

**Syllabus**

**Preventive Measures:** Car pools, promotion of public transport, no smoking zone, restricted use of fossil fuels, saving energy and encouragement of organic farming.

Pollution affects the air we breathe, the water we drink and the soil in which we grow our crops. The gaseous fumes from industries, the emission from motor vehicles and the burning of fossil fuels have made the air, especially in the cities, so poisonous that it has made life difficult for the citizens. Water is being polluted by the discharge of pollutants from industries, household detergents and sewage, offshore oil drilling, making it unfit for human consumption. Soil is being polluted by effluents discharged from chemical industries, paper and pulp mills, tanneries, textile mills, urban commercial and domestic waste and use of chemical fertilisers and pesticides. Therefore, a comprehensive set of preventive measures are required to check the growing menace of pollution. Some of these are given below:

### VEHICULAR POLLUTION

The rising levels of air pollution in most of our cities is due to the rapidly increasing number of private vehicles. An increase in the purchasing power of the middle class, along with the lack of efficient public transport system, has led to the upsurge in the number of cars per family in the cities. Consequently, the roads to and from any colony are so choked with cars of various makes and sizes, blocking the lanes, and bylanes at all

times of the day and creating heavy traffic jams. Besides, these vehicles are the major source of air pollution in the cities.

Vehicular emissions have two negative effects on the environment: one is global climate change and the other is air pollution and its negative health repercussions. Climate change is a result of increasing carbon dioxide, ( $\text{CO}_2$ ) emissions. The greenhouse effect results from carbon dioxide, the most important of the greenhouse gases, which acts like a blanket around the earth, keeping surface temperatures at warm levels. Increasing the  $\text{CO}_2$  concentration in the earth's atmosphere effectively adds another blanket which warms the earth's surface even more.

Besides  $\text{CO}_2$  emissions other vehicle emissions also contribute to air pollution. Vehicles account for most of the carbon monoxide (CO) and a large share of the hydrocarbons (HC), nitrogen oxides (NOx), and particulates found in the atmosphere in major urban areas. Nitrogen oxide (NO) is formed when nitrogen in



**Fig. 19.1.** Traffic Jam: Vehicular Pollution

the fuel or nitrogen of air heats to temperatures above 1200°F in the presence of oxygen. This reaction occurs in most car engines today. Nitric oxide (NO) is the initial product and oxidizes to nitrogen dioxide ( $\text{NO}_2$ ). Nitrogen oxides also combine with water leading to a component of atmospheric acidification, specifically nitric acid ( $\text{HNO}_3$ ). In turn, this leads to *acid rain*. Vehicle emissions constitute the greatest individual source of nitrogen oxides in industrialised countries.

Most of the big cities in India are affected by air pollution caused by high levels of total suspended particulates, carbon dioxide, sulphur dioxide, and nitrogen dioxide. It is exhaust pollution from vehicle emissions that has increasingly become the source of air pollution in these cities.

Alarmed at the air pollution levels in Delhi, the Delhi High Court termed living in Delhi as living "in a gas chamber". In 2014, the WHO released a list of world's 20 most polluted cities, 13 of which were in India. Therefore, Indian cities need to curb pollution from all sources, but vehicles need special attention as they emit toxic fumes within our breathing zone. The following measures can help to curb air pollution:

### 1. Carpools

*Carpooling* refers to the sharing of car journeys by persons travelling on the same route.

The main advantages of carpooling are the following:

- It reduces air pollution by reducing the number of vehicles on the road and thereby, cutting down the vehicular emissions.
- It helps to save money in buying fuel and maintenance cost of cars.
- It helps to save petrol and diesel and thereby, save foreign exchange that goes into buying these fuels.
- It reduces traffic congestion on the roads and thereby prevents traffic jams, reduces fuel consumption and commuting time and the cost of road repairs.
- It helps to use commuting time in useful pursuits. If one drives to work alone everyday, the time spent behind the wheel

is essentially wasted. Riding in a carpool can help one to use this time to check and answer emails, read newspaper or novels, prepare for meetings, check bank balances or simply relax.

- It helps to de-stress by talking to fellow commuters, sharing an anecdote, a story or a joke. This can also help to build friendships. Many online services provide a choice to ride share with people of your choice.

### 2. Promotion of Public Transport

*Public Transport* is a shared passenger transport service which is available for use by the general public, as distinct from modes such as taxis, carpooling or hired buses. Public transport modes include city buses, trams (or light rail), passenger trains and metro rail. Buses make up over 90 per cent of public transport in India and serve as a cheaper mode of transport for the general public. These buses are mostly run by State government owned transport corporations like Delhi Transport Corporation (DTC) in Delhi and Brihanmumbai Electric Supply and Transport (BEST) in Mumbai.

The suburban railway services in India are limited and are operational only in Mumbai; Kolkata, Chennai, Hyderabad, Ahmedabad, Pune, Delhi and between Kanpur and Lucknow. The Mumbai suburban railway transports

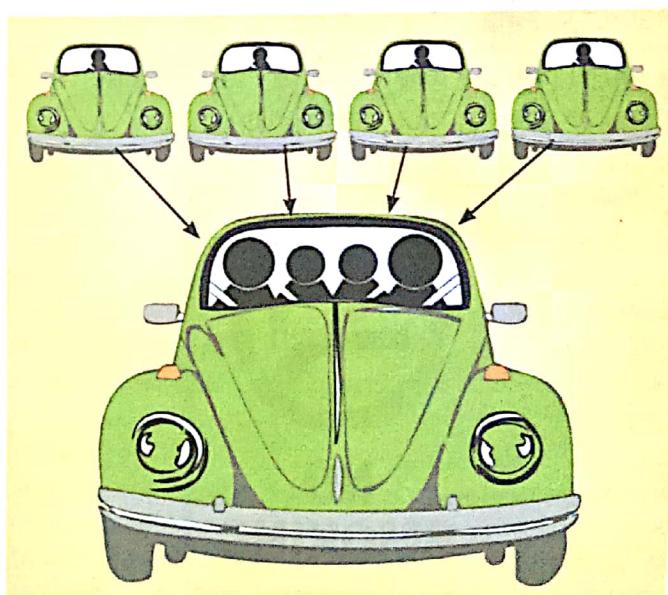


Fig. 19.2. Carpooling

6.3 million passengers daily and has the highest passenger density in the world. Suburban trains are run between a central business district and suburbs or other locations that draw large numbers of people on a daily basis. Suburban trains that handle commuter traffic are mostly Electric Multiple Units (EMUs). They usually have nine or twelve coaches and sometimes even fifteen to handle rush hour traffic.

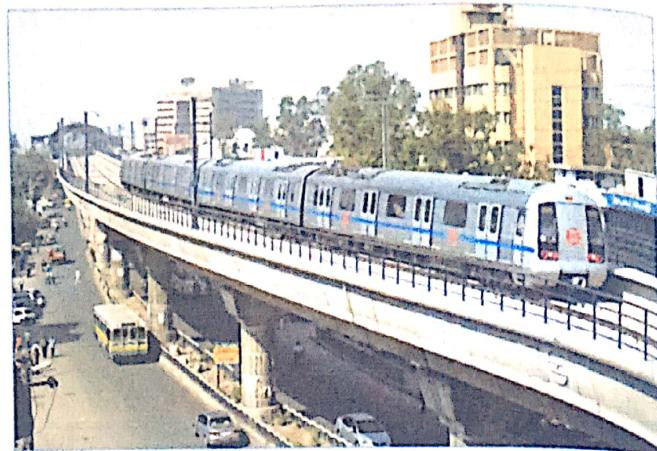
At present the metro rail is operational in metro systems in Delhi, Kolkata, Mumbai, Jaipur, Chennai, Gurgaon (Haryana), Bengaluru.

However, in recent years there has been an increasing trend for private vehicles. This has resulted in far more vehicles on the road leading to more vehicle emissions and thus more pollution. If public transportation is used more frequently, this trend can be reversed and its subsequent harmful effects. The main advantages of using public transport are the following:

- (i) It reduces damage to the environment by reducing emissions. For example, one bus emits far fewer fumes than 20 cars. Similarly, train emissions of carbon dioxide ( $\text{CO}_2$ ) per passenger per kilometre are much less than travel by car.
- (ii) It requires 1/5th energy per passenger per km compared to road based transport system. It therefore, reduces fuel consumption and thus helps to save foreign exchange used in buying petrol and diesel.
- (iii) It causes less noise, no air pollution and is eco-friendly transport system.



**Fig. 19.3.** No Smoking Zone



**Fig. 19.4.** Elevated Metro

- (iv) It helps to save money spent on maintenance of personal vehicles.
- (v) It occupies no road space if underground and only about 2.6 m width road if elevated.
- (vi) It avoids the need to find parking space for private vehicles.
- (vii) It reduces congestion on roads and thereby, traffic jams and travelling time.
- (viii) It is safer to travel by public transport than private vehicles. It averts number of accidents.

### 3. No Smoking Zone

Smoking is the inhalation of the smoke of burning tobacco encased in cigarettes, beedis, pipes and cigars. In this way, nicotine, the active ingredients in tobacco, is inhaled into the lungs, where most of it stays. The rest passes into the bloodstream, reaching the brain in about ten seconds and dispersing throughout the body in about 20 seconds. Smoking is recognised as the leading preventable cause of death. Anyone with a smoking habit has an increased chance of lung, cervical and other types of cancer, respiratory diseases such as asthma, bronchitis and cardiovascular diseases such as heart attack, high blood pressure, and stroke.

Smoking does not just harm the smoker but also the people nearby, who breathe in the smoke exhaled by the smokers and are called 'passive smokers'. Recent research has shown that concentration of second-hand tobacco smoke (the smoke exhaled by smokers) in many outdoor areas is often as high or higher than in

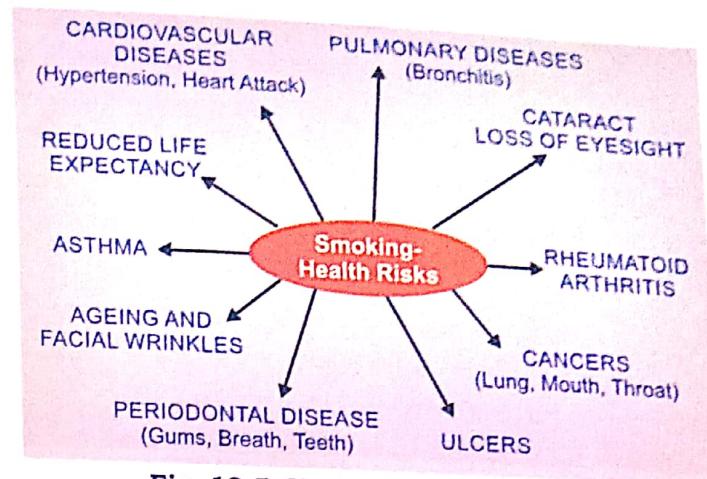
some indoor areas and the risks posed by such outdoor exposure are well beyond generally accepted norms when large numbers of people are involuntarily exposed. Therefore, the passive smokers or those who unavoidably breathe in second-hand tobacco at public places, have an increased chance of many health problems such as lung cancer, asthma, bronchitis and sudden infant death syndrome in children.

There are approximately 120 million smokers in India. According to the World Health Organisation (WHO), India is home to 12 per cent of the world's smokers and approximately around nine lakh people die every year in India due to smoking. As a preventive measure, a mandatory specific statutory health warning on cigarette packs was introduced in 1975. Realising the seriousness of the problem, smoking in public places was prohibited nationwide from October 2, under the *Prohibition of smoking in Public Places Rules 2008*. The smoking ban pertains to public places, which include auditoriums, cinemas, hospitals, public transport (aircraft, buses, trains, metros, taxis) and their related facilities (airports, bus stands, railway stations), restaurants, hotels, bars, pubs, amusement centres, offices, libraries, courts, post offices, markets, shopping malls, canteens, educational institutions and parks.

A person caught smoking in public places has to pay a fine. By creating 'No Smoking Zone' in public places, an attempt has been made to save not only passive smokers but also to discourage smokers to give up smoking.

Advantages of 'No Smoking Zone' are the following:

- It reduces the possibility of second-hand tobacco smoke being inhaled by non-smokers.
- It reduces air pollution. Areas which have prohibited smoking have been found to have better indoor air quality as opposed to areas where smoking is allowed.
- It reduces healthcare costs by reducing the chances of diseases caused by smoking.
- It reduces the chances of influencing others, especially the youth, to take on the habit of smoking.
- It reduces the chances of accidental fires in places with highly flammable



**Fig. 19.5. Health Risks of Smoking**

materials, forest fires and fires which start from lit cigarettes.

#### 4. Restricted Use of Fossil Fuels

Fossil fuels refer to buried, combustible deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, coal, and natural gas by exposure to heat and pressure in the earth's crust over hundreds of millions of years.

Fossil fuels are the major source of energy. Coal provides about 28 per cent of all commercial energy in the world. It is used to produce electricity and to make steel, besides use in many other industries and for domestic use. Petroleum furnishes about 40 per cent of the commercial energy used in the world. It provides most of the energy used for transportation and heats millions of houses as well. Natural gas accounts for 20 per cent of the commercial energy used in the world. It is used to heat homes, cook meals, in industries and its compressed form CNG is used as an alternative to petrol or diesel in automobiles.

Fossil fuels are the cause of environmental hazards like air pollution, global warming and acid rain. Air Pollution is one of the major disadvantages of fossil fuels. Carbon dioxide ( $\text{CO}_2$ ) released in the air, when fossil fuels are burnt, is the primary gas responsible Global Warming.

Sulphur dioxide is one of the pollutant that is released when fossil fuels are burnt and is a main cause of acid rain. Acid rain can lead to destruction of monuments made up of marble and damage crops due to acidification of loams.



Fig. 19.6. Petroleum

Pollution of air from vehicles and coal powered power plants can cause serious health hazards. It can result in diseases like asthma, Chronic Obstructive Pulmonary Disorder (COPD) and lung cancer. Long-term exposure may increase respiratory infections in general population. Children and the elderly are most vulnerable to fine particulate matter and other airborne toxicants. Transportation of crude oil via sea can cause oil spills which can pose hazard to the aquatic life by lessening the oxygen content of water.

Fossil fuels are non-renewable source of energy. As a result of growing demand fossil fuels are being depleted at a rate of 100,000 times faster than they are being formed. At the present rate of usage, the coal reserves are likely to last for about 200 years. Similarly, at the present rate of usage, the world's crude oil reserves would be exhausted in just 50 years. These resources are non-renewable and take millions of years to form. It is essential, therefore, to reduce dependence on such energy resources and explore and exploit the enormous potential of alternative sources of energy like solar energy, tidal energy, wind energy, geothermal energy and biomass based energy. They are not only renewable sources of energy but are environmentally clean and safe to use.

## 5. Saving Energy

India faces serious energy crisis due to population pressure and deterioration in the physical environment. Today, the fossil fuels are the main source of energy in the urban areas. Fossil fuels like coal, petroleum, etc.,

are being used at an alarming rate. If these fuels continue to be used at the present rate, they would not last for consumption for a long time. Hydro-electric power is used in urban areas. It is a clean fuel, but at the source of its production huge dams are being built which create environmental problems.

In the urban areas energy resources are used maximum without caring for the future while the rural areas do not have enough energy supply. Some of the villages use hydro electrical power for light and pumping up water from tubewells. However such supply is not regular and all rural areas do not have sources of hydroelectrical power. Despite urbanisation, 74 per cent of India resides in rural areas, where the villages still depend on traditional fuels to meet their energy needs.

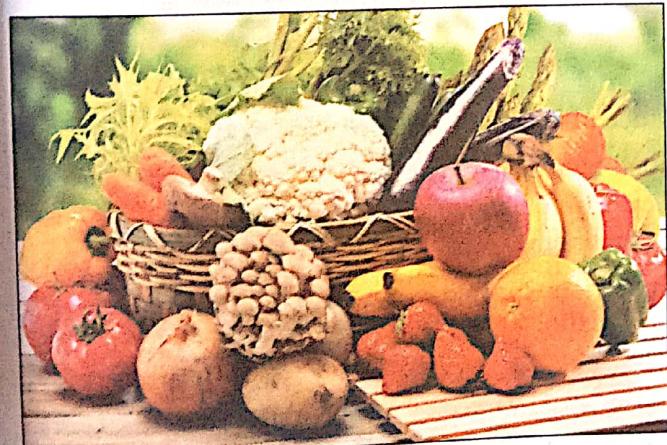
The following measures can help to save energy:

- (i) Use extra blankets and sweaters instead of using room heaters. Likewise, in summer, dress in light cotton clothes to save on air-conditioning costs and energy.
- (ii) Make sure that the houses are well insulated and, if heated or cooled, windows or doors are not left open. Raise shades on winter days; lower them in the summer. Seal all leaks. Block windows and doors with weather-strip tape and install blinds to reduce outside heat transfer.
- (iii) By using products with *Energy Star* label on products and equipment. This reduces energy bill by 30 per cent and electric lighting charges by 40 per cent while cutting pollution.
- (iv) Use a low-flow shower-head, to reduce water consumption and energy usage to heat the water.
- (v) Turn off equipment and lights at night and unplug appliances when they are not in use.
- (vi) Replace light fixtures with energy conserving CFL bulbs and tubes which help save 75 per cent of the energy used with incandescent bulbs. CFLs help to save money, use less energy, reduce light bulb changes, and lower greenhouse gas emissions. LED lighting differs from incandescent and compact fluorescent

- lighting in several ways. It is more efficient, durable, versatile and long lasting.
- (vii) Check furnaces, air conditioners and heat pump filters regularly. Cleaning the heating, ventilation and air-conditioning equipment, make them last longer, avoid costly down time and improve indoor air quality.
  - (viii) Paint your exterior and interior walls in a light colour so more light is reflected. Paint the edges of the window in white so more light is reflected inside. During the day, open blinds to bring in natural light instead of turning on lights.
  - (ix) By double siding on copiers, reusing single-sided paper, using electronic mail an organisation can save a significant amount of energy and natural resources. One ton of waste paper saves enough energy to power an average home for 6 months.
  - (x) Use public transport or car pool. This helps to save energy costs, and extends the life of the vehicle.

## 6. Organic Farming

Organic farming is a holistic system of farming, which is primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilisers) to release nutrients to crops for increased sustainable production in an eco-friendly pollution free environment.



**Fig. 19.7. Organic Produce**

It excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones and feed additives) and rely upon crop rotations, crop residues, animal manures, off-farm organic waste, and biological system of nutrient mobilization and plant protection.

According to Food and Agricultural Organisation (FAO) “Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs”.

The four Principles of Organic Farming are:

- (i) Organic farming should sustain and enhance the health of soil, plants, animals and humans as one and indivisible.
- (ii) Organic farming should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
- (iii) Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- (iv) Organic farming should be managed in a precautionary and responsible manner to protect the health and well being of current and future generations and the environment.

## Characteristics of Organic Farming

The main characteristics of Organic Farming are the following:

- (i) *Protecting the long term fertility of soils* by maintaining organic matter levels, and creating optimised conditions for biological activity within the soil.
- (ii) *Providing crop nutrients indirectly using relatively insoluble nutrient sources* which are made available to the plant by the action of soil micro-organisms.
- (iii) *Maintaining nitrogen self-sufficiency* through the use of legumes and biological nitrogen fixation, as well as effective recycling of organic materials including



- crop residues and livestock manures.
- (iv) Preventing weeds, disease and pests by relying primarily on crop rotations, natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention.
  - (v) Providing attentive care and management of livestock, paying full regard to their evolutionary adaptations, behavioural needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing.
  - (vi) Careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats.

### Importance of Organic Farming

The significant characteristics of Organic Farming are the following:

- (i) Organic farming promotes the use of crop rotations and cover crops, and encourages balanced host/predator relationships.
- (ii) Organic residues and nutrients produced on the farm are recycled back to the soil. Cover crops and composted manure are used to maintain soil organic matter and fertility.
- (iii) Preventative insect and disease control methods are practiced, including crop rotation, improved genetics and resistant varieties. Integrated pest and weed management, and soil conservation systems are valuable tools on an organic farm.

### EXERCISES

#### I. Choose the correct option:

1. Climate change is a result of increasing \_\_\_\_\_ emissions.  
 (a) sulphur dioxide    (b) carbon dioxide    (c) oxygen    (d) hydrocarbons
2. Vehicles account for most of the:  
 (a) carbon monoxide    (b) nitrogen oxides    (c) particulates    (d) carbon dioxide
3. The sharing of car journeys by persons travelling on the same route to save money and fuel:  
 (a) carsharing    (b) shared cars    (c) carpooling    (d) poolingcar
4. Which of the following is NOT an advantage of carpools?  
 (a) It helps to save money in buying fuel  
 (b) It helps to save money in maintenance cost of cars  
 (c) It increases traffic congestion  
 (d) It helps to use commuting time in useful pursuits
5. Which amongst the following is NOT an advantage of Public Transport?  
 (a) It causes more noise  
 (b) It is an eco-friendly transport system  
 (c) It reduces fuel consumption  
 (d) It helps to save money spent on maintenance of personal vehicles
6. Non-smokers who breathe in the smoke exhaled by the smokers:  
 (a) Secondary smokers    (b) Active smokers  
 (c) Passive smokers    (d) Indirect smokers
7. The buried, combustible deposits of organic materials, formed as a result of heat and pressure in the earth's crust over hundreds of millions of years:  
 (a) Fossil    (b) Fossil Fuel    (c) Crude    (d) Combustions
8. Coal : 28% :: Natural gas : \_\_\_\_\_  
 (a) 20    (b) 15    (c) 30    (d) 25

9. The major disadvantage of fossil fuels is:  
(a) Water Pollution (b) Radioactive Pollution  
(c) Air Pollution (d) Soil Pollution
10. A holistic system of farming, which is primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health in an eco-friendly pollution free environment.  
(a) Eco-friendly farming (b) Organic farming  
(c) Primary farming (d) Preventive farming

## II. Short Answer Questions

1. State two negative effects of vehicular emissions.
2. Name any two gases emitted by vehicular emissions.
3. What is meant by carpooling?
4. Name any three modes of public transport used in India.
5. What is a 'No Smoking Zone'?
6. What are Fossil Fuels? Name any two fossil fuels.
7. State why should we use fossil fuels judiciously.
8. State any three measures to save energy.
9. What is Organic Farming?

## III. Structured Questions

1. (a) Explain how vehicles are a source of air pollution.  
(b) State any two advantages of carpooling.  
(c) Why do we need to have an efficient public transport?  
(d) Who are passive smokers? How does smoking harm passive smokers?
2. (a) Name any two legal provisions meant to deter smoking.  
(b) State any two advantages of having a 'No Smoking Zone'.  
(c) Why do we need to reduce our dependency on fossil fuels?  
(d) Describe the measures an individual can take to reduce consumption of energy and to create a cleaner environment.
3. (a) Why is 'Organic Farming' so called?  
(b) State any two principles of Organic Farming.  
(c) What are the main characteristics of Organic Farming?  
(d) State why Organic Farming is gaining popularity in recent times.

## IV. Thinking Skills

1. Preventive measures being taken to check all types of pollution are too slow and too less. What do you think needs to be done to check the menace of pollution before it is too late?
2. The daily grind leaves no room to think about the haze and the smog or other types of pollution. In this scenario, how can the preventive measures be implemented to check pollution? Give reasons to support your answer.

## V. Practical Work

1. Make a Power Point presentation showing the advantages of using Public Transport.
2. Make a Case Study of two States in India showing the success of Organic Farming.