

Question No. 2

1- Introduction:

At time, Pakistan is facing multiple environmental issues. At one side there are threats of rising food insecurity while at others, the air quality index of many cities is deteriorating. Since the arrival of winter, there are different events which shows the declining air quality i.e fog. Air pollution has resulted into negative effects on humans, plants and environment as well on marine ecosystem. Different air control measure can be used to treat air pollution.

2- Defining Air Pollution:

WHO defines air pollution as:

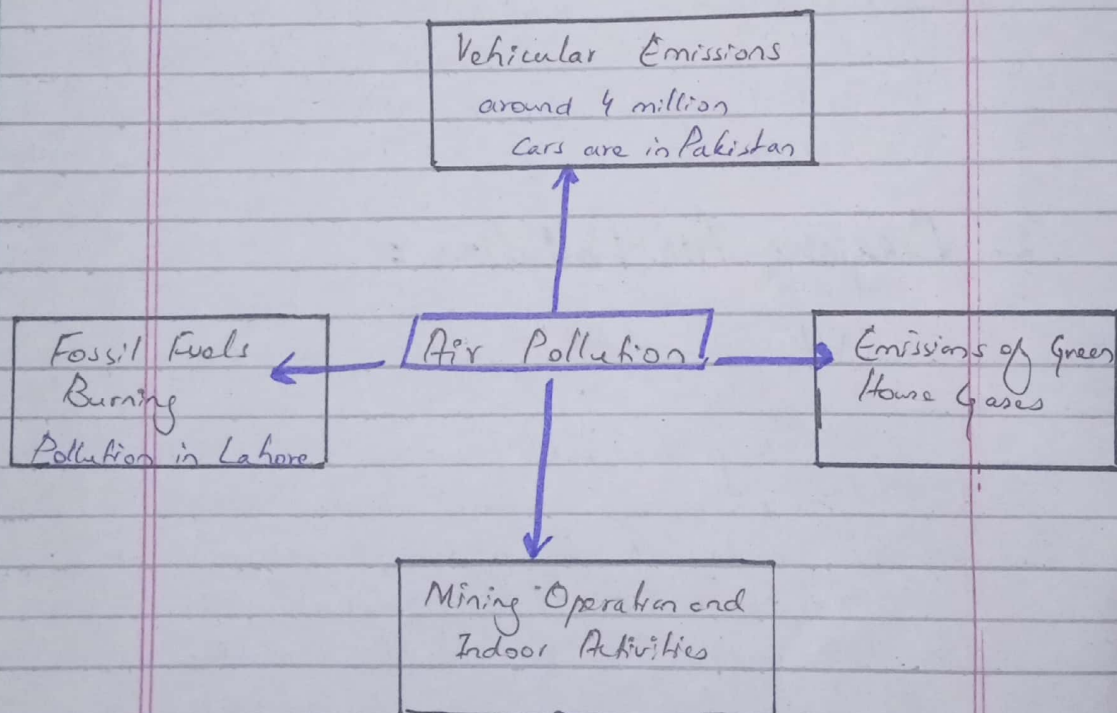
“any desirable change in parameters of air which makes it harmful to humans, other living organisms.”

In Pakistan, air quality index is above the safe level. For instance, as per international standards of IQ Air Index, the standard rate of healthy air is around 150. However, recently Lahore was regarded as most polluted city in the world and its air index is around 301, which is hazardous for breathing.

Cities of Pakistan	Air Quality Index
Lahore	301 (hazardous)
Karachi	204 (harmful)

WHO estimated that pollution levels in Pakistan is 10 times more than standard levels which is seriously alarming.

3. Causes of Air Pollution in Pakistan:



4. Effects of Air Pollution in Pakistan:

Air pollution has caused effects on humans, plants, environment as well as marine life. Some of effects are as follows:

1- Difficulty in Breathing:

As a result of air pollution and smog formation, there has been an increase in the number of patients that face breathing difficulty. In Punjab, emergency was declared in hospitals due to such situations.

2- Smog Formation:

Air pollution has resulted into formation of smog in different parts of Pakistan with mostly in Punjab. Many cities like Multan, Sukkur, Faisalabad, Lahore witnessed intense smog formation in last days of December 2023.

3- Risk of Lung Cancer:

Air pollution can increase the risk of lung cancer due to emission of pollutants like Asbestos, Mercury, Volatile Organic Compounds. These heavy metals have the tendency to accumulate in internal organs through breathing. All these metals are carcinogenic.

4- Risk to Coral Reefs:

Increased number of green house gases which are significant reason for air pollution have caused threats to world marine life. As per estimates of WWF, coral reefs

will become extinct by the end of this century due to acidification, which is enhanced by air pollutants.

5- Abscission and Necrosis in Plants:

Plants take pollutants through atmosphere and these pollutants become part of steps of photosynthesis. They stunt the growth of plant and this phenomenon is termed as abscission. Apart from this, they have ability to affect leaves indirectly to xylem and phloem tissues and finally death of plants. For example, oxides of nitrogen.

6- Damage to Central Nervous System:

Air pollutants have the ability to damage central nervous system in humans. For example, lead is one of dangerous pollutant that cause negative effects to central nervous system of humans.

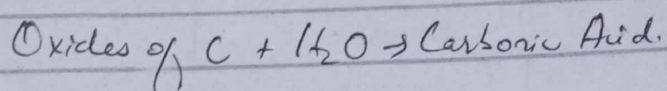
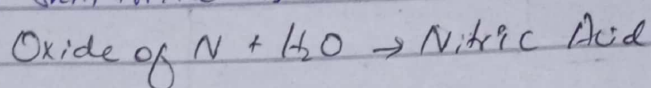
7. Dropsy in Fish:

Pollutants which released in the atmosphere become part of water cycle reached oceans and are accumulated by fish. This cause a disease in fish called dropsy. Dropsy is caused by Mercury.

8- Acid Rain:

When oxides of Nitrogen and carbon

are released in the atmosphere. They react with water vapours and form acid. This acid comes to earth in the form of precipitation and cause corrosion of buildings and skin irritation.



5- Measures to Reduce Air Pollution:

Air pollution is responsible for all above mentioned effects which makes it crucial to take the significant steps. There are different measures regarding control of pollution and are as follows:

i- Dust Collection System:

Dust Collection System involves the collection of dust at source level in the industries and factories. It involves following systems:

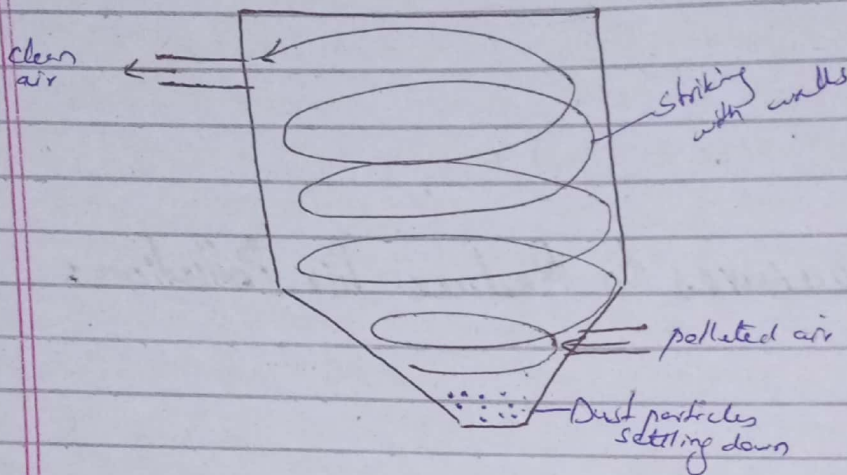
a- Filter Bags:

Bags made of cotton or nylon are used to capture dust. When polluted air is passed through it, dust particles are stucked in cotton cloth there by removes dust from air.

b- Cyclonic Separators:

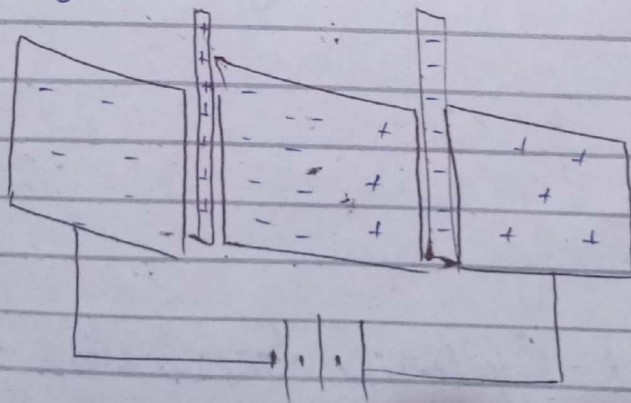
Cyclonic separators works on

principle of inertia. In cyclone, rotating wind strikes with the wall of cyclone and cause its particles to settle down.



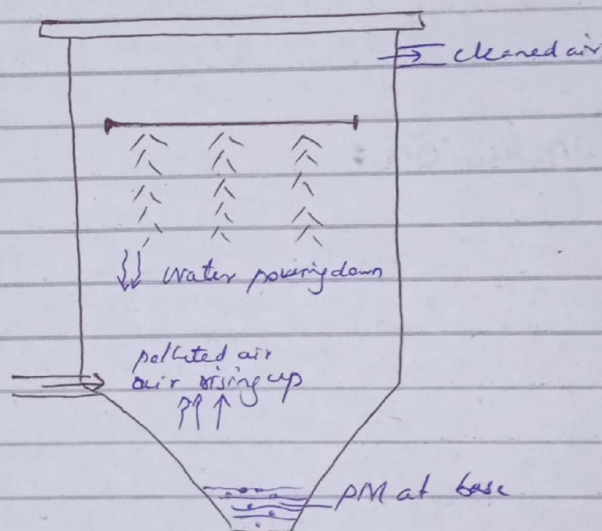
C- Electrostatic Precipitators :

Electrostatic Precipitators are used in Industries like cement, paper, furniture industry to remove dust by charging dust particles. In electrostatic precipitator, charged plates are present which are connected to the battery. Dust particles move through it and are charged, and are finally stored on opposite charged electrode.



ii- Scrubbers :

Scrubbers are used to removed harmful gases like SO_2 and particulate matter (PM). Scrubber are divided into different types based on their operating systems: Dry and Wet Scrubbers. Dry scrubbers used dry material to capture PM and emission gases. Whereas, wet scrubbers used hydrated lime or water to capture pollutants from emission gases.



This method is effective but it has draw back. Disposed material at bottom of machine needs proper treatment before disposal which makes it costly.

iii Vapour Recovery System :

It is used at fuel station to reduce the emission of gasoline. It is divided

into two phases:

Phase I



while transferring from trucks
to storage tanks

Phase II



while transferring
fuels from storage
tanks to vehicles

iv- Phytoremediation:

Phytoremediation is cheapest way to remove pollutants from atmosphere by growing plants. Plants will use atmospheric pollutants and can convert them into useful components. Also, this method has no significant drawback.

6- Conclusion:

In a nutshell, levels of pollution in different cities of Pakistan are exceeding the standard limit. This could result into different negative consequences however, through effective measure it is estimated that these levels could be decreased to standard ratio.

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Question No. 3

1- Introduction:

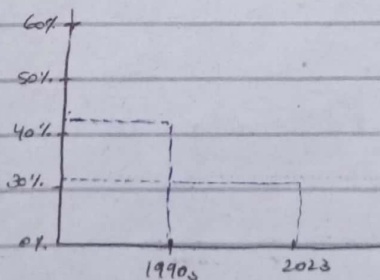
Industrialisation era has transformed the world globally and has pushed

earth is a unique era of advancement and technology. Of course, it was not without cost and earth has to bear environmental degradation which has affected the environmental balance. Climate change - which is a natural process - has instigated due to significant industrialization. Today, world is in an era where people, globally, the effects of climate change are witnessing. All these consequences are increasing at higher pace which need significant reduction of CO₂ outputs, international cooperation and strong commitment to achieve targets.

2- Statement, "Global Warming's era has ended, it's era of Global Boiling."

The statement was spoken by UN Secretary General by highlighting the severity of global warming. The statement implies that environmental challenges have been intensified. The consequences of global warming are witnessing at high levels. Some of the indicators of the statement are as follows:

i- Loss of Forest Cover and Increasing GHG emissions:



As per figures of FAO, forest cover in the world constitute 31% in current era which was 43% in 1990s. Decrease in forest cover have increased the emission of CO_2 - a main global warming contributor - in the atmosphere. According to an estimate, a single tree can store 48000 pounds of CO_2 annually.

ii- Increase in Average Temperature :

Since 1990s, there has been an average increase in temperature of 1.1°C as per sources of World Bank, which was 0.5°C in 1990. This increase in temperature is causing different other phenomena. June 2023 and July 2023 were recorded as hottest months of 2023. While heat wave was also witnessed across different parts of world including Europe.

iii- Melting of Glaciers :

Global warming has intensified the melting of glaciers. Over the past few decades, this has been observed by a number of scientists and researchers. As per NASA, Antarctica has almost shed 150 billion tons of ice. Glaciers are source of fresh water, melting can cause issue of water scarcity throughout the world.

iv- Rise in Floods:

Along with other climatic events, climatic disaster like floods are getting intense. In 2022, Pakistan has witnessed intense flood situation which has affected approximately 33 million people as per data of UNICEF.

v- Droughts and Food Insecurity:

The issue of food insecurity is addressed by a number of countries as a result of increasing food crisis. This is an alarming consequence of global warming. As per IPCC 6th assessment report published in March 2023, if climatic conditions persists as they are, Africa and Asia will be affected most. Africa will be most vulnerable, it will lose 30% of its maize cultivation and 50% of bean cultivation.

vi- Rising of Sea Levels:

Melting of glaciers are resulting in rise of sea levels. This is harmful for coastal population as they will submerge under water. According to an estimate, if water rises by 1 meter, 12% of Bangladesh will submerge under water. Every effect is linked with other effects.

vii- Disappearance of Small Island Developing States: (SIDS)

There are many small island developing states across the world. Rise of sea level poses serious threat to their existence. For instance states like Indonesia, Malaysia are more prone to disappearance. According to an estimate, Malaysia will disappear by the end of this century from the world map.

viii- Acidification of Oceans:

Increasing emission of CO_2 in the atmosphere not only increase the temperature on earth surface rather it has also considered a threat for marine population. Many marine species are vulnerable to pH and small change in pH can result into their decline. Coral reefs cannot survive in acidic environment.

ix- Spread of Vibrio Infections:

Many vibrio bacteria were frozen in glaciers and thus earth was safe from their infections. But, melting of glaciers has increased and it has been said that vibrio infections are going to increase. They will affect living organisms especially humans and can result into origin of different diseases.

3- Measures to Combat Global Warming :

In order to reduce or slow down the effects of global warming, different steps are required which are as follows:

i- Afforestation :

Trees are considered as carbon sink and they remove excessive CO_2 from atmosphere. So, it is crucial to plant more trees to combat negative effects of global warming. Forest will increase fertility of soil as well as give resistance against floods. For instance, Pakistan took initiative of 10-billion Tsunami tree project to plant 10 billion trees from 2021-2023.

ii- Efforts to Cut CO_2 Output :

Many industrialised nations like United States, United Kingdom, China and emerging economies like India are contributing more than 60% to global emissions. There is significant need of cut down of CO_2 production in phases as was decided in Kyoto Protocol. Saudi Arabia has already took the initiative to cut production of CO_2 as part of its Energy Vision 2030.

iii- Growth of Drought Tolerant Crops:

Change is inevitable and cannot be avoided and best way is to adapt oneself to changing environment. In this aspect, it is better to grow drought tolerant crops to meet demand of people and to tackle food insecurity. As, India has already put ban on rice exports. Similarly, 18 other countries upto now have put ban on export of food items. Therefore, it is crucial to grow crops like okra, mustard plant and other plants by using Genetically Modified Seeds.

iv. Role of International Organizations:

Different organizations like UN can play a role in addressing environmental concern and to adopt it in national policy agendas. UNEP can play its part in raising awareness about different environmental issues.

v- Addressing Naval Exercises in Oceans Amidst Geopolitical Strategy :

Different naval exercises are conducted due to joint cooperation among different states. Such exercises need to be addressed as they play significant role in global emissions. For instance, US joint military exercise in Indo-Pacific Ocean.

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vi- Ensuring Environmental Awareness:

Environmental awareness can be ensured at global level by using social media platforms. Different environmental activists are already in the field to address the issues of global warming. A Swedish girl Greta Thunberg is raising environmental awareness by silent protest and through her Instagram posts.

vii. Commitments like Kyoto Protocol:

Kyoto Protocol was enforced in 2005 and it played immense role in reducing global emissions by end of first phase. More commitments like it are needed to reduce global emissions. Similarly, along protocols, world needs political commitments.

viii. Assistance to Developing States:

As per data of IPCC 6th assessment report, Africa and Central Asia will be more vulnerable to climate change. These figures show the need of assistance required to developing states by Annex I countries of Kyoto Protocol. Their assistance would help in developing resilience against affects of global warming.

Conclusion:

In a nutshell, consequences of

global warming have been intensified. World need cooperation, commitments, political will and unity to fight against hovering monster of global warming. A time will come, where effects of global warming will be reduced as result of world's significant efforts.

Question No. 3

1- Introduction :

Since the existence of world, it has witnessed multiple problems. With time, it learned to reduce those issues by taking appropriate measures. Same is the case with ongoing environmental issues like climate change, global warming, pollution, threats of environmental disasters and rise of sea level significantly. However, it is crucial to understand that every problem needs effective management to resolve it. Moreover, effective policy decisions could help the world in building resilience and mitigating effects of environmental problems.

2- Defining Environmental Management:

Environmental Management is defined as:
"a systematic or strategic approach taken by individuals, institutions or governments to take

effective measure against environmental degradation to provide sustainable solution of the problem. It involves planning, implementing, monitoring and evaluation.

Environmental management is necessary to highlight ongoing issues, to take necessary measure against them. It can play role in ecological restoration, biodiversity conservation and pollution control.

3- Strategies Related to Environmental Management in the Past :

In the past, different environmental management practices were taken internationally to conserve environment and restore natural environment. Some of them are as follows:

- i- UNFCCC (UN Frame Convention on Climate Change).
- ii- UNCCD (UN Convention to Combat Desertification)
- iii- Ramsar Convention on Wetlands
- iv. Bonn Convention
- v. Convention on Biological Diversity (CBD)

4- Environmental Management in Pakistan:

By following, international protocols on environmental management, Pakistan has also taken following steps to ensure

environmental management:

- i- Formulation of Pakistan Environmental Protection Act 1997.
- ii- Establishment of EPA (Environmental Protection Agency)
- iii- Pakistan Wetland Programme
- iv- Pakistan Water Sanitation Policy
- v- SCRAP Project Against Land Degradation.

5- Success Stories of Environmental Management and Effective Decision Making :

Making :

i- Montreal Protocol and Protection of Ozone Layer:

In 1960s, it was addressed that due to degradation of Ozone layer in stratosphere, cases of cancer and eye cataracts had been increasing. As a result, in 1967, Montreal Protocol was adopted to stop the use of Chlorofluoro carbons which were destroying ozone. In the recent years, NASA has predicted that effective strategies had resulted into healing of Ozone layer.

ii- Reduction in Levels of Air Pollutants

in Los Angeles :

Another success story of

environmental management is reduction of air pollutants in Los Angeles which had been high in the past.

iii- Chesapeake Bay's Restoration in United States :

Similarly Chesapeake Bay's restoration was ensured as a result of United State's effective measure. It helped in restoration of ecosystem which had been destroyed due to different anthropogenic activities.

iv- Protection of Houbara Bustard Population in Pakistan :

In Pakistan, under Wetland Program, population of Houbara Bustard was conserved in order to conserve biodiversity. As a result, the population became better in the upcoming years.

v- CDM Projects Under Kyoto Protocol:

Under CDM projects as discussed in Kyoto Protocol, different developing countries were benefited. As a result, developed countries in Annex I were able to reduce their overall emissions in the form of CERs (Certified Emission

Reduction).

vi-SCARP Project in Pakistan:

In 2011, according to an estimate, out of 796096 square kilometer land more than 62000 square kilometers was facing salinity. Due to dependence on agriculture, Pakistan cannot afford the degradation of land. As a result, a project was initiated to resolve issue of salinity in Pakistan.

6- How Environmental Management and Effective Decisions Resolve Environmental Issues:

Environmental Management and effective decisions can resolve environmental issues in the following steps:

i- Planning:

Planning is a ^{first} step in environmental management and informed decision making. In planning significant steps are decided and then changed it into policies. These policies are formulated with help of experts, businessmen and stakeholders.

ii- Implementation:

After the approval of planned policy or strategy, it is left for national and international institutions for implementation. For instance, under Tsunami Tree project, 10 billions trees were planted in Pakistan from 2021-23.

iii- Monitoring:

After the implementation of policy or strategies, next step is monitoring which involves check and balance of policy. It is done when policy has been implemented or implementing. For instance, EPA monitors the constructing project whether it follows protocols of approved EIA or not.

iv- Evaluation:

Evaluation is done at the end when monitoring has been done to evaluate the impacts of proposed policy or strategy. In simple words, it highlights the significance of an informed decision. After the implementation of protocols of Kyoto Protocols, it was evaluated that the protocol was successful in reducing emission before the completion of first phase in 2012.

Conclusion:

Environmental management and informed decision making play vital role in resolving environmental issues. It helps in ensuring environmental healing and building resilience against ongoing environmental problems.

Question No. 7

1- Introduction:

According to "UN Land Outlook", around 1 million species are at risk of extinction. Similarly estimates of WWF predicted the extinction of Coral Reefs by 2100. These figures have highlighted the biodiversity threats in contemporary era. There are multiple causes of biodiversity loss including overpopulation, deforestation, global warming etc. UNEP has asked to undergo different transition which include environment as necessary part of development.

2- Defining Biodiversity:

Thomas Lovejoy used the term biological diversity for the first time. E.O. Wilson in 1986 use term biodiversity. It is combination of two words: Bio means life and diversity means variation. Biodiversity is variation among living forms on earth.

Levels of Biodiversity

<u>Gene Level</u>	<u>Species Level</u>	<u>Ecosystem Level</u>
Diversity of mangoes in Pakistan:	Species variation in a habitat.	Variation in each ecosystem.
Sindhri, Langru, Dusehri	Tropical Forest is rich in biodiversity	In Tundra ecosystem, Savana Ecosystem

3- Recent Trends in Biodiversity Loss: Important Figures

According to World Economic Forum report 2022, titled "Global Risk Report", biodiversity loss will be among three most severe threats that humanity will face in upcoming 10 years. As per estimates of IUCN (International Union for Conservation of Nature) activities ~~the~~ related to food, infrastructure and energy production accounts for 79% of impact on threatened species.

4- Causes of Biodiversity Loss :

i- Overpopulation:

As per November 2023, the world stands at 8 billion population and is expected to go 10 billion by 2050. Though, it was only 5 billion in 1990 as per World Bank. Rise in population has result in exploitation of natural species.

ii- Global Warming:

Since 1990s, the temperature has increased by 1.1°C and is expected to rise further. Global warming has resulted into biodiversity loss as most of species are not adaptable to temperature change. For instance coral reefs cannot sustain in acidic environment.

iii- Environmental Pollution:

Agricultural runoff has resulted into eutrophication and loss of marine life. Minerals in form of fertilizers increase the nutrient content of water body thereby cause excess growth of phytoplankton and reduced O_2 in water. Loss of O_2 ultimately results into biodiversity loss.

iv- Deforestation:

Deforestation has resulted into loss of habitat. As per statement of World Bank, forest cover decline from 43% to 31% in recent era. This has become significant cause of biodiversity loss.

5- Measure to Control Biodiversity Loss:

i- General Measures:

Biodiversity can be conserved into two ways: Ex-situ conservation and In-situ conservation.

Types of Conservation

Ex situ Conservation



Seed Gene banks, cryopreservation, botanical and zoological gardens

In situ Conservation



Protected Areas, National Parks, Sanctuaries, Biospheres

ii- Transition by WEF to Reduce Biodiversity Loss :

a. Compact Built Environment :

It is advised to compact urban areas in such a way that it clear a piece of land for agriculture, recreation and other activities. Vertical expansion will ensure sustainable urbanisation and protection of biodiversity.

b. Nature Positive Connecting Infrastructure :

Make changes in the connecting infrastructure like railways, roads in such a way that individual should be okay with some compromises. Like for people assistance, cutting a forest and destroying natural habitat for building road should be changed with choosing a long distance that avoid destruction of biodiversity.

6- Conclusion :

Biodiversity is a natural asset that must be protected. Human activities that affect the biodiversity loss must be dealt properly.

Part (b)

1 Introduction:

Environmental Awareness plays a crucial role in countering environmental problems by fostering a sense of responsibility and prompting individuals to adopt sustainable practices. Increased awareness has led to informed decision making. It also reduced resource consumption, and increased support for policies promoting environmental conservation.

2- Environmental Awareness:

Environmental Awareness is defined as:

"to educate the masses about potential threat to environment and their consequences on human health as well as other living organisms."

Environmental awareness is subject of almost all of international conventions and treaties where it was acknowledged that awareness plays significant role in protecting environment.

3- Role of Environmental Awareness:

Environmental Awareness played important role in countering environmental problems in the following ways:

i- Through Education:

Awareness raised through awareness educational

programs will inform people about environmental issues and their causes. It will also provide knowledge about their solutions. In course of Federal Board, chapter on Environment is part of Science subject.

ii- Behavioural Changes:

Encouraging individuals to adopt eco-friendly practices behavior such as reducing waste, conserving energy is helpful in addressing environmental issue. For instance, many clothing brands are offering jotten bags instead of using plastic bags.

iii- Consumer Choices:

Promote informed consumer choices to support environmentally conscious products and companies. Outfitter - a clothing brand in Pakistan is using recyclable bags and consumers are appreciating this efforts.

iv- Community Engagement:

Fostering a sense of environmental stewardship within communities ^{can} lead to collective efforts in conservation and sustainable practices. A video circulated on social media showed that group of grade 5 school students went to beach in Karachi and cleaned the beach from plastic wrappers.