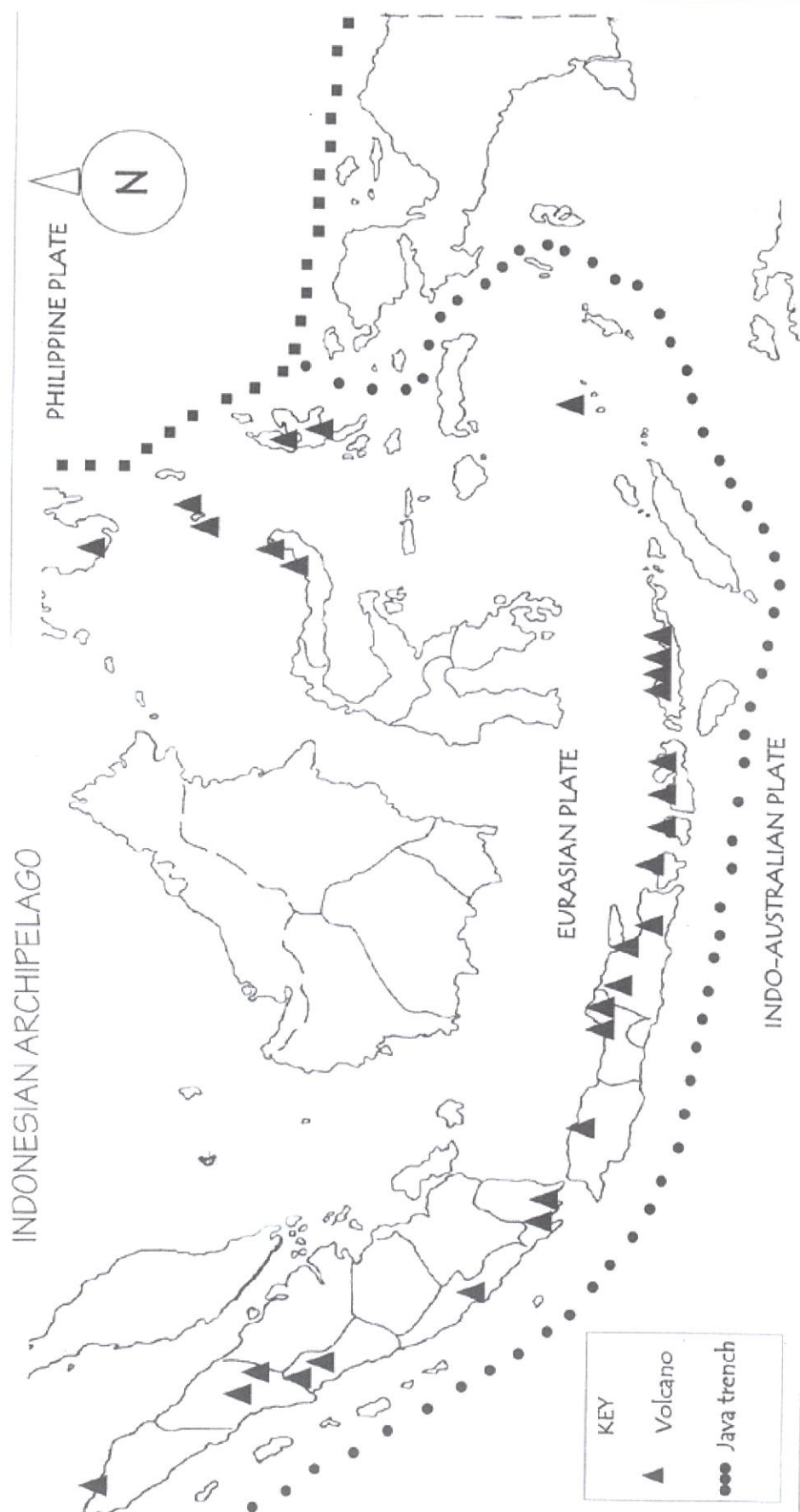
HOW ?

Three volcanoes on Krakatoa island disappeared in a volcanic eruption in 1833. The eruption was so loud, it could be heard in Australia. The smoke from the eruption changed the world's climate temporarily.

WHAT ?

A new cone, Anak Krakatoa (Child of Krakatoa) was formed from eruptions in the submarine caldera where two thirds of Krakatoa island disappeared in 1883. The volcano began emerging from the sea in 1927.

5. INDONESIA: A VOLCANIC COUNTRY



- Use an atlas to label the main islands of Indonesia
- Highlight the approximate location of the Java trench. This is the area where the Indo-Australian plate is moving north and sliding under the Eurasian plate.
- Colour each of the tectonic plates a different colour.
- Draw arrows to show the direction the Indo-Australian plate is moving.

6. INDONESIA: A VOLCANIC COUNTRY

Web work

Go to the Wikipedia website and read the information about Indonesian volcanoes. (<http://en.wikipedia.org/wiki/List-of-volcanoes-in-Indonesia>)

Construct a table of the five most recent volcanic eruptions in Indonesia.

Find a mark these volcanoes on your map of Indonesia.

Search for photos of your chosen volcanoes.

NAME OF VOLCANO	ISLAND / AREA	DATE OF ERUPTION

7. VOLCANOES: LIVING IN THE DANGER ZONE

People living near an active volcano face many dangers – before, during and after an eruption.

Give definitions for the events below and explain why they are considered dangers.



Gas



Lava



Tephra



Ash



Lahar



Tsunami



Pyroclastic flow



Famine and disease

8. INDONESIA: VOLCANO CULTURE

Indonesia's history is a succession of invasions from many different cultures; Indian, Chinese, Cambodian, Melanesian/Polynesian, Portuguese, Arabian, English and Dutch. These invasions have contributed to the development of a rich and complex civilisation in which the main religions of the world, Hinduism, Buddhism, Islam and Christianity, have been grafted on to the traditional **animist** religions of the **indigenous** Indonesians. Although the majority of Indonesians are Muslim (around 90%) their reverence and respect for the power of volcanoes remains constant.

For **millennia** , the people of the Indonesian **archipelago** have lived in the shadow of volcanoes. They view volcanoes as both providers and destroyers, and many people regard them as **sacred**, the home of **deities**.

In Bali, village and household temples are **oriented** toward the volcano, Gunung Agung . Balinese compounds are built so the areas concerned with family religious life are situated closer to the volcano while the day-to- day living areas such as the bathroom and kitchen are situated closer to the sea. Balinese people sleep with their heads toward the volcanoes.

In Flores, when the Nage people die, they are buried with their heads pointing to Gunung Ebulobo and their feet pointing to the ocean.

The Javanese people who live in the **vicinity** of the volcano, Gunung Merapi, believe that four centuries ago, the **ancestor** of the Sultan of Yogyakarta made a deal with the spirit queen of the Southern Sea, Nyai Ratu Kidul and the guardian ogre of the volcano, Sapu Jagat. In return for the spirits' protection, the sultan's **descendents** must make offerings and perform rituals at specific times of the year in the "abodes of the spirits." Gunung Merapi is one of these **abodes**.

Every year, the Sultan climbs to the top of Gunung Merapi followed by a royal procession carrying **offerings**—colourful rice cones, flowers and fruit. At the **caldera** of the most active volcano in the world they pray to the spirits of the volcano to protect them from catastrophe. The offerings are then given to the smoking crater.

Local people believe that the volcano erupts because the spirits or deities who reside in the volcano are angry. They may be angered by the disrespectful actions and attitudes of the people living on its slopes or by not receiving sufficient offerings or reverence.

Gunung Merapi has its own human guardian. Mbah (grandfather) Maridjan, is the *juru kunci* or key holder of Merapi appointed by the Yogyakarta Kraton (palace). It is his duty to tend the **shrines** around the volcano and ensure that the ceremonies to appease the spirits are properly carried out. He is believed to receive divine knowledge about when the volcano will erupt.

In 2006, he refused to **evacuate** the smouldering volcano , against the advice of scientists monitoring the volcanic activity. He climbed, instead, to the crater to meditate for 2 days and, then, led the *Tapak Bisu* (Silent Walk), an all- night **ritual** march through villages on the slopes, in an attempt to calm the volcano.

9. INDONESIA: VOLCANO CULTURE

Read the text on the previous page to complete the tasks. You may have to research some tasks.

- Locate words in the text that are **Bahasa Indonesia** (Indonesian language). List them and their meanings.

- Explain how the world's **4 main religions** came to Indonesia.

- What is **animism**?

- What are the **beliefs** of some Indonesians concerning volcanoes?

- What **rituals** are connected with Gunung Merapi?

- What actions do some Indonesian people perform that show **respect** for volcanoes?

- **Volcanoes are both providers and destroyers.**

Explain.

- The Telegraph.co.uk published an article about the Merapi eruptions in 2006. The headline reads "**Superstition stops villagers fleeing active Java volcano.**"
- What is the difference between **superstition** and **belief**?

10. WHAT IS THAT WORD?

Glossary for Volcano Culture

Put the highlighted words from the text (9. Indonesia: Volcano Culture) into alphabetical order in the left-hand column. Write the meaning of each word in the right-hand box.

[illegible]

11. KRAKATOA VOLCANO – WEB WORK

Allan Baillie's latest novel, **Krakatoa Lighthouse**, is about a Javanese boy named Kerta who is the son of a lighthouse keeper at Anjer, Java, in 1883.

The novel looks at events leading to the eruption which destroyed Krakatoa Island and its three volcanoes in the Sunda Strait. The explosion triggered pyroclastic flows and several tsunamis which submerged the coast of Java and resulted in the deaths of 36,000 people.

Looking at the events through Kerta's eyes, Baillie is able to examine the Indonesian peoples' belief in angry spirits who reside in volcanoes and who punish mankind with eruptions. He also looks at the relationship between the indigenous Javanese and the Dutch colonists.

Krakatoa Lighthouse is published by Penguin Group (Australia) 2009.

Visit Allan Baillie's website

<http://www.allanbaillie.com.au/news.htm>

You can view photos and maps he has posted about the Sunda Strait and Krakatoa. You can write to Allan and ask questions about his writing and his books.

Websites with information on the Krakatoa eruption

http://www.geology.sdsu.edu/how_volcanoes_work/Krakatau.html

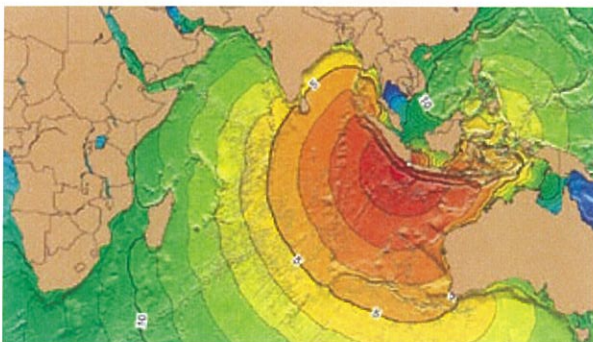
This is the most informative site on the 1883 eruption of Krakatoa Island and the environmental and human destruction it caused. It contains historic eyewitness descriptions of the tragedy.

<http://discover-indo.tierranet.com/volcano01.htm>

Click on the Krakatoa link and read the information about the 1883 eruption. This site has some images of Krakatoa before and after the eruption.

http://volcanoes.suite101.comcfm/krakatoa_volcano_1883

This page has a description of the 1883 explosion of Krakatoa and the events leading up to it.



Map of the tsunami generated by the explosion of the Krakatoa Volcano in Indonesia on August 27, 1883. It made a 30 meter wave in the Sunda Strait which killed about 36,000 people..

Source: NOAA website (National Oceanic and Atmospheric Administration).