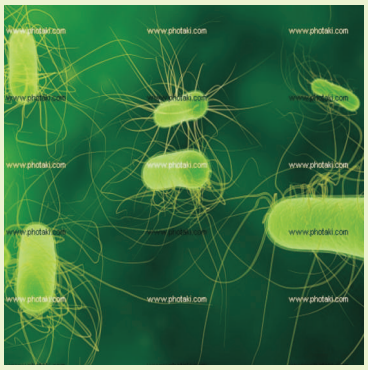
Science (086) : Class-IX

OPEN TEXT MATERIAL

Open Text - Based Assessment

Summative Examination-II

March 2014



Themes	Page
1. Clean Air-A Shared Concern	1
2. Environment and Development-Lessons from the Hills	8

CENTRAL BOARD OF SECONDARY EDUCATION

Shiksha Kendra, 2, Community Centre, Preet Vihar, Delhi-110 092 India

OPEN TEXT MATERIAL

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.

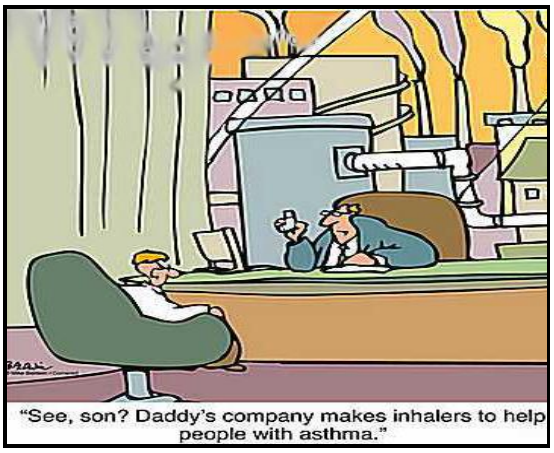
Clean air is vital for the existence and continuance of all living organisms on earth. Naturally existing mixture of gases in the atmosphere, comprising of mainly Nitrogen, Oxygen, Carbon dioxide and water vapours, provides excellent conditions to support and sustain life. However, this natural composition 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.

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. A person living in a city with polluted air is likely to suffer from one or the other breathing problem.



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

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

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 for 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.

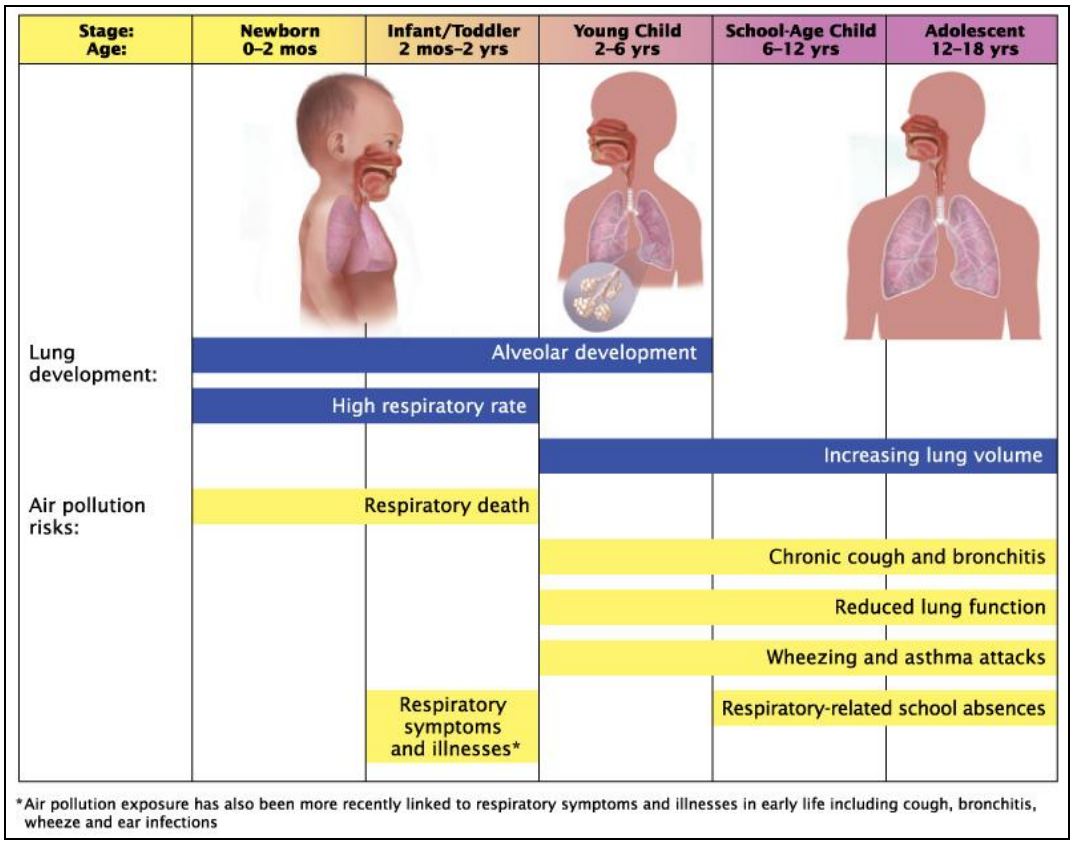
We all know about the smoke laden fog, called smog, which surrounded the city of London in the year 1952. It resulted in the loss of about 4000 human lives and many others suffering from serious breathing problems according to the available press reports. Even the cattle had been asphyxiated by the smog.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

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.

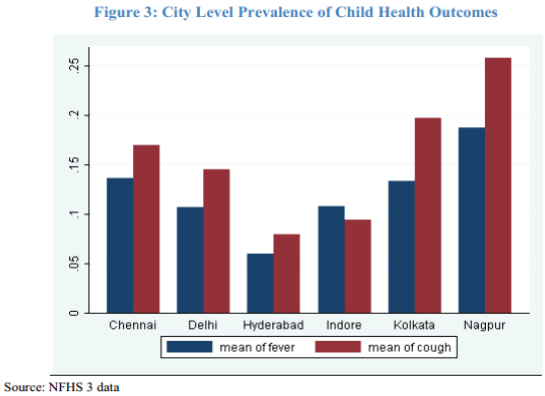
Early childhood is a critical period for the continued development and maturation of several biological systems such as the brain, lungs, and immune system. Air toxics can impair lung function and neurodevelopment, or aggravate existing conditions, such as asthma. Infants who were born premature or growth-retarded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



Picture: 5

Source: http://www.environment.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	116
11.	Nagpur	Maharashtra	8	35	108
12.	Raipur	Chhattisgarh	15	42	310

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 IST

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/
- http://www.sciencedaily.com/releases/2013/08/130808124501.htm
- http://economictimes.indiatimes.com/photo/18486442.cms
- http://thinkprogress.org/climate/2013/07/13/2296461/open-thread-plus-cartoon-of-the-week-29/

Sample Questions

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.
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?

OPEN TEXT MATERIAL

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 210mm 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.

	ALMORA	BAGESHWAR	CHAMPAWAT	CHAMOLI	DEHRADUN	HARIDWAR	NAINITAL
	1	2	3	4	5	6	7
HYDEL PROJECTS	1	13	2	51	11	2	4
RIVERBED MINING	59.6 ha	13.87 ha	182.8 ha	115.8 ha	63.51 ha	-	123.83 ha
FOREST DIVERTED	598.4 ha	478.3 ha	308.5 ha	1,766.7 ha	1,203.1 ha	5,176 ha	1,104.7 ha

	PAURI	PITHORAGARH	RUDRAPRAYAG	TEHRI GARHWAL	UTTARKASHI	UDHAM SINGH NAGAR	TOTAL
	8	9	10	11	12	13	
HYDEL PROJECTS	13	62	19	23	42	1	244
RIVERBED MINING	67.91 ha	34.08 ha	51.38 ha	29.56 ha	141.84 ha	724.69 ha	1,608.9 ha
FOREST DIVERTED	610.7 ha	1,281.6 ha	299 ha	1,522 ha	577.5 ha	145.1 ha	15,072 ha

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

Name of the affected districts	No. of villages affected	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 report 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.

Sample Questions

1. A study by the PHD chamber of commerce and industry suggests that tourism contributed to 30 percent to Uttarakhand's economic growth. Do you think it will be a wise decision to ban tourism to this state? Justify your answer.

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?