Remembering our learning...

Retrieving and recalling our prior learning; developing our longer term memory.

AQA GCSE Geography Checklist – Knowledge Organiser Booklet

Exam Paper 1: Living with the Physical Environment (35%)

Section A: The Challenge of Natural Hazards
□ Natural Hazards and Tectonic Theory
□ Tectonic Hazards (Chile/Nepal Case Study)
□ Weather Hazards (Typhoon Haiyan)
□ Climate Change

Section B: The Living World
□ Ecosystems
□ Tropical Rainforests
□ Hot deserts (not cold environments)

Section C: Physical Landscapes in the UK
□ UK Physical Landscapes
□ Coastal Landscapes
□ River Landscapes (Not Glacial Landscapes)

Exam Paper 2: Challenges in the Human Environment (35%)

Section A: Urban Issues and Challenges
□ Urbanisation and Rio Case Study
□ Leeds Case Study and Sustainable Development

Section B: The Changing Economic World
□ Reducing the Development Gap
□ Nigeria Case Study
□ UK Case Study

Section C: The Challenge of Resource Management
□ UK Resources
□ Water

Exam Paper 3: Geographical Applications (30%)

Section A: Issue Evaluation
□ Pre-release Booklet

Section B: Fieldwork
□ Physical Fieldwork
□ Human Fieldwork

Exam paper: 1
Section: A

NATURAL HAZARDS AND TECTONIC THEORY

BOX 1: KEYWORDS PART 1	
natural hazard	**natural event** (e.g. earthquake, volcanic eruption, tropical storm) which **has potential** to **cause damage, destruction, death**
earthquake	a **sudden violent movement** within the Earth's crust
tectonic hazards	caused by **movement** of **tectonic plates** (e.g. volcanoes and earthquakes)
weather hazards	e.g. **tropical storms** (hurricanes, cyclones, typhoons), **drought, flood**
hazard risk	the **probability** or **chance** that a **natural hazard** may **occur**
molten	**hot, liquid** and **melted** e.g. lava
magma	**molten rock** → flowing **under** the **ground**
lava	**molten rock** → flowing **over** the **ground**

BOX 2: FACTORS AFFECTING HAZARD RISK	
Urbanisation	**high population density** → **more people** in area → **more people affected**
Poverty	**low development**→ **weak buildings**, less medical care→ **more deaths**
climate change	**higher temperatures** → **more tropical storms** → **more people affected**

BOX 3: LAYERS OF THE EARTH	
inner core	**solid** → **iron** and **nickel** → **5000° C** → under high pressure
outer core	**liquid** → **iron** and **nickel**
mantle	**semi-molten rock** → **3800° C**
crust	**surface layer** of **Earth** → two types → **oceanic** (thin), **continental** (thick)

BOX 4: TYPES OF CRUST	
continental crust	**thick** (20-200 km) → **less dense** → **e.g. granite** → **old** (3.8 billion years)
oceanic crust	**thin** (5-10 km) → **more dense** → **e.g. basalt** → **young** (200 million years)

BOX 5: TECTONIC PLATE MARGINS	
tectonic plate	**section/segment** of **crust**
plate margins	where **plates meet** (plate boundary)
constructive margin	two plates move **away** from each other → **rising magma** fills the gap
destructive margin	two plates move **towards** each other → **oceanic crust** is **subducted** (sinks underneath) under the **continental crust**
conservative margin	two tectonic plates **slide past** each other

BOX 6: WHY DO TECTONIC PLATES MOVE?	
convection	**convection currents** → **magma heated** by core → **rises** → **moves plates**
ridge push	**molten magma rises** in the **gap** between the **plates** at **constructive plate margins**→ **cools** to **form new land**→ land **pushes** the **plates** further **apart**
slab pull	**oceanic crust subducted** at **destructive plate margins**→ **gravity** causes plate to **sink**→ **pulls** the rest of **plate along**→ causes entire **plate** to **move**

BOX 7: KEYWORDS PART 2	
VEI	**Volcanic Explosivity Index**→ shows **magnitude** (strength) **1=low, 8=high**
composite	**composite volcanoes** → **cone** shaped → occur at **destructive margins**
shield	**shield volcanoes** → **flat** like a shield → occur at **constructive margins**
high viscosity	**very thick lava** → **violent** eruptions → e.g. **composite** volcanoes
low viscosity	**very thin, runny lava** → **less violent** eruptions → e.g. **shield** volcanoes
earthquake focus	**point under** the **ground** → where an **earthquake starts**
epicenter	**point on** the **Earth's surface** → **directly above** the **earthquake focus**
Richter Scale	**used** to **decide** the **magnitude** (power/strength) of **earthquakes**
seismic wave	**waves** of **energy that travel through the Earth's layers** → **earthquakes**
seismometer	**equipment used** to **measure** and **record earthquakes**

BOX 8: TECTONIC ACTIVITY → AT CONSTRUCTIVE PLATE MARGINS	
plate movement	two plates move **away** from each other
earthquakes	earthquakes **sometimes** occur at **constructive margins** → as two **plates pushed apart** → **pressure builds** up within the **rocks** → **pressure released** as **vibrations** → which can cause **small earthquakes**
volcano formation	as the two plates **move away** from each other → **magma rises** to **fill** the **gap** → forms **volcano**
volcano type	**shield** volcanoes → **wide, flat, shield shaped** (formed from layers of lava)
Volcanic Explosivity Index	**low VEI** → **not very violent** eruptions → **thin runny lava (low viscosity)** → **lava spreads** over **large distances**
volcano example	**Mount Nyiragongo** → Democratic Republic of the Congo (Africa)

BOX 9: TECTONIC ACTIVITY → AT DESTRUCTIVE PLATE MARGINS	
plate movement	two plates move **towards** each other → **oceanic crust** is **subducted** (sinks underneath) under the **continental crust**
earthquakes	**pressure** and **friction builds** between the plates (as the oceanic plate is subducted) → eventually **plates slip suddenly** to new position → **sudden movement** causes **vibrations (seismic waves)** → felt as **earthquake**
volcano formation	**oceanic plate subducted** underneath **continental plate** → immense **heat** and **pressure** → **oceanic plate melts** as it sinks and turns into **magma** → **magma rises** to surface **through cracks** in **continental plate** → forms **volcano** on the surface
volcano type	**composite** volcanoes → **high, steep, cone shaped** (formed from layers of ash)
Volcanic Explosivity Index	**high VEI** → **extremely violent** eruptions → **thick lava (high viscosity)** → **lava explodes** into clouds of **thick ash**
volcano example	**Mount Sakurajima** → Japan (Asia)

BOX 10: TECTONIC ACTIVITY → AT CONSERVATIVE PLATE MARGINS	
plate movement	two tectonic plates **slide past** each other
earthquakes	**pressure** and **friction builds** between the plates as they **slide past each other** → eventually the **plates slip suddenly** to a new position → sudden movement causes **vibrations (seismic waves)** → felt as an **earthquake**
volcanoes	**no volcanic activity** at conservative plate margins (no rising magma)

EARTHQUAKES (TECTONIC HAZARD CASE STUDY)

BOX 1: KEYWORDS

tectonic hazard	**volcano** or **earthquake**
primary effects	what happens **straight away** e.g. **during** an **earthquake → buildings collapse**
secondary effects	what happens **later on** e.g. **after** an **earthquake → broken gas pipes** may cause **fires**
immediate responses	how people **help straight away** e.g. **straight after** an earthquake → **first aid** and **people rescued**
long-term responses	how people **help later on** e.g. **weeks, months** and **years** after an earthquake → e.g. **schools rebuilt**
contrasting wealth	e.g. places with **different** amounts of **money** and development
magnitude	**number** to show the **strength** of an **earthquake** • **magnitude 1 → not felt** by people • **magnitude 8 →** total **destruction**

BOX 2: EARTHQUAKE CASE STUDIES → IN CONTRASTING AREAS OF WEALTH

	earthquake → **Chile**	earthquake → **Nepal**
location	**Southwest of Santiago (capital)**	**Gorkha, Nepal (Asia)**
development	**High** Income Country	**Low** Income Country
GNI per capita	**In 2010 -> $13490**	In 2015 → **$780**
date and time	**February 27, 2010, at 3:34 a.m**	25th April **2015** (11:56 am)
magnitude	**8.8**	**7.8**
primary effects	• **Deaths -> 700** • **Injured -> 12,000** • **Cost of damage -> $30 billion** • **hospitals damaged -> 8** • **Important placed damaged -> historic town of 'Talca'**	• deaths → **8841** • injured →**16,800** • cost of damage→ **$5.15 billion** • hospitals damaged → **26** • important place damaged → **'Dharahara Tower'**
secondary effects	• **homeless -> 700** • **Education -> 11% of schools damaged or destroyed** • **Landslides -> central Chile, blocked and damaged roads**	• homeless → **1 million** • education → **50% schools lost** • **avalanche** on **Mount Everest → 19 died** • **rice seed lost → less food**
immediate responses	• **Aid -> food water and shelter distributed.** • **Evacuation -> residents sent to higher ground for safety.**	• The **Red Cross** provided **tents → for 225,000 people** • **World Health Organisation →** distributed **medical supplies**
long-term responses	• **Reconstruction -> aim to make stronger.** • **Incentives for business -> help economy grow again.**	• **aid** from European Union → **$274 million** • **23 areas to be rebuilt** • Mount Everest **trail re-routed**

BOX 3: WHY DO PEOPLE LIVE IN AREAS AT RISK FROM TECTONIC HAZARDS?

family and friends	people **do not** want to move away from **friends** and **family** → may have **cultural attachment** to the area → may also be a **cheaper** area to live
tourism	more than **100 million people** visit areas affected by **volcanoes** and **earthquakes** on **holiday → tourism** provides an **income** to **local people** e.g. **tour guides, hotel workers → locals stay** in area for **employment**
farming	areas with **tectonic hazards** are often very **fertile → volcanoes** release **nutrients** into **soil →** very **good** for **farming →** provides **income →** only **1% of Earth** has **volcanic soils** but this provides **food** for **10% of population!**
mining	people **employed** to **mine sulphur** from **volcanoes →** sulphur used in **matches**, to **bleach sugar** and for **fertilisers →** paid on average **$6 per day**
geothermal energy	**water heated** by hot **magma →** turns into **steam →** used to turn **turbines →** generates **electricity → renewable** energy → **30%** of **electricity** in **Iceland** is from **geothermal energy**

BOX 4: HOW CAN MANAGEMENT REDUCE THE RISKS FROM TECTONIC HAZARDS?

	earthquakes	**volcanoes**
monitoring and prediction	• **difficult** for earthquakes • **seismometers** record **foreshocks** in ground • **radon gas detectors** measure gas released from **cracks** • **earthquakes** are **mapped** to spot **patterns** and **trends**	• **easier** for volcanoes • **tiltmeters** record changes in **shape** of volcano • **heat sensors** detect **temperature** changes • **spiderbots** measure **gases escaping** from **volcano**
protection	• **earthquake proof buildings** e.g. **rubber shock absorbers, pendulum** in roof, **X shaped frame** • **nuclear power stations shut down** during **earthquake** • people can **hide** under **tables** for some **protection**	• **impossible** to **build homes** to **survive eruption →** so people must **evacuate** • can build **lava diversion channels** to **move lava** away from towns • **closing windows** to **stop ash** entering homes
planning	• **earthquake drills** to **rehearse 'drop cover hold'** • **emergency survival kits** • **smart phones detect shaking → send alert message** • **attach furniture** and **objects securely** to **wall** and **floor**	• **warning system** to **alert** people to **evacuate area** • **preparation** of an **emergency survival kit** using a **checklist** • **education** on how to **survive** • volcano **drills** to **rehearse evacuate route**

WEATHER HAZARDS

BOX 1: KEYWORDS	
tropical storms	a **natural hazard** e.g. **hurricanes, cyclones** and **typhoons**
extreme weather	when a **weather event** is **significantly worse** than the **usual weather**
Coriolis effect	the **rotation** of the **Earth** causes **winds** to **curve** as they move
cumulonimbus	very large and tall **thunderclouds**
Saffir-Simpson Scale	shows **wind speed** on **scale** from **category 1** to **category 5** (strongest)
weather hazards	e.g. **drought, floods, storms, heatwaves, snow**

BOX 2: GLOBAL ATMOSPHERIC CIRCULATION	
at Equator	**concentrated sunlight → hot → air rises → low pressure → wet**
at Poles	**less concentrated sunlight → cold → air sinks → high pressure → dry**
pressure belts	• **low pressure** along the **Equator** • **high pressure** near **Tropic of Cancer** and **Tropic of Capricorn** • **high pressure** at the **North Pole** and **South Pole**
surface winds	across the Earth's **surface** air moves from **high pressure** to **low pressure areas** e.g. **winds** from the **Tropic of Cancer** and **Capricorn** move **towards Equator** → these winds move **heat** and **moisture** around the planet

BOX 3: TROPICAL STORM DISTRIBUTION	
tropical storms are distributed →	• **in-between** the **Tropic of Cancer** and **Equator (5° to 30° north)** • **in-between** the **Tropic of Capricorn** and **Equator (5° to 30° south)**

BOX 4: FORMATION OF TROPICAL STORMS	
What do tropical storms need to be able to form?	1. need area of concentrated insolation → high temperatures → rising air → low pressure → clouds and precipitation 2. must form over **ocean** → ocean temperature must be **above 27° C** 3. **heat** and **moisture** needed → used as **energy** to power the storm 4. **Coriolis effect** needed → causes tropical storm winds to **spin** (no Coriolis effect at Equator so no tropical storms on Equator)
sequence of formation	**Step 1: air** above warm tropical ocean is **heated** by **sun** **Step 2:** warm **air rises** rapidly → **low pressure** → **cumulonimbus clouds** **Step 3: Coriolis effect** causes the **clouds to spin** → creates **fast winds** **Step 4: spinning cumulonimbus clouds** → cause **torrential rain** **Step 5:** tropical storm **reaches land** → **no heat** and **no moisture** from ocean to power storm → starts to **lose energy** → also **friction with land slows storm** → so tropical storm starts to **weaken** → **disappears**
features	• **eye** → **calm area** in **center** of tropical storm → **no rain or wind** • **eye wall** → **fast winds, cumulonimbus clouds, heavy precipitation**

BOX 5: HOW MIGHT CLIMATE CHANGE AFFECT TROPICAL STORMS?	
1. distribution	**warmer ocean** → tropical storms may **form** in **different areas**
2. intensity	**1° C increase** in **ocean temperature** may **increase wind speeds by 3-5%**
3. frequency	**warmer ocean** → more **intense** storms may occur **more often**

BOX 6: TROPICAL STORM CASE STUDY – TYPHOON HAIYAN	
location	**Typhoon Haiyan, Philippines (Asia) → November 2013** • wind speeds reached **314 km per hour → Category 5**
primary effects	• **6190 deaths** and **$12 billion** of **damage** • **1.1 million tonnes of crops destroyed** • **90%** of **Tacloban city destroyed → airport badly damaged**
secondary effects	• **4.1 million** people **homeless** • **oil leak** from ship → **800,000 litre oil spill** → environment damaged • **looting** and **8 deaths** in **stampede for rice** • **flooding** → caused **water** to become **contaminated** with **sewage**
immediate responses	• **President** made a **televised warning** • **800,000** people **evacuated** • **1 million food packs** and **250,000 litres** of **fresh water distributed** • **curfew** imposed to **reduce looting**
long-term responses	• plan of **'building back better'** and also **'no dwelling zone'** along coast • new **storm surge warning system** • **replanted mangrove trees along coast** → as **natural barrier**

BOX 7: REDUCING THE EFFECTS OF TROPICAL STORMS	
monitoring	**satellites** and **unmanned aircraft** collect **weather data**
prediction	**supercomputers** can give **warning 5 days** before **tropical storm**
protection	**storm shutters, installing emergency generators, securing loose objects**
planning	**'National Hurricane Preparedness Week'** in USA

BOX 8: UK EXTREME WEATHER CASE STUDY – SOMERSET LEVELS FLOODS	
location	County -> SW of England -> S of Wales & W of London -> Atlantic Ocean to the W
causes	Heavy rain Jan 2014 -> 350mm -> river overflow. High tides -> storm surge -> tides were higher -> river didn't drain to sea effectively. No dredging -> reduced capacity to hold water.
social impacts	Power supplies cut off -> livelihoods disrupted (shops closed for repairs). Villages cut off & isolated e.g., Moorland.
economic impacts	Cost of damage -> £10 million. People could not get to work as cut off -> decrease in local economy. Agricultural land flooded & destroyed -> lost business in the area.
environmental impacts	Destroyed local wildlife habitats and reduced available food for animals. Sewage and chemical leaks into floodwater -> harm to ecosystem. Water stagnant -> harm to fish.
management strategies used to reduce future risk	Dredging -> increases capacity of river to hold water. Drain enhancements -> increase drainage speeds to sea -> less reliant on expensive pumping systems. Bridgwater tidal barrier -> stops high tides contributing to flooding.

BOX 9: EVIDENCE THAT WEATHER IN THE UK IS BECOMING MORE EXTREME	
evidence	• **increase** in **extreme weather events** in UK **since 1980s** • UK **temperatures** have **increased** by **1°C since 1980s** • **frequency** and **severity** of **winter flooding** has **increased** from **1980s**

CLIMATE CHANGE

BOX 1: KEYWORDS	
climate change	**long-term change** in **climate patterns** e.g. **temperature** and **precipitation**
Quaternary period	period of **geological time** from **2.6 million years ago** to the **present day**
mitigation	**reducing** the **causes** of **climate change** (which also reduces the effects)
adaptation	**reducing** the **effects** of **climate change** (without reducing the causes)
glacial	a **period of time** with **cooler global temperatures** e.g. an ice age
interglacial	a **period of time** with **warmer global temperatures**
ice core	**ice tube** drilled out of ground → **gases** from **ancient atmosphere** frozen into ice → can **measure carbon dioxide** and **methane** levels from **past**
fossil fuels	**coal, oil** and **gas** → **formed** in the past **from** the **fossils** of **living organisms**
greenhouse gases	• **methane** → **released** from **cattle** (from **digestive system** of **cow**) • **carbon dioxide** → from **burning fossil fuels** e.g. to create **electricity**

BOX 2: THE GREENHOUSE EFFECT	
greenhouse effect	**incoming solar radiation** → some **outgoing radiation reflected back to space** → some **outgoing radiation absorbed** by **greenhouse gases** → **warms** planet → **maintains temperature** for **life** to survive ☺
enhanced greenhouse effect	**incoming solar radiation** → **less outgoing radiation reflected back to space** → as **more** is **absorbed** by **more greenhouse gases** → **warms** planet **more** → **temperature rises** → **negative effects** ⊗

BOX 3: EVIDENCE FOR CLIMATE CHANGE	
past	1. **ice cores** → show there have been **glacial** and **interglacial periods** in the **past** (show temperatures have increased and decreased) 2. **ocean fossils** → give **evidence** about **ancient ocean temperatures** (show temperatures have increased and decreased over time) 3. **art** → from **1684** shows **ice skating** on **River Thames** (artwork and diaries show temperatures have changed throughout history)
present	• **Earth's average temperature** has **increased 1° C** over last **100 years** • **sea levels** have **risen** by **19 cm** since **1900** • **ocean temperatures** are the **warmest** they have been **since 1850** • **glaciers** and **ice sheets** are **melting** • since 2002 → **134 billion tonnes** of **ice lost** from **Antarctica per year**

BOX 4: NATURAL FACTORS THAT CAUSE CLIMATE CHANGE	
1. volcanic activity	**volcanic ash** and **sulphur dioxide** can **reflect sunlight** → **reduces temperatures** → **Mount Tambora eruption** (1815) caused average **global temperatures** to **fall** by **0.4° C** to **0.7° C** → **'The year without a summer'**
2. orbital changes	**orbit** of the **Earth changes** → called **Milankovitch** cycles → **3 orbital cycles change** the **Earth's climate** and **seasons** over **thousands of years**: 1. **eccentricity** → orbit becomes more **elliptical** in **100,000** year cycles 2. **axial tilt** → Earth's axis **angle** changes in **41,000** year cycles 3. **precession** → the Earth **wobbles** on its axis in **26,000** year cycles
3. solar output (sunspots)	• **more dark spots** on sun → emitting **more energy** → **Earth warmer** • **fewer dark spots** on sun → emitting **less energy** → **Earth cooler** • sunspot cycle → **sunspots increase** and **decrease** every **11 years**

BOX 5: HUMAN FACTORS THAT CAUSE CLIMATE CHANGE	
fossil fuels	• **burning fossil fuels** releases **carbon dioxide** → **temperatures rise** • **over 50%** of **greenhouse gas emissions** are from burning fossil fuels
agriculture	• **rice farming** releases **methane** → **temperatures rise** • **cattle farming** releases **methane** → **temperatures rise** • **20%** of **greenhouse gas emissions** are from agriculture
deforestation	• **trees cut down** → **fewer trees** to **absorb carbon dioxide** during **photosynthesis** → **more carbon dioxide** stays **in atmosphere** → **enhanced greenhouse effect** → **temperatures rise** • **trees burnt** → to **clear** area of **land** → the **carbon dioxide stored inside tree** is **released** into **atmosphere** → **temperatures rise**

BOX 6: EFFECTS OF CLIMATE CHANGE	
predicted effects	• **ocean acidification** → **coral reef bleaching** → **biodiversity loss** • **warmer** → more **wildfires** → **deaths** and **destruction** • **more intense tropical storms** → **infrastructure damage** • **increased ice melt** → **sea level rise** → **coastal erosion** → **homes lost** • **droughts** → **lower crop yields** → **less food** → **famine** • **unreliable rainfall** → **desertification** → mass **migration** • **warmer** → **wider distribution** of **tropical diseases** e.g. **malaria**

BOX 7: CLIMATE CHANGE MITIGATION	
alternative energy	use **renewable energy** e.g. **solar** → **less greenhouse gases** in atmosphere
carbon capture	**stores carbon dioxide** in **rocks** → **less greenhouse gases** in atmosphere
planting trees	**trees** to **absorb carbon dioxide** → **less greenhouse gases** in atmosphere
international agreements	**Paris Agreement 2015** → **international agreement** to **stop global temperature increase rising above 2° C**

BOX 8: CLIMATE CHANGE ADAPTATION	
changing/adapting agricultural systems	as the **climate changes** → **difficult** to **grow crops** → may need to **grow crops differently (new locations, different seasons, more irrigation)** → e.g. in **Peru** project to **grow potatoes** at **higher altitudes** where it is **cooler**
managing water supply	1. **reduce demand** → e.g. **shorter showers, rainwater** to **flush toilets** 2. **increase supply** → new **reservoirs, desalination, water transfers**
reducing risk from rising sea levels	may need to **build more coastal defences** to **protect** from **flooding** e.g. **Thames Barrier protects London** from **coastal flooding**

Exam paper: 1
Section: B

ECOSYSTEMS

BOX 1: KEYWORDS PART 1	
component	a **part** of something
abiotic	**non-living** things → e.g. **soil** and **climate**
biotic	**living** things → e.g. **plants** and **animals**
flora	**vegetation** (plants) of a **particular region** (area), **habitat** or **time period**
fauna	**animals** of a **particular region** (area), **habitat** or **time period**
biodiversity	**the variety** of **plant** and **animal life** in a **particular habitat**
ecosystem	**community** of **biotic** and **abiotic components** → **interact** with **each other** and **environment** → example **small scale ecosystem UK** e.g. **pond**
large scale global ecosystems	**very large ecosystems** → also called **biomes** → examples → **tropical rainforest, hot desert** → have specific **climates, flora** and **fauna**
climate	**average precipitation** and **temperature** over **many years** → e.g. **tropical rainforest climate** → **high temperatures** and **high precipitation**
distributed	how something is **spread out**/where is it **located**
weather	**hour to hour changes** in **precipitation** and **temperature** → **at a particular place and time** → **always changing** e.g. **raining, sunny, cloudy**
latitude	**imaginary horizontal lines** around the **Earth** → show **how far north** or **south** a place is **from** the **Equator** → Tropic of Cancer is 23.5° N of Equator
longitude	**imaginary vertical lines** around the Earth → show **how far east** or **west** a place is **from** the **Prime Meridian e.g.** Leeds is 1.5° W of Prime Meridian
altitude	how **high** a place is **above sea level**

BOX 2: LARGE SCALE GLOBAL ECOSYSTEMS DISTRIBUTION AND CHARACTERISTICS	
tropical rainforest	• **distributed** along **Equator** → **in-between Tropic of Cancer** and **Tropic of Capricorn** • very **concentrated insolation** (sunlight) at **Equator** → **temperatures high** → **warm moist air rises** (creates low pressure) → lots of **evaporation** → lots of **precipitation** • **climate** → **high temperatures** and **high precipitation** → **flora** and **fauna thrive** → **high biodiversity** in **tropical rainforest** • **largest rainforest** → **Amazon, South America** → 7 million km²
hot desert	• **distributed** along **Tropic of Cancer** (15° to 35° north of Equator) and along **Tropic of Capricorn** (15° to 35° south of Equator) • **air rises** at **Equator** → **air pushed north and south** → north (to **Tropic of Cancer**) and south (to **Tropic of Capricorn**) → **air cools high** up in **atmosphere** → **air sinks** (high pressure) → **air warms as it falls** → **no clouds can form** → **arid** desert climate → **dry** • **climate** → **high temperatures** and **low precipitation** → **harsh** and **dry** → **arid** → **low biodiversity** in **deserts** • **largest hot desert** → Sahara, Africa → 9 million km²
tundra	**tundra global ecosystem** → **distributed** → **across northern North America** and **northern Asia** → at high latitudes above 60° N → **insolation less concentrated** here (sun rays are weak) → **temperatures below freezing most of year** → **very few plants** and **animals survive** here
polar	• **polar global ecosystem** → **distributed** → the **Arctic (Northern Hemisphere)** and **Antarctica (Southern Hemisphere)** → at high latitudes → **insolation less concentrated** here • **climate** → **temperatures mostly below freezing** → **windy** and **very little precipitation** → **soil covered** in **ice throughout** the **year** • **species** of **moss, algae** and **lichen survive** the **harsh conditions** → **few other plants** can **survive** → **low biodiversity**
alpine	**alpine global ecosystem** → **distributed** → **mountainous areas** → **high altitude** e.g. **the Alps** → as **altitude increases** → **temperature decreases** → every **100m increase** in **altitude** → **temperatures decrease** by **1°C**

BOX 3: KEYWORDS PART 2	
interrelationships	how **two** or **more things** are **linked** to **each other**
producers	**plant** → **absorb energy** from **sun** → **photosynthesis**
consumers	**organism** → **energy** from **eating producers** or **other consumers**
decomposers	**bacteria** or **fungus** → **energy** by **breaking down dead tissue** e.g. **fallen leaves** → **recycled** back to the **environment** (through the nutrient cycle)
food chain	**linear connections** between **organisms** that **rely on each other for food**
food web	**complex hierarchy** of **plants** and **animals relying on each other** for **food**
nutrient cycling	**organisms extract minerals** for **growth** from **soil** or **water** → **pass them** on **through** the **food chain** → then **back** to the **soil** and **water**

BOX 4: SMALL SCALE ECOSYSTEMS	
case study → small-scale ecosystem (UK)	**Epping Forest -> deciduous woodland (sheds leaves annually) -> northeast London** • **Wide variety of tree species e.g., beech** • **primary consumers, including insects and small mammals, and deer, along with 38 species of birds** • **secondary consumers such as owls, adders and foxes** • **700 species of fungi, important decomposers, which are common due to a large amount of deadwood;** • **over 100 lakes and ponds provide essential habitats for numerous fauna species (animals) and flora (plants).**
impact of changing one ecosystem component	• **removing one species** → **affects entire food web** → **removing producer** → **less food for consumers** → **reduces consumers** • **natural** factors → **damage** ecosystems → **drought, fire, disease** • **human** factors → **damage** ecosystems → **introducing more fish, changing the pH level, altering the nutrient levels** → **eutrophication**

TROPICAL RAINFORESTS

BOX 1: KEYWORDS	
sustainability	**meeting** the **needs** of **today** → **without harming** the **planet** for **future**
biodiversity	**high biodiversity** is **lots** of **species, low biodiversity** is **few species**
deforestation	**chopping down** and **removal** of **trees** to **clear** an **area** of **forest**
interdependence	when the **components** of an **ecosystem rely on each other** to **survive**
value	**importance/usefulness** → **does not** always mean the **price**
tropical hardwoods	**large valuable trees** → very **strong** wood → e.g. **mahogany** and **teak**
debt	when **money** has been **borrowed** and is **owed** to be **paid back**

BOX 2: TROPICAL RAINFOREST GLOBAL ECOSYSTEM → CHARACTERISTICS	
distribution	tropical rainforests are **distributed along the Equator**
case study	The **Amazon Rainforest, Brazil (South America)**
climate	• **high temperature** → (concentrated insolation at Equator) e.g. more than **25° C** • **high precipitation** → (heat causes evaporation and condensation) e.g. more than **2000 mm** of rain annually (yearly)
biodiversity	• tropical rainforests cover only **7%** of **Earth's surface** but are home to over **50%** of the **world's animal** and **plant species** • **high temperatures + high precipitation** → helps variety of **producers grow** → provides **food** for variety of **consumers** → leads to lots of **species variety** → **high biodiversity** in tropical rainforests
soil	• **surprisingly** → **soil** is **not very fertile** → **rain washes away nutrients** • very **fast nutrient cycle** → **nutrients** in soil **replenished** from plants **decaying quickly** in **humid** (hot and wet) conditions
interdependence → components rely on each other	• humid **climate** → helps **producers** to grow → helps to provide **food** and **shelter** for **consumers** and **people** → **animals** help **pollinate** plants → **trees** help **evapotranspiration** → **humid** climate

BOX 3: PLANT ADAPTATIONS		
	adaptation	This helps the plant to survive because…
emergent trees	**thick buttress roots**	**supports** tall trees → **stops tree falling**
	drip tip leaves	**rain** can **drip off leaf** → **no damage/rotting**
epiphytes	**grow on other plants**	**absorb nutrients** and **water from moist air**

BOX 4: ANIMAL ADAPTATIONS		
	adaptation	This helps the animal to survive because…
poison dart frogs	**toxic skin**	**poisons predators**
	bright coloured skin	**warns off predators**
glasswing butterflies	**transparent wings**	**camouflage from predators**

BOX 5: CHANGING RATES OF DEFORESTATION	
deforestation rates	• over **50%** of **tropical rainforests** have been **deforested** in **100 years** • **increasing rate** of deforestation → **Bolivia** • **decreasing rate** of deforestation → **Brazil** (but fluctuating ☹)

BOX 6: CAUSES OF DEFORESTATION → CASE STUDY AMAZON RAINFOREST		
1.	subsistence farming	trees cut down to create space for **small family farms** → farming only to **provide food** and **materials** for the **farmer's family** or **tribe**
2.	commercial farming	trees cut down to create space for **large farms** → farming to **sell produce** for a **profit** → e.g. **80%** of **deforestation** in **Brazil** from **cattle farming**
3.	logging	**valuable hardwoods** e.g. **mahogany** or **teak** are **cut down** and **sold**
4.	road building	trees cut down for **roads** → **Trans-Amazonian Highway** is **4000 km long**
5.	mineral extraction	trees cut down so **valuable minerals** can be **removed** from **ground** → **50,000 hectares** used for **gold mining** in the **Amazon** → **releases toxic chemicals** e.g. **mercury** into **rivers** → **poisons fish** and **people**
6.	energy development	**dams built over rivers** in the **Amazon Rainforest** → **generate hydroelectric power** → **forest upstream of dam** is **flooded** → **trees rot**
7.	settlement	**people working** in the **Amazon Rainforest** need **homes** → **large areas** of **forest cut down** to **create space** to **build homes** for the **workers**
8.	population growth	**population increases** → more **space** is **needed** for **homes** → trees cut down to create space for homes → also **more resources required**

BOX 7: IMPACTS OF DEFORESTATION → CASE STUDY AMAZON RAINFOREST		
1.	economic development	**cattle farming, exporting mahogany, mining gold** → **boosts economy** and **provides employment** → **increases GNI** → **increases development**
2.	soil erosion	**trees removed** → **bare soil vulnerable** to **erosion** by **heavy precipitation** → **washes away nutrients**→ **crops struggle** to **grow** → **farms abandoned**
3.	climate change	• **fewer trees to absorb carbon dioxide** → climate change worsens • **trees burned** → **releases carbon dioxide** → climate change worsens

BOX 8: VALUE OF TROPICAL RAINFORESTS TO PEOPLE AND ENVIRONMENT	
carbon sink	**Amazon Rainforest absorbs > 1 billion tonnes** of **carbon dioxide yearly**
medicines	**many medicines** and **cures for diseases** found in **rainforest plants** • **25%** of **ingredients** in **cancer drugs** found **only** in **rainforest** • **< 1%** of **rainforest plants** have been **tested** by **scientists** • **> 137** rainforest **species** go **extinct** every **day** due to **deforestation**
tribes	**Amazon** is **home** to **over 200 indigenous tribes** → **rely on** the **ecosystem**

BOX 9: STRATAGIES USED TO MANAGE THE AMAZON RAINFOREST SUSTAINABLY		
1.	selective logging	**only cut down mature trees** → **encourages growth** of **young trees**
2.	replanting	**trees planted** in **areas** of **deforestation** → use **rainforest seeds mixture**
3.	conservation and education	**NGOs** e.g. the **World Wildlife Fund** → **promote conservation message** in **schools, train conservation workers** and **purchase threatened areas**
4.	ecotourism	**small groups pay** to **visit rainforest** → **locals encouraged** to **protect area**
5.	international agreements	**International Tropical Timber Agreement** → **legally felled trees** are **marked** with a **unique code** → **discourages trade** in **illegally felled trees**
6.	debt reduction	**'debt-for-nature-swaps'** → some **debts cancelled** if **country promises** to **protect rainforest** e.g. **USA cancelled $21 million Brazilian debt** (2010)

HOT DESERTS

BOX 1: KEYWORDS PART 1	
Litter	Dead organic material e.g., fallen leaves or dead animals.
global ecosystem	very **large ecosystems** e.g. **desert, tropical rainforest** and **polar** biomes
interdependence	when the **components** of an **ecosystem rely on each other** to **survive**
climate	the **average temperature** and **precipitation** in a **place over many years**
Insulate	Processes where heat is trapped. E.g., Water vapor traps heat in the atmosphere
biodiversity	**variety** of **living things** in the **world** or in a particular **habitat**

BOX 2: HOT DESERT BIOME -> PHYSICAL CHARACTERISTICS	
distribution	Found along Tropics of Cancer and Capricorn -> between 15° and 30° N&S of equator
temperature	Up to 50° in day and can fall below 0° at night -> lack of cloud to insulate at night
precipitation	Less than 250mm of rainfall per year
soil	Infertile due to lack of litter -> soils are thin and dry and soak up water very quickly. Mostly composed of sand and rock. The surface of the soil can appear dry and cracked. Layer of salt on the surface of the soils as evaporation takes place so quickly, leaving the salt behind.
animal adaptation	Camel -> hump -> fat -> energy. Death Scorpion -> slow metabolism -> less water
plant adaptation	Cactus -> slow growing -> less photosynthesis -> less water use. Creosote bush -> deep and wide roots -> Large area to collect water from after rainfall
biodiversity	Low -> harsh conditions for life -> animals and plants need to be highly adapted and specialised
people	**indigenous people** and **workers employed** in **mineral extraction**

BOX 3: KEYWORDS PART 2	
development	to **improve** an **area** e.g. improve **amenities, jobs** and **quality of life**
opportunities	a **chance** to **improve something**
challenges	a **problem** or **difficulty** → makes improving something **difficult**
mineral extraction	**mining** (digging) **raw materials** from the **ground** → e.g. coal, iron ore
infrastructure	places and their **connections** e.g. **roads, water supply** and **sewage pipes** → needed for places to **function properly**
inaccessibility	when a **place** is **difficult** to **travel to/from** → e.g. not many roads
Evaporation	Sunlight warms water on surface -> changes into gas
Erosion	Where rock/ soil is broken down/ destroyed
Infertile	Unable to grow crops or vegetation
Fertile	Able to grow crops/ vegetation
Urban	Built up area such as a town or city
Cultivation	The caring and raising of plants/ crops
Yield	An amount of something (e.g. crops) produced

BOX 4: HOT DESERT BIOME -> CHALLENGES OF DEVELOPING HOT DESERTS	
case study	Western Desert
location	SW of USA ->made up of three different deserts -> spans several US states including California.
1. temperature	Can exceed 49 ° Celsius -> rapid evaporation -> makes farming difficult -> can lead to a shortage of water
2. inaccessibility	Access is limited to major cities such as Chicago and Las Vegas -> route 66 provides access to major urban areas. Large proportion of roads are unsurfaced
3. Water supply	Precipitation low ->55mm/year -> also pop. growth in cities e.g., Phoenix uses water

BOX 5: DEVELOPMENT OPPORTUNITIES IN HOT DESERTS ☺ -> WESTERN DESERT	
case study	Western Desert
1. mineral extraction	Minerals extracted from the region -> Coal & Copper -> mining business employ locals which feed into economy. Improves standards of living. Tax money can be reinvested (put back into) in dev. Projects in the region
2. energy	Renewable -> Sonoran desert-> solar energy. Arizona -> oil extraction
3. Farming	Coachella Valley -> water taken from aquifer -> grows peppers and grapes
4. tourism	Tourists visit natural attractions -> Grand Canyon -> also urban areas such as Las Vegas known for nightlife and famous shows

BOX 6: IMPACTS OF HUMANS ON THE DESERT -> DESERTIFICATION	
Desertification	Process of fertile (can produce vegetation) land turning into desert over time
Desertification causes	Climate change -> warmer and drier. Removal of trees -> for fuel -> roots lost -> soil not bound together -> soil erosion. Overgrazing by animals -> soil bare -> dries easier. Over-cultivation -> farming too intense to cope with pop. growth->becomes infertile
Desertification Impact	Crop failure -> soil erosion -> famine (starvation) -> people less able to work -> can result in death. 2012 -> drought-induced famine -> affected 20 million people (Somalia)
Desertification management	• Water & soil -> planting and harvesting appropriate crops ensure the soil can recover. • Tree planting ->helps reduce soil erosion -> tree roots stabilise the soil. • Appropriate technology –> technology or techniques that can be easily used or replaced by locals -> stone lines along the soil contours -> keep soil in place -> prevent erosion -> improve crop yields.

Exam paper: 1
Section: C

COASTAL LANDSCAPES

BOX 1: THE CHARACTERISTICS OF WAVES	constructive waves	destructive waves
effect on beach	• **deposition** of beach material	• **erosion** of beach material
formed by	• **wind** from **storms far away**	• **wind** from **storms close by**
wave height	• **low** (under 1 metre)	• **high** and steep (over 1 metre)
wavelength	• **long**	• **short**
frequency	• **low** (8-10 waves per min)	• **high** (10-14 waves per min)
energy	• **low** energy	• **high** energy
swash	• **strong** (beach deposited)	• **weak**
backwash	• **weak**	• **strong** (beach eroded)

BOX 2: THE FIVE COASTAL PROCESSES	
weathering	the **decomposition** or **disintegration** of **rocks** in **their original place**
mass movement	the **downhill movement** of **weathered material** due to **gravity**
erosion	**wearing away** and **removal** of **material** e.g. by a **wave**
transportation	the **movement** of **eroded material** e.g. in **waves**
deposition	material **transported** by **water** is **dropped** when **water loses energy**

BOX 3: COASTAL PROCESS 1 → WEATHERING	
1. mechanical weathering	**disintegration** of **rock** e.g. by **freeze thaw weathering** → when **water freezes** into the **cracks** in **rocks** → causes **rock** to **expand** and **break up**
2. chemical weathering	**decomposition** of **rock** due to **chemicals** e.g. the **chemicals** in **sea water** or **precipitation** → causes **rock** to **rot away** and **crumble**

BOX 4: COASTAL PROCESS 2 → MASS MOVEMENT	
1. sliding	after **heavy rain** → **cliff** becomes **saturated** and **heavy** → **extra weight** causes **material** to become **unstable** → **material slides rapidly downhill**
2. slumping	**cliff segment slumps** down along **line of weakness** e.g. **rotational slump**
3. rock falls	**chunks** of **rock fall from cliff** in **sudden movement**

BOX 5: COASTAL PROCESS 3 → EROSION	
1. hydraulic action	**waves compress air** into **cracks** in **cliff** → **pressure** → **cracks widen**
2. abrasion	**sediment thrown at cliff** by **breaking waves** → **cliff worn away**
3. attrition	**rocks transported** by **waves bump** into **each other** → **break up smaller**

BOX 6: COASTAL PROCESS 4 → TRANSPORTATION	
1. longshore drift 	• **swash moves material up beach** at **oblique** (diagonal) **angle** to coastline → due to **prevailing wind direction** • **backwash returns material** to **sea** at a **right angle** to **coastline** • **gradual zig zag movement** of **material** along **coastline**

BOX 7: COASTAL PROCESS 5 → DEPOSITION	
Why is sediment deposited in coastal areas?	• **deposition** is when **sediment carried** by **waves** is **dropped** • happens when **water slows** and **loses energy** e.g. **sheltered areas** (near spits/bars) or where **strong swash** (constructive waves)

BOX 8: GEOLOGICAL STRUCTURE AND ROCK TYPE	
discordant coast	**bands** of **rock** are **perpendicular** to **coastline**
concordant coast	**bands** of **rock** are **parallel** to **coastline**
resistant rocks	**hard** rocks → **erode less easily** e.g. granite, chalk, limestone
less resistant rocks	**soft** rocks → **erode more easily** e.g. clay, sandstone

BOX 9: LANDFORMS RESULTING FROM EROSION	
1. headlands and bays	**discordant** coast → **less resistant** rocks **erode easily** forming a **bay** → **more resistant** rocks **erode slowly** forming **headlands** → **bays sheltered** by headlands → **deposition** from **constructive waves builds beach** in bay
2. cliffs and wave cut platforms	**waves break** at **cliff base** → erodes **wave-cut notch** → cliff **unsupported** → cliff **collapses** → cliff **retreats** → leaves a **smooth wave cut platform**
3. caves, arches and stacks	**wave refraction** focuses **wave energy** onto **headlands** → **increases erosional processes** → creates → ***crack - notch - cave - arch - stack - stump***

BOX 10: LANDFORMS RESULTING FROM DEPOSITION	
1. beaches	**Constructive** waves = **sandy** beaches. **Destructive** waves = **pebble** beaches.
2. sand dunes	**sand** at **back** of **beach dries** out and is **blown backwards** by **wind** → **sand builds up** against **objects** → **marram grass stabilises** embryo **dune**
3. spits and bars	**longshore drift moves sand** along coast → **sand deposited** past the **edge** of coast forming **spit** or **bar** → **hook** shape on **end** → **salt marsh behind**

BOX 11: MANAGEMENT STRATEGY 1 → HARD ENGINEERING → ARTIFICIAL	benefits ☺ → positives	costs ☹ → negatives
sea walls	very **effective** at reducing erosion	very **expensive, unattractive**
rock armour	can be used for **fishing**	can be **dangerous** to walk on
gabions	**plants grow** and disguise the cages	can **rust** and **break apart** in storms
groynes	**reduce longshore drift**	**increase erosion down coastline**

BOX 12: MANAGEMENT STRATEGY 2 → SOFT ENGINEERING → NATURAL	benefits ☺ → positives	costs ☹ → negatives
beach nourishment and reprofiling	**builds up sand** on beach which protects against erosion	**constant maintenance** required
dune regeneration	**attractive, tourism, biodiversity**	**easily damaged** by storms

BOX 13: MANAGEMENT STRATEGY 3 → MANAGED RETREAT → ALLOWS FLOOD/EROSION	benefits ☺ → positives	costs ☹ → negatives
coastal realignment	creates **saltmarsh** ecosystem	**farmland flooded** by the sea

BOX 14: CASE STUDY → COASTAL MANAGEMENT SCHEME IN THE UK → HOLDERNESS	
scheme/strategy	Installation of sea walls, groynes and rock armour -> groynes alone cost over £5.2 million
needed because	Yorkshires largest lake is here -> site of wildlife interest. High pop. density. Infrastructure
effects of strategy	Wide sandy beach maintained -> continued tourism. Increase in erosion at Great Cowden
conflicts of strategy	**more traffic** from **tourists**, some people believe **scheme** is **unattractive**

RIVER LANDSCAPES

BOX 1: UK PHYSICAL LANDSCAPES	
fluvial landscape	**extensive** area of **land** → has been **shaped** by a flowing **river**
fluvial landform	a **specific feature** found in river landscapes e.g. a **waterfall** landform
UK upland areas	**more than 200m** above sea level → mostly **north/west** UK e.g. **Pennines**
UK lowland areas	**less than 200m** above sea level → mostly **south/east** UK e.g. **The Fens**
UK river systems	many river systems in the UK e.g. the **River Severn** → **longest river in UK**

BOX 2: FLUVIAL PROCESSES	
erosion	to **erode** → the **wearing away** and **removal** of **sediment** (e.g. rocks)
transportation	to **transport** → eroded **sediment** is **moved** to a **new location** by water
deposition	to **deposit** → eroded **sediment** is **dropped** when the **water loses energy**

BOX 3: TYPES OF EROSION	
1. hydraulic action	moving **water forces air** into **cracks** in **rocks** → **pressure weakens rocks**
2. abrasion	**rocks** carried by river **wear down** the **river bed** and **banks**
3. attrition	**rocks** carried by river **smash together** → get **smaller smoother rounder**
4. solution	**soluble** particles of **sediment** are **dissolved** into the **river**
5. vertical erosion	**downward erosion** of **bed** (bottom of river)
6. lateral erosion	**sideways erosion** of **banks** (sides of river)

BOX 4: TYPES OF TRANSPORTATION	
1. traction	the **rolling** of **boulders** and **large pebbles along** the river **bed**
2. saltation	particles of **sediment bouncing along** the river **bed**
3. suspension	**small** pieces of **sediment floating** in the **moving** river **water**
4. solution	**soluble** particles of **sediment** are **moved** whilst **dissolved** in flowing **river**

BOX 5: WHY DO RIVERS DEPOSIT SEDIMENT?	
river loses energy	1) at **inside bend** of a **meander** 2) in **shallow water** 3) at **mouth** of **river**

BOX 6: RIVER KEYWORDS	
source	**where** a river **begins/starts** → **upland** areas (**upper course**)
mouth	**where** a river **ends/flows into sea** → **lowland** areas (**lower course**)
channel	the **area** in the **river** where the **water flows** e.g. the river bed and banks
valley	the **V shaped** area of **land around** a **river**

BOX 7: HOW DOES THE PROFILE OF A RIVER CHANGE FROM SOURCE TO MOUTH?		
	cross profile	**long profile**
upper course/source	channel **narrow/shallow**→ valley **steep V** shaped	**steepest** gradient
middle course	channel **wider/deeper**→ valley **flatter** shape	**medium** gradient
lower course/mouth	channel **widest/deepest**→ valley **wide/flat** shape	**flattest** gradient

BOX 8: FLUVIAL LANDFORMS FORMED BY EROSION → UPPER COURSE	
1. interlocking spurs	river **erodes softer rock** → leaves **'zip'** shaped **pattern** of **harder rocks**
2. waterfalls	**hard** rock **on top** of **soft** rock → **soft** rock **erodes** → **hard** rock **overhangs**
3. gorges	overhanging **rock** at waterfall **collapses** → waterfall **retreats** → **gorge**

BOX 9: FLUVIAL LANDFORMS FORMED BY EROSION + DEPOSITION	
1. meanders	**faster flow** on **outside bank** = **lateral erosion** → **slower flow** on **inside bank** = **deposition**→ creates **bend shape** in river called a **meander**
2. oxbow lakes	**flood breaks** through **meander neck** → creates new **channel** and **lake**

BOX 10: FLUVIAL LANDFORMS FORMED BY DEPOSITION → LOWER COURSE	
1. levées	**flood** → **heaviest** sediment **deposited** river **edge** → creates **higher banks**
2. flood plains	**lateral erosion** of **meanders** makes **lower course** of **valley wider/flatter**
3. estuaries	**mouth** of some rivers **flooded** by **rising sea levels** after **last ice age** ended

BOX 11: HOW DO PHYSICAL FACTORS AFFECT FLOOD RISK?	
flood risk	**predicted frequency** of **floods** in an **area** → how **likely** an **area** is to **flood**
1. precipitation	**prolonged, intense rainfall** can **saturate soil** → increases **surface run-off**
2. geology - rock type	water **cannot infiltrate impermeable** rock →increases **surface run-off**
3. relief	water **cannot infiltrate** into **steep slopes** → increases **surface run-off**

BOX 12: HOW DO HUMAN FACTORS AFFECT FLOOD RISK?	
1. land use	**impermeable** surfaces (e.g. **tarmac**) and **deforestation** increase flood **risk**

BOX 13: HYDROGRAPHS	
hydrograph	shows **link** between **discharge** and **precipitation** over period of **time**
discharge	**volume** of **water** flowing past a point on a **river** (e.g. per **second**)
lag time	**length of time** between **peak** (highest) **precipitation** and **peak discharge**

BOX 14: MANAGEMENT STRATEGY 1 → HARD ENGINEERING → ARTIFICIAL		
	benefits 😊 → positives	**costs** ☹ → negatives
dams and reservoirs	used to **store water**	**people** displaced by construction
river straightening	water **flows away** more **quickly**	flood **risk increases downstream**
embankments	**higher banks hold** more water	can be **unattractive**
flood relief channels	**river** has **extra capacity** for water	**expensive**

BOX 15: MANAGEMENT STRATEGY 2 → SOFT ENGINEERING → NATURAL		
	benefits 😊 → positives	**costs** ☹ → negatives
flood warnings	**warning** people → can **evacuate**	**does not stop** the **flooding**
flood plain zoning	**important buildings not near river**	**less land** for **housing**
planting trees	**trees infiltrate** and **absorb water**	**less land** available **for farming**
river restoration	**reduces flooding downstream**	**floods** still **likely near restoration**

BOX 16: CASE STUDY → FLOOD MANAGEMENT SCHEME IN THE UK → YORK	
scheme/strategy	**Coordinated scheme -> Foss barrier -> Embankments -> Flood relief channels**
required because	**Ouse joined by tributaries. York at confluence of Ouse and Foss. York -> flat & low**
social issues	**2015 -> 600 homes flooded. Potential of increased flooding downstream**
economic issues	**Foss barrier -> £3.4 million. Overall costs of defenses over £ 10 million**
environmental issues	**Foss barrier closed -> restricts movement of wildlife. Floodplain zoning destroys animal habitats e.g., Tansy Beetle**

Exam paper: 2
Section: A

Urbanisation and Rio Case Study

BOX 1: KEYWORDS PART 1	
urban area	**cities, towns**
rural area	**countryside, villages**
urbanisation	**increase** in **%** of a **country's population living** in **urban areas**
megacity	**urban** area with **population** more than **10 million people**
HIC	**High Income Country** (UK) – richest countries
NEE	**Newly Emerging Economy** (Nigeria) – starting to become rich countries
LIC	**Low Income Country** (Nepal) – poorest countries
population	**number** of **people** in a **place**
migration	**moving from** one **area to another**

BOX 2: GLOBAL PATTERN OF URBAN CHANGE	
urban change	**global pattern → increasing urbanisation → moving to urban areas**
trend in HICs	**urbanisation rate** (speed) **slowing → 80% already moved** to **urban areas**
trend in LIC/NEE	**urbanisation rate speeding up → more people moving** to **urban areas**
megacities	**2015 → 28 megacities** → estimated **50 megacities** by **2050**

BOX 3: FACTORS AFFECTING THE RATE OF URBANISATION	
rural to urban	**rural to urban migration → people moving from countryside to cities**
push factors	**people migrate from rural** areas → negative reasons e.g. **famine**
pull factors	**people migrate to urban** areas → positive reasons e.g. **better paid jobs**
natural increase	**young adults move** to **urban** area **→ start a family → birth rate increases → birth rate higher than death rate → population increase**

BOX 4: KEYWORDS PART 2	
regional	a **small area** → Lagos regional area of Nigeria
national	**a whole country** → Nigeria is a national area of Africa
international	across **more than one country** → links between countries around world
manufacturing	**making things** in **factories**
industry	**processing raw materials** and **manufacturing goods** (usually in factories)
goods	**items** that can be **bought** and **sold**
import	**buying goods** from **abroad**
export	**selling goods** to **another country**

BOX 5: RIO BACKGROUND INFORMATION	
Location of Rio	**Rio de Janerio -> in Brazil, South America -> second largest city**
regional importance	**Provides schools, hospitals and universities and opportunities for employment, leisure and recreation.**
national importance	**Headquarters located there -> mining and oil companies. Rio is a city specialising in clothing, processed food, chemicals and pharmaceuticals.**
international importance	**Hosted the 2016 Olympic and Paralympic Games. in 2014 hosted the World Cup. Tourism -> the Statue of Christ the Redeemer.**

BOX 6: WHAT ARE THE CAUSES OF URBAN GROWTH IN RIO?	
urban growth	**Since 1950s population in city has trebled -> has a population of 6.5 million. Areas surrounding city has a further 13.5 million people.**
cause 1 → migration	**Rural to Urban Migration = population increase due to more opportunities e.g. healthcare. Development has meant migration from abroad e.g. Portuguese.**
cause 2 → natural increase	**High migration rate = youthful pop. as migrants are of working age. As a result there is a high birth rate and low death rate.**

BOX 7: HOW HAS URBAN GROWTH CREATED CHALLENGES IN RIO? ☹	
slums	**22% of city live in slums -> e.g., Rocinha -> overcrowded & inadequate housing**
clean water	**Illegal taping and leaks lead to 1/3 of water lost. Some areas need wells.**
sanitation	**Many use pit latrines = sewage in soil and rivers.**
energy	**Power cuts common as electricity supply overwhelmed. Illegal tapping into grid**
access to services	**Slums have reduced access to healthcare. Low school attendance.**
unemployment and crime	**Unemployment over 20% in slums -> 1/3 of people work in informal sector -> less taxes being paid. Crime -> drugs and vandalism -> criminal gangs**
waste disposal	**Slum streets narrow -> waste not collected regularly.**
air pollution	**Pollution levels are high from industry and traffic.**
water pollution	**Guanabara Bay -> untreated sewage from slums -> 200 tons a day**
traffic congestion	**One of the highest levels of traffic congestion in SA.**

BOX 8: HOW HAS URBAN GROWTH CREATED SOCIAL OPPORTUNITIES IN RIO? ☺	
health	**High access to healthcare compared to rural areas e.g., vaccinations & emergency**
education	**Schools and universities -> 95% of children above 10 are literate**
water supply	**Good infrastructure set up from Olympics 2014 -> 90% mains supply**
energy	**Power supply more reliable in city compared to rural areas.**

BOX 9: HOW HAS URBAN GROWTH CREATED ECONOMIC OPPORTUNITIES IN RIO? ☺	
industrial areas → stimulus for economic growth	**Employment opportunities are available in Rio's five ports through the export of coffee, sugar and iron ore -> led to improvements in services (such as water and energy), roads and transport.**

BOX 10: URBAN PLANNING → IMPROVING THE QUALITY OF LIFE FOR THE URBAN POOR	
Favela Bairro Project	**Upgrading of favelas -> Materials are provided to residents to improve their own houses while installing basic infrastructure such as roads, electricity, water, and sanitation. Access to fresh water and sanitation has been provided -> Schools and health centres have been built along with a cable car to transport workers to and from work -> credit has been provided to the residents to help them buy materials to improve their homes.** **Project costly to run due to the continued rapid growth of Rio de Janeiro. Infrastructure requires constant maintenance and people need training in construction.**

URBAN CHANGE & SUSTAINABILITY – LEEDS CASE STUDY

BOX 1: DISTRIBUTION OF UK POPULATION AND CITIES	
distribution of population in UK	• **higher population** density in the **south-east** of UK • **lower population** density in the **north-west** of UK
distribution of major cities in UK	**over 80%** of UK **population** live in **urban** areas → **most UK cities** are in **England** → **most major cities** in the **UK** are located close to **rivers**

BOX 2: LOCATION AND IMPORTANCE OF LEEDS	
location	**Leeds** → located in **West Yorkshire** in **England** → on the **River Aire**
importance of Leeds to the UK	• over **30** national and international **banks** located in Leeds • **Asda** has its **headquarters** in Leeds • Leeds has the **3rd busiest railway station** (outside of London)
importance of Leeds to the wider world	• **Leeds Bradford Airport** → worldwide flights • **First Direct Arena** → concerts from musicians from around the world • **4 universities** in Leeds → with many **international students** • Leeds hosts **international sporting events** e.g. football and cricket

BOX 3: NATIONAL AND INTERNATIONAL MIGRATION TO LEEDS	
impact of migration on growth of Leeds	• during **industrial revolution** → people from **rural areas migrated** to **urban areas** (e.g. Leeds) to find **employment** in **manufacturing** → **urbanisation** → **increased population** of Leeds • **national** and **international migrants** help to **boost** the **economy**
impact of migration on character of Leeds	**migration enhances** the **culture** and **character** of a city → e.g. more **languages, religions, foods, festivals** e.g. **Leeds West Indian Carnival**

BOX 4: KEYWORDS PART 1	
urban change	when the **character, size** or **population density** of a **city changes**
recreation	**fun activities**
integrated transport systems	when different types of **transport connect together** e.g. bus stations near train stations → **easier** → public transport more **popular** → **less traffic**
urban greening	**increasing green space** such as **public parks** and **gardens** in **urban areas**
urban regeneration	a project to **transform** and **improve** a **neglected urban** area

BOX 5: HOW HAS URBAN CHANGE CREATED OPPORTUNITIES IN LEEDS? ☺	
cultural mix	migration to Leeds has created a **diverse city** with many **cultural events**
recreation and entertainment	**youthful population** in Leeds → **increased recreational opportunities** → e.g. **first direct arena, Leeds Playhouse**, sports **stadiums, Leeds Festival**
employment	• in Leeds → employment in **hospitality** (e.g. restaurants and hotels) is estimated to boost the local economy by **£330 million**
integrated transport systems in Leeds	• **MCard** → **single way** to **pay** for **travel** on **all types** of **Leeds transport** • plans to **integrate existing railway** to the **new HS2 train line** • two **'Park and Ride'** locations on edge of Leeds e.g. **Temple Green** • Leeds to Bradford **cycle superhighway** → safe cycling route
urban greening	new **Aire Park** → will be **largest new city center green space** in the UK

BOX 6: KEYWORDS PART 2	
deprivation	when the **quality of life** of one group of people is **lower** than others
inequalities	**differences** between the **wealth/wellbeing** of different **groups** of people
dereliction	**abandoned buildings** and wasteland
greenfield site	**land** →that has **not been built on** before → often on **edge of a city**
brownfield site	**land** → has been **built on** and is now **derelict** → often found in **cities**
urban sprawl	the **unplanned growth** of **urban areas** into the **surrounding countryside**
rural-urban fringe	the area where the **main city area** and the **countryside** merge
commuter settlements	an area where **people live** but **travel elsewhere** to go **to work**

BOX 7: HOW HAS URBAN CHANGE CREATED CHALLENGES IN LEEDS? ☹	
urban deprivation	**many areas** of Leeds have **urban deprivation**
housing	inequalities→ some areas have much **higher house prices** e.g. **Harewood**
education	inequalities→ some areas with **deprivation** have **lower exam results**
health	inequalities→ **10-year life expectancy difference** between areas in Leeds
employment	inequalities→ areas with **deprivation** often have **higher unemployment**
dereliction	some areas suffer from **dereliction** e.g. the south bank of the River Aire
brownfield sites	The **South Bank Regeneration Project** plans to build **new homes** on brownfield land → **difficult** → land needs to be **cleared** of **waste**
greenfield sites	building on **greenfield sites** is **controversial** → environmental damage
waste disposal	Leeds produces lots of **waste** but most is **burned** to create **electricity**
urban sprawl	**reduces green space** → can put **pressure** on surrounding **villages**
commuter settlements	e.g. **Burley in Wharfedale** → plans to build **more houses** → creates **traffic issues** as people **commute** to **city center** jobs

BOX 8: URBAN REGENERATION PROJECT IN LEEDS	
project name	**Leeds South Bank Regeneration Project** → **south** of **River Aire**
Why does the area need regeneration?	**1970s** and **1980s** → **de-industrialisation** → **reduced** number of **factories** in this area → now a **derelict brownfield site** → needs **regeneration**
features of the regeneration project	**£500 million regeneration project** → will **double size** of **Leeds city center** → build **8000 new homes, reconnect communities** north/south of river with bridges, improve **public transport,** urban greening (e.g. **Aire Park**)

BOX 9: FEATURES OF SUSTAINABLE URBAN LIVING IN LEEDS	
example	**Leeds Climate Innovation District** → **sustainable urban living** community
water conservation	• **rainwater** collected from **green roofs** → **rainwater recycled**
energy conservation	• **100% renewable energy, large windows** mean **fewer lights** needed • **homes well insulated** → traditional central **heating not needed**
waste recycling	• waste sent to the **Recycling and Energy Recovery Facility** in Leeds
creating green space	• district has a **'Secret Garden'** with **25,000 square feet** of green space • spaces to **grow herbs** and **vegetables** → **reduces food miles**
urban transport strategies	district has **car free streets** → to encourage **walking, cycling** and **public transport** → **reduces traffic** congestion → **reduces air pollution**

Exam paper: 2
Section: B

REDUCING THE DEVELOPMENT GAP

BOX 1: KEYWORDS PART 1	
quality of life	**standard** of **health, comfort**, and **happiness experienced** by a **person**
limitations	the **negatives** or **limits** of something
economic development	to **improve** the **wealth** of a **place** → e.g. **money, jobs** and **amenities**

BOX 2: CLASSIFYING THE WORLD → BY DEVELOPMENT LEVEL	
LIC	**Low Income Countries** → **poorest** countries → **lowest GNI**→ e.g. **Nepal**
NEE	**Newly Emerging Economies**→**getting richer**→**medium GNI**→ **Nigeria**
HIC	**High Income Countries** → **richest** countries → **highest GNI**→ e.g. The **UK**

BOX 3: ECONOMIC AND SOCIAL MEASURES OF DEVELOPMENT	
GNI	**Gross National Income** → **total money made** in a **country**→ also includes **money** from **business** in **foreign countries** (per year, shown in dollars)
GNI per capita	same as GNI → but **per person** → **total GNI** is **divided** by **population**
birth rates	**number** of **live births (per 1,000 people)** → **high** in **LICs**
death rates	**number** of **deaths (per 1,000 people)** → **high** in **LICs**
infant mortality	**number** of **babies who do not survive** to **age of 1 (per 1,000 live births)**
life expectancy	**average age** that a **person** is **likely to live to** (in a particular place)
people per doctor	**ratio** to **compare** number of **people** to **doctors** → **more doctors** in **HICs**
literacy rates	**percentage** of **people** who can **read** and **write**
access to safe water	**percentage** of **people** who have **access** to **safe, clean water**
HDI	**Human Development Index** → combines **wealth, health** and **education** data → **score** between **1 and 0** for each country → **1 = most developed**

BOX 4: LIMITATIONS OF ECONOMIC AND SOCIAL MEASURES OF DEVELOPMENT	
limitations ☹	• **GNI** is an **average** → so **'hides'** the **poorest people** from the figure • **countries** with **less technology unable** to **record accurate data** • **government** may be **corrupt** and **change data** to **make it look better**

BOX 5: THE DEMOGRAPHIC TRANSITION MODEL (DTM)	
DTM	**Demographic Transition Model** → shows how **populations** should **change** over **time** → e.g. **birth rates, death rates** and **total population**
stage 1	**stage 1** → e.g. **Tribes** → **birth** and **death** rates are high → **population low** → lots of **disease** and **famine, no contraception**
stage 2	**stage 2** → e.g. **Nepal** → **birth rate high, death rate decreasing** → **population increasing** → more **money** for **healthcare** and **food**
stage 3	**stage 3** → e.g. **India** → **birth rate** and **death rate decreasing** → **population increasing**→ **better living conditions, more contraception**
stage 4	**stage 4** → e.g. The **UK** → **birth rate** and **death rate low** → **population high** → **free vaccinations** → **infant mortality rate** is **low**
stage 5	**stage 5** → e.g. **Japan** → **birth rate below death rate** → **population decreasing** → **death rate increasing slightly** → **aging population**
natural increase	when **birth rate** is **higher than death rate** → **population increases**
natural decrease	when **death rate** is **higher than birth rate** → **population decreases**

BOX 6: KEYWORDS PART 2	
uneven development	when **one area** or **country** is **less developed** than **another**
development gap	**difference** between **development level** of **richest** and **poorest** countries
cause	the **reason** for something
consequence	the **result** of something (also called an **impact** or **effect**)
international	across **more than one country** → links between countries around world
migration	**moving from** one **area to another**
strategies	a **plan** or **project** (sometimes called a **scheme**)

BOX 7: CAUSES OF UNEVEN DEVELOPMENT	
1. physical causes	**climate, natural disasters, raw materials, landlocked, tropical diseases**
2. economic causes	**debt, wars, corruption**
3. historical causes	**colonisation** → **slaves** and **resources removed** by **colonial powers**

BOX 8: CONSEQUENCES OF UNEVEN DEVELOPMENT	
1. health	health **disparities** (inequalities/differences)→ **LICs** have **worst** health
2. wealth	wealth **disparities** → **LICs** have **lowest** wealth
3. migration	**international migration** → **moving** from **LIC to HIC** → **to find better life**

BOX 9: STRATAGIES TO REDUCE THE DEVELOPMENT GAP → 8 STRATAGIES	
1. investment	**companies** in one country **invest** in (give money to) **companies** in another **country** → **improves business** → **more profit** → **development** → then some of this profit is sent back to the company who lent the money
2. industrial development	**reducing primary sector jobs** (farmer) and **increasing secondary sector jobs** (factory worker) → **more profitable goods** to **trade** → **development**
3. tourism	**tourists spend money** → **increases tertiary sector employment** for **locals** e.g. **hotel staff** and **tour guides** → **higher pay** → more **development**
4. aid	**money, goods** and **services given** as a **gift** to a country → to **improve** the **quality of life** and **economy** (or to help recover from a natural disaster)
5. intermediate technology	**simple, easily learned** and **maintained technology** used by **locals** in **LICs** → e.g. **'Life Straw'** → **cleans water** → **less sickness**→ more **development**
6. fairtrade	**producers** in **LICs** are **given** a **higher price** for the **goods** they **produce** → **improves income** and **reduces exploitation** → more **development**
7. debt relief	**cancelling debts** of **LICs** → use the **money** to **develop the country**
8. microfinance loans	**very small loans** → **given** to **people** in **LICs** → **help** them to **start** a **small business** → more **income** → better **quality of life** → more **development**

BOX 10:	USING TOURISM TO REDUCE THE DEVELOPMENT GAP IN TUNISIA
case study	**Tunisia -> a newly emerging economy (NEE) -> located in the north of Africa**
How has tourism increased development in **Tunisia?**	**370,00 jobs have been created in the tourism sector -> boosting incomes and increasing the movement of money within the economy.** **Dev. of coastal resorts has benefited a range of local businesses -> taxis, restaurants, shops and the construction industry.** **Gov. can invest more money into education and health care ->improved literacy rate and life expectancy.**

URBAN CHANGE & SUSTAINABILITY – LEEDS CASE STUDY

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ECONOMIC CHANGE – UK CASE STUDY

BOX 1: KEYWORDS	
industrial structure	percentage of people working in each of the four employment sectors
1. primary sector employment	getting raw materials from the land and sea e.g. farming → lower pay
2. secondary sector employment	making products in factories from raw materials e.g. car manufacturing
3. tertiary sector employment	service industries → employment that provides a service to other people e.g. doctors and teachers → higher pay
4. quaternary sector employment	highly skilled employment in IT and research e.g. computer designers and scientists → requires high level of education

BOX 2: THE CLARK FISHER MODEL	
Clark Fisher Model	graph → shows how industrial structure changes as a country develops
1. pre-industrial	employment → mostly primary e.g. farming, mining, fishing (LICs)
2. industrial	employment → mostly secondary e.g. manufacturing (NEEs)
3. post-industrial	employment → mostly tertiary (service industries) e.g. teachers (the UK)

BOX 3: CAUSES OF ECONOMIC CHANGE IN THE UK → A POST-INDUSTRIAL ECONOMY	
globalisation	more connected world, more movement of goods/people → UK imports manufactured goods from NEEs (cheaper) → less UK factories
de-industrialisation	1960s → rapid decline in traditional manufacturing industry in UK → due to mechanisation, globalisation and more tertiary sector employment
government policies	1980s → government policy 'privatisation' → encouraged primary and secondary industries to close. 2010 → government tried to rebalance economy → infrastructure investment and new high-tech industries

BOX 4: A POST-INDUSTRIAL ECONOMY IN THE UK → MORE TERTIARY/QUATERNARY JOBS	
service industries	tertiary sector → now largest sector in UK → over 75% of economy → e.g. health care, education, retail, entertainment and hospitality jobs
IT employment	more information technology companies → due to more internet access
finance	e.g. banking → over 1 million people employed in finance jobs (2019)
research	research important for economic growth e.g. UK Energy Research Centre
science parks	located near universities → provides educated workforce → 1500 high-tech scientific industries grouped together at Cambridge Science Park so can work together → e.g. AstraZeneca (created a COVID-19 vaccine)
business parks	specially built areas → offices and warehouses → at edge of city with access to main road e.g. Thorpe Park (Leeds) has over 100 businesses

BOX 5: IMPACTS OF INDUSTRY ON THE PHYSICAL ENVIRONMENT IN THE UK	
negative impacts	greenhouse gases, air pollution, toxic chemicals, landscape damage
sustainable solutions	modern industrial development can be environmentally sustainable → • making electric cars → e.g. 'Nissan Leaf' car manufactured in UK • 'The Unicorn Group' manufacture medical bins → factory uses 100% renewable energy e.g. solar and recycles waste (steel/plastic)

BOX 6: POPULATION GROWTH → IN RURAL AREAS IN THE UK	
example (rural area)	South Cambridgeshire (popular → quick commute to city of Cambridge)
social changes	too many people for doctors and schools → long waiting lists
economic changes	popular area → so house prices high → local people cannot afford homes

BOX 7: POPULATION DECLINE → IN RURAL AREAS IN THE UK	
example (rural area)	Outer Hebrides, Scotland (people leaving area to find jobs elsewhere)
social changes	schools closing due to not enough children, public transport decreasing
economic changes	shops closing → not enough customers → creating unemployment

BOX 8: IMPROVEMENTS TO TRANSPORT IN THE UK	
road infrastructure	'Smart Motorways' → electronic signs → vary speed limits and provide information to drivers → reduce traffic → but can cause accidents
rail (train) infrastructure	High Speed 2 (HS2) → plan for new train line between northern cities and London → reduce travel time → aims to boost employment in the north → but estimated to cost £80 billion to build
port capacity	new port → 'London Gateway' → can accommodate larger container ships (400 m long) → boost trade worldwide → will employ 2000 people
airport capacity	plans for 3rd runway at Heathrow Airport (would cost £18.6 billion) → would increase flights and business → but lots of environmental impacts

BOX 9: THE NORTH-SOUTH DIVIDE → REGIONAL DIFFERENCES IN THE UK	
regional differences (differences between different areas)	de-industrialisation → closed secondary industries (mostly in north) → created economic and social gap between Southern and Northern England → Northern England has worse health (5 year difference in life expectancy), lower house prices, lower income and worse education

BOX 10: STRATAGIES TO RESOLVE THE REGIONAL DIFFERENCES OF NORTH-SOUTH DIVIDE	
assisted areas	identifies areas of UK that need help → provides money for businesses
devolution	more power to individual areas → can decide how to best spend money
24 enterprise zones	government encourages investment, new businesses, faster internet
transport links	improvements to rail (e.g. HS2) and motorways → boost employment

BOX 11: THE PLACE OF THE UK IN THE WIDER WORLD	
trade links	trade is the buying and selling of goods and services between countries → the UK imports and exports goods from/to countries around world
culture links	UK events watched around world e.g. Glastonbury and Premier League
transport links	Channel Tunnel links UK to France by rail, also airports e.g. Heathrow
electronic communication	UK linked to wider world by internet, mobile phones and satellites (90% of people in UK now use internet compared to just 27% in 2000)
economic and political links	• 'The Commonwealth' → group of 53 countries → territories of former British Empire → united by language, history, culture, and shared values of democracy, human rights, and the rule of law • 'The European Union (EU)' → UK no longer part of the EU (BREXIT)

Exam paper: 2
Section: C

UK RESOURCES

BOX 1: KEYWORDS PART 1	
inequalities	**when something is unequal** (and usually unfair)
population density	**compares** the **number** of **people living** in **places** of the **same size**
significance	the **importance** of **something**
social wellbeing	**enough resources → good quality of life → economic development**
economic wellbeing	**enough jobs → people** have **money** for **good quality of life**
consumption	to **consume resources → food, water, energy being used**
supply	the **movement** of **resources** to **where** they are **used**

BOX 2: GLOBAL RESOURCE MANAGEMENT	
resources and wellbeing	**3 most important resources → food, water, energy →** important for **social** and **economic wellbeing →** quality of life and development
inequalities → food resources	over **1 billion people** do not have enough food **→ drought** and **lack** of **infrastructure** (difficult to transport food) in many African countries
inequalities → water resources	**some places less water** than **others → physical** reasons e.g. **climate → human** reasons e.g. **not enough infrastructure (water pipes)**
inequalities → energy resources	**energy resources → energy needed** for **economic** and **social development** e.g. **electricity** needed to **power factories** and **hospitals**

BOX 3: KEYWORDS PART 2	
agribusiness	**turning small farms** (agriculture) into **large profitable businesses**
carbon footprint	**amount** of **greenhouse gases** we **individually produce**
crops	**plants grown** on **farms**
demand	the **amount** of a **resource** that is **wanted/needed**
exports	a country **selling goods** (e.g. computers, bananas) **to another country**
food miles	**distance food travels** from **farms** to **customers**
imports	when a **country buys goods** from **abroad**
local food sourcing	**reduces food miles → reduces carbon footprint**
organic produce	**food produced without artificial fertilisers** and **pesticides**
seasonal food	**food that only grows** at **certain times** of **year** in **certain seasons**
yield	the **amount produced → lots** of **crops grown → high yield** of **plants**

BOX 4: FOOD RESOURCES IN THE UK	
high-value food exports to UK	**increasing incomes** in **UK → people want/can afford** to **eat exotic** foods **→ from LICs/NEEs →** e.g. **Vanilla** from **Madagascar → expensive**
all-year demand for seasonal food in UK	**people in UK like eating favourite fruits all year → most fruits only grow in certain seasons →** so **fruits imported** from **warmer countries**
demand for organic produce in the UK	**people** in **UK choosing organic food → difficult** to **grow →** grown **without pesticides/artificial fertilisers → more expensive** to **buy**
larger carbon footprints in UK	**food miles** increasing **→** often food is imported by **airplane → releases greenhouse gases → large carbon footprint**
local sourcing of food in the UK	**local food** becoming **more popular** in **UK →** people **buy food** from **local farms → smaller food miles → reduces** the **carbon footprint**
trend towards agribusiness in UK	**small farms bought** by **large companies →** to **maximise profits → field sizes increased →** more **machines** and **fewer workers → increase yields**

BOX 5: KEYWORDS PART 3	
deficit	**not enough** of **something** (also called resource **insecurity**)
irrigation	to **water crops artificially** e.g. by **using large sprinklers**
leached	e.g. **rain washes fertilisers** out of **soil** and **into rivers**
surplus	having **too much** of **something** (also called resource **security**)
water pollution	when **harmful substances** have **entered water** e.g. rivers and the sea
water transfer	**water moved from area** of **water surplus to area** of **water deficit**

BOX 6: WATER RESOURCES IN THE UK	
changing demand for water in the UK	**amount** of **water used** by **UK homes risen 70%** since **1985 → more appliances** e.g. **dishwashers →** due to more **frequent showering**
improving water quality in the UK	**water pollution → pesticides, fertilisers, oil, sewage → pollution management improves water quality → illegal** to **pollute rivers**
water deficit and surplus in UK	**areas** with **highest population** in **UK** are **however areas** with **least rainfall → 1/3 UK population lives** in **south east → driest part** of **UK**
water transfer to maintain supplies	**water transferred** from **one place** to **another** in the **UK →** e.g. from **area** of **water surplus (Wales)** to **area** of **water deficit (Liverpool)**

BOX 7: KEYWORDS PART 4	
domestic	about the **home →** can mean '**about** the **country you live in**'
energy mix	the **different energy sources used** by a **place**
exploitation	**resource exploitation →** using **too many resources → damages planet**
fossil fuel	**natural fuel → coal, oil gas →**formed from **remains** of **living organisms**
fracking	**forcing** high pressure **liquid** into **ground → extract oil/gas from rocks**
renewable	**energy sources** that **do not run out** e.g. **solar, wind, tidal** etc.
non-renewable	**energy sources** that will **run out** e.g. **coal, oil, gas, nuclear**

BOX 8: ENERGY RESOURCES IN THE UK	
changing energy mix in the UK	• **the energy mix in the UK is changing → UK decreasing reliance** on **fossil fuels → using less fossil fuels** • **UK → growing significance** of **renewable energy → using more**
issues of energy exploitation in UK	• **fossil fuels** release **greenhouse gases** into **atmosphere → cause climate change → coal mines → destroy habitats** for **animals** • **nuclear power stations → very expensive → Hinkley Point →** estimated over **$22 billion to build → radioactive nuclear waste** • **renewable energy** can be **expensive** and **not completely reliable → wind turbines → noisy →** can **reduce tourism** (visual impact)

RESOURCE MANAGEMENT - WATER

BOX 1: Keywords	
Surplus	More than what is needed
Deficit	Less than what is needed
Consumption	The usage of a resource
Security	Access to the correct quantity of clean water
Insecurity	Where people don't have access to the correct quantity of clean water
Abstraction	To take something away or remove it
Infrastructure	Basic systems that allow a country or place to work e.g., roads, cables, rail lines, airports, pipes to transport clean water etc.
Desalination	Removal of salt and other impurities from undrinkable salt water
Groundwater	Water stored beneath the Earths surface

BOX 2: Global patterns of water surplus and deficit	
Surplus	Areas with a water surplus include North America, Europe and Asia. These areas have a water surplus for a range of reasons including low population densities and high levels of rainfall.
Deficit	Areas with a water deficit include Northern Africa and the Middle East where there may be low levels of rainfall, high agricultural demands and/or high population densities.

BOX 3: Reasons for increasing water consumption	
Economic development	Demand for water in HICs is higher than NEEs and LICs because: • Demand for food increases -> more water to farm • Manufacturing goods -> requires water for production • More leisure activities that require water e.g., golf for lawn maintenance
Rising population	World pop. rising especially in LICs & NEEs. More people = more water needed to keep people healthy & increased demand for agriculture.

BOX 4: Factors affecting water availability	
Climate	Areas of high rainfall tend to have a water surplus
Geology	The type of rock under the ground can influence the availability of water e.g., aquifer (store of water underground) exists because the rock types allows water to collect in one place.
Pollution	Pollution e.g., sewage reduces availability of clean water
Over-abstraction	Removing more water than can be replaced e.g., from an aquifer
Infrastructure	LICs & NEEs may lack methods to transport clean water to where it is needed e.g., pipes
Poverty	Cost of fresh water can price many people out of access, so they rely on polluted sources

BOX 5: Impacts of water insecurity	
Waterborne disease & water pollution	River Ganges, India -> People use it for farming, washing & drinking -> the river contains raw human sewage, industrial waste, pesticides, fertilisers & ashes from cremated bodies -> can lead to cholera & dysentery
Food production	Agriculture uses 70% of the world's water supply -> droughts can lead to a lack of production of crops and a global food crisis -> hunger, starvation & malnutrition
Industrial output	Development of manufacturing in NEEs = increased demand for water supplies. E.g., 33% of China's waster supply is for manufacturing (making products).
Conflict	Future conflicts are likely to be over water. Water sources, such as aquifers and rivers, cross many political and national borders. What one country does with a water source could affect another.

BOX 6: Strategies to increase water supply -> example of a large-scale water transfer scheme	
Case study	The South-North Water Transfer Project, China. Introduced to transfer a surplus of water in the south to the north where there is economic growth and high pop. density.
Advantages	• Reducing water insecurity in the north and supporting economic development • Food security improving as more water is available for irrigation • Health benefits from improved water quality
Disadvantages	• Hundreds of thousands of people displaced from the construction of dams and reservoirs • Ecological damage to the natural environment • The region is prone to earthquakes which could cause extensive damage to the scheme

BOX 7: How to make water sustainable	
Water conservation	Using water more sparingly -> reducing leaks in pipe infrastructure -> reducing water usage by installing water usage meters in homes.
Groundwater management	Government need to monitor aquifer levels and ensure we are not taking more water than what can be replenished.
Recycling	Where water can be treated and re used e.g., sink water is funneled to a cooling tower for industry.
Grey water	Waste domestic water is taken form another source e.g., capture rainfall to flush toilets rather than using fresh water.

BOX 8: Example of a local scheme in a LIC to increase water supply	
Case study	Warka Water towers -> Ethiopia -> NE of Africa. A tower that collects rain and harvests dew and fog.
Advantages	Can provide 100 liters of drinking water a day to rural communities or areas with a lack of infrastructure. Can be built with simple tools operated by villagers.
Disadvantages	There needs to be adequate moisture in the air to produce water. If there are high levels of pollution in the air, then the water could be contaminated.

Exam paper: 3
Section: B

HUMAN GEOGRAPHICAL ENQUIRY

BOX 1: Our enquiry	
Location	Hornsea -> seaside town -> East Riding of Yorkshire
Human enquiry question	Are recreation and tourism important for Hornsea's economy?
Hypotheses (prediction)	Hornsea's economy relies on recreation and tourism

BOX 2: Factors that need to be considered when selecting suitable questions/hypotheses	
Accessibility	Easy to get to and sites clear to take measurements
Cost	Costs are low to get to & perform measurements at the site = all can participate
Time	Enquiry can be completed in full when factoring in transport to and from Hornsea
Safety	The low-risk site as safe, flat path available if the tide comes in.

BOX 3: The geographical theory/concept underpinning the enquiry.	
Theory/ concept	For several decades, the UK has been experiencing de-industrialisation. This has led to a rise in service (tertiary) industries, including tourism. Our enquiry wants to assess the extent to which the economy of Hornsea relies on tourism-which is likely as it is a coastal town.

BOX 4: Potential risks and how these could be reduced

Risk	How it can be reduced
Traffic accident	Walk in a single file on the designated path. Cross at appropriate crossings.
Abduction	Stay in small group with a member of staff.
Adverse weather	Check the weather in advance and dress appropriately/ pack appropriately.

Box 5: Selecting, measuring, and recording data appropriate to the chosen enquiry	
Primary data	• Photographs of each location • Notes on the condition of each site
Secondary data	• Prepared a map from google maps to navigate the area and identify locations of the sites before we set off
Justification of data collection method	• The map was essential from google maps to navigate the site and identify the facilities we were going to survey. • The photographs provided evidence and a 'snapshot' of the condition of the facilities and removed bias from the opinion of its state, while the notes served as a backup to the photograph but also allowed us to add more information than what could be seen in the photograph.
Sampling technique	• We used random sampling -> allows for an unbiased opinion of the state of the facilities at Hornsea as a whole.

BOX 6: Selecting appropriate ways of processing and presenting fieldwork data	
Annotated map	The annotated map combines the location with the photos and notes that we took while showing an overview of where these are in Hornsea. It means that with one glance we could see the evidence for and against our hypothesis, helping us to analyse our data.

BOX 7: Describing, analysing and explaining fieldwork data	
What our results show	Our results show that leisure and recreation are important to Hornsea, and that the economy relies on it as there are many areas for leisure and recreation. However, the tourist areas are in decline whereas the local recreation and economy sector is thriving more.
Explanation of results	Leisure and recreation are important to Hornsea as this is a seaside resort that relies increasingly on the service sector in post industrial Britain. Unfortunately, the tourist areas are in decline due to falling number of tourists as package holidays have become more popular than seaside holidays. The local economy is based on elderly people (mobility shops, cafes etc.) as the area is a popular retirement resort.

BOX:8 Reaching conclusions	
Conclusion in relation to the hypotheses.	My results showed that Hornsea has a lot of leisure and tourism facilities. Many of these are run down, but they are still relatively popular. Overall, this shows that the economy of Hornsea does indeed rely on the tertiary service sector as it relies on leisure and tourism. This is clearly shown by the large range of leisure facilities in the area (games arcades, food shops, gift shops etc.) and the lack of other types of industry e.g., manufacturing.

BOX 9: Evaluation of geographical enquiry	
Advantages of data collection technique	Visual-photos allow the person viewing to see the condition of the tourist attraction in addition to what it is/ Allowing us to include our fieldwork notes in the presentation enabled us to include key information e.g., that mainly elderly people were using the facilities/ evaluation using presentation allowed us to identify that our sample area was small compared to Hornsea size
Disadvantages of data collection technique	**Sample size** -> Small samples mean that the data is not representative of the whole town -> This may lead us to conclude that the economy of the area is dependent on leisure and tourism when it isn't -> to improve we should take more samples. **Type of data presentation** -> we used qualitative data with descriptions and photos. This is subjective and means that results are biased -> this leads to biased conclusions that reflect only our opinion -> to improve we could have tried a questionnaire or a quantitative data collection technique to reduce bias. **Time of visit ->** We went to Hornsea on a weekday when many people were probably at work. This means buildings may have appeared closed or unused as they were not open for tourists -> this may lead to a conclusion that the tourist industry and the economic benefits of it are declining which may not be true -> to improve we could visit other days as well- weekends, Bank Holidays, Summer Holidays.

PHYSICAL GEOGRAPHICAL ENQUIRY

BOX 1: Our enquiry	
Location	Hornsea -> seaside town -> East Riding of Yorkshire
Human enquiry question	Are the groynes in Hornsea effective at stopping longshore drift?
Hypotheses (prediction)	The groynes in Hornsea are effective at stopping longshore drift

BOX 2: Factors that need to be considered when selecting suitable questions/hypotheses	
Accessibility	Easy to get to and sites clear to take measurements
Cost	Costs are low to get to & perform measurements at the site = all can participate
Time	Enquiry can be completed in full when factoring in transport to and from Hornsea
Safety	The low-risk site as safe, flat path available if the tide comes in.

BOX 3: The geographical theory/concept underpinning the enquiry.	
Theory/ concept	Longshore drift is the movement of material along the beach due to the direction of the prevailing wind. Groynes are a hard engineering strategy designed to stop longshore drift by allowing the material to pile up on one side of the groyne. This keeps the beach from washing away.

BOX 4: Potential risks and how these could be reduced	
Risk	**How it can be reduced**
Traffic accident	Walk in a single file on the designated path. Cross at appropriate crossings.
Abduction	Stay in small group with a member of staff.
Adverse weather	Check the weather in advance and dress appropriately/ pack appropriately.

Box 5: Selecting, measuring, and recording data appropriate to the chosen enquiry	
Primary data	• Measurements of sediment heights on the sides of the groynes • Conducted field sketches to assess landscape without groynes
Secondary data	• Environment agency - Erosion at Hornsea is increasing • Used an OS map to work out the study area and identify the groynes on the beach
Justification of data collection method	• By measuring the sediment drop on each side of the groyne we will be able see if there is a difference between the north and south-facing sides of the groynes. • If there is a smaller drop (more sediment) on the north side compared to the south, then longshore drift is moving from north to south • This method is easy to do - it will allow us to collect a lot of data in the limited amount of time • No expensive equipment is required • Field sketches allowed us to assess immediately the action on the landscape without the coastal defences.
Sampling technique	• Used systematic sampling (fixed intervals e.g., every second groyne) – removes bias.

BOX 6: Selecting appropriate ways of processing and presenting fieldwork data	
Located bar charts	• We drew located bar charts to show the drop in sediment between the north and south-facing sides of each groyne. • We drew the beach as a transect on a piece of paper to scale and marked on the location of each groyne • We drew 8 bar charts. On the X axis was the 'Amount of drop measured in cm' and on the Y axis was the 'Drop facing side' • Each bar chart was located to the relevant groyne.

BOX 7: Describing, analysing and explaining fieldwork data	
What our results show	Our bar charts clearly showed the pattern that the sand was higher on the north side of the groyne. We could see that the sand was higher at each north side of the groyne (in 8 out of 8 groynes) because the north side had a smaller drop.
Explanation of results	The reasons why there was a smaller drop on the north sides of the groynes is because longshore drift along the stretch of coastline goes from north to south. This was further confirmed by a field sketch beyond the groyne which showed that there was little beach material and therefore a lot of erosion of the clay cliffs. This shows that the groynes are effective in stopping longshore drift here as there was more beach material in the area with the groynes. Groyne 8 had the largest difference because it was the longest groyne.

BOX:8 Reaching conclusions	
Conclusion in relation to the hypotheses.	The groynes are effective at stopping longshore drift. • The prevailing wind is blowing from the northeast. • The swash is pushing material along the beach with backwash bringing it back down • As it reaches a groyne the sediment builds up. This is always on the north facing side of the groyne • This was true of all groynes measured

BOX 9: Evaluation of geographical enquiry	
Advantages of data collection technique	• Using bar charts meant we could clearly see on which side of the groyne the sand was higher • The bar charts allowed us to: summarise a large data set in visual form, clarify trends better than tables, and estimate key values at a glance • Locating it on a bar chart allowed me to look for patterns along groyne e.g., larger difference further south • Locating the bar charts allowed us to identify site 5 as an outlier • Field sketch - > lots of detail can be recorded in this way e.g., more erosion after sea defences and less beach material
Disadvantages of data collection technique	If certain groynes were a little higher than others, naturally this would add to a bigger drop when completing the measurements. This would impact the accuracy of our results as when measuring the drop in height from the top of the groyne to the top of the sand -> this would not have had a huge impact on our conclusion as we were looking at the effectiveness of each groyne in controlling longshore drift -> to improve the results we could have measured the height of each groyne. By the time we reached Hornsea Beach the weather had changed, and it was drizzly. This meant that it was difficult to draw an accurate field sketch as our booklets were getting wet -> this problem would have had an impact on the accuracy of my results as the field sketches, we drew were affected by the wind/ rain -> to improve the results we could have taken a photo and recorded notes instead of doing both on site