

South Asia quake - two years on 20 Oct 2005



Shown in green is Kashmiri region under Pakistani control. The dark-brown region represents Indian-controlled Jammu and Kashmir while the Aksai Chin is under Chinese occupation. The epicentre of Muzaffarabad is shown in red

Image originally from www.cia.gov

At 8:50 a.m. on October 8, 2005, a powerful earthquake rattled northern Pakistan, India, and Afghanistan. Centered at Muzaffarabad, in Pakistan-administered Kashmir, the 7.6 quake flattened nearby cities, causing an estimated 80,000 deaths and leaving millions homeless. The massive quake was followed by dozens of strong aftershocks, most of which were larger than 5.0 on the Richter scale.

As Saturday is a normal school day in the region, most students were at schools when the earthquake struck. Many were buried under collapsed school buildings - a whole generation lost in some settlements.

Disrupted communication and transport links, inaccessible terrain, landslides and poor weather hampered the rescue and relief operation. UN officials said it was the most challenging aid operation it had faced: "a logistical nightmare". International aid poured

into the region after media reports raised concerns about the co-ordination and effectiveness of the response especially in remote areas.

What were the impacts? 20 Oct 2005



An aerial view of the damaged caused by the earthquake to the town of Balakot, Pakistan October 9, 2005. A road is blocked by a landslide and buildings have been flattened

© Reuters

The overall impact of the earthquake was huge but there were contrasting impacts depending on the exact location and distance from the epicentre.

Pakistan-administered Kashmir

The area's capital city of Muzaffarabad was almost completely destroyed. Nearby Rawalakot suffered some damage, although most schools and colleges there were closed for a public holiday so the number of casualties from collapsed schools was not so high. Landslides blocked roads and there was extensive damage to electricity, water and telephone infrastructure.

North-West Frontier Province

Balakot (pictured above), a town of 30,000, suffered extensive damage with two schools and an Islamic seminary collapsing. Several villages in the province

have been completely wiped out. Landslides again caused havoc to infrastructure.

Indian-administered Kashmir

The districts of Uri and Tangdar near the 'Line of Control' were worst affected, with 10 villages in the area are still cut off at the time of writing.

The chief minister Mufti Mohammad Sayeed said 40,000 homes have been destroyed and twice as many damaged.

Earthquake casualties (confirmed)

Location	Deaths	Injured
Pakistan	79,000+	65,038
India	1,329	4,500
Afghanistan	4	
Total (Minimum)	80,333+	69,538+

Pakistan

In the initial aftermath of the quake the international media's focus was the two blocks of the Margalla Towers complex in Pakistan's capital city Islamabad (pop. 810,000) which collapsed.

India

In Punjab state, shops and houses collapsed and rescuers cut through rubble to find survivors. Buildings in Delhi and Amritsar were damaged. Tremors caused panic in Gujarat (where an earthquake in 2001 killed 20,000) and were also felt in Uttar Pradesh, Uttaranchal, Himachal Pradesh, Rajasthan and Madhya Pradesh.

Afghanistan

The tremor was felt across much of eastern and central Afghanistan but damage to property was minimal.

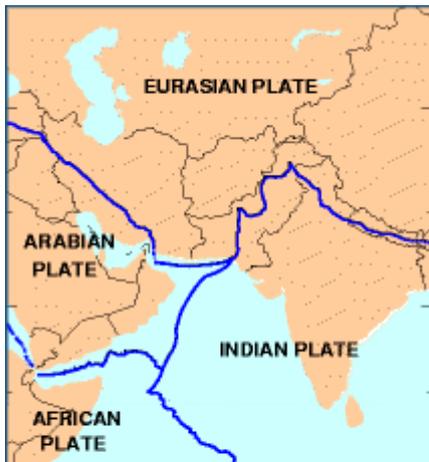
Recent deadly quakes

2004	Asian tsunami, triggered by undersea quake	kills at least 200,000
2003	Bam, Iran	kills 26,271
2001	Gujarat, north-west India	kills more than 20,000
1976	Tangshan, China	kills 242,000
1923	Tokyo	kills 140,000

Source: BBC News

What were the tectonic causes?

20 Oct 2005



Map depicting tectonic plates shows Indian subcontinent and Eurasian landplate divide throughout Pakistan and Kashmir where earthquake activity is common.

Image credit: USGS

The United States Geological Survey (USGS) measured the earthquake's magnitude as 7.6 on the moment magnitude scale, with its epicenter, about 19 km (11.8 miles) northeast of Muzaffarabad], and 100 km (65 miles) north-northeast of Islamabad (Pakistan) at a depth of 26 km (16.2 miles) from the surface. The Japan Meteorological Agency gave it a magnitude of 7.8. The earthquake is classified as "major" by the USGS. (By comparison, the 2004 Indian Ocean earthquake had a magnitude of 9.15.)

According to the USGS, earthquakes and active faults in northern Pakistan and adjacent parts of India and Afghanistan are the direct result of the Indian subcontinent moving northward at a rate of about 40 mm/yr (1.6 inches/yr) and colliding with the Eurasian continent. This collision is causing uplift that produces the highest mountain peaks in the world including the Himalayan, the Karakoram, the Pamir and the Hindu Kush ranges. As the Indian plate moves northward, it is being subducted or pushed beneath the Eurasian plate. Much of the compressional motion

between these two colliding plates has been and continues to be accommodated by slip on a suite of major thrust faults that are at the Earth's surface in the foothills of the mountains and dip northward beneath the ranges. In the rugged mountainous terrain, it is difficult to identify and map all of the individual thrust faults, but the overall tectonic style of the deformation is clear in the area of the earthquake; north- and northeast-directed compression is producing thrust faulting. Near the town of Muzaffarabad, about 10 km southwest of the earthquake epicenter, active thrust faults that strike northwest-southeast have deformed and warped Pleistocene alluvial-fan surfaces into anticlinal ridges. The strike and dip direction of these thrust faults is compatible with the style of faulting indicated by the nearby M 7.6 earthquake.

What factors determined the impact of this hazard?

20 Oct 2005

1. Construction techniques



Pakistani army soldiers search for bodies of earthquake victims from the debris of a school in Muzaffarabad, capital of Pakistan-administered Kashmir October 9, 2005.

© Reuters

"It's not earthquakes that kill people, it's the way houses are built and whether they are built to withstand earthquakes, which is what we've seen in Pakistan," says Felix Waldhauser, seismologist Columbia University, New York.

Most of those killed were crushed by buildings that collapsed. The city of Muzaffarabad was flattened with over 11,000 dead. In the city of Balakot over 80% of the buildings were levelled and some 400 children were killed when their schools collapsed on top of them. Initially much of the media attention was on scenes in Islamabad where the Margalla Towers collapsed killing between 30-80 people.

Geographer Dr Ben Wisner said that the urban damage in housing was probably a function of the magnitude of the quake (7.6) but also the style of construction

common in Pakistan, Afghanistan, Iran, and elsewhere in the region, which features very heavy roofs

and un-reinforced walls. This was also a notable impact of the [Bam earthquake in Iran](#) which in which most victims died due to the immediate collapse of poorly-constructed multi-storey homes with heavy roofs.

He believes that at relatively low cost, it is possible to construct all public buildings such as schools with anti-seismic protection that will protect them such catastrophic collapse. Tragically, many of the victims were schoolchildren, who had just begun classes when school buildings collapsed on top of them (tragically a similar tragedy [occurred in eastern Turkey in 2003](#)).

Earthquakes destroy houses by shaking the ground from side to side. If buildings are made of brittle materials such as bricks, they can break apart. In previous earthquakes, homes not bolted to foundations have slipped off and cracked in half. In San Francisco and earthquake-prone Japan, buildings have been designed to be more flexible so they sway as the ground shakes. Reinforcing beams have been added to older buildings to strengthen them against sideways jarring. But for poorer countries, the options are more limited, said Ian Main, a seismologist at Edinburgh University. "It's a real problem as to what poorer countries are supposed to do," he said (*Thursday October 13, 2005 The Guardian*). In many LEDCs a consequence of development has been the replacement of traditionally built (vernacular) housing with unreinforced concrete buildings that when they collapse are far more deadly.

Geographer Ken Hewitt also believes that the region's 'building culture' is to blame in three ways:

- Deforestation of steep slopes. Previous earthquakes in the region have shown that landslides are responsible for up to 40-50% deaths and destruction of communications, but were conspicuously absent on well-timbered slopes.
- A timber shortage. As wood was exported down country, this forced the local construction of homes to shift to rubble and dressed stone walls. The traditional architecture with abundant timber in walls, where it still existed stood up well, unless the timber was very old and not replaced.
- Public buildings on marginal land. There has been terrific political pressure to get children into schools. These and other public buildings tend to be built on the little available open land and it tends to be on flood plains, stream terraces and base of slope situations traditionally avoided for reasons all good geographers know about. Hence, although construction is often quite good, foundations are not or rock falls are a threat.

2. Reliance on an organised and centralised response

As with Hurricane Katrina we have heard criticism of a slow response from government and military after a large scale natural disaster. But geographer Maureen Fordham of University of Northumbria thinks that community-based measures to provide local people with basic search and rescue expertise and local/regional caches of appropriate tools would have helped. "We know that in major disasters with a wide geographic spread, the organized emergency response cannot get everywhere fast (or at all in some of the more remote locations) and so it makes sense to give people the tools/skills they need to build local resilience beforehand." At the very least, this way lives could be saved whilst waiting for the army and the international aid agencies arrive.

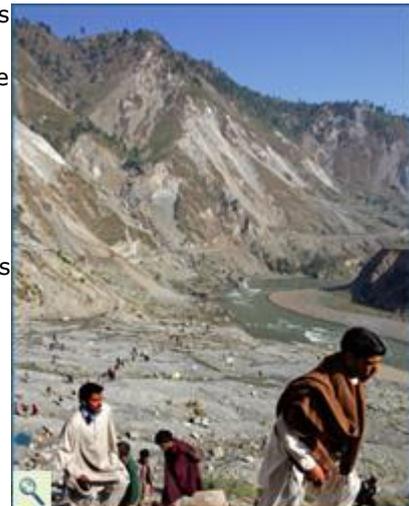
But in a region that has been under martial law since Pakistan was created is it surprising that most of the heavy equipment, vehicles, and best medical supplies is in hands of the army?

3. Inaccessibility of the terrain

Relief efforts in many remote villages were hampered because roads were buried in rubble and landslides. Many affected areas remained inaccessible for days after the quake. Poor weather compounded the rescue teams as well as making conditions worse for survivors without shelter. The rains also sparked a fear of new landslides as slopes loosened by the quake could fail. Many of the towns and villages destroyed by the quake are in remote locations (this is the remotest part of south Asia!) that are difficult to access even when conditions are good, let alone after an earthquake has blocked roads and damaged communication and transport infrastructure.

According to the BBC, one UN official in Pakistan said the deep valleys and high mountains of Kashmir are less accessible for relief workers than the area affected by the 2003 [Bam earthquake in Iran](#) or the coastal regions devastated in [last year's tsunami](#).

"Here we've got over 15,000 villages spread out through the affected region," Andrew McLeod, operations manager of the UN Emergency Response Team working out of Islamabad, told the BBC. "The affected areas are much larger in geographical size than the tsunami, and rather than being in flat coastal areas, we are operating in some of the highest mountains and deepest valleys in the world."



Kashmiri evacuees climb a hill that had collapsed during an aftershock on a detour around a collapsed road after crossing a river in the Neelum Valley, north of Muzaffarabad, October 18, 2005, on their way to Muzaffarabad. Troops cut mule paths through landslides to get aid to tens of thousands of villagers in two Kashmir valleys cut off since the quake on October 8, 2005 © Reuters

So was this another Bam disaster?

Seismologist Manuel Berberian is convinced the calamity of Bam has been revisited in the 2005 South Asia earthquake:

"Earthquake-resistant construction codes (if any) have been consistently violated in both urban and rural areas of developing countries due to: (i) the lack of government initiative in enforcing such codes, even for critical facilities such as schools and hospitals; (ii) the lack of emergency planning, preparedness, and coordination; (iii) inadequate response to natural disasters, and (iv) the mismanagement of the lives and properties of the citizens. The earthquake mitigation plan in developing countries - never considered a high priority - has been premised on a theory of ignorance such that authorities consistently offer too little too late."

For more on the Bam earthquake and a comparison with an MEDC earthquake (USA) [see our report "Twin Quakes"](#)

Was the response to the disaster effective?

20 Oct 2005



Earthquake survivors walk back to their homes after attending school in Poonch, 250 km (156 miles) northwest from the northern Indian city of Jammu, October 17, 2005. The October 8 earthquake was most destructive to those parts of Indian and Pakistani frontier that are both breathtakingly beautiful and not easy to access. The mountains are a problem, but so is the fact that India and Pakistan are at a tense stand-off over disputed Kashmir and Islamic militants are known to be active in the area, which makes parts of the region restricted to ordinary traffic. © Reuters

In many areas there was no power, or adequate food or water; there is also the danger of disease spreading. Distributing relief supplies to the victims was especially urgent as the victims faced the risk of exposure to cold weather due to the region's high altitude and the approaching winter. Food, medicine supplies, tents and blankets have been identified by relief workers as essential items. On October 10, the United Nations warned that the earthquake left 2.5 million people homeless and they are in need of shelter. Tents for those without shelter were in short supply and untreated wounded limbs were being amputated (*BBC 17 October 2005*).

"There is a need for large supplies of medicines, tents and cargo helicopters to reach out to the people in far-flung and cut-off areas - the bigger these copters the better"

Pakistan President Pervez Musharraf

Key moments in the response:

- Hundreds of people were taken to Srinagar's hospitals, mostly those who are critically injured.
- The Pakistan Army directed to extend all out help to the civilian population in the quake-hit areas.
- The rescue effort slowed by landslides which wiped out roads and bridges, and a lack of helicopters to ferry in heavy lifting equipment. Most of the roads were closed in the Northern Sector near the earthquake, and some were completely washed out, so the Pakistani army flew supplies in by helicopter.
- A row broke out over the use of helicopters with Pakistan saying it would accept Indian helicopters but not crew, while India insisted its pilots must fly them. On a more positive note, India restored telephone links between Indian and Pakistani-controlled Kashmir to enable people to speak to their relatives after the earthquake. The service was suspended 15 years ago after an armed insurgency broke out against Indian rule. Both countries are also considering opening the 'Line of Control', which divides the disputed territory, to allow families on both sides to cross.
- On the Indian side of Kashmir, the injured were treated at the Srinagar's SMHS hospital and the Uri Field Hospital, with many makeshift medical facilities set up to help the injured.
- Media criticism of the initial response for being too focused on the capital, Islamabad and slow to reach other areas.
- Pakistani government says it needs another 500,000 tents capable of withstanding winter conditions. These 'winterised' tents are heavy duty, designed for long-term use by a single family with a PVC groundsheet sown onto the sides for wind proofing and to retain warmth and designed to accommodate cooking stoves

As with the Bam earthquake and the Indian Ocean tsunami, the South Asia earthquake disaster mobilised the world into an outpouring of aid pledges – but not nearly as much cash nor as many countries as after the tsunami. Only 15-20 countries offered help compared with over 90 for the 2004 tsunami

Large aid pledges

\$100m	Kuwait
\$100m	UAE
\$50m	US
\$20.9m	UK
\$20m	Canada
\$20m	Japan
\$20m	World Bank
\$10m	Asian Development Bank
\$7.6m	Australia
\$6.2m	China
\$4.4m	EU
\$3m	South Korea

\$3.6m

Germany

Are we having more natural disasters? 20 Oct 2005

The Red Cross has said that more people are being killed and affected by disasters in recent years but Prof John McCloskey, Head of School of Environmental Sciences at University of Ulster at Coleraine says that this is not always clear: "The Tangshan earthquake in 1974 killed [a quarter of a million] people. Back in the 1500s there was another earthquake in China that may have caused more deaths than any other in history." In terms of earthquake hazards, the contrast between MEDCs and LEDCs is stark. Richer countries, like Japan and the USA are putting up more and more earthquake resistant buildings, saving lives, whereas poorer countries with population pressures and fewer resources are finding that more people are forced to live in vulnerable areas in poorly constructed housing.

When?	What?	Where?	Impact?
December 2004	Tsunami	India, Sri Lanka, Indonesia, Thailand	More than 225,000 dead
February 2005	Earthquake	Zarand, Iran	Around 500 dead
March 2005	Earthquake	Indonesian island of Nias, west of Sumatra	Around 1,300 dead
March 2005	Malnutrition and illness (excludes those who have been killed in the ethnic violence)	Sudan	Around 180,000 dead
July 2005	Heat wave	Eastern USA and in cities of Baltimore, Philadelphia and Washington	At least 37 dead
August 2005	Monsoon flooding	Mumbai and across Maharashtra state	1,050 direct from floods. Over 5,000 suffer cholera and high fever
Summer 2005	Drought and locusts cause food shortages	Niger, Mali, Mauritania, Burkina Faso	Food shortage impacts some 3.3 million people —including 800,000 children under age five— in some 3,815 villages

August 2005	Hurricane and flooding	Katrina sweeps through New Orleans and southern USA	972 dead
September 2005	Hurricane and flooding	Rita hits Texas and southern states	6 direct deaths, 119 in total including deaths caused by hurricane-related accidents and as well as clean-up and evacuation incidents and health issues (i.e. poisoning, illnesses, waiting for help)
September 2005	Typhoon (flooding and landslides)	China	At least 129 dead, 30 missing
September 2005	Typhoon	Yen Bai province of N.Vietnam	More than 50 dead
October 2005	Volcano	El Salvador's highest volcano, Llametepec erupted	Two dead, thousands displaced
October 2005	Tropical Storm	Stan hits Central America	Guatemala: 650 dead, 1,400 missing Costa Rica, El Salvador, Nicaragua, Honduras and southern Mexico: 100 dead
October 2005	Earthquake	Pakistan/India	40,000+ confirmed dead and rising 70,000 injured

According to climatologists, droughts, hurricanes, typhoons and cyclones will become more intense because of global warming. Whether or not the severity of events reflects global warming caused by the unprecedented rates of release of carbon into the atmosphere by humans in recent years is unclear. There is a growing consensus that global warming is being contributed to by anthropogenic carbon emissions and that more intense hydro-meteorological events will be concomitant with this in the future.

South Asia Quake AS and A level notes and links 20 Oct 2005

AS and A-level notes

Geography students are likely to want to discuss the causes and consequences of this dreadful event in various contexts perhaps when writing about earthquakes, hazard management, international aid efforts, refugees, political conflicts or many other related topics. However, some students may have had relatives or friends caught up in the tragedy so first and foremost it is important to give students the opportunity to express their feelings on events. If appropriate later on, here is a basic guideline on a couple of academic areas where good knowledge of recent events might feature in their studies:

(1) Earth systems This event reminds us how much earthquakes can vary in terms of both their size and impact. Consider the deceptively simple question 'what are the impacts of earthquakes?' Candidates might emphasise that the damage and death caused by the earthquake was a function of its magnitude and that the region is constantly subjected to smaller less damaging quakes, both which are caused by its location on one of the earth's major destructive plate boundaries, where one tectonic plate subducts beneath another.

(2) Hazard causes, impact & management With so much media coverage, there is no shortage of information dealing with the management failings that have come to light in the Kashmir region. However, when writing about hazard management, it is important to stress the varying *scale* of natural hazards. While small-scale events – such as flooding in Boscastle Cornwall – can be effectively managed and perhaps even prevented, the sheer scale of the South Asia earthquake (The affected areas were much larger in geographical size than the India Ocean tsunami, and rather than being in flat coastal areas, were in some of the highest mountains and deepest valleys in the world) and its unpredictability meant that major losses of life were always inevitable. However, there is a valid argument that if there is the political will, then the death of hundreds of people (especially children) could have been prevented by the installation of relatively cheap anti-seismic public buildings and schools. In the immediate aftermath, local rescue and relief plans, techniques and supplies had they been in place, could have prevented deaths whilst people waited for the 'organised' relief and aid effort and the military.

Useful links for teaching and learning about the South Asia Quake

[BBC - at a glance quake impact](#)

[BBC - indepth - South Asia Quake](#)

[Associated Press of Pakistan](#)

[Pakistan Newspapers](#)

[BBC - in pictures](#)

[BBC - Muzaffarabad ghost town photos](#)

[Guardian - Map: where the quake happened](#)

[Guardian - Interactive - how quakes happen](#)

[Guardian Interactive - South Asia quake](#)

[Homework task from Tony Cassidy's wonderful Geography World](#)

[USGS Preliminary Earthquake Report](#)

[Latest quakes map](#)

[2005 Kashmir earthquake - from Wikipedia, the free encyclopedia](#)

[DEC ASIA QUAKE APPEAL - donate](#)