Using Earth’s Resources

Using the Earth's resources and obtaining potable water

Using the Earth’s resources and sustainable development

- We use them to provide warmth, shelter, food and transport
- Natural resources, supplemented by agriculture, provide food, timber, clothing and fuels
- Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials
- Chemistry plays an important role in improving agricultural and industrial processes to provide new products and in sustainable development, which is development that meets the needs of current generations without compromising the ability of future generations to meet their own needs
- Renewable energy resources: sources of power that quickly replenish themselves and can be used again (only includes plants/wood if they continue to be re-planted)
- Finite resources: have a limited supply that will eventually run out

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Potable water

- Potable water= water that is safe to drink
- Potable water is not 'pure' because it contains dissolved substances, although to be safe it must have sufficiently low levels of dissolved salts and microbes
- The methods used to produce potable water depend on available supplies of water and local conditions. In the UK:
  - an appropriate source of fresh water is selected (rain provides water with low levels of dissolved substances and this collects in the ground/rivers/lakes)
  - the water is passed through filter beds to remove different sized insoluble solids
  - the water is then sterilised, to kill microbes (sterilising agents include: ozone, UV light or chlorine)
- If only salty/sea water is available, desalination is required:
  - can be done by distillation
  - OR can be done using processes with membranes (e.g. reverse osmosis)
  - BOTH are very expensive

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Waste water treatment

- Water of the correct quality is essential for life. It must be free of poisonous salts and harmful microbes.
- How correct quality water is produced:
  1. Water is passed through a mesh screen to remove large bits e.g twigs or grit
  2. Chemicals are added to make solids and microbes stick together to form sediment and sink
  3. There is then anaerobic digestion of sewage sludge
  4. The water is then sterilised with chlorine to kill any microbes left.
- it is relatively cheaper and easier to obtain potable water from groundwater and wastewater than salt water, although seawater is a plentiful raw material, so is good for countries with little fresh water

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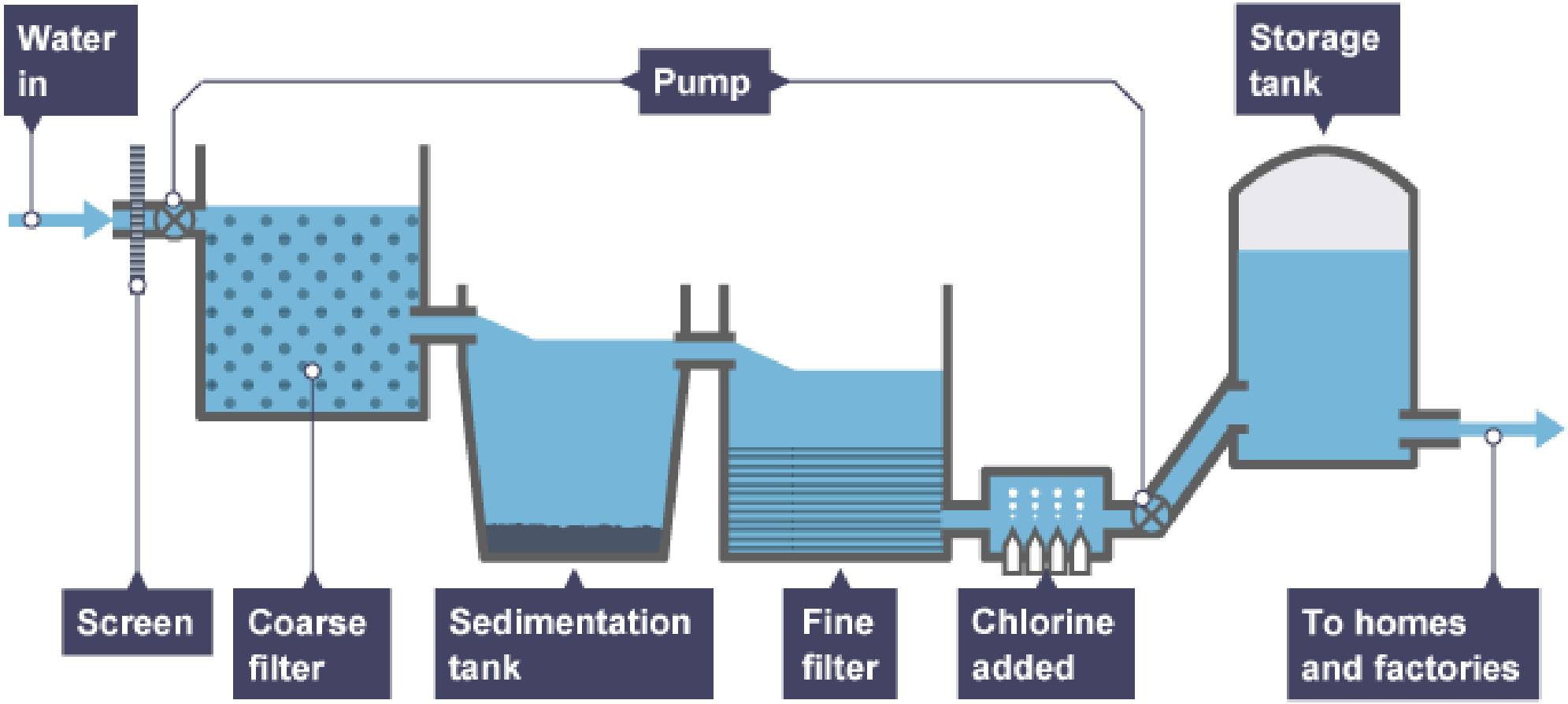
Waste water treatment



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Life cycle assessment and recycling

Life cycle assessment

- These are carried out to assess the environmental impact of products in each of these stages:
  - Extracting and processing raw materials
  - Manufacturing and packaging
  - Use and operation during its lifetime
  - Disposal at the end of its useful life, including transport and distribution at each stage
- Use of water, resources, energy sources and production of some wastes can be fairly easily quantified
- Allocating numerical values to pollutant effects is less straightforward and requires value judgements, so LCA (life cycle assessment) is not a purely objective process
- Selective or abbreviated LCAs can be devised to evaluate a product but these can be misused e.g. in support of claims for advertising purposes

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Life cycle assessment and recycling

Ways of reducing the use of resources

- Reduction in use, reuse and recycling of materials by end users reduces the use of limited resources, use of energy sources, waste and environmental impacts
- Metals, glass, building materials, clay ceramics and most plastics are produced from limited raw materials.
  - Much of the energy for the processes comes from limited resources
  - Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts

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Life cycle assessment and recycling

Ways of reducing the use of resources

- Some products, such as glass bottles, can be reused
  - Glass bottles can be crushed and melted to make different glass products
  - Other products cannot be reused and so are recycled for a different use
- Metals can be recycled by melting and recasting or reforming into different products
  - Amount of separation required for recycling depends on the material and the properties required of the final product
  - ▪ E.g. some scrap steel can be added to iron from a blast furnace to reduce the amount of iron that needs to be extracted from iron ore