

8.3 Solid domestic wastes

Significant ideas:

- Solid domestic waste (SDW) is increasing as a result of growing human populations and consumption.
- Both the production and management of SDW can have significant influence on sustainability.

Applications and skills:

- **Evaluate** SDW disposal options.
- **Compare and contrast** pollution management strategies for SDW.
- **Evaluate**, with reference to figure 3, pollution management strategies for SDW by considering recycling, incineration, composting and landfills.

Guidance:

- SDW includes household waste such as paper, glass, metal, plastics, organic (kitchen or garden), packaging, construction debris, and clothing.
- Students should consider the amount and source of non-biodegradable pollution generated within a chosen locality and how it is managed.
- The adoption of the circular economy provides an alternative approach to waste and sustainability.

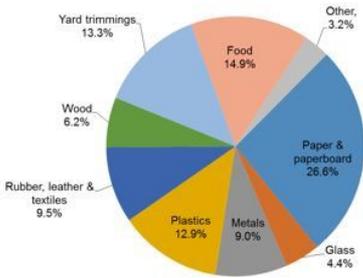
International-mindedness:

- Pollution can be transborder; the pollution from one country may affect another.
- Differences in development level of countries can influence the amount and type of SDW they generate.

Theory of knowledge:

- The circular economy can be seen as a paradigm shift—does knowledge develop through paradigm shifts in all areas of knowledge?

- There are different types of SDW, the volume and composition of which changes over time.



Total MSW Generation (by material), 2014
258 Million Tons (before recycling, composting, or combustion with energy recovery)

←- USA statistics

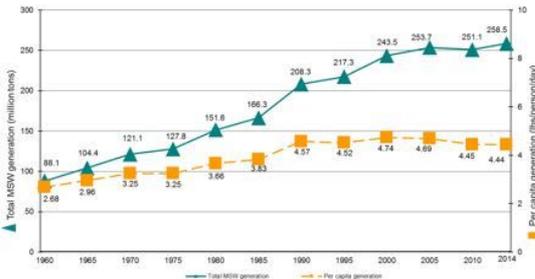
SDW or Municipal solid waste (MSW) is paper, packaging, organic materials, glass, dust, metals, plastic, textile, paint, old batteries and electronic waste.

Waste collected from homes and shops

5% of total waste

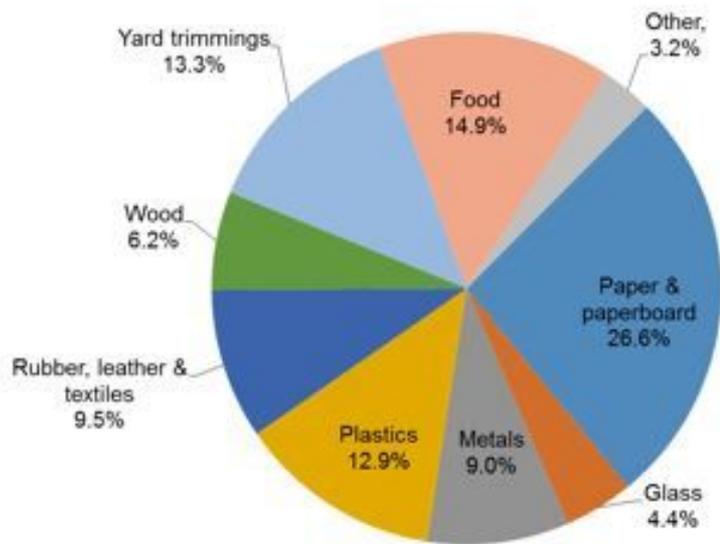
Waste we can control

3.5 kg/day in USA, 1.4kg/day in the EU and less in LEDC

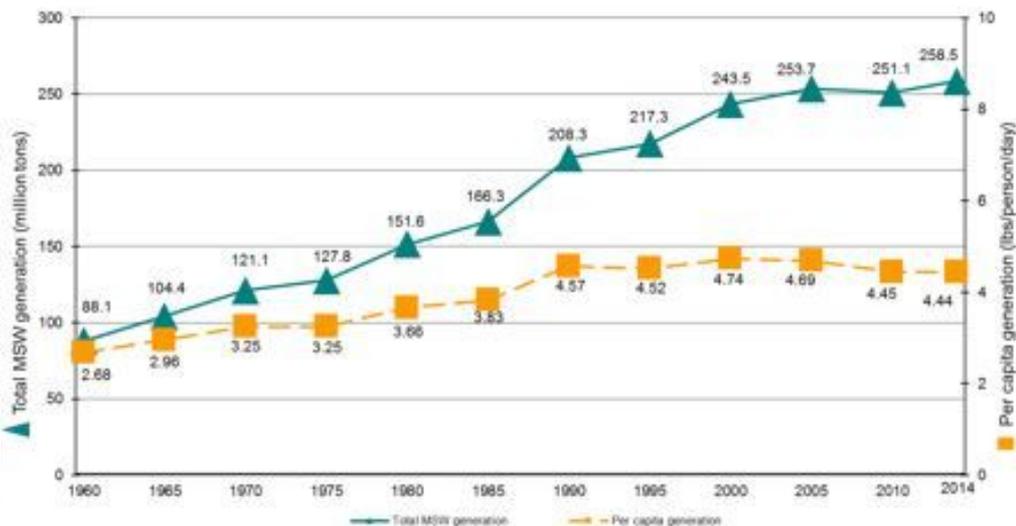


MSW Generation Rates 1960 to 2014

Total MSW Generation (by material), 2014 258 Million Tons (before recycling, composting, or combustion with energy recovery)



Total MSW Generation (by material),
258 Million Tons (before recycling,
composting, or combustion with energy
recovery)



MSW Generation Rates 1960 to 2014

- There are different types of SDW, the volume and composition of which changes over time.

Types of SDW

Biodegradable
i.e. Food waste,
paper, green waste

Toxic i.e.
Pesticides,
Herbicides

Recyclable
i.e. Paper, glass,
metal, plastic,
clothes, batteries

eWaste
i.e. TVs,
computers,
phones, fridges

Hazardous
i.e. Paint,
chemicals, light
bulbs, strong
cleaners

Medical
i.e. Needles,
Syringes,
Drugs

- The abundance and prevalence of non-biodegradable pollution (such as plastic, batteries or e-waste) in particular has become a major environmental issue

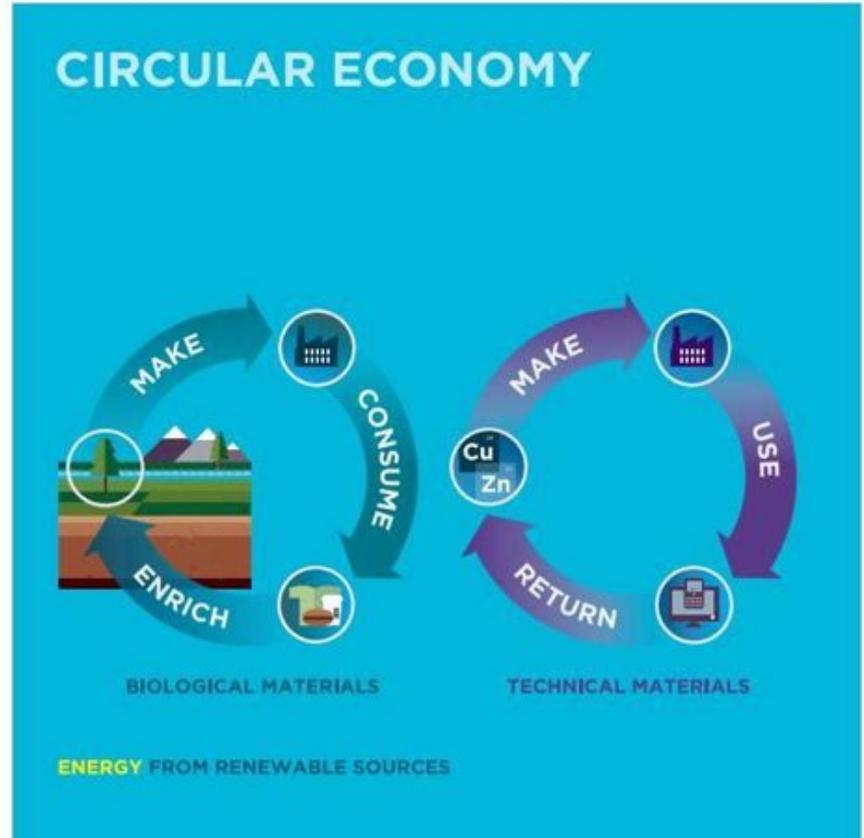
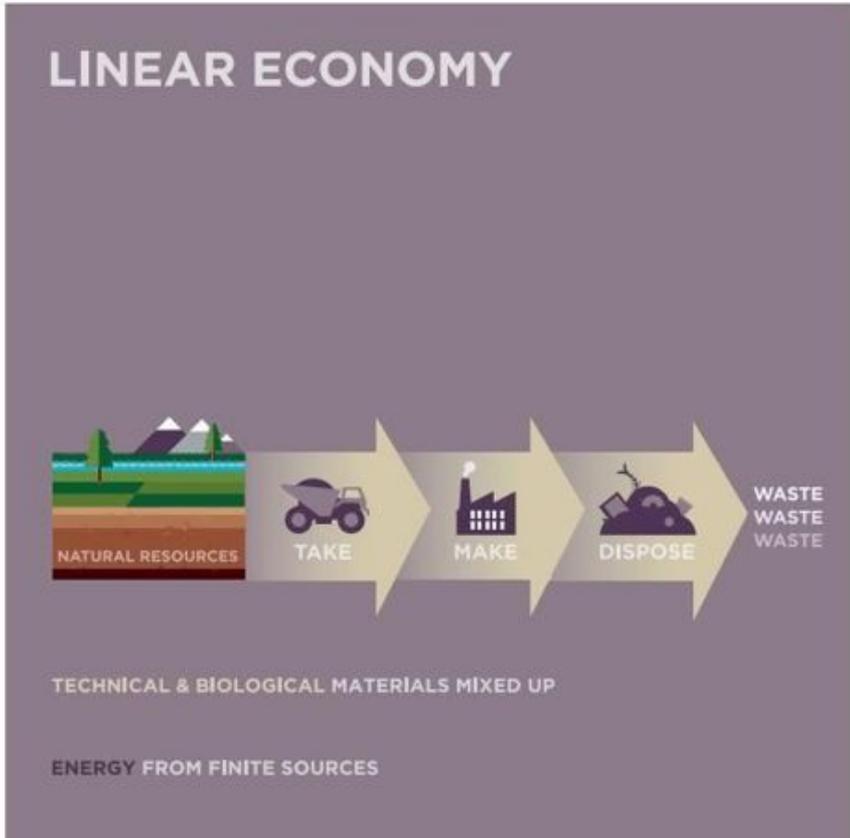
Circular economy versus the linear economy aims to:

- Be restorative to the environment
- Use renewable energy sources
- Eliminate or reduce toxic waste
- Eradicate waste through careful design



| Principle | Agriculture sustainable practice | Circular economy practice |
|------------------|----------------------------------|--|
| Design out waste | Reduce food waste | Recyclable plastic, metals |
| Think in systems | Systems are non-linear | Increase effectiveness and connections through manufacturing |

There is no away which things can be thrown



- Waste disposal options include landfills, incineration, recycling and composting.

Advantages and Disadvantages

| | | Advantage | Disadvantage |
|---|-----------------|---|---|
| <p>Other options?</p> <p>Composting..</p> <p>Dumping at sea...</p> <p>Ejection into space?</p> <p>What else is there? What can you come up with?</p> | Landfill | <p>Landfill advantage of disposal of waste / way of producing energy (in the form of methane) from waste / no time/labour required / creates land e.g. in Hong Kong; Manhattan, Singapore</p> | <p>Landfill disadvantage pollution of watercourses by leachate / unpleasant odors /increases vermin / attract animals and insect pests / can cause disease/sickness/illnesses to spread / produces methane which is a GHG/greenhouse gas / takes up land area / potential of subsidence/contamination for future building land;</p> |

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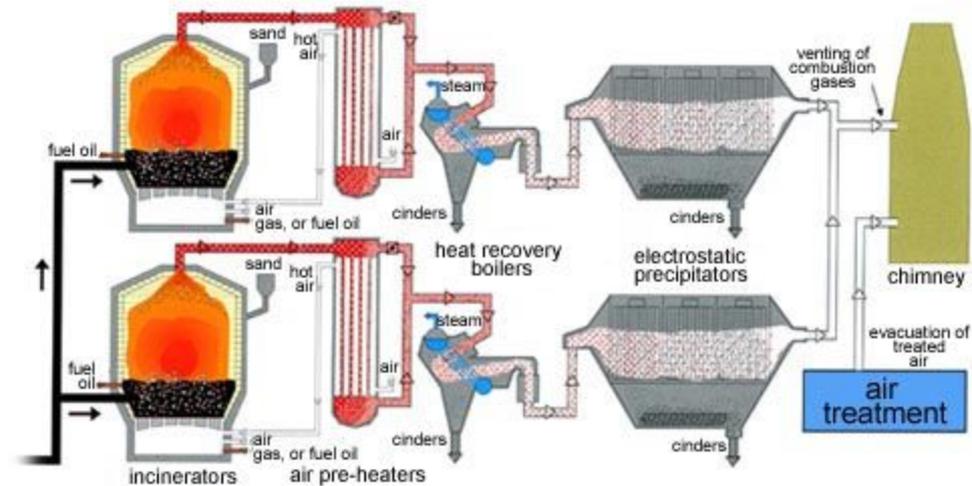
Advantages and Disadvantages

| | | Advantage | Disadvantage |
|---|------------------|--|--|
| | Recycling | <p>Recycling advantage reduced amount of energy required to recycle compared with exploiting the resource /reduces amount of material in landfill sites / can be used to make new products / largely prevents GHG/greenhouse gas emissions / creates job opportunities / encourage local industries;</p> | <p>Recycling disadvantage requires energy / involves transport of sometimes heavy/bulky goods / may produce toxic waste/pollutants / time/labour required;</p> |
| <p>Other options?</p> <p>Composting..</p> <p>Dumping at sea...</p> <p>Ejection into space?</p> <p>What else is there? What can you come up with?</p> | | | |

- Waste disposal options include landfills, incineration, recycling and composting.

Actual IB Question

State one type of solid domestic waste management strategy. (1)



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incineration;

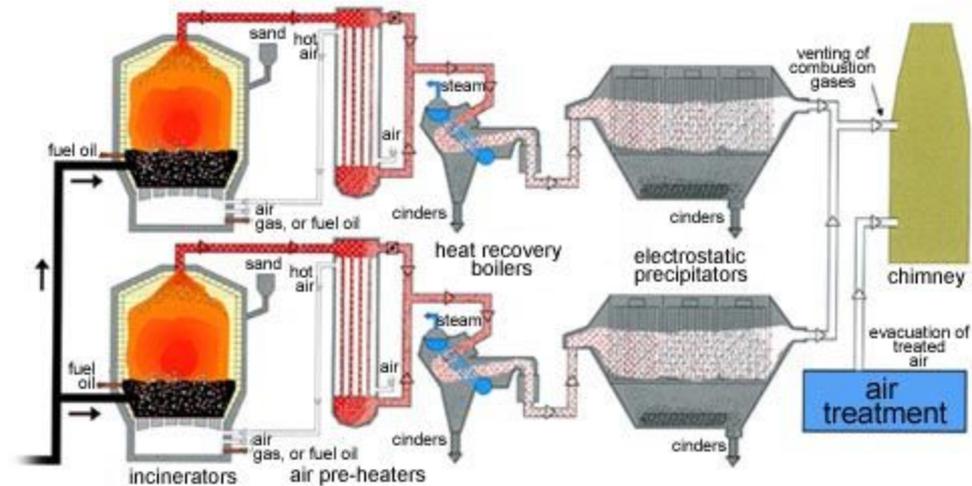
landfill;

composting;

recycling;

waste minimization/reduce

such as reduction of packaging used;



How to make: Compost

A tree gives shelter and shade.

Why use compost?
Compost is a free organic fertilizer. It improves soil structure and helps soil to hold water. Compost increases yields.

Compost is made by adding layers of different organic materials in a heap. As it rots, the heap becomes compost. There are many different ways to make compost. This is just one way.

Ready In
6+ Weeks

A cover protects and keeps the compost moist

Use a Temperature Stick to check that the heap is rotting.

1 Dry plant material gives soil carbon and improves soil structure

2 Sprinkle Water to help the heap to rot

3 Animal droppings from cows, chickens, goats, pigs or rabbits adds nutrients

6 Sprinkle Ash for potassium and Water to help the heap to rot

5 Green plant material adds nutrients

4 Top soil for insects and worms

Dig a pit and make a bed for the compost with twigs or stalks

Step by Step



Make the Base

- Find a shady area
- Dig a pit for the compost
- Make a bed with twigs or stalks



Heap the layers

- Chop the materials and heap the layers.
- Repeat the layers 3 or 4 times
- Cover with soil and dry grass

1. Dry plant material
2. Water
3. Animal Droppings
4. Top soil
5. Green plant material
6. Ash and Water



Turn the heap

- After 3 weeks turn the heap layer by layer. This helps the compost to rot.
- After another 3 weeks it will be ready.



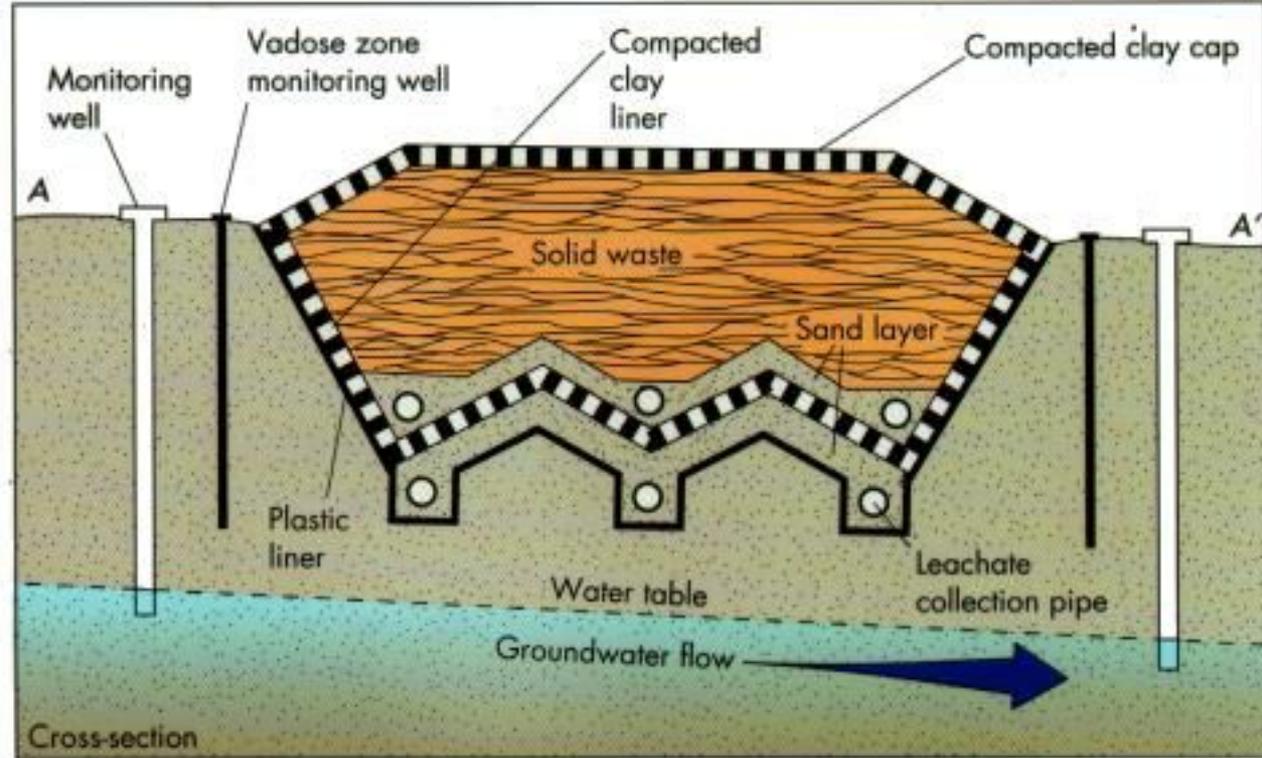
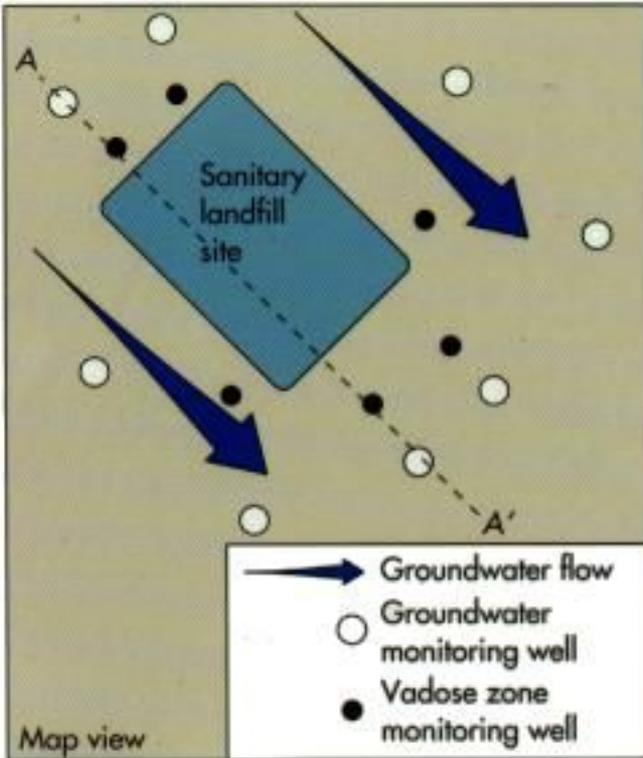
Apply to crops

- When the heap is brown and lumpy it is ready.
- Dig a ditch around crops, add compost and cover.

"Using compost means my crops grow faster, healthier, and give a high yield"
Joyce, Kyenjojo



Landfills



Composting



A COMPOST RECIPE TO FEED YOUR SOIL.



KEEP MOIST: As wet as a wrung out sponge.

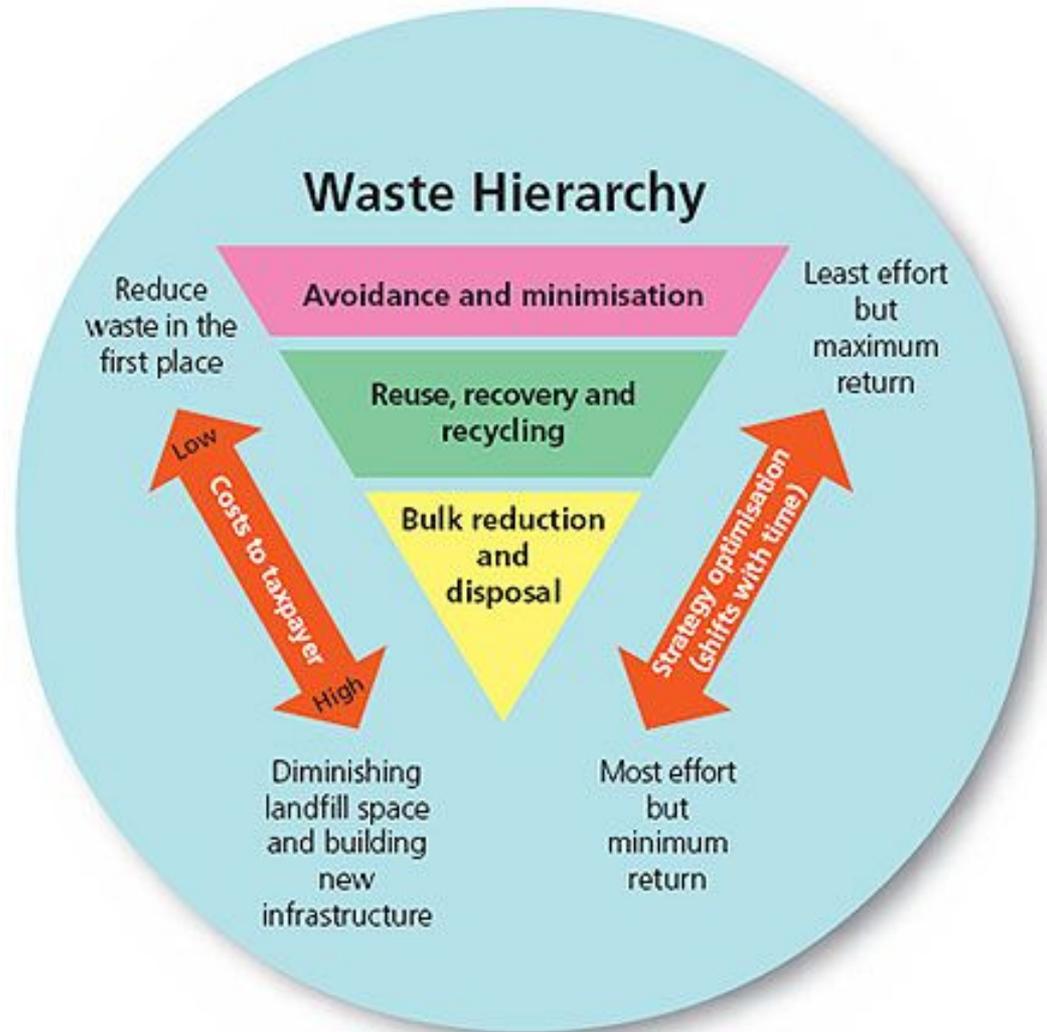
AERATE: Air helps to speed up decomposition. Aeration should be done throughout the entire composting process.

KEEP COVERED: Use a compost lid, cardboard or canvas over top of your pile.

[What about emerging markets?](#) - Click here to find out more.

What is the three level model of waste management? (topic 1.5)

1. Altering Human Activity
2. Controlling release of pollutant
3. Clean up and Restoration



- There are a variety of strategies that can be used to manage SDW influenced by cultural, economic, technological and political barriers. These strategies include:

1. Reduce

- a. Change shopping habits
- b. Less packaging
- c. Buy from recycled
- d. Energy efficient products
- e. Avoid imported goods
- f. Awareness on water/electricity use

2. Reuse

- a. Returnable/refillable bottle waters
- b. Compost food waste
- c. Old clothes for rags
- d. Rent DVD (NETFLIX!!!!!!)
- e. Read Ebooks/Share books

3. Recycle

- a. [What is the recycling program in your own community?](#) - Click here to find out more

- There are a variety of strategies that can be used to manage SDW influenced by cultural, economic, technological and political barriers. These strategies include:

How many different ways are there to manage SDW?

Which ones can be recycled or nonrecyclable?

Need motivation? Click [here](#)

Need ideas? Click [here](#)

As a class research some ideas and [add them to this document](#)

IS IT GREEN TO BE GREEN?

Which type of lifestyle are you?

| Category | The Green Lifestyle | The Typical Lifestyle |
|--------------------------|---------------------|----------------------------|
| CLUTS SHIPPED | \$239 | \$1,589 |
| BREAKFAST FEEDING COSTS | \$695 | \$1,240 |
| ENTERTAINMENT | \$69 | \$34 |
| TRANSPORTATION | \$173 | \$189 |
| TOTAL COST | \$773 | \$3,034 |
| TRANSPORTATION TO SCHOOL | \$0 | \$1,420 |
| COST OF PLACING OUTSIDE | \$0 | \$1,420 |
| COST OF ORGANIC LUNCH | \$1,581 | \$5,480 |
| FOR A SCHOOL LUNCH | \$3.50 | \$8 HRS A WEEK WATCHING TV |
| TOTAL COST | \$7,581 | \$16,046 |
| FIRST CAR | \$40,000 | \$50,000 |
| LIVING IN A CO-OP | \$2,230 | \$6,000 |
| 1/2 KEG OF BEER | \$825 | \$1,120 |
| 24 PACK OF BEER | \$1,120 | \$46,610 |
| MEDIAN HOME | \$145,000 | \$156,160 |
| 2 DAY CAMPING TRIP | \$178 | \$850 |
| PRICE OF USED HYBRID SUV | \$44,200 | \$80,000 |
| DOWNSIZE HOME | \$178,000 | \$35,550 |
| 2 DAY THEMATIC TRIP | \$178 | \$180 |
| BUY FOOD FROM GROCERY | \$175 | \$193 |
| TOTAL COST | \$238,880 | \$240,753 |
| TOTAL COST | \$489,758 | \$589,659 |

GIVE OUR PLANET A CHANCE TO RECUPERATE AND YOUR WALLETS A CHANCE TO FLOURISH...
(going green means saving green in the long run)

payday.com

- controlling the release of pollutant—governments create legislation to encourage recycling and reuse initiatives and impose taxes for SDW collection and on disposable items.



Evaluate SDW disposal options.

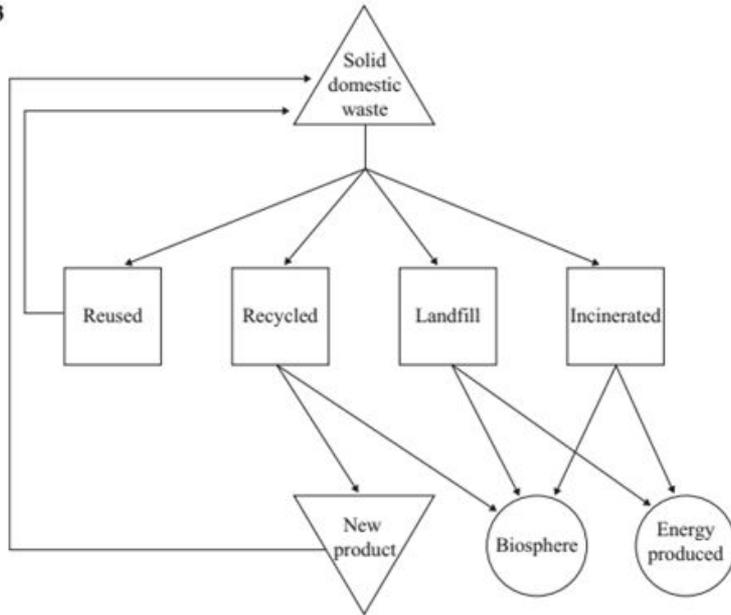
ACTUAL IB QUESTIONS...

State one advantage and one disadvantage of each of the following methods of solid waste disposal.

Identify one other method of solid waste disposal and state the name of a material that is managed in this way. (1)

..

Figure 3



| | Advantage | Disadvantage |
|--------------|----------------------------------|----------------------------------|
| Recycling | | |
| Landfill | | |
| Incineration | | |

Compare and contrast pollution management strategies for SDW.

State one type of solid domestic waste management strategy. (1)

incineration; landfill; composting; recycling; waste minimization/reduce such as reduction of packaging used;

Outline one advantage and one disadvantage of the strategy named above. (2)

Advantage Incineration reduces volume of waste; produces a sterile ash; can be used to generate energy/electricity;

Disadvantage heavy metals may be in the ash; ash still needs to be disposed of; toxic air/atmospheric/CO₂/ greenhouse gas pollution may occur; smell; noise/traffic pollution from trucks transporting to site; community objection to location of incinerator;

Advantage Landfill cheap; methane generated can be used to generate heat and electricity;

Disadvantage smell; large area needed; leachate pollution; attracts vermin; landfill gases generated; wind-blown litter from site; cost/availability of land; noise/traffic pollution from trucks transporting to site; community objection to siting of landfill;

Advantage Composting creates manure; provides natural soil conditioner/fertilizer for gardens; produces marketable commodity; can be done at any scale eg from household to municipal;

Disadvantage requires sorting of waste; smells; attracts vermin/fly nuisance; only applicable to organic material; contains biohazards; requires time to produce product; requires land space;

Advantage Recycling reduces need for manufacturing of goods; reduces use of resources; reduces landfill/incineration;

Disadvantage requires sorting; time consuming; not all waste can be recycled; requires storage space/area; increased cost due to need for different/specialised collection centres; requires transportation/collection;

Evaluate pollution management strategies for SDW by considering recycling, incineration, composting and landfills

Actual IB Questions

Outline two factors at the national scale which affect the choice of waste disposal method. (2)

Explain how the use of waste to generate energy can increase greenhouse gases in the atmosphere. (2)

| Process of pollution | Level of pollution management |
|--|---|
| HUMAN ACTIVITY PRODUCING POLLUTANT  | Altering human activity The most fundamental level of pollution management is to change the human activity that leads to the production of the pollutant in the first place, by promoting alternative technologies, lifestyles and values through: <ul style="list-style-type: none">• campaigns• education• community groups• governmental legislation• economic incentives/disincentives. |
| RELEASE OF POLLUTANT INTO ENVIRONMENT  | Controlling release of pollutant Where the activity/production is not completely stopped, strategies can be applied at the level of regulating or preventing the release of pollutants by: <ul style="list-style-type: none">• legislating and regulating standards of emission• developing/applying technologies for extracting pollutant from emissions. |
| IMPACT OF POLLUTANT ON ECOSYSTEMS | Clean-up and restoration of damaged systems Where both the above levels of management have failed, strategies may be introduced to recover damaged ecosystems by: <ul style="list-style-type: none">• extracting and removing pollutant from ecosystem• replanting/restocking lost or depleted populations and communities. |

Figure 3

Pollution management targeted at three different levels

Outline two factors at the national scale which affect the choice of waste disposal method. (2)

government policy/legislation/guidelines e.g. strategy to encourage recycling; population density / amount of land available for landfill; involvement in international agreements to cut e.g. greenhouse gases / dumping it sea; cultural attitudes to environment/resource use; political context e.g. controlled economies vs free market economies; involvement of significant environmental pressure groups/NGOs e.g. Greenpeace, in influencing attitudes; geographic/climate characteristics, e.g. access to coastline; economic considerations e.g. costs of energy/transport;

Explain how the use of waste to generate energy can increase greenhouse gases in the atmosphere. (2)

decomposition/composting of organic waste produces carbon dioxide/methane; carbon dioxide/methane is a greenhouse gas; methane is a more powerful/potent GHG/greenhouse gas than carbon dioxide; composting organic material/manure/waste food produces biogas/methane; biogas/methane generates carbon dioxide when the methane is burnt; incinerating solid domestic waste to produce heat (to generate electricity) produces carbon dioxide;