Introduction to Noise Pollution

Meaning of Noise:-

- **Noise is defined as unwanted sound.**
- **It is part of our environment.**
- **Noise is a normal phenomenon of life**

Introduction to Noise Pollution

Meaning of Noise:-

- **and is one of the most effective alarming systems**
- **in man's physical environment.**
- **It is a subjective experience.**

L-37 Introduction to Noise Pollution

- **It has short decay period.**

- **The word ‘noise’ is derived from the latin word’ nausea’ which means**

- **a feeling sickness at the stomach with**
- **an urge to vomit.**

L-37 Introduction to Noise Pollution

Noise can also be defined as –

“Noise is any sound independent of loudness which can produce

- **an undesired physiological or**
- **psychological effect in an individual.”**

L-37 Introduction to Noise Pollution

Noise of sufficient intensity and duration can induce

- **temporary or permanent hearing loss.**

- **Noise is a significant environmental pollutant and potential hazard.**

- **Noise is nothing but unwanted sound.**

L-37 Introduction to Noise Pollution

- **Sound consists of wave motion in**

- **an elastic medium and caused by**
- **the vibrations of molecules.**

- **Sound is periodical disturbance in matter.**
- **Noise radiates from vibrating surfaces.**

L-37 Introduction to Noise Pollution

- **Noise also grows rapidly,**
- **with an increase in machine power and with**
- **increase in the speed of exhaust gases.**

- **Nature of sound waves depends upon the following factors:**

L-37 Introduction to Noise Pollution

- **Pitch:-**
- **“The attribute of auditory sensation which sounds” may be**
- **ordered on a scale extending from low to high.**

- **It is related to frequency from**
- **about 20 to 20,000 vibrations per second.**

L-37 Introduction to Noise Pollution

- **Amplitude or Magnitude:-**
- **The distance that a vibrating object i.e.,**
- **musical instrument string moves as**
- **it vibrates is called**

- **the amplitude of vibrations.**
- **Sound waves have different amounts of energy.**

L-37 Introduction to Noise Pollution

- **The greater the energy used in producing the sound greater the amplitude**
- **Bigger object will produce a sound of greater intensity and loudness than**
- **a smaller vibrating object.**

L-37 Introduction to Noise Pollution

Loudness:-

- **Loudness may be described as a listener's auditory impression.**
- **Loudness is the intensity of sound waves**
- **combined with the reception characteristics of the ear.**

L-37 Introduction to Noise Pollution

Loudness:-

- **Annoyance results from both the loudness and the frequency of a noise.**
  - **Loudness is expressed in a**
  - **relative unit called SONE.**
  - **One sone equals to**
  - **40 dB sound pressure**
  - **at 100 cycles/sec.**

L-37 Introduction to Noise Pollution

- **1 SONE = 40 dB.**
- **Generally 35 dB with**
- **loudness 10 – 50 Sones,**
- **depending on the frequency may be regarded as**
- **the critical level for ear damage.**

L-37 Introduction to Noise Pollution

- **Modern life has given rise to a new form of pollution i.e.,**
- **Noise pollution**

- **when noise becomes harmful to health and**
- **diminishes the quality of life.**

L-37 Introduction to Noise Pollution

- **On the basis of Nature, noise pollution can be classified in the following types-**

(a) Natural **(b) Biological**

(c) Artificial

L-37 Introduction to Noise Pollution

- **Natural noise pollution arises from Natural sources such as**
- **cloud thunder,**
- **high intensity rainfall,**
- **hailstorms,**
- **waterfalls etc.**
- **it may be widespread, sporadic, frequent or rare.**

L-37 Introduction to Noise Pollution

- **Biological noise pollution can be due to sounds of of wild and tame animals such as**
- **roars of lions in circus cages,**
- **street dogs are perpetual sources of noise pollution.**

L-37 Introduction to Noise Pollution

- **Man also creates different types of sounds and noise such as during**

- **laughing,**
- **crying,**
- **singing,**
- **weeping etc.**

L-37 Introduction to Noise Pollution

- **Whereas artificial or man – made noise pollution is due to**
- **high intensity sound created by human activities such as**
- **Industrialization,**
- **aircraft etc.**

L-37 Introduction to Noise Pollution

- **With progress in industrial growth, noise pollution is continuously increasing.**
- **Noise pollution cannot be carried far away and spread from**
- **its source area like other pollutants.**

L-37 Introduction to Noise Pollution

Measurement of Noise:-

- **The sound becomes louder as the pressure increases and at about**
- **20 N/m^2 the sound felt which is called threshold or beginning of feeling.**
- **This is not simple and can not be easily described.**

L-37 Introduction to Noise Pollution

- **The universal measure of loudness is called ‘Bel’ but it is too large.**
- **In practice decibel (dB) is used which is equal to 1/10th of Bel.**
- **Decibel is not an absolute physical unit but**

L-37 Introduction to Noise Pollution

- **Decibel is not an absolute physical unit but**
- **it is a ratio expressed as a logarithmic scale relatively to a reference sound pressure level.**
- **1 Decibel (dB) = 10 $\log^{10}$**

L-37 Introduction to Noise Pollution

1 Decibel (dB) =

$10 \log^{10}$ $\dfrac{\text{Intensity measured (I)}}{\text{Reference intensity}}$

- **Noise can be m**
- **(1) Intensity**
- **(2) Pressure**
- **(3) Decibel**

L-37 Introduction to Noise Pollution

Intensity (Wm^{-2})	*Pressure (Nm^{-2})*	*dB*	*Sound source*
100	200.000	200	Saturn rocket take Off
1.0	20	120	Boiler shop
10^{-2}	2.0	100	Siren at 5 mts
10^{-4}	0.2	80	Heavy machinery Workshop
10^{-6}	0.02	60	Normal conversion at 1 m
10^{-8}	.002	90	Public library
10^{-12}	$2 \times 10\text{-}5$	0	Threshold of hearing

L-37 Introduction to Noise Pollution

- **Decibel (dB) is also a measure of sound pressure level (SPL), it is defined as:**
- **dB = log** $\frac{P^2}{P_o^2}$
- **Where P is root – mean – square sound pressure in pascals (N/m^2) and**
- **P_o is reference r – m – s sound pressure (2×10^{-5} Pa).**

L-37 Introduction to Noise Pollution

- **For all the standard atmospheric conditions sound intensity level and sound pressure level are equal in magnitude to each other.**

- **The dB-scale begins from zero, which represents the faintest sound that is audible to a normal ear.**

L-37 Introduction to Noise Pollution

- **In the decibel-scale, each ten fold increase is represented 10 dB. e.g.**

- **Faintest sound is 0 dB**

or $10 \times 0 = 0$

$$\because \quad \mathrm{dB} = 10 \log\left(\frac{I}{I_0}\right)$$

L-37 Introduction to Noise Pollution

- Ten times more intense sound is 10 dB.
- $$\because \quad dB = 10 \log\left(100 \times \frac{I}{I_0}\right) = 10 \times 1 = 10.$$

$$\therefore \quad dB = 10 \log_{10} \left(100 \times \frac{I}{I_o}\right) = 10 \times 2 = 20 \text{ and so on.}$$

L-37 Introduction to Noise Pollution

- **Zero decibels is the threshold of hearing, while**
- **85 dB is usually considered loud enough to cause ear damage.**
- **The pain threshold is about 140 dB.**

L-38 Sources & Effects of Noise…

Sources of Noise:-

The main sources of noise are different means of transport such as

- **motorized vehicles,**
- **aeroplanes,**
- **railroads etc.**

The diverse noise arising from the environment by

- **factories,**
- **Loudspeakers…..**

L-38 Sources & Effects of Noise…

Sources of Noise:-

The noise arising by the

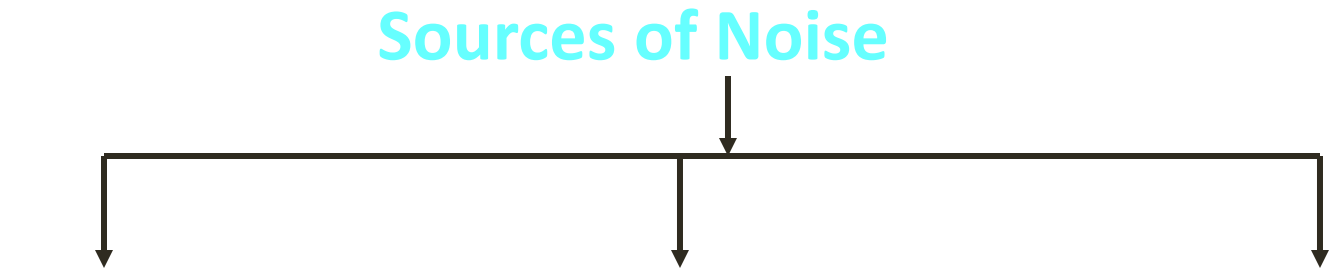
- factories,
- loudspeakers,
- places of entertainments,
- restaurants,
- radios, record players,
- television sets,
- household equipments and appliances etc

L-38 Sources & Effects of Noise…

Sources of noise are also classified on the basis of the area such as-

- Rural sources of noise pollution.
- Urban sources of noise pollution.
- Industrial sources of noise pollution.

L-38 Sources & Effects of Noise…



(Festivals,, Marriages Elections, Quarrels)

(Automobiles, Rocket Shooting, Festivals, Cultural programme)

(Factories, Mills)

L-38 Sources & Effects of Noise…

- Rural source generates least noise pollution.
- There are certain occasions when the noise crosses
- normal permissible level (25 to 35 dB.).

L-38 Sources & Effects of Noise…

Urban noise pollution produced from

- automobiles,
- rocket,
- religious activities,
- musical night etc.

- Loud speakers are the most significant noise pollutants.

L-38 Sources & Effects of Noise…

- Industrial noise pollution includes noise produced from

- factories,
- defense establishment,
- mining operations etc.

L-38 Sources & Effects of Noise…

- World Health Organization (WHO) has fixed
- 45 dB as the safe noise level for a city,
- Mumbai, New Delhi, Kolkata and Chennai usually register

L-38 Sources & Effects of Noise…

- the street noise level above, 95 dB.

- Near airports it is between
- 80 to 85 dB.

- With increase of 20 to 25 dB during take off and landing.

L-38 Sources & Effects of Noise…

- Near rail tracks the noise of 90 dB at a distance of 10 metres.
- Noise level in public hospitals ranges from 50 to 75 dB
- against the permissible level of 35-40 dB.
- During Diwali noise levels go up.

L-38 Sources & Effects of Noise…

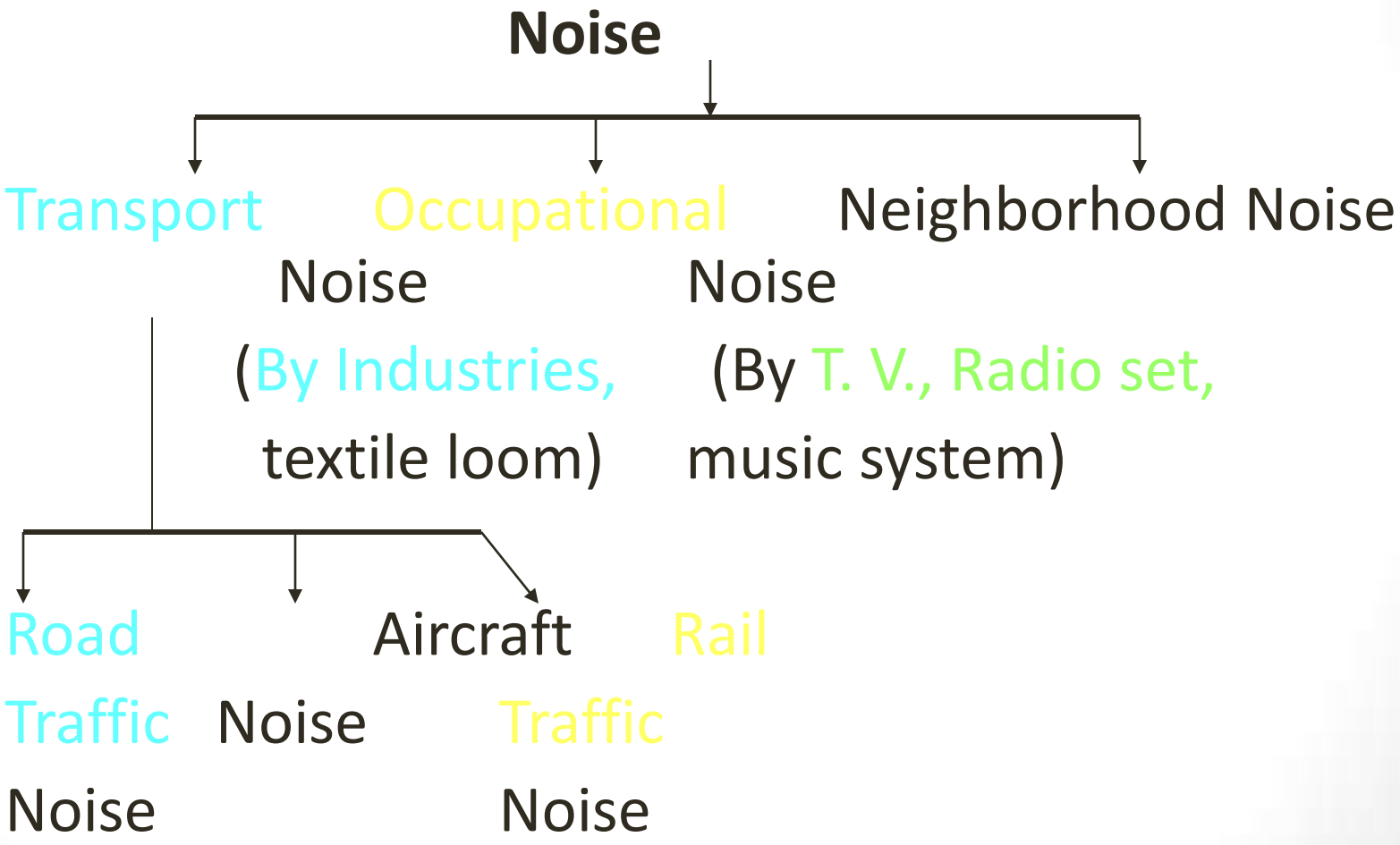
- During Diwali noise levels go up.
- from the normal 50 dB during evening hours to 0 – 100 dB.

loudspeakers produce

- 55-75 dB noise in the morning,
- 70-90 dB in the afternoon and
- 80-95 in the evening.

L-38 Sources & Effects of Noise…

Noise Classification:-



L-38 Sources & Effects of Noise…

1. Transport Noise:- This is again classified into the following types:

a) Road Traffic Noise

b) Aircraft Noise:-

c) Rail Traffic Noise:-

L-38 Sources & Effects of Noise…

(Transport Noise)

a) Road Traffic Noise:-

- Different vehicles on road produces irritating noise,
- increasing continuously with the increase in number of road vehicles,
- due to increase in traffic density and speed of vehicles.

L-38 Sources & Effects of Noise…

b) Aircraft Noise:-

- This type of noise is not continuous but intermittent.
- There are peak noise levels when aircrafts take off and land.
- The peak frequency varies with..

L-38 Sources & Effects of Noise…

b) Aircraft Noise:-

- The peak frequency varies with
- the number and type of aircraft operational height.

The big noise – makers are the

- supersonic aircrafts- noise level is
- about 120 dB to 150 dB.

L-38 Sources & Effects of Noise…

- **Aircraft noise is now a sensitive issue in developed countries.**
- **Laws have been introduced by the Government and local authorities.**

L-38 Sources & Effects of Noise…

c) Rail Traffic Noise:-

- Rail traffic noise is generally of lower frequency
- than that of street vehicles.
- Most of the railway tracks run through rural areas.

L-38 Sources & Effects of Noise…

(Rail Traffic Noise)

- Buildings beside the railway tracks are
- exposed to this noise menace.

- The introduction of diesel and all – electric locomotives

- has greatly reduced rail traffic noise.

L-38 Sources & Effects of Noise…

2. Occupational Noise:-

- This is mainly produced by industrial machines,
- domestic gadgets such as washing machine etc.

- Noisy industrial processes cause hearing loss to the workers.
- Noise reduction is essential especially for the workers.

L-38 Sources & Effects of Noise…

Occupational Noise

Industrial Source	*Noise Level dB.*
Textile loom	112
Farm tractor	103
News paper press	101
High speed drill	85
Super market	60

L-38 Sources & Effects of Noise…

3. Neighbourhood Noise:-

- This includes a variety of noise which disturbs
- and annoy the public, interfere with
- their comfort, and welfare.

L-38 Sources & Effects of Noise…

(Neighbourhood Noise)

- Loud TV, radio,
- cassette player,
- loudspeakers,
- disco music and dance etc.,

cause noise nuisance to nearby residents.

L-38 Sources & Effects of Noise…

Neighbourhood Noise:-

Source	*Noise Level dB.*
1. Door slamming	70-90
2. Domestic generator	80-85
3. Radio/Tape	76
4. Television	65-67
5. Pressure cooker	65
6. Air conditioner	61.

L-38 Sources & Effects of Noise…

- **Noise is harmful and has**
- **physical or physiological effects on human beings.**

- **Harmful effects of noise pollution may be classified into two ways-**

- **auditory effect and**
- **non – auditory effects.**

L-38 Sources & Effects of Noise…

- The most acute effect of noise pollution is impairing of hearing
- leading to auditory fatigue or deafness.

Non – auditory effects may also cause

- interference with
- speech communications,

L-38 Sources & Effects of Noise…

Non – auditory effects also cause

- **interference with**
- **speech communications,**

- **annoyance leading to ill temper.**
- **Violent behaviour,**

- **loss of working efficiency etc.**

L-38 Sources & Effects of Noise…

- Noise is air-borne mechanical energy striking the human eardrum.

- Ear damage is brought about by
- continuous periods of

- high intensity noise level

L-38 Sources & Effects of Noise…

- exceeding 90 dB
- for a few minutes.

Noise pollution can also cause

- pathological or psychological **disorders.**

L-38 Sources & Effects of Noise…

- High frequencies of ultra sonic sound can affect internal ear whereas
- very low frequency noise can reduce heart beat,
- change in blood pressure and lead to
- breathing difficulties.

L-38 Sources & Effects of Noise…

- Mid-audible frequencies can affect the
- brain and nervous system,

- severe vibration results in
- damage to bones and joints.

- It is difficult to assess non-pathological or psychological noise effects on man.

L-38 Sources & Effects of Noise…

Sound Intensity	*Effect*
0 – 23	No disturbance
30 – 60	Stress, tension, psychological (illness, heart attack) effects.
60 – 90	Health damage, Psychological, vegetative and gastro intestinal disorders, muscle pain, high B.P. disturbed sleep.
90 – 120	Damages to health. Psychological, vegetative and (ear disease)
140 – 150	Feel burning.
150 – above	Painful effects on long run.

L-38 Sources & Effects of Noise…

Different frequencies of noise

results in

- **lower efficiency,**
- **reduced work rate and a**
- **higher potential for accidents.**

In residential areas noise..

L-38 Sources & Effects of Noise…

In residential areas noise

- affects sleep.
- By this body strain, weakness etc. happen.

Excessive noise show

- disorderness in children also.

L-38 Sources & Effects of Noise…

This is the major factor for

- chronic exhaustion and
- consequent tension.

- Migratory birds also show impact of noise pollution

L-38 Sources & Effects of Noise…

- Different evidence show that

- noise pollution not only affect the biotic environment but also
- affect non-biotic environment.

- Some of the important effects of noise pollution are given below:

L-38 Sources & Effects of Noise…

1. **Noise pollution affects**
   - human health,
   - comfort and
   - efficiency.

2. **It causes**
   - high blood pressure,
   - contraction of muscles **and**
   - **blood vessels.**

L-38 Sources & Effects of Noise…

3.Noise changes hormone content of blood, increased heart-beat, dilation of pupil of eye.

4. Excessive noise also causes psychological and pathological disorders.

L-38 Sources & Effects of Noise…

5. Psychological disorders causes

- neurosis,
- Hypertension,
- increased sweating,
- gastro intestinal disturbances, stress etc.

L-38 Sources & Effects of Noise…

6.Noise pollution causes

- **frustration,**
- **physical and**
- **mental fatigue.**

- **Low frequency noise cause disturbance in sleep.**

L-38 Sources & Effects of Noise…

7. Noise pollution produces

- emotional disturbances,
- behaviour changes,

- causes nervous breakdown,
- tension and even insanity.

L-38 Sources & Effects of Noise…

8. The most harmful effect of noise pollution is

- impairment of hearing and
- eardrum damage.

L-38 Sources & Effects of Noise…

9. Auditory fatigue produced with

- **whistling and buzzing in ears.**
- **This causes temporary deafness whereas**
- **100 dB noise causes permanent deafness.**

L-38 Sources & Effects of Noise…

10. Ultrasonic sound can affect the

- **digestive, respiratory,**
- **cardio vascular system and**
- **semicircular canals of the internal ear.**

L-38 Sources & Effects of Noise…

11. Brain is also adversely affected by loud and sudden noise such that of

- **jet and aeroplane noise.**
- **It is also injurious to health of**
- **pregnant women and fetus.**

L-38 Sources & Effects of Noise…

12. According to recent reports Noise causes

- **eosinophilia,**
- **hypoglycaemia etc.**

13. Noise is responsible for disturbing the

- **whole biological system.**

L-38 Sources & Effects of Noise…

14. Noise also causes

- irritation,
-
- dissatisfaction,
- disinterest and
- affect work performance.

L-38 Sources & Effects of Noise…

15. The noise of

- **crackers during Diwali**
  are too loud and
- **unbearable for health and**
- **causes serious air pollution.**

L-38 Sources & Effects of Noise…

16. Non living things such as buildings undergo

- physical damage by cracks,
- broken windows, glasses etc. by
- sudden and explosive sounds.

L-38 Sources & Effects of Noise…

17. Excessive noise causes

- **chronic headache and irritability**
- **It affects health efficiency.**

19. Noise affects the autonomous nervous system.

- **It causes annoyance to people,**
- **those do close works in factories etc.**

L-39 Standards of Noise Pollution

Sound Unwanted Form of Noise:-

Musical Noise :

The sound waves which are

- **periodic**
- **regular and of**
- **long duration and**
- **produce a pleasant effect**
- **called musical noise.**

Noise

L-39 Standards of Noise Pollution

Sound 'Unwanted Form' of Noise:-

Noise

When sound waves are

- **non periodic,**
- **irregular and**
- **short duration**

they produce an

- **irritating effect called noise.**

L-39 Standards of Noise Pollution

- The intensity of sound wave combined with the reception characteristics of ear is known as loudness.

- For an average young adult with normal hearing the sound pressure is about 0.00002 N/m^2 .

L-39 Standards of Noise Pollution

- **Sound becomes louder with more pressure , upto 20 N/m^2 .**

- **Noise is the unwanted and undesired form of sound.**

L-39 Standards of Noise Pollution

Modern civilization creates more and more noise because of the development of

- industry,
- machinery and
- technology.

Unwanted sound i.e. noise has increased

- in hospitals,
- in colleges,
- in theatres, factories etc.

L-39 Standards of Noise Pollution

Permissible Noise Levels (Standards):-

Many people work and live in where the noise level is not hazardous.

- **The maximum level of noise which will**
- **neither irritate the occupants**

- **nor damage the acoustics**
  (Noise from sound wave) of building
  is known as
- **acceptable noise level inside the building.**

L-39 Standards of Noise Pollution

- acceptable noise level inside the building. This depends upon the

- nature of the noise,
- time of fluctuation of noise,
- background noise etc.

But over the years they suffer from

L-39 Standards of Noise Pollution

But over the years they suffer from

- **progressive hearing loss and**
- **psychological hazards**
- **including tension.**
- **The maximum permissible noise levels are summarized in the table.**

L-39 Standards of Noise Pollution

Maximum Permissible Noise, dBA

S.No.	Situation	Permissible noise dBA
1.	Road traffic near residential areas	70
2.	Ear protection to be worn	85
3.	Factory work for 8 hour day	105
4.	Prolonged noise causing permanent damage	100
5.	Threshold of pain – duration of 30 seconds	120
6.	Absolute limit with ears protected	150
7.	Ear drum rupture	180
8.	Lung damage	195

L-39 Standards of Noise Pollution

Permissible Ambient Noise Levels

Area	Noise Level dB	
	Day time (6 am to 9 pm)	Night time (9 pm to 6 am)
• Industrial area	75	65
• Commercial area	65	55
• Residential area	55	45
• Silence zones	50	45

L-40 Control Techniques of Noise..

Control of Noise Pollution:-

- Noise is an unwanted form of sound.
- It is also known to be a nuisance.
- An awareness of the seriousness of the problem of noise pollution has become important.

L-40 Control Techniques of Noise..

(Control of Noise Pollution)

- Preventive measures and methods of
- reducing the noise pollution must be learnt to
- maintain the acceptable level of noise pollution.

L-40 Control Techniques of Noise..

Control of Noise Source:-

It is possible to control noise at three levels:

- **Reducing the sound produced.**
- **Interrupting the path of the sound.**
- **Protecting the recipient noise.**

L-40 Control Techniques of Noise..

On the basis of the sources the controls are also different.

1. Industrial Noise Control:-

2. Community Noise Control

L-40 Control Techniques of Noise..

1. **Industrial Noise Control:-**

Industrial noise can be controlled by

- **replacement of noise producing machinery with quiet alternative.**
- **Interrupting the path of the sound by using insulating material.**

L-40 Control Techniques of Noise..

(Industrial Noise Control)

Industrial noise can be controlled by

- **Protecting the recipient by distribution of ear muffs to the employee and**
- **by the application of engineered control techniques.**

L-40 Control Techniques of Noise..

2. Community Noise Control:-

The main sources of community noise are:

- **aircraft,**
- **Road traffic and**
- **construction.**

Aircraft noise is maximum at the time of

- **take off and take on.**

L-40 Control Techniques of Noise..

To control aircraft noise it is necessary that

- the flight paths are far away from populated areas.

Another method is

- set the limits on aircraft engine noise and
- Do not allow the aircrafts exceeding these limits.

L-40 Control Techniques of Noise..

Roadway traffic

Vehicles produce

- **exhaust noise,**
- **engine intake noise,**
- **gears,**
- **transmission and**
- **aerodynamic noise.**

L-40 Control Techniques of Noise..

Roadway traffic

- Heavy vehicles can produce more noise than light vehicles.
- A number of alternatives are available for reducing highway noise.

L-40 Control Techniques of Noise..

1. The source can be controlled by making quiet vehicles.

2. Highway could be routed away from populated areas.

3. The noise can be baffled with walls or other barriers.

L-40 Control Techniques of Noise..

4. Lowering the speed limits and designing for non-stop operation also reduces the noise pollution.

5. Green plants or vegetation is good absorber of noise pollution.

6. So greater noise pollution can be reduced by plantation by the sides of highways.

L-40 Control Techniques of Noise..

Third source of community noise pollution is construction.

It must be controlled by local ordinances and usually involves:

- muffing of air compressors,
- Jack hammers,
- hand compactors etc.

L-40 Control Techniques of Noise..

Control of Noise Source by Design:-

i) Reduce Impact Forces:-

to reduce noise from impact forces

following steps can be taken:

- **Reduce the weight,**
- **size or height**

of fall of the impacting mass.

L-40 Control Techniques of Noise..

- Cushion the impact by
- inserting a layer of shock absorbing materials between the surfaces

- Substitute the application of a
- small impact force
- over a long time period for
- a large force over a short period.

L-40 Control Techniques of Noise..

- Smooth out acceleration of moving parts.
- Avoid high jerky motion.

L-40 Control Techniques of Noise..

- **Reduce Speed and Pressures:- By reducing, pressure and flow velocities noise radiations can be reduced-by the following ways:**
  - **Fans, motors, turbines should be operated at**
  - **lowest blade tip speeds and maximum diameter devices should be used.**
  - **All other factors being equal,**
  - **centrifugal squirrel cage type fans are less noisy than vane axial or propeller type fans.**
  - **In air ventilation system 50% reduction if the speed of air flow may lessen the noise output.**

L-40 Control Techniques of Noise..

- **Reduce Noise Leakage:- These can be done by following ways:**

  - All unnecessary holes or cracks at joints should be covered.
  - All electric or plumbing penetrations
  - of the housing or cabinet should be sealed with rubber gaskets.

L-40 Control Techniques of Noise..

- All other functional openings should be covered with lids or shields edged.
- Other openings required for exhaust, cooling etc. should be equipped with mufflers.
- Opening should be directed away from other people.

L-40 Control Techniques of Noise..

Reducing Frictional Resistance:-

Reducing friction between

- **rotating, sliding-parts in**
- **mechanical system frequently results in**
- **smoother operation and lower noise output.**

A system designed for quick operation will employ the following features:

L-40 Control Techniques of Noise..

- Low flow speed.
- Smooth boundary surfaces.
- Simple layout.
- Long radius turns.
- Flared sections.
- Streamline transition in flow path.
- Remove unnecessary obstacles.

L-40 Control Techniques of Noise..

- **Isolate and Damper Vibrating Elements:-**
- **To maximize vibration damping efficiency following should be done.**

  - **Dampening materials should be applied to**
  - **most flexing bending vibrating surfaces.**

L-40 Control Techniques of Noise..

- Single layer damping materials should be
- about two or three times as thick as the
- vibrating surface to which they are applied.

- Sandwich materials with effective vibration dampers can be used.

L-40 Control Techniques of Noise..

- Providing Mufflers/Silencers:- **Mufflers are of two types:**

i) Absorption mufflers is a device which reduces noise by fibrous or porous materials.

ii) A reactive muffler is one whose noise reduction is determined be geometry.

- **By using these, noise can be controlled to some extent.**

L-40 Control Techniques of Noise..

Noise Control in the Transmission Path:-

This can be done by the following ways:

- **Separations:-**

  Air absorbs high frequency sound more efficiently.

  If enough distance is available noise can be reduced by absorption.

L-40 Control Techniques of Noise..

Noise Control in the Transmission Path:-

- **Absorbing Materials:-**

  Sound absorbing materials can be used to reduce noise level.

- **Acoustical Lining:-**

  In noise transmitted through ducts pipe, Noise can be reduced by…

L-40 Control Techniques of Noise..

by lining the inner surface of the ducts with sound absorbing materials.

- Barriers and Panels:-

In the noise path placing screens can be an effective way of reducing noise.

Barrier size depends upon the noise frequency.

L-40 Control Techniques of Noise..

- **Protect the Receiver:-**

The following two techniques are commonly employed:

i) Alter Work Schedule:-

Limit continuous exposure to high noise levels.

The intensely noisy operation should be done for a short interval of time.

L-40 Control Techniques of Noise..

(Protect the Receiver)

ii) Ear Protection:-

- Molded and pliable earphone,
- cup-type protectors and
- helmets

are commercially available as hearing protectors.

L-40 Control Techniques of Noise..

Many industrial countries of the worlds have enacted legislation to control and abate noise.

India has recently declared noise pollution as an offense through the promulgation of Air Pollution Act 1986.

Accordingly the recommended noise levels for various areas have been fixed by Central Board of Pollution Control.

Introduction to Land Pollution

Lithosphere

Meaning of Lithosphere:-

- **'Lithosphere' in Greek means "Stony Sphere".**

- **The earth has soil and rocks on its surface as well as under oceans.**

- **The lithosphere is the solid outer crust of the earth.**

Introduction to Land Pollution
Lithosphere

- **While the mantle and core comprises the interior of the earth.**

“The solid outer portion of the earth containing soil and rocks is called lithosphere.”

Or in other words-

Introduction to Land Pollution
Lithosphere

- **In other words –**
- **The solid, rocky portions of the earth made up of the crust of**
- **normal silicate rocks & metal silicates mostly magnesium & Iron silicates, makes lithosphere.**

Introduction to Land Pollution
Lithosphere

- **"Lithosphere is a part of environment which includes the soil".**
- **'Lithosphere is the 1/3 part of the earth. The earth may be divided into three zones –**
- **the core, mantle and crust.**

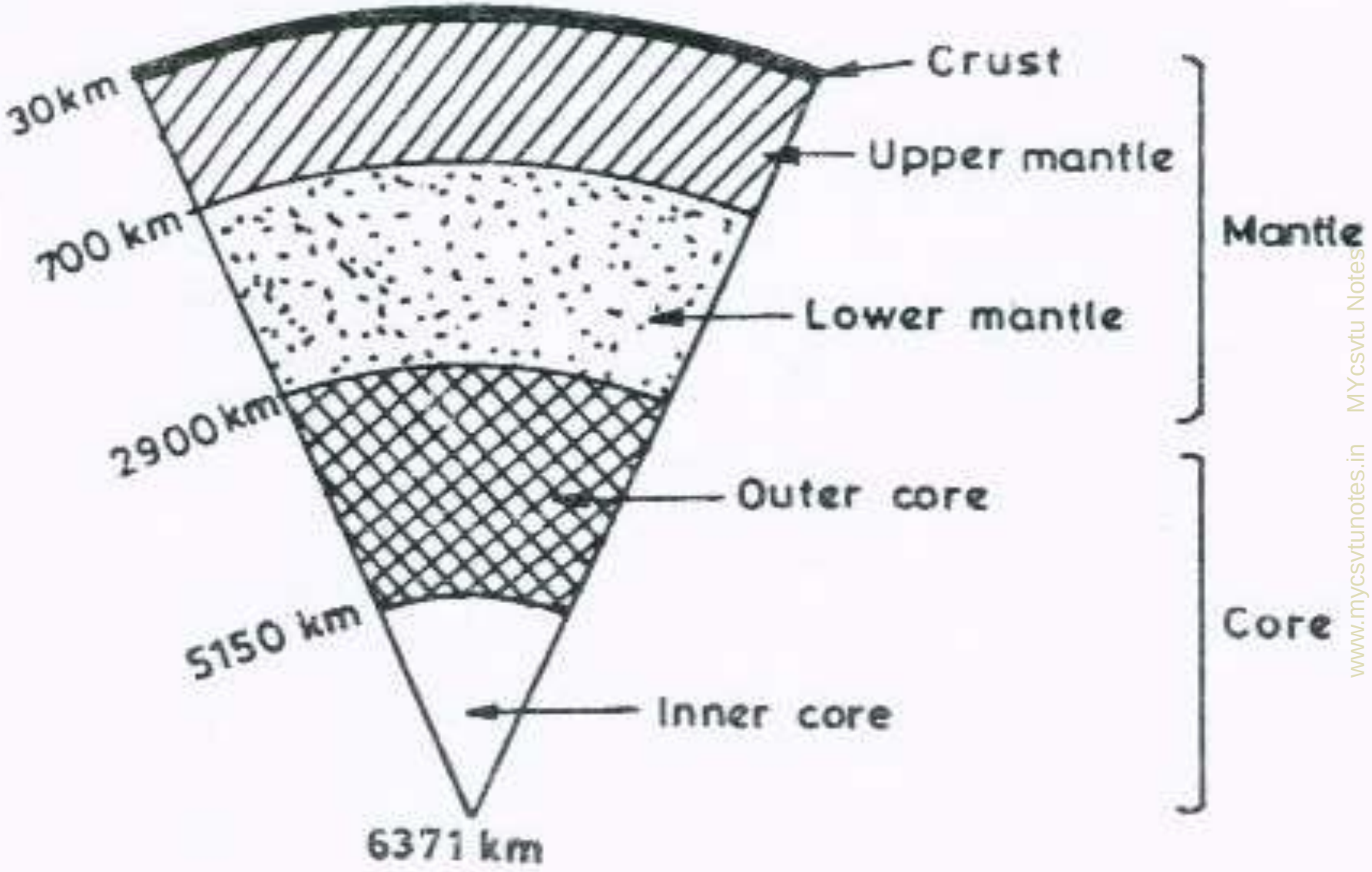


Fig. The Major Components of Earth.

Introduction to Land Pollution Lithosphere

- **The lithosphere is composed of the crust and the upper mantle.**

- **The upper part of crust is made up of igneous and sedimentary rocks.**

Introduction to Land Pollution
Lithosphere

- -igneous and sedimentary rocks.
- This makes up the continents.

- The lower crust is made up of igneous rocks which
- form the ocean floors.

- The most abundant elements out of many are oxygen and silicon.

Introduction to Land Pollution
Lithosphere

- **The boundary between the crust and upper mantle called the**

Moho.

- **The crust represents less than 1% of the earth's total mass and only about 0.5% of its radius.**

- **It does not have a uniform thickness.**

Introduction to Land Pollution
Lithosphere

- **The average thickness of lithosphere is about 100 km.**
- **The thickness in the continental regions is about 35 km. Whereas**
- **under the oceans it is 5 – 10 km.**

Introduction to Land Pollution
Lithosphere

- **the crystal layer is of lighter density as compared to the interior layers.**

- **As the crystal layer comprises of rocks rich in silica and aluminium are called the**

sial layer.

Introduction to Land Pollution
Lithosphere

- **Below the sial layer lies the mantle which extends up to a depth of 2900 km.**
- **the mantle consists of**

(a) Inner silicate (Rich in silica and Magnesium),
(b) Transitional zone of mixed metals and silicates.

Introduction to Land Pollution
Lithosphere

- **The core consists of metals in liquid or plastic state due to high temperature and pressure.**
- **The core of the earth has a radius of about 3400 km.**
- **As nickel and iron are dominant in the core, it is called**

‘nife’

Introduction to Land Pollution
Lithosphere

Land

- **A broad term embodying**
- **the total natural environment of the areas of earth**
- **which is not covered by water is called land.**

- **Land forming processes that have their origin within the earth are said to be**

endogenic,

Introduction to Land Pollution
Lithosphere

- **while surface processes (such as erosion) are said to be**

exogenic.

- **Lithosphere lies above a relatively soft region of the mantle called the**

asthenosphere.

Introduction to Land Pollution
Lithosphere

Composition of Lithosphere:-

The main constituents of Lithosphere are

- **sold silicate rocks and**
- **metal compound of**
- **Mg an Fe silicate,**
- **organic matter**
- **and air etc.**

Introduction to Land Pollution
Lithosphere

- **In India All land cannot be used for agricultural purposes and**
- **hence it is used for other purposes.**

- **Some land is also protected for wild life preservation**

- **Some land is required for construction of reservoirs.**

Introduction to Land Pollution
Lithosphere

- **Disposal of wastes also require land.**
- **Accordingly all modern and growth activities are having their**
- **direct or indirect impact on land.**

Introduction to Land Pollution
Lithosphere

- **Land resources are related to natural disasters like**

- **volcanic eruptions,**
- **earthquakes.**

- **Land also includes waste land and wetland.**

Introduction to Land Pollution
Lithosphere

Lithosphere is a part of environment which include

- **the soil and**
- **the upper part of crust.**

Introduction to Land Pollution Lithosphere

Waste land is a piece of land which is not capable of producing crops and this includes the

- **degraded forests,**
- **eroded valleys,**
- **over – irrigated soils and**
- **water logged marshy land.**

Introduction to Land Pollution Lithosphere

- **Wet lands are the parts of an aquatic ecosystem.**

- **Wet lands are lands transitional between terrestrial and aquatic systems when**

Introduction to Land Pollution
Lithosphere

- **the water level is near the surface or the land is covered by shallow water.**

- **The wet lands could be natural, artificial or man-made.**

Introduction to Land Pollution Lithosphere

The major source of land pollution is the amount of solid waste disposed by society which includes

- **household refuse,**
- **commercial rubbish**
- **industrial waste,**

- **agricultural waste,**
- **garbage waste and**
- **other specific wastes.**

Introduction to Land Pollution Lithosphere

- **household refuse,**
- **commercial rubbish,**

- **industrial waste,**
- **agricultural waste,**

- **garbage waste and**
- **other specific wastes.**

Introduction to Land Pollution
Lithosphere

SOIL:-

According to Knight (1956) soil

- **is the mineral material that exists in solid or unbroken form like**
- **boulders and gravels or**

- **finely divided particles of mineral matters such as**
- **sand, silt or clay depending upon the texture.**

Introduction to Land Pollution Lithosphere

- **finely divided particles of mineral matters such as**

- **sand, silt or clay depending upon the texture.**

Introduction to Land Pollution Lithosphere

Soil differ from the material below in

- **morphology,**
- **chemical constituents,**
- **composition and**
- **biological characteristics.**

Introduction to Land Pollution
Lithosphere

- **The word soil has been derived from the Latin word “Solum” meaning**
- **upper crust of the earth.**

- **Soil is differentiated into**

- **various horizons and capable of supporting plant life.**

Introduction to Land Pollution
Lithosphere

- **Soil is a dynamic layer of earth's crust which is**
- **constantly changing and developing.**
- **Soil formation takes place with**
- **the decomposition of rocks and minerals.**

Introduction to Land Pollution
Lithosphere

Soil properties like

- **soil texture,**
- **structure,**
- **permeability,**
- **soil water porosity,**
- **soil pH,**

Introduction to Land Pollution
Lithosphere

(Soil properties)

- **organic matter content**
- **cation exchange capacity,**
- **microbial properties etc.**

play an important role to determine the productivity.

Introduction to Land Pollution
Lithosphere

Types of Soil:-

(1) Sandy Soil:- It contains loose and dry sand particles and has poor water holding capacity.

(2) Clayey Soil:- This type of soil is unsuitable for plant growth because it inhibits the free circulation of air and water.

Introduction to Land Pollution
Lithosphere

3) Loamy Soil:- These contain sand, silt and clay in equal proportion. It is best soil for plant growth.

- **Other types of Soil are:-**

(1) Sandy Loam Soil.

(2) Clay Loam Soil,

(3) Silt Loam Soil.

Introduction to Land Pollution
Lithosphere

Soil Profile:-

- **At any place when weathering takes place over a period of time,**
- **layers of soil develop one over another with time and maturity.**

Introduction to Land Pollution
Lithosphere

- **The vertical section of such soil is called soil profile.**
- **This is characteristics of mature soil and**
- **are made up of different horizons.**

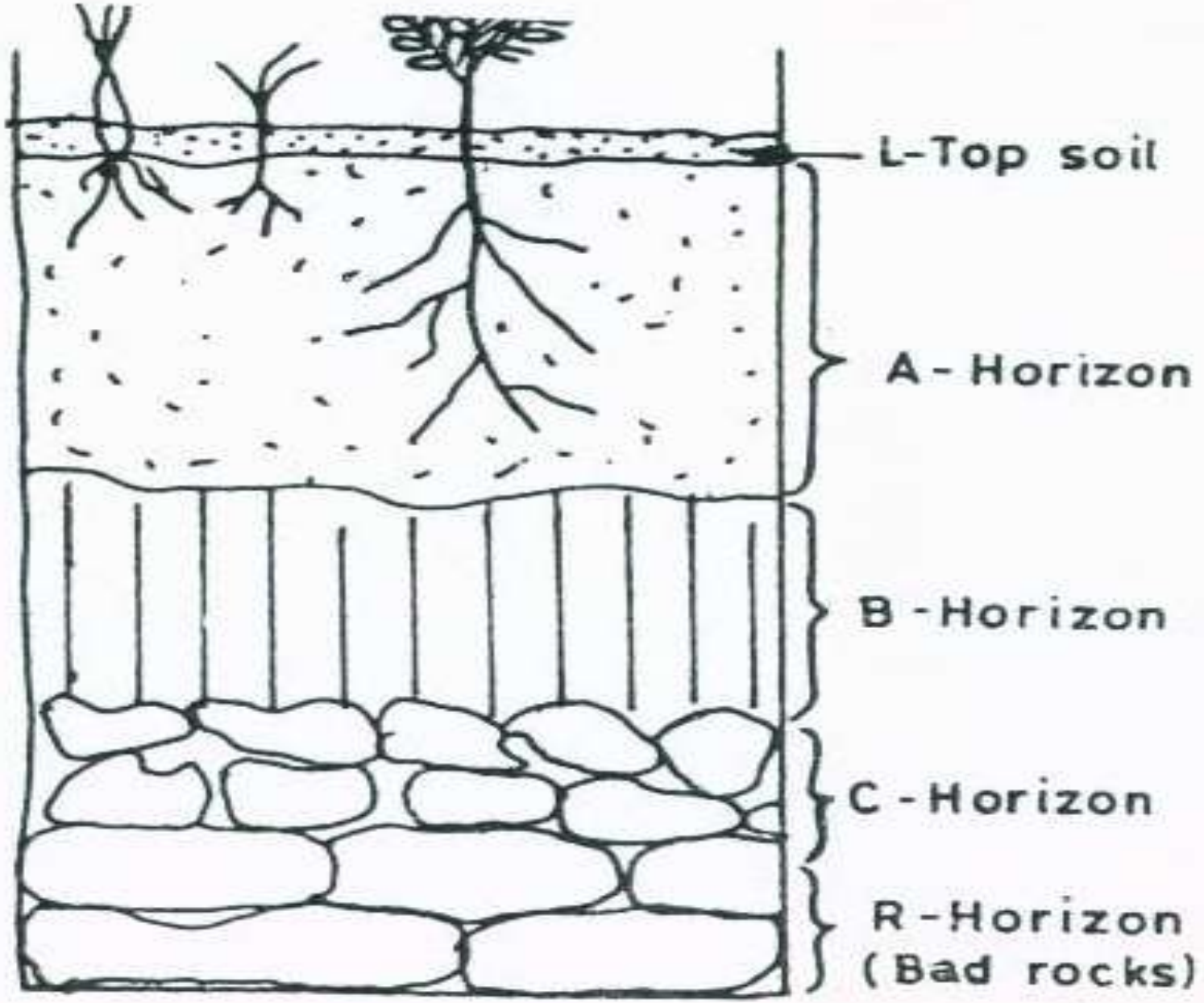


Fig. Soil Profile

Introduction to Land Pollution Lithosphere

These horizons vary in

- **thickness,** **colour,**
- **texture,** **structure,**
- **acidity,** **porosity and**
- **composition**

Origin & Effects of land Pollution Agricultural & Industrial

- **Land and Soil Pollution:-**

- **Land pollution means addition of unwanted substances in any proportion.**

- **Soil pollution is also called land pollution.**

Origin & Effects of land Pollution Agricultural & Industrial

- **It is due to the addition of different chemicals or**
- **due to erosion of upper layer i.e., soil.**
- **These reduce soil fertility.**

Origin & Effects of land Pollution Agricultural & Industrial

- **Due to air borne pollutants emitted by factory stacks**

-it travel long distances and slowly deposit on soil.

Origin & Effects of land Pollution
Agricultural & Industrial

- **SO_2 present in the fumes causes acid rains and lowering of soil pH.**

- **Chlorine and nitrogen oxides are other common gaseous – pollutants which**

Origin & Effects of land Pollution
Agricultural & Industrial

- **SO_2, Cl_2, & NO_x etc.**
- **combine with water and pollute the soil.**

Origin & Effects of land Pollution Agricultural & Industrial

- **Particulate matter near cement factories, coal and mining belts etc.**
- **reach soil surface of neighbouring regions.**
- **Land or soil get polluted by the following ways:**

Origin & Effects of land Pollution Agricultural & Industrial

Source of Soil Pollution:-

1. **Industrial wastes**
2. **Agricultural practices.**
3. **Urban wastes**
4. **Chemical and metallic pollutant.**
5. **Radioactive pollutants**
6. **Biological agent.**

Origin & Effects of land Pollution Agricultural & Industrial

1. By Industrial Wastes:-

- **Disposal of industrial waste is the major reason for soil pollution.**
- **These are mainly discharged from**
- **pulp and paper mills,**
- **chemical industries,**
- **oil refineries,**

Origin & Effects of land Pollution Agricultural & Industrial

These are mainly discharged from:

- **pulp and paper mills,**
- **chemical industries,**
- **oil refineries,**
- **sugar factories,**
- **tanneries,**
- **textiles,**

Origin & Effects of land Pollution Agricultural & Industrial

- **steel distilleries,**
- **coal and**
- **mineral mining industries,**
- **drugs,**
- **glass,**
- **cement,**
- **petroleum industries etc.**

Origin & Effects of land Pollution Agricultural & Industrial

- **Thermal,**
- **atomic and**
- **electric power plants**

Origin & Effects of land Pollution Agricultural & Industrial

- **Fly ash and other industrial effluents are either**
- **discharged into streams or**
- **dumped into the surrounding land.**

Origin & Effects of land Pollution Agricultural & Industrial

Industrial wastes mainly consist of

- **organic compounds along with**
- **inorganic complexes and**
- **non-biodegradable materials.**

Origin & Effects of land Pollution Agricultural & Industrial

- **The pollutants affect and alter**
- **the chemical and biological properties of soil.**

Origin & Effects of land Pollution Agricultural & Industrial

2.By Agricultural Practices:- Agricultural wastes cause land and water pollution. Agrochemical such as

- **fertilizer,**
- **pesticides,**
- **insecticides,**
- **weedicides**

cause land pollution.

Origin & Effects of land Pollution Agricultural & Industrial

(2.By Agricultural Practices)

- **DDT, BHC, etc.**
  and chemicals like
- **lead (Pb),**
- **mercury (Hg),**
- **arsenic (As),**
  accumulate on the soil
  permanently.

Origin & Effects of land Pollution Agricultural & Industrial

These substances adversely affect the physical, chemical and biological properties of soil.

Origin & Effects of land Pollution Agricultural & Industrial

1. Fertilizers:-

Fertilizers are the chemical compounds containing one or more of plant nutrients i.e.,

- **Nitrogen,**
- **Phosphorous and**
- **Potassium.**

Origin & Effects of land Pollution Agricultural & Industrial

(Fertilizers)

- **Excessive use of fertilizers pollute soil.**
- **Fertilizers are retained by the soil and increase crop efficiency .**

Origin & Effects of land Pollution Agricultural & Industrial

2. Pesticides:-

- To increase food production land resources are manipulated.
- Different kinds of pesticides and biocides are used to control pests.
- It is observed that pesticide residues coexist within biological system with other forms of life.

Origin & Effects of land Pollution Agricultural & Industrial

3.Soil Conditioners and Other Chemical Agents:-

- soil conditioners and fumigants are also employed to the land system to
- increase and protect the soil fertility,
- to kill the hazardous insects.

Origin & Effects of land Pollution Agricultural & Industrial

- **These chemicals alter both agricultural and horticultural soil areas.**
- **These contain several toxic metals such as Pb, As, Cd, Hg, Co etc.**
- **which accumulate on the soil permanently and enter the growing crops.**

Origin & Effects of land Pollution Agricultural & Industrial

4. Farm Wastes.

- **Increased number of cow, cattle etc. also add to soil pollution.**
- **Buildings in which these animals are housed can be cleaned using water but**
- **the manure is also washed out and deposited as wet slurry on the land.**

Origin & Effects of land Pollution Agricultural & Industrial

- **This slurry deposited on soil seep into ground water and pollute it.**

- **This slurry consist of nitrates and phosphates that can cause undesirable effect in the soil texture.**

Urban and Hazardous wastes

Classification of Solid Wastes:-

1. **Domestic Wastes**
2. **Industrial Wastes**

3. **Pathological Wastes**
4. **Industrial Wastes**

5. **Agricultural Wastes**
6. **Hazardous Wastes.**

L- 33 Urban and Hazardous wastes

1. Domestic Wastes:-

Include household wastes like:

- **rubbish, wastes of food, soap water etc.**

2. Municipal Wastes:-

These include garbage of

- **hotels, hospitals, markets, dirt etc**

L- 33 Urban and Hazardous wastes

3. Pathological Wastes:-

- **Dead animals, human waste etc. included in this group.**

4. Industrial Wastes:-

- **Chemicals, paints, sand, metal ore processing, flyash, sewage treatment sludge etc.**

L- 33 Urban and Hazardous wastes

5. Agricultural Wastes:-

This includes solid wastes from

- **farms, feed lots, animals manure etc.**

6. Hazardous Wastes:-

- **Such as radioactive waste, enzymes, antibiotics, toxic wastes etc. come in this type of wastes.**

Urban and Hazardous wastes

By Urban Wastes:-

- **Urban wastes comprise both commercial and domestic wastes**
- **consisting of dried sludge of sewage.**
- **All the urban solid wastes are commonly referred to as refuse.**

Urban and Hazardous wastes

(Urban wastes)

- **Solid wastes and refuse contribute to soil pollution which contain -**
- **garbage and rubbish materials like**

- **plastics,**
- **glasses,**
- **metallic cans,…….**

Urban and Hazardous wastes

(urban wastes)

- **fibers, paper,**
- **rubbles, street sweepings,**
- **fuel residues,**
- **leaves, containers,**
- **abandoned vehicles and**
- **other discarded manufactured products.**

Urban and Hazardous wastes

- **Pollution concentration in**
- **urban areas and**
- **unplanned industrial progress have to a greater extent**
- **contributed to soil pollution problems.**

Urban and Hazardous wastes

Hazardous Wastes:-

Hazardous wastes are those wastes that pass a

- **substantial danger**
- **immediately or**
- **over a period of time to**

human, plant or animal life.

Urban and Hazardous wastes

(Hazardous Wastes)

A waste is said to be hazardous if it exhibits any of the following characteristics, viz.

- **Ignitability,**
- **corrosivity,**
- **reactivity or**
- **toxicity.**

Urban and Hazardous wastes

(Hazardous Wastes)

Typical hazardous wastes are

- **radioactive substances,**
- **chemicals,**
- **biological wastes,**
- **flammable wastes and**
- **explosives.**

Urban and Hazardous wastes

- **The source of hazardous wastes are**
- **industries,**
- **nuclear plants,**
- **hospitals,**
- **research institutes,**
- **laboratories etc.**

Urban and Hazardous wastes

Effects of Industrial Pollutants:-

- **Different industries release different harmful toxins.**
- **These toxins enter in the food chain causing a number of undesirable effects.**

Urban and Hazardous wastes

- Industrial effluents when discharged through sewage system will
- poison the biological purification mechanism of sewage treatment
- causing several soil and water borne diseases.

- Metallic contaminant (Hg, Zn, Cd, etc.) destroy bacteria and beneficial micro organisms in the soil.

Urban and Hazardous wastes

- **Soluble salts are responsible for crop damage.**
- **These cause crop loss, soil loss, metallic corrosion.**
- **Some of the trade wastes contain pathogenic bacteria e.g.,**
- **Anthrax bacilli bacteria from tannery wastes.**

Urban and Hazardous wastes

Effects of Radioactive Pollutants:-

- **The problem of radioactive wastes dumped into the soil is more complicated.**
- **Radio-active elements can remain active in soil for long times.**
- **Harmful effects of radioactive pollutants are:-**

Urban and Hazardous wastes

- Radiation actually affects the soil and soil fertility
- These radiations kill plant species.
- Variations in radio sensitivity among tree and shrubs are
- due to differences in their chromosome number and size.

Urban and Hazardous wastes

A recent report indicates that a large number of induced radio nuclides as

- **carbon – 14,**
- **Fe-55,**
- **Mn-54,**
- **CO-57 etc.**

get concentrated in biological systems.

Urban and Hazardous wastes

- **Effects of Modern Agro – Technology:-**
- **Effects of Fertilizers:-**
  - **Potassium fertilizers in soil decreases the valuable nutrient**

ascorbic acid (vitamin C) and carotene in vegetables and fruits.

Urban and Hazardous wastes

- **Excessive use of nitrogenous fertilizers in land leads to accumulation of nitrate in the soil.**

This excess accumulation can cause diarrhea and cyanosis in children.

Urban and Hazardous wastes

- Phosphate fertilizer is considered detrimental to crop production.

- Cereal crops like Jawar, Maize etc. grown on alkaline soil

  absorb higher amounts of fluorides and responsible for the spread of fluorosis.

Urban and Hazardous wastes

- Effects of Pesticides:-

- **Pesticides like DDT, aldrin etc. are known to seep gradually through soil into ground water and contaminate drinking water supplies.**

Urban and Hazardous wastes

- **Organo phosphates pesticides**

cause extreme muscular weakness, tremors and dizziness in poisoned animals.

Solid waste

- All the solid

useless, discarded, unwanted are included in the term

SOLID WASTE

Harmful Effects of Solid Waste:-

- **Some harmful effects of solid waste :-**

- **Improper handling of solid wastes is dangerous to health and environment.**

Collection of Solid Wastes & Recycling

- These become a source of food for rats and small rodents .
- Rats destroy property and spread various diseases like
- plague, endemic typhus, trichinosis etc.

Collection of Solid Wastes & Recycling

- **The hazardous wastes are injurious to human health.**

Collection of Solid Wastes & Recycling

- **Uncontrolled burning of open dumps**
- **cause air and water pollution.**

Bacillary dysentery

- **amoebic dysentery**
- **diarrhoeal diseases**

are all due to the same.

Collection of Solid Wastes & Recycling

Recycling of Solid Waste:-

- **For stable economic growth……**

- **The choice is between one time use of materials i.e., throw away society and**

- **use of recycled materials i.e., sustainable society.**

Collection of Solid Wastes & Recycling

Recycling of Solid Waste:-

- **The latter will make available materials to future generations and**
- **will also save energy and environment.**

Collection of Solid Wastes & Recycling

Recycling Techniques:-

- **Crushing of materials as discarded furniture, appliances etc.**
- **Selection for magnetic, non – magnetic and specific gravity based materials.**
- **Thermal decomposition of waste organics in the form of gas and oil**

Collection of Solid Wastes & Recycling

- **Melting plastic domestic toys and moulding into new ones.**
- **Melting blast furnace sludge for making artificial jewellery etc.**
- **Use of incineration heat.**

Collection of Solid Wastes & Recycling

- Methane fermentation and residual sludge.
- Converting waste into
- solid fuel (wood chips, raw dust etc.).
- Alcohol fermentation.
- Composting garbage and using it as manure.

Collection of Solid Wastes & Recycling

Utilizing Agricultural Wastes:-

- **An agricultural waste sugarcane bagasse, is a chief source of cellulose.**

Collection of Solid Wastes & Recycling

- **Medicine from Agricultural Wastes:-**

synthesis of nirrofurans.

These are important germicides used for treating cattle disease.

Collection of Solid Wastes & Recycling

Liquid Fuels from Agricultural Wastes:-

Agricultural wastes contain

- **45% cellulose,**
- **35% hemicelluloses and**
- **10% lignin.**

Collection of Solid Wastes & Recycling

Proteins from Cellulose Waste:-

- **Experiments have shown the possibility of commercializing a process for making proteins from waste cellulose.**

Collection of Solid Wastes & Recycling

- First, the cellulose materials such as crop wastes, urban wastes including newspapers, grass, bagasse, etc.
- are needed with strong alkali using
- cobalt chlorides catalyst and
- heated from 25 to 100^0 C.

Collection of Solid Wastes & Recycling

Collection of Solid Wastes & Recycling

- **The cell mass consists of about 60% proteins which on**
- **separation and drying energy at a granular material.**
- **The product is considered suitable for human consumption.**

Collection of Solid Wastes & Recycling

Urban Waste and Bagasse for Electricity:-

- **Recent research in Indonesia has shown that**
- **urban wastes and bagasse from sugarcane be used to generate electricity.**

Collection of Solid Wastes & Recycling

The technology

- **the materials to be burnt are suspended by**
- **blowing an upward stream of air through it in a reactor.**
- **The materials in the resulting fluidized bed,**
- **which resembles a boiling viscous mass,**

- **is more accessible to chemical rection**
- **than the same material in a solid, static state.**

Collection of Solid Wastes & Recycling

The technology

- **The process ensures about 98% combustion. Moreover,**
- **the process is environment – friendly,**
- **since emissions of NOx are almost negligible.**

Collection of Solid Wastes & Recycling

Rubber from Old Tyres:-

- American chemists have identified
- some strains of sulphur – mounting bacteria seuephotobees
- from the hot springs of yellow stone national park.

Collection of Solid Wastes & Recycling

Wyoming can help recycle rubber from old types.

- Powdered rubber from tyre waste is kept in fernentse which
  - contains the sulphur loving bacteria
  - consuming the sulphate,
  - leaving the

polymer backbone of carbons intact.

L-34 Collection of Solid Wastes & Recycling

Oil from Plastic Waste:-

- A waste recycling plant in Bottrop, Germany has developed a technology, of
- converting aerated plastic wastes into oil.
- The synthetic waste – plastic bags, cartons and computer casings is mined

L-34 Collection of Solid Wastes & Recycling

Oil from Plastic Waste:-

- The synthetic waste – plastic bags, cartons and computer casings is mined
- with heavier oil residues and
- then water is added.
- As a result, chemical compounds break up to produce synthetic oil

L-34 Collection of Solid Wastes & Recycling

- which is piped to a refinery to yield high quality of based products.
- Though plastics normally account of 7% by weight of municipal solid waste,
- they store upto 30% of the energy content of garbage.

Collection of Solid Wastes & Recycling

Silk Industry Waste as Poultry Feed:-

- According to researches of the department of chemistry, cotton college, Guwahati, assam
- the silk industry wastes containing large quantities of waste pupae
- can be used as poultry feed,

L-34 Collection of Solid Wastes & Recycling

Silk Industry Waste as Poultry Feed:-

- because waste mugg (a wild silk from an Arsanese moth cocoon)
- prepared in dry form
- is very rich in animal protein.
- A mixture prepared from raw mugg pupae compares well with

Collection of Solid Wastes & Recycling

- conventional fish meal as rich source of protein.
- It has been found that it significantly
- increases the growth rate of chicken
- which also retains more nitrogen compared to fish meal.

L-34 Collection of Solid Wastes & Recycling

Utilizing Fly Ash as Bricks:-

- Fly ash, a waste material of
- pulverised coal fried thermal power stations,
- has been utilized as building bricks.

L-34 Collection of Solid Wastes & Recycling

- About 80% of the ash from the coal fed to the boiler is collected in the form of fly ash and
- about 20% is collected as bottom ash.
- Fly ash is very fine about 60 to 70%
- below 76 micron,
- whereas bottom ash is a coarse, spongy material.

Disposal Techniques

Solid Waste Disposal Method:-

- The selection of right process of solid waste disposal method is must
- not only to save thousands of rupees but
- also to solve future problems related to the environment

Disposal Techniques

- . The chosen method should fulfill present requirement and future situations.
- It should also provide opportunities for recycling of materials and
- should not pollute air, water or land.

L-35 Disposal Techniques

The various methods of solid waste disposal in different countries are:

- **Open dumping.**
- **Land filling.**
- **Incineration.**
- **Pulverization.**
- **Compositing.**
- **Disposal into sea.**

Disposal Techniques

Open Dumping:-

- **In India this method is used.**
- **It is cheap and needs no planning.**

- **The low – lying areas and outskirts of the town and cities**
- **are used for the open dumping.**

Disposal Techniques

Open Dumping:-

- This causes public health problems like
- breeding of flies, rats, mosquitoes etc.
- These are also the source of air pollution.

Disposal Techniques

- **Land Filling (sanitary) :-**
- **a process of disposing refuse on land without creating nuisances or hazards to public health.**
- **It is carried out without environmental damage.**

Disposal Techniques

- Solid waste is dumped in the low lying areas.

- The refuse is filled up or dumped in
- layers of 1.5 m or so and

- each layer is covered by good earth of at least 20 cm thickness,

Disposal Techniques

- After a certain desired elevation, a final cover of about one metre of earth is placed and it is again compacted (Fig.____).

- Each layer is left out for at least seven days and
- compaction by trucks is carried out for its settlement.

Disposal Techniques

- Insecticides like DDT should be sprayed on top to prevent mosquitoes and flies.

- With the passage of time, solid – wastes
- get stabilized by

- the decomposition of the organic matter and
- converts into stable compounds.

L-35 Disposal Techniques

- The refuse is stabilized, within
- 2 to 12 months, and
- settles down by 20 to 40% of its original height.
- The land fill operation is a biological method of waste treatment.

- This process has five distinct phases as:

L-35 Disposal Techniques

Phase I:-

- IN this aerobic bacteria deplete the available O_2 and
- increase the temperature.

Phase II:-

- Anaerobic reactions are established and
- H_2, CO_2 etc. gases are evolved.

L-35 Disposal Techniques

Phase III:-

- In this phase methanogenic activity starts due to the presence of bacteria.

Phase IV:-

- In this phase methanogenic activity gets stabilized.

L-35 Disposal Techniques

Phase V:-

- **In phase V the methanogenic activity decreases representing**
- **depletion of the organic matter and ultimately**
- **the system returns to aerobic conditions within the land fill.**

L-35 Disposal Techniques

- **The end products of III and IV phase are CO_2 , $CH4_4$, NH_3 and water.**
- **After 200 – days of land filling CH4 is produced.**
- **Landfill gas is a rich and renewable source of energy.**

L-35 Disposal Techniques

Advantages:-

- Simple and economical.
- Costly plant and equipment not required.
- Skilled labour is not required.
- Separation of solid – wastes not required.
- No residue or by - product.

L-35 Disposal Techniques

- Low lying areas can be better used.
- Problems of public health are minimized.
- No air pollution from burning.
- No fire hazards.

L-35 Disposal Techniques

Disadvantages:-

- Large land area requirement.
- Evolution of foul smell near the site of disposal.
- Use of insecticide is required.
- Covering good earth for top layer may not be available.

L-35 Disposal Techniques

- To prevent ground water pollution (due to leachates)
- plastic membranes are developed.
- Landfill operation is widely used in western countries but limited in India.
- Landfill can be used as parks, playgrounds or golf courses.

L-35 Disposal Techniques

Incineration:-

- **Incineration means burning of the solid wastes in hearths or furnaces.**

This method is used when

- **suitable dumping land areas are not available and**
- **disposal in sea is not possible.**

L-35 Disposal Techniques

- the non – combustible and inert materials are separated to reduce load on hearth.
- combustible garbage, rubbish and dead animals are also burnt.

- The temperature should be
- > 670^0 C
- to burn all the organic matter and foul smell.

L-35 Disposal Techniques

- When the moisture contents of the solid – wastes is high,
- fuels like wood, coal or oil may be used.
- The final products will be ashes and clinkers.
- The ashes are dispersed off by dumping in low lying areas.

L-35 Disposal Techniques

Advantages:-

- **The method is sanitary, as**
- **all the pathogens and insects are destroyed.**

- **No odour and dust nuisance.**
- **Some revenue can be generated by using steam power and selling of the clinkers.**

L-35 Disposal Techniques

Disadvantages:-

- **Relatively high initial cost.**
- **Nuisance of smoke, odour and ash during the**
- **improper functioning of incinerators.**

L-35 Disposal Techniques

Pulverization:-

In this method,

- **the solid – waste is pulverized in grinding machines**
- **to reduce its volume and change its physical character.**

- **By doing so it becomes practically**
- **odourless and unattractive to insects.**

L-35 Disposal Techniques

Pulverization

- Although it contains fertilizing elements, but
- it cannot be suitably used as a manure.
- It has to be further disposed of by land filling.
- This method is quite costly and hence not commonly used, in India.

L-35 Disposal Techniques

Composting:-

- **In this method the putrescible organic material in solid – wastes is**
- **digested anaerobically and converted into**
- **humus and stable mineral compounds.**
- **Its volume also considerably reduced and**

L-35 Disposal Techniques

- is made free of most of the pathogenic organisms.
- It is a hygienic method.
- This is best suited to Indian conditions,
- especially for small and medium size towns.

- There are three methods of composting, as explained below:

L-35 Disposal Techniques

Composting by Trenching:-

- by sandwiching 5 cm layers of
- good soil or animal dung in semi – liquid form,
- till the heaps rise about 30 cm above the ground level.
- A layer of 5 to 7.5 cm of
- good earth is then spread on top
- to prevent the flies and
- for the wind blowing them off.

L-35 Disposal Techniques

Composting by Trenching:-

In this method

- **4 to 10 m long,**
- **2 to 3 m wide and**
- **0.7 to 1.0 m deep area made**
- **at a clear spacing of 2 m.**

Solid waste is disposed of into these trenches in layers of

- **15 cm and**

L-35 Disposal Techniques

- Within 2 – 3 days, intense biological action starts .
- After 4 – 5 months it is fully stabilized and
- changes into warm oduorless powdery, humus having fertilizing value.

- It is then removed from trenches,
- sieved on 1.25 cm sieve to remove
- coarse inert materials like stones, brick bats, broken glass etc.

L-35 Disposal Techniques

Open Window Composting:-

- The, coarse inert matter is first removed.
- Then it is dumped on the ground as:

- 5 to 10 m long,
- 1 to 2 , wide and
- 0.5 to 1 m high piles

- at about 60% moisture content.
- The pile is then covered with good soil/animal dung.

L-35 Disposal Techniques

- Due to biological activity through aerobic bacteria, temperature rises to
- 75^0 in piles.
- After few days the pile is turned up for cooling and aeration.
- The pile temperature again rises and the process of turning cooling and aeration is repeated.
- The complete process may take
- about 4 to 5 weeks.

L-35 Disposal Techniques

Mechanical Composting:-

The above methods of composting is laborious, time consuming and require large land area.

- **These difficulties can be solved by mechanical composting, in which**
- **stabilization of putrescible organic matter is done by**
- **mechanical devices of turning the compost.**

L-35 Disposal Techniques

- . Mechanical composting stabilizes the solid – wastes only
- within 3 to 6 days.
- The various unit processes or operations involve in a large scale.

L-35 Disposal Techniques

- Stabilization is carried out in mechanical digesters.
  which are of various types,
- such as pits or cells,
- windows or stacks, and
- vertical or horizontal cylinder.

L-35 Disposal Techniques

- Disposal into Sea:-
- The solid waste disposal done in coastal areas having
- deep sea water (> 30 m) at
- a reasonable distance (≤ 16 to 20 km), and
- with strong forward current.
- This is quite a simple and cheap method

L-35 Disposal Techniques

Disadvantages.

- **The bulky and lighter components of solid wastes**
- **float, spread, and tend to return to the shores during high tides.**

- **During monsoons or stormy weather solid – waste has to be**
- **either stored or disposed of by some other methods.**

L-35 Disposal Techniques

- Some portion of the solid wastes may
- return and spoil the beaches,
- despite all the necessary precautions.

L-36 Solid Waste Management

Solid Waste Management:-

- **It is a planned system of effectively, controlling the production, storage, collection, transportation or processing disposal or utilization of a solid waste in**
- **a sanitary aesthetically acceptable and economical manner.**

L-36 Solid Waste Management

Solid Waste Management:-

It includes all

- **administrative,**
- **financial,**
- **legal and**
- **planning functions**

as well as the

- **physical aspects of solid waste handling.**

L-36 Solid Waste Management

The main objects of solid waste management are -

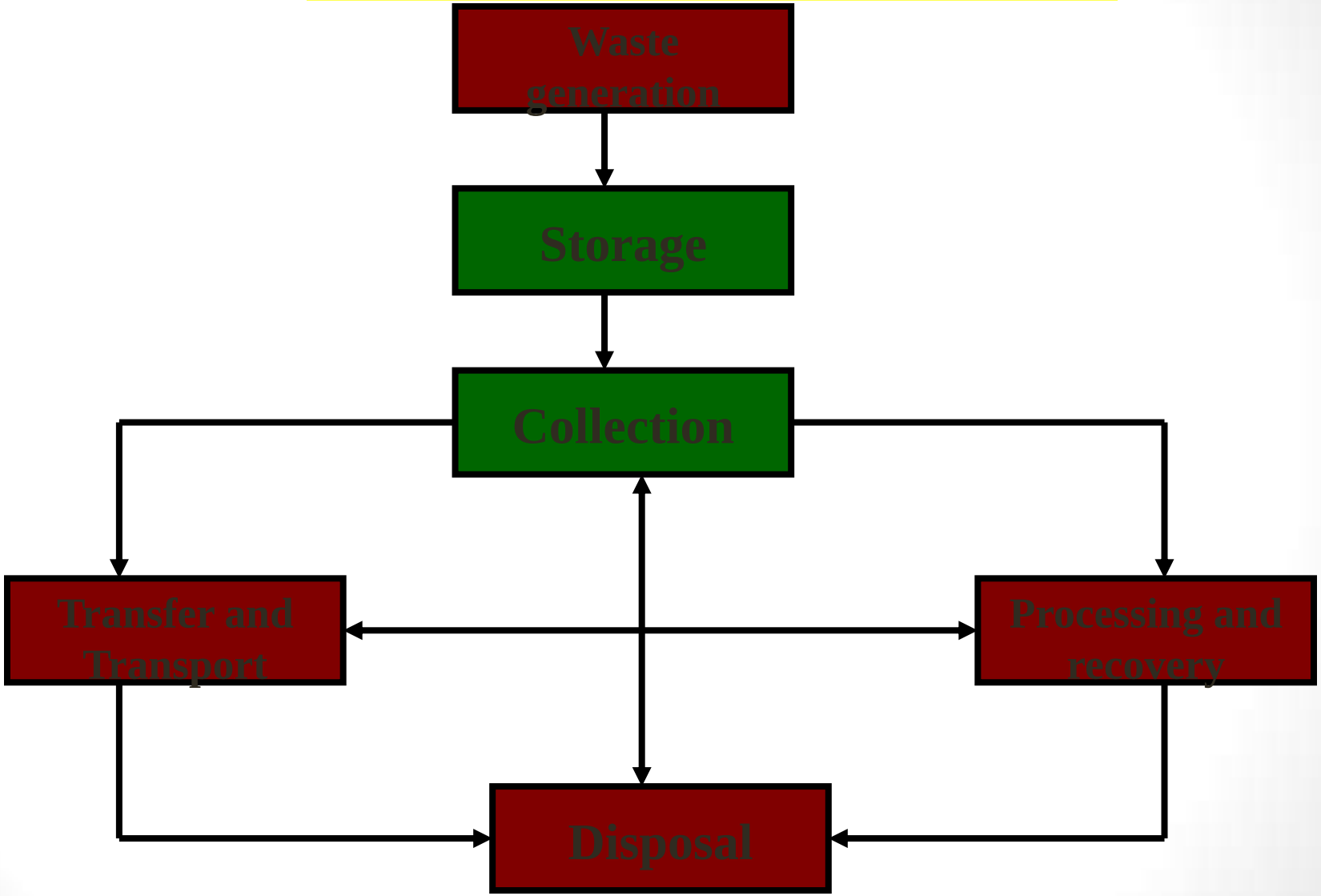
- **to remove discarded materials from**
- **inhabited placed for**
- **preventing spread of disease,**
- **to reduce insects and**
- **method used for management are environmentally acceptable.**

L-36 Solid Waste Management

One should consider

- **Materials recovery.**
- **Energy recovery.**
- **Day – to – day solid waste management.**
- **Waste generation**
- **Storage**
- **Collection Processing and**
- **recovery Transfer, Transport and**
- **Disposal**

L-36 Solid Waste Management



Activities of solid waste management with their relationship.

L-36 Solid Waste Management

- **The various activities involved with the management of solid wastes are:**

  - Waste generation.
  - On-site handling,
  - storage and processing.
  - Collection.
  - Transfer and transport.
  - Processing and recovery.
  - Disposal.

L-36 Solid Waste Management

(A) Solid Waste Generation:-

- Solid waste are generated from
- domestic,
- industrial,
- municipal etc.
- The quantity and composition of the waste is important for
- design and operation of solid waste management systems.

L-36 Solid Waste Management

- Factors that influence the quantity of municipal wastes generated are:-

- Geographic location.
- Season of the year.
- Use of kitchen waste grinders…..

L-36 Solid Waste Management

- Collection frequency.
- Characteristics of populae.
- Extent of salvaging and recycling.
- Public attitude.
- Legislation.

L-36 Solid Waste Management

- Significant reductions in the quantities of solid wastes will occur
- when and if the public and consumer – oriented
- companies are willing to change on their own volition
- to conserve national resource and
- to reduce the economic burdens
- associated with management of solid wastes.

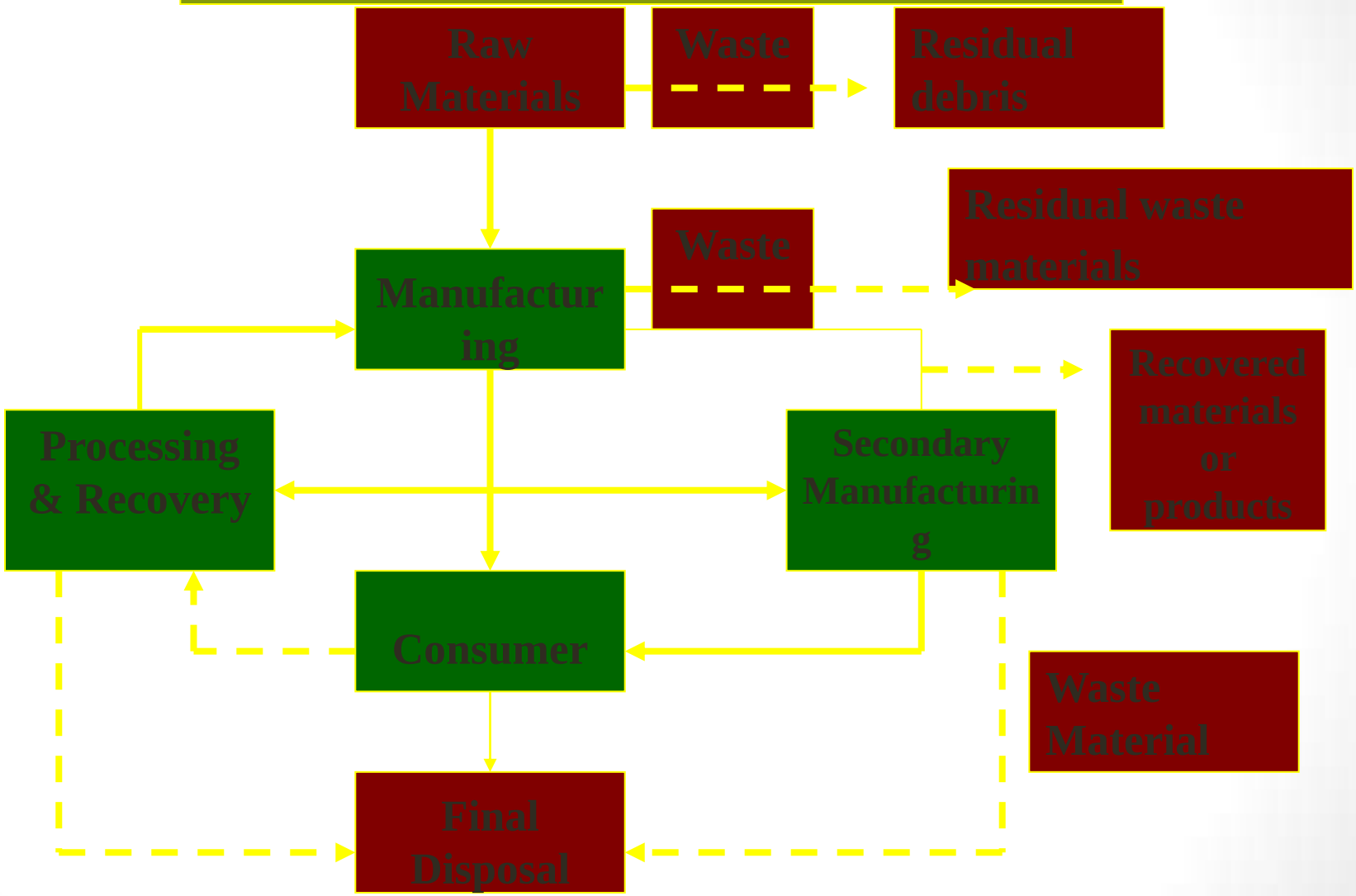
L-36 Solid Waste Management

Table ___ Generation Rates for Municipal Refuse

(Kg/Capita/Day)

Category	Rate
Residential Refuse	0.3 to 0.6
Commercial Refuse	0.1 to 0.2
Street Sweeping	0.05 to 0.2
Institutional Refuse	0.05 to 0.2

L-36 Solid Waste Management



Flow of Materials and the Generation of Solid Waste in Society.

L-36 Solid Waste Management

- **(B) Storage of Solid Wastes:- Storage of solid wastes of SWM which includes:**

- **The type of container to be used for storage.**
- **The container location.**
- **Public health and aesthetics.**
- **The collection methods to be used.**
- **Containers used should be of different in size.**

L-36 Solid Waste Management

- (C) Collection and of Wastes:
- These are essential parts of the SWM programme because of these two constitute
- about 75% of the total cost.
- Refuse collection in India is done from communal storage point.
- See previous slides

L-36 Solid Waste Management

- **(D) Transportation of Wastes:- Transportation of wastes from collection point to disposal site is another point of solid waste management.**

- **In India no single mode of transport can prove effective, economical and efficient due to congested and narrow lanes and streets in towns and cities.**

L-36 Solid Waste Management

- **Thus various types of vehicles used for transportation, these include handcarts to modern mechanized vehicles.**
- **Handcarts are used in narrow streets and small cities whereas large vehicles are used for transporting of refuse in well planned cities.**

L-36 Solid Waste Management

- There are three methods of transportation of solid waste from generation site to disposal site:
- **Direct Discharge Method:** In this method, wastes from the collection vehicle usually are emptied directly into the vehicle to be used to transport them to a place of disposal site.

L-36 Solid Waste Management

- **Storage Discharge Methods:- In this, wastes are emptied into a storage pit or onto a platform from which they are loaded into transport vehicles.**
- **Figure**

L-36 Solid Waste Management

- **Combined Direct and Storage Method:- In this method, both direct discharged and storage discharged methods are used. These are multi – purpose facilities designed to service a broader range of users than a single purpose facility.**

L-36 Solid Waste Management

- **(E) Processing and Recovery Techniques:- Processing techniques are used in solid waste management system to improve for recovering resources and for preparing materials for the recovery of conversion products and energy.**

L-36 Solid Waste Management

- **Important processing techniques and routinely are compaction, thermal volume reduction (incineration) and manual separation of waste components. The main objects related to the processing and recovery are-**

L-36 Solid Waste Management

- To determine appropriate time and place for processing process.
- To establish priorities.
- To recognize that most of the available recovery technology.
- To identify commercial place for the sale of recovered materials.
- To assess the impact of market stability on the waste management materials.

L-36 Solid Waste Management

- **(F) Disposal of Wastes:- Final disposal of solid waste is the last step of solid waste management. Different methods are used for disposal of waste those are discussed earlier in same chapter.**

NOISE POLLUTION