**21. Human influences on ecosystems.**

**21.1 Food supply**

**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 & 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**

**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**

**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**

1. *Species extinction through habitat loss:*

* Reduction of habitats or food sources for animals can result in their extinction;
* Loss of forest habitat also reduces plant & animal diversity & disrupts the food chains.

1. *Loss of soil by soil erosion:*

* Removal of trees means there are no roots to hold soil, thus the thin top layer of soil is washed away during rain;
* This causes soil erosion and leaching of minerals;
* Desertification can eventually result.

1. *Flooding;*

* Soil from erosion is washed into rivers, silting it and causing flooding;
* When forest is removed there are no plant roots to take up rainwater, which instead flows into streams and rivers, causing further flooding.

1. *Carbon dioxide build up:*

* Forests have high rates of photosynthesis so absorb large amounts of carbon dioxide from the atmosphere;
* Removal of forests therefore contributes to increases in atmospheric carbon dioxide.

**Explain the undesirable effects of deforestation on the environment**

**21.3 Pollution**

**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**

Pollution by sewage:

* Sewage (urine and faeces) contains high levels of nutrients such as phosphates, organic matter and bacteria;
* Phosphates act as fertilisers for algae, thus resulting in algal bloom;
* Sewage contains organic matter which bacteria break down, causing them to multiply and deoxygenate the water through aerobic respiration;
* Furthermore sewage may contain disease-causing bacteria, which could get into drinking water supplies, causing cholera and typhoid.

**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**
* To increase crop yields farmers use excess of fertilisers;
* A high concentration of fertilizer around plant roots can cause the roots to lose water by osmosis resulting in the wilting and death of plants;
* Another effect is eutrophication of rivers and lakes as follows:

1. Fertilisers (very soluble) are easily leached out of the soil and washed into rivers and lakes;
2. Algae absorb fertilizer and grow rapidly (algal bloom);
3. Algae form a blanket on the surface of water, blocking sunlight from algae below;
4. Algae and other plants below the surface die without light;
5. Bacteria decompose the dead algae and plants, using up oxygen in the water for respiration;
6. Animals in water die due to lack of oxygen.

**Discuss the effects of non-biodegradable plastics in the environment, in both aquatic and terrestrial ecosystems**

**State the sources and effects of pollution of the air by methane and carbon dioxide, limited to the enhanced greenhouse effect and climate change**

* Carbon dioxide is produced by burning of fossil fuels;
* Methane is produced from the decay of organic matter and as a waste gas from digestive processes in cattle;
* Carbon dioxide and methane are *greenhouse gases*;
* They are called greenhouse gases as they trap heat in the earth’s atmosphere in the same way a greenhouse traps heat;
* As the concentration of these gases increase in the atmosphere more heat is trapped, making the atmosphere warmer. This is called *enhanced greenhouse effect*;
* It is causing *global warming* –Earth’s average temperature is rising;

**Explain how increases in carbon dioxide and methane concentrations in the atmosphere cause an enhanced greenhouse effect that leads to climate change**

* Explanation above
* Global warming is causing the following problems:

1. Melt polar ice caps, causing flooding of low-lying land;
2. Change weather conditions in some countries by increasing flooding or reducing rainfall;
3. Cause the extinction of some species that cannot survive at higher temperatures.

**Discuss the causes and effects on the environment of acid rain**

|  |  |  |  |
| --- | --- | --- | --- |
| *Causes* | *Main sources* | *Effects* | *Possible solutions* |
| Sulphur dioxide, Oxides of nitrogen | Burning of fossil fuels  Combustion of petrol in car engines. | 1. Damage to leaves, killing plants;  2. Acidification of lakes, killing animals;  3. Increased risk of asthma attacks and bronchitis in humans;  4. Corrosion of stonework on buildings;  5. Release of aluminium from the soil into lakes that are toxic to fish. | 1. Changing the power stations from coal and oil to renewable energy sources.  2. Using ‘scrubbers’ in power station chimneys sulphur dioxide.  3. Using catalytic converters in car exhausts to convert oxides of nitrogen to harmless nitrogen. |

**State the measures that are taken to reduce sulfur dioxide pollution and reduce the impact of acid rain**

**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**

**Define a *sustainable resource*** - one which is produced as rapidly as it is removed from the environment so that it does not run out

**Define the term *sustainable development*** - development providing for the needs of an increasing human population without harming the environment

**Explain the need to conserve non-renewable resources, limited to fossil fuels**

* Fossil fuels are non-renewable and therefore need to be conserved in the following ways:

1. By increasing the use of renewable energy (wind energy, solar energy, hydroelectric power);
2. By improving the efficiency of energy use (better insulation, smaller car engines, more public transport);

**State that some resources can be maintained, limited to forests and fish stocks**

**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**

**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**

**Explain the risks to a species if the population size drops, reducing variation (knowledge of genetic drift is not required)**

**Describe how endangered species can be conserved, limited to monitoring and protecting species and habitats, education, captive breeding programmes and seed banks**

*Reasons for conserving species include the following:*

* Many species are in the danger of extinction due to habitat destruction, introduction of other species, international trade and pollution;
* Loss of species also means that its genes are lost, these may be important in future for genetic engineering;
* The presence of rare species can be an important source of money for poor communities, through tourism;
* The species may play an important role in a food chain and thus its loss could endanger other species.

*A habitat can be conserved by:*

* Using laws to protect the habitat;
* Using wardens to protect the habitat;
* Reducing or controlling public access to the habitat;
* Controlling factors, such as water drainage and grazing, that may otherwise contribute to destruction of the habitat.

**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**