

The University of Zambia
School of Engineering
Dept. of Civil & Environmental Engineering

CEE 4412: Environmental Engineering I
WASTEWATER/FAECAL SLUDGE
MANAGEMENT

JM T

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Objectives

The aim of this topic is to introduce students to the aspects of **wastewater management**. Specific objectives include to:

- ❖ Introduce students to wastewater and its characteristics
- ❖ Highlight environmental and public health implications of Wastewater
- ❖ Explain some of the amelioration measures for addressing the environmental and public health impacts associated with wastewater

Sanitation

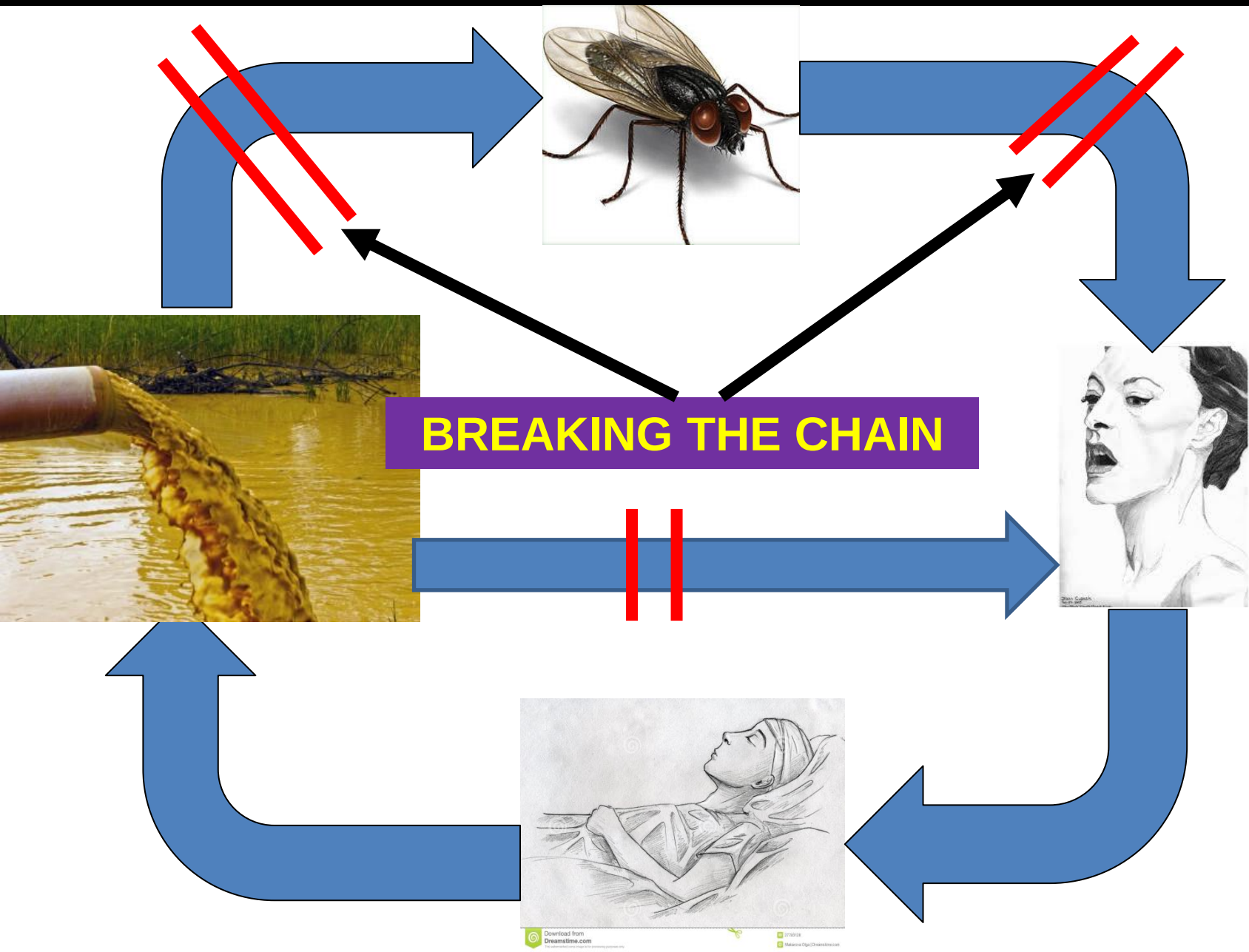
Before we delve into wastewater management, we firstly look at sanitation which means:

- ❖ Making Healthy

or

- ❖ Removal and safe disposal of wastes that can be hazardous to health

Sanitation – Why??



Sanitation - What does it consist of?

1. wastewater management (Black and Grey Water)



Sanitation - What does it consist of?

2. Faecal Sludge and excreta management



Sanitation - What does it consist of?

3. Solid waste management



Sanitation - What does it consist of?

4. Drainage for rain or storm water



Wastewater

What is wastewater?

- ❖ Water that is no longer needed – mostly which has **served the intended purpose** and in the process has been loaded with various pollutants in form of *suspended, colloidal* and *dissolved constituents*.

Or

- ❖ Any water that has been **adversely affected in quality** by anthropogenic activities and needs to be disposed of.

Types

❖ Domestic sewage or pure sewage (**Excreta + Sullage**)

❖ Trade effluents

❖ Industrial

❖ *Sewage + Trade = Municipal Wastewater*

Faeces +
Urine (Black Water)

- ❖ Cleaning of food; Food left-overs
- ❖ Dish washing; Body washing; Washing of clothes
- ❖ Washing of floors (Grey Water)

Characteristics

Organic Matter (CHNOP)

- ❖ High content of organic matter mainly in form of:-
 - Carbohydrates
 - Fats and Grease
 - Protein

Raw Sewage Strength (BOD)

Characterisation of wastewater is usually through the organic matter content as follows:

WEAK	MEDIUM	STRONG
>200	<200 to >350	>350

Determination of strength is either through Chemical Oxygen Demand or Biochemical Oxygen Demand.

Measurement of Organic Matter (Strength)

Chemical Oxygen Demand (COD)



This test will give the oxygen required to oxidise both the organic and non organic component of the wastewater

Biochemical Oxygen Demand (BOD)

- ❖ Simulating Natural process
- ❖ Organic matter + DO + Saprophytic bacteria = More
Bacteria + H₂O + CO₂ + Energy
- ❖ For domestic wastewater COD/BOD = 1.5 – 1.8
- ❖ COD vs BOD importance of relationship

Biochemical Oxygen Demand (BOD)

❖ Ultimate BOD versus BOD_5^{20}

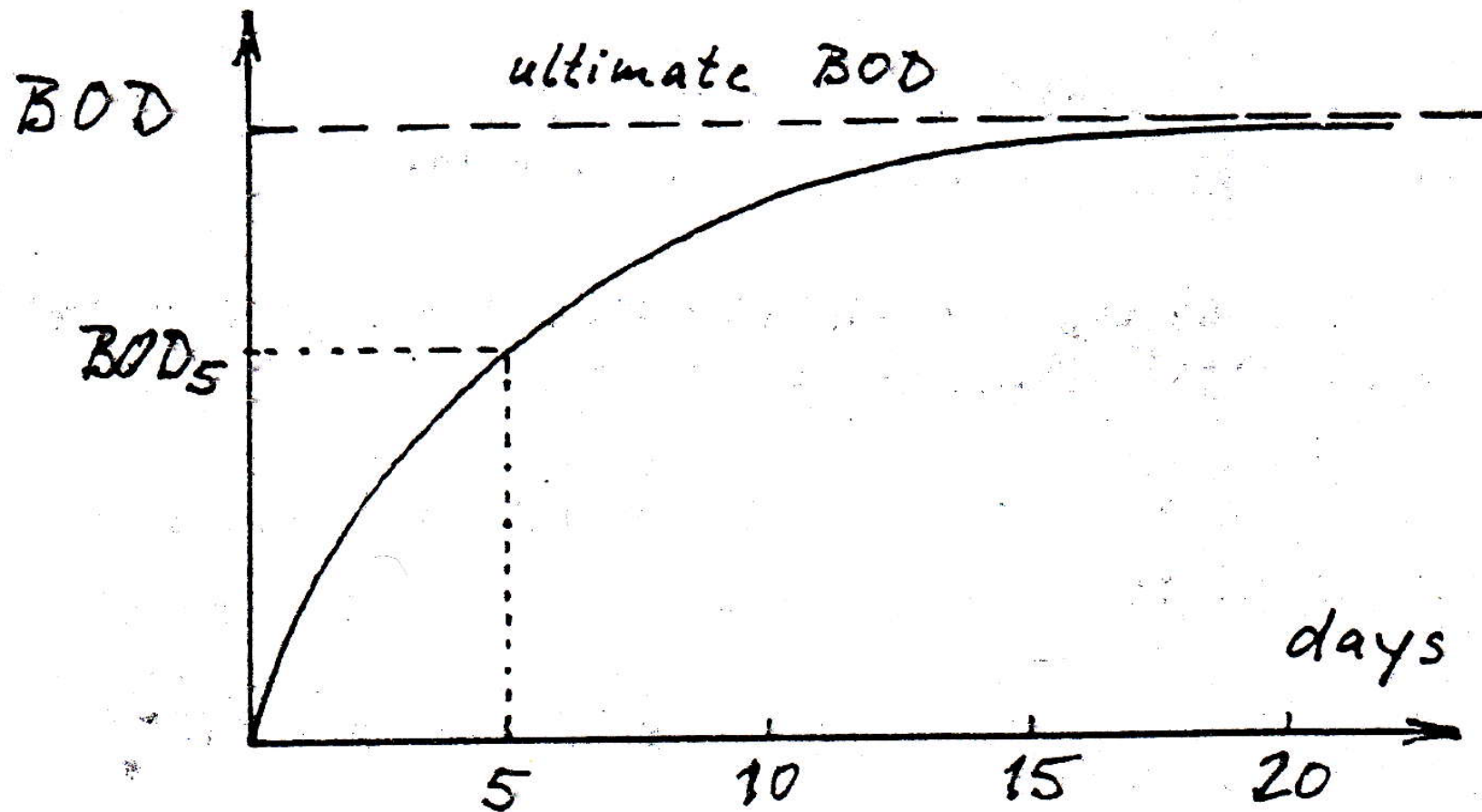


Figure 50. BOD curves