

## (IGCSE) (Environmental Management) (0680/02) (unit 2): (Hydrosphere)

### Recommended Prior Knowledge

An understanding of some processes from physical geography, hydrology and biology. While many physical geography text books for the GCSE include elements of all three, typically they contain limited detail on diseases and life cycles in the oceans. Supplementary information can be obtained from GCSE science text books. An appreciation of the importance of supplies of fresh water (as an increasingly limited natural resource), and of the role of dirty water in spreading diseases and perpetuating poverty in the developing world. Awareness of increasing concern about the over-exploitation of marine resources.

### Context

Although not essential, a good case can be made out for studying this unit second. Information about the water cycle, flooding, drought and ocean currents provides a link with the later atmosphere unit. A similar link exists between water cycle and ecosystems, before the latter becomes a more specialised study in the biosphere unit. Case studies are suggested, but it might be considered desirable to replace or supplemented these with examples more local to the Centre, or that are more topical at the time of study.

### Outline

The syllabus lay out for Hydrosphere is the same as for unit 1 Lithosphere. Separate topic areas within the Hydrosphere unit are followed through the four syllabus columns. Content in column 1 is based on how natural cycles operate – first on the land, and then in the oceans. How people use fresh water and exploit ocean resources are the main themes running through column 2. The effects of human activities and actions are examined in column 3, before management strategies for control and improvement are identified in column 4. The syllabus content is naturally divided into two parts, between water on the land and in the oceans, which makes for two separate studies. Within each of the two parts, it makes sense to follow related themes through the columns; for example, to begin with natural sources of fresh water in column 1, and follow it through to human demand and water uses in column 2, to water pollution from human use in column 3, and finally to the safe clean water strategies outlined in column 4. Opportunities for students to re-use and extend their practical skills will continue to be suggested. Students should be encouraged to keep up to date with topical events, such as floods, droughts, oil spills and continuing attempts to find a cure for malaria, a major killer of people living in the tropics.

AO	Learning outcomes	Suggested Teaching activities	Learning resources
	<b>Water on the land</b>		
6.1	How the water cycle operates	A good starting point is to make students aware that only 3 per cent of water on Earth is fresh water, that in terms of human availability it is a scarce resource, since so much is locked up in ice and snow. To give students the opportunity to draw a labelled diagram to show how the water cycle works and understand how the main processes operate. To	<b>Environmental Management</b> John Pallister Oxford University Press, Karachi Pakistan ISBN 10 019 597785 8 pages 58-59

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		investigate source(s) of domestic water supplies and their reliability in the students' home areas	Natural Economy 0670/02 June 1999 Question 1(a) Past Paper Natural Economy 0670/02 Oct/Nov. 2002 Questions 1(a)(b) Past Paper
6.3	The role of the water cycle within ecosystems	To introduce students to the concept of ecosystems, emphasising interdependence, and to the vital importance of fresh water for all life on Earth. To suggest student investigations, such as how vegetation cover affects water cycle processes, and how natural vegetation changes from the Equator to the tropics in response to reductions in rainfall.	<b>Environmental Management</b> pages 60-61  Natural Economy 0670/02 June 1999 Question 1(b) Past Paper Natural Economy May/June 2003 Questions 1(a)(b) Past Paper
6.2	How the natural availability of water varies from place to place	In order to demonstrate to students the wide variations in fresh water availability, world maps in atlases can be studied (e.g. annual precipitation, world water resources per head). Students can be guided to identify areas of high and low water supply, and comment on the relative level of water availability (whether water-rich or water-poor by world standards) for their home country and world region.	<b>Environmental Management</b> pages 62- 64  Natural Economy 0670/02 May/June 2003 Question 1(d) Past Paper
8.2	Competing demands for water	To make students aware that competition operates at different levels – within a country (between water for domestic, industrial and agricultural uses) and between countries (e.g. where large rivers flow through several countries). To obtain water user percentages between sectors for the home country and ask students to display them in a bar graph. For case studies about competing demands for water both within one country and between countries, Egypt and the River Nile Basin or water use from the Rivers Tigris, Euphrates and Jordan in the Middle East are suitable choices.	<b>Environmental Management</b> page 66  Natural Economy 0670/02 June 1999 Question 1(d) Past Paper
8.3	Mismatch between water supply and demand	One approach is to focus upon water-poor countries with rapidly increasing water demands, such as those in the Middle East like Saudi Arabia, the UAE and Kuwait.	<b>Environmental Management</b> pages 65-66

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8.1	Collection and control of water for a variety of uses	<p>To suggest that each student completes a spread sheet or questionnaire about water uses by them and their family (in a day or for a week). Class data can be collected and similarities and differences commented on. Next they can be asked to consider whether (and why) their water use is increasing. Then scale of the work can then be changed, to ask them to give reasons (perhaps working in small groups) why world consumption of water is increasing. To provide them water use statistics for rich and poor continents/countries. Request students to display them in divided bar or pie graphs, and to suggest reasons for differences (i.e. why water use is so much greater in rich countries).</p> <p>To introduce students to the different types of natural water stores; to ask them to draw a labelled sketch of an aquifer and check understanding of the importance of permeable rock. To make a special study of a large dam as an example of a human store (e.g. Aswan High Dam, Three Gorges Dam, or one in the home country or region), suggesting to students that they focus on both costs and benefits. As a whole class discussion, to compare the advantages and disadvantages of large and small dams.</p>	<p><b>Environmental Management</b> pages 69 to 75</p> <p>Natural Economy 0670/02 June 1999 Questions 1(c)(i)-(iv) Past Paper</p> <p><b>Longman Geography for GCSE</b> pages 222-3</p> <p>Natural Economy 0670/02 May/June 2003 Questions 1(g)(h) Past Paper</p> <p>Environmental Management 0680/02 May/June 2007 Questions 1(a)(b)(c) Past Paper</p>
10.2	Contrasts in availability of water in terms of quality, quantity and access	<p>After previous coverage of water availability, to concentrate here on variations in water quality and access (between developed and developing countries, and rural and urban areas within developing countries). To ask students to draw graphs to highlight differences in percentage access to safe water and sanitation between countries and areas. To make a special study of a rural region where lack of access is a major issue. To ask students to draw a spider diagram summarising the reasons why access to safe water is poorer in rural areas.</p>	<p><b>Environmental Management</b> pages 75-76</p> <p>Web sites of charities such as <a href="http://www.wateraid.org.uk">http://www.wateraid.org.uk</a></p> <p>Natural Economy 0670/02 May/June 2002 Question 2(g) Past Paper</p> <p>Environmental Management 0680/02 May/June 2007 Question 1(d) Past Paper</p>
8.4	The ways in which processes operating within the water cycle affect development	<p>To concentrate on the causes and effects of flooding and drought, begin with a reminder of water cycle processes and to identify which one is the principal physical cause of them. To make students aware that humans contribute to causing them as well, by activities which change</p>	<p><b>Environmental Management</b> pages 77-81</p> <p><a href="http://www.bbc.co.uk/floods">http://www.bbc.co.uk/floods</a></p>

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		<p>land uses and alter how some water cycle processes operate. To give students with a list of the effects of flooding and/or drought and ask them to re-order them under particular headings e.g. immediate, short-term and long term. To take advantage of the many case study opportunities, such as for countries most at risk e.g. Bangladesh for floods and African countries in the Sahel such as Niger for drought, or use examples closer to home. In order to guide student investigation, provide a framework of questions such as 'How regular are they?', 'When and why are they most likely to happen?' and 'What kinds of damage do they cause?'.</p>	<p><a href="http://www.bbc.co.uk/drought">http://www.bbc.co.uk/drought</a></p>
10.1	The causes and consequences of water pollution	<p>To begin by directing students towards the three general human causes of water pollution, namely agriculture, domestic and industry, and what they add to groundwater and rivers that causes the pollution. To make a special study of water pollution in the home area – nature of the pollution in two or three different locations, what has caused it, where it is worst and why, whether the authorities have done anything to prevent or reduce it. To introduce students to the process of eutrophication, beginning with a definition and followed by how eutrophication affects natural water ecosystems.</p>	<p><b>Environmental Management</b> pages 81-83</p> <p>Natural Economy 0670/02 June 1999 Questions 1(c)(v)-(vii) Past Paper Natural Economy 0670/02 Oct/Nov.2002 Questions 1(e)(f) Past Paper Environmental Management 0680/02 Oct/Nov. 2006 Question 1(c) Past Paper</p>
12.1	Ways of improving water quantity, quality and access	<p>To study an example of a river which has been improved, to act as an example for how this could be achieved in streams which are still badly polluted. Similarly to make a study of a village or region in the developing world where access to a clean water has been provided.</p>	<p><b>Environmental Management</b> pages 84-85</p> <p><b>ADB (Asian Development Bank) Review</b> January-February 2003</p>
10.3	The cycle of water-related diseases, and their impact on human activities and development	<p>To explain to students the difference between 'water-based', 'water-borne' and 'water-bred' diseases, using the examples named in the syllabus. To ask students to draw a circular flow diagram to show how disease reduces the ability of people to work contributing to the cycle of poverty and the poverty trap. To make a special study of one of these diseases, using headings such as causes, symptoms and consequences for people and their activities. Unless one of the named diseases is locally much more important, the obvious choice is malaria given its virulence and widespread distribution in developing countries.</p>	<p><b>Environmental Management</b> pages 86 to 88 and pages 90 to 91</p> <p>Natural Economy 0670/02 May/June 2001 Question 1(g)(i) Past Paper</p> <p><a href="http://www.bbc.co.uk/malaria">http://www.bbc.co.uk/malaria</a></p>

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12.2	Strategies to control and eradicate water-related diseases	To research statistics for the main causes of death in the home country in order to assess relative importance of water-related diseases.	<b>Environmental Management</b> pages 88-91
7.1	<b>The oceans</b> The role of the ocean as an environment for interdependent ecosystems	To make students aware of the difference between prevention and cure of diseases, and why strategies for prevention are preferable whenever possible. To direct students to work in small groups to think about and discuss the problems of controlling and eradicating water related diseases in poor rural areas in developing countries; to ask them to draw a spider diagram identifying problems in order to summarise their findings.	Natural Economy 0670/02 May/June 2001 Questions 1(g)(ii)-(iii) Past Paper Environmental Management 0680/02 May/June 2007 Question 1(e) Past Paper
7.2	The resource potential of the oceans	To begin with a general introduction to the oceans, marine ecosystems, their resource potential and why they may be vulnerable to over-exploitation. To give students the opportunity to draw an example of a marine ecosystem from primary producers (e.g. phytoplankton), to zooplankton, to larger sized consumers such as fish, seals and whales and finally the top carnivores (e.g. man and polar bears).	<b>Environmental Management</b> pages 92-93
7.2	The resource potential of the oceans	To focus student attention on the continental shelf, because it is the part of the oceans with the greatest resource potential for humans. Begin with an atlas study to determine locations where continental shelves are wide; describe how continental shelves are physically from the rest of the ocean, and explain why they are rich in marine life. To investigate where oil and gas are extracted offshore from an atlas map showing the world's oil fields.	<b>Environmental Management</b> pages 93-94
9.2	Factors that limit full exploitation of the ocean's potential resources	<b>Class activity</b> - to arrange students into two groups, one to discuss reasons why drilling for oil from the sea bed is more expensive and difficult than on land, and the other to come up with reasons why fishing is more hazardous activity than farming. Each group gives a summary of reasons, from which individual students make a list of factors why ocean resources are less easy to exploit fully than those on land.	Environmental Management 0680/02 Oct/Nov. 2006 Question 1(d) Past Paper
7.3	The distribution of ocean currents and	To study an atlas map of oceans showing the currents, to recognise the	<b>Environmental Management</b> pages 94-96

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	their effects	different directions of flow of warm and cold currents, and to note the effects of the continents and prevailing winds on their distribution. For students, to mark and name on an outline map the currents in the ocean(s) closest to their world region. To make students aware of the strong relationship that exists between the presence of ocean currents and the world's richest fishing grounds, and to discover reasons for it. To guide students into the investigation of one example. A good choice would be the Peruvian current and fishing grounds off the coast of Peru, since it links in with the following study of el nino.	
7.4	Reversal of ocean currents e.g. el nino and its effects	To guide students into drawing two sets of directly comparable maps and diagrams to show surface currents and underwater features in the Pacific Ocean, one for a normal year and the other for an el nino year. To explain the effects of this change for weather and human activities both in Peru and the rest of the world. In an el nino year students can keep a note of its effects from sources such as newspapers, TV programmes and news based internet sites.	<b>Environmental Management</b> pages 97-98 <a href="http://www.bbc.co.uk/el_nino">http://www.bbc.co.uk/el_nino</a>
9.1	The environmental and human factors in the distribution and exploitation of the world's ocean fisheries	Begin with a map of the world's major ocean fisheries and identify named areas. Ask students where they can identify close relationships between them and the presence of continental shelves and ocean currents. To research data about total fish catches by country from official websites and draw a graph to show the largest. To initiate a class discussion about the different diets of people around the world – in which countries is fish consumption high, and why? To make a special investigation of fishing in the home country or region to discover whether or not fishing is important and why.	<b>Environmental Management</b> pages 99-101 Natural Economy 0670/02 May/June 2001 Questions 1(a)(b) Past Paper <a href="http://www.FAO.org">http://www.FAO.org</a> – the official site of the United Nations Food and Agricultural Organisation
11.1	The implications of uncontrolled exploitation of marine resources	To introduce students to the problem of overfishing and why it has become a major international issue. To concentrate on the improvements in technology which are leading to rapid reductions in fish stocks. To make students aware that fish stocks also go up and down due to natural causes e.g. in el nino years off the coast of Peru.	<b>Environmental Management</b> pages 101-103 Environmental Management 0680/02 May/June 2004 Question 1(e)(i) Past Paper Oct/Nov.2006 Questions 1(e)(f) Past Paper

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13.1	Strategies for the sustainable harvesting of ocean fisheries	To lead students into describing and explaining the four strategies named in the syllabus, namely net types and sizes, quotas, conservation laws and territoriality (e.g. restricted fishing areas to allow breeding and fish stocks recovery). To emphasise to students that the use of more than one method increases the chances of a better result. To suggest possible case studies for further individual investigation, bearing in mind varying degrees of success (e.g. low success Grand Banks off Newfoundland and EU, high success non-EU countries such as Iceland and Norway), or choose a more local regional example if available. To make suggestions about how fishing can be made more sustainable, such as more international cooperation, better rule enforcement, more campaigns from environmental groups, then to break the students up into discussion groups asking for ideas.	<p><b>Environmental Management</b> pages 103-105</p> <p>Environmental Management 0680/02 May/June 2004 Questions 1(e)(ii)-(iii) Past Paper</p> <p>Oct/Nov. 2006 Question 1(g) Past Paper</p> <p><a href="http://news.bbc.co.uk/2/hi/science/nature/6108414.stm">http://news.bbc.co.uk/2/hi/science/nature/6108414.stm</a></p>
11.2	Causes of marine pollution and its impact on the marine ecosystem and on coastal zones	To identify the main types of materials responsible for marine pollution (nutrients, sediments, pathogenic organisms, plastics and other litter, oil, toxic wastes and radioactive wastes), their main sources and impacts. To guide students into an individual investigation of a major oil spill by providing working headings related to syllabus need, such as location, size of spill, causes, effects on wildlife, effects on people and attempts made to reduce these effects. While a recent spill widely covered by the international news media is always best, some earlier incidents are well documented, such as the Exxon Valdez in Alaska (1989) and during the Gulf War (1991).	<p><b>Environmental Management</b> pages 106-108</p> <p><b>Longman Geography for GCSE</b> pages 236-7</p> <p>Exxon Valdez oil spill <a href="http://evostc.state.ak.us/History/">http://evostc.state.ak.us/History/</a></p> <p>Natural Economy 0670/02 May/June 2001 Question 1(c) Past Paper</p> <p>Environmental Management 0690/02 Oct/Nov. 2006 Questions 1(a)(b) Past Paper</p>
13.2	Marine pollution controls and remedial action	To stress the importance of international cooperation in preventing the disaster from happening in the first place, and in providing equipment and know-how to poor countries after the disaster has occurred. To identify some of the methods used for prevention, such as tankers with	<p><b>Environmental Management</b> pages 109-110</p>

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**Learning outcomes**

**Suggested Teaching activities**

**Learning resources**

a double hull, and for remedial action, such as booms, detergent sprays and skimmers. To look for local, national or regional opportunities for a more detailed study of marine pollution coming from the land, such as from a heavy industrial works next to the sea or from a river entering the sea after passing through large urban / industrial areas.