Factors affecting earthquake damage

The extent of earthquake damage is influenced by the following:

Strength and depth of earthquake and number of aftershocks
The stronger the earthquake, the more damage it can do, e.g. an earthquake of 6.0 on the Richter Scale is 100 times more powerful than one of 4.0; the more aftershocks there are the greater the damage that is done. Earthquakes that occur close to the surface (shallow-focus earthquakes) are potentially more damaging than earthquakes deep underground (deep-focus earthquakes), since overlying rocks will absorb more of the energy of the latter.

Population density
An earthquake that hits an area of high population density, such as in the Tokyo area of Japan, could inflict far more damage than one which hits an area of low population and building density

Type of buildings
MEDCs generally have better-quality buildings that have been built to be earthquake resistant. (People in MEDCs are also more likely to have insurance cover than those in LEDCs.)

Time of day
An earthquake during a busy time, such as rush hour, may cause more deaths than one at a quiet time. There are fewer people in industrial and commercial areas on Sundays; at night more people are in their homes.

Distance from the centre of the earthquake
The closer a place is to the centre (epicentre) of the earthquake, the greater the damage that is done.

Types of rocks and sediments
Loose materials may act like liquid when shaken, a process known as liquefaction; solid rock is much safer, and buildings built on flat areas of solid rock are more earthquake resistant.

Secondary hazards
These include mudslides and tsunamis (high sea waves), fires, contaminated water, disease, hunger and hypothermia.

Economic development
MEDCs will generally have a better level of preparedness and more effective emergency response services, better access to technology and better health services. The funds to cope with disasters will be greater.

Kobe, Japan, January 1995

The Kobe earthquake was responsible for over 5,000 deaths, 30 000 injuries and for making over 300 000 people homeless. It was caused by the oceanic Pacific plate plunging under the continental Eurasian plate.

The earthquake, which registered 7.2 on the Richter scale, struck at 5.46 a.m., when most people were still asleep. Many people were crushed in their beds, although the number of people killed by collapsing motorways was relatively low. Many important buildings, such as the City Hall and public hospitals, were destroyed. Up to 80% of the schools, museums and sports facilities were also destroyed.

The earthquake came as a surprise to Japanese scientists, since the area was considered to be one of the safest for earthquake activity. Conditions for the survivors worsened as rain, strong winds and lightning increased the risk of landslides. Doctors were faced with outbreaks of disease due to the damp, unhygienic conditions.

Over 1,300 aftershocks were recorded, and these toppled many buildings. Gas and water pipes were broken and there were 175 separate fires in Kobe. Water supplies to deal with the fire were badly disrupted.

Transport and communications were badly affected. A 1-kilometre stretch of elevated highway collapsed, and Japan's bullet train was closed. The damage was estimated at $160 billion.

Muzaffarabad, Kashmir, October 2005

The Kashmir earthquake recorded 7.7 on the Richter scale. There were over 22 aftershocks in the 24 hours after the main earthquake, some of which measured over 6.0 on the Richter scale. The quake and its aftershocks were felt from central Afghanistan to western Bangladesh. The cause of the earthquake was the Indo-Australian plate moving against the Eurasian and Iranian plates.

The epicentre was at the city of Muzaffarabad (Pakistan Kashmir), but buildings were wrecked in an area spanning at least 400 kilometres across, from Jalalabad in Afghanistan to Srinagar in Indian Kashmir. The death toll was over 86 000, at least 1 00 000 were seriously injured, and more than 3 million people were left homeless.

Of the homeless, nearly a million had to sleep in the open. In built-up areas, water and sanitation systems were broken, giving a high risk of an outbreak of disease. There was a desperate shortage of tents capable of withstanding the Kashmiri winter, as well as a lack of blankets, sleeping bags, warm clothes, medicine and food.

Some charities expressed concern that the public might be suffering compassion fatigue. The UN had received just 12% of the $3 12 million pledged to its emergency appeal, in contrast with 80% of pledges at the same stage after the south Asian tsunami of the previous year. Whatever the reason, the earthquake did not provoke the response from the rest of the world that it needed. Perhaps the tsunami, killing hundreds of thousands, had deadened compassion for the victims of another disaster.

Recap questions:

a Suggest reasons why the Kobe earthquake was so devastating.

b Briefly explain why the Kashmir earthquake had a greater impact than the Kobe earthquake.