UNIT 3 ENVIRONMENTAL HEALTH AND SANITATION

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3.0 INTRODUCTION

This unit is important in context of the ‘SWACHHTA ABHIYAN’ declared by our Hon’ble Prime Minister. We have learnt about definition, concept and determinants of health. That included ‘what is health?’, ‘whom do we call as healthy?’, ‘why is health important to ensure a good quality of life?’ We have also learnt ‘what factors enhance or compromise our health?’ This was explained in terms of disease agents (bacteria, chemicals, injury), host factors (our age, education, occupation, income, habits, lifestyle, genes, diet, immunity etc.) and environment (physical – water/ air etc; social– family relations, culture etc; biological– vectors like flies/ mosquitoes, animals like rats/dogs; psychosocial – stress, pace of life).
Any health worker may think that her job is to take care of people, mainly the health of women and children. So why should she/he be worried about (or even working for) improvement in Environmental Health and Sanitation (EHS)? Bulks of diseases we suffer from are due to some problem with our environment, yet it is usually a neglected area. Whether it is a doctor or a health worker, we are all working for improving the health status of people in our assigned areas. The success of a hygiene programme is not determined only by the number of latrines or the number of wells constructed. Successful programmes are created by what people do, that is, by their behaviours and practices. So, if we are serious about helping people to remain healthy, we need to change our approach. In this unit you will learn issues related to management of physical environment and sanitation in a sub-centre area, e.g. safe water, waterborne diseases, air / noise pollution waste. Before proceeding further it will be worthwhile for you to understand that all the related activities will have to be done by you within mechanism and the settings available to you.

### 3.1 OBJECTIVES

After completing this unit, you should be able to:

- explain the characteristic of a village;
- define the concept of safe water;
- list waterborne diseases;
- enumerate the physical and chemical standards of drinking water quality;
- list the steps in water purification processes;
- describe the concept of water conservation;
- discuss the management of solid waste, human excreta and sewage disposal; and
- list the commonly used insecticides and pesticides; symptomology of poisoning related to these.

### 3.2 CONCEPT OF ENVIRONMENTAL HEALTH AND SANITATION

WHO defined environment sanitation as the control of all those factors in man’s physical environment which exert a deleterious effect on physical development, health and survival.

**Poor environmental sanitation leads to:** Contamination of water, pollution of air, soil unhygienic disposal of sewage, refuse and waste, infestation of insects, rodents etc. Therefore it is important to learn about environmental sanitation and improvement of environmental sanitation so that many communicable diseases can be prevented and controlled in our country.

Let us read one by one, physical environment first i.e. water which constitute the most important component of physical environment. Water is prime natural resource, a basic human need and a precious national asset and therefore, WHO refers to “**Control of water supplies to ensure that they are pure and wholesome**” as one of the primary objectives of environmental sanitation. Equilibrium between man and environment leads toward health and imbalance heads to ill-health Fig. 3.1
Fig. 3.2 depicts components of environment such as Physical, Biological, Social and Cultural. In Fig. 3.3 shows reasons of environmental pollutions. Fig. 3.4 concept of sanitation.

### Fig. 3.1: Concept of Environment and Health

![Diagram showing equilibrium between Man and Environment](image)

*EQUILIBRIUM*

- MAN
- ENVIRONMENT

**Disequilibrium leads to ill-health**

### Fig. 3.2: Components of Environment

- **Physical:** Water, air, soil, housing, radiation, light, noise, vibrations, refuse wastes
- **Biological:** Plant, Animal, Rodents, Insects, and Microbes
- **Social:** Occupation, literacy, income, religion lifestyle, availability of health services
- **Cultural:** Knowledge, attitude beliefs, practices, traditions, custom habits

### Fig. 3.3: Causes of Environmental Pollution

- Industrialisation
- Urbanisation
- MAN only is responsible for pollution of his environment

### Fig. 3.4: Concept of Sanitation

- “The science of safe guarding the health”

### 3.3 CONCEPT OF POLLUTION PREVENTION

There are a number of principles of pollution prevention.

**Principle of waste optimisation: Reduce, Reuse and Recover.** Reduction refers to changing the process so that waste is not produced in the first place. Reuse involves using an item more than once (for example, you can reuse plastic bottles...
for collecting water). Recovery involves recovery of materials or energy through recycling, composting and incineration. An example of recycling is taking used aluminium cans (tin cans) and recycle the metal to make it into something else. In composting we can take waste organic matter and make it into useful compost for fertilizer. Through incineration (burning) we can recover the energy contained in waste materials.

**Polluter pays principle:** This principle identifies the people or organisations who generate or produce waste or pollution. They are responsible for paying the costs of any damage.

**Principle of ‘Cradle to Grave’**: Production of any object or to any activity by an individual or institution and all the pollution that object or activity might cause throughout its lifecycle; for example, if you make a plastic bottle, pollution might be caused in the manufacturing process; or by the lorries that transport the bottles around the country; and when the bottle is thrown away.

**Principle of discharge/emission permit**: A waste generator has an obligation to obtain permission from the regulatory authority in order to discharge waste to surface water and to the atmosphere.

**Infrastructure and Basic Life Amenities: Housing**: Good-quality housing is a key element for ensuring a healthy village. Poor housing is related to indoor air pollution, poor lighting, ventilation and over crowding. Poor housing can lead to many health problems e.g. infectious diseases, stress and depression. (Fig. 3.5).

![Fig. 3.5: Kuchcha house and a Pucca house in a village](image)

Overcrowding causes ill-health because it makes disease transmission easier and because the lack of private space causes stress. Overcrowding is related to socioeconomic level, and the poor villagers in India often have little choice but to live in cramped conditions. In India, often, many people share the same room. Privacy is lacking which causes mental disorders. Overcrowded house causes respiratory and skin disease.

### 3.4 CONCEPT OF SAFE WATER, SOURCES, WATER BORNE DISEASE AND WATER PURIFICATION

Let us now read in details about safe water, sources, waterborne diseases and purifications of water as discussed below:

#### 3.4.1 Safe (potable) Water

An adequate, safe and accessible water supply must be available to all people. Improving access to safe drinking water can result in tangible benefits to health.
Safe water is
- Free from harmful chemicals
- Pleasant to taste
- Usable for domestic purpose

3.4.2 Sources of Water

Surface water

Surface water supplies taken from rivers, lakes or ponds can provide a consistent and manageable source of water. However, it is subject to greater risk of contamination than groundwater and therefore usually requires treatment. Contamination is most likely to be with microbiological pathogens from human and animal excreta. There is also the possibility of accidental or deliberate pollution by industries or farming.

Groundwater

Groundwater can be obtained from springs, boreholes or wells i.e. deep sources, may provide water of good microbiological quality. Ground water sources are therefore preferable to surface water sources. However, groundwater can contain chemical contaminants, such as arsenic, fluorides and nitrates. A spring may vary in volume and contamination levels according to the amount of rainfall. Springs are likely to be polluted by direct contamination unless the surrounding land area is protected. A spring can produce both a consistent volume and a better quality supply. Springs should be protected from flooding and surface water pollution by constructing a deep diversion ditch above and around the spring. The ditch should be constructed so it collects surface water running towards the spring and carries, or diverts, it away. It needs to be deep enough to carry all surface water away, even in a heavy rainstorm. The surrounding area should be fenced to protect it from animals.

Well water is still an important source of supply in many Indian villages. During heavy rain, dug wells are susceptible to contamination by pathogens which may be deposited on the surface or naturally present in the soil and are washed in to the well, particularly if it is improperly constructed. Hand pumps placed over the well need to be built so the surrounding surface is covered and protected.

Bored wells have small yields, may be easily polluted and are affected by droughts.

For protection of well water from pollution and contamination it should be located on a higher level than possible sources of contaminants such as latrines and cesspits. This is because the liquid from the pit may seep into the surrounding ground and into the groundwater. If the latrine is higher up a slope than the well, then the contaminated groundwater is likely to flow downwards and into the well. The natural flow of the groundwater should be away from the well and towards the sources of contaminants, and not the other way round. In normal soils, the minimum distance between the well and the source of contaminants should never be less than 15 meters.

A concrete cover should be fitted over the casing to prevent dust, insects, small animals and any other contaminants from falling in.

A pump should be installed, but if a pump is not available then a sanitary bucket and rope system may be used. The immediate area of the well should preferably
be fenced to keep animals away. The area surrounding the well should be graded off (i.e. should slope away from the well) in order to prevent the flow of storm water into the well.

Organisms causing diseases such as typhoid fever, gastroenteritis will contaminate surface water sources.

The government has provided water containers with taps under *Indira Gandhi Pey Jal Yojna* to people in villages. Still, even the houses having water supply from their own taps have irregular supply of water. Wells have been closed in most villages. Ponds are used for bathing cattle and not fit for human consumptions. Fig. 3.6 shows some of sources of water supply is village.

![Water Tank](image1)
![Handpump](image2)

*Fig. 3.6: Sources of water supply in village - tap at house level, motorised hand pump, village pond and well*

![Village pond](image3)
![Well](image4)

Many villages in India have now piped water systems. These piped water systems are often small and rely on community management, and many use untreated groundwater sources. Small piped water systems are usually fed by gravity, either from protected springs or from surface water above the village, although some may be supplied from boreholes fitted with motorised pumps. Piped systems require regular maintenance. Leakage need to be repaired rapidly to prevent water loss, and to prevent surface water from entering the pipes and contaminating the supply. One way of dealing with these issues is to give someone in the community responsibility for checking communal taps and making repairs. To prevent the accumulation of stagnant water around community taps, which could become mosquito breeding sites, community members could build a concrete platform at the base of the taps and an outlet.

*Water is so called contaminated “When it contains pathogens and said to be called polluted when it contains impurities”.*
### 3.4.3 Waterborne Diseases

Let us learn disease caused by unsafe water. These include cholera, typhoid and bacillary dysentery etc. These are caused by ingestion of water contaminated by human or animal excrement.

- **Water-washed diseases** are caused by poor personal hygiene due to water shortage, e.g., scabies, trachoma, typhus, flea, lice and tick-borne diseases.
- **Water-related diseases** are caused by insect vectors, especially mosquitoes, that breed or feed near water, e.g., dengue fever, filariasis, malaria.

**Chemical contamination** of water is another potential cause of health problems. In some places, water may contain naturally occurring toxic chemicals such as arsenic and fluoride. Other chemicals may get into the water supply because of pollution. Lead poisoning, for example, can result from water contaminated with lead. Examples of chronic health effects of chemical contamination of water are liver / kidney damage. Sample checklist for well water sanitary inspection is given below as Table 3.1. You as MLHP should know about well water to be monitored for safety of community.

#### Table 3.1: Sample checklist for well water sanitary inspection

<table>
<thead>
<tr>
<th>Questions to be asked during survey</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is there a latrine within 15 m of the well and handpump?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Are there any animal excreta or rubbish within 15 m of the handpump?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Does the drainage channel contain stagnant water within 2 m of the handpump?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Is the drainage channel broken allowing a pool of water to form?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Does the wall or fencing around the handpump have any breaks that would allow animals in?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Is the concrete floor less than 1 m wide all around the handpump?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Are there any pools of water on the concrete floor around the handpump?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Does the concrete floor around the handpump have any cracks that could let water in?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Is the handpump loose at the point of attachment to the base which could let water enter the casing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Is the cover of the well unhygienic (unclean)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Are the walls of the well poorly sealed at any point for 3 m below?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name of Interviewer ——————————— Signature ————————
Date ————————
The finding of survey should be discussed with village panchayat for corrective measures.

### 3.3.4 Water Purification Processes

The control of pollution should ideally take place at the point of generation i.e. at source. Water is unlikely to be completely free of contaminants at the original source. The types of water treatment processes depend on the characteristics of the raw water (untreated water direct from its source) and required water quality standards. Suspended solids, bacteria, algae, viruses, fungi, minerals such as iron and manganese, and fertilizers are among the substances that are removed during water treatment. Effective treatment should ensure the removal of all disease-causing agents and so reduce the possibility of the outbreak of waterborne disease.

The options for improving water quality in the home are to treat water, by boiling, filtering, chlorinating or leaving the water to settle.

Boiling is a simple way of killing any ova (eggs), cysts, bacteria and viruses present in contaminated water. Water should be heated until large bubbles are continuously coming to the surface of the water. Boiled water can become re-contaminated once it has cooled.

Solar disinfection (SODIS) relies on energy from the sun to kill bacteria. For this, collect several bottles (0.3 to 2.0 liter) made of clear plastic, remove all labels and wash them thoroughly. Fill the bottles with water of low turbidity and shake for about 20 seconds to aerate the water. Expose the bottles to the sun by placing them on a roof or rack for at least six hours (if sunny) or two days (if cloudy). The water is now ready to drink.

Chlorine solution (bleach) is the most affordable, easiest to produce, and most widely available chemical for household water treatment. Add a capful of chlorine solution to a 25 liter container (bucket). Shake and wait for 30 minutes chlorine contact time before drinking. Double dosing is advisable if the water is visibly dirty. Chlorine tablets, supplied by health department treats 20 liters of clear water. For visibly turbid water, two tablets per 20 liters are needed. It is very important to mix well and leave for 30 minutes contact time before consumption. Whatever type of treatment method is used, it is essential that water is stored safely and hygienically. Even if water has come from an improved source, this will not guarantee that it is safe because contamination can occur in the household due to poor storage and handling practices. The principal health risk associated with household water storage is the ease of recontamination, particularly where the members of a family or community do not follow good hygiene practice. Safe storage is especially designed to eliminate sources of recontamination by keeping objects, including hands, out of the system.

### 3.4.5 Household Purification of Water

Three methods are used for purifying at home.

- **Boiling:** Water must be brought to ‘ROLLING BOIL’ for 5 to 10 min.
  
  Advantages: Cheap and best method.
  
  Along with microorganism, spores, ova, cyst, viruses etc are also destroyed and water get sterilised.
Points to Remember
Boil water in the same container in which it is to be stored to avoid contamination during storage.

• Chemical method: There are various chemical substances which purifies water such as Chlorine, Iodine and Potassium Permagnate.
  Let us discuss important features of these chemical substances: Chlorine is used as gas, powder and solutions as given belows:
  a) Chlorine in gas form used for purification of water on large scale.
  b) Powder form–bleaching powder 2.5 gm per 1000 liter of water
  c) Solution form–prepared from bleaching powder.

Iodine:
This method is used in emergency conditions. Not used as a routine because iodine interferes with thyroid activity. It is high cost also. It is costlier than bleaching powder.

Potassium Permagnate:
It is used for disinfectations of fruits and vegetables. It destroys Vibrio Cholera organism. It alters (change) the colour, smell and taste of water.
Water resource should be protected and there is need to reserve water. Protection of water resource by avoiding wastage of water. Hence, extensive education to be public is required about economical use of water and consumption of minimum requirement for daily use.

Sanitary analysis of water
This means to collect information of water source and its laboratory examination of water sample.

Field Survey - To collect data on the nature and source of water supply, likely source of water pollution, mode of filtration, mode of distribution etc.

Laboratory examination of water - Sample collection for routine. 2 liter sample should be collected in a clean glass bottle (Winchester Overt bottle).

For Bacteriological analysis - Collect 200 cc of water in sterile bottle, sterilised in an autoclave.

For radiological analysis, polythene bottle is preferred.

3.5 PHYSICAL AND CHEMICAL STANDARDS OF DRINKING WATER QUALITY AND TESTS FOR ASSESSING BACTERIOLOGICAL QUALITY OF WATER

You are not expected to carry out microbiological and chemical tests of drinking water. But it will help you if you understand the principles. The source of the
pathogens is usually human faeces; therefore, tests have been devised that detect faecal contamination. This indicates that pathogenic organisms such as E.Coli may be present. The most widely used tests are total coliforms count. These are a group of bacteria found in human and animal faeces and also in soils and some other natural environments.

Water can also be contaminated if water containers are not properly washed. Water could also be contaminated during transportation. Open buckets are very often easy to contaminate and should be replaced by small neck covered containers. Water can also be contaminated at home when it is left open for animals to drink, children to dip their hands in. The safe way is to store it in a narrow necked container that can be covered with a screw cup.

Serving water from a container with a spout and a lid is ideal, but if there is no container with a spout and a lid available, the best alternative is to serve water by pouring it from a pitcher or to serve it with a clean, long-handled dipper and well washed hands. A bowl should never be used to dip water from a container because it can be contaminated very easily. What is most important when serving water is that nothing dirty – such as hands, a bowl, or a cup – comes into contact with the water.

The ideal situation for storing water is to use a container with a lid and a spout. It is important to have a lid that seals tightly on the container in which treated water is stored. Water should never be stored in a container with a lid that is not well sealed.

### 3.5.1 Physical Standards of Drinking Water Quality

Potable water is at a desirable temperature, completely transparent and free from turbidity, tastes, odours and colours, but is not necessarily free from disease-causing agents. Aesthetically also, drinking water should look clear and taste good.

### 3.5.2 Chemical Standards of Drinking Water Quality

Some analytical equipment is portable and can be taken to the site but other tests can only be done in a laboratory. The recommended tools for field use are a portable pH meter with digital readout, a hand-held colorimeter, portable spectrophotometer and residual chlorine test kit. The orthotolidine-arsenite test (OTA) is used to determine the amount of free chlorine residual. When the reagent is added to water containing chlorine, a greenish-yellow colour will appear. The amount of residual chlorine needs to be in the range of 0.2–0.5 mg/l if it is to prevent recontamination with bacteria. The OTA test requires a special test kit available from district health office.

### 3.5.3 Tests for Assessing Bacteriological Quality of Water

Water quality should be monitored on a regular basis. To know whether water is polluted with specific bacterial contaminants, samples should be taken and sent to a laboratory for analysis. E.coli is the standard indicator organism for faecal contamination of water and for the possible presence of faecal pathogens. For water intended for drinking, E.coli must not be detectable in any 100 ml sample.
3.6 CONCEPTS OF WATER CONSERVATION

Rainwater can be used for domestic purposes in areas where there are no alternative sources of safe water such as springs, rivers and lakes. Rainwater harvesting means collecting, or harvesting rainwater as it runs off from hard surfaces such as rooftops and storing it in a tank or cistern. This can alleviate water scarcity.

Most piped water supplies include storage tanks so that water is always available. Such tanks are usually necessary because the rate of water use at peak times of the day is greater than the average rate of use throughout the day. The tanks also provide emergency storage in the event of a breakdown.

3.7 AIR AND NOISE POLLUTION

Air is immediate constituent of physical environment. Without air life existence is not possible. It is not only necessary for breathing purposes, cooling of body, hearing and smelling but it also act as a vehicle of transmission of disease, resulting in even epidemics and pandemics.

In nature, the environment has an inherent capacity to clean itself through self-cleaning processes. Pollutants can come from natural sources of pollution (volcanoes; ash and dust; arsenic) or man-made pollutants (industrial, domestic), transport and agriculture.

3.7.1 Air Pollution

Let us go through the sources of air pollution:

**Sources of Air Pollution**

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Source</td>
<td>Burning of fire wood, Kerosene oil, coal</td>
</tr>
<tr>
<td>Industrial Source</td>
<td>Factories of iron, steel, paper, cement, fertilizers, thermal power plant, petroleum refineries.</td>
</tr>
<tr>
<td>Vehicular Source</td>
<td>Motor vehicles, railways, ships, airplanes</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Tobacco smoking, nuclear explosions, forest fire, burning of refuse, dust storms, ocean sprays.</td>
</tr>
</tbody>
</table>

Hazards or ill effects due to air pollution on health

**Immediate and acute effects**: Irritation of conjunctiva, nose, throat and
respiratory mucous membrane, allergic rhinitis, acute pharygits, bronchitis asthma. It may cause suffocation and death. E.g. **Bhopal Gas Tragedy**.

**Delayed and Chronic Effects:** Chronic bronchitis, bronchiectasis, emphysema, COPD, bronchial asthma, even lung cancer.

**Global Effects:** Acid rain causes acidification of soil and water, Tree gets killed by acid rain causes deforestation, erosion of soil.

**Global warming:** Increase dryness of climate, reduce food production, increased sea level resulting floods, smog formation, increased incidence of skin cancers, depletion of ozone layers.

Crowded living spaces, damp rooms, smoke and dust filled environment, all these give rise to respiratory problems and lead to diseases like TB. Cooking activities inside the house, where family members spend most of their time, generates smoke that is hazardous to health. Mothers, children and elders are the ones who are most exposed to the effects of smoke. The usual type of fuel that is used for cooking and heating in the rural areas is biomass, i.e. animal dung, crop residues and wood. Biomass fuel is inferior to kerosene, because it is not energy-rich when burned. Carbon monoxide and tiny carbon particles are dangerous if inhaled. Indoor air pollution occurs when the air inside is predominantly smoke instead of clean air. This can lead to acute respiratory infections, bronchitis and chronic lung diseases.

You can advise the family to use an efficient *chulha* that minimises fuel consumption and therefore smoke emission (equipped with a chimney). Promoting the separation of the kitchen from the main house. Promoting the separation of animal sheds from the main house (animal dung and urine produce bad odours). Advising mothers to cook without involving children in the kitchen. Recommending that a window be installed and left open until cooking is finished. This is important in rural areas where wood, charcoal and dung are used as fuel. These give off smoke containing harmful chemicals/dust. Where cooking is done indoors, it is essential that smoke and fumes be removed from the house quickly and efficiently. Smokeless *chulahs* should be popularised.

![Fig. 3.8: Village belle kindling the fire in chullah](image)

**Other measures for prevention of air pollutions are:**

- Enforcement of Act: Indian factory Act, Prevention and Control of Air Pollution Act, Smoke Nuisance Act etc.
- General Measure: Traffic control, maintenance of vehicles
- Create ‘Green Belt’ grooming plants and trees
3.7.2 Noise Pollution

Nothing worthwhile is being done in this field. FHW may not have any responsibility in this regard. Yet she can co-ordinate with PRI for appropriate location of any nearby industry at its establishment stage. Also she/he can educate proper to produce less noise.

Check Your Progress 2

1) Explain sources of Air pollution.

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................................................................................................................

2) What are the hazards or ill effects due to air pollution on health?

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3.8 SOLID WASTE, HUMAN EXCRETA, SEWAGE DISPOSAL

Waste is introduced into the environment due to the day-to-day activities of humans. There are many methods and processes of dealing with waste at every stage from generation and collection through to final disposal. Main idea is to isolate waste from humans and the environment. This safeguards our health. In addition, the aesthetic value of a clean physical environment is important for our emotional well-being.

Solid waste is dry in form and is discarded by people as unwanted, e.g., domestic waste. Other varieties include industrial, commercial, institutional or agricultural waste, or street sweepings. The solid waste that is produced as a result of food preparation, or any foodstuff leftover after eating, is called kitchen waste or garbage.

Domestic waste is mostly non-hazardous. It may include rubbish, such as packaging materials, kitchen wastes, ash, etc. Agricultural wastes could include food residues, animal dung, crop residues, grass and leaves (mostly non-hazardous and biodegradable). However, containers for used or obsolete pesticides, herbicides and rodenticides could be a health hazard to families and sprayers. Therefore, these items should be safely removed in collaboration with the agricultural department. Commercial wastes are generated from business establishments, shops or market places. These may include packaging paper, cardboard, electronics, timber, wire, metals, plastic bags (festal), tin cans, garbage and other non-hazardous wastes. Industrial waste may vary depending on the raw material used. These may be hazardous or non-hazardous. It could contain chemicals, wood, metal, ceramic etc. Institutional solid waste is produced from public or government institutions, offices, schools, universities, religious
Introduction to Public Health and Epidemiology

Rural waste is suitable for making compost (a mixture of decomposed organic matter, mostly of plant origin). It can be used to improve soil structure and to return nutrients to the land. The waste can be used to fill in a hole in the ground - Landfill sites. In landfill sites and some community waste disposal sites, the leachate will seep out from the bottom of the waste tip and can pollute surface and groundwater. It may contain toxic chemicals in addition to pathogenic microorganisms. This needs to be disposed of safely.

**Improper disposal of wastes** is one of the major risk factors that affect our health and comfort through environmental pollution, breeding of disease-vector insects, animal scavengers. This may result in a range of diseases through different routes of exposure such as feco-oral and soil transmitted mechanisms (fluids, fingers, fomites and flies by contaminating our food.

To break the transmission route of these disease agents, there needs to be total sanitation. This includes prevention of any human contact with waste, i.e. no open defecation and the proper handling of solid waste. There is a need to protect the food from contamination and to protect the people from contaminated food, fingers, drinking water etc.

### 3.8.1 Solid Waste Management

The common practice for household refuse disposal in rural areas is to dump solid wastes openly in backyard gardens or in an open space. Such indiscriminate disposal is an environmental hazard and can threaten human health and safety. It can create a breeding ground for pathogenic microorganisms and vectors of disease, and cause a public nuisance due to unsightliness and bad smell. It can cause contamination of surrounding soil, groundwater and surface water, and it can also create fire hazards, physical hazards and have poisoning effects (from pesticides and insecticides).

However, these problems can be avoided by using appropriate management techniques. For all waste management issues, FHW should engage community members and families in awareness of the solid waste problems in their area and try to change their behaviour.

The type of waste will determine the choice of possible disposal methods. Waste can also be described as combustible or non-combustible depending on whether it will burn or not. Putrescible wastes are generated by growing, handling, preparation, cooking and consumption of food. These kinds of wastes tend to be more abundant during the summer (rainy) seasons. Non-putrescible wastes do not decompose easily; they may or may not be combustible. Because they do not break down, they persist in the environment and are often the cause of nuisance and aesthetic problems.

Plastic bags are widely used to carry goods from market to home in all areas because they are convenient, cheap and easy to use. Plastic bags are usually non-biodegradable and persist in the environment for a very long time. Moreover, when discarded indiscriminately, they pollute the land surface of your community,
prevent rainwater from percolating into the soil, can easily be blown all over the place by wind, and create unsightly and nuisance conditions. The bags can also be easily swallowed by animals, which may block their digestive system and kill them.

**Main components of waste management**

In any waste management process, there is a stage when waste will be temporarily stored or contained on the place where the waste is produced. If storage is temporary, then subsequent stages will be the transfer or transport to a treatment facility or technology, followed by final disposal offsite away from village.

The most usual method of onsite liquid and human excreta waste containment in rural India is the pit latrine. Pit latrines are simple drop and store systems in which the liquid waste collects in a pit below. In places where water is more easily available, typical methods are pour-flush latrine.

Wastewater from water carriage systems may be piped into a septic tank or into a community treatment system. Onsite handling, storage and processing methods are undertaken at household level. Collection and transfer or transport activities are not common in rural areas because the waste is usually disposed of immediately onsite in a prepared waste disposal or composting pit.

Ideally, waste management should go beyond pollution prevention and disease prevention for humans and should benefit society by providing economic gain for families and communities. The preferred approach for dealing with solid waste is integrated solid waste management (ISWM). This considers not only the appropriate disposal of solid waste but also integrating this with other management options such as minimising waste production, recycling, composting and other waste recovery options. It considers all options and aims to manage waste in ways that are most effective in protecting human health and the environment. ISWM can also have many economic and social benefits for your community. For example, you could consider composting of human waste and animal manure to produce natural fertilizer for gardening and for cultivating vegetables and crops. Some solid wastes can be recycled or reused. You could also consider helping your community in the development of a biomass waste digestion plant that will produce biogas to be used for cooking and lighting energy.

Biomass is any biological material from living or recently living plants that is used to generate energy, usually in the form of biogas.

**Hazardous and non-hazardous waste**

Hazardous wastes are those with a potential to harm human health (corrosive substances that cause damage on contact, e.g. acids; ignitable (materials that can catch fire easily like benzene; toxic materials that can be poisonous to humans when inhaled or ingested, or come in contact with skin or mucous membranes; reactive (substances that can yield a harmful chemical if they react with other substances; infectious (substances that are capable of causing or communicating infection).

Potential sources of hazardous waste in rural households include obsolete pesticides, herbicides or rodenticides. Non-hazardous wastes include all other types of waste.
3.8.2 Human Excreta Disposal and Management (Liquid Waste)

Liquid waste includes human waste, runoff (rainwater that collects on the ground and runs off into channels, ditches and rivers), sullage, industrial wastewater and other forms of wastewater from different sources. Human waste is mainly composed of feces and urine, which together are known as excreta. All human body waste is classed as liquid waste. The mixture of human waste with wastewater is known as sewage. Sullage is water that has been used for washing in bathrooms and kitchens it does not include human waste.

Human waste is biodegradable and when contained in a waste containment facility (for example, a pit latrine or septic tank). It undergoes a biological digestion process by which bacteria decompose the organic matter. This does not require oxygen. This may take days to a few months, before it is completely decomposed or degraded. The digested waste is called sludge. Animal wastes, food waste, paper, and agricultural wastes are also biodegradable. This way these wastes do not accumulate in the environment. Many plastics are not biodegradable and these create environmental problems because they remain unchanged for many years.

Although human waste is a potential source of disease, the amount of human feces disposed of indiscriminately in open fields and under bushes, mostly in rural settings, is a major problem. In rural areas, a large proportion of households do not have pit latrines and although this situation is changing, open defecation continues to be widely practiced. This can spread disease, contaminate the soil and pollute drinking water sources. To avert these risks, everyone should work towards community goals to be ‘open defecation free’. This can be achieved through the building, and consistent use of, onsite communal or household latrines.

Excreta Disposal: Plans for locating sanitation facilities, and for treating and removing waste, must consider cultural issues, particularly as sanitation is usually focused on the household. It may be a difficult subject for a community to discuss: a taboo. People may not like to discuss issues they regard as personal and unclean. In some cases, people may feel that children’s faeces are not harmful. In others, separate facilities may be required for men and women, and it may be necessary to locate the facilities so that no one can be seen entering the toilet. If the disposal facilities smell and are a breeding ground for flies, people may not use them. As of now, open field defecation is still rampant in rural India. Various schemes launched by the government for sanitary latrine construction have not yielded desired success (even in village schools, latrines are not maintained properly).

Latrines have the added advantage of providing privacy when they have walls and a door or curtain. This has become an issue in rural Indian setting where prospective brides are known to reject marriage in a family that lacks a latrine. This has also been portrayed in some TV / radio advertisements.

Excreta can be made safe by burial in the ground. Even a cover or shallow covering of soil over the top of the excreta will prevent flies from walking and feeding off the excreta. Where no other type of excreta disposal system is available, burial is a clean and convenient way of disposal. Care needs to be taken to make sure that all excreta, is disposed of in a latrine or is buried. The possession of an improved latrine, on its own, will not halt the transmission of faeco-orally transmitted diseases among the people of your community. For this to have an impact on
health, the people have to use their latrines and hand washing facilities effectively. Both hands should always be washed using soap or ash after defecation or after going to a latrine. It is important that everyone always washes their hands after defecation and before handling food. However, most people do not wash their hands often enough. Latrines should be located at least 6 meters away from kitchen.

3.8.3 Sewage Disposal and Management

Sullage management

Some people may think they can simply throw used cooking and washing water away but it should not be disposed of indiscriminately because of its negative health effects on families and community members. Proper collection and disposal of sullage is advised. Some of the disadvantages of improper disposal of sullage include the potential to contaminate the soil, pollute water sources and create favourable breeding conditions for disease vectors.

Sullage can be discharged to sewers or septic tanks in areas where they exist. However, in many rural areas there is no sewer system so it is necessary to construct a pit near the household to dispose of sullage properly. The pit should be filled with gravel or sand and the sullage can be allowed to percolate into the ground. A soak pit keeps the wastewater in one place and encourages it to soak quickly into the ground. It also avoids bad odor and unsightliness in the environment.

Septic tanks are used with water carriage sanitation systems. The human waste is washed into the tank, where it is stored and partially treated. It’s a watertight chamber, usually made of concrete, and is mostly under the surface of the ground. They have inlet and outlet pipes. The retention time of the wastewater in septic tanks should be a minimum of 19 hours but can be a great deal longer. The purpose of septic tanks is for the solids to settle out of the wastewater and for anaerobic decomposition of organic solids to take place. However, the treatment in a septic tank is only partial. The solids will be broken down in the tank and diluted in the wastewater but this will still contain high levels of organic pollutants. Septic tanks should only be used in places where water is plentiful and where vacuum trucks are available to remove sludge periodically from the chamber (desludging).

Septic tanks are a storage and treatment unit to complement such facilities as WCs (cistern flush toilets), pour-flush toilets and aqua privies. The effluent from septic tanks is usually piped into a soak pit. It is lined with open-jointed or porous material such as bricks or stone without mortar, which allows the wastewater to seep out slowly into the soil. Alternatively the wastewater may be spread across a drainage field using an array of pipes buried below the surface.

A septic tank has the following advantages:

- can be built and repaired with locally-available materials
- has a long service life
- presents no problem of flies and odour, if properly used
- has a relatively low capital cost (though it may not be affordable by rural households), and moderate operating costs
- does not require electrical energy because it uses gravity flow.
However, the constraints of a septic tank include the following:

- only applicable for water carriage sanitation systems
- treatment is only partial and the effluent may still contain pathogens
- sludge must be removed periodically.

An anaerobic biogas reactor, also known as an anaerobic digester, uses anaerobic digestion to convert liquid wastes and other organic matter into sludge and biogas. The sludge can be used as a soil fertilizer and the biogas can be used for energy to produce heat (for use in cooking) or electricity. This affordable technology can easily be adapted by rural families and communities if appropriate training is given to local artisans and masons in the design and construction of the reactor.

**Pit latrines**

In general, pit latrines with a slab are effective sanitation systems because they isolate human excreta from the surrounding environment and prevent the transmission of faeco-orally transmitted diseases. They also have other advantages:

- They do not require water so are appropriate in areas where there is no adequate water supply.
- Squatting is normal to many people and thus is acceptable to users.
- Alternating double pits will allow the excreta to drain, degrade and transform into a nutrient-rich, safe humic material that can be used to improve soils.
- They avoid contamination of surface water and top soil if properly installed and maintained.
- They can be constructed with minimum cost using local material and local skills.
- The presence of properly constructed slabs will allow easy cleaning and avoid flies and unsightliness.

However, pit latrines are not without limitations. There may be a foul odour from the pit and they can be a favourable place for the breeding of flies and mosquitoes. With single pits, a new pit needs to be dug every time one gets full. They can be susceptible to failure/overflowing during floods. Other disadvantages can be overcome by proper design, construction and usage. For example, if the superstructure is not properly constructed, it may discourage use of the latrine by family members. Children may be discouraged from using the latrine if the slab is not designed with them in mind and is too big for them. Use of excess water or less compostable materials for anal cleansing should be avoided because it may affect the decomposition rate of human excreta.

Pit latrines must be properly maintained to function properly. You should advise families to keep the squatting or standing surface clean and dry. This will help to prevent pathogen/disease transmission and limit odours. If the pit has been dug to an appropriate size for the number of users, then it may never become full. The liquid will drain into the soil and the solid waste will slowly decompose so the volume remains stable. Villages in India do not have sewerage system since it is a costly proposition.

**Hazardous waste: Health effects and management**

Health effect of hazardous waste range from bad smells and simple irritation of eyes, skin, throat and breathing (lungs), to serious health conditions that affect
the nervous system and could cause paralysis of the functional body parts, birth defects and cancer. Not all stages of solid waste management are relevant in rural areas. Onsite handling is the very first step in waste management. It involves individual family members, households and communities, all of whom need to know how to handle waste properly at this level. Benefits of appropriate onsite handling include reducing the volume of waste for final disposal and recovering usable materials.

It is important that waste is stored in proper containers, e.g., baskets, plastic buckets or metal containers, dustbins that are leak proof, have tight lids and be long-lasting. In rural areas, waste is not normally collected house to house. Disposal is limited to onsite processing. Even after recycling and resource recovery there will almost certainly be some residual waste that needs final disposal. Methods of disposal can be sanitary or unsanitary. Open field dumping is the most unsanitary method of refuse disposal and is most likely to cause a health hazard. Sanitary methods include controlled tipping or controlled burial, incineration and sanitary land fill.

**Final disposal: Landfill, controlled tipping and burning**

This means the controlled filling of compacted layers of solid waste and soil into pre-prepared land. Large-scale landfill sites for municipal waste need to be designed to protect surface and ground water from contamination by leachate, the liquid waste that may seep out into the ground underneath the layers of waste. Sanitary landfill sites are not just rubbish dumps for open field dumping. The site must be managed to minimise any negative environmental impact. Controlled tipping or controlled burial is similar in principle to sanitary landfill but at a smaller scale that is appropriate in rural areas. Here, solid waste is disposed of into a dug pit and is regularly covered with soil to avoid attracting disease vectors such as flies and rodents. Sites for controlled tipping should be 10 m away from the house (preferably at the back of the house), atleast 15 m and preferably 30–50 m away from water wells and at a lower ground level. The site should be easily accessible, with adequate space, and should be fenced so that it is not accessible to children and domestic animals.

**Latrine Utilisation : Changing Attitudes and Behaviour**

There is poor utilisation of latrines among individuals and families in India. Involving model families to share their experiences and participate in regular inspections will help households to properly use their latrines, to seek technical advice when they need it and to solve any problems they encounter. The purpose of this study session is to teach you about approaches that are currently being used to achieve behavioural changes of people towards good practice of hygiene and sanitation. Promotion of hygiene and proper sanitation is the single most important way to improve the health of your community. However, the right approaches need to be used to change behaviour and get people to take better care of themselves, their family’s health and their environment.

For example, elderly or uneducated people in rural areas may find it difficult to get used to new technologies and may resist the adoption of new behaviours. In some local cultures, people may not want to share latrines with others; for example, women may not want to share the same facility as their father-in-law and there are some cultural practices that inhibit the use of one latrine by both the husband and wife. Household members may be discouraged from using the latrine at night.
because of the fear that ‘evil’ or ‘devils’ inhabit the latrine during that time. There are other more practical reasons such as the use of inappropriate materials for latrine construction, the collapse of latrines due to termites, flooding problems or loose soil conditions, and the need for frequent maintenance.

**Motivating people to change their behaviour**

Community mobilization and household visits are essential for TOTAL BEHAVIOUR CHANGE. The Regional Behaviour Change Strategy identifies the critical role of COMMUNITY MOBILISATION AND HOME VISITS in achieving the ambitious goals of hygiene and Sanitation Improvement. Health education is frequently delivered by someone lecturing about hygiene and sanitation in health facilities and community gatherings. However, such an approach is not recommended as the sole means to achieve individual behavior change. Because human behaviour is influenced by the surrounding environment and social context, specific messages instead of universal messages of hygiene and sanitation are more important. Hygiene messages must be contextually and culturally suitable, and comfortable, for your community.

If you are trying to change behaviour by targeting individuals, you need to consider not only their prior experience but also their learned behaviours. These are the habits gained by social learning channels, i.e. from parents, friends and opinion leaders in their community. Each individual has their own beliefs, values and knowledge about health practices. People may ask themselves, before adopting a new behaviour, if the new practices are going to fit with their ideas and way of life. They need to be convinced that there will be important benefits from changing their behaviour.

**Healthcare Waste Management**

Improper handling and disposal of healthcare wastes puts the health worker, the patient and the community at large at risk through transmission of pathogens via blood or body fluids, contaminated medical equipment, or sharp instruments. Recognising the health risks involved in poor healthcare waste management and practicing proper medical waste disposal will help protect everyone from the hazards of healthcare waste.

Between 75% and 90% of the waste produced in healthcare establishments is general waste. This includes papers, packaging materials, dust and the like. This can be disposed of in the same way as other non-hazardous wastes, but only if is not contaminated by contact with hazardous wastes. The remaining 10–25% of waste is hazardous and could be composed of sharps (needles, lancets, etc.), syringes, blood or body fluid, contaminated surgical instruments, delivery bowls, used gauzes and gloves, plasters, etc. It may also contain expired drugs, lab reagents and other chemicals.

There is a need to take precautions to avoid environmental damage by such waste. Usually, in rural areas there is little or no segregation of non-hazardous and hazardous waste, it is inevitable that the general waste component will become contaminated and must then be regarded as hazardous. Everyone in the community is potentially at risk from exposure to health care waste, including people within the health care establishment and those who may be exposed to it as a result of poor management of the waste. The details of Biomedical waste or health care waste is given seperatly.
3.9 COMMONLY USED INSECTICIDES AND PESTICIDES

Pesticides include insecticides, herbicides and fungicides. There are several thousand different types in use and almost all of them are possible causes of water pollution. For example, DDT, malathion, parathion, deltametrine and others have been sprayed in the environment for long periods of time for the control of disease vectors such as mosquitoes, and to control the growth of weeds and other pests. The extensive use of fertilizers and pesticides in agricultural regions means that both surface and groundwater are affected by these pollutants. The pollution by chemicals such as pesticides may have long-term consequences, such as groundwater pollution.

Presence of pesticides in cold drinks/soft drinks and drinking water (whether packaging or municipal drinking water) has been found in India also. Most of the water supplies in India are found contaminated due to the pesticide discharge. In case of bottled water, pesticide residues were found in 5 top brands and other less popular brands. According to a study conducted in India by ICMR, 85% of milk samples found to have pesticides level above the acceptable limits. The most common pesticides found were organochlorines and organophosphorus. Among the organochlorines, HCH and DDT were frequently detected and among organophosphorus, Endosulfan. Malathion and Chlorpyrifos pesticides were also most frequently detected.

The indiscriminate use of pesticides and unchecked effluent flow from industries into the rivers and drains contaminates underground water. When a pesticide is applied to a target pest either plant or animal, the whole site is affected which includes crop plants, soil organisms, wildlife and potentially humans and children in the immediate area. In addition, part of it evaporates into the air or drain into surface waters due to emission or drift. From the air it may deposit on humans, wildlife, plants or on the soil. It can also enter into groundwater through leaching. Pesticides in surface water may go into aquatic organisms, and by sedimentation into other organisms that remain in the sediment.

Once the pesticide is released in the environment, they have different distribution and persistence patterns in air, water and soil. The persistence of the pesticide depends on its physical and chemical properties and the characteristics of the soil, air and water. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their place of application. For example, many pesticides which are used in homes have been found in house dust for many days to weeks after the application. Climatic characteristics also play a role in persistence. Studies in the Arctic have shown that insecticides and herbicides persist 3 to 8 times longer in cold climates than in temperate zones.

The most persistent pesticides are termed “persistent organic pollutants” (POPs) and may represent long-term dangers. They have a capacity to bio-magnify up the food-chain. Humans, and particularly breastfed babies, are at the top of the food-chain. In India due to more use of persistent pesticide, their residues remain in food products. The examples of pesticides which are considered as most persistent organic pollutants (POPs) are organochlorine pesticides, namely, aldrin, endrin, clordane, DDT, heptachlor, mirex, toxaphene and hexachlorobenzene. There are various processes through which the pesticides when sprayed on the
target pests also enters into other media of environment which includes air, water and soil.

**Food residue**

As per Ministry of Agriculture, in India, pesticides mainly enter into food products due to following reasons:

- Indiscriminate use of chemical pesticides
- Non-observance of prescribed waiting periods
- Use of sub-standard pesticides
- Wrong advice and supply of pesticides to the farmers by pesticide dealers
- Continuance of DDT and other uses of pesticides in Public Health Programmes
- Effluents from pesticides manufacturing units
- Wrong disposal of left over pesticides and cleaning of plant protection equipments
- Pre-marketing pesticides
- Treatment of fruits and vegetables

**Effect on non-target organisms by both pesticides and pesticide residues.**

“It is not my contention that chemicals never be used. I do contend that we have put poisonous and biologically potent chemicals in the hands of persons largely or wholly ignorant of their potential harm.” (Rachel Carson, Silent Spring, 1964)

Accidental oral exposure occurs most frequently when pesticides have been taken from the original labelled container and put into an unlabelled bottle or food container. Unfortunately, children are the most common victims. For example, children under age 10 are the victims of accidental pesticide deaths. Breast milk may be contaminated and represents the very top of the food-chain: Residues of organochlorine pesticides and POPs have been detected in breast milk (including DDT, HCB and HCH isomers) in contaminated areas. Pesticide powders, dusts, gases, vapours and especially very small spray droplets can be inhaled during mixing, loading or application or when pesticides are applied in confined areas. Once breathed into the lungs, pesticides can enter the bloodstream rapidly and damage can damage nose, throat and lung tissue.

Pesticides can cross the epithelium of the skin and mucous membranes that exchange gases (alveoli) or nutrients (gastrointestinal mucosa).

Pesticides have been detected in the amniotic fluid and body tissues of human foetuses even during early stages of prenatal life.

**Effects on human health and children: The signs and symptoms of pesticide poisoning**

- dermal and ocular irritation (or allergic response)
- upper and lower respiratory tract irritation
- allergic responses and asthma
- gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
• neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polyneuritis

Remedial measures
Many strategies can be adopted to mitigate the hazards due to pesticides. The most important is Personal protective equipment (PPE) because it can prevent 90% of the pesticides related injuries.

Personal Protective Equipment (PPE)
Personal protective equipment (PPE) is clothing and devices that are worn to protect the human body from contact with pesticides or pesticide residues. Personal protective equipment includes such items as coveralls or protective suits, footwear, gloves, aprons, respirators, eye-wear and head gear. According to a study, 90% of the pesticides injuries can be prevented by the use of PPE. This protective equipment are made up of woven fabric or a water repellent material, for example, Neoprene, nitrile, polyvinyl chloride (PVC) and butyl rubber. Besides clothing, other devices like face shields, goggles, boots are also required for the protection. For the proper maintenance of pesticides contaminated clothing, it should store and wash separately from the family laundry. Discard clothing that has become saturated with a concentrate. Washing in hot water removes more pesticide from the clothing than washing in cooler water.

Pesticides regulations in India
Many efforts have been done by the Government of India to tackle the problem of adverse health effects of pesticide use. Pesticides regulations are governed in India under various Acts/Rules. The monitoring of pesticides residue levels in food comes under the purview of Union Ministry of Health and Family Welfare. Ministry of Agriculture is taking some steps to minimise pesticides residues. These are -

• Educating farmers about ill effects of pesticides, need-based use of chemical pesticides
• Use of recommended dosage
• Correct application techniques
• Observance of prescribed waiting period
• Practices of Integrated Pest Management (IPM)
• Benefits of organic farming

Action taken to prevent pesticide exposure for health and environment welfare
Many steps can be taken at the local/practice level, national/government level and international treaty/trade levels to decrease exposure to pesticides and related illnesses.

Prevention at Local level
• Pesticides should be used only when the non-chemical pest control procedures have failed.
• Integrated pest management (IPM) procedures which include hygiene, sealing of cracks and crevices, screening of doors and windows and other measures should be the first line of defence for pest management.
• Users should always follow the safety precautions specified by the manufacturer and should also wear Personal protective equipment (PPE).

• Pregnant women should not apply pesticides and it should be kept away from the infants and small children.

• If chemicals are required, the least hazardous chemical (when there is scientific evidence of less toxicity) should be used.

Prevention at Community Level

• Many organisations like Food and Agriculture Organisation (FAO) and World Health Organization (WHO), promote alternative non-chemical forms of pest-control and there is increasing engagement in non-pesticide dependent agriculture and integrated pest management (IPM).

• A variety of local initiatives involving the community can help to create an environment that promotes decreased dependence on pesticides in homes, schools, public areas, health facilities and parks.

• Other examples of community activities include:
  i) community campaigns and school activities
  ii) local awards or contests
  iii) pesticide-free “zones”

• Education is a key component of safe pesticide use and prevention of toxic exposures. Farmer, pesticide applicators and their families need to be informed and educated on how to recognise and prevent pesticide poisonings. Trained or licensed pesticide applicators can maximise preventive measures.

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Check Your Progress 3

i) List the Signs and Symptoms of pesticide poisoning.

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................................................................................................................

ii) Write advantages and disadvantages of pit latrines.

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3.10 LET US SUM UP

The Centrally Sponsored Rural Sanitation Programme (CRSP) was launched in 1986 in India with the overall objective of improving the quality of life of the rural people and to provide privacy and dignity to the women. Total Sanitation Campaign (TSC) was introduced in 2002. It was people centered and community led programme. It involved construction of sanitary latrines for households below poverty line, construction of village sanitary complexes for women, setting up of sanitary marts and intensive campaign for creating awareness and health education. However, despite these programmmes the scenario of sanitation system in Indian villages is quite dismal.
Low-cost sanitation facilities and hygiene promotion campaigns have never been prestigious; politicians and movie stars don’t demonstrate latrines. Among professionals, the best and the brightest avoid low-cost sanitation as a low-status, low-paying career, particularly as it is more difficult and demanding than the high-status, high-tech engineering or medical fields. Among consumers, low cost sanitation has no prestige in comparison with “conventional” water borne sanitation that the industrialised world and the economic elite of developing countries use. Still due the importance involved FHW should actively participate in TSC and Swachhhta Abhiyaan.

3.11 MODEL ANSWERS

Check Your Progress 1

1) These include cholera, typhoid and bacillary dysentery etc. These are caused by ingestion of water contaminated by human or animal excrement.
   - **Water-washed diseases** are caused by poor personal hygiene due to water shortage, e.g., scabies, trachoma, typhus, flea, lice and tick-borne diseases.
   - **Water-related diseases** are caused by insect vectors, especially mosquitoes, that breed or feed near water, e.g., dengue fever, filariasis, malaria.
   - **Chemical contamination** of water is another potential cause of health problems. In some places, water may contain naturally occurring toxic chemicals such as arsenic and fluoride. Other chemicals may get into the water supply because of pollution. Lead poisoning, for example, can result from water contaminated with lead. Examples of chronic health effects of chemical contamination of water are liver / kidney damage.

2) Three methods are used for purifying at home
   - Boiling: Water must be brought to ‘ROLLING BOIL’ for 5 to 10 min.
     - Advantages: Cheap and best method.
     - Along with microorganism, spores, ova, cyst, viruses etc are also destroyed.
     - Water get sterilised.

Check Your Progress 2

1)

<table>
<thead>
<tr>
<th>Source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Source</td>
<td>Burning of fire wood, Kerosene oil, coal</td>
</tr>
<tr>
<td>Industrial Source</td>
<td>Factories of iron, steel, paper, cement, fertilizers, thermal power plant, petroleum refineries.</td>
</tr>
<tr>
<td>Vehicular Source</td>
<td>Motor vehicles, railways, ships, airplanes</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Tobacco smoking, nuclear explosions, forest fire, burning of refuse, dust storms, ocean sprays.</td>
</tr>
</tbody>
</table>

2) Ill effects of air pollution
   - **Immediate and acute effects**: Irritation of conjunctiva, nose, throat and respiratory mucous membrane, allergic rhinitis, acute pharygits,
bronchitis asthma. It may cause suffocation and death. E.g. Bhopal Gas Tragedy.

- **Delayed and Chronic Effects**: Chronic bronchitis, bronchiectasis, emphysema, COPD, bronchial asthma, even lung cancer.

- **Global Effects**: Acid rain causes acidification of soli and water, Tree gets killed by acid rain causes deforestation, erosion of soil.

**Check Your Progress 3**

1) **The signs and symptoms of pesticide poisoning**
   - dermal and ocular irritation (or allergic response)
   - upper and lower respiratory tract irritation
   - allergic responses and asthma
   - gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
   - neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polynuritis

2) **Advantages and disadvantages of pit latrines**

   In general, pit latrines with a slab are effective sanitation systems because they isolate human excreta from the surrounding environment and prevent the transmission of faeco-orally transmitted diseases. They also have other advantages:
   - They do not require water so are appropriate in areas where there is no adequate water supply.
   - Squatting is normal to many people and thus is acceptable to users.
   - Alternating double pits will allow the excreta to drain, degrade and transform into a nutrient-rich, safe humic material that can be used to improve soils.
   - They avoid contamination of surface water and top soil if properly installed and maintained.
   - They can be constructed with minimum cost using local material and local skills.
   - The presence of properly constructed slabs will allow easy cleaning and avoid flies and unsightliness.

**3.12 REFERENCES**

1) NRHM: Handbook for members of Village Health Sanitation and Nutrition Committee.


4) Training Manual on Hygiene and Sanitation Promotion and Community Mobilization for Volunteer Community Health Promoters (VCHP).
TOTAL BEHAVIOUR CHANGE IN HYGIENE & SANITATION VCHP GUIDE.

