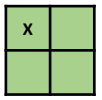
Revision Checklist – Our Changing Climate

	Revised for homework? (1)	Revised for homework? (2)	Revised in lesson?
Weather, climate, climate change, global warming / cooling.			
Past climate change: glacial periods and interglacial periods.			
Natural climate change: Earth's orbit, solar energy, volcanoes.			
Natural greenhouse effect, enhanced greenhouse effect.			
How can people cause global warming?			
Positive effects of global warming.			
Negative effects of global warming.			
Mitigating global warming: energy, vehicles, food, afforestation.			
Adapting to global warming: coastal defences, new crops.			
Geographical skills.			

Coordinates	OS maps	Grid references	Distance	Percentages	Averages	Writing tips	Revision tips
				%			

Knowledge Organiser – Our Changing Climate

Lesson 1: What are the natural causes of climate change? (1/2)

Core Knowledge	Revision Questions
What is climate change?	
• The atmosphere is the layer of gases around Earth. It extends from the surface to 10,000km above sea-level.	• What is the atmosphere?
• Weather is the atmospheric conditions (temperature, precipitation, wind speed and direction, clouds, sunlight) in a specific place and time and can change rapidly. Climate is the average atmospheric conditions over the long term.	• Give one example of an atmospheric condition. • What is the difference between weather and climate?
• Climate change is a change in the average atmospheric conditions on Earth. Global warming is a rise in the average temperature of Earth. Global cooling is a fall in the average temperature of Earth.	• What is climate change? • What is the difference between climate change and global warming?
• Earth's climate has naturally changed throughout history. Global average temperature has fluctuated in cycles known as glacials (colder) and interglacials (warmer).	• How has Earth's climate changed throughout history?
How do we know climate has changed in the past?	
• Thermometers measure temperature. Records of thermometer measurements exist from the mid-1700s. "Proxies" are used to estimate temperatures in earlier years.	• When were the earliest thermometers used?
• An example of a proxy is tree rings. Tree trunks grow an extra ring each year. Thicker rings grow when the climate is warmer and wetter. This means that the pattern of rings is a record of past temperature and precipitation.	• Name one example of a climate proxy. • How do tree rings show past climate?

Knowledge Organiser – Our Changing Climate

Lesson 1: What are the natural causes of climate change? (2/2)

Core Knowledge	Revision Questions
Why has climate changed in the past? • Sometimes Earth orbits closer to the Sun. This means that more solar heat energy reaches Earth, so more is absorbed by Earth. This causes global warming. Sometimes Earth orbits further from the Sun. This means that less solar heat energy reaches Earth, so less is absorbed by Earth. This causes global cooling. • Sometimes the Sun releases more heat energy. This means that more solar heat energy reaches Earth, so more is absorbed by Earth. This causes global warming. Sometimes the Sun releases less heat energy. This means that less solar heat energy reaches Earth, so less is absorbed by Earth. This causes global cooling. • Volcanoes can release large clouds of ash when they erupt, blocking solar heat energy from reaching Earth. This means that Earth absorbs less solar heat energy, causing global cooling.	• How can Earth's orbit change to cause climate change? • How can the Sun cause climate change? • How can volcanoes cause climate change?

Knowledge Organiser – Our Changing Climate

Lesson 2: What are the human causes of climate change 1/2

Core Knowledge	Revision Questions
What is the natural greenhouse effect? • Earth absorbs solar heat energy, warming it up. It cannot hold this heat energy forever, so eventually releases it back into the atmosphere. • Earth's atmosphere is made of many gases including nitrogen, oxygen, carbon dioxide (CO_2), methane, nitrous oxides and water vapour. • CO_2, methane and nitrous oxides are greenhouse gases. This means that they reflect a lot of heat energy released by Earth back towards Earth. Therefore, heat energy remains in the atmosphere around Earth for longer, keeping Earth warm. This process is called the natural greenhouse effect. Without it, Earth would be too cold for life to survive.	• Explain the natural greenhouse effect.
What is the enhanced greenhouse effect? • If there are more greenhouse gases in the atmosphere, the greenhouse effect is stronger. This means that more heat energy is reflected back towards Earth. This is called the enhanced greenhouse effect. It causes global warming.	• What is the difference between the natural and enhanced greenhouse effects?
How do people cause global warming? • Our activities cause global warming by enhancing the greenhouse effect. • Burning fossil fuels such as coal, oil and gas releases extra carbon dioxide into the atmosphere. As the population of Earth grows, more fossil fuels are burned to generate electricity for businesses and homes, and to provide energy for transport and heating.	• Name one fossil fuel. • Why do we burn fossil fuels? • How does burning fossil fuels cause global warming?

Knowledge Organiser – Our Changing Climate

Lesson 2: What are the human causes of climate change 2/2

Core Knowledge	Revision Questions
• However, energy use per person varies across the world. Countries with lots of industry tend to burn more fossil fuels in factories. Countries with high GNI per capita use lots of energy to support their high standard of living. Often this energy comes from burning fossil fuels.	• Do all countries burn the same amount of fossil fuels? Why?
• Cows release methane into the atmosphere when they burp and fart. As the population of Earth grows, and as countries develop, more meat is used to feed people. This means that more cows are farmed for beef, so extra methane is released into the atmosphere.	• How does farming cows cause global warming?
• Fertilisers are used to help crops grow quicker and larger. Fertilisers break down to release nitrous oxides. As the population of Earth grows, and as countries develop, more crops are needed to feed people. This means that more fertiliser is used, so extra nitrous oxides are released into the atmosphere.	• What do farmers use fertilisers for? • How do fertilisers cause global warming?
• Waste dumped in landfills breaks down, releasing methane. As the population of Earth grows, and as countries develop, more waste is created and added to landfill. This means that extra methane is released into the atmosphere.	• Where does non-recycled waste go?
• Cement is made by breaking down limestone. This releases large amounts of carbon dioxide into the atmosphere. As the population of towns and cities increases, more cement is used for construction. This means that extra carbon dioxide is released into the atmosphere.	• What do we use cement for? • Where does cement come from? • How does using cement cause global warming?
• Plants, including trees, absorb carbon dioxide for photosynthesis. This means that trees remove carbon dioxide from the atmosphere, so are a “carbon sink”. As more trees are cut down (deforestation), less carbon dioxide can be removed from the atmosphere, so the greenhouse effect is enhanced.	• “Trees are a carbon sink”. What does this mean? • How does deforestation cause global warming?

Knowledge Organiser – Our Changing Climate

Lesson 4: What are the effects of global warming? (1/2)

Core Knowledge	Revision Questions
• Although energy use per person is highest in HICs, global warming mostly affects people in LICs. **What are the positive effects of global warming?** • Boats travelling from Europe to Asia travel through the Panama Canal. Average journey time is 23 days. • As global average temperature increases, sea-ice melts. This means that boats will be able to travel between islands in northern Canada, called the North-West Passage. Average journey time from Europe to Asia would be 15 days. This means that boats would need less fuel, so the cost of delivering goods between countries would be lower. • Most grapes are grown in Spain, France and Italy, in south-west Europe. This is because the temperature here is often between 15°C and 20°C, which is ideal for growing grapes. • As global average temperature increases, other places will be warm enough to grow grapes. Wine manufacturers are starting to grow grapes in the UK, in north-west Europe. **What are the negative effects of climate change?** • As global average temperature increases, ice on land is melting. On some days in 2021, over 8 billion tonnes of ice on Greenland melted. Meltwater flows into rivers and then into the sea, causing the height of the ocean to increase. This is called sea-level rise. • Low-lying places are not high above sea-level and are very flat. Sea-level rise will submerge low-lying land in HICs, such as the UK and Netherlands in Europe, as well as in LICs, like Kiribati in Australasia.	• Which countries are mostly affected by global warming? • How will global warming lower the cost of delivering goods between countries? • How will global warming change grape farming? Why? • How will global warming affect ice on land? • Where does meltwater go? • How does meltwater change sea-level?

Knowledge Organiser – Our Changing Climate

Lesson 4: What are the effects of global warming? 2/2

Core Knowledge	Revision Questions
• People in Kiribati are having to abandon their submerged homes. Supplies of fresh water are being contaminated by seawater. Smaller beaches mean that fewer tourists visit and fishing boats are easily damaged.	• Where is Kiribati? • How does submerged land affect people in Kiribati?
• As global average temperature increases, growing crops becomes more difficult in some places. Darfur is in west Sudan, in north Africa. In Darfur, settled farmers have lived with nomadic herders for centuries. Since high temperatures have caused more crop failure, farmers have put fences around their fields and herders have competed with each other for space on the smaller grasslands. This has caused famine and conflict.	• Describe the location of Darfur. • How has global warming cause conflict in Sudan?
• Submerged low-lying land, famine, and conflict can force people to migrate to other places. Over 250 million people are predicted to migrate because of global warming by 2050. Most will travel from LICs to HICs as “climate refugees”.	• Why will people migrate as Earth becomes warmer?
• As global average temperature increases, snow is less likely to fall. As less of mountains are covered in snow, winter sports tourism will decline. In the Alps mountains, in Europe, some ski resorts have started to buy artificial snow from factories. Others are improving their spas and hotels to keep attracting tourists.	• How will global warming affect winter sports tourism?
• ⅓ of extra carbon dioxide released into the atmosphere is absorbed by seawater. It reacts with seawater to form carbonic acid. This means that seawater can more easily dissolve the limestone bases of coral reefs, damaging them. As sea-level rises, less sunlight reaches coral reefs. This means that their “polyps” struggle to photosynthesise, so die.	• How will global warming affect coral reefs?

Knowledge Organiser – Our Changing Climate

Lesson 5: What are the effects of global warming?

Core Knowledge	Revision Questions
• As global average temperature increases, precipitation can change. Warmer water in lakes, rivers and the sea will cause more evaporation. This means that more water vapour will rise into the atmosphere, where condenses and form clouds. However, warmer air can hold more water than colder air. This means that in a warmer climate, clouds can hold more water before rain falls. This means that precipitation will be less frequent but more intense in some places.	• How will global warming affect precipitation?
• Most precipitation falls in India during the summer. This is called the “monsoon” season. Indian farmers depend on monsoon rains to grow their crops. Indian villages depend on monsoon rains to fill wells with drinking water.	• What is the monsoon season? • Why does India depend on the monsoon season?
• Scientists predict that, because of global warming, monsoon rains will be less frequent but more intense in the future. This means that more days in summer will be dry, so crops might die and people might not have enough drinking water.	• How are monsoon rains predicted to change because of global warming?
• Raj-Samadhiyala is a village in Gujarat State, north-west India. Its people have adapted to changing monsoon rains. For example, they have used satellite images to show where monsoon rains fall and where rainwater flows, then built small dams to collect the water into a lake. This means that they have water to drink and for their crops all year, not just when the less frequent monsoon rains fall.	• How has the village of Raj-Samadhiyala adapted to drier summers?

Knowledge Organiser – Our Changing Climate

Lesson 6: How can we stop global warming? 1/3

Core Knowledge	Revision Questions
• The Intergovernmental Panel on Climate Change (IPCC) insists that hope should not be lost. Action by individuals and governments can slow or even stop global warming.	• Who can take action to slow or even stop global warming?
How can climate change be mitigated?	
• Mitigation strategies aim to release less extra greenhouse gases into the atmosphere, or remove extra greenhouse gases from the atmosphere. This means that the greenhouse effect will be less enhanced, so global average temperature could stop increasing.	• What is the aim of mitigation strategies? • How could mitigation strategies stop global warming?
• **Alternative energy** is a mitigation strategy. It involves using renewable sources of energy, such as solar power, wind power or hydroelectric power. This means that less fossil fuels are burned for energy. • Governments are mostly responsible for increasing the use of alternative energy. For example, they can raise taxes on fossil fuel sales, making them more expensive to use for generating electricity. Meanwhile, they can lower taxes on equipment needed to generate electricity from renewable sources, such as solar panels.	• What is alternative energy? • Name one renewable source of energy. • Why does using renewable energy mitigate climate change? • Who is responsible for alternative energy use? How?
• **Electric vehicles** can be a mitigation strategy. If they are charged using electricity generated from renewable sources, less fossil fuels will be burned for energy. • Governments and individuals are responsible for increasing the use of electric vehicles. Governments can ban the sale of petrol cars. For example, new petrol cars cannot be sold in the UK from 2030. As electric vehicles become cheaper, people can choose to buy them instead of petrol cars. However, the highest quality electric cars, such as Teslas, are still very expensive.	• Why does using electric vehicles mitigate climate change? • Who is responsible for electric vehicle use? How?

Knowledge Organiser – Our Changing Climate

Lesson 6: How can we stop global warming? 2/3

Core Knowledge	Revision Questions
• **Vegetarianism** is a mitigation strategy. It involves eating less or no meat, especially beef. This means that less cows are farmed for beef, so less extra methane is released into the atmosphere. • Individuals are mostly responsible for decreasing the amount of meat eaten. In the UK, vegetarianism has become easier as supermarkets have started to sell meat-alternative foods. While these can sometimes be expensive, people can cook vegetable-based meals instead of meat-based meals.	• What is vegetarianism? • Why does eating less or not meat mitigate climate change? • Who is responsible for vegetarianism? How?
• **Afforestation** is a mitigation strategy. It involves planting trees to absorb carbon dioxide for photosynthesis. It could also involve "urban greening", where more plants are grown in cities, where 80% of extra carbon dioxide comes from. • Governments, individuals and NGOs are responsible for afforestation. For example, governments can buy large areas of land to protect forests from deforestation or regrow them.	• What is afforestation? What is urban greening? • How does planting trees mitigate climate change? • Who is responsible for afforestation. How?
• City governments can stop green space on the edge of cities being built on. These protected areas are called "green belts". Meanwhile, people living in cities can choose to grow more plants in gardens or on balconies. NGOs, such as #TeamTrees, are often responsible for small scale afforestation projects outside cities.	

Knowledge Organiser – Our Changing Climate

Lesson 6: How can we stop global warming? 3/3

Core Knowledge	Revision Questions
How can people adapt to climate change? • Adaptation strategies accept the effects of climate change, so aim to help people survive and thrive in a warmer climate.	• What is the aim of adaptation strategies?
• **Coastal defences** are an adaptation strategy. They often involve building "sea walls" between coastal settlements and the sea. This reduces the risk of the city being submerged when sea-level rises.	• Give one example of a coastal defence. • How can coastal defences help coastal settlements adapt to climate change?
• **Desalination** is an adaptation strategy. It involves removing salt from seawater so it can be drunk. This means that people do not need to use fresh water from underground. On low-lying islands like Kiribati, this underground water could mix with seawater as sea-level rises.	• What is desalination? • How can desalination help low-lying islands adapt to climate change?
• Coastal defences and desalination plants are expensive. This means that governments need to build them. Often, governments in LICs cannot afford them. For example, the Kiribati Government is relying on the World Bank, an NGO, to give $60 million of aid for a new desalination plant. Its older desalination plants, which cost less, often break. Meanwhile, the Netherlands spends over $1 billion on coastal defences each year.	• Where are most high quality coastal defences and desalination plants built?
• Using **new crops** is an adaptation strategy. Scientists are creating crops which can survive high temperatures and low precipitation. This means that farmers can keep growing crops for themselves and to be sold.	• How can using new crops help farmers adapt to climate change?