

Question # 2.

- (a) Explain eutrophication, its causes, effects and give appropriate measures.

Answer:

* Thesis:

Eutrophication is enrichment of water body with nutrients such as nitrogen and phosphorus resulting in growth of algae on surface of water, blocking sunlight penetration into the water body, decreasing the oxygen content inside water by bacteria causing death of aquatic life. Measures include control ^{use} of fertilizer in nearby areas of water bodies, and also ultraviolet ^{induced} killing of ^{excessive} algae on water surface.

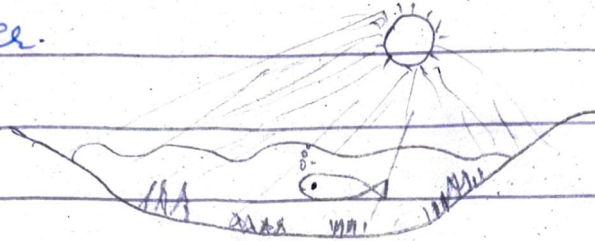
* Introduction:-

Eutrophication is a natural phenomena which takes over thousands of years to develop and causes death of a river/water body. However due to anthropogenic activities the rate has been ~~exaggerated~~ ^{exacerbated} because of the run-off of excessive fertilizer ~~use~~ ^{use} from agriculture sites into water bodies. Fertilizer consists of nitrogen and phosphorus which helps in ~~production~~ growth of algae on water bodies surfaces.

★ Cause and Effect

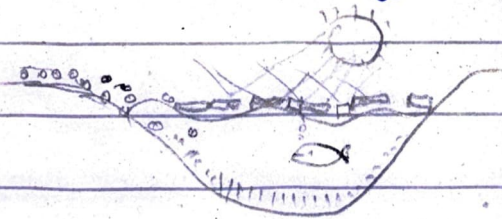
→ Process of Eutrophication

1. Fresh water body has aquatic life which comprises of fishes, plants and microorganism sustained with dissolved oxygen in water.



The plants in water body thrives with sunlight to do photosynthesis.

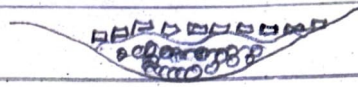
2. Nutrients runoff from nearby areas by drainage or fertilizer runoff during rain which causes in growth of algae on surface of water called Algal bloom. The



algal bloom stops the sunlight reaching the bottom of water body causing the death of flora in the water body. Bacteria in the water consume these died plants with respiration. This respiration consumes dissolved oxygen in the water body.

3. Due to lack of oxygen, fishes in the water

starts dying. Resulting in complete death of a water body.



* Measures to reduce /mitigate Eutrophication:

1. Control use of fertilizer:

Since it is caused by nutrients running off to the water bodies in order to stop it the source of nutrients has to be stopped. Which is over use of fertilizer in nearby areas. Since these fertilizers are more than needed they are drained to the water bodies. Government should educate farmers for controlled use of fertilizers.

2. Use of technology :-

Once the water body has the algal bloom in order to restore it technology can be used to restore it. One way is to destroy the algal bloom on the surface. UV rays can be utilized in targeting the the algae. which will hence allow the sunlight to penetrate to water and hence restore the water body.

(b) Give a brief about Ramsar convention?

★ Introduction:

In 1971 Ramsar convention took place in Iranian city of Ramsar. The purpose of convention was preservation of wetlands. It was attended by 173 countries making it an intergovernmental treaty.

★ Wetlands:

Wetlands are ^{large} places on lands with abundance of water and which hold around 800 species of wildlife, and hence ensures biodiversity of the region.

★ Objectives of Ramsar convention:

The convention has three main objectives

1. Nationally wise use of the wetlands in a territory by its state. Planning of its sustainable development to be done.
2. Nomination of Ramsar Sites — wetlands which are of global importance — ensure their effective management.
3. Coordination between countries holding shared wetlands.

★ Ramsar sites Statistics:

There are currently 2500 Ramsar

sites throughout the world. UK holds the largest amount of Ramsar sites totalling 176 sites. However, Brazil hold the largest area of Ramsar sites. Pakistan has 19 Ramsar sites spreaded throughout 4 provinces.

Question no 3.

- (a) Why global warming is considered as threat to humanity?

"There is no plan B, because there is no Planet B" — Ban Ki Moon.

Thesis:

Global warming is caused by emission of greenhouse gases which are CO_2 , CH_4 , NO_x and Fluorocarbons. It is a threat to humanity because it is disturbing ecosystem of land, seas and polar regions with melting of glaciers, rising sea levels, increased precipitation biodiversity loss and droughts. Making the life difficult on earth.

Introduction:

According to IPCC the earth temperature has risen by 1.5°C upto 2024 as compared to pre-industrial levels. This is caused by

emission of greenhouse gases such as CO_2 , CH_4 , NO_x and fluorocarbon due to anthropogenic activities such as fossil fuel burning, cement manufacturing, livestock, agriculture and industrial emission.

Impacts

1. Glacier melting:

With rising temperatures, glaciers are melting at an unprecedented rate. The melted water goes to lakes and rivers first, which gets flooded. These floods disturb the land by wiping the infrastructure and agriculture impacting the economy. It then dumps to sea, which causes sea level rising.

2. Rising sea level: Increase in sea level affects the coastal areas which have people and in megacities at coast has to displace resulting in loss of land and resources, affecting humanity economically. The land mass is also decreasing as some islands are completely down with passage of time. Tuvalu island country in Pacific ocean is sinking and it will become first country to be wiped by sea water.

3. Droughts: countries with ^{sub}tropical and arid climates are becoming deserts with increasing temperature. impact the livelihood of people living in those land areas, as the life is becoming unbearable with high temperature. Resulting in migration of people from such areas straining life at other areas of the world.

4. Ocean biodiversity loss: Aquatic life lives in coral reefs. However, coral reefs are sensitive to temperature. With increase in sea temperature, coral reefs are bleaching. This is degrading aquatic fishes. Humans rely on fish for food, with degrading fishes food security is also under threat.

Mitigation of global warming.

Global warming can be controlled if serious actions are taken jointly. First of all fossil fuel burning has to be stopped and the world has to shift to non-renewable energy resources. Pollution has to be controlled. Thirdly, reforestation and afforestation has to be ensured throughout the world. Lastly, deforestation has to be stopped.

"The climate crisis has already been solved.

All facts and solutions are known. All we need is political will" — Greta Thunberg.

(b). Define Biodiversity. Explain its causes and effects and give suggestion to counter.
Answer.

* Biodiversity :- The variability of living organisms genetically, species and ecosystem sustaining on Planet Earth.

* Loss of biodiversity causes:- Loss of biodiversity is an important topic, which need serious attention of human beings. This is happening because of loss of habitat, pollution, climate change, Habitat fragmentation and introduction of alien species in an ecosystem.

1. Habitat loss:- Due to urbanization diverse habitats are deforested, and hence species are losing their indigenous environment. Displacement of species causes their death, as some of them are not able to survive in different environment.

FAO estimates that every year world losses 10 million hectares of land covered with forest.

2. Climate Change:- Due to global warming

ice is melting in polar regions so fauna in polar regions are getting displaced. Coral reefs are bleaching which is disturbing the aquatic life as coral reef is their main habitat.

3. Pollution: water, air and soil pollution is also killing different species. Due to waste of plastic in seas fisheries are dying. Air pollution due to particulate matter ~~is~~ causes breathing difficulties for various species and hence resulting in their death. Fertilizer run-off to lakes and rivers causes eutrophication and hence results in death of the water body ecosystem.

4. Habitat fragmentation: When a habitat is divided by anthropogenic urbanization the contact of species is lost and hence breeding is affected and hence disturbing genetic diversity.

5. Alien species introduction.

When outsiders are introduced into an ecosystem by human beings, these compete with the existing species for resources often passing them. Which results in death.

of indigenous species.

Effects of loss of Biodiversity:-

When biodiversity is lost it impacts the balance of ecosystem as the food chain is affected and hence variety of foods available is reduced. When ecosystem diversity is lost e.g. the wetlands or forests the climate is impacted. As trees are source of transpiration and hence rainfall. Also the plantation which is used for medicinal purposes will also impact human beings.

Suggestion for Conservation:-

Biodiversity loss can be avoided by in-situ conservation i.e. by creating national parks. ~~with~~ An environment that is indigenous to species has to be provided to them. Species like tiger and lions survive on vast areas of land. So large areas of lands has to be fixed for wildlife sanctuaries.

Additionally, Ex-situ conservation has to be done. Seed bank of diverse species has to be saved which can be utilized after extinction of any species. Also animals

can be protected by keeping them in zoological gardens where their food~~s~~ needs are catered attentively. Deforestation has to be stopped. Pollution has to be controlled. To avoid the global warming fossil fuel burning has to be stopped and humans have to move to non-renewable energy resources to protect the environment.

Question # 4

(a) What are technological options available to counter air pollution. ^{vehicle}

Answer.

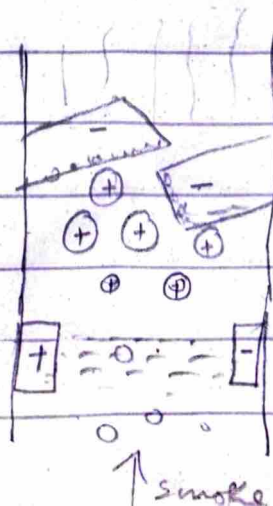
Ther's :

Air pollution is caused by industries, vehicles and construction activities.

Technologically in industries electrostatic collectors can be installed in chimneys, for vehicles catalytic converters should be installed in vehicles exhaust and construction activities needs to be done with cranes in co-ordinated condition. Agriculture sector contribute to air pollution by burning left over crops in Pakistan that can be countered by large machinery mechanized harvesters.

Introduction:- Air pollution is a type of pollution in which particulate matter of size $PM_{2.5}$ and PM_{10} are released to the atmosphere which is harmful for human health as it causes breathing problems, heart issues and lung cancer. ~~However~~, It is caused by burning of fossil fuels and more technological practices can be used to stop them.

1. Industrial air pollution:- Primarily the air waste of the industries are left into the environment through their chimneys. However cleaning of ~~air pollution~~ fumes can be done using electrostatic collectors. In which the particles are first charged by passing through high voltage field. Which then attracts to the opposite charged plates while passing through it. These plates are later cleaned mechanically and dust is collected in the hoppers.



2. Vehicle pollution: When hydrocarbons are burned in IC engines the incomplete combusted fuel ~~is~~ released from vehicle exhaust causes air pollution which can be avoided by installing catalytic converters to the exhaust of vehicle. It converts released NO_x in combustion to harmless gases N_2 and O_2 . Also carbon monoxide is converted to carbon dioxide. ~~For~~ Catalytic converter has palladium catalyst plates which oxidizes these harmful gases to relatively safe gases. Additionally, electric vehicles ~~can be~~ has to be used ~~as~~ instead of internal combustion engine vehicle. These vehicles are clean energy as they don't release harmful gas to atmosphere.

3. Agriculture and Construction cause pollution: Construction releases coarse particles to the atmosphere. Technologically, the transport of material should be done with cranes and heavy loaders also the construction activities has to be done in well cordoned environment. ~~by using~~ Agriculture burning can be countered by using harvesters which does not ~~let~~ any residue left after operation.

(b). How can Pakistan adapt climate changes? Gives challenges and opportunities

1. Moving to Renewable energy resources.
2. Reducing GHGs emission.
3. Making dams to store water.
4. Floods can be avoided by making more canals to channel water appropriately.
5. Using drought resistant crops.
6. Smog can be prevented by regulating industrial and vehicle emission.
7. Investing in infrastructure that is green. Building more parks.
8. Foresting the mountains.
9. Stop deforestation.

Question # 6

(a) Population explosion:

Population is an acute challenge of modern times as it strains the resources available and degrades the environment.

Population explosion happens because of three factors (1) Internal breeding (2) Migration inflow (3) Migration outflow.

$$\text{Population growth} = \text{Internal population} + \text{inflow of migration} - \text{outflow of migration}$$

Due to population growth land ~~use~~ requirement is increased hence causing urbanization. Also more people mean more resources requirement such as food, water and energy. Thirdly, population explosion increases waste. So waste management challenge arises.

(b) Food Insecurity.

Food is a necessity of life but increase demand and climate change challenges is giving rise to food insecurity.

With increasing population the demand for food is more so unsustainable agricultural practices is done to ensure the constant

supply. However, this causes degradation of soil fertility, loss of forest as more land is used for cultivation. Hence resulting in degradation of climate.

Also with the degrading climate global warming is increasing which has strained the food supply. As with increasing temperature the droughts are happening. Additionally the melting of glaciers and flooding destroys the agriculture lands, wiping them out.

(c) Water logging & Salinity.

When water is more concentration than the soil requirement, water logging happens. It creates marshes on lands rising the ground water level and making the land ineffective for any plantation.

When this water evaporates the nutrients in it remain on the soil making a thick layer on top of the soil. This is called salinity. Saline land is ineffective for farming as the crops are not able to penetrate into the soil for water uptake and other nutrients.

(e) Energy security.

Energy is an important requirement of current times. However, to ensure energy security fossil fuels are burnt to make electricity majorly in the world causing pollution and hence climate change.

However, renewable energy resources can also be used to meet the demand as they don't impact the environment. Renewable energy sources include solar, wind, hydro, Geothermal and Biomass. Hydropower is most extensively used because of its constant supply however the cost of such projects are relatively high. Geothermal can only be harnessed in areas with high tectonic activity. However solar and wind are emerging to be the most widely adopted energy resources.

Non-renewable energy sources are also unsustainable as their reserves are depleting.