

LEARNING OBJECTIVES

By the end of this lecture, you will be able to describe;

- Solid wastes
- Methods of disposal of waste
- Sanitation barrier
- Sewage

SOLID WASTE

- Garbage (food wastes)
- Rubbish (paper, plastics, woods, metal, glass, throw away containers etc.)
- Demolition Products (Bricks, Pipes etc.)
- Sewage Treatment Residual
- Dead Animals

“The per capita daily waste produced is 0.25-2.5 kg in different countries”

SOLID WASTE (Contd.)

Solid Wastes if allowed to accumulate, is a health hazard because:

- Promotes fly breeding
- Attracts rodents & vermins
- Pathogens conveyed to food through flies
- Water & soil pollution
- Unsightly appearance, nuisance due to bad odours
- Food contamination

SOLID WASTE (Contd.)

A. Sources of Refuse

- Street Refuse – Collected by the street cleansing service or scavenging
- Market Refuse – Collected from markets
- Stable Litter – Collected from stables
- Industrial Refuse – Varying from inert materials to toxic compounds
- Domestic Refuse – Ash, Rubbish, Garbage

SOLID WASTE (Contd.)

B. Storage

- Its is done in galvanized steel dustbin with closed fitting covers.
- If collection is done every three days a bin having a capacity of 1.5-2 c. ft. would be adequate.
- Paper sack – recent innovation



- Public bins – caters larger number of people

SOLID WASTE (Contd.)

C. Collection

- Depends upon the funds available
- House to house collection – the best method
- Refuse collection vehicles; in form of closed vans rather than open carts
- Dustless refuse collector (latest arrival)

D. Methods of disposal

Dustless Refuse Collector



Methods of Disposal

i. Dumping

- Easy method of disposal of dry refuse
- Used in low lying areas
- Drawbacks of open dumping
 - Source of nuisance
 - Water & Air pollution
 - Refuse exposed to flies
- WHO expert committee condemned dumping as “a most insanitary method that creates public health hazards, a nuisance, and severe pollution of the environment”

Methods of Disposal

- ii. Controlled Tipping or Sanitary landfill
 - Most satisfactory method where suitable land is available
 - Trench is prepared → adequately compacted → covered with earth at the end of working day
 - Modified sanitary landfill

Methods of Disposal

iii. Incineration

- Method of choice where suitable land is not available
- Best for Hospital refuse disposal
- Practiced in several industrialized countries

Methods of Disposal

iv. Composting

- Method of combined disposal of refused + night soil or sludge
- Organic matter → Bacterial action → Humus Like Material **Compost**
- Compost – good soil builder, containing few or no disease producing organisms.
- Composting can be done by aerobic and anaerobic method.

Methods of Disposal



Methods of Disposal

v. Manure Pits

- Helpful in rural areas
- Garbage is dumped into manure pits and covered with earth after each day.
- Two such pits will be needed, when one is closed other will be in use.
- In 5-6 months, refuse is converted into manure

Methods of Disposal

vi. Burial

- Suitable for small camps
- Its contents maybe taken out after 4-6 months and used on the fields

**How the faecal borne diseases
are transmitted to new host???**

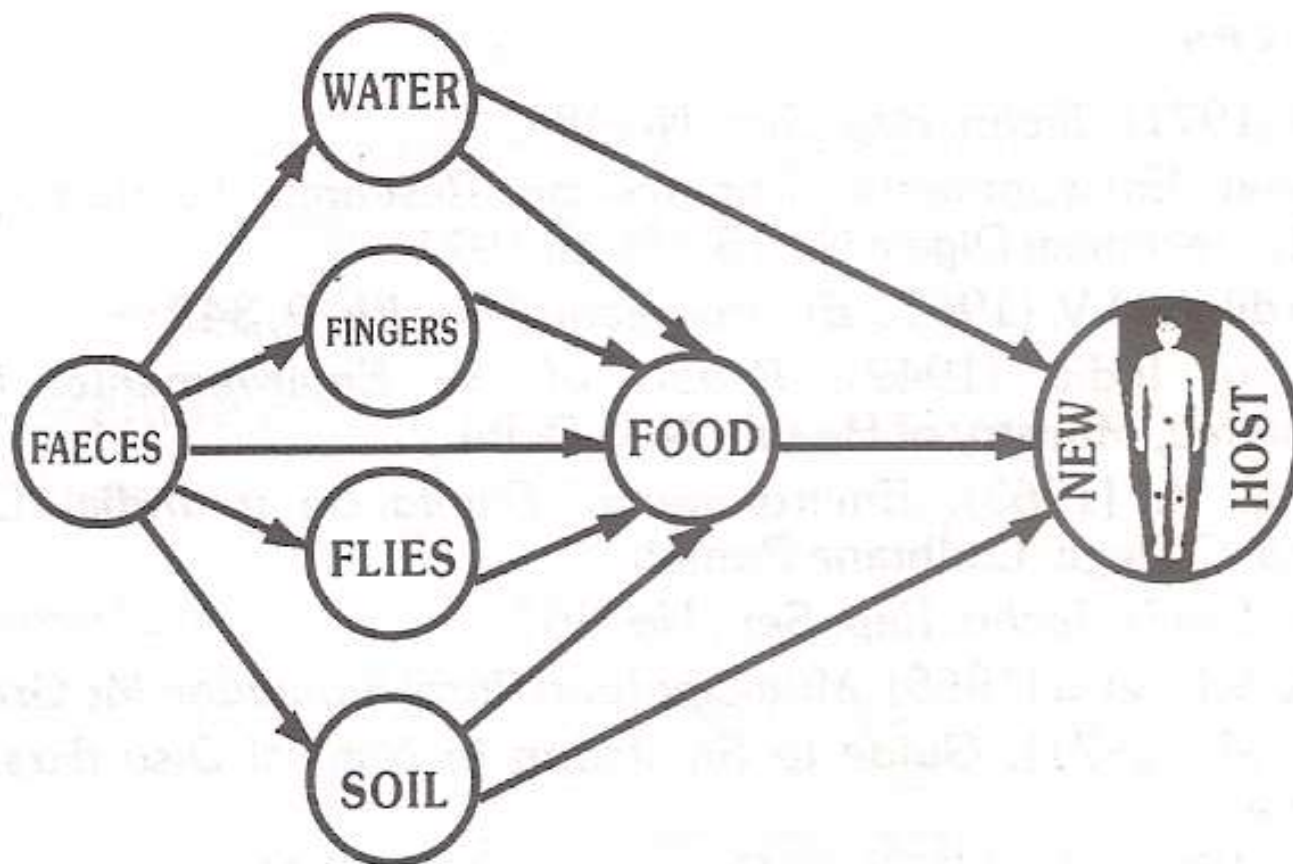


FIG. 1

Transmission of faecal-borne diseases (13)

SANITATION BARRIER

Sanitation barrier means provision of sanitary latrine such that there should be no access of flies to the human excreta.

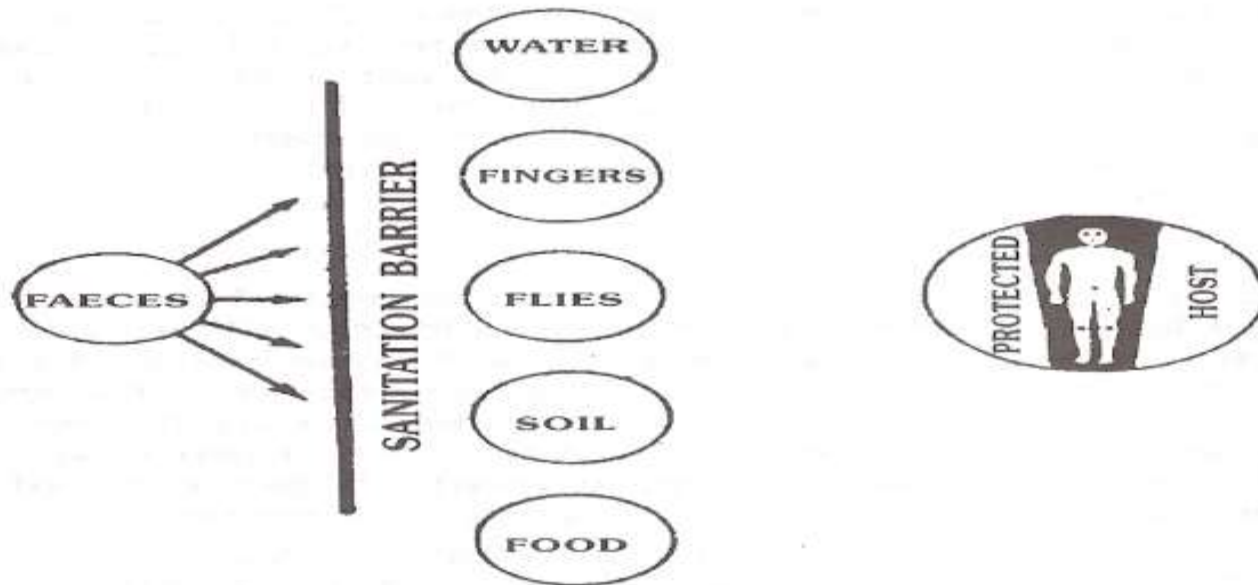


FIG. 2

Sanitation barrier to transmission of faecal-borne diseases (13)

What is Sewage

“It is waste water from community, containing solid and liquid excreta, derived from houses, factories & industries.”

SULLAGE:

Waste water which does not contain human excreta.

DRY WEATHER FLOW:

“The average amount of sewage which flows through the sewerage system in 24 hours”

WHAT IS SEWAGE(contd)

- **COMPOSITION OF SEWAGE:**

- Water - 99.9%
- Organic & inorganic substances – 0.1%
- Living organisms

The offensive nature of the sewage is mainly due to organic matter.

WHAT IS SEWAGE(contd)

- **AIM OF SEWAGE PURIFICATION:**
 - To “stabilize” the organic matter so that it can be disposed off safely.
 - To convert sewage into an effluent of an acceptable standard of purity which can be disposed of in land, rivers or sea.

WHAT IS SEWAGE(contd)

- Strength of sewage is expressed in terms of:
 - **Biochemical Oxygen Demand (BOD)**; BOD is defined as,
“amount of oxygen absorbed by a sample of sewage during a specified period, generally five days, at a specified temperature, generally 20 °C, for aerobic destruction or use of organic matter by living organisms”
 - BOD value range from 1mg/ ltr for natural waters to 300 mg/ ltr for untreated domestic sewage
 - BOD is 300mg/ ltr – Strong Sewage
 - BOD is 100 mg/ ltr – Weak Sewage

WHAT IS SEWAGE(contd)

- **Chemical Oxygen Demand**; the oxygen equivalent of that portion of the organic matter in the sample which is susceptible to oxidation by a strong chemical oxidizer.
- **Suspended Solids**
 - Suspended solids 100mg/ ltr – weak sewage
 - Suspended solids 500mg/ ltr – weak sewage

LEARNING OBJECTIVES

- By the end of this lecture, you will be able to describe;
- Methods of excreta disposal both for sewerred and unsewerred areas.
- Resulting diseases due to unsatisfactory waste disposal

METHODS OF EXCRETA DISPOSAL

- Unsewered Areas
- Sewered Areas

UNSEWERED AREAS

- Service Type (Conservancy System)



- Non Service Type (Sanitary Latrines)
- Latrines suitable for camps / Temporary use

NON SERVICE TYPES

- a) Bore Hole Latrine
- b) Dug well or Pit Latrine
- c) Water Seal type of Latrines
- d) Septic Tank
- e) Aqua Privy

NON SERVICE TYPES(SANITARY LATRINES) (contd.)

1. Bore Hole Latrine:

- Family type of installation
- Action is through anaerobic digestion

Merits :

- No need for services of sweeper
- No fly breeding

Demerits :

- Small capacity
- Special equipment required for construction
- Not very much used today

NON SERVICE TYPES(SANITARY LATRINES) (contd.)

2.Dug well or Pit Latrine:

Action of dugwell latrine is by anaerobic digestion.

Merits :

- Easy to construct, no special equipment required
- Greater capacity

NON SERVICE TYPES(SANITARY LATRINES) (contd.)

3. Water Seal type of Latrines:

- Squatting plate is fitted with a water seal
- Water seal is performing two important functions:
 - Prevent the access of flies
 - Prevents the escape of odours and foul gases
- More acceptable by the people

NON SERVICE TYPES(SANITARY LATRINES) (contd.)

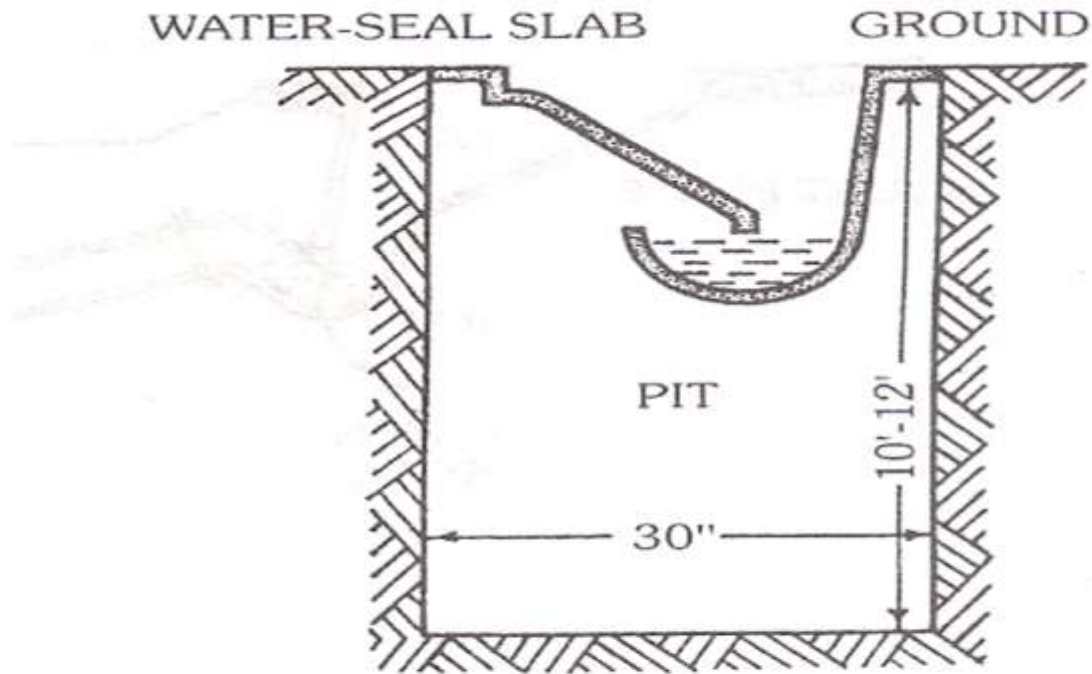


FIG. 5

Water seal latrine (direct type)

NON SERVICE TYPES(SANITARY LATRINES) (contd.)

3.SEPTIC TANK:

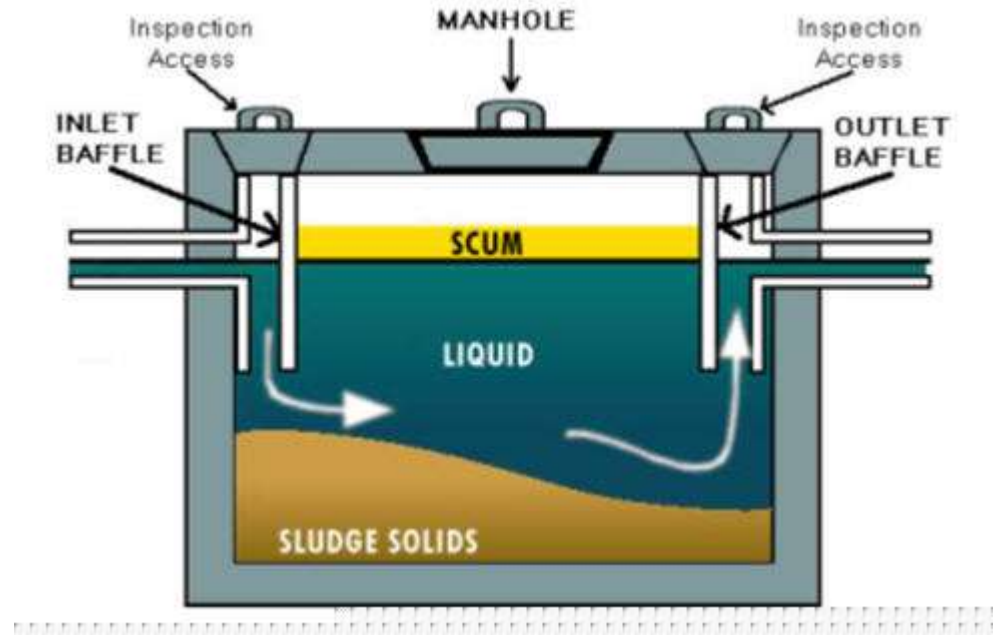
- Water –tight masonry tank into which household sewage is admitted to treatment.

Working of septic tank:

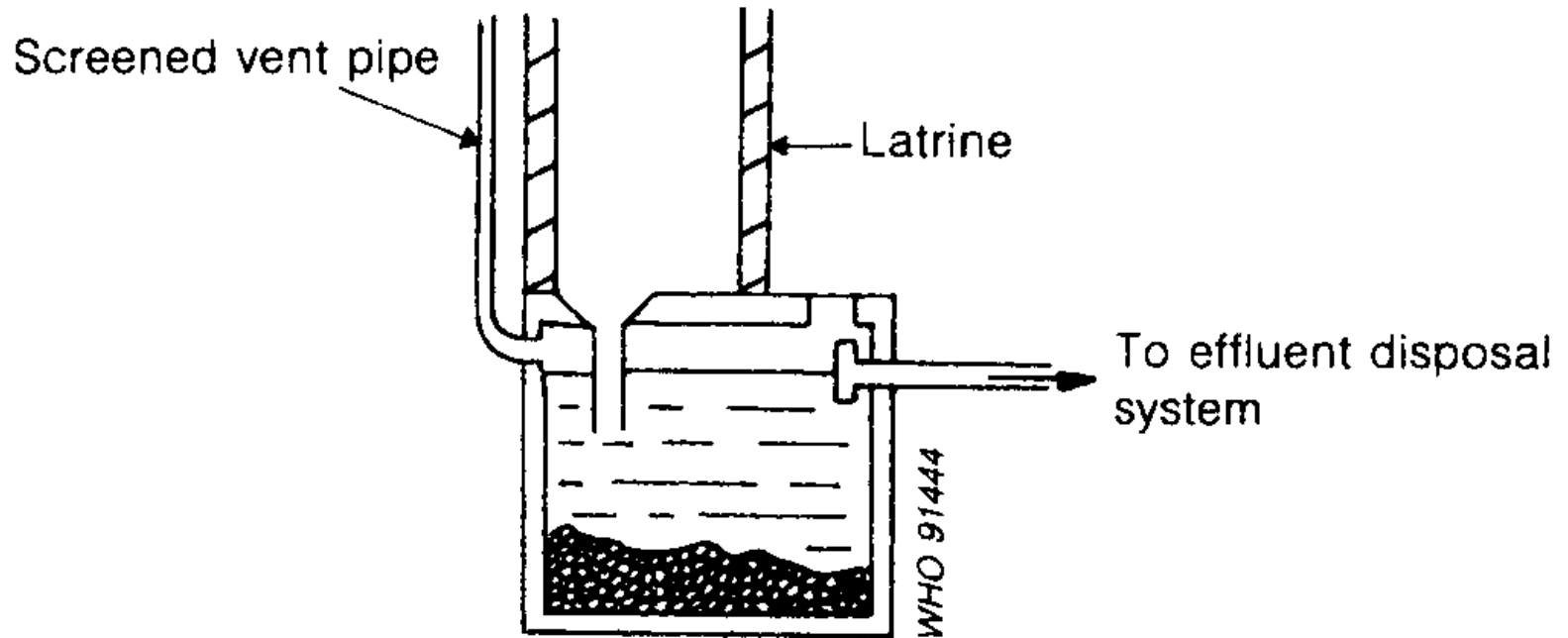
Purification of sewage by septic tank takes place in two steps:

- Anaerobic digestion
- Aerobic digestion

SEPTIC TANK



AQUA PRIVY



Latrines suitable for camps / Temporary use

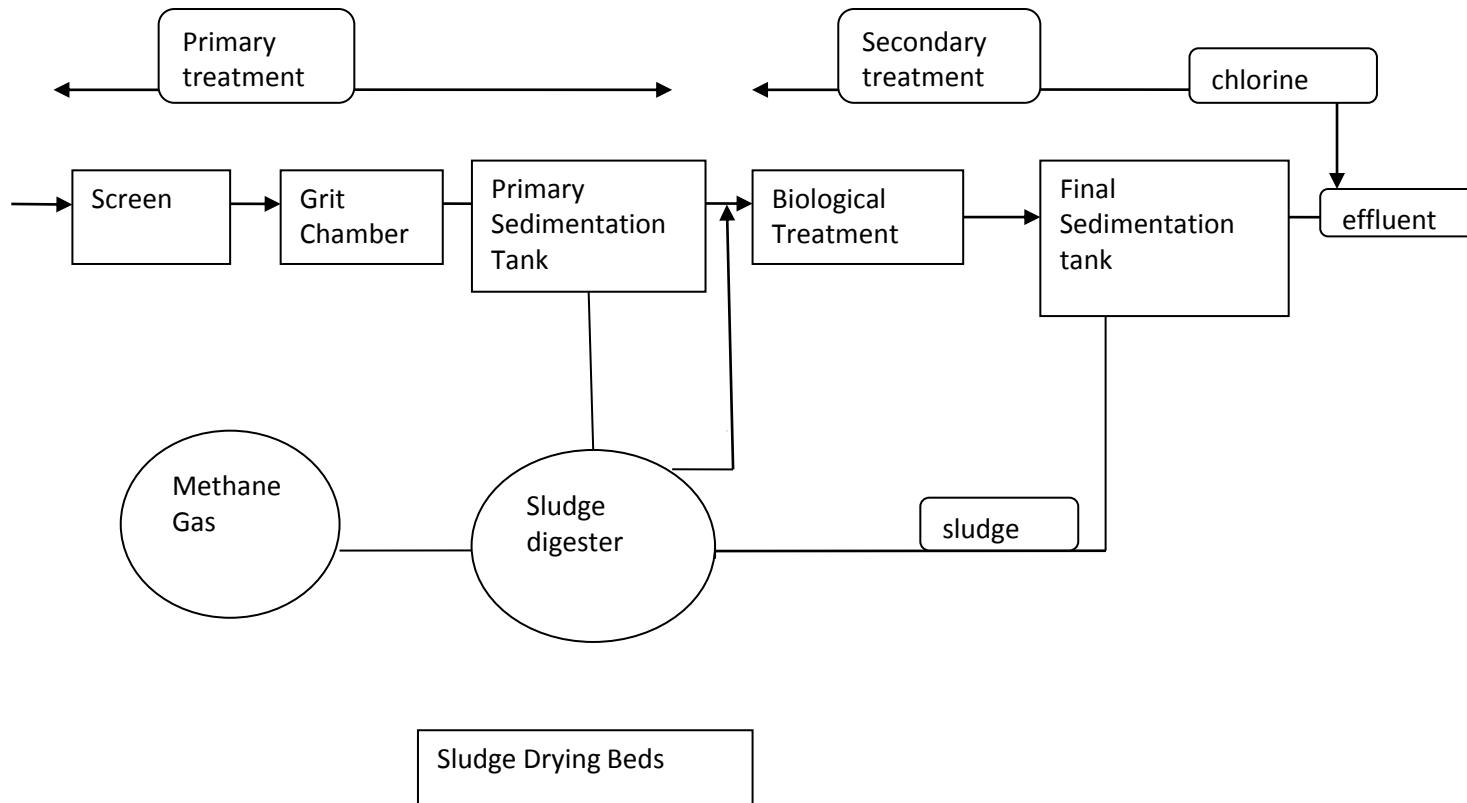
- Shallow trench latrine
- Deep trench latrine
- Pit latrine
- Bore hole latrine

SEWERED AREAS

1. Water carriage System Sewage Treatment

- Primary Treatment
 - Screening
 - Removal of grit
 - Plain sedimentation
- Secondary Treatment
 - Trickling Filters
 - Activated Sludge Process

Flow diagram of a modern sewage treatment plant



SEWERED AREAS (Contd.)

- **SECONDARY SEDIMENTATION:**

- The oxidized sewage from the trickling filter is led into secondary sedimentation tank where it is detained for 2-3 hrs.
- Sludge that collects in the secondary sedimentation tank is called “***Aerated sludge,***” as it is fully aerated.

- **SLUDGE DIGESTION:**

- One million gallons of sewage produces 15-20 tons of sludge.
- It takes 3-4 weeks or longer for complete sludge digestion, that is inoffensive & excellent manure.

SEWERED AREAS (Contd.)

- **DISPOSAL OF EFFLUENT:**

- DISPOSAL BY DILUTION:

It is disposal into water courses such as river & streams .

- DISPOSAL ON LANDS:

If suitable land is available effluent can be used for irrigation purposes.

SEWERED AREAS (Contd.)

2. Other Methods

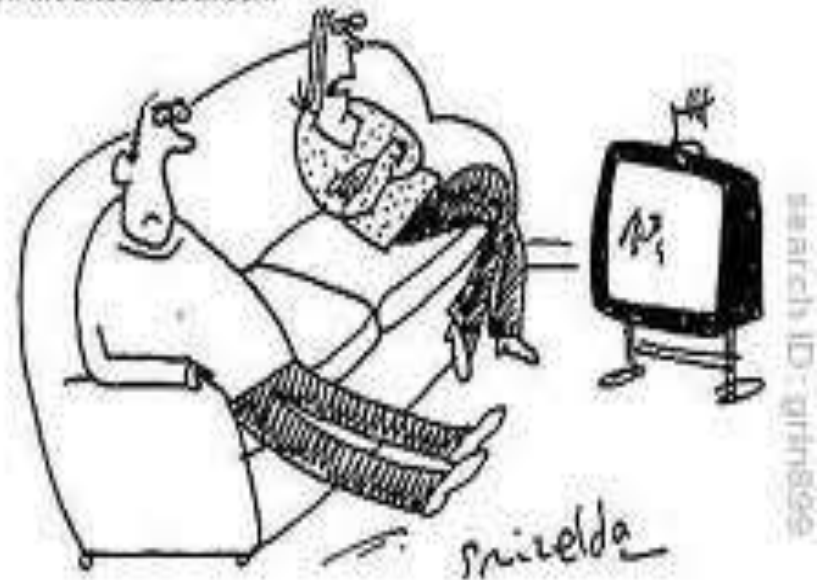
- Sea Out fall
- River Outfall
- Sewage farming
- Oxidation Ponds

IMPROPER DISPOSAL OF HUMAN EXCRETA/ NIGHT SOIL

The resulting diseases are:

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- Typhoid & Paratyphoid
- Dysentry
- Diarrhea
- Cholera
- Hookworm Infestation
- Ascariasis
- Viral hepatitis etc.



"Can you put the rubbish out in next door's garden."



Thanks

