Reliable

Based on CBSE OTBA

OPEN TEXT BASED ASSESSMENT

Science

SA-II/2017

(Class – IX)

CONTENTS

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Theme-1 : Solid Waste Management — How to Bring Best Out of Waste ?

OPEN TEXT MATERIAL

Learning Objectives

- ❒ To distinguish between different types of wastes.
- ❒ To learn the policies present in our country governing Solid Waste Management.
- ❒ To formulate strategies for effective waste management.
- ❒ To understand the role of rag-pickers (informal sector) in Solid Waste Management.
- ❒ To study the effect of Solid Waste Management on soil, water and air and the innovative solutions.

A Note to Readers

This article deals with handling and managing of solid waste. Solid waste management is becoming a grave problem in India, being a highly populous country. Owing to the problems associated with conventional methods like incineration and landfill, several novel methods are put forth for managing different types of solid wastes like industrial waste, biomedical waste and municipal waste. The different approaches include incorporation of 5R's *i.e.*, reduce, reuse and recycle, refuse and regenerate, in our daily life such as converting rice husk into bricks, segregation of waste at source and adapting careful methods in disposal of all non-biodegradable and hazardous waste. In this article, two case studies are also included that reinforce the concept of sustainable development. Purpose of this writing is to make students understand the importance of being vigilant in waste disposal starting at home itself and its management. Teachers should act as facilitator and should design the questions which are open-ended and the answers to which should not be directly available in the text.

Abstract

Solid Waste Management (SWM) is the efficient disposal of unwanted substances which we can characterize as waste. In our country, practices and methodologies used for SWM are still following the unscientific and inefficient methods and are mainly dependent on the informal sector. Besides, owing to the population explosion, enormous amount of waste is generated leading to the overflowing landfills. These overburdened landfills pose serious implications including environmental, health, air, water and soil pollution and even global warming. Adding to the woes is the large scale dependence on the informal sector for waste segregation, disposal and recycling working on outdated technology.

State-of-the-art technology along with prudent planning is required for scientific disposal of waste in future. Moreover, our country also needs something in terms of policy and guidelines to enable the municipal corporations to run the waste services efficiently.

Every day we generate so much of solid waste,
Isn't this such a disgrace?

There is so much of waste all around,
Heaps of garbage lying on the ground.

These are an open invite,
To all vectors who spread diseases via their bite.

Glass bottles and plastic bags litter the city,
oh! Isn't this a pity?

The things like aluminium, tins and foil,
do nothing more than polluting the soil.

All this is harming the environment at an alarming rate,
Let us keep a check before it is too late.

Solid Waste Management has always been an issue of serious concern in a densely populated country like India and this concern is in terms of both health and environment, depending on the following challenges put forth due to usage of conventional methods in handling waste. The issues include :

- ❒ Less awareness about reducing waste at source.
- ❒ Lack of segregation, poor collection, illegal dumping, open dumping and burning of waste.
- ❒ Limited involvement of private sector and communities.
- ❒ Relying on landfills and composting.
- ❒ Generation of the green house gases.

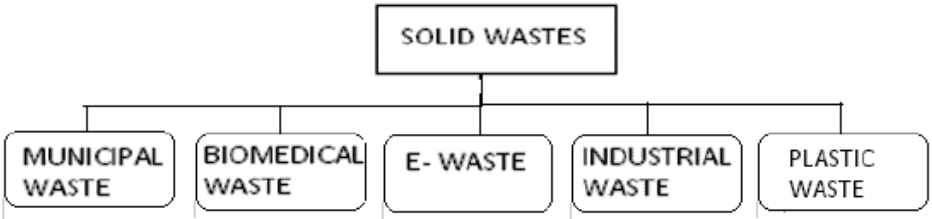
Figure 1 : Landfill site : Despite composting and incineration, a massive amount of waste remains to be sent to landfill sites. Though three of four landfills have exhausted their lifespan, dumping continues there.

[*Source : Hindustan Times*]

Waste Management encompasses activities ranging from its collection at the source, its transport, different types of treatment and eventually disposal of the treated waste. But, waste management is becoming a major bottleneck in clean civic society due to the lack of finances, outdated technologies, and the callous attitude of the society as a whole. Recent outbreak of all vector borne diseases such as dengue, chikungunya, malaria and typhoid are due to the profuse and unhygienic method of dumping waste in open.

Objective of solid waste management

- ❒ To control, collect, process and dispose solid waste in an economical and consistent way with public health protection.
- ❒ To reduce the quantity of toxic and hazardous chemicals and materials.
- ❒ To maintain waste recycling programs regularly.
- ❒ To reuse and recover the material from waste.



A. Municipal Solid Waste

It consists of household waste, construction and demolition debris, sanitation residue and waste from streets. This garbage is generated mainly from residential and commercial complexes. More than 25% of the municipal solid waste is not collected at all.

The Government of India has framed Municipal Solid Waste (Management and Handling) Rules 2000, under the Environmental Protection Act, 1986 which frame the guidelines for collection, handling and disposal of solid waste.

Case Study — Kanjurmarg Landfill in Mumbai

Source : http://www.mcgm.gov.in/irj/go/km/docs/documents/Circulars/01101506_Kanjur%20 bioreactor% 20project.pdf

In an endeavor to fulfill the MSW (M&H) Rules 2000, MCGM has proposed Integrated Solid Waste Management Programme (ISWMP). As a part of ISWMP, MCGM has established MSW processing plant at Kanjurmarg. After overcoming various hurdles right from 2009, finally MCGM has succeeded to start the project of Bio-reactor land filling having capacity of processing 3000 MT per day.

Bioreactor technology is an environmental friendly technique in which microbial cultures are used to treat the waste produced and is converted into compost or manures by using the enzymes present in the microbes. Thus, reducing the amount of waste and also generating useful product from the same.

Benefits of Bio-reactor Technology : Waste degradation time is reduced and this leads to the increased rate of gas generation. They allow efficient conversion of waste into electricity.

B. Biomedical Waste

According to Biomedical Waste (Management and Handling) Rules, 1998 of India "Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities or in the production or testing of biological samples are referred to as biomedical waste." Improper disposal increases risk of infection and develops resistant microorganisms. Mixing of hazardous waste with the non-hazardous waste results in contamination and makes the entire waste hazardous. The Ministry of Environment has recently released the new Bio-medical Waste Management Rules, 2016 which will bring in a wider and more comprehensive regime for bio waste management.

C. Electronic Waste (E-waste)

The E-Waste constitutes all types of unwanted products obtained from the disposal of electronic gadgets and their manufacturing units. Owing to the present mad race for buying smart phones, laptops to the buying of AC and fridge, e-waste is increasing exponentially due to global warming. This impact is even worse where the people are living near these landfills or dumping sites and are working without any safe guards or protection from the possible health hazards of e-waste exposure. The Central Government under Environment (Protection) Act, 1986 has prepared E-Waste (Management & Handling) Rules, 2015. Most important feature of the e-waste is Extended Producer Responsibility (EPR). EPR management means setting up an effective channelization system such as collection centers, take back systems, registered dismantler or recycler.

D. Industrial Waste

Industrial waste is the waste generated from the industrial units. These are considered to be hazardous as they generally contain toxic substances which are discharged into soil, water or evaporate in the air affecting the growth, development and health of all living organisms (plants and animals). In the industrial sector, the major generators of hazardous waste are metal, chemical, paper, pesticide, dye, refining, and rubber goods industries.

The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 notified by the Ministry of Environment distinguish hazardous waste from others such as waste tyres, paper waste, metal scrap and used electronic items. The rules recognize the latter as a resource for recycling and their reuse thereby adding to the country's GDP and reducing the load on the country's resources.

E. Plastic Waste

Plastics, due to their versatility in use and impact on environment can be grouped under a different category of solid waste. Non-judicious disposal of plastics leads to the choking of drains, reducing the soil fertility, killing animals on ingestion and hindering the recharge of groundwater. Thus, conventional plastics, right from their manufacture to their disposal are a major problem to the environment.

As per Plastic Waste (Management and Handling), Rules, 2011, a State Level Advisory committee has to be constituted to oversee the handling, use and disposing of plastic waste. The rules have introduced the concept of Extended Producer Responsibility (EPR) for the first time with respect to plastic waste.

Case Study of Jambulingam Street, Chennai

The tar road in the bustling Nungambakkam area has weathered a major flood, several monsoons, recurring heat waves and a steady stream of cars, trucks and auto rickshaws without showing the usual signs of wear and tear. Built in 2002, it has not developed the mosaic of cracks, potholes or craters that typically make their appearance after it rains. Holding the road together is an unremarkable material: a cheap, polymer glue made from shredded waste plastic.

Jambulingam Street was one of India's first plastic roads. The environmentally conscious approach to road construction was developed in India around 15 years ago in response to the growing problem of plastic litter. With time, polymer roads proved to be surprisingly durable, winning support among environment scientists and policymakers in India. Today, there are more than 21,000 miles of plastic road in India, and roughly half are in the southern state of Tamil Nadu. Most are rural roads, but a small number have also been built in cities such as Chennai and Mumbai.

Waste Hierarchy

The waste hierarchy simply deals with categorization of the waste in 5 R's category *i.e.*, reduce, reuse and recycle, refuse and regenerate. This hierarchy is laid down as a reference point for the others to classify and manage the waste in a sustainable manner. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

Benefits of Waste Management

Waste management done in an efficient and effective manner that not only solves the problem of excess waste but can also generate other benefits which include :

1. **Economic —** Creation of new job opportunities and business activities are the direct implication of effective waste management as is evident from their reuse and recycle.
2. **Social —** By reducing adverse impacts on health by proper waste management practices, social benefits can be reaped easily. One such example is the prevention of the outbreak of the recent vector borne diseases such as dengue and chikungunya.
3. **Environmental —** Reducing, reusing and recycling reduces or eliminates adverse impact on the environment. It also improves the quality of air and water and help in reduction of greenhouse emissions.
4. **Inter-generational Equity —** Effective waste management practices can provide subsequent generations a more robust economy, a fairer and more inclusive society and a cleaner environment.

Effect of Solid Waste on Soil, Water and Air and the Prospective Solution

Improper disposal of hazardous and other waste through burning or incineration leads to emission of toxic fumes comprising mercury and heavy metals, causing air pollution and associated health-related problems. Municipal dumps or disposal in water bodies leads to leaching of toxic substances in land and water, thus degrading soil, water and air quality.

Key Concepts in Waste Reduction

Source reduction : The procedure to reduce wastes at the point of generation, in contrast to sorting out recyclable components after they have been mixed together for collection.

Role of Informal Sector (Ragpickers) in Waste Management

Waste pickers in Sangam Vihar, New Delhi. Plastic production is growing 2.5 times faster than the GDP in India.

Chotu is a waste dealer in Azadpur in Delhi, who employs around 15 people to segregate mixed waste into paper, plastic and bottles. His monthly income of around ₹ 30,000 is just enough to survive, but his business is always at stake. Waste pickers work for about six days per week and around 9-12 hours per day without protective gear. This puts them at a risk of frequent injuries like cuts and bruises. The disposal of plastic also carries severe health risks as it contains heavy metals like lead, copper, cobalt, selenium, cadmium, and chromium, which are highly toxic.

The informal sector is the backbone of waste management, especially plastic and solid waste. The Plastic Waste Management Rules 2016 mention including waste pickers in the waste management system, but do not mention how that would happen. The state pollution control boards or the approving authority must ensure the integration of the informal sector in the waste management plan made by the producer, Municipal corporations, should enumerate waste pickers and other informal waste workers with the help of civil society organizations.

Source : http://www.downtoearth.org.in/news/trashing-the-ragpicker-53516

Source separation : Different categories of recyclables and organics separate at source, *i.e.*, at the point of generation, to facilitate reuse, recycling, and product formation like compost.

Reuse : It includes reusing a product for the same or a different purpose.

Recycling : It is defined as the process of transforming materials into secondary resources for manufacturing new products.

Producer responsibility : Sometimes producers of products or services accept a degree of responsibility for the wastes that result from the products they market, by reducing materials used in production, making recyclable goods, and reducing packaging.

The case study of some villages in Rajasthan has shown that the burning of rice husk which is the waste material in the paddy fields, has caused air pollution. Subsequently, it has been utilised as raw material in the formation of bricks, averting the problem of air pollution and adding income to the farmers.

Yamuna is accruing the problem of water pollution by dumping of solid wastes making it difficult to treat the Yamuna water. If the segregation of the waste is performed at the source level than the additional cost of water treatment can be saved and water can be purified easily.

Moreover, if the solid waste is discharged into the soil, the texture of the soil will not be healthy that will further add to the woes of the farmers as the crop productivity will be highly impaired.

It can be concluded from the above that segregation at source is the best remedial measure. We have seen the usage of smart composters in kitchens, agricultural waste utilization for commercial purposes like brick formation using rice husk and municipal waste utilization for biofuel production, manure production and so on. Subsequently, waste hierarchy tells us the importance of 5 R's (reduce, reuse, recycle, refuse and regenerate). The importance of waste management is that it results in social, economic, environmental and inter-generational benefits. This is proved by the case study of Kanjurmarg which lies in greater Mumbai Municipal Corporation which further reinforces the utilization of waste for production of biofuels and other useful products and of Jambulingam Street, Chennai where plastic waste is used in making roads which is an innovative and practical use of the plastic waste.

Abbreviations used

MSW : Municipal Solid Waste

TSP (Total Solid Particles)

PM (Particulate Matter)

Extended Producer Responsibility (EPR)

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- ❒ http://edugreen.teri.res.in
- ❒ downtoearth.org.in/
- ❒ http://www.moef.nic.in/
- ❒ www.mcgm.gov.in/
- ❒ newspaper reports (HT)

SAMPLE QUESTIONS WITH ANSWERS

Q. 1. Waste management can help in improving the health status of our country. Justify the statement. (2)

Ans. (1) Waste management helps in disposing the biomedical waste in a proper way thereby helping in providing clean air and water.

(2) By proper waste management, prevention of various vector borne diseases like 'dengue' and 'chickengunya' can be done in an effective manner.

Q. 2. Rag pickers act as saviors for municipal corporations. Elaborate on their role in waste management. (3)

Ans. (1) Rag pickers play an important role in segregating the waste at the ground level.

(2) It's the cheapest mode of disposal since low cost labour (*i.e.*, rag pickers) involved in this act are easily available.

(3) Segregating waste at ground level helps in avoiding the mixing of biodegradable waste with non-biodegradable waste.

Q. 3. Suggest any one strategy for effective waste management being used in your area/locality/school. (5)

Ans. (1) In our school, first step in waste management is collecting the waste at one place and then it is segregated by identifying biodegradable waste and non-biodegradable waste.

(2) The strategy involved is known as segregation of disposal at ground level (SDGL).

(3) Then we apply the 'principle's of recycling' of various waste by sending them to various industries such as paper industries, plastic industries, etc. for recycling purpose through scrap dealers.

(4) Teachers have taught the concept of recycling of paper to obtain newspaper sheet's for reusage.

(5) They explain the concept of utlisation of waste for the production of bio fuels that is beneficial for the community.

SOME PROBABLE QUESTIONS WITH ANSWERS

Q. 1. What are common problems involved in the waste management ?

Ans. (1) Waste management is facing many hurdles in our civic society such as lack of finances, outdated technology, etc.

(2) Improper disposal of waste increases risk of infection and develops microorganisms.

(3) Non-judicious disposal of plastic waste leads to the choking of drains, reducing the soil fertility, hindering the recharge of groundwater and death of street animals.

Q. 2. State two objectives of solid waste management.

Ans. (1) The main objective is to control, collect, process and dispose waste in an economical and effective way.

(2) It also aims at to reuse and recover the material from the waste.

Q. 3. State three common issues involved in solid waste management.

Ans. (1) There is lack of awareness about reducing waste at source level. Waste thrown on the street makes environment ugly and unhygienic. People throw waste in open drain, make it choked.

(2) Lack of segregation, illegal dumping and burning of waste make the problem severe.

(3) There is limited involvement of private sector in the field of waste management.

Q. 3. Write a short note on E-waste.

Ans. (1) E-waste constitutes all types of unwanted products obtained from the electronic gadgets.

(2) Extended Producer Responsibility (EPR) management is the remedial measure for curing that E-waste.

Theme-2 : Healthy Environment, Healthy People

OPEN TEXT MATERIAL

Learning Objectives

- ❒ To recognize critical links between environment, development and human well being.
- ❒ To list the environmental causes affecting human health.
- ❒ To evaluate one's environmental health.
- ❒ To explore solutions to the environmental pollution problems.
- ❒ To generate awareness among students to maintain a healthy environment for healthy life.

A Note to Readers

After exploring the content, students will develop, a more enlightened view relating human health to nature. They will be able to recognize that plants and animals (including humans) do not exist as independent entities but instead are part of complex and interconnected ecosystems on which they are entirely dependent. It is designed with a view to create awareness relating nature and natural environment to human health and well being.

Students will explore the relations between environment and health. It is of vital importance to consider a broader definition of "environment" : not only the quality of the air, water and ground, but also indoor air quality, food and the living and working environment need to be taken into account.

Abstract

Plants and animals (including humans) do not exist as independent entities but instead are part of complex and interconnected ecosystems on which they are entirely dependent. While analysing relations between environment and health, it is of vital importance to consider a broader definition of "environment". Not only the quality of the air, water and ground, but also indoor air quality, food and the living and working environment need to be taken into account.

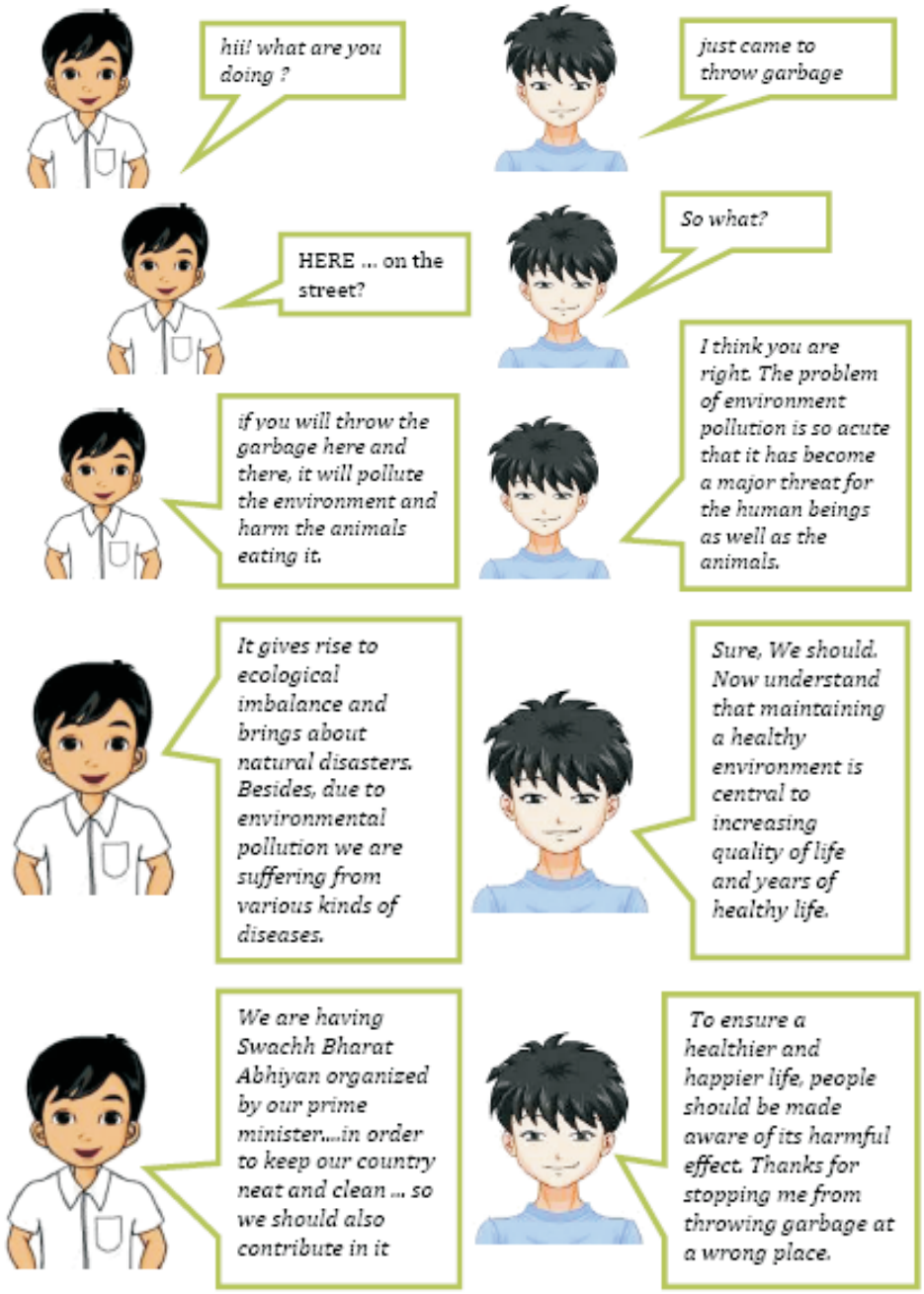
Health and Environment

(1) Environment plays a significant role in determining the health of people.

(2) The 2030 Agenda for Sustainable Development highlights critical links between development, the environment, human well-being and the full enjoyment of a vast range of human rights, including the rights to life, health, food, water and sanitation.

(*Source : http://www.open.edu/openlearn/nature-environment/the-environment/environmental-studies/world-environment-day-2016-local-engagement-global-celebration*)

(3)



Two main aspects of environment which influence health are the physical and the social.

A. Social Factors

Individual's working environment presents many potential dangers with almost any form of employment such as :

1. Repetitive strain injury in the office place.
2. Stress related illness in the customer care industries.
3. Labour jobs such as coal miners are at high risk of breathing problems.
4. Family relationships, friends, and peers in the school or work place. These relationships can produce negative peer pressure and potential bullying.

B. Physical Factors

1. **Sanitation facilities :** Mahatma Gandhi said in 1923, "Sanitation is more important than independence".

   Of human excreta, faeces are most dangerous to health. Faeces from an infected person can contain viral pathogens, bacterial pathogens, protozoan cysts or oocysts, and helminth eggs. This contamination is a major cause of diarrhoea, and leads to other major diseases such as cholera, schistosomiasis, and trachoma.

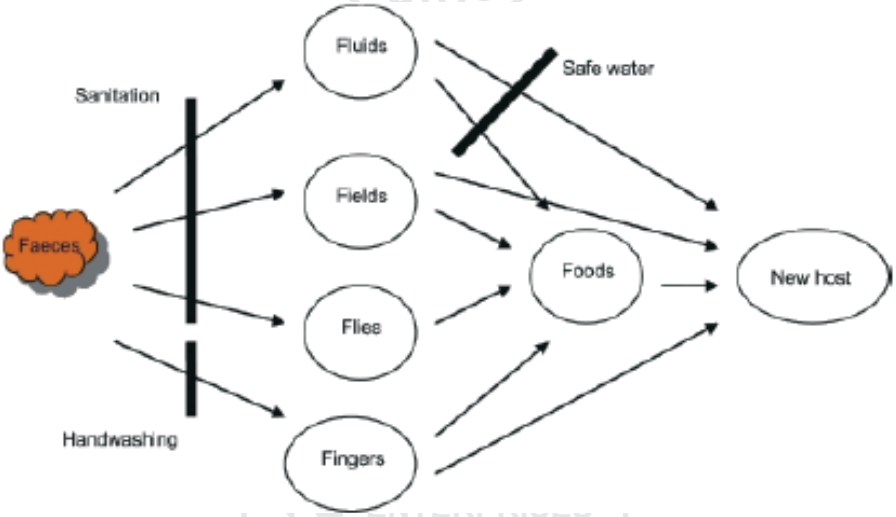


Fig 1 : *Faeco-oral disease transmission pathways and interventions to break them.*

   There are many allergens like faecal material of house dust mites that may cause asthma attacks or "hay fever" (allergic rhinitis). Facts show that a high exposure to these allergens during early period of life, increases the possibility of suffering from asthma in later period of life.

2. **Water :** There are various sources of chemical hazards. Water is one of them. If water is soft, it may leach lead from the pipes. Sometimes high content of Nitrate is found in water, which probably arises due to fertilizer leaching. This increases the risk of methaemoglobinaemia ('blue babies') in bottle infants which occurs very rarely.

   Recreational Water Illness (RWI) can be caused by the chemicals found in water that causes gastrointestinal and various other kinds of infections.

As we know that now a days plastic water bottles are very commonly used. Do you know that a chemical, Bisphenol A (BPA) has been frequently used in plastic bottles. It is harmful to humans as it interferes with their hormone levels and possibility of human reproductive disorders is increased.

3. **Quality of food :** Quality of food and its resources both have a significant impact on our life. We all know how harmful pesticides are, to human life. According to United State Environmental Protection Agency (EPA), *"If high levels of pesticides are used for long time it may cause birth defects, nerve damage and cancer"*.

   Although agencies like EPA carefully monitor pesticide use, but consumers should also be aware and sensitive towards its possible risks. Children are more prone to the serious effects of pesticide exposure.

   As one of the effluents released from industries, mercury enters water resources and gets absorbed by naturally occurring bacteria present there and is converted into another form 'methyl mercury; we all know that fishes are one of the most popular and commonly eaten sea food. If fishes tainted by mercury are consumed by any human, the mercury acting as neurotoxin, interferes with his / her brain and nervous system.

4. **Quality of indoor air :** Fungal hyphae and dust provide favourable conditions for the development of conditions like asthma and allergies.

   Smoke contains carcinogenic chemicals and when present in homes or workplaces, possess significant risk in causing cancer to the people.

   Inadequately ventilated fire — places and stoves may cause lung diseases. Various sources of pollution are present in the indoor environment and cause adverse impact on health.

   Exposure to radiations, Environmental Tobacco Smoke (ETS), Chemical and biological contaminants like mold causes a number of health problems.

Table 1 : Diseases and Environmental Risk Factors

Disease/ injury	Ratio of disease burden linked to environmental factors	Main environment risk factor
Diarrhoea	58%	Inadequate water, sanitation, hygiene
Lower respiratory infections	20%	Household and outdoor air pollution
Cardio-vascular diseases	14%	Chemical, air pollution and Environmental Tobacco Smoke exposure
Malaria	42%	Poor water resource, housing and land use management which fails to curb vector populations effectively
Road traffic injuries	40%	Poor urban design or poor environmental design of transport systems

Cancer	19%	Exposure to air pollution, pesticides, consumer products, radiation, biological agents, industrial chemicals etc. occurring in the home, the community or in the workplace, as well as environments which are not conducive to physical activity
Chronic obstructive pulmonary diseases	38%	Use of polluting fuels for cooking, outdoor air pollution and exposures to workplace dusts and fumes
Perinatal conditions	11%	Exposure of mothers to air pollution, tobacco smoke, pesticides and other chemicals; unsafe water and inadequate sanitation.

Sources : *WHO (2015). Preventing diarrhoea through better water, sanitation and hygiene. Exposures and impacts in low- and middle-income countries. Geneva; WHO (2015). The Global Health Observatory." Retrieved 11 June 2015; WHO (2014).*

5. **Radiations :** Exposure to ultraviolet (UV) radiation increases the possibility of skin cancer such as melanoma, and of cataracts.

6. **Chemical Hazards : How do they affect us :** We all are aware of the toxic effects of consumption of tobacco to our health. The Government has also launched various awareness campaigns and issued advisories regarding this, from time to time. Likewise tobacco smoke has also been identified as a major airborne chemical risk to health. It causes a number of diseases like **lung cancer, chronic bronchitis** and **emphysema.** Smoking adversely affects the **immune system,** thereby making smokers **more prone** to the **respiratory infections.**

   Combustion of solid fuels and coal releases smoke (containing polycyclic aromatic hydrocarbons) and sulphur dioxide. They also generate and release particulate matter in air, add on carbon di-oxide, an important greenhouse gas.

   Large scale industrial release of chemicals with serious acute effects are fortunately rare in India but there are some major events occurred in the past.

   Here are certain incidents which highlight the impact of chemicals and pesticides on human health.

1. The Bhopal Disaster — How can we forget ?

Monday 15 December 2014

Rows of people whose lives were snuffed out on the fateful night of December 2-3, 1984 (Photo: Ashok Chaddha)

It was the cursed night of December 2, 1984, when Bhopal died a million deaths. The chemical, methyl isocyanate (MIC), that spilled out from Union Carbide India Ltd's (UCIL's) pesticide factory turned the city into a vast gas chamber. People ran on the streets, vomiting and dying. The city ran out of cremation grounds.

Within weeks of the accident, people were seen suffering from common ailments of the poor, such as *tuberculosis* and *anaemia*. The health burden was compounded by two more variables — one, children born after the disaster were also its victims because of exposure to the deadly gas while they were in their mothers' wombs; two, chemical wastes remain dumped in and around the premises of UCIL factory, contaminating the water that was used by people for drinking.

Some of the studies had found high incidence of lung, eye disease and morbidity in the victims. Meanwhile, some independent studies had also pointed to serious health problems such as *cancer, mental problems* and *birth defects*. But since there is no epidemiological study, it is easy to dismiss these as ailments caused by poverty and lack of hygiene.

The Indian economy is growing at a tremendous rate but at significant cost in *environmental health and public safety as large and small companies* throughout the subcontinent continue to pollute. Far more remains to be done for public health *in the context of industrialization to show that the lessons of the countless thousands dead* in Bhopal have truly been heeded.

2. Cancer Bathinda's dubious distinction


SUNDAY
hindustantimes
hindustantimes.com
think
LOST NOT FOUND
Nine districts in grip of pesticide poisoning

TODAY'S PAPER »

THE HINDU

NATIONAL

BATHINDA, September 6, 2011

❒ VRINDA SHARMA

The crowd waiting to board train no 339 from Bathinda Railway Junction shares more than the overnight journey to Bikaner (Rajasthan), its passengers are bound together by the misery of cancer and the hope of getting cured. "I see close to a hundred people boarding the train every night... *What else can be done, there is no hospital for nearly 150 km and every street has patients*," says Vicky Kumar who runs a tea stall at the station. "*It's like a curse on the region, not a personal plight*," he added.

A family of five, from village Gehri Bhagi, 10 km from here, wait at the station to take their 17-year-old son to Bikaner. "We don't know why he got cancer in the food pipe, he takes no tobacco, no alcohol. But there have been over 15 cases in the last year in our village," his mother breaks down while speaking about her son's illness. Home to a million people, Bathinda boasts a thermal power plant, two coal power plants, a fertilizer plant, and a large oil refinery, and countless cancer patients. The latest data from the health department puts the number of patients in Malwa region at 120-125 per lakh against 71, which is the national average. The department states that there is a jump of 80 per cent in the number of cases from the region in 2010 compared to 2009.

A 2007 epidemiological study, known as the **PPCB-PGIMER Report,** found that **Bathinda surface waters are contaminated with arsenic, cadmium, chromium, selenium and mercury.** The waste water generated from industry "is drained mostly partially or untreated in the local drains, which had led to the pollution of these drains." *Pesticides such as heptachlor, ethion and chlorpyrifos were also higher in samples of drinking water, vegetables and blood in the cotton belt of Punjab.*

3. Cosmetic Products

Think for a while about the products that you or your family members generally apply on your skin or hairs to keep them fresh and glowing. You will find a wide variety of body lotions or shampoos around you. But do you know that various *cosmetic products contain different kind of chemicals. Phthalates generally found in nail polish, perfumes is linked to birth defects in human and animals. Shampoos may contain selenium sulphide as one of the ingredient that is a potential carcinogen.*

Suggestive Measures

What can we do to reduce our exposure to these chemicals?

- ❒ Go for environment friendly and natural products. Make yourself aware about the chemicals harmful to us. Look out for the labels found on the products that display the names of their ingredients. Read the label, think over it and act accordingly. Strongly say '**No**' to the **products that contain harmful chemicals.**
- ❒ Avoid using **plastic** bottles, its **wear and tear releases toxic chemicals.** Then what may be the possible alternatives. **Glass is considered as one of the best and safe alternative.** Avoid storing **food items/eatables in plastic containers and heating food in plastic containers in microoven. On heating, plastic releases harmful chemicals into the food.** When such food is consumed, these chemicals enter our body.

Towards Safe Home

Look at your house and find out —

Is your house properly ventilated?

Is your house free of the 'big three' ? Radon, mold and lead.

1. Radon is a radioactive gas found in the soil. Our house should be free from **Radon** as its long term exposure is **one of the major cause of lung cancer.** There are technologies available for testing Radon in the indoor air.
2. **Indoor moisture** is an **important component,** it provides favourable conditions **for growing mold.** Hence it is suggested to test the presence of indoor moisture and mold content.
3. It has been found that paints and plastic pipes contain heavy metals like lead. We should use the paints and plastic pipes that are free from toxic metals and are environment-friendly.
4. For maintaining large lawns **use of pesticides and grass cutter machine is common.** It causes air as well as noise pollution. We may opt the following, to avoid it —
   - ❒ Planting perennial ground covers
   - ❒ Low maintenance landscaping
   - ❒ Planting native foliage plants

Air monitoring station must be installed at work places to check air quality and all efforts must be made for improving air quality by developing more and more green belt around them.

Lets record natural sounds, such as water or birds to mask the noise from urban environments.

Lets plant "trees as a noise screen"

Lets resort to biopesticides and organic farming

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SAMPLE QUESTIONS WITH ANSWERS

Q. 1. List the impact of consuming fish with high mercury levels on human health. (2)

Ans. (1) Industries near the water bodies possess a great threat to human and aquatic life by releasing effluents such as mercury.

(2) When sea food such as fishes tainted by mercury are consumed by humans, the mercury present in it, interferes with their brain and nervous system. 1×2=2

Q. 2. List any three priority problem areas, based on the evidence of the linkages between poor environmental quality and health. (3)

Ans. (1) Household (indoor) and ambient (outdoor) air pollution, which currently cause morbidity and reduced quality of life within countries and across borders;

(2) Poor quality of water, insufficient sanitation or hygiene conditions cause mortality, illness and loss in economic productivity.

(3) Toxic wastes and chemicals, which cause deaths and mental morbidity.

(4) Diet, poor in nutrition and quality, and increased physical inactivity has resulted in the increase in the growth of non-communicable diseases throughout the world.

(5) Degraded ecosystems and stresses to the Earth's natural systems, enhance the possibility of natural disasters, food security, and from time to time these have resulted in disease outbreaks. (*any three*) 1×3=3

Q. 3. Discuss the impact of chemicals on human health through a case-study other than those mentioned in the text. (5)

Ans. (1) Case study of beauty products by studying harmful chemicals involved in it.

(2) A few chemicals are very harmful for human health and environment which are used in various beauty products.

(*i*) **Formaldehyde :** Found in nail products, hair dye, fake eyelash adhesives etc.

(*ii*) **Lead :** Known as carcinogen found in various lipsticks and hair dyes.

(*iii*) **Mercury :** It is the allergen that impairs brain development and is found in mascara.

(3) (*i*) Strict laws should be made against the industries that uses the above mentioned harmful chemicals.

(*ii*) People should be made aware of their side-effects.

SOME PROBABLE QUESTIONS WITH ANSWERS

Q. 1. State the major environment risk factors for the diseases like diarrhoea and cancer.

Ans. (1) Inadequate water, sanitation, hygiene are few factors involved in diarrhoea.

(2) Exposure to air pollution, pesticides, radiation are main risk factors for cancer.

Q. 2. Why is smoking is injurious to health ?

Ans. (1) Smoke produced from cigarettes contain carcinogenic chemicals leading to severe respiratory problems and even causing significant risk of cancer.

(2) Smoking affects blood vessels of legs causing chronic pain in legs.

Q. 3. Why should eatables be stored in glass containers rather than plastics ?

Ans. (1) Wear and tear of plastics or heating the food in plastic containers in micro's releases toxic chemicals which can cause severe harms.

(2) Plastic trash is the most obvious form of pollution that releases poisonous gases in the environment.

(3) Excess plastic waste in landfills damages soil fertility.

Q. 4. How does environment affect people's health ?

Ans. (1) Cleaner or pollution free environment make anyone healthy or disease free.

(2) Improper disposal of waste causes many health problems.

(3) Plastics are also harmful to humans as it interferes with their hormone levels and reproductive disorders are increased.

(4) Air pollution, water pollution and noise pollution also affect the human health.

(5) Human excreta, faeces in open field are most dangerous to health. Faeces from an infected person may cause of diarrhoea, and leads to other major diseases such as cholera, trachoma, etc.