

## CHAPTER 21

# HUMAN INFLUENCES ON ECOSYSTEMS

The stuff you need to know in this chapter:

### 21.1 FOOD SUPPLY

#### Core

- State how modern technology has resulted in increased food production in terms of:
  - agricultural machinery to use larger areas of land and improve efficiency
  - chemical fertilisers to improve yields
  - insecticides to improve quality and yield
  - herbicides to reduce competition with weeds
  - selective breeding to improve production by crop plants and livestock, e.g. cattle, fish and poultry
- Describe the negative impacts to an ecosystem of large-scale monocultures of crop plants
- Describe the negative impacts to an ecosystem of intensive livestock production

#### Extended

- Discuss the social, environmental and economic implications of providing sufficient food for an increasing human global population
- Discuss the problems which contribute to famine including unequal distribution of food, drought and flooding, increasing population and poverty

### 21.2 HABITAT DESTRUCTION

#### Core

- Describe the reasons for habitat destruction, limited to:
  - increased area for food crop growth, livestock production and housing
  - extraction of natural resources
  - marine pollution
- State that through altering food webs and food chains, humans can have a negative impact on habitats
- List the undesirable effects of deforestation as an example of habitat destruction, to include extinction, loss of soil, flooding and increase of carbon dioxide in the atmosphere

#### Extended

- Explain the undesirable effects of deforestation on the environment

### 21.3 POLLUTION

#### Core

- State the sources and effects of pollution of land and water, e.g. rivers, lakes and the sea, by insecticides, herbicides and by nuclear fall-out
- State the sources and effects of pollution of water (rivers, lakes and the sea) by chemical waste, discarded rubbish, untreated sewage and fertilisers
- State the sources and effects of pollution of the air by methane and carbon dioxide, limited to the enhanced greenhouse effect and climate change



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## **Extended**

- Explain the process of eutrophication of water in terms of:
  - increased availability of nitrate and other ions
  - increased growth of producers
  - increased decomposition after death of producers
  - increased aerobic respiration by decomposers
  - reduction in dissolved oxygen
  - death of organisms requiring dissolved oxygen in water
- Discuss the effects of non-biodegradable plastics in the environment, in both aquatic and terrestrial ecosystems
- Discuss the causes and effects on the environment of acid rain
- State the measures that are taken to reduce sulfur dioxide pollution and reduce the impact of acid rain
- Explain how increases in carbon dioxide and methane concentrations in the atmosphere cause an enhanced greenhouse effect that leads to climate change
- Describe the negative impacts of female contraceptive hormones in water courses, limited to reduced sperm count in men and feminisation of aquatic organisms

## 21.4 CONSERVATION

### **Core**

- Define a sustainable resource as one which is produced as rapidly as it is removed from the environment so that it does not run out
- Explain the need to conserve non-renewable resources, limited to fossil fuels
- State that some resources can be maintained, limited to forests and fish stocks
- State that products can be reused or recycled, limited to paper, glass, plastic and metal
- Outline how sewage is treated to make the water that it contains safe to return to the environment or for human use
- Explain why organisms become endangered or extinct, limited to climate change, habitat destruction, hunting, pollution and introduced species
- Describe how endangered species can be conserved, limited to monitoring and protecting species and habitats, education, captive breeding programmes and seed banks

### **Extended**

- Define the term sustainable development as development providing for the needs of an increasing human population without harming the environment
- Explain how forests and fish stocks can be sustained using education, legal quotas and re-stocking
- Explain that sustainable development requires:
  - management of conflicting demands
  - planning and co-operation at local, national and international levels
- Explain the risks to a species if the population size drops, reducing variation (knowledge of genetic drift is **not** required)
- Explain reasons for conservation programmes, to include:
  - reducing extinction
  - protecting vulnerable environments
  - maintaining ecosystem functions, limited to nutrient cycling and resource provision, e.g. food, drugs, fuel and genes



## Food Supply

1. Explain why world food production must continue to increase in the future

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2. Explain how each of the following has helped increase food production over the past century or so:

Method/ technology	How this has resulted in increased food production
Agricultural Machinery	<hr/> <hr/> <hr/>
Chemical Fertilisers	<hr/> <hr/> <hr/>
Herbicides	<hr/> <hr/> <hr/>
Insecticides	<hr/> <hr/> <hr/>
Selective breeding	<hr/> <hr/> <hr/>



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3. Describe the negative impacts on the environment of:

a) large-scale monocultures of crop plants

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b) Intensive livestock production

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4. Even with all of the modern technology and farming techniques we have, it is difficult to feed the world population.

a) For each sentence below, decide whether the statement is true or false.

	True?	False?
There are people in the world who don't have enough food to eat	<input type="checkbox"/>	<input type="checkbox"/>
We are capable of producing enough food to feed everyone on Earth.	<input type="checkbox"/>	<input type="checkbox"/>
Food is distributed equally around the planet	<input type="checkbox"/>	<input type="checkbox"/>
Every country produces enough food to feed its own people	<input type="checkbox"/>	<input type="checkbox"/>

b) Explain why increases in food price can lead to uneven distribution of food.

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c) Explain why droughts and flooding can cause food shortages

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d) Explain how the following things can keep people in poverty:

i) War and conflict

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ii) Increasing local population

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## Habitat Destruction

1. Define the word "habitat".

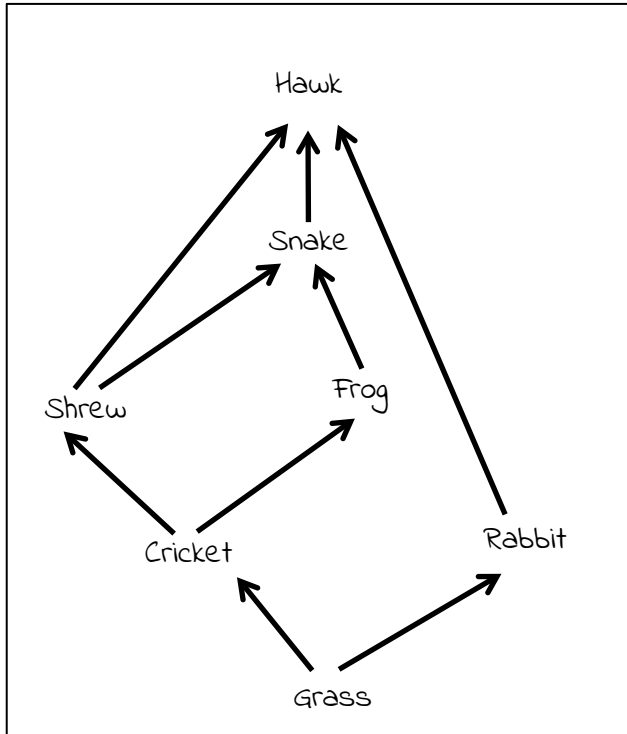
2. Each of the following can result in habitat destruction. Complete the table to give details of the reason for the activity and the way in which they are damaging.

Activity	Why we do it	How it affects habitats
Increased land use	Farming: crops and livestock are essential to provide food and also provide profits Housing: A growing population need places to live	
Mining		Sometimes large areas of land are destroyed for the mine. Lots of waste water is released from some mines which affects local rivers as well as the soil.
Marine pollution		



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3. Sometimes we remove large amounts of a species from an area. This may have a huge impact on the other organisms in the food web. Look at the following food web, which is found in an ecosystem close to farm land:



The local farmer is using large amounts of insecticide on his crops. This insecticide is reaching the surrounding area.

Describe the impact on organisms in this food web of the introduction of an insecticide (you can assume that the insecticide only directly affects the insects - crickets).

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4. Large areas of land are cut down every day, totaling millions of hectares per year (tens of thousands of kilometres per year)

a) Give reasons why we cut down forests

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b) Using the table, list and explain the undesirable effects of deforestation

Effect	Explanation
Extinction	The destruction of any habitat destroys the natural home of organisms. This can completely wipe of species.
Soil loss	<hr/> <hr/>
Flooding	<hr/> <hr/>
Increase in atmospheric carbon dioxide	<hr/> <hr/>





## Pollution - Land and Water

1. Complete the table below detailing the sources and effects of different types of pollution

Pollutant	Effects...		Source(s)	Impacts
	Water	Land		
Insecticides/herbicides	<input type="checkbox"/>	<input type="checkbox"/>	  	  
Nuclear fallout	<input type="checkbox"/>	<input type="checkbox"/>	  	  
Chemical waste	<input type="checkbox"/>	<input type="checkbox"/>	  	  
Discarded rubbish	<input type="checkbox"/>	<input type="checkbox"/>	  	  
Untreated sewage	<input type="checkbox"/>	<input type="checkbox"/>	  	  
Fertilisers	<input type="checkbox"/>	<input type="checkbox"/>	  	  

2. Explain the process of eutrophication

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3. Complete the sentences below about plastics and their impact on the environment.

Plastics are non-\_\_\_\_\_ which means that they won't be \_\_\_\_\_ by decomposers. Because of this, plastic that is discarded just \_\_\_\_\_ (builds up). Some animals eat discarded plastics. For example, sea turtles mistake plastic bags for \_\_\_\_\_ (which is their food source). As they cannot digest the plastic, it builds up in their \_\_\_\_\_ and they will possibly \_\_\_\_\_.  
Other animals might get trapped or tangled in plastic material, which can also result in \_\_\_\_\_.

4.

a) Explain how the female contraceptive pill is negatively affecting male fertility

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b) State the potential impact of the female contraceptive pill on gender in aquatic organisms



## Pollution - Air

1. State the sources and effects of the following pollutants

*Methane:*

Sources: \_\_\_\_\_

Effects: \_\_\_\_\_

*Carbon Dioxide:*

Sources: \_\_\_\_\_

Effects: \_\_\_\_\_

2. Draw a labeled diagram to summarise the greenhouse effect.

*You should show one layer representing the Earth's surface, another layer representing the atmosphere, and arrows to show the movement of the Sun's energy. Be sure to annotate it to show where reflection, absorption and emission is occurring, as well as which sun rays are long wave and shortwave.*



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3. Some people say that burning fossil fuels is causes the greenhouse effect. This is not a very scientifically accurate thing to say.

Distinguish between the phrases "greenhouse effect", "enhanced greenhouse effect" and "global warming".

(Help: "Distinguish between" means to say how they are different.)

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## Acid Rain

1. Acid rain is caused by the release of sulphur dioxide and oxides of nitrogen

a) State the sources of the compounds:

Sulphur dioxide: \_\_\_\_\_

Oxides of Nitrogen: \_\_\_\_\_

b) Explain how the above compounds cause acid rain

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c) Describe the effect of acid rain on the following:

*Plants:*

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*Fish:*

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d) Describe how emissions of sulphur dioxide can be reduced

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## Resource Conservation

1. Define "Sustainable Resource"

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2. Define "Sustainable Development"

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3. Sustainable development involves management of conflicting demands. Explain the following conflicts (the first one has been done for you.)

### *Profit vs Environment*

Taking the environment into consideration when building new houses/factories affects how much money can be made. However, without profits, there will be no development or progress, and we won't be able to house and feed a growing population. We need to find a balance.

### *Aesthetics\* vs Wind farm development*

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### *Deforestation to provide land for housing vs habitat destruction*

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\* "Aesthetics" means how nice something looks



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4. Sustainable development requires planning at the local, national and international level. Tick the boxes below to state which groups are involved in the following aspects of planning for sustainable development

Level of planning	Local people and local authorities	National government	International organisations
Sharing ideas and opinions on where to build a new factory or housing estate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creating major agreements and conventions on sustainable development such as the "World Summit on Sustainable Development."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creating laws as to where new factories can be built, and what sort of areas are protected and can't be destroyed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

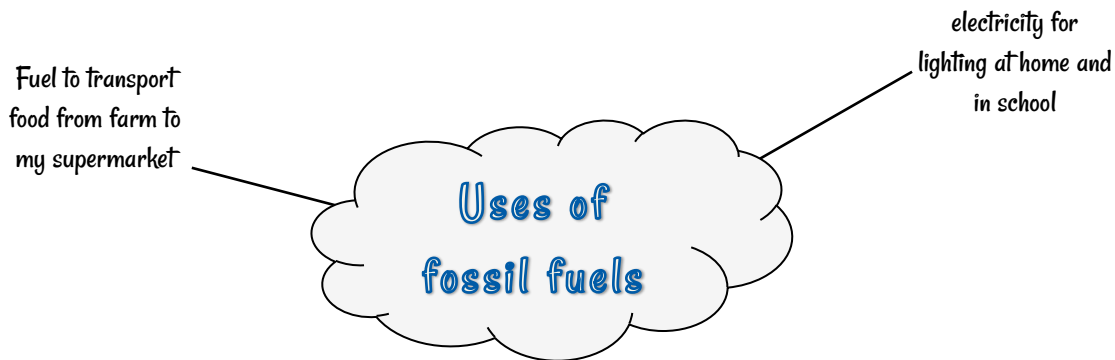
5. Below is a list of energy resources used by humans. State which ones are "renewable" and which ones are "non-renewable"

Energy resource	Renewable or Non-renewable?	
	Renewable	Non-renewable
Solar energy	<input type="checkbox"/>	<input type="checkbox"/>
Wind power	<input type="checkbox"/>	<input type="checkbox"/>
Coal	<input type="checkbox"/>	<input type="checkbox"/>
Ethanol for biofuel	<input type="checkbox"/>	<input type="checkbox"/>
Oil/Petrol	<input type="checkbox"/>	<input type="checkbox"/>
Tidal energy	<input type="checkbox"/>	<input type="checkbox"/>
Natural gas	<input type="checkbox"/>	<input type="checkbox"/>



6.

a) Complete the bubble diagram to list the uses of fossil fuels that are important for you in your life. Think about cooking, heating/cooling your home, transport, products that you buy etc.



b) Explain why it is important to conserve fossil fuels

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7. Some resources can be considered renewable if you use them at the correct rate. In terms of sustainability, explain why...

a) ...we must limit the amount of fish we catch

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b) ...we must be careful about how much forest area we cut down each year.

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E c) Explain how the following can be used to maintain fish stocks:

*Education*

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*Legal Quotas*

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*Re-stocking*

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E d) With reference to genetic variation, explain how reducing the population size of a species can have negative consequences

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8. Some physical resources can be re-used or recycled

a) Using glass as an example, distinguish between "re-using" and "recycling"

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b) List some of the materials that are commonly recycled

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9. One way to conserve water is to have effective sewage treatment so that dirty, unusable water can become useable again.

a) Explain how trickling filters work to clean sewer water

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b) Draw an annotated diagram to show how "activated sludge" sewage treatment works.



## Species Conservation

1. Explain why some species can become extinct or endangered. Use the headings to guide your answer

*Climate change*

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*Habitat Destruction*

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*Hunting*

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*Pollution*

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*Invasive species*

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2. A number of methods can be used to protect species that are threatened with extinction. Complete the table to explain each of the following

Method	Description
Monitoring and protecting the species in its natural habitat	<hr/> <hr/> <hr/> <hr/>
Captive breeding programmes	<hr/> <hr/> <hr/> <hr/>
Seed banks	<hr/> <hr/> <hr/> <hr/>
Educating people	<hr/> <hr/> <hr/> <hr/>



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3. Using the headings to guide your answer, explain why conservation programmes (such as those mentioned in Q2) are important.

*Bio-rights (the right of a species to live)*

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*Protecting vulnerable environments*

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*Maintaining nutrient cycling*

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*Providing resources for humans to use*

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