UNIT 10: Human influences on the environment.

Recommended Prior Knowledge: Students should have covered Unit 9 before beginning this Unit.

Context: This Unit builds on ideas studies in Unit 9, and brings together knowledge from many other areas of the syllabus such as cell division.

Outline: General features of population growth are considered, before looking in particular at problems associated with human population growth. A number of different effects of the growing human population on the environment are then considered. Some of these are complex issues, with no straightforward answers, and students should be encouraged to discuss and debate them. There is some opportunity to interpret data from population graphs and pollution data.

	Learning Outcomes	Suggested Teaching Activities	Resources
IV 4	Population size • Define population as a group of organisms of one species, living in the same area at the same time • State the factors affecting the rate of population growth of an organism (limited to food supply, predation and disease), and describe their importance. • Identify: - the lag, - the exponential (log) - the stationary - the death phases in the sigmoid population growth curve for a population growing in an environment with limited resources. • Describe the increase in the human population size and its social implications. •	Adequate food will enable the organisms to breed and to produce more offspring. A shortage of food can result death, emigration and a decrease in the population. Predation can illustrate the delayed effect of the population and graphs to illustrate this are helpful. The interrelated populations of the snowshoe hare and the lynx in Canada is a clear example. Disease can spread quickly in crowded populations like myxomatosis that killed many rabbits in the UK about 40 years ago. The class could discuss how populations grow . Simple sketch graphs should be drawn to illustrate population growth, and possible factors that might cause a levelling off in population growth should be considered. The ideas developed in the previous section are now applied to human population growth. Graphs showing how the human population has changed over the last two centuries and predictions for the future should be drawn. Students could be introduced to population pyramids and their interpretation for their own country.	

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IV 4	• Interpret graphs and diagrams of human population growth.	Comparisons could be made between developed and less developed countries and this would form a link with Geography for some students. They should discuss the possible implications of continued growth of the world human population, if possible with reference to particular examples, collected from newspapers and other sources of up-to-date information and data. To include food and water shortages. Reference to Unit 7 1.4, contraception.	
IV 4	Supplement • Explain the factors that lead to - the lag phase, - exponential (log) phase - stationary phase in the sigmoid curve of population growth making reference, where appropriate, to the role of limiting factors.	Limiting factors affect the size of the population such as lack of food when the population is too big for the available resources. Lack of oxygen may affect a fish population in a polluted lake.	
IV 5.	Human Influences on the ecosystem • outline the effects of humans on ecosystems, with emphasis on examples of international importance: - tropical rain forests - oceans - important rivers	This should be related both to the students' own country, and to other countries in the world. Students should be able to refer to one specific example of pollution in rain forests, oceans and important rivers. There are many relevant web sites relating to human influences on the environment although poor coverage in most IGCSE text books. Ideas to consider are the introduction of machinery : tractors to replace draught animals, specialised machinery to sow and to harvest crops like carrots and wheat. The increasing use of pesticides and fertilisers. The breeding of new high-yielding crop varieties. .	
V 5.1	Agriculture • List the undesirable effects of deforestation: - extinction - loss of soil - flooding - carbon dioxide build up • Describe the over-use of fertilisers	Deforestation may already have been considered in relation to the carbon cycle, and more wide-ranging effects should be considered, such as loss of habitat and biodiversity and the increased soil erosion and flooding. The flooding of the river Indus in Pakistan in 2010 could be discussed or the Three Gorges dam on the Yangtze River in China. Again, it is a good idea to try to introduce at least one specific example, as well as discussing the problems in general.	

	Learning Outcomes	Suggested Teaching Activities	Resources
	to include - eutrophication of lakes and rivers	The use of fertilisers containing nitrate can be concentrated on here, and related back to the nitrogen cycle (dealt with in Unit 9). Ensure that students realise that both organic (for example manure) and inorganic fertilisers can cause pollution problems. Leaching into waterways, and subsequent eutrophication, should be described and explained.	
IV 5.2	Supplement • Discuss the effects of non-biodegradable plastics in the environment • Discuss the causes and effects on the environment of acid rain and the measures that might be taken to reduce its incidence • Explain how increases in greenhouse gases, carbon dioxide and methane are thought to cause global warming.	Non-biodegradable materials will be detrimental to the environment if they are put in land fill sites. There is also a problem of too many huge land fill sites in many countries. Biodegradable plastics are being produced that are slow to be decomposed but this is an improvement on the removal of plastic waste and its recycling. Explain why plastics will produce air pollution if they are burnt in an incinerator. The environmentally friendly option is to recycle materials such as paper, glass, metal and batteries. This reduces environmental pollution and saves energy in production costs although there is some disagreement about paper recycling as the chlorine to bleach the paper and the temperature required require energy. Students should understand that acid rain is caused by sulphur dioxide (released from the burning of oil and coal, for example in power stations) and nitrogen oxides (present, for example, in car exhausts). They should know something of the biological effects of acid rain. Discussion about the effect of greenhouse gases on climate should be discussed. The fact that no agreement has been made globally is relevant and many students will have an opinion on this problem that has many factors to be considered besides burning of wood and fossil fuels.	
IV 5.3	Conservation • Describe the need for conservation of: - species and their habitats - natural resources: water - and non-renewable materials including fossil fuels	It is best to look at some specific examples, either relating to the students' home country, or of international importance such as: tigers in India, elephants in Africa, Sun bears from Cambodia or orang-utans in Borneo. The influence of humans and the need for populations to maintain their viable numbers could be discussed. The importance of maintaining biodiversity on the planet for ecosystems, chemical compounds used for medicines and for their genetic diversity. Tropical rainforests have millions of species that should be preserved.	

	Learning Outcomes	Suggested Teaching Activities	Resources
	Supplement • Explain how limited and non-renewable resources can be recycled: - recycling of paper - treatment of sewage to make the water that it contains safe to return to the environment or for human use.	The practice of recycling and its importance is covered in many aspects throughout the IGCSE courses. Emphasis could be given to metals, batteries, glass as well as paper. Students should learn how sewage is dealt with in their own local area, and there may be an opportunity to visit a sewage treatment plant, or to obtain information from the water company responsible for this.	