**Paper 1 – The Challenge of Natural Hazards** *– tectonic hazards, weather hazards, climate change*

GCSE REVISION AT A GLANCE – GEOGRAPHY AQA TOPIC SUMMARIES

**Natural Hazards**

**Natural hazard** – a natural event causing damage to people/property; **Natural disaster** – a hazard that has happened

**Types** – geological (volcanoes, earthquakes, landslides) or meteorological (storms, extreme weather, climate change)

**Factors affecting risk** – vulnerability (how able you are to cope), wealth (money), type of hazard (tectonic or meteorological), frequency (how often), magnitude (how big)

**Tectonic hazards**

**Distribution** – hazards are found on plate margins; often on the edges of continents; they occur in lines; clustered around the edge of the Pacific plate (Ring of Fire)

**Layers of the earth** – **crust** (solid rock), **mantle** (molten rock or magma, contains convection currents), **outer core** (molten iron and nickel), **inner core** (solid iron and nickel)

**Types of crust** – oceanic (more dense, newer, sinks), continental (less dense, older, doesn’t sink)

**Margins (gaps between tectonic plates)**

**Constructive** – e.g. Iceland; plates pull apart due to convection currents; volcanoes and earthquakes happen

**Destructive** – e.g. west coast of S. America; plates push into each other; oceanic crust sinks below continental; volcanoes, earthquakes and tsunamis happen; fold mountains and ocean trenches form

**Conservative** – e.g. San Andreas fault line in California; plates push past each other or move in same direction but at different speeds; only earthquakes happen here



**Earthquakes**

**Causes** – friction builds between plates (at all types of plate boundaries); tension builds as plates move, and energy is released in a violent movement that sends out shockwaves

**Effects** – **primary** (buildings collapse, deaths, injuries, roads/railways/airports damaged, water/gas/electricity disrupted, communications down); **secondary** (landslides, tsunamis, gas leaks, fires, disease, expensive repairs)

**Responses** – **immediate** (rescue people, set up shelters, send foreign aid); **long term** (re-house people, build earthquake proof buildings, reconnect water and electricity)

**Reasons to live near tectonic hazards** – tourism, farming (fertile soil), reluctance to leave family & friends, belief hazard may not happen, confident of government support in case of a disaster

**Managing tectonic hazards – monitor and predict** – satellites (detect ground movement & heat changes), seismometers (detect ground shaking), escaping gas (indicates a volcano may erupt); **protect** – make earthquake proof buildings (cross-bracing, deep foundations, shock absorbers); **plan/prepare** – educate people (earthquake drills), prepare emergency services, encourage public to be ready with supplies, make evacuation routes



**LIC case study: Port-au-Prince, Haiti, Caribbean, 12th January 2010**

**Cause**: situated on the Caribbean and North American plates

**Effects**: **Primary** (230,000 dead, 300,000 injured, 1.5 million homeless, most buildings destroyed including the parliament building and most schools/hospitals); **Secondary** (outbreaks of cholera as water pipes and sewage systems were broken, people living in tents, aid slow to arrive due to badly damaged roads)

**Responses**: **Immediate** (locals had to search and rescue people); **Long term** (money sent from HICs, food, water, tents, and toilets flown in, emergency teams and doctors arrived to help with the cholera outbreak)

**HIC case study: Christchurch, New Zealand, 22nd February 2011**

**Cause**: sits on a destructive plate boundary between the Australian plate and Pacific plate

**Effects**: **Primary** (185 deaths, 1500-2000 injured, over half the city’s buildings damaged, water and sewage pipes damaged, the iconic cathedral spire fell down); **Secondary** (business out of action, unemployment & income loss, schools shared classrooms, loss of income from tourism, cost of roads/building repairs)

**Responses**: **Immediate** (help from Australia brought food, water & medical supplies, emergency services searched for & rescued people, local people helped each other); **Long term** (foreign aid sent from HICs, careful rebuilding of the city with earthquake proof designs, tourism and businesses restored)

**Reasons people live close to hazardous areas**

Connections, to family/friends, farmland (volcanic soils), tourism, valuable minerals in the ground, geothermal energy, belief that a big hazardous event won’t happen in their lifetime

**Weather hazards**

**Air circulation model** – shows the rising and falling of air around the world driven by temperature; winds move from high pressure to low pressure forming loops or cells

**Air cells** – loops of air rising and falling, driven by changes in temperature and humidity

**Hadley cell** (equator to tropics); **Ferrell cell** (tropics to mid-latitudes); **Polar cell** (mid-latitudes to poles)

**Pressure belts** – rising air forms low pressure belts; sinking air forms high pressure belts

**Surface winds/Trade winds** – transfer heat and moisture from one place to another

**Affect on world weather** – cloudy & wet in UK (unstable air where cold polar air and warm sub-tropical air meet); hot & dry in desert (warm sinking air prevents clouds forming); hot & humid at equator (warm rising air, rains daily)

**Tropical storms (hurricanes, typhoons, cyclones)**

**Distribution** – along the equator, in between the tropics; USA & Caribbean, south-east Asia, Japan, Philippines

**Causes** – warm oceans (above 27oC) along with rising air and storms clouds; earth’s rotation causes this to spin

**Formation** – 1) upward movement of air draws up water vapour from ocean surface; 2) air cools & condenses to form clouds; 3) released heat powers the storm further; 4) lots of thunderstorms join together to form a giant spinning storm; 5) an eye develops; 6) wind speeds are around 120kmh; 7) storm pushed over ocean by prevailing winds; 8) energy dies out as it reaches land and storm dissipates

**Structure and features** – circular, up to hundreds of kms wide, lasts 7-14 days, spin anticlockwise in N Hemisphere and clockwise in S Hemisphere; centre of storm is the eye created by descending air; eye wall has spiralling rising air

**Effects of climate change** – more & stronger storms due to rising global temps (increased frequency & intensity)

**Effects of storms** – **Primary** (buildings & bridges destroyed, river & coastal flooding, drownings, injuries, transport links damaged, contamination from sewage); **Secondary** (homelessness, disease, aid can’t get through, job losses)

**Responses** – **Immediate** (evacuation, temporary shelters, temporary food, water & medical help, foreign aid); **Long term** (repair homes & businesses, improve flood defences, improve forecasting techniques, strengthen buildings)

**Managing storms** – **monitor & predict** (use satellites & radar to track storms, evacuate people); **protect** (make buildings storm proof with reinforced doors & windows, build houses on stilts, build sea defences); **plan/prepare** (educate people to have action plans ready; build new developments away from risk areas, have evacuation routes)

**Case study – Hurricane Katrina – 29th August 2005 New Orleans, Louisiana USA.**

The hurricane’s powerful winds and storm surge caused massive destruction along the coasts of Louisiana, Mississippi, and Alabama.

The failure of levees in New Orleans led to catastrophic flooding, with approximately 80% of the city submerged.

**Effects** – **Primary**

1386 Deaths (most as a result of the storm surge), loss of prime agricultural land to flooding (sugar cane & cotton crops lost), loss of infrastructure (3 million with no electricity for 10 days), $300bn worth of damage.

**Effects - Secondary**

Communications disrupted (roads highways railways blocked or flooded), many evacuees never returned, job losses, homelessness, looting, oil leakage from refineries caused huge environmental impact. Insurance was revoked in some areas of New Orleans.

**Responses** – **Immediate**

Evacuation, 50000 rescued during the storm, 25000 sheltered in the Super Dome, water food & shelter distributed by the government but they were slow to react, $10.4 billion aid package,

**Long term**

$62.3 billion in aid for victims; FEMA provided housing assistance (rental assistance, trailers, etc.) to more than 700,000 applicants; FEMA has also paid for the hotel costs of 12,000



**UK weather hazards**

**UK weather hazards** – **rain** (frequent; prolonged rainfall with sudden downpours can cause flooding); **wind** (strong winds damage properties; storms can be connected to hurricanes in USA); **snow & ice** (less common; causes injuries, closures, damage to crops); **thunderstorms** (common in summer; can cause fires); **drought & heat waves** (dangerous to elderly; can damage road tarmac; hosepipe bans may happen)

**Case study – Somerset Levels flooding, south-west England**

**Causes** – severe rainfall (350mm in 2 months), high tides & storm surges, lack of river dredging (removing sediment)

**Effects** – **social** (600 houses flooded, 16 farms evacuated, villages cut off); **economic** (£10 million in costs, 14,000 hectares of farm land underwater for 4 weeks); **environmental** (contaminated floodwaters, debris had to be cleared)

**Management** - £20million Flood Action Plan – dredging, raising road levels & river banks, building flood defences

**Climate change**

**Evidence** – **long term** (CO2 levels in ice cores); **medium term** (tree rings, harvest records), **short term** (CO2 readings)

**Causes** – **natural** (changes to earth’s orbit, sunspots, volcanic eruption); **human** (fossil fuels, farming, deforestation)

**Effects** – sea level rise, flooding, droughts, loss of species & farmland, environmental refugees, spread of malaria

**Management** – **mitigation** (reducing pollution, e.g. renewable energy, carbon capture, plant trees, use international agreements); **adaptation** (live with the effects of climate change, e.g. develop drought-resistant plants, limit water supply, build flood defences, move away from flood risk areas)