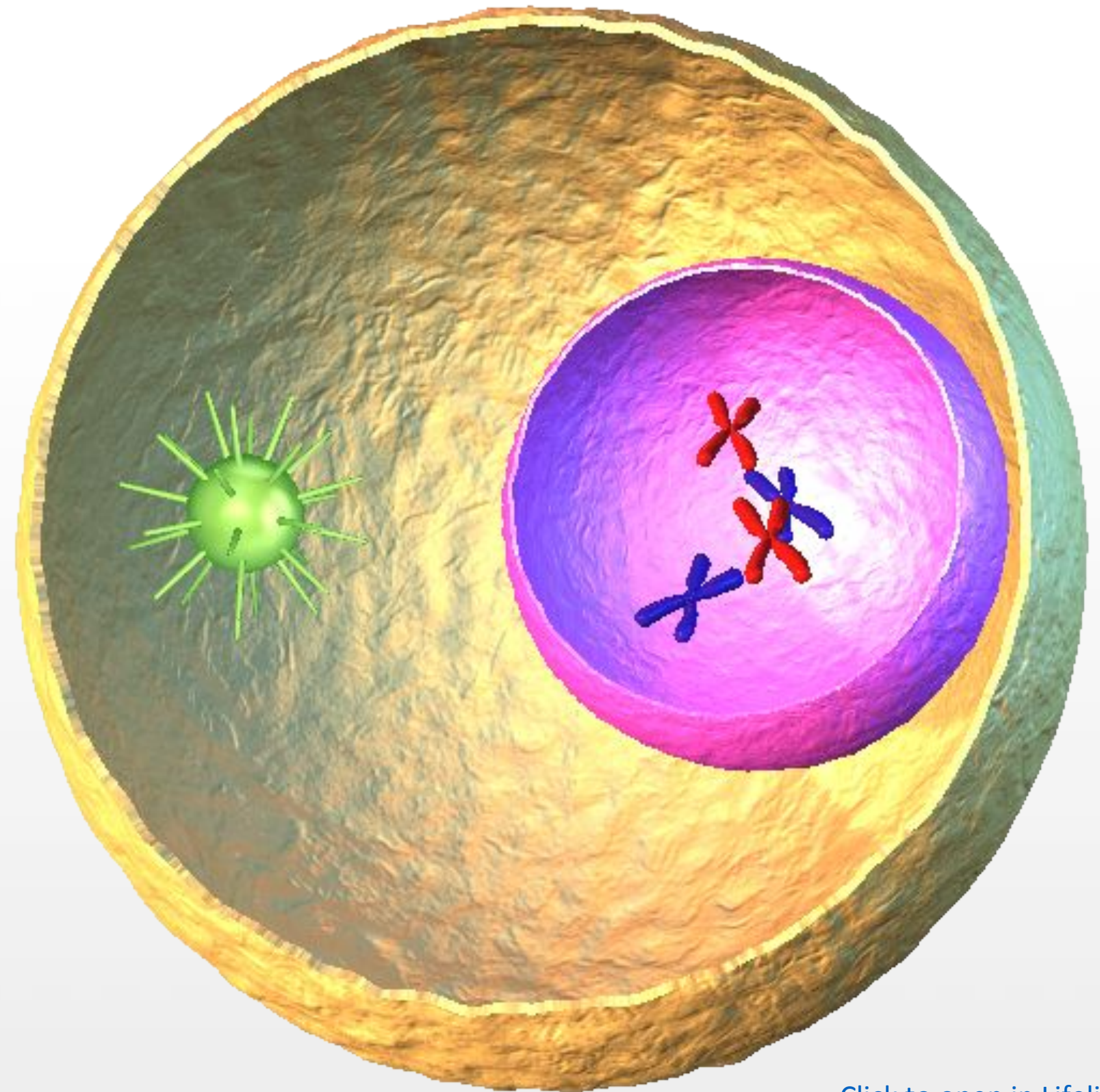


Soil Pollution & Solid Waste Management

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Definition of Soil Pollution

Soil receives solid and liquid pollutants from both natural and man-made sources. Gaseous pollutants come down on land surface in the form of liquid. These pollutants undergo chemical, bio chemical and photochemical reactions and remain unchanged. This ultimately changes the natural composition of soil, which leads to **soil pollution**. These pollutants enter the body of living organisms through plants or specifically through food chain and show the adverse effects.

Source of Soil Pollution

(1) Chemical fertilizer:

- (a) Chemical fertilizers cannot support soil bacterial activity and as a result natural enrichment of soil with humus is inhibited.
- (b) Chemical fertilizers containing excess nitrogen, phosphorous & potassium ultimately reduce the quality of vegetables.
- (c) Cattle, consuming nitrate enrich vegetables, is effected.
- (d) Excessive use of chemical fertilizer reduces the ability of plant to fix atmospheric nitrogen, which ultimately causes of degradation of soil quality.
- (e) Excessive use of potassium fertilizer in soil may reduce the quantity of valuable ascorbic acid (vitamin C) and carotene in fruits and vegetables grown in such soil.

(2) Pesticide:

- Pesticides are used to kill the pest. These pesticides are usually toxic and sometimes carcinogenic. After spraying the pesticide, the residue of it may affect the quality of soil.

(3) Anthropogenic pollutants:

- Generally some solid, semi-solid and liquid wastes are created by human beings due to agricultural, industrial and commercial activities are dumped on the land. These wastes are sometime toxic in nature and this reduces the quality of soil.

Solid Waste

Solid waste, often called the third pollution, is that solid material which arises from various human activities and which is normally discarded as useless or unwanted. It consists of the highly heterogeneous mass of discarded materials from the urban community as well as more homogeneous accumulation of agricultural, industrial and mining wastes.

Sources of Solid Waste

The main sources of solid waste are -

- i) Domestic area
- ii) Commercial area
- iii) Industrial area
- iv) Agricultural area
- v) Hospitals

Classification of Solid Wastes

Garbage: The solid wastes which are produced during the preparation or storage of meat, fruit, vegetables etc., are called **garbage**.

These wastes have **moisture content of 70%** and **heating value of 6×10^6 J/kg**. These are generally **biodegradable**.

Rubbish: These types of solid wastes are mainly non-biodegradable. It may be **combustible** and **non-combustible**. The combustible wastes would include paper, wood, scrap, rubber, leather etc. Non combustible wastes are metal, glass, ceramics etc. These wastes contain **moisture content of about 25%** and **heating value of 15×10^6 J/kg**.

Agricultural waste: Crop residue, animal manure are mainly considered as agricultural waste. Rural people mainly depend on these wastes as their main source of fuels.

Industrial waste: All types of industrial waste like metallic, non-metallic, organic compounds come under this category.

Pathological waste: The main source of this waste is hospital and nursing home. Dead human being, animals, disposable glass and metallic items come under this category. The disposable and unwanted medical articles are also considered as pathological waste.

These waste sometime are referred as biomedical **wastes**. It contains about **85% moisture** and **heating value** is about **2.5×10^6 J/kg**

- Besides these different types, the solid wastes which are generated due to domestic as well as commercial activities are known as **municipal solid waste (MSW)** and which are coming from the industrial sectors are known as **industrial solid waste (ISW)**.

- There is another kind of classification of solid waste. This classification is based on the activity and effects on living beings.

According to this classification solid waste are grouped into two classes -

1. Hazardous solid waste (HSW)

2. Non Hazardous solid waste (NHSW).

- Sometime, domestic and commercial wastes are togetherly called as **urban waste**.

Different Methods of Disposal of Non-Hazardous Solid Waste

Open Dumping: Open dumping of solid waste is very common in India and other countries. It is cheap and requires no technical planning. Generally low lying areas of the out skirts of the town and cities are used for that purpose. The open dumps cause public health problems by encouraging the breeding of flies, rats, mosquitoes and other pests. They also become a source of objectionable smell and cause air pollution when the wastes are burnt in order to reduce their volume and conserve space.

Sanitary land filling: Sanitary land filling is an engineered operation designed and operated according to the acceptable standards. It may be defined as a method of disposing wastes on land without creating nuisance or hazard to public health or safety. The operation is carried out without environmental damage and in areas which are already spoiled or in need for restoration.

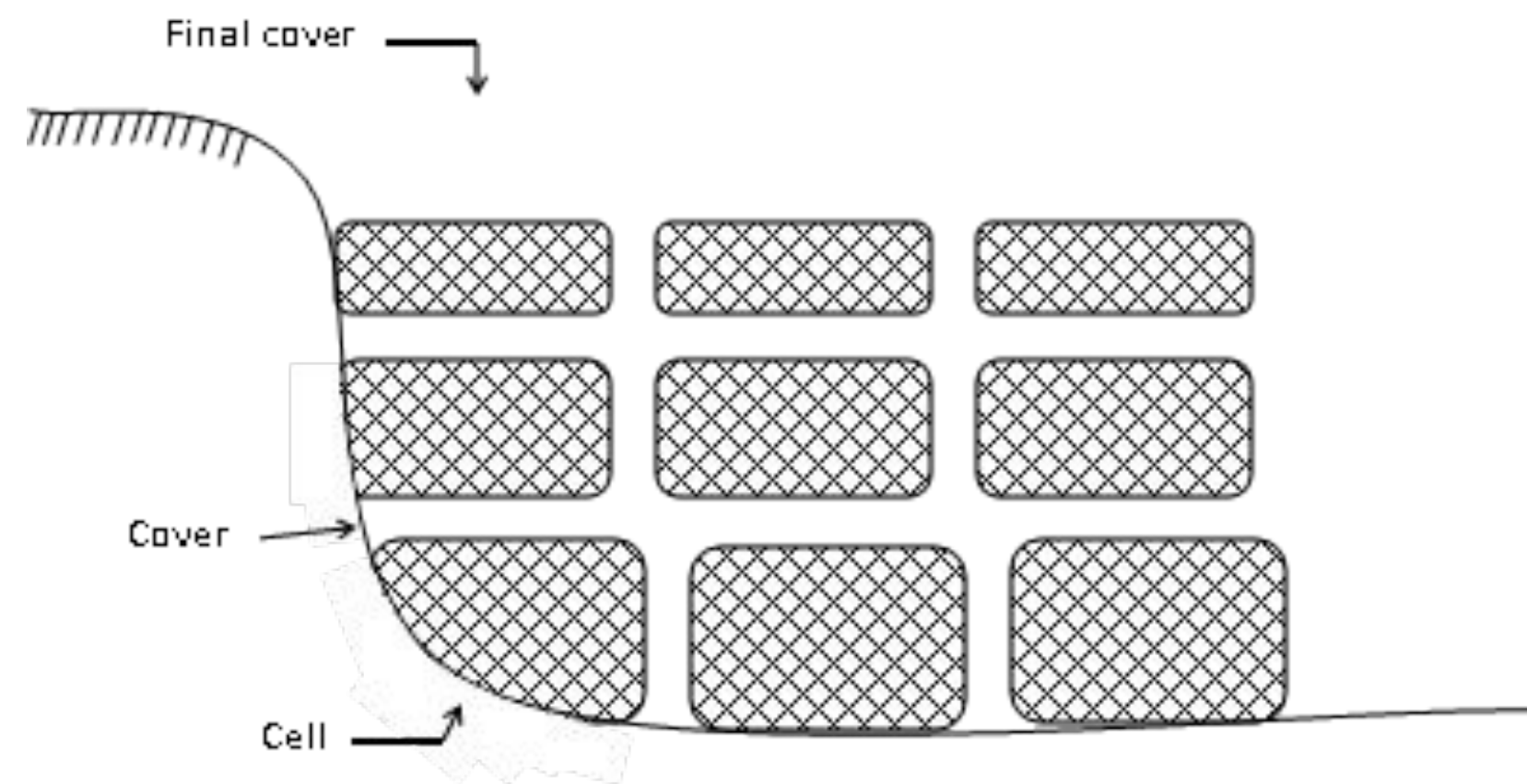


Fig. 5.6 Sanitary land filling

Phase	Operation	Remark
1st Phase	Aerobic digestion and as a result depletion of O_2 present in the waste.	Increase of temperature.
2nd Phase	Anaerobic digestion.	Hydrogen & carbon dioxide are evolved.
3rd phase	Methanogenic activity.	Formation of CH_4 .
4th phase	Methanogenic activity becomes stabilized.	
5th phase	Methanogenic activity stopped or reduced.	All the organic matter present in the waste is completely digested and the system returns to aerobic condition.

Incineration:

Incineration involves the burning of solid waste at high temperature, left over ashes plus metals and unburnt combustible amount reduced to perhaps 25% of the original waste. This residue must still be disposed of in same manner incineration leads to air pollution unless the plant is designed, equipped and operated to comply with air pollution standards. Typical air pollutions from incineration are **fly ash, sulphur dioxide, hydrogen chloride** and **organic acids**. The materials which are non-combustible are removed from the waste by gravity or magnetic separation. Many of the separated materials, fine glass or metals can be recycled. Air pollution can be controlled by installation of proper controlling equipments.

Composting

In contrast to sanitary land filling, composting of waste materials is an aerobic method. Many types of micro organisms are present in the waste, stabilize the organic matter in the waste to produce soil conditioner. The organisms include bacteria which predominate at all stages, fungi which often appear after last week and actinomycetes which assist during the final stage.

Initially the process starts with mesophilic bacteria which oxidizes the organic matter in the waste to CO₂ and liberate heat. The temperature rises to about 45°C and at this point the thermophilic bacteria takes over and continue the decomposition. During this phase the temperature rises to about 60°C. The waste is periodically turned over to allow sufficient O₂ to penetrate to all parts of the waste to support aerobic life. After about three weeks the compost is stabilized. The end point of a composting operation can be measured by noting a drop in temperature. The compost should have typical smell & dark brown color.

Solid waste is the solid material which arises from various human activities and which is normally discarded as useless and unwanted.