(IGCSE) (Environmental Management) (0680/02)
(unit 4): (Biosphere)

Recommended Prior Knowledge
The main requirement is knowledge of certain biological processes, well covered in GCSE biology textbooks. Geography GCSE text books include sections on natural ecosystems (and sometimes soils), but their emphasis is on surface features rather than biological processes. The latter are more useful for population, differences in development between countries and world trade. An awareness of the the natural world and how wildlife habitats are being destroyed and changed by humans, due to population growth and higher levels of technology

Context
This is the largest of the four units, with considerable variety in content. As the natural systems studied in units 1-3 directly affect all plants and animals living on Earth, including humans, it makes good sense to study the biosphere unit last. Case studies and practical tasks are included where appropriate. Opportunities for local investigations of plant and animal habitats are also given, for an ecosystem, vegetation succession, food chain and food web,

Outline
In order to maintain continuity in study, three topic themes are identified and followed through the content columns in the syllabus. They are first **ecosystems, biomes and types of vegetation**, then **human activities – impacts and strategies for conservation**, and finally **population and economic development**. The arrangement for each one mainly follows syllabus assessment objectives, but in places use of an alternative approach could be considered preferable for facilitating study. Within human activities, for example, there are topic themes which might benefit from individual, separate study. The theme of forest clearances is one. It can be followed through from factors influencing clearance over time in 24.1, to the effects of loss of habitat in 25.2, followed by causes and consequences of rapid deforestation in 27.1, then sustainable forest management techniques and alternatives to deforestation in 30.2 and 30.3. Tourism is another suitable topic; the impact of tourism in 25.3 is naturally followed by managing tourism in 29.4, as also is population (population growth in 23.1, consequences in 26.1 and strategies for management in 29.1. Throughout opportunities are provided for students to use and further develop their practical skills, such as drawing graphs, diagrams and labelled sketches. Students are encouraged to keep up to date with current world events and changes. The big issues within biosphere include deforestation (especially tropical rainforests), habitat loss, reduced biodiversity and land degradation, most of which are related to rising world population and rapid urbanisation. There is the separate issue of the widening development gap between rich and poor. Within agriculture there is the great debate about use of GM (genetically modified) crops.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
	Ecosystems, biomes and types of vegetation		
20.1	The concept of an ecosystem	To review and extend the introductory work on ecosystems in the hydrosphere unit. To demonstrate the importance of both biotic and	**Environmental Management** John Pallister Oxford University Press, Karachi Pakistan

AO	Learning outcomes	Suggested Teaching activities	Learning resources
		abiotic elements to the system. To give students the opportunity to draw a systems diagram to show energy flows.	ISBN (10) 019 597785 8 page 176 **GCSE Biology** D.G. Mackean John Murray page 255 **Longman Geography for GCSE** pages 94-96
20.2	Organisation within an ecosystem	To ensure that students understand the key syllabus terms, namely population, community, habitat and niche, and how they are organised in well ordered, integrated and competitive communities. Local investigation – students can be taken to observe a nearby ecosystem and asked to draw a labelled field sketch to describe its main features.	**Environmental Management** page 177 **GCSE Biology** D.G. Mackean pages 253-254
20.3	Physical factors	To introduce students to the physical factors which most affect life on Earth – sunlight, weather and climate (temperature, rainfall, wind), water supply and soils (characteristics, nutrients, pH). To emphasise how physical factors vary greatly from place to place. To give examples of plant characteristics for survival in different environments. Students could then be asked to investigate contrasts in plant and animal adaptations between two contrasting physical environments – for example, hot deserts (great heat but shortage of water) and hot wet tropics (heat and plentiful water all year), or for any two other contrasting environments, at any scale.	**Environmental Management** pages 178-180 **GCSE Biology** D.G. Mackean pages 232 and 256-257
20.4	Relationships of living organisms	First to focus first on the main theme – how living organisms depend on each other for survival. To illustrate this by referring to pollination, dispersal of fruits and seeds, and vegetation succession. To study a plant succession (possibly in the local area), and ask students to draw a labelled sketch or a section diagram from pioneer community to climax vegetation. Secondly to focus upon food chains and food webs, distinguishing producers from consumers. To explain why there is a pyramid of numbers from many producers to only a few tertiary consumers. For students to draw pyramids and food web flow diagrams for examples.	**Environmental Management** pages 181-185 **GCSE Biology** D.G. Mackean pages 69-70, 224-226 and 232-233
20.5	Energy flow	To stress the importance of photosynthesis for life on land and explain	**GCSE Biology** D.G. Mackean pages 35-39

AO	Learning outcomes	Suggested Teaching activities	Learning resources
		how the process operates. To illustrate by means of examples how and why energy losses occur higher up the food chain.	**Environmental Management** pages 18
		For students to research a food chain and food web in their home and draw a diagram to show it.	Environmental Management 0680/02 May/June 2005 Questions 1(a)(b) Past Paper
20.6	Nutrient cycling	For students to draw a flow diagram to show how nutrients are recycled in an ecosystem. To explain why the fastest and largest nutrient cycling occurs in tropical rainforests. To make special studies of the carbon and nitrogen cycles named in the syllabus.	**Environmental Management** pages 187-189 **GCSE Biology** D.G. Mackean pages 227-229

Natural Economy 0670/02 Oct/Nov. 2003 Question 1(c) May/June 2000 Question 1(e) Past Papers |
| 20.7 | Resource potential | To give a brief introduction to biomass and variations in productivity between different ecosystems / biomes. To concentrate on biodiversity – definition, why it is greatest in tropical rainforests, and its importance as a genetic resource (for crop seeds and drugs against human disease). | **Environmental Management** pages 190-191 |
| 21.1 | The distribution and main characteristics of natural vegetation zones (biomes) and relationship to climatic zones | To begin with a study of a world map of major natural vegetation zones in an atlas. To note the location and extent of the six biomes named in the syllabus. To compare their distribution with a map of world climate regions (all except monsoon were studied in the earlier Atmosphere unit) and to note the similarities between them. To ask students to draw a sketch map to show the distribution of biomes in their home continent. For students to prepare outline climatic information for each of the biomes (as previously advised in the atmosphere unit) before studying the main vegetation characteristics of each of the six biomes and how they are related to climate. To recognise and describe characteristic features of biomes from photographs of natural vegetation cover. | **Environmental Management** pages 213-219 **Longman Geography for GCSE** pages 94-95

Environmental Management 0680/02 Oct/Nov. 2003 Questions 1(a)(b) Natural Economy 0670/02 May/June 2002 Questions 1(a)-(e) Past Papers |
| | **Human activities – impacts and strategies for conservation** | | |
| 22.1 | How different types of human society use and value their natural environment | To provide students with background information about the range of human activities; the syllabus names examples from the primary, secondary and tertiary sectors. To illustrate reduced dependence on the | **Environmental Management** pages 192-194

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AO	Learning outcomes	Suggested Teaching activities	Learning resources
		natural environment from hunter-gatherer (total dependence) to industry and tourism (much lower dependence), in line with greater economic development. To study differences in employment patterns between developed and developing countries. For students to research data about percentage employment in primary, secondary and tertiary in the home country and display them in a pie graph.	May/June 2005 Question 1(c) Natural Economy 0670/02 Oct/Nov. 2003 Question 1(d) May/June 2002 Questions 1(g)-(h) Past Papers
22.2	The increasing ability of humankind to create artificial environments as a result of economic and technological development and social and cultural change	To begin by asking students to look back and review the new agricultural techniques which increase yields previously studied in the atmosphere unit. To continue with the main theme of increasing human impact for greater and more assured food supplies by examining past developments which allowed this to happen like domestication of plants and animals to replace hunter-gatherers, as well as ongoing modern technological change with genetic engineering and GM crops. To make students aware of differences between earlier HYVs and new GM crops. To initiate student investigation about GM crops from web sites by giving guidance about what to search for, such as main countries of growth, main types of crops, how and why they increase output, objections to their growth and use for food in Europe.	**Environmental Management** pages 194-197 **GCSE Biology** D.G. Mackean pages 215-217 http://www.bbc.co.uk/GMcrops
24.1	Factors influencing the clearance of natural vegetation over time	Organise students into groups for a brainstorm session **Different reasons why people clear forests and natural vegetation**. Groups to make a visual presentation based on a summary of reasons shown on a spider diagram. To provide students with data by continent for world forest or tropical rainforest clearances, which can be plotted in graphs. For students to make a case study investigation of the causes of forest clearances in a country where deforestation is an issue, such as Brazil or Indonesia.	**Environmental Management** pages 219-223 **Longman Geography for GCSE** pages 100-101 Environmental Management 0680/02 May/June 2004 Questions 1(f)(g) Past Paper http://news.bbc.co.uk/2/hi/americas/7206165.stm
25.1	Habitat destruction, loss of biodiversity, genetic depletion	To link back first to the earlier work on biodiversity and its great importance. To make students aware of how species loss is being speeded up by humans, linking it to habitat destruction from forest clearance and other activities such as dam building.	**Environmental Management** pages 190-191

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25.2	The effect of loss of habitat on wildlife and on the food chain	To follow up this work by asking each student to draw up a list of reasons why forests, wetlands and other natural habitats are worth preserving. For students to investigate a natural habitat under threat in their home region or own country.	**Environmental Management** pages 198-
25.3	The impact of tourism	To give background information about the growth of tourism in general, and reasons for the increasing numbers visitors to developing countries. To examine some of the unfavourable impacts of tourism. To organise students into small groups with the task of making full lists of the advantages and disadvantages of tourism; then for students individually to reorganise the lists under headings such as environmental and economic.	**Environmental Management** pages 200-203
27.1	Causes and consequences of rapid and progressive deforestation	To link causes back to what was studied in 24.1. To extend the work to include general consequences of deforestation, linking into work on air pollution and climate change in atmosphere (unit 3), and soil erosion and desertification in 27.2.	**GCSE Biology** D.G. Mackean page 239 **Longman Geography for GCSE** page 97 Environmental Management 0680/02 May/June 2005 Questions 1(d)-(g) Natural Economy 0670/02 Oct/Nov. 2003 Questions 1(e)-(h) Oct/Nov. 2001 Questions 1(c)-(d) Past Papers
27.2	Causes and consequences of soil erosion and desertification	To make students aware that soil erosion is a natural process which is speeded up by humans. To advise students to separate physical causes (dry climate, lack of natural vegetation cover, steep slopes) from human causes (vegetation clearances, overgrazing, overcultivation, poor farming techniques and population pressure) and consequences into environmental and economic. To show students photographs of several different rural areas (for relief and land uses) and ask them to estimate how high are the risks of soil erosion; alternatively this could be done by visiting a rural area in the home region.	**Environmental Management** pages 226-228 **GCSE Biology** D.G. Mackean pages 239-241 Environmental Management 0680/02 Oct/Nov. 2007 Question 1(g) May/June 2006 Question 2(b) Past Papers
28.1	Strategies for conservation of	To introduce students to strategies for the sustainable harvesting of wild	**Environmental Management** pages 203-206

AO	Learning outcomes	Suggested Teaching activities	Learning resources
	biodiversity and the genetic resource	plants and animal species, and gene banks. For students to investigate world biosphere reserves from the MAB (Man and Biosphere) programme part of the UNESCO web site and write an account using suggested headings such as reasons for their creation, locations and conservation benefits.	http://www.unesco.org/mab http://www.amazonteam.org Natural Economy 0670/02 May/June 2002 Question 1(g) Past Paper
28.2	World conservation strategies and legislation	To provide background information about the types of conservation work undertaken by international agencies. To make students aware of the diverse nature of the four agencies named in the syllabus as well as their areas main areas of interest. For students to research the interests and activities of one international organisation, either from those named in the syllabus, or for one that is active in the home country.	**Environmental Management** pages 211-212 **GCSE Biology** D.G. Mackean pages 247-248 UNEP http://www.unep.org IUCN http://iucn.org WWF http://www.panda.org http://www.mungabay.com
29.4	Managing tourism	To begin with definitions of national park and eco-tourism. To describe how these can be used to conserve species and environments and to study an example of each. Student investigation - nature reserves and/or national parks in the home country or region. Suggest that they show locations on a map and describe the environments and habitats which are being protected.	**Environmental Management** pages 207-210 http://www.ecotourism.org.
30.1	Strategies for soil conservation	To organise the strategies listed in the syllabus under three headings for study – mechanical methods which change the land surface and farming landscape (terracing, contour ploughing, windbreaks), changes in farming practices (dry land farming, tree planting), and community solutions (integrated rural development programmes, land reform, community participation).	**Environmental Management** pages 231-232
30.2	Sustainable forest management techniques	To demonstrate how and why it is easier to replant and mange softwood temperate coniferous forests than hardwood tropical forests. To examine ways for more sustainable use and management of tropical rainforests such as methods of sustainable logging, agro-forestry and community forestry. For students to make a summary check list of sustainable methods.	**Environmental Management** pages 224-226 **Longman Geography for GCSE** page 99
30.3	Alternatives to deforestation	Class activity – **How can people save the world's forests** To design	

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		posters and displays promoting methods of conservation including re-use and recycling, alternative sources to timber for building and construction, and for fuelwood.	
	Population and economic development		
23.1	Population growth	To provide students with world population totals at key dates from 1800 for drawing a line graph, to identify different rates of growth before and after about 1950. To introduce students to the four population terms in the syllabus for population growth (birth rate and fertility rate, death rate and infant mortality rate). Explain how the rate of natural increase can be calculated. Students can be given the task of calculating rates of natural increase for a selection of developed and developing countries, including their own country for comparison.	**Environmental Management** pages 233-235 **GCSE Biology** D.G. Mackean pages 261-262 http://www.un.org/esa/population/wpp2003/countries Environmental Management 0680/02 Oct/Nov. 2007 Questions 1(a)(b) Oct/Nov. 2005 Question 2(a) May/June 2004 Questions 1(a) and 1(b)(i) Past Papers
23.4	The model of demographic transition and its limitations	To introduce students to the five stages of the model, emphasising where it shows the largest natural increases, but also pointing out the more recent natural decrease in stage 5. To give students the opportunity to draw the diagram and make a table below it to give an outline summary for each stage. To identify the stage in the model for their own country. To conclude with the model's advantages and disadvantages.	Natural Economy 0670/02 Nov. 2000 Question 1(b) Past Paper
23.2	Population structure	To guide students into the best technique for interpreting population pyramids i.e. look first at the base (decide whether it is narrow or wide), look next at the top (decide whether it is high with some width, or low and narrow), before looking at the overall shape (whether triangular or straight up and down). Give students two contrasting pyramids for study, one for a developing country with a young and rapidly growing population and the other for a developed country with an ageing population. To obtain population data by age groups for the home country, from which students can draw a population pyramid and analyse the home country's main population characteristics.	**Environmental Management** pages 237-239 **GCSE Biology** D.G. Mackean page 263

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23.3	Migration	To provide students with a list of factors for migration, for them to separate out into push and pull factors. To make a special study of factors for rural to urban migration, the main type of migration in developing countries. To organise students into small groups, with the task of examining the relative strength of push and pull factors for different types of migration. For students to investigate push and pull factors for the main type of migration in their country.	**Environmental Management** pages 239-2 http://news.bbc.co.uk/1/hi/world/americas/5342168.stm
26.4	Urbanisation	To provide students with an accurate definition of urbanisation. Ask students to find the top 10 (or 20) cities in the world by size, then plot them on an outline world map before commenting about their distribution between the developing and developed worlds. To review previous work on the big difference in service provision between rural and urban areas, such as for water supply and sanitation (hydrosphere AO 10.2), to help explain the scale of rural to urban migration. To concentrate on the urban problems listed in the syllabus, and use a big city in the home country or world region as a specific example.	**Environmental Management** pages 241-243 http://world-gazeteer.com http://www.sin.org.uk/blowmedown/shanty Environmental Management 0680/02 May/June 2006 Questions 2(c)(i)(ii) Oct/Nov. 2005 Questions 2(b)-(d) Past Papers
26.1	Social, economic and environmental implications of population growth rates and structures	To ask students to summarise in a table the environmental problems (already covered) either caused or made worse by population growth. Headings can be suggested for guidance such as loss of natural vegetation, pressure on water sources and supplies, water and air pollution and soil damage from over-farming in rural areas. To show students a population pyramid of an urban area fro them to identify differences in population structure, especially the bulge in numbers of working age from rural to urban migration, and the implications.	**Environmental Management** pages 244-245 Environmental Management 0680/02 Oct/Nov.2007 Questions 1(c)(d) May/June 2004 Questions 1(c)(d) Past Papers
29.1	Strategies for managing population growth	To begin by introducing students to the range of ways for reducing population growth, in general terms. To study in more detail population policy in two countries to bring out differences in strength of policy and	**Environmental Management** pages 246-248 http://www.un.org/unpp

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		its success. For students to round off the work with a study of population policy in the home country and how successful it has been.	Environmental Management 0680/02 May/June 2004 Questions 1(b)(ii)-(v) Natural Economy 0670/02 May/June 2002 Question 1(f) Nov. 2000 Question 1(d) Past Papers
29.2	Strategies for managing the urban and rural environments	To begin with strategies for managing urban problems, with special study of housing which allows the three named ways in the syllabus to be developed i.e. planning (planned new housing zones inside cities, new towns outside), environmental improvement (authorities providing essential services to slum areas) and community participation (self-help schemes with help from the authorities/organisations/ charities). Students to choose the nearest city or one of the world's big cities as a case study. Brainstorm – students in small groups **Ways to improve standards of living and quality of life in rural areas**. To name ways, discuss them and arrange them in order of importance for people in rural areas, to reduce the strength of push factors for continuing rural to urban migration.	**Environmental Management** pages 248-253 http://www.geographyinthenews.rgs.org/news/article/?id=282 Environmental Management 0680/02 May/June 2006 Questions 2(c)(iii) and (d) Oct/Nov. 2005 Questions 2(e)(f) Past Papers
26.2	Measures of world poverty and the North-South divide	For students to study the course of the dividing line between 'rich North' and 'poor South' on a world map, and to note which continents make up the developed and developing worlds. To introduce students to examples of measures of development to include economic (e.g. GDP per head) and socio-economic measures (e.g. housing, health and nutrition). To obtain data for the home country such as GDP per head, percentage access to safe water, infant mortality rate. For students to analyse what the data shows and suggest the relative wealth of the home country in world terms.	**Environmental Management** pages 254-257 **Longman Geography for GCSE** pages 192-193 and 200-201 http://www.cia.gov/the-world-factbook Environmental Management 0680/02 Oct/Nov. 2007 Question 1(e) May/June 2006 Question 2(a) Past Papers

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26.3	The implications of the cycle of poverty, as it affects individuals and communities, for the environment	For students to study and draw examples of poverty cycles leading to family poverty (e.g. from lack of access to safe water leading to disease and inability to work, or from malnourished babies, high infant mortality and high birth rates) and environmental damage (e.g. overuse of farmland leading to soil erosion, desertification and salinisation).	**Environmental Management** page 257
29.3	Strategies for overcoming world inequalities	To revise previous work about why world trade favours developed at the expense of developing countries (from unit 3 AO 15.7). To make students aware of the aims and objectives of the Fair Trade movement. To concentrate on the topic of Aid to countries, distinguishing between short- term (relief, emergency, food) aid and long-term (development) aid, as well as distinguishing between aid from government and non-government sources. For students to investigate the work of one NGO (non-governmental organisation) / charity, working under guided headings such as 'countries of operation', 'sources of funds', 'types of work' and 'special study of one project' – perhaps for one which operates in the home country.	**Environmental Management** pages 258-261 **Longman Geography for GCSE** pages 197-199 http://www.fairtrade.org.uk http://www.oxfam.org.uk http://www.unicef.org.uk Environmental Management 0680/02 Oct/Nov. 2007 Question 1(f) Past Paper