

The Natural Environment

Introduction

Humans have lived on earth for about 1 million years, a small fraction of the life of the Earth, which is estimated at 4.6 billion years. Our earliest ancestors lived closely with the natural environment. Their earliest habitations were shelters excavated either by enlarging caves or burrowing into cliffs.

In the past 250 years, human activity has brought about many changes in land use, especially deforestation. Also, there appear to be global changes of weather systems and changes in the chemistry of the atmosphere caused by burning of fossil fuels, mainly in power stations and from car exhaust emissions.

In addition, in the last 50 years nearly 20% of the world's soil has been damaged to some extent by over farming or totally lost due to deforestation.

Currently, the greatest increase in population is taking place in the poorest countries in the world. These countries have limited resources and are least able to deal with waste disposal and pollution control.

It took 2 million years to add the first billion people; 130 years to add the second billion; 30 years to add the third billion; 15 years to add the fourth billion; 12 years to add the fifth billion; and 10 years to add the sixth. The seventh billion is expected to be added by the year 2006.

Hunter gatherer societies

Archaeological evidence suggests that until 10,000 years ago, we were hunter - gatherers, who survived by hunting wild animals and by gathering wild plants.

Our ancestors lived in small groups of rarely more than 50 people. Men did the hunting and women did most of the gathering. Women could not hunt because they had to carry their infants and children with them.

The first settlements would most certainly have been located close to water and food supplies. Shelters would have been natural or man made caves or made from bits of wood and grasses / reeds.

These societies were very mobile as they had to move with the seasons because they did not build permanent dwellings to protect them from the extremes of weather. Such societies did not damage the natural environment.

Agricultural society

About 10,000 years ago, people gradually shifted from small hunting and gathering bands to settled agricultural communities. People discovered that they could grow wild plants by digging holes and placing the roots of these plants in these holes.

To prepare for planting, they cleared small patches of forest - cutting down trees and other vegetation. After a plot had been planted and harvested for a few years, few if any crops could be grown. This is because the soil had been depleted of nutrients.

When yields dropped, the growers shifted to a new area of forest and cleared a new plot. The growers learned that each abandoned plot had to be left fallow (unplanted) for 10 to 30 years before the soil became fertile enough to grow crops again.

The gradual shift from hunting and gathering to farming had several significant effects:

- The population increased because of a more reliable food supply
- People began to accumulate material goods. Nomadic hunter - gathers had to travel with few possessions, but farmers could accumulate as much as they could afford.
- The formation of villages, towns and cities. Many farmers moved into permanent villages. Some villages grew into towns and cities, which served as centres for trade, government and religion.

The growing population of these emerging civilisations needed more food and more wood for fuel and buildings. To meet these needs people cut down vast areas of forest and ploughed up grasslands.

Industrial Societies

After the agricultural revolution, the next great cultural change to occur is known as the Industrial Revolution. This began in England in the mid 1700s.

The Industrial Revolution arose as a result of the overuse and depletion of wood for fuel and construction. People began to burn surface deposits of coal as a substitute for wood.

The availability of coal lead to the invention of the coal-powered steam engines to pump water. People invented machines powered by coal and later by oil and natural gas.

The use of machines lead to a switch from small-scale, localised production of goods by hand, to large-scale production of goods by machine.

This also led to settlements being enlarged, often near to rivers, where the water was used to power the machines.

Urban Societies

An urban area is a town or city with a population of more than 2,500 people. Urbanisation is the formation of villages, towns and cities or the process of more and more people living in towns and cities.

The greatest growth of populations is now taking place in cities. Just after the second world war about 30% of the world's population lived in cities. By the 1990's half the world's population is living in urban areas.

Cities are like living organisms both taking in resources and giving out waste products. This is slowly polluting the atmosphere, the oceans and underground water sources.

There is an ever increasing effect on the natural environment. Currently, about 10% of the total land area of Britain is covered with bricks, concrete and tarmac.

Archaeology has shown us that previous urban societies have collapsed in various parts of the world such as Mexico and the Indus valley. The detailed reasons for these collapses vary widely but are all related to three basic factors :

- over population
- over use of natural resources
- pollution of the environment

Even now some cities are perilously close to the limit, for example :

- pollution around some cities in the USA has reduced crop yields by up to 10%
- waste dumped into Tokyo bay has completely polluted the ocean
- Mexico City is sinking as it bleeds its rivers and underground water supplies dry

There is now a world wide recognition that our planet is fragile and has limited resources. Nationally, there is an ever increasing awareness of the effects we are having on the natural environment.

Road construction and house building need to be carefully controlled in order to limit the damage to our natural environment and ensure energy is not wasted.

The growth of cities is increasing rapidly. In 1990 there were about 32 cities with populations over 5 million, of which 20 were in the developing world.

By 2000 there were about 55 cities with populations over 5 million, of which 45 are in the developing world.

Currently the greatest increase in population is taking place in the poorest countries in the world. These countries have limited resources and are least able to deal with environmental problems such as waste disposal and pollution control.

Environmental Impact

Planners, architects and engineers are increasingly having to take a new look at design of the built environment, both in respect of individual buildings and entire settlements.

- **Buildings**

Architects must focus on the inflexibility of many current designs and produce buildings that can allow for change in use in the future. This may increase the initial cost of a building but will have huge benefits over the life time of the building.

In the 1970's and 1980's 'Green architecture' was almost entirely domestic E.g. use of solar panels for water heating and increased use of insulation. Britain is far behind many countries, the 1990 Building Regulations took us to a level of energy conservation achieved in Sweden in 1935!

- **Settlements**

Planners, looking at the wider picture, should be aware of the total resource requirements of proposed settlements including energy supply, water supply and waste disposal.

The '**ecological footprint**' of an urban area represents the land area required to feed it, supply it with timber needs and convert its CO₂ output into oxygen.

For a city like London the surface area of this 'footprint' is about 20 million hectares. This is equal to the entire land area of the United Kingdom!

- **Efficiency measures**

Reuse of materials, recycling and making buildings more energy efficient are all important aspects of reducing the ecological footprint of cities.

- **Transportation**

Making transportation systems more efficient will also play an important part in reducing pollution and energy consumption.

This inevitably means increasing the use of public transport systems and reducing the use of cars.

The future

- **Urbanisation**

In the next 30 years, the population of cities in the developing world is expected to rise to 2 billion people. Many of these people will live in shanty towns, on the edge of cities, with no running water, no electricity and no sanitation.

The outskirts of cities usually have industrial areas and waste disposal sites. Within these are residential areas where the upper and middle classes live and further in are the inner city ghettos. In addition, there are commercial and business districts.

This 'zoning' of cities causes the 'well off' to move out to the suburbs creating an increased use of the private car and the less well off remain in areas of growing inner city poverty.

The future

▪ **Transport**

The creation of more integrated cities is essential both to increase the sense of community and to reduce the pollution and congestion caused by the motor car. This will require much better public transport systems :

- mass transit rail or subways are needed for main cross city travel
- linked bus and tram systems then provide for local journeys

This will help to remove cars from the city streets resulting in :

- less pollution, therefore improved air quality
- a safer environment which encourages :
 - increased use of cycling
 - more pedestrian areas
- more public space such as parks

▪ **Waste Disposal**

Disposal of wastes in landfill sites should be reduced. Recycling of materials such as glass, metals and paper already takes place but much more could be done.

Combustible waste that cannot be recycled can be burnt in incinerators to provide heat for local buildings and power to be fed back into the National Grid. This also greatly reduces pollution caused by power generation and is much more efficient as two thirds of the fuel energy put into power stations is lost as heat.

Sewage disposal could also be improved. Sewage can be recycled to yield methane for heat and power and to produce fertilisers. The treated 'grey' water could be used to irrigate adjacent forests which act to purify the water further while at the same time increasing the growth rate of the timber. In addition the forests would help to purify the air by turning carbon dioxide into oxygen.

▪ **Buildings**

Typical office buildings constructed in recent years were designed to create a sealed internal environment that required large amounts of energy to provide light to internal parts of the building and to control the temperature.

More modern buildings do not take this approach. They depend on designing the building to reduce energy consumption.

- The horizontal and vertical profiles of the building can be designed to carefully control air flow to provide a comfortable environment.
- The buildings are made narrower to reduce the need for internal lighting.
- Windows can be opened to provide natural ventilation.
- Trees are used to provide shade and filter out pollutants.
- Solar glass can be used to control passive heat gain.

Summary

Important features of the natural environment include:

- air quality
- water quality
- the ozone layer
- soil quality
- the landscape
- water resources
- natural habitats
- biodiversity

These features can be affected by man's activities. Architects, planners and engineers must consider :

- land use
- wildlife
- natural amenities
- natural drainage
- agriculture
- forestry

All these factors and others will be studied in this unit. You will consider:

- the global environment
- the local environment
- the indoor environment
- legislation and controls
- design specifications
- environmental impact assessments
- sustainable construction

Assessment

The Natural Environment

Questions 1 to 5 - Select the correct response for the following questions :

1. How much of the world's soil has been damaged by over farming in the last 50 years?
 - A 5%
 - B 10%
 - C 15%
 - D 20%

2. Which type of society survived by killing animals and collecting wild plants?
 - A hunter - gatherer society
 - B agricultural society
 - C industrial society
 - D urban society

3. Which of the following was **not** an effect of the shift from hunter - gather societies to agricultural societies?
 - A population increased because of more reliable food supply
 - B people began to accumulate goods
 - C pollution of the atmosphere due to burning fossil fuels
 - D formation of permanent villages and towns

4. Which of the following is **not** a recognised reason for the collapse of urban societies?
 - A over population
 - B over use of natural resources
 - C pollution of the environment
 - D natural disasters

5. How large is the world population predicted to be by the year 2006?
 - A 8 billion
 - B 7 billion
 - C 6 billion
 - D 5 billion

Questions 6 to 10 - Decide whether each of these statements is True (T) or False (F).

6. i) By the 1990's half the world's population was living in urban areas.
ii) By 1990 there were over 30 cities world-wide with populations over 5 million.

Which option best describes the two statements?

- A i) T ii) T
B i) T ii) F
C ii) F ii) T
D ii) F ii) F

7. i) Making transportation systems more efficient will play an important part in reducing pollution and energy consumption.
ii) This will mean increasing the use of cars and decreasing public transport.

Which option best describes the two statements?

- A i) T ii) T
B i) T ii) F
C i) F ii) T
D i) F ii) F

8. i) The zoning of cities cause the 'well off' to move away from the suburbs into the city centre.
ii) Disposal of waste in landfill sites should be reduced.

Which option best describes the two statements?

- A i) T ii) T
B i) T ii) F
C i) F ii) T
D i) F ii) F

9. i) To improve public transport systems, mass transit rail or subways are needed for main cross city travel.
ii) Linked bus and tram systems should be provided for local journeys in cities.

Which option best describes the two statements?

- A i) T ii) T
B i) T ii) F
C i) F ii) T
D i) F ii) F

10. i) Combustible waste that cannot be recycled can be burnt in incinerators to provide heating for local buildings.
ii) Buildings shouldn't be designed to take advantage of natural light and ventilation.

Which option best describes the two statements?

- A i) T ii) T
B i) T ii) F
C i) F ii) T
D i) F ii) F