

Higher Geography Global Issues: Global Climate Change

Paper 2 is worth 60 marks; it contains four "choices" and one compulsory question (geographical skills). One of the two choices you pick will be **Global Climate Change**. You may be asked about the following:

- ✓ **physical and human causes**
- ✓ **local and global effects**
- ✓ **management strategies and their limitations**



What is climate change?

The Earth's climate has always been changing, sometimes heating or cooling. Since the last ice age (which ended about 11,000 years ago) the Earth's climate has been relatively stable. However, the Earth's climate has risen so drastically throughout the last century, predominantly due to Human reasons, and is causing significant problems for people and environments all over the world.

Causes of Climate Change

Climate change can occur due to "natural" reasons which we call **physical causes**. Climate change can also occur due to "man-made" reasons which we call **human causes**.

Physical causes of Global Climate Change

- **Variations in solar energy** - we do not always receive the same energy from the sun. Sunspots (temporary dark spots on the sun's surface) **increase** global temperature.
- **Volcanic eruptions** - eruptions can throw millions on tonnes of ash, dust and sulphur dioxide into the atmosphere. This can shield the Earth from incoming insolation and stop heat energy reaching the Earth's surface. Volcanic eruption **temporarily cools** temperatures. *E.g. Mount Pinatubo in 1991 caused a dip in global temperatures.*
- However, some scientists argue that large eruptions could worsen the greenhouse effect and lead to global warming.
- **Milankovitch cycles (Stretch, Wobble and Roll theory)** - the Earth 'wobbles', so there is a variation in the time of year when the Earth is nearest the sun. Every 41,000 years the Earth changes its tilt on its axis meaning **more sunlight/energy for polar regions**. Over 97,000 years, the Earth's orbit 'stretches', affecting the amount of energy received.
- **Changing Oceanic Currents** - the oceans can heat or cool. Some ocean currents flow towards the tropics (taking cold water from the poles) and some flow towards the poles (taking hot water from the tropics). *E.g. (El Nino) causes warming and La Nina causes cooling of areas of the Pacific Ocean.*
- **Melting permafrost** - permafrost is ground (rock or soil) that has been frozen for over 2 years. It contains carbon and methane that are both released into the atmosphere when it melts causing **warming**.

Exam Question

Give detailed reasons!

ONLY physical reasons

Explain the physical causes of climate change - 6 marks

Named examples
e.g. Mt Pinatubo
get credit

Human causes of Global Climate Change

Climate change has been significant over the last century with many human activities causing **global warming**. Developed countries use more energy, burn more fossil fuels and emit more greenhouse gases than developing countries. But, developing countries are striving to catch up with developed countries and this normally means using more energy and burning more fuel.

- **Burning of fossil fuels** - fossil fuels such as coal, oil and natural gas are used for transport, industry and power. These release carbon dioxide into the atmosphere that **heats** the Earth.
- **Worldwide deforestation** - trees take in carbon dioxide and release oxygen and when trees are felled (cut down) all the carbon dioxide that was stored is released into the atmosphere causing **global warming**. Deforestation sometimes involves rainforest burning which also causes more carbon dioxide.
- **Methane** - is a powerful greenhouse gas that heats the earth. It is 23 times more harmful than carbon dioxide. Methane is created by humans in many ways:
 - **Paddy fields** produce the most methane as rice farming continues to increase in developing countries with the growing demand for food.
 - **Cattle (cows)** release methane through belching and flatulence. More cows are being bred to keep up with demand for food from growing populations.
 - **Landfills** (rubbish dumps) are full of waste, when this decomposes it produces methane.
- **Nitrous Oxide** - is up to 300 times more effective in **trapping heat** than CO_2 and lasts up to 1250 years in the atmosphere. Soil fertilisers used in farming are the biggest contributor towards nitrous oxide.
- **Chlorofluorocarbons (CFCs)** - are another group of greenhouse gases that have been responsible for depleting the o-zone layer (The ozone layer is a high layer of gas in the stratosphere, it helps to keep out harmful UV rays, which cause sunburn and damage plants). They were used in aerosols, such as hairspray cans, fridges, air-conditioning and in foam plastics like food containers. CFCs were banned in many countries in the 1990s due to their damage of the ozone.

Exam Question

Give detailed reasons!

ONLY human reasons

Explain the human factors that may lead to climate change - 6 marks

Extra Task: When you have both your separate physical and human questions completed and marked. Write or type up a 12-mark response combining both.

Effects of Global Climate Change

Melting Ice Caps and Rising Sea Levels

- Ice is melting worldwide, especially at the Earth's poles. This includes mountain glaciers, *Arctic sea ice and ice sheets covering west Antarctica and Greenland*. Sea levels are rising and continued melting at the poles could add between 10-20cm to the already rising waters.
- This can cause flooding which means coastal areas and low-lying land are at risk; it is estimated around 80 million people across the world could be affected e.g. countries like *Bangladesh and the Maldives*.

Extreme weather

- Hurricanes will become stronger and reach more places as ocean water temperatures rise. Hurricanes are becoming worse and lasting longer *E.g. USA*.
- Climate change can increase the frequency of heat waves, floods and drought conditions around the world. *Europe and the UK* can experience hotter summers.
- Floods and droughts will become more common. Rainfall in *Ethiopia* where droughts are already common is expected to decrease even more; this could lead to increased desertification.
- Although the *UK* has a stable climate, some climatologists argue that the *UK* climate is changing because of global warming with the possibility of more frequent floods, water shortages and extreme weather conditions e.g. snow and ice in winter, extreme heat in the summer.

Wildlife

- Forecasts predict that 30% of land-based bird species could become extinct if temperatures continue to rise.
- Climate change will also negatively affect plants, insects and parts of the world's rainforests, some parts of tropical countries are experiencing drought e.g. *Brazil*.
- The number of *Adélie penguins in Antarctica* has fallen by over 20,000 in 30 years.
- Polar bear numbers are falling and it is feared they will become extinct as there is less ice to live on and less fish to hunt.

Crop failure, desertification and water shortages

- Increased demand for water will have a negative effect on global food production, as there is less water available for agricultural purposes.
- Crop yields will decrease for all major crops and some crops may be flooded in low-lying areas. With fewer crops available, food prices are likely to increase.
- Farmers will have to spend more money on irrigation to ensure they have enough water for crops; they may also need to use more fertilisers and chemicals to ensure yields. This can have a negative effect on the environment as it increases pollution.
- Agricultural land may become useless, through the process of desertification as soils become dry and infertile.
- More heat in areas such as the *Mediterranean* could result in desertification and increased pressure on water supplies. This may put off some tourists from visiting and have a negative impact on the economy. This is also a problem in coral reefs such as The Great Barrier Reef where coral is dying due to rising sea temperatures.

Consequences for people: Health and Migration

- Increased temperatures may cause tropical diseases such as malaria to spread.
- Floods may also cause water borne infectious diseases to spread e.g., cholera is spread by contaminated water.
- Heat waves can cause death, especially for vulnerable groups like children and the elderly. E.g., the UK heat waves in 2018 resulted in around 700 deaths.
- Drought can force people to migrate as they are at risk from starvation. The term "climate refugees" is often used to describe these people although they do not have the same rights as refugees fleeing war and conflict.
- Low-lying regions can also cause displacement as people are forced to move away from coastal areas. E.g., around 17 million people in Bangladesh are vulnerable to flooding.
- Increased migration will put pressure on services such as schools and hospitals.
- There will be less fresh water available for people who rely on it for drinking water and electricity purposes.

Does Climate Change have any positive effects?

- The *Arctic, Antarctic, Siberia* and other frozen regions of the Earth may experience milder climates that improves living conditions and means more crops can be grown.
- Longer growing seasons could mean increased agricultural production in some areas. E.g. the UK can benefit from more varieties of crops being grown and higher yields.
- Melting sea ice can make trade easier and cheaper. E.g., *The Northwest Passage through Canada's* formerly icy waters is used for sea transportation.
- There is likely to be fewer deaths or injuries due to cold weather e.g. hypothermia.
- The next ice age may be prevented from occurring. Many scientists believe that the planet is due to enter the next ice age and global warming will prevent this.

Exam Question

RANGE = choose
a variety



Discuss a range of possible impacts of climate change. You should support your answer with specific examples - 10 marks.

Examples are essential
for full marks



Management Strategies and their Effectiveness - Local, National and Global

Local Strategies ("local areas", not specific to whole country)

- **Glasgow Low Emissions Zone (LEZ)** - an LEZ is an area where a person cannot drive a vehicle, which does not meet a specified emission standard. LEZ reduce pollution as drivers can receive a fine or ban from the area if their vehicle does not comply. Glasgow introduced this due to the concerning levels of nitrous oxide in the city centre
- **Reduce, Reuse, Recycle** - people are encouraged to cut down on waste by reducing and reusing things e.g. water bottles, carrier bags. People are also encouraged to reduce their energy usage by switching off lights, power sockets, phone chargers and TVs when not in use and using energy saving light bulbs. People are also encouraged to recycle; most Local Councils have recycling bins and encourage all residents to cut down on waste.
 - This has cut down huge amounts of waste and people are making more sustainable choices.
- **London congestion charge** - there is a charge for driving in the congestion charge zone. The aim is to discourage drivers from using the zone during peak hours. Drivers are encouraged to use public transport to reduce congestion and pollution.
 - This has reduced congestion, accidents and pollution levels; bus services are more reliable and retail sales in the area have increased as more people are walking.
 - However, the results are limited as many people simply pay the charge to drive
- **Thames Flood Barrier** - is a series of gates that are raised across the river to prevent seawater from flooding London.
 - This has successfully protected London from flooding on numerous occasions.
 - However, a second barrier may be required to cope with flooding beyond 2070.

National Strategies (a whole country involved)

- **Scotland Renewable Energy** - Scotland is reducing greenhouse emissions by increasing energy production from renewable energy (e.g., wind turbines) which was meeting 50% of the demand by the end of 2015. People are also encouraged to get their homes insulated and install solar panels in their home to generate their own energy.
 - There has been an increase in the number of installed solar panels and many "new build" homes now include solar panels as standard. This means more renewable energy is being used and less pollution from burning fossil fuels.
 - However, solar panels can be expensive to purchase and set up.
- **'Helping Households to cut their Energy Bills'** - encourages the use of 'Smart Meters' improving energy efficiency by showing people how much energy they are using.
 - People are able to cut down their energy use and cause less pollution.
- **Banning petrol/diesel cars** - the UK government is committed to banning the sale of new petrol/diesel cars by 2040 to reduce emissions.
 - There has been an increase in the ownership of more energy efficient electric cars.
 - However, some users complain that there are not enough charging stations to cope with the increasing demand.
- **Green driving** - New cars have 'stop start' technology which means that engines stop whenever cars stop, for example at traffic lights. This reduces fuel consumption and pollution. Learner drivers are also encouraged to drive more efficiently to create better habits for the future.
- **USA carpooling**- residents in the USA are encouraged to share car journeys.
 - This has been very successful in the USA, with car poolers being able to use 'fast lanes' during peak hours and single motorists are fined for using these lanes.
- **UK hosepipe bans** - this reduces water wastage during periods of drought, people are encouraged to limit their use of hosepipes and sprinklers when gardening, washing cars etc.
 - These are very unpopular and difficult to enforce as many people continue to use them.
- **Plastic bag charge** - Scotland introduced the 5p plastic bag charge in 2014, other countries also did this e.g. England in 2015. Many supermarkets have taken this further and now only sell reusable bags rather than single-use bags.
 - There has been an 85% fall in the use of plastic bags and many shoppers are changing their habits resulting in less wastage.

Global Strategies (several countries and international groups involved)

- **Paris Climate Agreement 2015** - leaders in the United Nations agreed to try to limit climate change below a 2°C rise. Developed and developing nations came together to limit the impact of climate change.
 - Agreements include reducing energy consumption and by preparing for extreme weather events, e.g. encouraging flood defences to hold back floodwater.
 - However, President Trump removed the USA from the deal, which caused worldwide concern, as the USA is one of the world's biggest contributors to global warming.
- **Kyoto Protocol** - an international treaty that sets binding obligations on industrialised countries to reduce emissions of greenhouse gases.
 - Many governments signed the Kyoto Protocol, committing them to reducing greenhouse gas emissions.

- Not all countries agreed to the treaty and it is hoped that a stricter treaty will be put into place from 2020.
- **Worldwide Afforestation** - is the process where new trees are planted across land without trees, this is usually areas where trees have been unsustainably felled. Many companies and government are involved in the replanting.
 - As the forest grows, it naturally removes CO₂ from the atmosphere. This also prevents further desertification from taking place.
 - However, many nations are still cutting down far too many trees for timber and products like palm oil.

Exam Questions

1

Explain possible strategies for managing climate change - 10 marks.

Mix of local, national & global

Only strategies - no effectiveness

2

"Many strategies have been implemented to both reduce greenhouse gas emissions and to manage the effects of climate change"

With reference to strategies you have studied, comment on their effectiveness - 12 marks.

You must make a judgement - have these management strategies been successful?

