**Unit 2: Global climate – vulnerability and resistance**

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| **2.1 Causes of global climate change**  Key aims of this unit: | Tick when you have a clear understanding |
| I know the basic structure of Earth’s atmospheric system and how this creates the natural greenhouse effect. |  |
| I understand that an energy balance exists in the atmosphere due to incoming shortwave and outgoing longwave radiation being balanced. |  |
| I understand that the energy balance can be changed due to variations in solar radiation through processes such as global dimming due to volcanic eruptions. I understand that feedback loops occur in response to these processes. |  |
| I understand that the energy balance can be changed due to changes in terrestrial albedo and the feedback loops that occur. |  |
| I understand that the energy balance can be changed due to methane gas release and the feedback loops that occur. |  |
| I understand the process of the enhanced greenhouse effect. |  |
| I understand that human emissions of greenhouse gases vary internationally due to economic development, globalization and trade. |  |
| **Synthesis, evaluation and skills opportunities**  I can explain how the climate system is dynamic and complex and that different processes and feedback mechanisms interact across space to produce outcomes which may be hard to predict. |  |

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| **2.2 Consequences of global climate change**  Key aims of this unit: | Tick when you have a clear understanding |
| I know that global climate change will affect places, societies and environmental systems. |  |
| I can explain the terms **hydrosphere**, **atmosphere** and **biosphere**. |  |
| I can explain how water is stored in ice and oceans and how changes in this can lead to changing sea levels. |  |
| I can explain how carbon moves around the earth – and how it can be stored in ice, oceans and the biosphere. |  |
| I can discuss how changes is the hydrosphere and atmosphere can lead to extreme weather events, including drought. |  |
| I can explain how climate change can lead to spatial changes in where we find different biomes and habitats, and how this can affect animal migration patterns. |  |
| I can explain how climate change can lead to changes in agriculture by affecting crop yields, limiting where humans can cultivate certain species, and causing erosion in places it may not have occurred before. |  |
| I can discuss how the changes given above can impact on people’s lives and their environments, possibly leading to health hazards. |  |
| I can discuss how migration might occur as a result of climate change. |  |
| I can explain the opportunities that climate change might bring with regards to ocean transport routes, but that this comes at an environmental cost. |  |
| **Synthesis, evaluation and skills opportunities**  I can explain the uneven distribution of effects and the uncertainty of the timing, scale, and impacts of these effects on individuals and societies. |  |

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| **2.3 Responding to global climate change**  Key aims of this unit: | Tick when you have a clear understanding |
| I understand that different societies may be more or less exposed to climate change risks. |  |
| I can explain how a society’s vulnerability will be increased or decreased depending on their location, wealth, social differences (age, gender, education) and risk perception. |  |
| I understand that governments are leading adaptation and mitigation strategies. |  |
| I can describe the global government strategies being developed which recognize that the source/s of greenhouse emissions may be spatially distant from the countries most impacted and so are trying to address this. |  |
| I can explain how government-led carbon emissions offsetting and trading work and what the benefits and limitations of them may be. |  |
| I can discuss the role of technology in responding to climate change and some geo-engineering techniques being developed. |  |
| I understand that as well as government-led initiatives, civil societies and corporations are also developing strategies to address climate change and I can use examples to show what they are doing. |  |
| **By the end of this unit you should have:** |  |
| Detailed examples of two or more societies with contrasting vulnerability |  |
| A case study of the response to climate change in one country focusing on the actions of non-governmental stakeholders |  |
| **Synthesis, evaluation and skills opportunities**  I can discuss why the many perspectives and viewpoints may be different about the need for, practicality and urgency of action on global climate change. |  |

**Unit 2: - Glossary**

**acidification** - the change in the chemical composition of soil (mainly a change in pH value) which may trigger the circulation of toxic metals.

**advancing and retreating coastlines –** coastlines that are growing/getting larger either due to deposition (of sediment) or a fall in sea level are called advancing coasts. Retreating coasts are those that are getting smaller/disappearing either due to erosion or to a rise in sea level.

**afforestation** - planting seeds or trees to make a forest on land that has not been a forest recently, or which has never been a forest.

**albedo** - the proportion of solar radiation that is reflected by a particular body or surface. Snow has a high albedo (is reflective) and does not absorb heat, whereas concrete has a lower albedo (is less reflective) and absorbs heat from the sun.

**aquifer** – a permeable rock that will hold water and allow its passage

**anthropogenic –** human-related processes and/or impacts.

**arid –** areas with less than 250mm of precipitation per year.

**atmosphere –** is an open energy system receiving energy from both sun and earth. It is 500km wide and is made up of 4 distinct layers: troposphere, stratosphere, mesosphere, and thermosphere.

**biodiversity** - the diversity of plant and animal life in a particular habitat or in the world as a whole

**biodiversity hotspot** – an area with a particularly high level of biodiversity eg Amazon Rainforest

**biome** - a naturally occurring organic community of plants and animals

**biosphere -** the regions of the surface and atmosphere of the earth or another planet occupied by living organisms

**carbon sink** – an environmental reservoir that absorbs and stores more carbon than it releases

**climate change** - long-term sustained change in the average global climate

**conduction** - the transfer of heat by contact

**convection** – the transfer of heat by the movement of a gas or liquid

**deforestation** - the process of destroying a forest and replacing it with something else, especially by an agricultural system

**desertification** - the gradual transformation of habitable land into desert

**dust storms** – a severe windstorm that sweeps clouds of dust across an extensive area, especially in arid (hot and dry) regions

**ecosystem** - a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit

**energy balance** – the natural phenomenon whereby the energy entering Earth’s atmosphere equals the energy leaving it, thereby keeping the temperature relatively constant over time

**energy budget** - the balance between incoming solar radiation and outgoing terrestrial radiation which prevents earth from heating up or cooling down if insolation increases or decreases

**(natural) Greenhouse Effect** - the process by which certain gases (water vapour, carbon dioxide, methane and chlorofluorocarbons) allow short-wave radiation from the sun to pass through and heat up the earth but trap an increasing proportion of long-wave radiation from the earth. This radiation leads to a warming of the atmosphere. This is a natural process but is being enhanced by human-made greenhouse gases causing warming.

**enhanced Greenhouse Effect** - This results from human activities which increase the concentration of naturally occurring greenhouse gases and leads to global warming and climate change.

**external forcings** - natural processes both outside and within the atmosphere that can force changes in climate

**global brightening** – an increasing amount of sunlight reaching the Earth’s surface caused by an intensification of solar radiation

**global dimming** – a worldwide decline of the intensity of the sunlight reaching the Earth’s surface, caused by air pollution and natural events (eg volcanic ash)

**global warming** - the increase in the average temperature of the Earth's near-surface air in the 20th and early 21st centuries and its projected continuation

**groundwater** - water found below the surface which is not combined chemically with any minerals present

**hydrosphere -** all the waters on the earth's surface, such as lakes and seas, and sometimes including water over the earth's surface, such as clouds

**insolation** - the heat energy from the sun consisting of the visible spectrum together with ultraviolet and infrared rays. INcoming SOLar radiATION

**longwave radiation –** the energy radiating from the Earth as infrared radiation at low energy to Space. Shortwave radiation is usually absorbed by objects on earth then re-emitted back to space as longwave radiation with less energy. It’s ‘visible’ as infra-red.

**negative feedback** – occurs when a system adjusts itself in ways that lessen or cancel out the effect of the original change. Feedback triggers changes which act in the opposite direction.

**overgrazing** - the grazing of natural pastures above the livestock carrying capacity

**ozone layer –** a region of the upper atmosphere containing relatively high levels of ozone, located mostly within the stratosphere, with the greatest concentrations occurring from about 15 to 30 km above the Earth's surface. The ozone absorbs large amounts of solar ultraviolet radiation, preventing it from reaching the Earth's surface. This protects living cells from UV.

**positive feedback** – knock-on effects in natural systems which amplify/increase changes which have already started to occur. A change in one element of a system may upset the overall equilibrium thereby leading to changes in other elements which reinforce what is happening.

**reforestation** - re-establishing a forest after its removal

**salinization** - the condition in which the salt content of soil accumulates over time to above normal levels; occurs in some parts of the world where water containing high salt concentration evaporates from fields irrigate with standing water

**shortwave radiation** – the energy emitted from the **sun** which has short wavelengths in the visible light and ultra-violet spectra. It has a lot of energy because the sun has a lot of energy to give off. Radiation emitted from hot bodies.

**soil degradation** – a severe reduction in quality of soils. The term includes soil erosion, salinization and soil exhaustion (loss of fertility)

**solar forcing** – radiative forcings (changes) caused by changes in incoming solar radiation

**sustainable agriculture** - agricultural systems emphasising biological relationships and natural processes, which maintain soil fertility - thus allowing current levels of farm production to continue indefinitely

**tropical rainforest** - a forest found near the equator, typically characterised by high temperature and rainfall, poor soil, and a high diversity of plant and animal species

**troposphere** – the lowest layer of the atmosphere

**water table** – the top of the water-saturated part of a permeable rock. During periods of very high rainfall the water table may extend into the soil and possibly reach the surface of the ground. This may make it available for use by people.

**List any other useful terms here:**