HUMAN IMPACT ON THE ENVIRONMENT

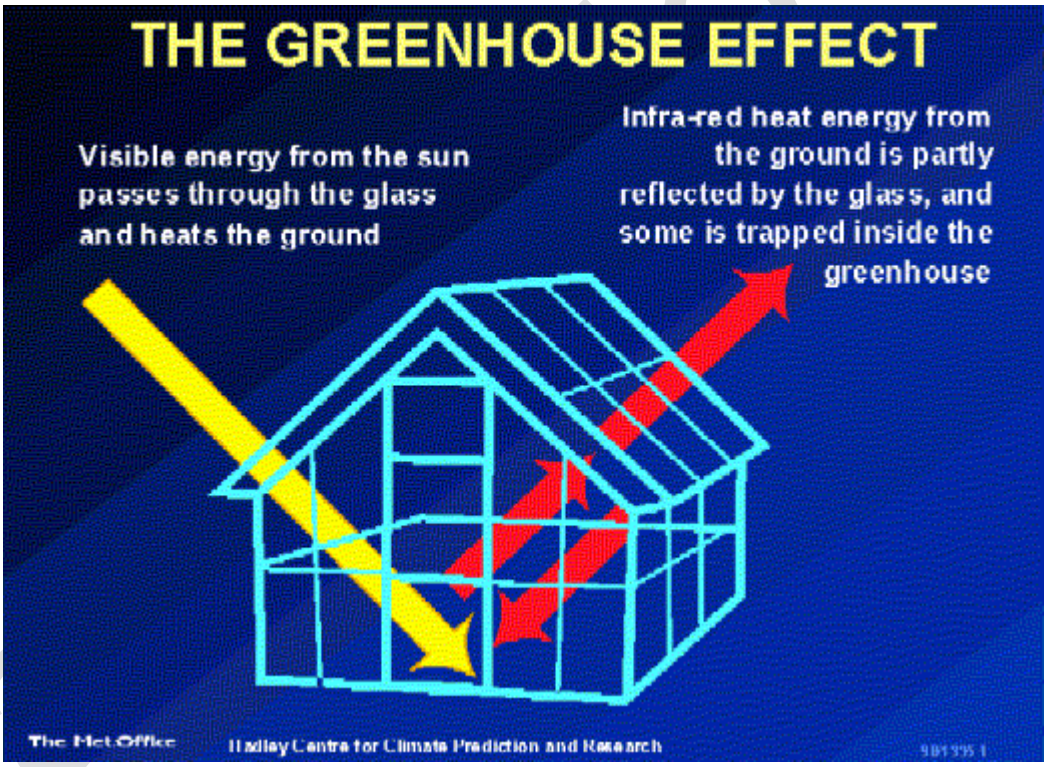
(GRADE 11-PAPER 2 - 70 MARKS)

(GRADE 12-PAPER 1 -25 MARKS)

A.The atmosphere and climate change

1. State what is meant by the 'greenhouse effect' and why it is important for life on Earth

   The greenhouse effect is when radiation enters the Earth's atmosphere, but prevents heat from leaving. It is a necessary effect to sustain life on earth, but due to the presence of excessive greenhouse gasses, may lead to global warming



http://www.realscience.org.uk/pics/greenhouse.gif

2. Describe the sources of carbon dioxide emissions and methane emissions (greenhouse gases) which lead to the greenhouse effect

   CO_2 -

   - **Burning(combustion) of fossil fuels**
   - **Cellular Respiration (due to increased human and livestock populations)**
   - **Decomposition of the excessive wastes that humans produce**

Methane -

- **Increased number of landfills**
- **Coal mining**
- **Rice agriculture**
- **Increased livestock**
- **Sewage**
- **Combustion of oil and natural gas**

3. Describe how deforestation leads to an increase in the CO_2 concentration
   CO_2 is used in photosynthesis. Deforestation leads to a reduction in photosynthesis and therefore the CO_2 remains in the atmosphere. Also, when forests are cleared, "slash and burn" techniques are used to remove the trees. This leads to an increase in CO_2 due to combustion.

4. State when the 'greenhouse effect' becomes known as the 'enhanced greenhouse effect'
   An accumulation of greenhouse gasses (methane and CO_2) prevents excess heat from leaving the atmosphere

5. Describe how an increase in greenhouse gases (enhanced greenhouse effect) leads to global warming

An accumulation of greenhouse gasses (methane and CO_2) prevents excess heat from leaving the atmosphere and therefore leads to an increase in the Earth's temperature- a phenomenon known as "Global warming"

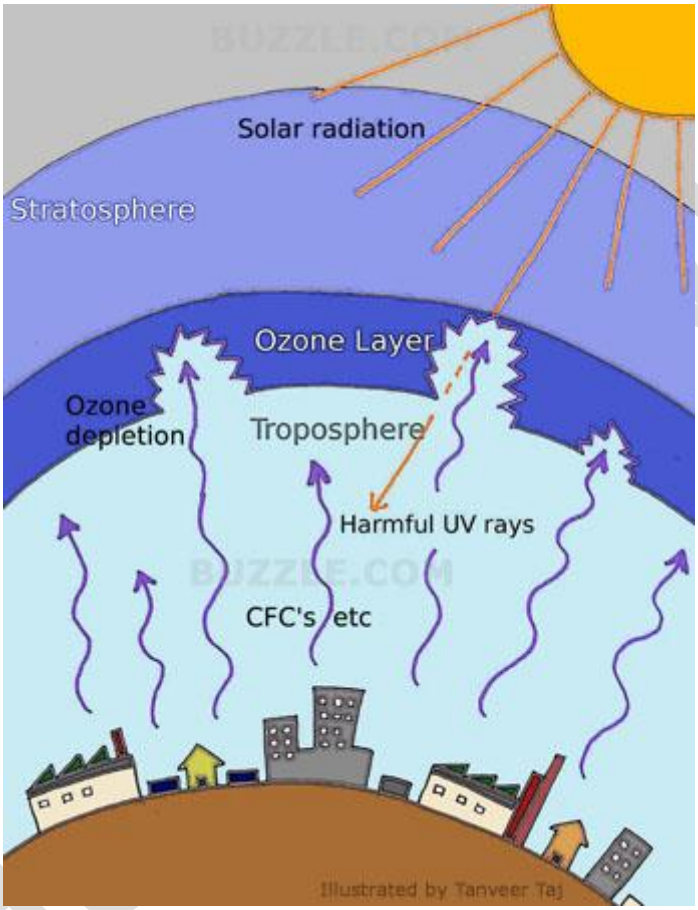
6. Describe how global warming may lead to desertification, drought and floods
7.

An increase in global temperatures would lead to increased evaporation of water and transpiration, thereby leading to droughts. This would increase precipitation (rain, snow etc) in other areas leading to floods in those areas. The melting of glaciers would also cause flooding. Thermal expansion of water would also cause floods.

8. State what is meant by 'carbon footprint'

It is the measure of the amount of greenhouse gas emissions produced by an individual, group of people or country in a year

9. Describe ways in which we can reduce our 'carbon footprint' in order to decrease global warming
    - **Recycle and re-use our waste**
    - **Use of alternate forms of energy to the burning of fossil fuels (wind, solar etc.)**
    - **Start reforestation projects (trees act as carbon sinks)**
    - **Use energy efficient appliances and products**
10. Describe the causes and consequences of ozone depletion



Ozone is O_3 and protects the earth from harmful UV rays. It is destroyed by CFCs.(from aerosols, electronics, air conditioners, foams and refrigerants)

Effects of Ozone depletion:

More UV radiation will reach the earth, which:

- **Can destroy DNA**
- **Cause sunburn, eye damage, skin cancer and premature skin wrinkling**
- **Prevents seeds from germinating**
- **Slows down photosynthesis**

- **Kills off algae in freshwater and sea water therefore less oxygen is released back into the atmosphere**
- **Cause an imbalance in food pyramids, as there are less producers to feed the primary consumers**

11. List ways in which we can decrease ozone depletion

Use CFC-free products/appliances
Use environmentally –friendly fast food packaging and discourage the use of aerosols
(The Montreal protocol was drawn up to discourage the use of Ozone-depleting substances)

B. Water availability

12. Describe how the following factors affect or influence the availability of water:

a. Construction of dams

Increases the availability upstream for agriculture, domestic and industrial use, but decreases the availability of water downstream. Reduces biodiversity. Affects those animals that require water as part of their reproductive cycles. E.g. frogs

b. Destruction of wetlands

Wetlands are areas of shallow water and act as a filter. Their destruction leads to a reduced quality and availability of water and also reduced biodiversity.

c. Exotic plantations and depletion of water table

Exotic plants have a higher water requirement than indigenous plants. Their roots are deep and penetrate into the underground water table. This reduces water availability.

d. Water wastage

A large amount of water used for irrigation is lost due to poor farming practices open drain irrigation leads to loss of water by evaporation.
The use of water for irrigation upstream reduces the availability of water downstream
Water wastage due to burst pipes, dripping taps etc also reduces water availability
Wastage can be reduced by reducing pressure in the pipes and by educating people to use water wisely and to maintain plumbing in good condition.

e. Cost of water

Costs are increased to improve the availability and quality of water.
The cost per kilolitre (kl) increases and with increased usage of water this is meant to discourage over-use of water thus allowing for its sustained use.
Many South African residents receive free water due to poor socio-economic conditions

f. Poor farming practices

Contamination of water sources by fertilizers and pesticides decreases the quality of water and increases the costs.
Over-grazing and poor ploughing methods cause soil erosion and run-off into rivers etc. This causes sedimentation in the rivers which affects its flow.

g. Droughts and floods

Droughts decrease water availability and increase water scarcity. Flooding decreases the availability of clean, safe water

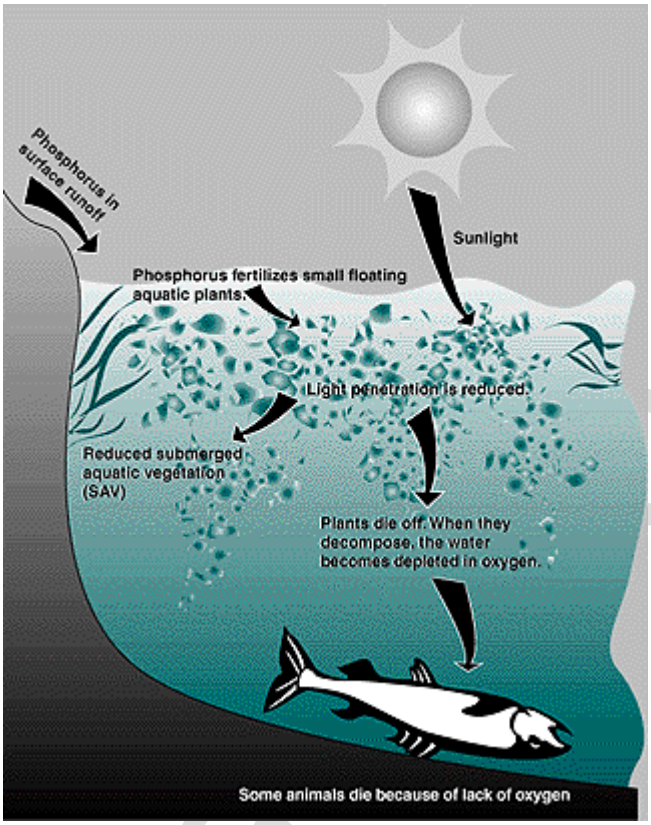
h. Boreholes and its effects on aquifers

Aquifers are rocks that contain water and is the source of borehole water. Boreholes are used to provide water to communities that do not have access to clean water. Excessive use of boreholes dries up aquifers and decrease the availability of water for the future, since it decreases water in the water table

C. Water quality

13. Describe how each of the following factors reduce water quality:
    a. Eutrophication and algal bloom

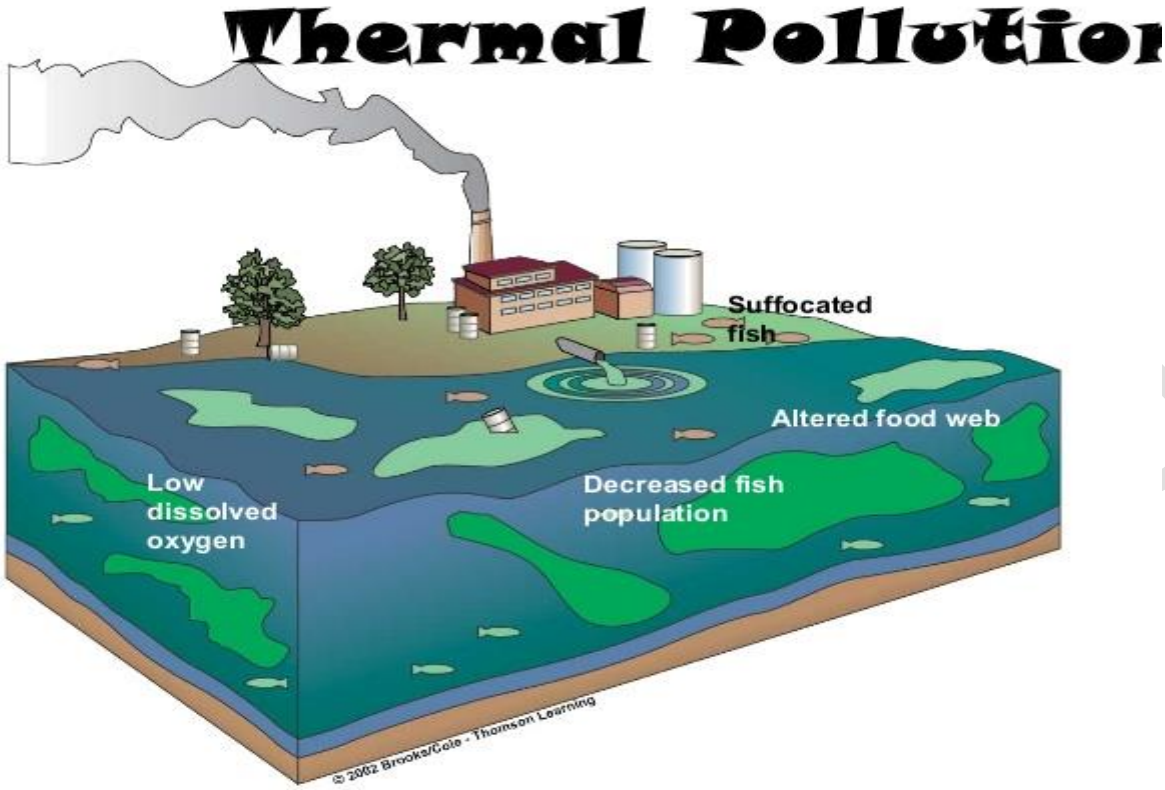
Increased run-off of fertilizers and animal dung into rivers
causes an increase in nitrates and phosphates in the river
which enhances algal growth on the surface (algal bloom)
Light can no longer penetrate to the deeper levels
Resulting in plant death
Animal death ,and increased decomposition. This causes reduced oxygen levels in the river



http://plaza.ufl.edu/ecarsonb/image44.gif

b. Thermal pollution

Factories use water to cool down the machinery, this water is then released into rivers increasing the water temperature which can cause the death of plants and animals. It also reduces the amount of oxygen that can dissolve in the water.



http://image.slidesharecdn.com/tidalenergyndthermalpollution

c. Domestic use, industry, agriculture leading to pollution and disease

After the water is used for domestic purposes, it may contain detergents (from washing) and pathogenic bacteria (such as in sewage)- This has to be treated before it can be used.

After water is used for industrial purposes it may contain heavy metals, oil, heat and fertilizers. This affects the quality of the water.

Fertilizers and pesticides may run off into rivers, ponds and dams and pollute the water.

d. Mining

Water returned to the environment from mines is generally acidic and toxic. This water is hot and contributes to thermal pollution

e. Alien plants, e.g. *Eichornia* (water hyacinth)

Alien invasive plants block the waterways reducing light and space to other aquatic plants, these plants eventually die and decompose. Bacteria that decompose these dead plants then reduce the oxygen content of the water.

https://encrypted-tbn1.gstatic.com/images?

14. Describe how water quality may be increased through water purification

Undrinkable water can be made drinkable through water purification methods

15. Describe how water availability may be increased through recycling of water

Water that is recycled increases water availability e.g. bath water can be used for watering plants- this will make more water available for drinking purposes

D. Food security

16. State what is meant by 'food security'

The access by all people at all times to adequate safe and nutritious food for a healthy and productive life

17. Describe how food security is influenced by each of the following factors:

a. Human exponential population growth

Enough food cannot be produced to feed the world's growing population

b. Droughts and floods (climate change)

Climate change has led to more frequent and severe droughts and floods .Droughts result in crop losses and livestock death which reduces the food available in the area. Floods cause extensive damage in a short period of time and decrease the amount of farmland available to grow crops. People also lose their homes, possessions and economic security during floods, further impacting on food security

c. Alien plants and reduction of agricultural land

Alien plants deplete topsoil of water and nutrients> they out-compete indigenous plants since they have no natural consumers, grow rapidly and invade space that could be used to grow crops. Alien plants in lakes etc, affect the use of fish as a food source

d. The loss of wild varieties: impact on gene pools

Crop plants have replaced wild varieties. The preservation of wild varieties is important, because if changing environmental conditions destroy the present crop plants, then wild varieties could be used as food sources. If wild varieties are wiped out, it will reduce the genetic diversity and hence the gene pool.

e. Wastage

Wastage could occur during storage, production and processing. This increases the cost of food to consumers and reduces food security

f. Genetically engineered foods

Genetically engineered food is produced from genetically modified organisms (GMOs) genetic engineering involves the inserting of a gene with desired characteristics from one organism into another organism to increase the yield

g. Poor farming practices such as:

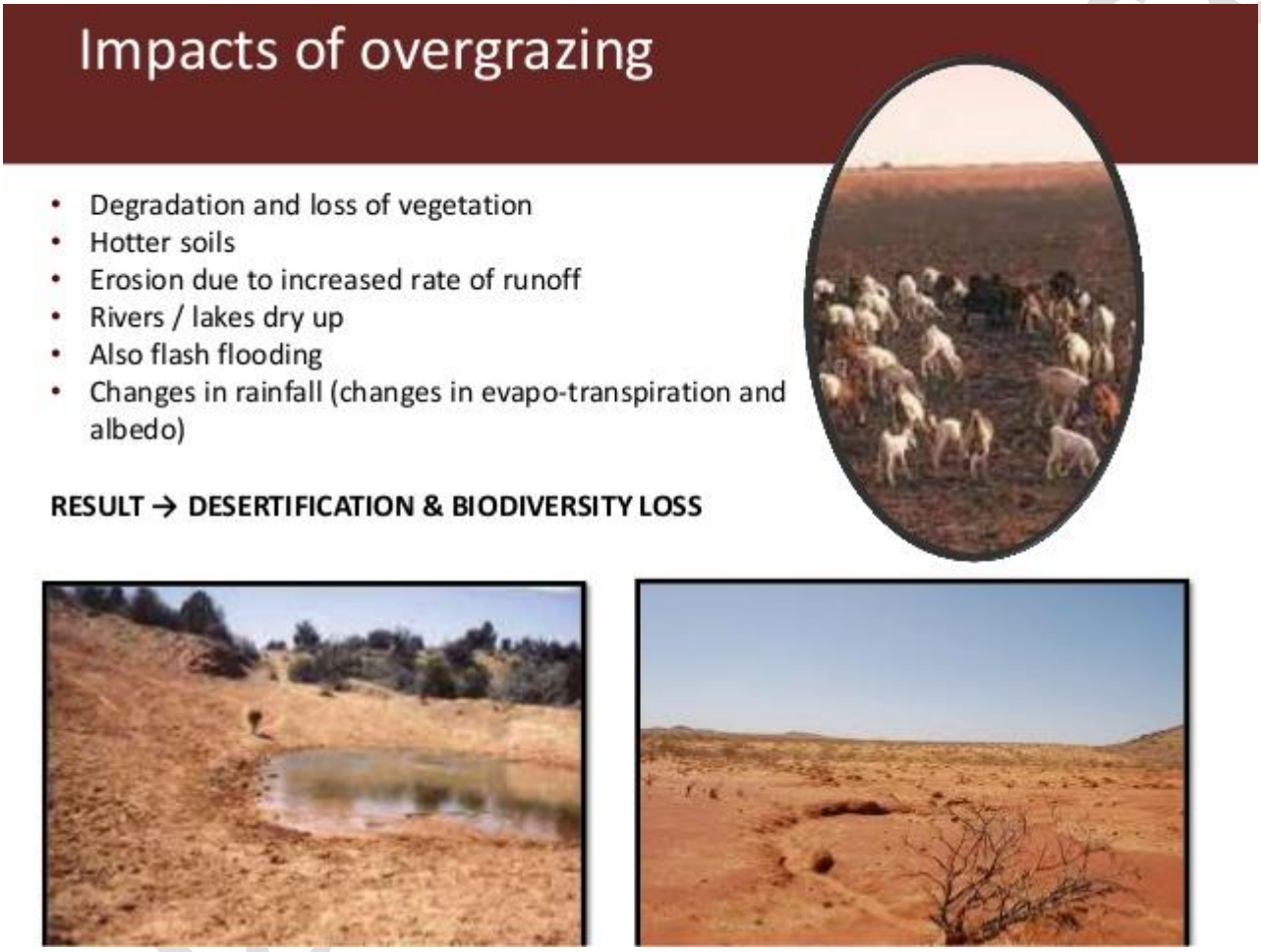
- Monoculture

  Is the growing of one type of crop over large areas of land year after year. Monoculture depletes the nutrients and water supplies and therefore impacts negatively on the quality of topsoil. (nutrient-rich upper layer of soil)

https://encrypted-tbn0.gstatic.com/images?

- Overgrazing and the loss of topsoil

Topsoil is the top 1.5 metres of soil that contain the nutrients that plants need for growth. The tilling of soil between plantings and heavy rainfall cause much of the topsoil to be lost. Overgrazing leaves the topsoil bare, allowing soil erosion by wind and water. This impacts negatively on food security



http://image.slidesharecdn.com/overgrazingandsustainability

- The use of fertilisers

Although fertilisers increase the nutrient quality of soil and thereby increase food production, they also increase the cost of food.

- The use of pesticides

The use of pesticides increases the cost of food and may cause the food to be unfit for human consumption. Also unintended organisms that are beneficial, may also be killed.

E. Loss of Biodiversity (reduction in the number of species)

17. State the importance of maintaining biodiversity

Biodiversity ensures that we have food, freshwater, medicines and fuel that we obtain from the environment. It also ensures that the climate is regulated, floods are controlled (wetlands), diseases are kept in check (predators eat the sick animals) and water is purified (filtering by wetlands). Biodiversity further ensures that seeds are dispersed, nutrients are cycled and oxygen and soil continue to form. It also provides us with forms of recreation and ecotourism.

18. Describe how each of the following factors may reduce biodiversity:

a. Habitat destruction through:

- Farming methods (overgrazing and monoculture)

Monoculture – reduces biodiversity, since the insects that specialise in feeding on one type of crop spread rapidly because there are no natural barrier to stop them. This requires the use of more pesticides, resulting in further loss of biodiversity.

Overgrazing –When sheep and cattle are kept in an area for too long, the vegetation is grazed to a point where it will not grow back. This results in soil erosion, loss of topsoil and a resulting loss in vegetation and desertification. This reduces biodiversity even further

- Golf estates

These developments, not only replace large areas of natural vegetation, but also increases the use of pesticides, fertilisers and excess water, which further reduces the biodiversity. Also natural plants are replaced by exotic trees and plants

- Mining

Pollutants in the form of dust and smoke may be released into the air while vegetation Is removed and replaced with rock and waste dumps. Underground water may be poisoned because of sulphates and heavy metals released into them.

-Urbanization

The growth of large cities (urbanisation) also negatively impacts on biodiversity. Surfaces are covered with concrete and natural habitats are destroyed to build houses and businesses. Habitat fragmentation (breaking up of the habitat into smaller sectors) causes loss of biodiversity as natural plants are replaced by exotic trees and plants

- Deforestation

This is the permanent destruction of indigenous forests and woodland areas due to human activities such as agriculture, logging and using trees as firewood. Deforestation, leads to the destruction of the habitats of other organisms, like frogs and insects, and this leads to the loss of biodiversity

- Loss of wetlands and grasslands

Grasslands and wetlands have unique plant and wildlife, their destruction would lead to a loss of species

b. Poaching (rhino horn, ivory, 'bush meat' or any other example)

Poaching is the illegal hunting of animals and may also refer to the illegal removal of plants for medicinal and other reasons. Some wild animals are hunted for food (bush meat) and are on the verge of extinction

c. Alien plant invasions

Alien plants compete with indigenous plants for space, nutrients, water and pollinators. They have no natural consumers and therefore become invasive

18. Describe how each of the following factors may reduce the loss of biodiversity:

a. Control alien plant invasion using mechanical, chemical and biological methods

Mechanical – physically remove the invasive alien plants, to restore the natural vegetation- this may be labour intensive and time consuming

Chemical- The use of herbicides to destroy the alien plants. This may destroy the environment and is expensive

Biological control- the use of another living organisms that is a natural enemy to the alien plant e.g. an insect or worm, to control the growth of the alien plants. This may be an effective method but is slow and long-term effects of introducing a new organism into a food chain may have unknown long-term effects

b. The sustainable use of the environment using any ONE of the following examples: Devils' claw, rooibos, fynbos, the African potato (*hypoxis*) or hoodia

Sustainable use means using the resources in such a way that it does not harm the environment and the ability of future generations to use the resource. Encouraging traditional healers etc in sustainable harvesting and re-planting will ensure growth for future generations. Legislation should be passed to ensure that medicinal plants are not over harvested.

F. Solid Waste disposal

19. State what is meant by solid waste.

Any solid material that is of no use to humans and which needs to be disposed of

20. State why we should reduce solid waste or find ways of managing it

Landfills are filling up quickly, reducing available land

Waste produces toxins, pathogens and pollutants which could be harmful to human health and affect the plant and animal life.

---

20. Describe the following aspects of solid waste disposal:

a. The dangers associated with open dumpsites

It is unattractive and may pose a health risk due to toxins, pathogens and pollutants.

b. Ways in which dumpsites can be managed for rehabilitation and prevention of soil and water pollution

The use of gutters in landfills to drain the leachate (the liquid from waste sites) and treat it for safe disposal.
Once the landfill is full, it can be covered and rehabilitated for sports and playgrounds, thereby reclaiming the land.
The waste can be sorted for recyclable material that can be restored

c. The use of methane from dumpsites for domestic use such as heating and lighting

Methane is a gas that is a by-product of decomposition and is a greenhouse gas. It can be recycled to be used as a fuel in cooking etc. and can also be used to generate electricity.

d. The need for recycling

Recycling is a process whereby used materials/waste products are recycled to make new products

This reduces the amount of solid waste and the over-use of resources. Recycling provides employment, reduces the use of raw materials and energy, and reduces air, ground and water pollution

e. The need for safe disposal of nuclear waste

South Africa uses radioactive material such as Uranium to power its nuclear power station at Koeberg in the Western Cape. The by-product of uranium usage id nuclear waste that is still radioactive and therefore dangerous to living organisms- the nuclear waste is stored in thick steel drums and buried in trenches at special protected sites.

A STRATEGY FOR STUDYING HUMAN IMPACT ON THE ENVIRONMENT

	DEFINITION	CAUSES	EFFECT	STRATEGY TO COMBAT
Enhanced Greenhouse effect	High concentration of greenhouse gases trapped in the atmosphere.	• increased burning of fossil fuels, • Larger populations. • increased livestock numbers • greater decomposition due to increased landfill sites	Leads to climate change/ global warming	• Alternate forms of energy (wind, solar, etc.) • Reforestation to absorb excess CO_2 • Recycling of products
Carbon footprint	The **amount** of carbon emissions produced per **group** (company, country, continent) per **year**	Increased greenhouse gases	Global warming	Encourage countries to reduce their carbon footprint.
Ozone depletion	Reduced levels of ozone in the upper atmosphere	Excessive use of CFCs, refrigerants, aerosols etc.	Leads to increased UV radiation; cancers etc.	Reduce the use of CFCs
Food security	The access by all people at all times to adequate safe and nutritious food for a healthy and productive life	• Good farming practices • Gentically modified organisms • Application of fertilisers and pesticides	N/A	N/A
Soil erosion				
Alien/exotic organisms				
Indigenous organisms				
Eutrophication	Depleted Oxygen levels in rivers, dams etc.	Run-off of fertilisers into water bodies which cause algal bloom.		
Overgrazing				
Thermal Pollution				