EDEXCEL GEOGRAPHY HAZARDS

JANUARY 2008

"A hazard is a perceived natural event which has the potential to threaten both life and property – a disaster is the realization of this hazard" – Whittow, 1980

Types of hazard we are interested in:

<u>Climate and Meteorological</u>

Floods

Tropical Depressions

- Hurricanes (USA, Caribbean)
- Tornadoes

<u>Geological and Geomorphological</u>

Earthquakes

Landslides

Tsunami

Volcanic Eruptions

Characteristics of Hazards which need considering in reference to their response:

- Magnitude – the size of the event, can it be portrayed on a scale? Mercalli scale, Richter scale, Beaufort scale
- Frequency – how often does the event occur, refer to recurrence intervals, e.g. once in a year, once in a decade floods, etc
- Duration – the length of time that the hazard exists for, matter of hours to matter of decades
- Areal extent – the size of the area covered by the hazard. Could cover a large extent/range yet only a few people die, or vice versa depending on population density of a certain area.
- Spatial concentration – where on the earth do they occur, on fault lines, plate boundaries, coasts, valleys? Why is this a hazardous area?
- Speed of onset – how long does it take for the hazard to 'kick in' for example in relation to flooding, lag/peak times etc.

<u>Definitions:</u>

Hazard: An event which poses a threat to human life and property
Hazards are extreme natural events that may create risk and potentially turn into disasters if the exposed elements are vulnerable.

Risk assessment: The process of establishing the probability that a hazardous event of a particular magnitude will occur within a given period and estimating its impact, taking into account the locations of buildings, facilities and emergency systems in the community, the potential exposure to the physical effects of the hazardous situation or event and the community's vulnerability when subjected to those physical events.

RISK = HAZARD x VULNERABILITY
Or to put it another way a hazard is the potential to cause harm; risk is the likelihood of harm

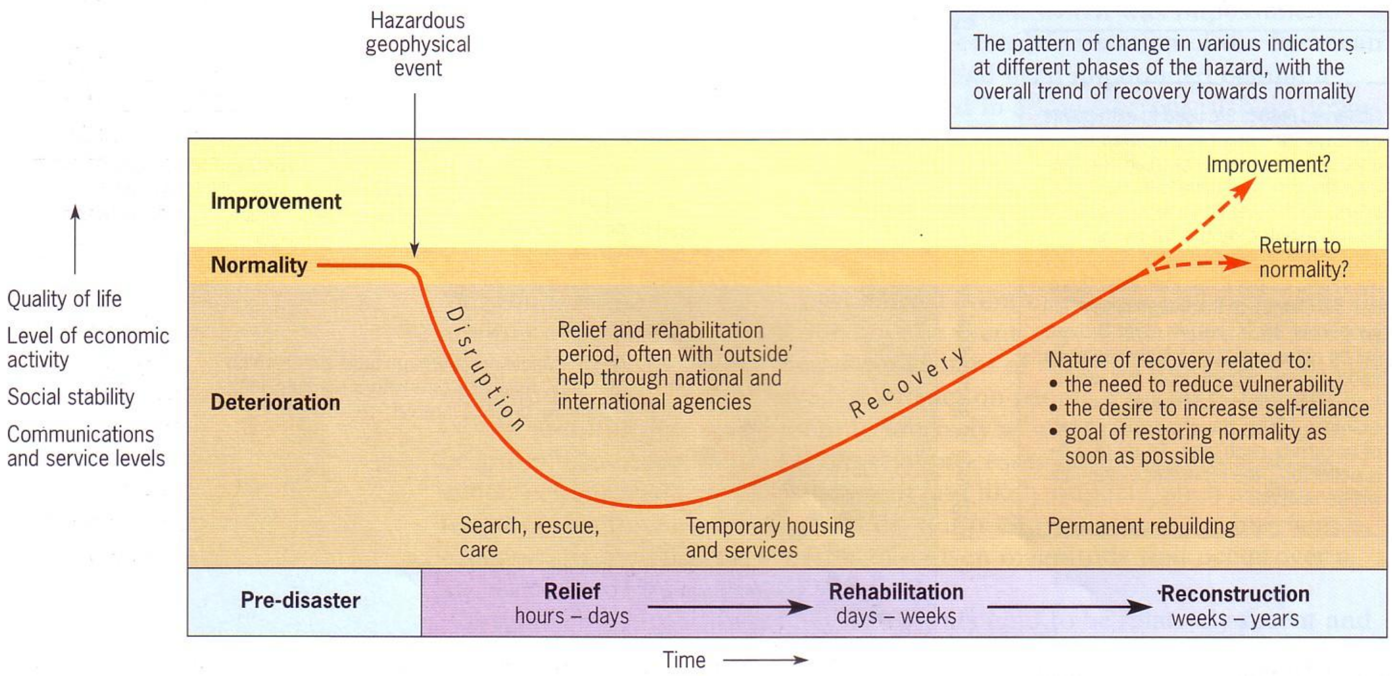
Vulnerability: Vulnerability is a function of many interacting factors – *physical, social, economic and environmental – perhaps even political and cultural.*

Disaster: A natural disaster is the consequence of when a potential natural hazard (e.g. volcanic eruption, earthquake, landslide, tsunami) becomes a physical event and this event affects humans.

"The first few days were a natural disaster. The last four days were a man-made disaster."
Phillip Holt reporting on Hurricane Katrina

Geographical Hazard Models

Parks Model:



- APPLY the model to a case study in relation to HUMAN RESPONSE
  How long for example did it take the area or quality of life to return to normal?
  Mention the various stages and how they implemented into the management of the hazard
- The trick here is to help you to see that they can adapt Park's model to compare different hazards – for instance to:
  - Contrast a forecast event with and unforecast one
  - Compare the same hazard in LEDC –v- MEDC
  - Compare events before and after mitigation strategies were put in place
  - Compare different hazards in the same country / region

The Disaster Management Cycle:

- The disaster management cycle is an equally good model, and perhaps easier to reproduce under time pressure in an exam
- This model is very useful in revision, to help students understand the impacts of hazards, and to think ahead in terms of future management and mitigation.

What does the Specification say?

Option 5.2 Living with hazardous environments

Key question	*Guidance for students*	Generalisations
Foundation for study What are hazardous environments? How can hazards be classified and assessed?	***Foundation for study*** • *Using examples to define natural hazards, their nature, and the relationship between process, event, hazard and disaster.* • *Classifying hazards based on definition, distribution, scale of impact, cause, magnitude, frequency.* • *Assessing risk and vulnerability to people.*	**Foundation for study** ***Defining and Classifying hazards***. Natural hazards can be classified by a range of criteria. Most 'natural' hazards are not entirely natural' as they are affected by human land use patterns and processes. Assessing the risks posed by hazards is an imperfect but developing science.
1 What are the physical processes that cause natural hazards? What problems do these cause for people?	*Investigating the physical causes of a selection within these types –* • *tectonic hazards – eg earthquakes, volcanoes and tsunami and their links to theories of plate tectonics, earth structure, hotspots* • *meteorological and climatic hazards – eg specific events (tropical and temperate storms, flooding), longer-term trends (eg drought)* • *geomorphic hazards – eg mass movement processes (rockfalls, landslides, avalanches, soil erosion)* *and the effects of these on people in different places and at different scales.*	1 ***Causes of different types of hazard***. Hazards have many causes; some hazards have multiple causes. Tectonic, meteorological, climatic, and geomorphic hazards require a knowledge of physical process in order to understand their occurrence and their impact upon people.
2 What are the impacts of natural hazards upon people, the economy and the environment? How and why do these vary spatially?	*Investigating and assessing the impact of –* • *a range of natural hazards (eg tectonic, climatic and geomorphic) at a range of scales in both MEDCs and LEDCs* • *multiple hazards in a country or region eg Japan, New Zealand* • *hazards in MEDCs and LEDCs (eg no of deaths, economic damage).*	2 ***Spatial variations in the impact of natural hazards***. The impacts of natural hazards include social, economic and environmental effects. Impact is related to – • the type, frequency, magnitude and spatial distribution of the natural hazard • the nature of the area affected, including its economic status.
3 How successfully do people respond to and attempt to manage the impact of natural hazards?	*Investigating how societies respond to hazards at a range of scales in both MEDCs and LEDCs – eg* • *strategy – 'do nothing', management, forecasting, and engineering* • *the different players – eg government, insurance, planners, civil defence, relief agencies* • *different schemes at local and regional scales, in both MEDCs and LEDCs, designed to protect, alleviate and/or prevent hazards.*	3 ***The human response to hazards***. People respond to natural hazards in different ways. Responses may – • be influenced by hazard type, frequency, magnitude, and location • include management of causes and/or effects, such as avoidance, education, protection and prevention schemes • depend on factors such as research, understanding of cause, frequency, location, and economic environment.
4 What are the issues in living with natural hazards in future? Can hazard threats ever be predicted or reduced?	• *Investigating hazard awareness and disaster trends. Hazards trends eg deaths, links with economic development* • *Are hazards occurring more frequently?* • *The role of prediction in managing, protecting and preventing hazards, and its difficulties – eg earthquake forecasting. The future for hazard prediction; can it be effective in reducing hazard impact?*	4 ***Global trends in hazards and hazard management***. Global trends of hazards are uncertain; the future impact of hazards may rely upon the effectiveness of – • management to reduce their effects rather than their causes • hazard prediction.

Structuring the Essay (1500 words – 80 minutes)

A knowledge of how the paper is assessed is imperative to achieving success in January. The mark scheme is split into five sections.

D – 10 marks

R – 15 marks

U – 15 marks

C – 10 marks

Q – 10 marks

Totalling 60

D is for Defining

You are expected to introduce the question, define the concepts and identify the data to be analysed.

Define the term natural hazard
Define physical and human causes of hazards
Remember it is only a hazard if it affect people
Possible link to the Parks Model/Disaster management diagram
Clear selection of case studies
Justify your choice of case studies

R is for Research

You should have researched and selected appropriate sources of case study evidence including facts and figures

You may include a balance between:
Tectonic, Geomorphological and climatic depending on the quetion
Describe the hazard with case studies to support as evidence
Explore the processes and link to human involvement
Providing case studies with a range of *human interaction and human response* would be good.
Possible range:

- Avalanches and cliff instability
- E/Qs:, central America, Kobe, India (tsunamis)
- Volcanoes: Iceland, Italy, Pinatubo, Etna, St Helens
- Drought and Fires: France, Australia, The Sahel
- Hurricanes: Katrina and Sidr (Bangladesh)

U is for Understanding

You must demonstrate that you understand the concepts in question. You must show an appreciation of values and attitudes in the case study area(s). You case studies should be organised and applied to support your arguments

You must demonstrate knowledge that most hazards are not entirely natural
Secondary, tertiary, quaternary impacts
Understanding of each type of hazards and a comparison
Understanding of the level of human interaction varies between hazards:
Volcanoes, E/Qs not people
Floods may be caused by building on flood plains.

C is for Conclusion

You must demonstrate an ongoing evaluation (continuously assessing how valuable each case is in support or against the arguments set)

Ongoing throughout the essay
Discussion of the interaction and the concept of a spectrum of hazards
You should finish by drawing upon examples to show that hazards have varied interaction and range from entirely physical to entirely human

Q is for Quality of Written Communication

You must demonstrate the ability to organise your work, provide valid arguments and use appropriate geographical terminology

Geographical Terms
Organised
Clear arguments
Logical use of material
Integration of knowledge, process and cases
Sequenced paragraphs reflected in the introduction and conclusion
Good SPG

What the examiners think:

Taken from Examiners Report from January 2007
Questions 3&4 were from the Hazards section of the exam.

Details on DRUCQ for Q 3 and 4

D = Most candidates showed evidence of planning their essay, which led to a more structured response and enabled the candidate to refer to their plans in their introduction. The more detailed introductions followed a systematic approach by defining NH, highlighting the issues within the question and explaining how their argument would be made (framework and examples used). Fewer though addressed frequency and awareness or prediction. Wording such as 'In this essay.' helped to access the top band (if all other areas covered). The weaker introductions were limited to a basic definition of NH and restating of the question, ending with a vague 'a range of examples will be used', which provides little framework and would only enable the candidates to access 5-6 marks out of a possible 10. A strong introduction (of about 1-1 ½ pages in length) often led to well argued essay.

R = All essays contained a range of case studies (usually in excess of four). There were a number of very popular examples that cropped up in many pieces of work (Boxing Day Tsunami, Kobe, Katrina, Mt Helens, Nevado Del Ruiz to name a few). A strong bias towards the tectonic and atmospheric hazards though, sometimes limited the candidate's ability to argue their case. The research element of this essay was generally stronger than the argument made. The best responses were able to select examples that proved their point well and provided contrasts to ensure their argument covered all angles.

U = Most candidates understood the general concepts involved and tended to argue the case for increased vulnerability in most cases as opposed to frequency. The more detailed responses provided a critical evaluation of all types of hazards and the different factors that affect their frequency and awareness to them e.g. urbanisation; global warming; poverty; media and technology.

C = A clear break in the writing of the essay and/or the words 'In conclusion' or similar - helped the candidate access the higher bands. Some candidates are still incorporating new evidence - often in a rush to finish/due to poor planning - which often led to overlong and repetitive conclusions. The language needs to change in the conclusion and it is clear where candidates have been tutored in essay writing style. Time management shows in this section of the essay - especially when candidates repeat their overall decision to the title. The better responses avoided simply repeating the title with their opinion. Some candidates went on to discuss issues of management and needed guidance on how and when to end their essay.

Q = real evidence of better structure, terminology here. Most candidates recognised the command words required - but only those that concluded the factors that influenced their decision about the title could gain the top band. Weaker candidates simply summed up their examples used and re-worded the title into an answer.

This gives you an insight into what the examiner is looking for and how they will go about marking the exam. Maybe worth taking into consideration.

CASE STUDIES

GEOLOGICAL AND GEOMORPHOLOGICAL

EARTHQUAKES

Earthquakes occur due to the interaction of plate tectonics. Plate tectonics is a category which covers sea floor spreading, continental drift, earthquake activity and mountain building. The system helps us to explain the past and present distribution of volcanoes, earthquakes and folding mountains. Types of boundary include:

- Constructive (two oceanic plates moving apart) – Mid Atlantic Ridge,
- Destructive (oceanic plate moving towards a continental plate and sinks beneath it) – Nazca sinking under the South American plate,
- Collision (two continental plates colliding forming fold mountains) – Indian plate collided with the Eurasian to form the Himalayas,
- Conservative (two continental plates move sideways past each other, no land created or destroyed) – San Andreas Fault in California,

An earthquake is a series of shocks and tremors that result from a sudden release of pressure. They are measured on the Richter (logarithmic) and Mercalli Modified Mercalli intensity scale.

KOBE EARTHQUAKE, JAPAN, JANUARY 1995

Japan experiences more earthquakes than any other country due to its position on the Pacific Ring of Fire. The Pacific Ocean plate is descending below the Eurasian plate, forming a subduction trench of up to 8 km. The earthquake in the area of Hanshin in Japan on the 17th January 1995 killed over 5000 people, injuring over 30,000 and made a third of a million people homeless. It came in as 7.2 on the Richter scale and caused a great deal of destruction due to vertical and horizontal shaking.

Rain, strong winds and lightning increased the risk of landslides, and doctors were faced with outbreaks of disease due to the damp unhygienic conditions people were forced to live in. Since then many reinforcements have been made. Building and cities are more able to cope with the disasters, reinforcing of the disaster prevention systems and increasing the awareness of the disaster prevention, and also promoting earthquake prediction.

The parts or sites which cause particular problems are areas of unconsolidated material, soft soils and faults. Measures which have been put in place to help cities cope in the event of an earthquake include: securing and improving evacuation sites and routes; promoting fire-resistant construction of buildings and improving fire-fighting facilities; upgrading aseismatic standards for buildings, enforcing standards of public facilities; improving prediction and monitoring of earthquakes in disaster and prevention centres.

The 'Large scale Earthquake Countermeasures Act' of 1978 created the: basic plan for earthquakes; earthquake disaster prevention; and emergency plan for earthquake disaster prevention. The act also provided the financial assistance needed for such programmes. Areas of special observation have also been set up which: have had a large scale earthquake in living memory, but not recently; are in an active tectonic area; have recently experienced active crustal movement; and have critical social importance such as Tokyo.

The earthquake proved to be a major wake-up call for Japanese disaster prevention authorities. Japan installed rubber blocks under bridges to absorb the shock and rebuilt buildings further apart to prevent them from falling like dominoes. The national government changed its disaster response policies in the wake of the earthquake, and its response to the 2004 Chūetsu earthquake was significantly faster and more effective. The Ground Self-Defence Forces were given automatic authority to respond to earthquakes over a certain magnitude, which allowed them to deploy to the Niigata region within minutes. Control over fire response was likewise handed over from local fire departments to a central command base in Tokyo and Kyoto. Hereby displaying the effect of a human response after the earthquake occurred.

KASHMIR EARTHQUAKE, PAKISTAN. OCTOBER 2005

The 2005 Kashmir Earthquake (also known as the South Asian earthquake or the Great Pakistan earthquake), was a major earthquake, of which the epicentre was the Pakistan-administered Kashmir. The earthquake occurred on 8 October 2005. It registered a debatable 7.6 or 7.7 on the richter scale making it a major earthquake similar in intensity to the 1906 San Francisco earthquake, 1935 Quetta earthquake, and the 2001 Gujarat earthquake. As of 8 November, the Pakistani government's official death toll was 73,276, while officials say nearly 1,400 people died in the Indian administered state of Jammu and Kashmir and fourteen people in Afghanistan.

Most of the affected people lived in mountainous regions with access impeded by landslides that blocked the roads, leaving an estimated 3.3 million homeless in Pakistan. The UN reported that 4 million people were directly affected, prior to the commencement of winter snowfall in the Himalayan region. It is estimated that damages incurred are well over US$ 5 billion (300 billion Pakistani rupees) Five crossing points were opened on the Line of Control (LoC) between India and Pakistan to facilitate the flow of humanitarian and medical aid to the affected region, and international aid teams from around the world came to the region to assist in relief. Relief efforts in many remote villages were loaded, as roads were buried in rubble and many affected areas remained inaccessible. Heavy equipment was needed to clear the roads and to rescue survivors buried under the earthquake wreckage, as many rescuers were picking the rubble with pickaxes and their bare hands, looking for survivors.

In many areas there was no power, or adequate food or water; there was also the danger of disease spreading, including measles. Distributing relief supplies to the victims was especially urgent as the victims face the risk of exposure to cold weather due to the region's high altitude and the approaching winter. Food, medicine supplies, tents and blankets were 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 were in need of shelter. The UN made an appeal to raise US$272 million to help victims. International relief organizations remain, particularly in the hard hit areas of NWFP and rural Kashmir

VOLCANOES

Volcanoes are openings in the earth's crust through which magma, molten rock and ash can erupt onto land, Most volcanoes are located at the plate boundaries, although some are found in the interior of plates. There are various different hazards which are a result of volcanic activity, including; lava flows; ballistics and tephra clouds; pyroclastic flows; gases and acid rain; lahars; and glacier bursts.
Volcanoes are classified in a number of ways and there are different types (getting more and more powerful down the group):

- Icelandic lava eruptions
- Hawaiian eruptions
- Strombolian eruptions
- Vulcanian eruptions
- Vesuvian eruptions
- Plinian eruptions

Scientists are becoming more and more successful at predicting volcanoes using seismometers to record small earthquakes; chemical sensors to measure increased sulphur levels; lasers to detect the physical swelling of a volcano; and ultrasound to monitor low frequency waves in the magma, from the surge of gas and molten rock just under the surface.

MOUNT ST HELENS, UNITED STATES OF AMERICA, MAY 1980

After a dormant period of 123 years, a series of small earthquakes began, and these were consequently monitored daily. Due to the early prediction that the volcano could erupt at any time, the area was closed to tourists and sightseers, however on the 18th May, the volcano erupted, killing 62 people most of whom had managed to gain access to restricted areas to obtain a better view of the volcano.

The May 18, 1980, event was the most deadly and economically destructive volcanic eruption in the history of the United States. Fifty-seven people were killed and 200 homes, 47 bridges, 15 miles (24 km) of railways and 185 miles (300 km) of highway were destroyed. U.S. President Jimmy Carter surveyed the damage and stated it looked more desolate than a moonscape. A film crew was dropped by helicopter on St. Helens on May 23 to document the destruction. Their compasses, however, spun in circles and they quickly became lost. A second eruption occurred the next day (see below), but the crew survived and were rescued two days after that.

The ash fall created some temporary but major problems with transportation, sewage disposal, and water treatment systems. Visibility was greatly decreased during the ash fall, closing many highways and roads. Interstate 90 from Seattle to Spokane was closed for a week and a half. Air travel was disrupted for a few days to 2 weeks as several airports in eastern Washington shut down because of ash accumulation and poor visibility. Over a thousand commercial flights were cancelled following airport closures. Fine-grained, gritty ash caused substantial problems for internal-combustion engines and other mechanical and electrical equipment. The ash contaminated oil systems and clogged air filters, and scratched moving surfaces. Fine ash caused short circuits in electrical transformers, which in turn caused power blackouts.

Early estimates of the cost of the eruption ranged from US$2–3 billion. A refined estimate of $1.1 billion ($2.74 billion in 2007 dollars) was determined in a study by the International Trade Commission at the request of the United States Congress. A supplemental appropriation of $951 million for disaster relief was voted by Congress, of which the largest share went to the Small Business Administration, U.S. Army Corps of Engineers, and the Federal Emergency Management Agency. Since the eruption, there have been several other eruptions however the volcano is under monitoring and thus with this the area can be evacuated if necessary.

MONSERRAT, CARIBBEAN ISLANDS, 1995 – 1997

Montserrat is a small island in the Caribbean which has been affected by a number of recent hazards. It is important to notice that it is a relatively poor country and the effect that this may have had in its survival. The cause of the volcanic activity on Montserrat is a subduction zone caused by the South American and North American plates plunging under the Caribbean plate. The rising magma forms domes (islands). In 1995, after being dormant for nearly 400 years, the Soufriere Hills, in the south of the island showed signs of volcanic activity, and in 1996 it finally erupted. This caused mudflows, pyroclastic clouds and boiling ash and rocks were thrown out of the volcano. 23 people died because of the eruption and the majority of the land was affected.

Even though the eruption was small on Montserrat, it had a large impact on the people and the island of Montserrat. Public services and utilities have been moved to the north of the island, away from the agricultural south of the island, at a cost of $37 million. The largest settlement Plymouth has also been abandoned. As a direct result of the volcano, the eruptions brought about a partial evacuation of the island, over half its population of 12000 people have left the island since the volcano awakened in 1995. In terms of human response to the volcano, there was not much the country could do due to its size and lack of wealth on the matter. As it was a small settlement and small island also this meant that it became insignificant in comparison to other areas/regions.

Other Caribbean countries provided materials and humanitarian aid to the colony, however the UK was criticised because it appeared unwilling to move quickly or definitively to support the inhabitants of the island. Rioting broke out as a consequence of this, protesting at the lack of facilities provided by the authorities and therefore by implication, lack of funding b the UK. Critics suggested that the UK was reluctant to accept its full responsibility and that it was hoping that voluntary evacuation would spare the UK government the need and cost of moving the inhabitants off the island. Whilst this was said, the UK did provide around $10 million in aid.

The volcano has become one of the most closely monitored volcanoes in the world since its eruption began, with the Montserrat Volcano Observatory taking detailed measurements and reporting on its activity to the government and population of Montserrat. The observatory is operated by the British Geological Survey under contract to the Government of Montserrat.

TSUNAMIS

Tsunamis are waves caused by earthquake and/or volcanic activity. Some Tsunami's are caused by the shocks of massive undersea landslides. They have very long wavelengths (the distance between successive waves). The danger from tsunamis rests in their size and the energy they contain. They travel fast in open oceans and the waves are difficult to observe until they approach land. Measurements which can be taken to reduce the impacts include:

- Warnings accompanied by evacuation
- Land use zoning
- Houses and other buildings being removed to higher ground and new construction banned in the main risk areas
- Breakwaters, sea walls and dense groves of trees being established to absorb the initial impact of a tsunami and reduce the force that remains.

JAPANESE TSUNAMI, JAPAN, JULY 1993

On 12TH July 1993, a series of five earthquakes ranging up to 7.8 on the Richter scale occurred on in the Sea of Japan, near Japan's northern island of Hokkaido. The tsunami produced by the earthquakes was travelling at an estimated speed of 500 km/h when it hit the island of Okushiri, only 60km from the earthquakes epicentre. The island was engulfed by a wall of water up to 30m high. This tsunami was then followed by a smaller one.

Damage to the island was extensive. Fishing boats were hurled inland and electrical fires broke out, rapidly spreading from house to house. Aided by strong winds, the fire ignited fuel tanks on the island, many of which exploded. Within half an hour of the tsunami, a substantial area of the island was ablaze and the residents had little time to escape. The tsunami caused the death of 158 people and destroyed over half the houses on the island. A wave-induced landslide buried a hotel and killed at least 15 people also. The wave also struck the coast of eastern Russia but caused less damage.

It was the worst earthquake related disaster in Japan since 1948. The final death toll was over 250, with most of the fatalities occurring on Okushiri, and nearby areas.

THE ASIAN TSUNAMI, INDONESIA AND SURROUNDING AREA, DECEMBER 2004

The 2004 Indian Ocean earthquake was an undersea earthquake that occurred at 00:58:53 UTC December 26, 2004, with an epicentre off the west coast of Sumatra, Indonesia. The earthquake triggered a series of devastating tsunamis along the coasts of most landmasses bordering the Indian Ocean, killing more than 225,000 people in eleven countries, and inundating coastal communities with waves up to 30 meters (100 feet). It was one of the deadliest natural disasters in history. Indonesia, Sri Lanka, India, and Thailand were hardest hit.

With a magnitude of between 9.1 and 9.3, it is the second largest earthquake ever recorded on a seismograph. This earthquake had the longest duration of faulting ever observed, between 8.3 and 10 minutes. It caused the entire planet to vibrate as much as 1 cm (0.5 inches) and triggered other earthquakes as far away as Alaska.

The disaster is known by the scientific community as the Great Sumatra-Andaman earthquake, and is also known as the Asian Tsunami and the Boxing Day Tsunami. The tsunami occurred exactly one year after the 2003 Bam earthquake and exactly two years before the 2006 Hengchun earthquake. The plight of the many affected people and countries prompted a widespread humanitarian response. In all, the worldwide community donated more than $7 billion (2004 U.S. dollars) in humanitarian aid.

The Indian Ocean Tsunami Warning System is a tsunami warning system set up to provide warning to inhabitants of nations bordering the Indian Ocean of approaching tsunamis. It was agreed to in a United Nations conference held in January 2005 in Kobe, Japan as an initial step towards an International Early Warning Programme. The system became active in late June 2006 following the leadership of UNESCO. It consists of 25 seismographic stations relaying information to 26 national tsunami information centers, as well as three deep-ocean sensors. However, UNESCO warned that further coordination between governments and methods of relaying information from the centers to the civilians at risk are required to make the system effective.

Its creation was prompted by the 2004 Indian Ocean earthquake and resulting tsunami, which left some 230,000 people dead or missing. Many analysts claimed that the disaster would have been mitigated if there had been an effective warning system in place, citing the well-established Hawaii-based Pacific Tsunami Warning Center, which operates in the Pacific Ocean.

People in some areas would have had more than adequate time to seek safety if they were aware of the impending catastrophe. The only way to effectively mitigate the impact of a tsunami is through an early warning system.Other methods such as tsunami walls only work for a percentage of waves, but a warning system is effective for all waves originating outside a minimum distance from the coastline.

In the immediate aftermath of the July 2006 Java earthquake, the Indonesian government received tsunami warnings from the Hawaii center and the Japan Meteorological Agency but failed to relay the alert to its citizens. At least 23,000 people did evacuate the coast after the quake, either fearing a tsunami or because their homes had been destroyed. It has been suggested that in Muslim-dominated coastal areas, the loudspeakers fitted to mosques could be used to broadcast warnings.

CLIMATE AND METEOROLOGICAL

FLOODS

Flood plains may be defined in various ways depending on who is viewing them. Disasters are caused by extremes of floods or drought and catastrophes are caused under very extreme conditions. In flood conditions the river channel is unable to contain the discharge of water and so this water and sediment spill onto, and move across, adjacent surfaces.
Responses to flooding include:

- Bearing the loss
- Emergency action
- Flood proofing
- Land-use zoning
- Flood insurance
- Flood control

THE U.K FLOODS, THE U.K, 2007

Widespread flooding occurred throughout the United Kingdom in June and July 2007, killing 11 people. The floods affected thousands of businesses, tens of thousands of homes and further affected up to a million people. Estimated damages on 23 July 2007 were over £2 billion. The most severe floods occurred across Northern Ireland on 12 June; East Yorkshire and The Midlands on 15 June; Yorkshire, The Midlands, Gloucestershire and Worcestershire on 25 June; and Gloucestershire, Worcestershire, Oxfordshire, Berkshire and South Wales on 20 July.

June was one of the wettest months on record in Britain (see List of weather records). Average rainfall across England was 140 millimetres (5.5 in), more than double the June average. Some areas received a month's worth of precipitation in just 24 hours and it was Sheffield's wettest month since records began. July had unusually unsettled weather and above-average rainfall through the month, peaking on 20 July as an active frontal system dumped more than 120 mm (4.7 in) of rain in Southern England. Civil and military authorities described the June and July rescue efforts as the biggest in peacetime Britain. The Environment Agency described the July floods as critical and expected them to exceed the 1947 benchmark.

Following the flooding in late June, the rescue effort was described by the Fire Brigades Union as the "biggest in peacetime Britain". Following the flooding in July, the RAF said it is carrying out its biggest ever peacetime rescue operation, with six Sea King helicopters from as far afield as RAF St Mawgan in Cornwall, RAF Valley in Anglesey and RAF Leconfield in the East Riding of Yorkshire rescuing up to 120 people. An RAF heavy lift Chinook helicopter was also employed to move aggregate to reinforce the banks of the River Don. The Environment Agency describes the situation as "critical".

BANGLADESH FLOODS, BANGLADESH, 2007

Bangladesh is built over the flood plains of three major rivers, the Brahmaputra, Meghna, and Ganges Rivers. The three rivers converge in Bangladesh and empty into the Bay of Bengal through the largest river delta in the world. The flat land within each flood plain is fertile, and the country is densely populated. As a result, floods on any of the three rivers can affect a vast number of people. When all of the rivers run high with monsoon rains and melting snow from the Himalaya Mountains (the source of the rivers), much of Bangladesh can be under water. Floods help make the cultivable land in Bangladesh fertile and thus help the agriculture sector of the country. But, excessive flood is considered a calamity. The floods have caused havoc in Bangladesh throughout history, especially during the recent years: 1987, 1988, and 1998. The most recent one occurred in 2007. According to government statistics 298 people died and a total of 1,02,11,780 people are badly affected by it. 58,866 houses are completely damaged for the flood up to 13 August 2007.

Bangladesh is a very low lying country, (only 3-7 feet in most parts). The rise in sea water levels, the narrow north tip to the Bay of Bengal, tropical storms that whip up wind speeds of up 140 mph (225 km/h)send waves (up to 26 feet tall) crashing into the coast, the shallow sea bed and the fact that water coming down from the rivers Ganges and Brahmaputra can not escape when the water level rises all contribute to the severe flooding of the Bangladesh coastline. However this is not the only reason as due to the effects of deforestation in Nepal, there have been an increase in the flood risk of the two major rivers running through Bangladesh. The river Ganges and the river Brahmaputra. Deforestation leads to more water in rivers which allows more sediment to build up which leads to a higher risk of flooding.

To further increase the risk of flooding, Bangladesh is a frequent receiver of cyclones. These fierce winds create chaos in the water, and often, destroy banks and dams. Since Bangladesh is adjacent to a warm ocean, cyclones are a common occurrence.

So far, few plans have worked well in the way of stopping floods. There was limited success in reducing monsoon flood depths. Projects aimed to protect crops in northeast Bangladesh from early flooding were very successful. The most successful plan has been submersible embankments. The embankments protect the winter rice crop from flooding in April-May when it is ready for harvest. By July, when summer rice crops need the fertile silt, the floods are much higher, and the embankments are flooded. These embankments are not only used for protection, but they also serve as roads, a linear housing development, agro-forestry, crops, grazing, markets, sites for wells, and emergency flood refuges. These embankments were not built for this, but in the future, they will be built to even better accommodate all of these functions. Overall, it appears small, simply conceived projects are the most likely to work. Bangladesh must eliminate harmful flooding, but still be able to get the fertile silt and fish roe.

HURRICANES

Hurricanes, typhoons and tropical cyclones are among the most violent storms that affect the world. The amount of energy produced in a single hurricane would be enough to supply the whole of the USA with all its electricity for six months. Hurricanes are compound hazards which include heavy rainfall, strong winds and high waves which can cause other hazards such as flooding or mudslides. They are intense hazards which affect a large area but are difficult to predict accurately. The onset of any individual hurricane is rapid. They may travel slowly at first but their path is erratic. For hurricanes to form a number of conditions are needed:

- Sea temperatures must be over 27 degrees
- The low pressure area has to be sufficiently far from the equator so that the Coriolis force creates rotation in the rising air mass.

HURRICANE KATRINA, NEW ORLEANS, AUGUST 2005

Hurricane Katrina was the costliest and one of the five deadliest hurricanes in the history of the United States. It was the sixth-strongest Atlantic hurricane ever recorded and the third-strongest hurricane on record that made landfall in the United States. Katrina formed on August 23 during the 2005 Atlantic hurricane season and caused devastation along much of the north-central Gulf Coast. The most severe loss of life and property damage occurred in New Orleans, Louisiana, which flooded as the levee system catastrophically failed, in many cases hours after the storm had moved inland. The hurricane caused severe destruction across the entire Mississippi coast and into Alabama, as far as 100 miles (160 km) from the storm's centre. Katrina was the eleventh tropical storm, fifth hurricane, third major hurricane, and second Category 5 hurricane of the 2005 Atlantic season.

Within the United States and as delineated in the National Response Plan, disaster response and planning is first and foremost a local government responsibility. When local government exhausts its resources, it then requests specific additional resources from the county level. The request process proceeds similarly from the county to the state to the federal government as additional resource needs are identified. Many of the problems that arose developed from inadequate planning and back-up communications systems at various levels.

Some disaster recovery response to Katrina began before the storm, with Federal Emergency Management Agency (FEMA) preparations that ranged from logistical supply deployments to a mortuary team with refrigerated trucks. A network of volunteers began rendering assistance to local residents and residents emerging from New Orleans and surrounding parishes as soon as the storm made landfall, and continued for more than six months after the storm.

Of the 60,000 people stranded in New Orleans, the Coast Guard rescued more than 33,500. Congress recognized the Coast Guard's response with an official entry in the Congressional Record, and the Armed Service was awarded the Presidential Unit Citation.

A June 2007 report released by the American Society of Civil Engineers states that the failures of the federally built levees in New Orleans' were found to be primarily the result of system design flaws. The US Army Corps of Engineers, who by federal mandate is responsible for the conception, design and construction of the region's flood-control system failed to pay sufficient attention to public safety. Various conspiracy theories began floating around that the levees were in fact deliberately demolished. A number of New Orleans residents described hearing "explosions" coming from the Industrial Canal levee in the Lower 9th Ward before the floodwaters rushed in. A National Guard worker claims he was sworn to secrecy upon finding explosives residue at the site of the break

CYCLONE SIDR, BANGLADESH, NOVEMBER 2007

Cyclone Sidr (JTWC designation: 06B, also known as Very Severe Cyclonic Storm Sidr) is the fourth named storm of the 2007 North Indian Ocean cyclone season. The storm formed in the central Bay of Bengal, and quickly strengthened to reach peak sustained winds of 215 km/h (135 mp/h), which would make it a Category-4 equivalent tropical cyclone on the Saffir-Simpson Scale. The storm eventually made landfall near Bangladesh on November 15. The storm caused large-scale evacuations in Bangladesh. So far, 3,447 deaths have been blamed on the storm, with that number expected to rise.

Save the Children estimated the number of deaths to be between 5,000 and 10,000, while the Red Crescent Society reported on November 18 that the number of deaths could be up to 10,000. As of November 19, international groups have pledged US$25 million to repair the damage.

After the storm, five Bangladesh Navy ships were immediately dispatched with food, medicine, and relief supplies for the hardest-hit areas. Saudi Arabia also donated US$100 million to the relief effort as the country's largest relief sum ever. The European Commission also released €1.5 million (US$2.4 million) in emergency relief to Bangladesh. The United States, through the U.S. Agency for International Development, has pledged more than US$14.4 million in emergency assistance, including more than US$10 million in food assistance from the U.S. Food for Peace program. The United States Navy also released over 3,500 Marines aboard USS Kearsarge and USS Wasp (located in the Gulf of Oman) and USS Tarawa (located in Hawaii) to aid in the recovery efforts.

Other agencies quickly followed in providing aid. World Vision released volunteers to help house more than 20,000 people left homeless. The Red Cross also brought a significant presence, while assessments of the damage were underway. Bangladesh Red Crescent Society initally asked 400 million Taka to the international community. As part of the Bangladeshi cricket team's tour in New Zealand, a charity Twenty20 match was held with all funds raised going to the victims. In addition, the International Cricket Council donated US$250,000 to the funds at the start of the match.

People of the cyclone affected area are having severe health problems as diseases like diarrhea spread due to shortage of drinking water.The landfall of Sidr had followed the devastation caused by consecutive floods earlier in 2007