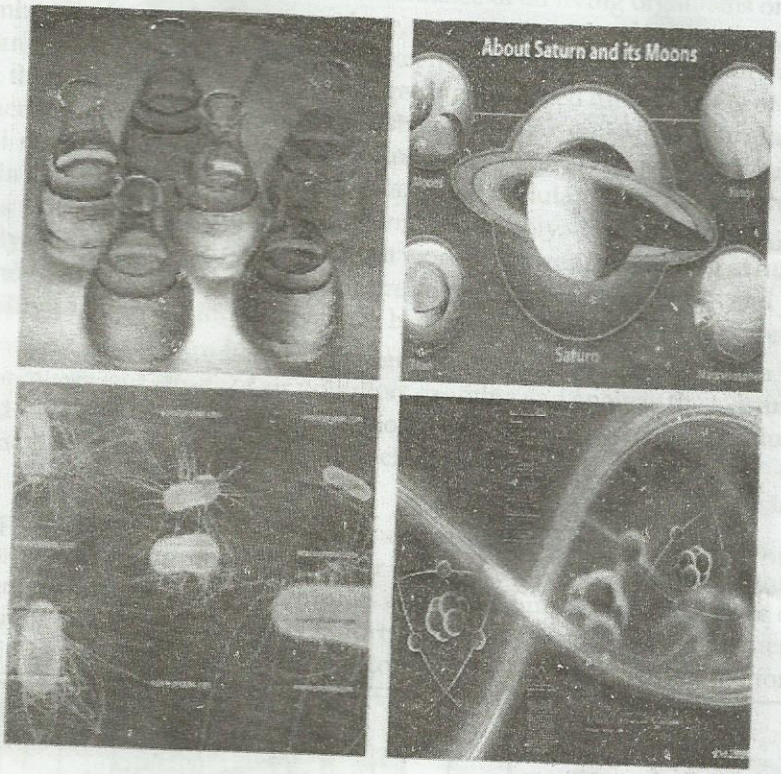
Science : IX

Code : 086 / 090

Open Text-Based Assessment
Summative Examination-II
March 2014



Themes :

1. Clean Air–A Shared Concern
2. Environment and Development–Lessons from the Hills

Science

Code (086/090)

1. Theme –

Clean Air - A Shared Concern

Abstract

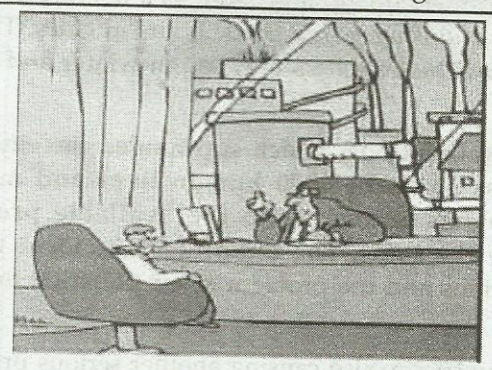
Human activities have put water and air in a bad state
Let's save, freshen and conserve them before it is too late.

Clean air is vital for the existence and continuance of all living organisms on earth. Naturally existing mixture of gases in the atmosphere, comprising of mainly Nitrogen, Oxygen, Carbon dioxide and water vapours, provides excellent conditions to support and sustain life. However, this natural composition of air is getting disturbed due to variety of human activities. Human activities related to mainly industry, vehicular emissions, burning of fossil fuels, accidental nuclear emissions etc. contaminate the natural air with undesired components resulting in air pollution. These components, called pollutants, are not only harmful for living organisms but also affect non-living things adversely. The situation is quite alarming, particularly in big industrialized cities. With worldwide trend of shifting of human population to cities and their human desire to lead more comfortable life, the issues and concerns related to availability of clean air for survival are becoming a great challenge for everyone.

The present text attempts to help the reader comprehend the situation in a holistic manner, identify the causes and effects of air pollution, examine and analyze the existing status, reflect, debate and generate ideas as to what actions need to be taken at individual, collective or governmental level to meet the emerging challenges.

The Context

The atmosphere surrounding the earth is a mixture of many gases which, along with the other conditions, makes it a unique planet for existence of life. Unprecedented urbanisation and development during the past few centuries and many human activities have disturbed the natural composition of this atmosphere. It is unfortunate that the cost of development is very heavy and is being paid by causing a severe damage to the life support system in the form of clean air.



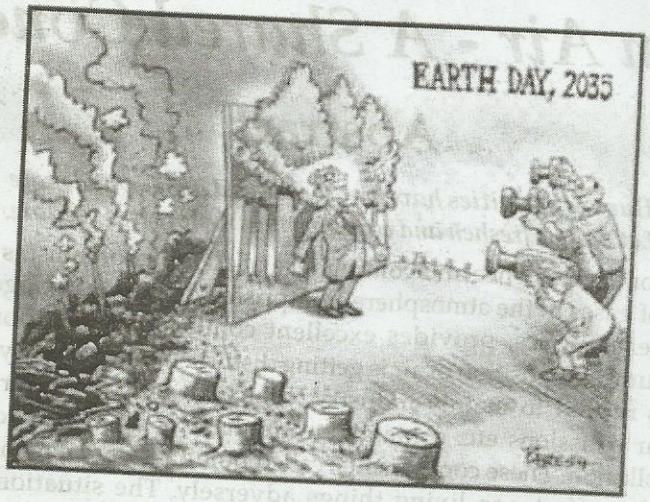
"See, son ? Daddy's company makes inhalers to help people with asthma."

Picture : 1
Source : http://www.cartoonstock.com, http://oneair.webs.com

Picture : 2
Source : http://oneair.webs.com

The contamination of air with undesirable gases and particulate matter is called air pollution. The substances which cause pollution are called pollutants. These are either gaseous pollutants like oxides of carbon, sulphur, nitrogen etc. or particulate matter in the form of dust, smoke, fume or mist. A person living in a city with polluted air is likely to suffer from one or the other breathing problem.

To sensitize people towards keeping the planet Earth non polluted, **Earth Day,** an annual event is celebrated on April 22. On this day, programmes are held worldwide to sensitize people towards environmental protection. People are made aware that if they do not act collectively, the green clean environment will be only for the pictures.



Picture : 3

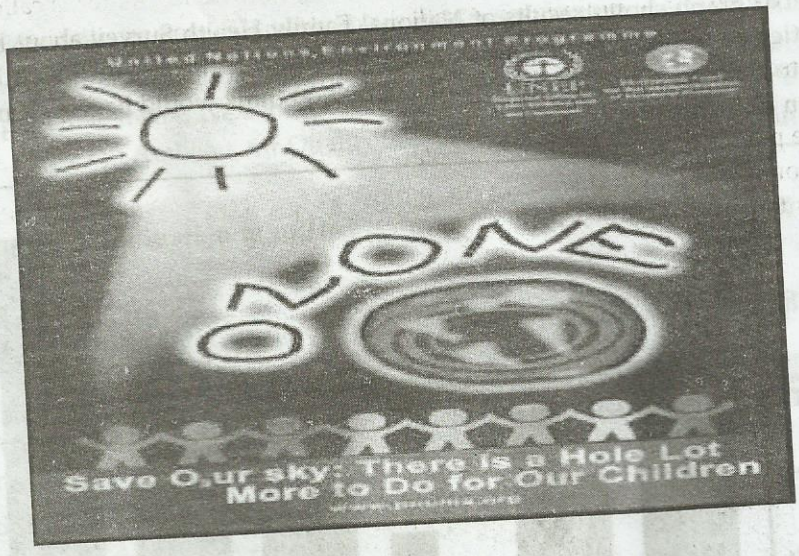
Source : http://www.tumblr.net

Carbon dioxide is necessary for the survival of life on Earth as it is an essential raw material in the process of photosynthesis and green house effect. This effect is essential to maintain and keep the earth's atmosphere warm to sustain life. But due to excessive burning of fossil fuels and other carbon containing fuels, there has been an excessive release of CO_2 in the atmosphere. The increasing CO_2 levels in the atmosphere lead to excessive heating of the earth's surface. The heating results into a new phenomenon called **Global Warming.** Besides carbon dioxide, the other green house gases present in the earth's atmosphere in their order of abundance are; water vapour, carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons.

The gaseous and particulate pollutants together cause further damage to life. Have you ever observed that visibility is very low during winters due to fog? Smog is a mixture of smoke dust particles and fog. This phenomenon increases during heavy traffic hours in cities. The reason is that smoke emitted from the exhaust of the vehicles settles over fog in winter and reduces the visibility.

We all know about the smoke laden fog, called smog, which surrounded the city of London in the year 1952. It resulted in the loss of about 4000 human lives and many others suffering from serious breathing problems according to the available press reports. Even the cattle had been asphyxiated by the smog. The unfortunate accident gave a major shock to the Governments of different nations and the problem of air pollution took a central stage.

The human lifestyle in many developed countries is also causing another serious problem in the form of depletion of ozone layer. The use of refrigerators and air conditioners, fire extinguishers, aerosol sprays like deodorants etc. results in release of CFCs and N_2O in the atmosphere which are responsible for depletion of ozone layer. This results in ultraviolet radiations entering the atmosphere unobstructed causing damage to all kinds of life on Earth.

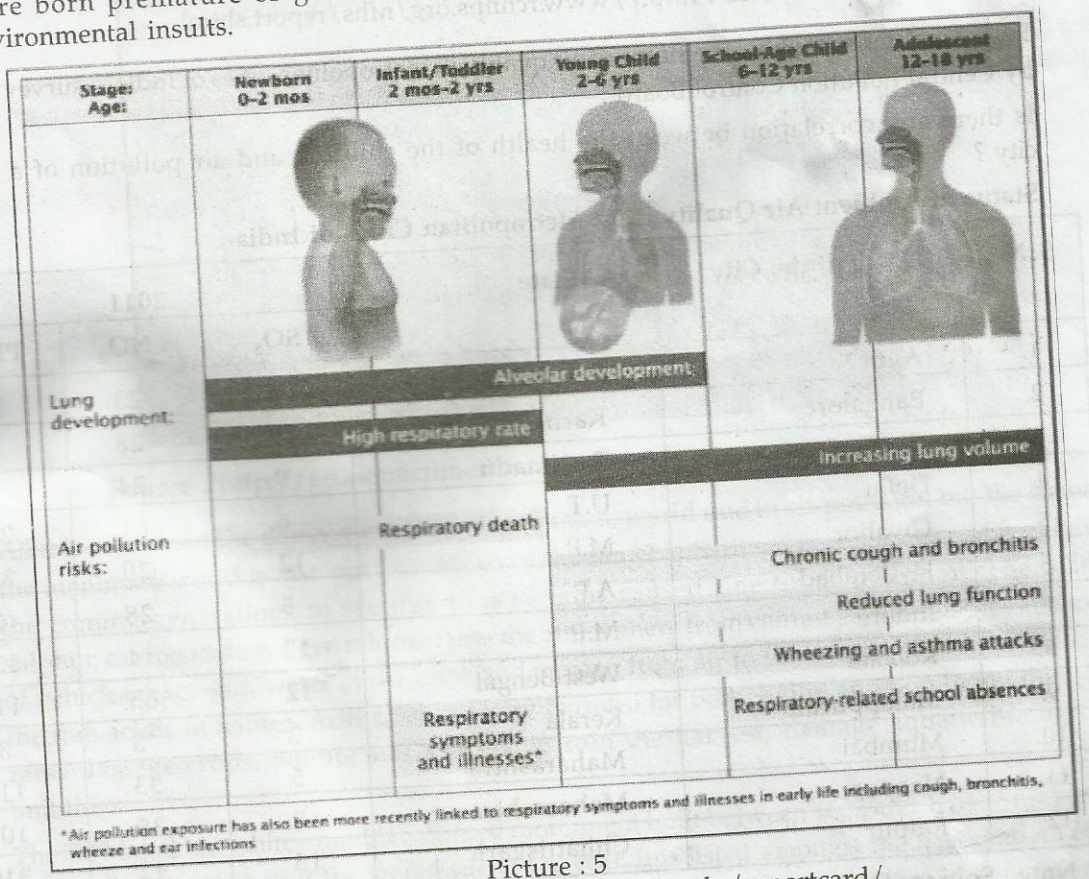


Picture : 4

Source : www.pnuma.org

Many organizations are coming forward to create awareness among the masses so that we leave a cleaner planet for the coming generations.

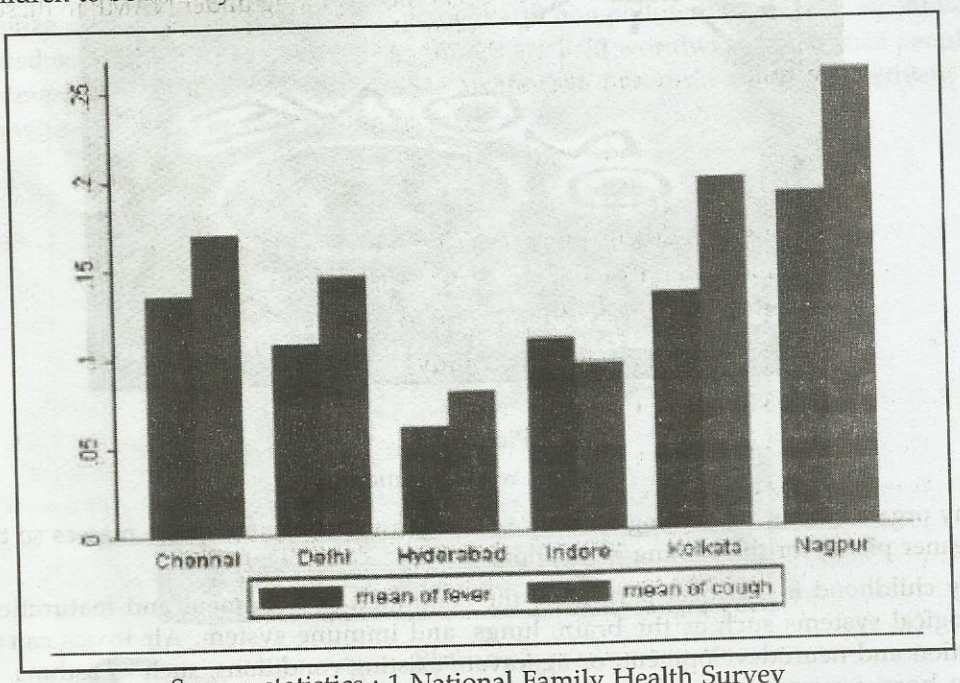
Early childhood is a critical period for the continued development and maturation of several biological systems such as the brain, lungs, and immune system. Air toxics can impair lung function and neurodevelopment, or aggravate existing conditions, such as asthma. Infants who were born premature or growth-retarded may be particularly vulnerable to additional environmental insults.



Picture : 5

Source : http://www.enironment.ucla.edu/reportcard/

Following bar graph shows results of National Family Health Survey about health of children in various cities of India. What could be the reasons for ill health of the children of Nagpur as compared to Delhi or Hyderabad ? Which city do you think would have a cleaner environment for the children to be healthy ?



Survey statistics : 1 National Family Health Survey

Source : http://www.rchiips.org/nfhs/report.shtml

Following statistics show the status of air quality in metropolitan cities of India, a survey conducted by Central Pollution Control Board :

Is there any correlation between the health of the children and air pollution of a particular city ?

Status of Ambient Air Quality in 12 Metropolitan Cities of India

S. No.	Name of the City	State	2011		
			SO_2	NO_2	PM10
1.	Agra	U.P.	3	23	155
2.	Bangalore	Karnataka	14	28	91
3.	Chennai	Tamilnadu	9	24	92
4.	Delhi	U.T.	6	61	222
5.	Gwalior	M.P.	12	20	311
6.	Hyderabad	A.P.	5	28	74
7.	Indore	M.P.	12	14	132
8.	Kolkata	West Bengal	12	65	113
9.	Malappuram	Kerala	2	5	30
10.	Mumbai	Maharashtra	5	33	114
11.	Nagpur	Maharashtra	8	35	108
12.	Raipur	Chhattisgarh	15	42	300

Note : Source : Data as reported by CPCB/SPCBs/PCCs/NEERI

Data for 2011 is average of data available as on date (08.08.2012). National Ambient Air Quality Standard for Residential, Industrial, Rural and others Areas (Annual average) for SO_2 = 50 microgram per cubic metre, NO_2 = 40 microgram per cubic metre and PM10 = 60 microgram per cubic metre. NA = No Ambient Air Quality Stations operating under NAMP in these cities during the period.

Annual average concentration in µg/m3

Survey statistics: 2

Source : *http://cpcbenvis.nic.in/airpollution/air%20data%202011-2007/2011/air2011.html*

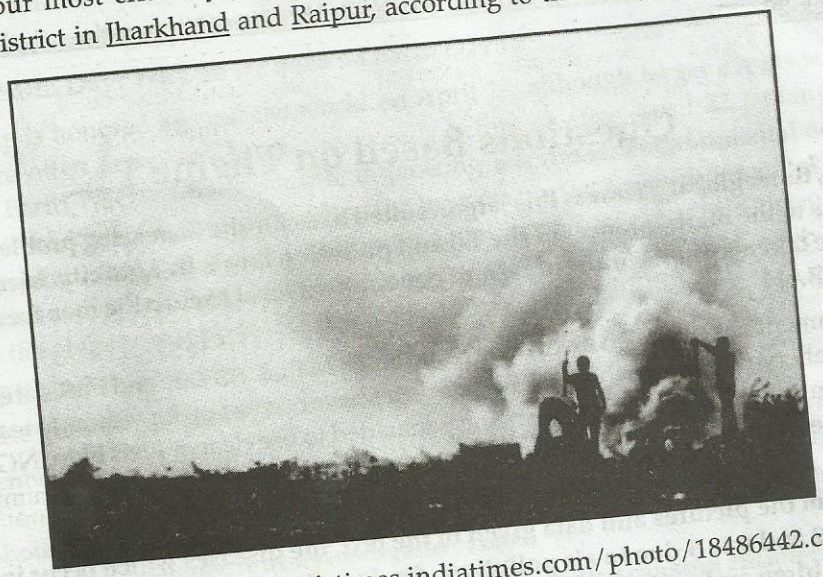
*"PM10 is the term used to describe tiny particles in the air, made up of a complex mixture of soot, organic and inorganic materials having a particle size less than or equal to 10 microns diameter (10 microns is equal to one hundredth part of a millimetre)."

Air pollution, the 5th largest killer in India: Study

PTI Feb 13, 2013, 08.35PM 1ST

NEW DELHI : Air pollution is the fifth largest killer in India taking 6.2 lakh lives per year and Delhi is among one of the five most critically polluted regions in the country, a study by a US-based health institute has claimed.

The other four most critically polluted regions in the country are Ghaziabad, Gwalior, West Singbhum district in Jharkhand and Raipur, according to the study.



Source : http://economictimes.indiatimes.com/photo/18486442.cms

All this was about the damage caused to the animate world due to air pollution but the damage to the inanimate world is also not less. Much of the tangible heritage is at a danger of surviving for the coming generations to see due to acid rains caused due to air pollution. The oxides of sulphur, carbon and nitrogen released into the atmosphere from chimneys of industries and exhaust of vehicles react with water of the rains and oxygen from air to form acids. Dissolved acids make the rain acidic in nature. Acid rains are very harmful for both, living and non living things. Acid rains damage crops, pollute soil and water, ruin the harvest, damage aquatic life and erode buildings.

The Taj Mahal is a white - marbled domed monument built between 1632 and 1654. Approximately three billion tourists visit the famed site every year. It is listed amongst the ten wonders of world but is turning yellow because of air pollution. Glass factories, rubber industries, Mathura oil refinery

and other industries of the neighbouring towns which burn fossil fuels are responsible for this. These industries release soot particles and gases into the atmosphere. The soot particles turn the colour of the marble to yellow and the gases react with water to form acid rain which corrodes the marble of the monument. This phenomenon is also called "marble cancer". In order to prevent further degradation of the building, the government has put a ban on driving near the Taj Mahal. All cars and buses are parked roughly 1 km away. Battery-run buses or horse-drawn carriages have been set up for visitors to reach the monument. Industries in neighbouring towns are being persuaded to use cleaner fuels like CNG and LPG instead of coke in their furnaces.

The challenges and problems are complex and deserve to be addressed urgently. Immediate action points need to be decided and taken by every individual, social groups and governmental level. Can you reflect, debate, discuss and decide these action points with your friends, parents, teachers and others to make a difference ?

References :

- http://cpcbenvis.nic.in/airpollution/air%20data% 202011-2007/2011/air2011.html
- National family health Survey: http://www.rchiips.org/nfhs/report.shtml
- http://www.environment.ucla.edu/reportcard/
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- http://thinkprogress.org/climate/2013/07/13/2296461/open-thread-plus-cartoon-of-the-week-29/

Questions Based on Theme 1

Q. 1. "Act local, think global". How is this jargon suited to tackle the increasing problem of air pollution? Relate this to the marble cancer of the Taj and pollution levels in Agra city. Identify various steps that can be taken up at the individual and government level to curb the menace of air pollution. [CBSE OTBA]

Ans. The government has put a ban on driving near the Taj Mahal. All cars and buses are parked roughly km away. Battery-run buses or horse drawn carriages have been set up for visitors to reach the monument. Industries in neighbouring towns are being persuaded to use cleaner fuels like CNG and LPG instead of coke in their furnaces. All people should co-operate with the government to minimize pollution near Taj Mahal.

Q. 2. Identify from the pictures and data given in the text, the diseases which occur in children of age group 6 to 12 and 0 to 5 due to air pollution. Analyse the given data and draw conclusion about health of children and pollution levels of various cities in India. What are the steps which can be taken by the authorities and communities to check the same? [CBSE OTBA]

Ans. Early childhood is a critical period for the continued development and maturation of several biological systems such as the brain, lungs, and immune system. Air toxics can impair lung function and neurodevelopment, or aggravate existing conditions, such as asthma. Infants who were born premature or growth-retarded may be particularly vulnerable to additional environmental insults. Air pollution exposures have also been more recently linked to respiratory symptoms and illness in early life including cough, bronchitis, wheeze and ear infections. To achieve air clean enough to have only negligible effects on pregnancy, infant and children's health will likely require drastic changes to motor vehicle and transportation systems, as well as industrial processes, all of which take many years or decades.

Q. 3. "Human activities have put water and air in a bad state. Let's save, freshen and conserve them before it is too late." Justify the statement.

Ans. Clean air is vital for the existence and continuance of all living organisms on earth, natural composition of air is getting disturbed due to variety of human activities. Human activities related to mainly industry, vehicular emissions, burning of fossil fuels, accidental nuclear emissions etc. contaminate the natural air with undesired components resulting in air pollution. These components, called pollutants, are not only harmful for living organisms but also affect non–living things adversely. The situation is quite alarming, particularly in big industrialized cities. With worldwide trend of shifting of human population to cities and their human desire to lead more comfortable life, the issues and concerns related to availability of clean air for survival are becoming a great challenge for everyone.

Q. 4. Write a brief note on air pollution. Suggest the ways to minimize it.

Ans. The contamination of air with undesirable gases and particulate matter is called air pollution. The substances which cause pollution are called pollutants. These are either gaseous pollutants like oxides of carbon, sulphur, nitrogen etc. or particulate matter in the form of dust, smoke, fumes or mist.

Air pollution can be controlled with the help of following measures :

(i) Use of CNG and unleaded petrol instead of leaded petrol and diesel in automobiles can reduce air pollution.

(ii) Use of alternative fuels like solar energy, wind energy and hydropower instead of fossil fuels can reduce air pollution.

(iii) We should plant trees and nurture the ones already present.

(iv) We should not burn crackers on Diwali or on other celebrations.

(v) Instead of burning dry leaves, they should be put in a compost pit to make manure.

Q. 5. When is Earth Day? Why do we need an Earth Day ?

Ans. Earth Day is honored around the world on April 22, although larger events such as festivals and rallies are often organized for the weekends before or after April 22. Many communities also observe Earth Week or Earth Month, organizing a series of environmental activities throughout the month of April. Earth Day broadens the base of support for environmental programs, rekindles public commitment and builds community activism around the world through a broad range of events and activities. Earth Day is the largest civic event in the world, celebrated simultaneously around the globe by people of all backgrounds, faiths and nationalities. More than a billion people participate in our campaigns every year.

Q. 6. What are greenhouse gases? Name any five of them.

Ans. A greenhouse gas (sometimes abbreviated GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide, and ozone.

Q. 7. The human lifestyle in many developed countries is also causing another serious problem in the form of depletion of ozone layer. How is it so ?

Ans. The human lifestyle in many developed countries is also causing another serious problem in the form of depletion of ozone layer. The use of refrigerators and air conditioners, fire extinguishers, aerosol sprays like deodorants etc. results in release of CFCs and N_2O in the atmosphere which is responsible for depletion of ozone layer. This results in ultraviolet radiations entering the atmosphere unobstructed causing damage to all kinds of life on Earth.

Q. 8. Visibility is very low on roads during winters due to fog. Why?

Ans. The gaseous and particulate pollutants together cause further damage to life. Have you ever observed that visibility is very low during winters due to fog? Smog is a mixture of smoke dust particles and fog. This phenomenon increases during heavy traffic hours in cities. The reason is that smoke emitted from

the exhaust of the vehicles settles over fog in winter and reduces the visibility.

Q. 9. How smog had affected the city of London in the year 1952.

Ans. Smog resulted in the loss of about 4000 human lives and many others suffering from serious breathing problems according to the available press reports. Even the cattle had been asphyxiated by the smog. The unfortunate accident gave a rude shock to the Governments of different nation and the problem of air pollution took a central stage.

Q. 10. How air pollution has affected the capital city Delhi?

Ans. Air pollution is the fifth largest killer in India taking 6.2 lakh lives per year and Delhi is among one of the five most critically polluted regions in the country, a study by a US-based health institute has claimed.

All this was about the damage caused to the animate world due to air pollution but the damage to the inanimate world is also not less. Much of the tangible heritage is at a danger of surviving for the coming generations to see due to acid rains caused due to air pollution. The oxides of sulphur, carbon and nitrogen released into the atmosphere from chimneys of industries and exhaust of vehicles react with water of the rains and oxygen from air to form acids. Dissolved acids make the rain acidic in nature. Acid rains are very harmful for both- living and non-living things. Acid rains damage crops, pollute soil and water, ruin the harvest, damage aquatic life and erode buildings.

Q. 11. What is the scientific consensus on the causes and consequences of climate change?

Ans. Global warming is real. The global average temperature in 2003 was the third hottest since record keeping began in the late 1800s (1998 was the first, 2002 was second), and the ten warmest years on record have occurred since 1990. The 1990s was the warmest decade in the Northern Hemisphere in the past 1,000 years.

What some scientists continue to debate is the extent to which humans are affecting global temperatures and causing climate change. But the majority of scientists who study these issues around the world—including those with the World Meteorological Organization, the Intergovernmental Panel on Climate Change (IPCC), and the U.S. National Academy of Sciences—agree that humans are the main force behind the sharp global warming trend of the past century.

Most scientists agree that the climate changes caused by global warming will never be completely predictable, but that they present serious risks—more extreme temperatures (hot and cold), greater storm intensity and frequency, more frequent droughts and floods, and rising sea levels—that warrant immediate efforts to reduce emissions from fossil fuels.

Q. 12. What are climate change and global warming, and how are they related?

Ans. Global warming refers to an increase in average global temperatures, which in turn causes climate change.

Climate change refers to changes in seasonal temperature, precipitation, wind, and humidity for a given area. Climate change can involve cooling or warming.

Temperature readings taken around the world in recent decades, and scientific studies of tree rings, corals, and ice cores, show that average global temperatures have raised since the industrial revolution began, with increases accelerating over the past few decades. The overwhelming consensus among climate scientists is that most of the increase is due to human economic activity, especially the burning of fossil fuels and deforestation. These activities contribute to a build-up in carbon dioxide (CO_2) and other gases in Earth's atmosphere.

Our atmosphere is made up of gases, such as nitrogen, oxygen, and CO_2, and water vapor, which act like a "blanket" draped around the planet. Some of these gases—such as CO_2, water vapor, and methane—absorb heat, reducing the amount that escapes to space, and increasing global temperatures. This is what is called the "greenhouse effect," and these gases are often referred to as "greenhouse gases."

Q. 13. What role does human activity play in the current global warming trend ?

Ans. (a) A variety of heat trapping—or "greenhouse"—gases collect in Earth's atmosphere and keep the planet warm enough to sustain life. This occurs through natural processes. For example, humans and animals inhale oxygen and exhale carbon dioxide (CO_2). Plants absorb CO_2 while growing, but release it as they decompose. The decomposition of cattle manure and peat releases methane, an even stronger, but shorter-lived heat-trapping gas.

(b) Human activities also produce greenhouse gases. Carbon dioxide is released when we burn fossil fuels to produce electricity; heat our homes with oil, coal or gas; drive our cars; or switch on our natural gas stoves for cooking. And landfills release methane into the air as our garbage decomposes. Such activities have significantly increased the quantity of several heat-trapping gases in the atmosphere over the past few centuries. For example, carbon dioxide concentrations in the Earth's atmosphere are 34 percent higher today than they were at the onset of the industrial revolution in 1750—higher than at any time in the last 400,000 years.

(c) Scientists have determined that as atmospheric levels of carbon dioxide have increased, largely due to human activities, the average global temperature has risen significantly. In 2003, the average global temperature was the third highest ever recorded, just slightly below the 1998 and 2002 averages. Scientists predict that average surface temperatures will increase during this century at rates unprecedented in the past 10,000 years.

Q. 14. How does the Ozone layer of atmosphere protects lives on earth ? These are some probable damages due to Ozone layer depletion. Mention any two of them. Replacement of CFC's by other substances are now in process to avoid Ozone depletion. Identify various steps which shows that CFC's are a source of Ozone depletion.

Ans. The Ozone layer is a layer of the earth's atmosphere in which most of the atmosphere's ozone is ocncentrated. It protects the earth from harmful radiatons like high energy UV-radiations from passing through it.

Probable Damages Due to Ozone Layer Depletion :

(i) Exposure to UV rays can lead to greater incidence of skin cancer, cataracts on other damages to the eye and immune deficiency.

(ii) It may also disturb global rainfall, causing ecological disturbances and bring about reduction in global food supplies.

Reasons for Ozone Layer Depletion :

(i) When harmful chemicals like chlorofluorocarbons (CFCs) are released into the air, it accumulates in the upper atmosphere and reacts with ozone resulting in reduction in thickness of the ozone layer. The Antarctic hole in ozone layer is caused due to chlorine molecules present in chlorofluorocarbon (CFCs), that are used by human beings.

Q. 15. Pollution is a serious problem of the modern times due to very rapid advancement in several areas, like industries, transport etc. What is pollution ? Name the pollutants. Mention some effects of pollution.

Ans. Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and soil that may harmfully affect the life or create a potential hazard for any living organisms.

Pollutants are substances which cause pollution like harmful gases, smoke, mining, dirty, particles, pesticides, fertilizers etc.

Harmful Effects of Pollution :

(i) It lowers the efficiency of work.
(ii) It causes many diseases which lead to death.
(iii) It disturbs life and leads to nervous irritability.
(iv) It damages vegetation and environment.

Q. 16. Fossil fuels are non-renewable sources of energy which on combustion releases carbon dioxide gas. "Being a green house gas, it adds to global warming". Justify the statement. Also find out some ways for controlling carbon dioxide levels in the atmosphere.

Ans. With the increased industrialiation, burning of fuels in homes and rising population more CO_2 is released. On the other hand, the decreasing vegetation and deforestation is leading to less CO_2 utilistaion in photosynthesis. Thus overall rise in CO_2 is leading to greater retention of the solar radiation in the atmosphere causing global warming.

Some Measures for Controlling Carbon Dioxide in the Atmosphere :

(i) Reduce the consumption of petrol in the automobiles.
(ii) Use of CNG or clean fuel.
(iii) Instead of buring litter prepare manure out of it.
(iv) Treatment of smoke to remove harmful gases before discharging into the atmosphere.
(v) Plant more trees. *(any three)*

Q. 17. Find out the names of the gaes that are given out during burning of fossil fuel and contribute towards acid rain formation. What is acid rain ? Is there any harmful effects of acid rain. If yes then mention them.

Ans. The gases that contributes in the formation of acid rain are Carbon dioxide (CO_2), Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2).

Due to increasing industrialisatioin there is lot of emission of CO_2 and SO_2 and oxides of nitrogen which get dissolved in the rain drops and form carbonic acid, sulphuric acid and nitrous acid which fall on earth as rain and known as Acid Rain.

Harmful Effects of Acid Rain :

(i) Damage to vegetation by pollution of the soil.
(ii) Decay of building material and paints.
(iii) Erosion of ancient monuments, statues and sculpture by the acid reacting with the calcium.
(iv) The fine particles (sulphates, nitrates) degrade visibility and harm the human health.

Q. 18. Find out with the help of internet, books on environment and newspaper reports, the international efforts to check Ozone depletion. Also mention the ODS which are responsible for Ozone depletion.

Ans. International Efforts to Check Ozone Depletion :

(i) **Montreal Protocol :** In 1987, United Nations Environment Programme (UNEP) suceeded in forging an agreements between industrialised nations to limit production of chlorofluorocarbons to half the level of 1986.

(ii) **Helsinki Declaration :** In 1989 most nations plaedged to phase at CFC's and halons by 2000. CFCs hav been replaced with hydrofluorocarbons (HFC). The main ozone deplating substances or ODS are chlorofluorocarbons, halons, nitrous oxide, methane, carbon tetrachloride and chlorine.

Q. 19. Respiratory and lung problems are generally caused by Air pollution. Find the various pollutants which causes air pollution. What is smog and its effect ? Find out some natural and some man-made sources which causes air pollution.

Ans. The chief industrial gaseous pollutants consists of CO_2, SO_2 and CO and also oxides of nitrogen. The smoke released by the factory chimneys into the air contains lot of particulate pollutants.

The smoke released from various sources may get mixed with dust particles and small drops of fog to produce is called smog. Smog is harmful to plants and if inhaled, may cause asthama and allergies in humans.

Natural Sources of Air Pollution :

(i) Ash from burning volcanoes, dust from storms and forest fires.

Man-made Sources of Air Pollution :

(i) Vehicular, industries, garbage, brick kilns. These are major sources of air pollution by humans.

Q. 20. "Act local, think global". How is this jargon suited to tackle the increasing problem of air pollution ? Relate this to the marble cancer of the Taj and pollution levels in Agra city. Identify various steps that can be taken up at the individual and government level to curb the menace of air pollution.

Ans. It helps in awaring the people to take immediate actions to avoid the use of certain substance which are related to the cause of air pollution. Taj Mahal was turning yellow because of the soot particles and gases released by industries like glass factories, rubber industries, Mathura oil refinery etc. into the atmosphere which causes air pollution. The root particles turn the colour of the marble to yellow and the gases react with water to from acid rain which corrodes the marble of the Taj Mahal.

Certain norms have been laid down under the titles Euro-Bharat norms which are applicable to all automobiles, on the levels of emissions given out—Government of India has adopted auto fuel policy to effectively cut down sulphur and nitrogen oxides in the automobile exhaustes.

Q. 21. Identify from the pictures and data given in the text, the diseases which occur in children of age group 6 to 12 and 0 to 5 due to air pollution. Analyse the given data and draw conclusion about health of children and pollution levels of various cities in India. What are the stpes which can be taken by the authorities and communities to check the same ?

Ans. Early childhood is a critical period for the continued development and maturation of several biological systems such as the brain, lungs, and immune system. Air toxins can impair lung function and ueurodevelopment, or aggravate existing conditions, such as asthma. Infants who were born premature or growth-retarded may be particularly vulunerable to additional environmental insults.

Government organise many campaigns for the people to make them aware about health. National Family Health Survey have been organised to estimate the health conditions of the children in the country. ❑

2. Theme –
Environment and Development - Lessons from the Hills

Abstract

Man's ability and power to transform his environment through technological developments has undoubtedly enhanced quality of living in many ways. The same power, if applied without rational thinking and understanding the consequences of actions, can also cause incalculable harm to the environment including the man himself.Recent Uttarakhand disaster on 16th and 17th June, 2013 speaks volumes about irrational human actions and unscientific approach in the name of so called development resulting in a great tragedy.

The irreversible damage done to the basic components of environment due to cutting down of forests, buildings roads for promoting tourism, unplanned structures, setting up industries and constructing hydroelectric plants etc all contributed to what mankind will never like to see again.

The need of the hour is to reflect, examine and understand the natural as well as man-made factors responsible for the misfortune. The present text intends to initiate debate and generate ideas as to what actions need to be taken on the part of individuals, social groups and the government to strike a better balance between economic developments and environmental concerns.

The Context

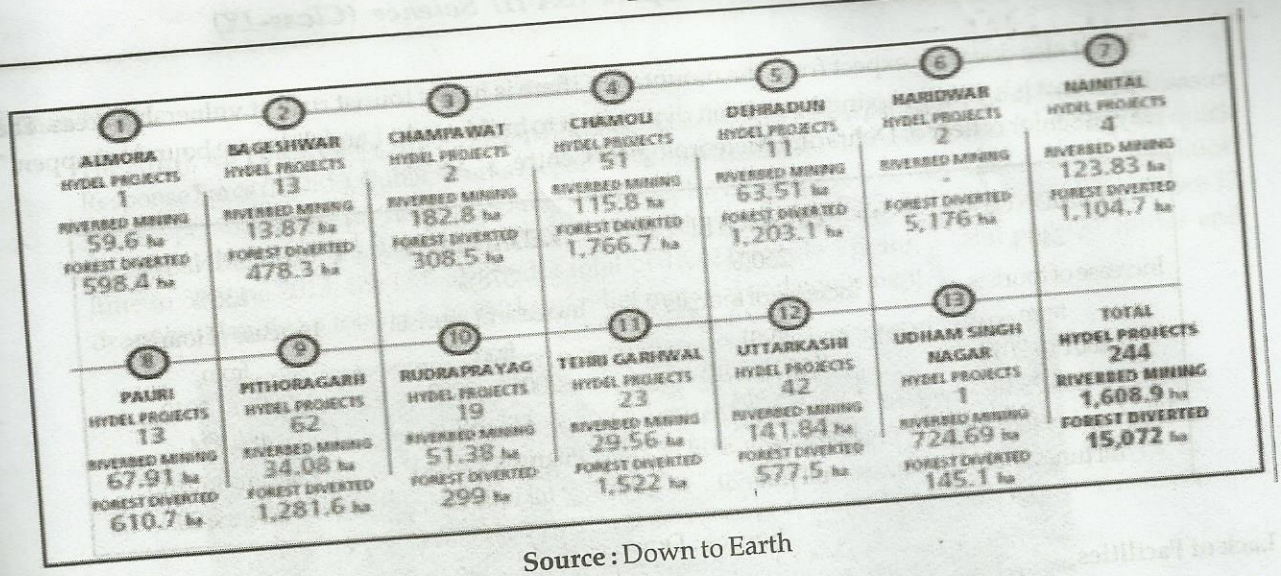
The widespread devastation in the hills of Uttarakhand brought about by cloudbursts and sudden torrential rains was tragic. Thousands lost their lives, villages were washed away, buildings crashed into rivers and those who survived lost everything they had. Between 16 and 17 June 2013, the hills of Uttarakhand experienced intense rainfall (370mm within a period of 24 hours) which is exceptionally rare, particularly in this month. The average monthly rainfall in this region for the month of June is 210 mm while in July and August it is more than 600 mm. This happened to be the highest ever single day rainfall in June for the state - the previous highest being 350.5mm in 1970.

Many Reasons

The horrific disaster that struck Uttrakhand has been assessed as a mix of natural and man-made reasons. Although cloudburst and landslides were the main causes of this disaster, nature alone can't be blamed for this unfortunate turn of events. Man has played an equal, if not greater, role in this disaster. Poor disaster management infrastructure, lousy building constructions, massive deforestation, erroneous agricultural practices on barren hill slopes, unscientific road building and quarrying contributed to make this India's worst flood disaster.

Natural phenomena can sometimes strike very hard and cause disasters if preventive measures are not taken or if some human activities have harmed the natural environment or upset the balance of the ecosystem.

Ecologists point out that the huge expansion of hydro-power projects to meet the growing demands of the expanding state and construction of roads to cope with the lakhs of tourists in Uttarakhand compounded the scale of the disaster. The incessant construction work also resulted in increased surface flow and rise of river bed due to disposal of debris in the rivers. There has been excessive deforestation in these areas to make way for construction in the name of development. The given table is a pointer in this direction.



Source : Down to Earth

One can observe from the data that in order to build 244 hydel power projects, about 14,072ha of forests have been cleared. The region thus became vulnerable to landslides. Also this displaced a large number of local people for whom the forests were a source of livelihood. There have also been reports to say that a large part of the power that is generated is lost during transmission. This raises a question on the effectiveness of these hydropower projects. A report commissioned by the Union Environment and Forests Ministry in May 2012 had warned the centre against going ahead with 24 hydropower projects planned on the Alaknanda and Bhagirathi river systems in Uttarakand. It stated that the projects would destroy 22 percent of the state's forestland and affect the unique Himalayan ecology along one-third of lengths of the two main tributaries of Ganga.

It seems that no rules and regulations that were put in place in order to protect ecologically fragile regions in the state have been ever considered. There is no doubt that the region needs economic growth. But this cannot happen at the cost of environment. Data with the Uttarakhand state transport department bears this out. The state has seen a 1000 per cent increase in vehicular traffic in the last eight years, with ecologists having forewarned about the correlation between tourism increase and the higher increase of landslides. Uttarakhand ranks eighth among all states on the tourism map. This is one of the most fragile regions suffering from poor soil stability. Instead of looking at solutions to this problem, we have seen mushrooming of more and more construction in this area.

According to media reports, when the floods struck, about 28 million tourists were visiting the state, while the local population is close to half that number. It is irresponsible to let such a huge volume of human traffic into an ecologically sensitive area, that too in the monsoon season.

"What else does one expect from the mountain if there is heavy tourist rush at vulnerable areas. The Himalaya is a young mountain and you dynamite it to build roads. Landslides are bound to happen," says a senior officer of Dehradun Meteorological Centre.

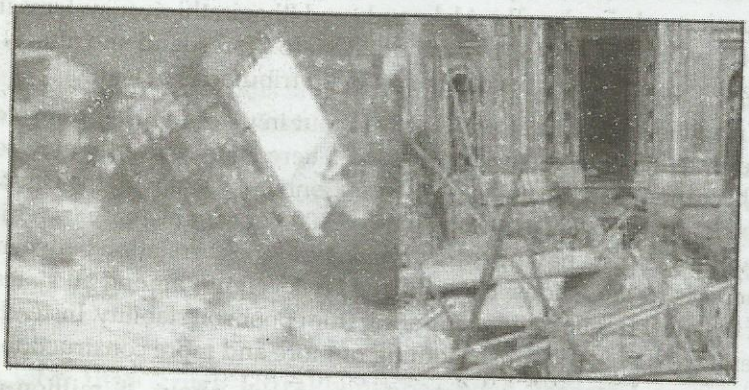
YAMUNOTRI	GANGOTRI	KEDARNATH	BADRINATH
240% Increase of tourists from 2001 to 2012 209,753 Pilgrims in 2013 till June 20	250% Increase of tourists from 2001 to 2012 252,783 Pilgrims in 2013 till June 20	378% Increase of tourists from 2001 to 2012 323,867 Pilgrims in 2013 till June 20	136% Increase of tourists from 2001 to 2012 489,924 Pilgrims in 2013 till June 20

Source : Down to Earth

Lack of Facilities

There were no warning systems in place, no weathering monitoring systems near the major pilgrimage centres which saw a large number of tourists year after year. There do not seem to be any rain-gauges at Kedarnath and Badrinath and hence one may never know how much rainfall fell at those sites and we will never have full scientific explanation of what happened on June 16-17.

The floods washed away entire villages and small towns and destroyed entire roads, cutting off large areas, as well as homes, hotels and pilgrimage sites.

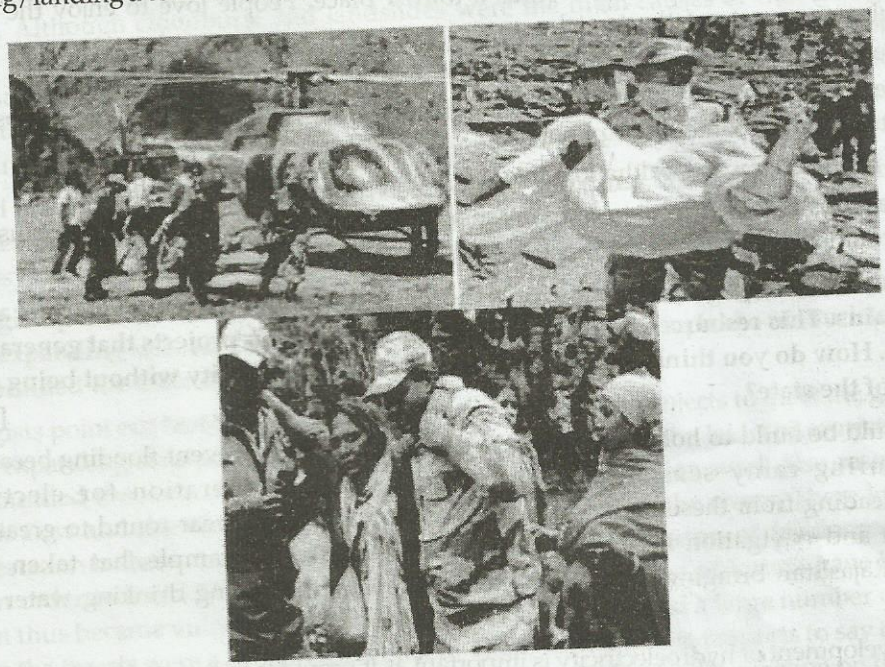


Much of the infrastructure been completely destroyed in the affected areas—roads, bridges, dams and civic facilities—have been completely destroyed or damaged.

Name of the affected districts	No. of villages affee tell	No. of persons missing	No. of casualties	No. of Houses damaged washed away	No. of animals died
Rudraprayag	60	10000	The causality due to the disaster is 1056 as reported by Govt.	700	Approximately 9500 animals killed
Chamoli	39	2500		130	
Utterkashi	28	3000		160	
Tehri	15	-		60	
Pithoragarh	10	100		25	
Bageshwar	8	-		-	
Almora	8	-		-	
Deheradun	-	-		1	
	168	15600		1076	

Human Help

The Army, Air Force, Navy, Indo-Tibetan Border Police (ITBP), Border Security Force, National Disaster Response Force (NDRF), Public Works Department and local administration worked together for quick rescue operations. Several thousand soldiers were deployed for the rescue missions. Activists of political and social organizations were also involved in the rescue and management of relief centres. From 17 June to 30 June 2013, the IAF airlifted a total of 18,424 people - flying a total of 2,137 sorties and dropping/landing a total of 3,36,930 kg of relief material and equipment.



WHAT NEEDS TO BE DONE

The Administration is planning to enhance the monitoring of ecosystem with a focus on recession of glaciers and their impact on river system in hilly areas. Strict rules are likely to be enforced on the pilgrims and tourists as far as sanitation and garbage disposal is concerned, for promoting the healthy environment at many holy sites scattered all over the Himalayas. People in the region also need to be prepared against potential disaster. There has to be a mandatory environmental impact assessment for the construction of all state and national roads and expressways of more than a few kilometres in length, including the broadening of existing roads. The most important precaution which needs to be taken is that all hilly roads must have adequate drainage systems to fight with such natural calamities.

Uttarakhand disaster is a wakeup call for every planner and decision maker across the country. It is said that 'those who do not learn from history are doomed to repeat it'. The disaster affected people from all across the country from different parts of the country, who were on a pilgrimage to Uttarakhand.

We can't stop natural phenomena from happening. But we can make them less damaging if we understand better why they happen, and what we can do to prevent or mitigate them. Since people are partly responsible for disasters happening, we have to change what we are doing wrong, in order to avoid or reduce the impact of natural phenomena.

Every community must get to know its own features and surroundings: the natural environment as well as environment built by human beings. This is the only way for a community to manage the hazards that surround it and to reduce its own vulnerability to these hazards.

Questions Based on Theme 2

Q. 1. **A study by the PHD chamber of commerce and industry suggests that tourism contributed [illegible] percent to Uttarakhand's economic growth. Do you think it will be a wise decision to ban tourism to this state? Justify your answer.** [CBSE OTBA]

Ans. **Ans.** No, tourism shouldn't be banned to Uttarakhand because :

(i) It is a pilgrimage centre as well as a tourist place. People love to enjoy the nature and the beautiful monuments of the temple.

(ii) The economy from tourism helps in the development of the place.

(iii) The local people of Uttarakhand which work for tourism and have shops and business related to it will become unemployed.

(iv) As for Tourism, Uttarakhand ranks eighth among all states on the map.

(v) The steps taken to initiate tourism should be eco-friendly and does not cause any harm to the environment.

Q. 2. **The Uttarakhand region's key resource is the water that flows from high glaciers and mountains to the plains. This resource was utilised to build hydropower projects that generate revenue for the state. How do you think this can be utilised as an opportunity without being a threat to the ecology of the state?** [CBSE OTBA]

Ans. Dam should be build to hold back water in the streams. Dam prevent flooding because they store water during rainy season. They are also used for generation for electricity. Canal systems leading from these dams carry large amounts of water year round to great distances for irrigation and navigation in state. Indira Gandhi Canal, for example, has taken water to arid areas of Rajashtan bringing greenery all along the way, providing drinking water to thousands of people.

(a) The development of hydroelectricity is important as it provides the country with a renewable source of energy and is a revenue source for the state. It can be argued that the development of its water resources is a revenue trade-off, which will take the pressure off its forests.

(b) We need to understand the impact of this development on the ecology and hydrology of the region. It is feared that the hydrology will be impacted because of climate change—and extreme events. The flood in Uttarakhand has seen hydropower projects badly affected. It is also clear that the impact of the flood was exacerbated because of the number and poor construction of the hydropower projects. These projects must be reviewed and many scrapped.

(c) The policy for water-based energy in the region needs to be carefully balanced to take these concerns into account. The policy should lay down mandatory ecological flow provisions (at least 50 per cent in lean season); a distance criterion (5 km) and tough enforcement measures and penalties for ensuring that construction of the project does not harm the mountain stability or local water systems. It must be noted that while rivers cannot and must not be re-engineered, dams can be re-engineered to optimize on available water for energy generation.

Q. 3. **Recent Uttarakhand disaster on 16th and 17th June, 2013 speaks volumes about irrational human actions and unscientific approach in the name of so called development resulting in a great tragedy. How far this statement is true? What do you think ?**

Ans. The statement is quite true. Man's ability and power to transform his environment through developments has undoubtedly enhanced quality of living in many ways. The same power, if applied without rational thinking and understanding the consequences of actions, can also cause incalculable harm to the environment including the man himself. The irreversible damage done to the basic components of environment due to cutting down of forests, buildings roads for promoting tourism, unplanned structures, setting up industries and constructing hydroelectric plants etc. all contributed to the recent disaster occurred in Uttarakhand.

Q. 4. Why do you think is the need to examine and understand the natural as well as man-made factors responsible for the misfortune happened in Uttarakhand ?

Ans. The need of the hour is to reflect, examine and understand the natural as well as man-made factors responsible for the misfortune. The present text intends to initiate debate and generate ideas as to what actions need to be taken on the part of individuals, social groups and the government to strike a better balance between economic developments and environmental concerns.

The horrific disaster that struck Uttarakhand has been assessed as a mix of natural and man-made reasons. Although cloudburst and landslides were the main causes of this disaster, nature alone can't be blamed for this unfortunate turn of events. Man has played an equal, if not greater, role in this disaster. Poor disaster management infrastructure, lousy building constructions, massive deforestation, erroneous agricultural practices on barren hill slopes, unscientific road building and quarrying contributed to make this India's worst flood disaster.

Natural phenomena can sometimes strike very hard and cause disasters if preventive measures are not taken or if some human activities have harmed the natural environment or upset the balance of the ecosystem. Therefore all these factors need to be examined.

Q. 5. "Ecologists point out that the huge expansion of hydro-power projects to meet the growing demands of the expanding state and construction of roads to cope with the lakhs of tourists in Uttarakhand compounded the scale of the disaster." Comment.

Ans. Ecologists point out that the huge expansion of hydro-power projects to meet the growing demands of the expanding state and construction of roads to cope with the lakhs of tourists in Uttarakhand compounded the scale of the disaster. The incessant construction work also resulted in increased surface flow and rise of river bed due to disposal of debris in the rivers. There has been excessive deforestation in these areas to make way for construction in the name of development. It is predicted that in order to build 244 hydel power projects, about 14,072ha of forests have been cleared. The region thus became vulnerable to landslides. Also this displaced a large number of local people for whom the forests were a source of livelihood. There have also been reports to say that a large part of the power that is generated is lost during transmission. This raises a question on the effectiveness of these hydropower projects.

Q. 6. Why the Union Environment and Forests Ministry in May 2012 had warned the centre against going ahead with 24 hydropower projects planned on the Alaknanda and Bhagirathi river systems in Uttarakhand.

Ans. A report commissioned by the Union Environment and Forests Ministry in May 2012 had warned the centre against going ahead with 24 hydropower projects planned on the Alaknanda and Bhagirathi river systems in Uttarakand. It stated that the projects would destroy 22 percent of the state's forestland and affect the unique Himalayan ecology along one-third of lengths of the two main tributaries of Ganga.

Q. 7. "What else does one expect from the mountain if there is heavy tourist rush at vulnerable areas. The Himalaya is a young mountain and you dynamite it to build roads. Landslides are bound to happen," says a senior officer of Dehradun Meteorological Centre. Justify the statement.

Ans. It seems that no rules and regulations that were put in place in order to protect ecologically fragile regions in the state have been ever considered. There is no doubt that the region needs economic growth. But this cannot happen at the cost of environment. Data with the Uttarakhand state transport department bears this out. The state has seen a 1000 per cent increase in vehicular traffic in the last eight years, with ecologists having forewarned about the correlation between tourism increase and the higher increase of landslides. Uttarakhand ranks eighth among all states on the tourism map. This is one of the most fragile regions suffering from poor soil stability. Instead of looking at solutions to this problem, we have seen mushrooming of more and more construction in this area. According to media reports, when the floods struck, about 28 million tourists were visiting the state, while the local population is close to half that number. It is irresponsible to let such a huge volume of human traffic into an ecologically sensitive area, that too in the monsoon season.

Q. 8. As far as facilities are concern what do you think is responsible for the loss of lives in Kedarnath and Badrinath.

Ans. There were no warning systems in place, no weathering monitoring systems near the major pilgrimage centres which saw a large number of tourists year after year. There do not seem to be any rain-gauges at Kedarnath and Badrinath and hence one may never know how much rainfall fell at those sites and we will never have full scientific explanation of what happened on June 16-17. The floods washed away entire villages and small towns and destroyed entire roads, cutting off large areas, as well as homes, hotels and pilgrimage sites.

Q. 9. Comment upon the rescue operation taken at Uttarakhand. How far it proved worthy.

Ans. The Army, Air Force, Navy, Indo-Tibetan Border Police (ITBP), Border Security Force, National Disaster Response Force (NDRF), Public Works Department and local administration worked together for quick rescue operations. Several thousand soldiers were deployed for the rescue missions. Activists of political and social organizations were also involved in the rescue and management of relief centres. From 17 June to 30 June 2013, the IAF airlifted a total of 18,424 people - flying a total of 2,137 sorties and dropping/landing a total of 3,36,930 kg of relief material and equipment.

Q. 10. We can't stop natural phenomena from happening. But we can make them less damaging if we understand better why they happen, and what we can do to prevent or mitigate them. What needs to be done to reduce the vulnerability to these hazards?

Ans. The disaster affected people from all across the country from different parts of the country, who were on a pilgrimage to Uttarakhand. The Administration is planning to enhance the monitoring of ecosystem with a focus on recession of glaciers and their impact on river system in hilly areas. Strict rules are likely to be enforced on the pilgrims and tourists as far as sanitation and garbage disposal is concerned, for promoting the healthy environment at many holy sites scattered all over the Himalayas. People in the region also need to be prepared against potential disaster. There has to be a mandatory environmental impact assessment for the construction of all state and national roads and expressways of more than a few kilometres in length, including the broadening of existing roads. The most important precaution which needs to be taken is that all hilly roads must have adequate drainage systems to fight with such natural calamities.

Since people are partly responsible for disasters happening, we have to change what we are doing wrong, in order to avoid or reduce the impact of natural phenomena. Every community must get to know its own features and surroundings: the natural environment as well as environment built by human beings. This is the only way for a community to manage the hazards that surround it and to reduce its own vulnerability to these hazards.

Q. 11. The horrific disaster that struck Uttrakhand has been assessed as a mix of natural and man-made reasons. Comment.

Ans. The horrific disaster that struck Uttrakhand has been assessed as a mix of natural and man-made reasons. Although cloudburst and landslides were the main causes of this disaster, nature alone can't be blamed for this unfortunate turn of events. Man has played an equal, if not greater, role in this disaster. Poor disaster management infrastructure, lousy building constructions, massive deforestation, erroneous agricultural practices on barren hill slopes, unscientific road building and quarrying contributed to make this India's worst flood disaster. Natural phenomena can sometimes strike very hard and cause disasters if preventive measures are not taken or if some human activities have harmed the natural environment or upset the balance of the ecosystem.

Q. 12. Uttarakhand disaster is a wakeup call for every planner and decision maker across the country. It is said that 'those who do not learn from history are doomed to repeat it'. Do you think it can serve as future warnings ?

Ans. The disaster affected people from all across the country from different parts of the country, who were on a pilgrimage to Uttarakhand. We can't stop natural phenomena from happening. But we can

make them less damaging if we understand better why they happen, and what we can do to prevent or mitigate them. Since people are partly responsible for disasters happening, we have to change what we are doing wrong, in order to avoid or reduce the impact of natural phenomena. Every community must get to know its own features and surroundings: the natural environment as well as environment built by human beings. This is the only way for a community to manage the hazards that surround it and to reduce its own vulnerability to these hazards.

Q. 13. When we visited a town or village after a few years of absence, we noticed new roads and houses have come up on the field areas. Where do you think the materials for making these roads and buildings have come from ? Mention the role of humans that harmed environment.

Ans. All the construction work requires the use of concrete, water, metals, glass etc. This has come from the natural resources, a part of which has been used up in the construction of these roads and houses. Concrete, marble, stone and cement would come from mines. Metals and glass would come from the soil after being process in industries. Wood is obtained from the forest by deforstation.

Man has played an equal role in destroying the environment. Poor disaster management infrastructure, lousy building constructions, massive deforestation, erroneous agricultural practices on barren hill slopes, unscientific road building and quarrying contributed to make country's disaster.

Q. 14. Industrialisation is one main cause of deterioration of Environment. Discuss. Suggest three ways to maintain a balance between environment and development.

Ans. This is correct that industrialisation is one main cause of deterioration of environment. This is because :

(i) Noise and air pollution from the industries in disturbing.

(ii) Industrial waste which is led to water bodies causes water pollution.

(iii) Gases like SO_2 and NO_2 which are emitted by the industries are toxic.

(iv) Radioactive radiations are emitted by nuclear power stations.

These rays are highly toxic to the environment. Three ways to maintain a balance between invironment and development are :

(i) We should use natural resources cautiously.

(ii) Resources should be used in environmentally and developmentally sound manner.

(iii) If the exploitation of resources is too high, economic and social development will be faster at the cost of environment.

Q. 15. Cutting down of forest for constructing roads in the name of development in Uttarakhand is a problem. Find out the effects of deforestation caused by felling of trees and clearing of forest in such areas.

Ans. Effects of Deforestation :

(i) **Soil Erosion :** Removal of plant cover exposes the fertile soil to wind and water. The latter remove the top soil and make the area infertile.

(ii) **Desertification :** Removal of forest cover in the plains and hills makes the area dry.

(iii) **Flood :** In rainy season many temporary rivulets are formed due to loss of absorption capacity by unprotected soil.

(iv) **Destruction of Wildlife :** Deforestation leads to destruction of natural habitats of organisms, like wild animals and plants.

(v) **Climatic Changes :** The climatic changes are unfavourable and drastic which causes cloudburst and landslides.

Q. 15. Kedarnath and Badrinth are two major pilgrimage centres where thousands of tourist vist every year. But these tourist polluted the water of Ganga. How does the water of Ganga get polluted ? Mention with example the water harvesting system created by government in hilly areas to protect water from contamination by human and animal waste.

Ans. Ganga is polluted due to following reasons :

(i) Dumping of garbage and untreated sewage from all the towns and cities on the banks of the river.

(ii) Millions of people bathe and wash their clothes, animals and vehicles in the river water.

(iii) Releasing chemical effluents from industries.

(iv) Immersion of ashes or even dead bodies in the river performed as a ritual.

Parts of Himachal Pradesh, had evolved the local system of canal irrigation called Kulhs over four hundred years ago. The water flowing in the streams was diverted into man-made channels which took this water to numerous villages down the hillside. In addition to irrigation, water from these Kulhs also percolated into the soil and fed springs at various points.

Q. 17. Environmental problems are caused by man causing environment pollution. Find out the difference between biodegradable and non-biodegradable pollutants. As a student what measures would you take for the disposal of garbage which are generated in your house daily ?

Ans. The substanes which are decomposed by micro-organisms and accumulate in the environment are called Biodegradable wastes. Example—sewage, paper, wood, clothes, domestic waste etc. The substances that cannot be decomposed by micro-organisms and accmulate in the environment are called Non-biodegradable wastes. Examples—Plastic, DDT, glass, aluminium cans etc.

Measures for Disposal :

(i) Segragation of biodegradable and non-biodegradable wastes.

(ii) Safe disposal of plastic bags.

(iii) Vegetable/fruit peels can be placed near trees/plants, which on decomposition will enrich the soil with nutrients.

(iv) Give paper wastes for recycling.

(v) Prepare a compost pit for kitchen wastes.

(vi) Use of gunny bags/paper bags in place of polythene/platic bags.