

To understand how we can limit the damage caused by earthquakes



Starter :

Match up the correct keyword with its meaning.

- Earthquakes are...where the earthquake begins in the crust.
- Conservative margins are...an instrument to measure earthquakes.
- Plate boundaries are...a movement or tremor in the earths crust.
- Destructive margins are...where two plates move alongside each other.
- A seismograph is ...where two plates are destroyed as they push towards one another.
- The focus is....directly above the focus on the earths surface.
- Epicentre...a boundary between two plates.

1) How can we predict an earthquake?

predict

plan

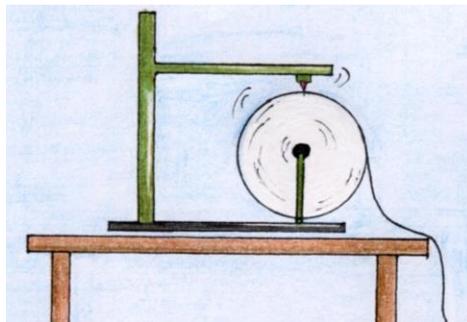
protect

a tiltmeter can check any movement within the rocks

water levels can rise in wells and lakes because of cracks in the rock

1. predict

animals can act strangely before the earthquake



foreshocks before the main quake can be detected by a seismometer

advise people to plan for an earthquake (eg tell them to turn off the gas, find a 'safe' place in their homes, pack an emergency kit)



make an emergency plan

enforce regulations to make some buildings earthquake proof

organise regular 'earthquake practices' for offices and schools

2) How can we plan for an earthquake?

Prepare in advance

Earthquakes are unpredictable. There will be little, if any, warning. You can take steps to prepare yourself and your house in advance to make sure that risks are kept to a minimum. Bookcases and tall furniture that might fall over can be screwed to the nearby wall, hot water tanks and heaters can be strapped to a wall, cupboards can be fitted with strong catches or locks. Fire extinguishers should be available and you should know how to use them. Know how to shut off water, gas and electricity supplies. Everyone should know where fire, police and medical help can be found and how to summon assistance. Identify a meeting point outside of the house.

Every house should have an emergency kit in case of disaster, kept together or easily reachable if needed

- **first aid kit - know what to do and what to use**
- **food in cans (don't forget to include a can opener)**
- **sleeping bags, protective outer clothing, sturdy shoes**
- **water supplies (one gallon per person per day - allow for three days)**
- **torch, batteries, battery powered radio**
- **any special items required for young children or the elderly**
- **keep a torch, batteries and shoes by your bed in case of a night time earthquake**

When an earthquake occurs, don't panic!

Drop, Cover and Hold On!

Drop alongside something strong and sturdy - a desk or table, **Cover** yourself to prevent falling objects from hitting your head or body and **Hold on** to stay in your protected area.

Crawling under desks and tables can lead to crush injuries and death - sitting next to desks and tables means that they are likely to absorb any falling objects and will leave a space at the side - large enough for a person to survive.

If you cannot get close to a table or desk then you should sit on the floor, near to an inside wall and away from windows (glass can shatter), bookshelves or furniture that could fall over. Sit beneath stairs or in door frames.

Earthquake drill should be practiced at least twice a year so that everyone knows what to do the moment the ground starts to shake.

Built to withstand earthquakes.

The Transamerica Pyramid in San Francisco , built to withstand earthquakes, swayed more than 1 foot but was not damaged in the 1989 California earthquake.



7) Why do we think it not get damaged?

Turkish earthquake (August 1999)

The magnitude of the earthquake was higher than first thought, measuring 7.4 on the Richter Scale.

Seismologists expect a large number of aftershocks, possibly for up to a year. These could bring down the damaged buildings.

The search continues for survivors, but temperatures, 30°C in the day and 10°C at night are far from ideal.

International rescue teams carry on searching for up to 72 hours after a disaster, but it has been known for people to survive much longer than this. The longest survival is 17 days by a Korean who chewed cardboard and drank his own urine before being rescued.

Fact File (3 days after the earthquake)

Dead : 10,059

Missing : up to 35,000

Injured : over 45,000

Activity 1: You are in charge of the earthquake task force in Turkey. It is three days after the earthquake. Put these problems in the order of urgency. Explain your choice.

Organise emergency camps and supplies for the survivors

Bury the dead

Organise emergency hospital to look after injured

Search for more survivors

Stabilise the damaged buildings

Factors affecting the damage caused by earthquakes

size of the earthquake

emergency services

building design and construction

time of day

education

physical landscape

Activity 3:

- a) Which factor/s do you think are the most important?
- b) Which factors are related to the wealth of the country?
- c) How can the education of the population affect the amount of damage caused by an earthquake?

Read the following two slides.

Compare the earthquake in Los Angeles (94) with the earthquake in Turkey (99) using the following table. Why were there more deaths in the Turkish earthquake?

number of deaths

size of the earthquake

time of day

emergency services

building design and construction

education

GNP (wealth)

Los Angeles	Turkey

Internet research

www.eqe.com

www.geography.com.sg

www.ngdc.noaa.gov/seg/hazard/hazard.html

Earthquake struck on holiday honouring Dr Martin Luther King....57 dead

Fires burned out of control last night after a devastating earthquake measuring 6.6 on the Richter Scale hit LA. Over fifty people have been killed including fourteen people trapped in a collapsed block of flats, near the epicentre, in the district of Northridge.

Reports suggest that over one thousand people are injured and the city is at a standstill. Freeways have buckled, trains have been derailed and the airport is closed. The earthquake struck before dawn and was felt over a wide area. The quake was felt as far away as Las Vegas, 125 miles away to the east !

Emergency shelters have been set up by the Salvation Army and the Red Cross. In addition, twelve search and rescue teams and four medical teams have been sent to the quake zone. The teams are using dogs, sensitive listening devices and tunnelling equipment to look for survivors.

Izmit buildings substandard

The earthquake that hit Turkey last month has resulted in an estimated death toll of between 30,000 and 40,000. The earthquake that measured 7.4 on the Richter Scale, struck at 3am. It had an epicentre approximately 11 km to the south east of Izmit and it was felt as far as 320km away.

Turkey received international help to rescue the thousands trapped in collapsed buildings. At least 20,000 buildings collapsed or suffered heavy damage. The buildings which collapsed were mainly between 6 and 8 stories high and had been built in the last few years. Although new buildings in earthquake areas are supposed to follow the 'Uniform Buildings Code' (California), many of these buildings were poorly constructed in concrete and had unreinforced masonry walls.

Concerns were also raised over the fact that the Tupras oil refinery in Korfez was allowed to be built so close to the North Anatolian Fault. The oil refinery burned out of control for several days after the earthquake. The fault has produced seven earthquakes with a magnitude of more than '7' on the Richter Scale since 1939.

To understand the impact of earthquakes on people.



The LA earthquake USA 17/1/1994



A huge earthquake has rocked Los Angeles, killing more than 20 people. The earthquake, which measured 6.6 on the Richter scale and lasted for 40 seconds, struck at 0431 local time. More than 1,000 people have been injured and the death toll is expected to rise as rescuers continue to pull bodies from collapsed buildings.

The airport has been closed due to a lack of power and doctors are having to perform surgery in the open air because hospital buildings are severely damaged.

The area worst hit is reported to have been the San Fernando Valley where the quake is likely to have affected up to three million people. Los Angeles emergency services are stretched to the limit and using heat detecting cameras and listening equipment to trace signs of life beneath the rubble. Experts are warning of potential aftershocks and police have issued a statement warning of isolated cases of looting.

The final number of dead was 60. The number of injured was 7,707 and more than 5,000 buildings were deemed to be unsafe. Repairing the damage to the city cost around \$30 billion. The earthquake was felt as far south as San Diego 200km away and as far north as Las Vegas, 440km to the north east. President Clinton visited the area in the week following the earthquake and immediately asked Congress to raise \$6.6 billion for an emergency relief fund.



Gujarat Earthquake – India 26/1/2001



A massive earthquake has struck western India and parts of Pakistan, killing many thousands of people. The death toll is expected to rise quickly as rescue teams flood into the worst-affected towns – Bhuj, in the state of Gujarat, and the nearby city of Ahmedabad. Indian officials say more than 2,000 bodies have been recovered so far. Thousands more are still thought to be trapped inside collapsed buildings, including some 400 children inside a school building in Bhuj, near the epicentre.

Floodlights were set up as night fell to help rescuers using crowbars and their bare hands to search through the rubble. Volunteers, friends and neighbours joined them to dig with whatever tools they could find. Many old buildings susceptible to earthquake damage. The Home Minister of Gujarat, Haren Pandya, said people had been told to evacuate old buildings and those which have developed cracks. Local authorities said that government buildings were constructed to withstand earthquakes but most private buildings were not.

The quake struck at about 0850 local time (0320 GMT). It was a public holiday, and many people were out on Republic Day parades or still at home. Medical facilities are in crisis, with many hospitals damaged by the quake and others overwhelmed by the demand for treatment. Thousands of people camped outside the air force hospital in Bhuj waiting for treatment. At another hospital in the city, doctors were forced to treat patients on the street. The quake was measured at a magnitude of between 6.9 and 7.9, and was felt as far away as Bangladesh.

The death toll in the Gujarat earthquake eventually rose to 25,000. A million people were left homeless. In the aftermath there was angry criticism from those in urban areas that the authorities failed them. Most aid agencies had concentrated on damaged rural villages where it was easier to reconstruct houses.

A year later many were still living in tents and shelters in primitive conditions with little sign of damaged houses being redeveloped. Millions of pounds in emergency aid were raised all over the world to help rebuild communities with the help of international agencies. But in 2002 the Disasters Emergency Committee published a report which was critical of UK aid agencies in the aftermath of the earthquake in Gujarat.



Activity 1: Use the information from the previous slides to complete the table below. This will help you to complete a piece of extended writing.

Activity	LA - USA	Gujarat - India
What are the facts figures and details?		
What words sprang to mind when you saw this? How did you feel when you read it?		
What are the problems? How many were killed and injured?		
What are the positive outcomes? How did it improve in the future?		
What are the suggestions for the future? What ideas do you have?		
What are the differences between the two earthquakes?		
What are the similarities?		