DP IB Environmental Systems & Societies (ESS): SL

Your notes

Solid Domestic Waste

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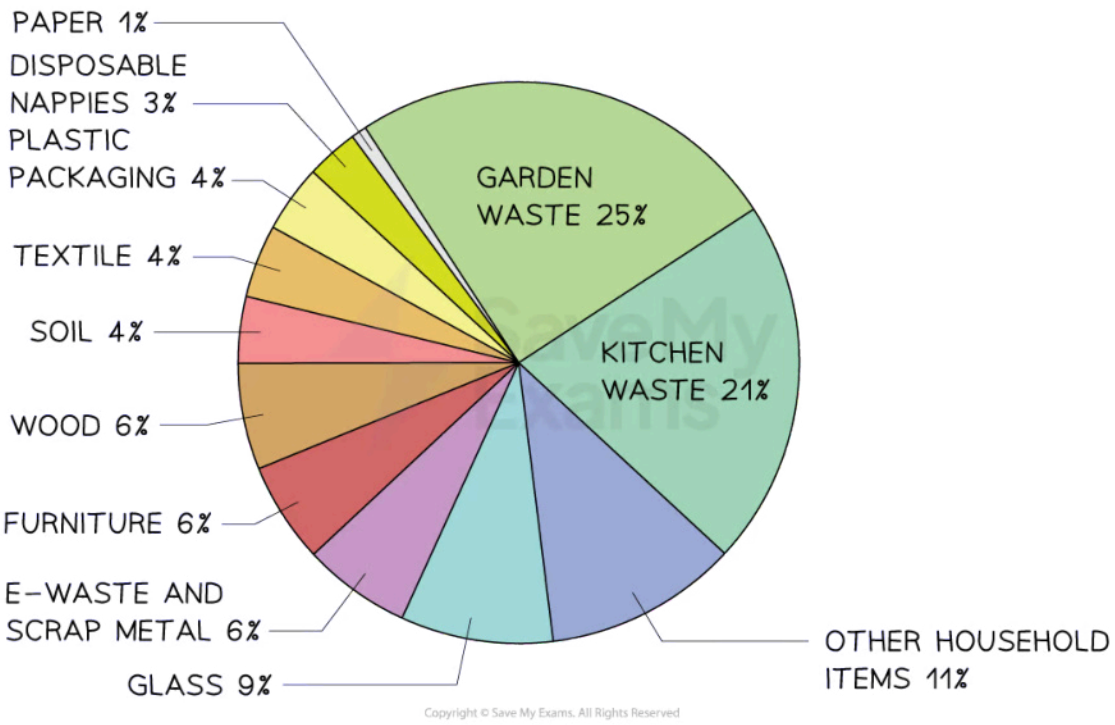
Solid Domestic Waste

Types of Solid Domestic Waste



Estimate of the proportions of solid domestic waste in the UK in 2020

- Solid domestic waste (SDW), also known as household waste, refers to the waste generated by **households** and small-scale commercial establishments
  - It consists of various materials discarded by **individuals** and **families**
- The **volume** and **composition** of solid domestic waste can **vary over time** due to several factors, including changing consumption patterns, technological advancements, and waste management practices

Organic Waste

- This includes food waste, garden waste, and other **biodegradable** materials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- The volume of organic waste tends to be **significant** and can vary based on cultural practices, dietary habits, and seasonal factors
- Over time, the composition of organic waste may change due to shifts in food preferences, increased consumption of processed foods, and advancements in waste management technologies that promote **composting**

Paper and Cardboard

- These materials are commonly found in solid domestic waste and are derived from packaging, newspapers, magazines, and other paper-based products
- The volume of paper and cardboard waste may fluctuate depending on factors such as **digitalisation trends** (for example, the increasing trend for people to read the news on phones and tablets rather than by reading a physical newspaper), and efforts to **promote recycling** and reduce paper consumption

Plastics

- Plastics are a major component of solid domestic waste and can include packaging materials, containers, and various single-use items
- The volume and composition of plastic waste have experienced a **significant increase** in **recent decades** due to the widespread use of plastics in various sectors
- **Changes** in consumer **behaviour**, government **regulations**, and **recycling initiatives** can influence the composition and management of plastic waste

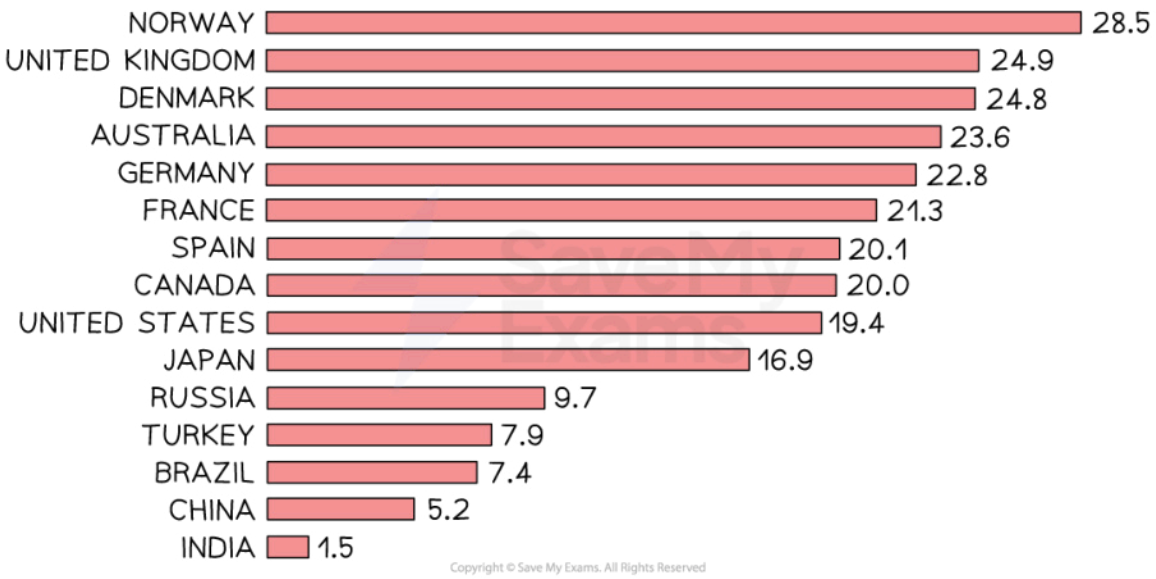
Glass and Metals

- Glass and metal waste, such as bottles, cans, and other packaging materials, contribute to solid domestic waste
- The volume of glass and metal waste can be influenced by factors like **beverage consumption** patterns, **recycling rates**, and the availability of alternative packaging materials
- Changes in packaging preferences, recycling infrastructure, and resource conservation efforts can impact the composition and volume of glass and metal waste

E-waste

- With the **rapid advancement of technology**, electronic waste, or e-waste, has become a growing concern
- It includes discarded electronic devices such as computers, mobile phones, televisions, and appliances
- The volume and composition of e-waste can change over time due to the introduction of new devices, upgrades, and the speed at which older electronics become **obsolete** (i.e. they become out-of-date)

- Increasing awareness of e-waste management and the implementation of **regulations** can influence the handling and disposal practices of electronic waste



Kilograms of electronic waste (e-waste) produced per capita for a selection of countries in 2016

Non-biodegradable Waste

- Non-biodegradable pollution, including **plastic**, **batteries**, and **e-waste**, has become a significant environmental issue due to its **persistence** in the environment
  - Unlike biodegradable materials, these pollutants do not naturally break down and can remain in the environment for extremely long periods of time
- Plastic pollution, especially single-use plastics, has reached alarming levels, with large quantities ending up in **oceans**, **rivers**, and **landfills**
  - The abundance of plastic waste in the oceans poses risks to marine life, including birds, turtles fish and cetaceans, through **ingestion** or **entanglement**, leading to ecological imbalances and threats to biodiversity
- Batteries, which contain **heavy metals** and **toxic substances**, pose a serious threat to the environment if not properly disposed of
  - Improper disposal of batteries can result in **leaching** of harmful chemicals into **soil** and **water**, leading to contamination and potential health hazards for humans and wildlife
- Electronic waste, including discarded electronic devices, contains various toxic substances such as lead, mercury, and cadmium

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- Inadequate management of e-waste can lead to the release of these hazardous materials into the environment, posing risks to human health and ecosystems

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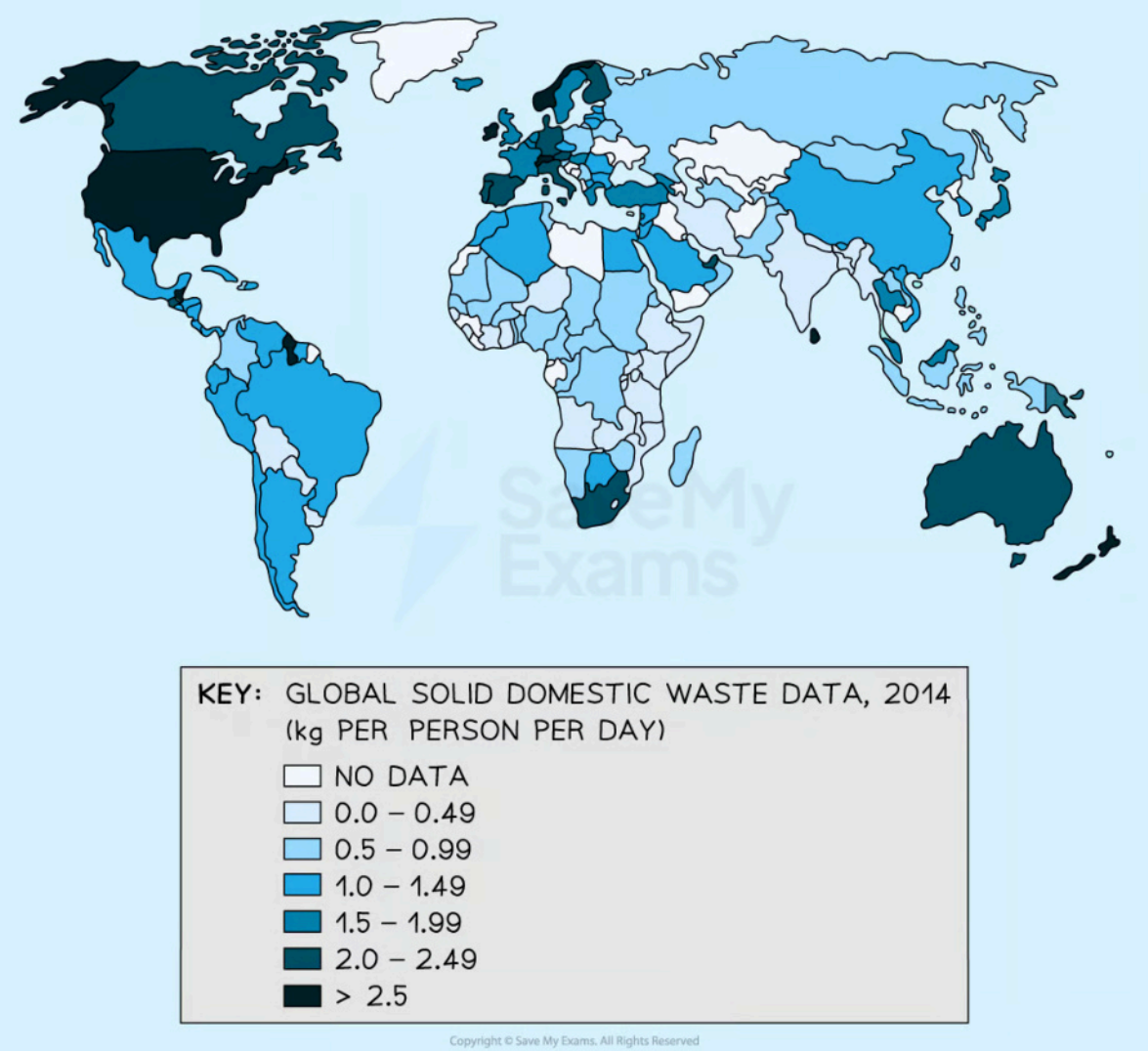

Average daily per capita solid domestic waste generation for different countries in 2014

- Non-biodegradable pollution has become a major environmental issue due to **unsustainable consumption** and **production** patterns, inadequate waste management infrastructure, and limited recycling efforts
- The increasing demand for **convenience** and the rapid pace of **technological advancements** contribute to the accumulation of non-biodegradable pollutants
- Addressing non-biodegradable pollution requires a **combined approach** that includes:

- Reducing the production and consumption of single-use items
- Promoting eco-friendly alternatives
- Implementing proper waste management systems
- Encouraging recycling and responsible disposal practices

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Waste Disposal Methods

- Waste disposal is critical in managing and minimising the environmental impact of waste
- Various methods are available, each offering distinct approaches to handling waste materials

Landfills

- Landfills involve **burying waste** in designated areas, often lined with protective barriers
- They provide a centralised and controlled disposal method for a wide range of waste types

Advantages and Disadvantages of Landfills

Advantages	Disadvantages
Provides centralised waste management	Generates methane, a potent greenhouse gas
Can accommodate a wide range of waste types	Requires suitable land availability and careful site selection
Relatively low operational costs compared to other options	Potential risk of groundwater and soil contamination
Can be engineered with liners and **leachate** collection systems to minimise environmental impact	Long-term management and monitoring required after closure

Incineration

- Incineration involves the **controlled burning** of waste materials at high temperatures
- It reduces the volume of waste and can sometimes be used generate energy through the combustion process

Advantages and Disadvantages of Incineration

Advantages	Disadvantages

Reduces the volume of waste and minimises space requirements	Releases air pollutants, including greenhouse gases and toxic emissions (public concerns over health and environmental impacts)
Potential to generate energy through the combustion process (provides waste-to-energy potential)	Requires careful management of air emissions and ash disposal
Reduces the reliance on landfills	Potential for the release of hazardous substances during incineration
Can handle various types of waste, including hazardous waste	High operating costs


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Recycling

- Recycling focuses on **converting waste** materials into **reusable** materials
- It conserves natural resources, reduces energy consumption, and minimises greenhouse gas emissions associated with the production of new materials

Advantages and Disadvantages of Recycling

Advantages	**Disadvantages**
Conserves natural resources and reduces the need for raw materials	Requires energy and resources for collection, sorting, and processing
Reduces the amount of waste sent to landfills or incinerators	Limited availability and accessibility of recycling facilities
Saves energy and reduces greenhouse gas emissions	Contamination of recyclables can hinder the recycling process
Prevents pollution caused by extracting and processing raw materials	Some materials are difficult or costly to recycle
Creates job opportunities in the recycling industry	Market demand and prices for recycled materials can fluctuate

Reusing


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- Reusing involves using products or materials **multiple times** instead of discarding or recycling them
- It extends the lifespan of products, reduces waste generation, and decreases resource consumption

Advantages and Disadvantages of Reusing

Advantages	Disadvantages
Reduces the need for new products and resource extraction	Limited availability of reusable items in certain areas
Saves energy and resources required for manufacturing	Requires proper cleaning and maintenance of reusable items
Minimises waste generation and landfill usage	May not be suitable for all types of products or materials
Can be cost-effective, saving money for individuals or businesses	Limited market for used or second-hand items in some cases
Promotes a **circular economy** and sustainable consumption	Requires a change in consumer behaviour and mindset

Composting

- Composting involves the **decomposition** of **organic waste** materials into nutrient-rich soil
- Successful composting relies on the proper balance of organic materials, moisture, and aeration to facilitate the decomposition process
- It diverts organic waste from landfills, reduces methane emissions, and produces high-quality compost for use in agriculture and landscaping

Advantages and Disadvantages of Composting

Advantages	Disadvantages
Diverts organic waste from landfills, reducing methane emissions	Requires space and proper management for composting process

Produces nutrient-rich compost for soil enrichment	Takes time for organic waste to decompose and turn into compost
Reduces the need for chemical fertilisers	Some materials may not be suitable for composting (e.g., meat, dairy)
Helps retain soil moisture and reduces erosion	Potential for odour and pest issues if not properly managed
Promotes healthier plant growth and biodiversity	Requires knowledge and education to ensure proper composting practices


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- These waste disposal options offer a **range of strategies** for managing waste materials effectively
- The choice of method depends on various factors, including the type of waste, available infrastructure, environmental considerations, and societal preferences
- Implementing a **combination** of these options can contribute to sustainable waste management and **resource conservation**

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Managing Solid Domestic Waste

- There are three levels of pollution management:
  - Changing human activity
  - Regulating and reducing the release of pollutants
  - Cleaning up the pollutants and restoring the ecosystem after pollution has occurred

Photo by Jas Min on Unsplash

A pile of domestic waste in Tübingen, Germany – the three levels of pollution management strategies can be applied to the management of solid domestic waste pollution

- Solid domestic waste management is a crucial aspect of environmental sustainability, involving various strategies influenced by cultural, economic, technological, and political factors

- These strategies aim to minimise the **environmental impact** of waste and promote **resource conservation**


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1. Altering human activity

- Reduction of consumption:
  - Encouraging individuals to adopt **sustainable consumption patterns** by promoting awareness campaigns, providing information about the environmental consequences of overconsumption, and fostering a culture of mindful and **responsible purchasing habits**
- Composting of food waste:
  - Promoting the practice of composting organic waste, such as kitchen scraps and garden trimmings, to **divert it from landfills**
  - This approach not only reduces the volume of waste but also produces nutrient-rich compost that can be used to enrich soil fertility in gardens, farms, and urban green spaces

2. Controlling the release of pollutants

- Legislation and policies:
  - Governments play a crucial role in waste management by enacting **laws** and **regulations** that incentivise recycling and reuse initiatives, impose taxes or fees on solid domestic waste collection, and discourage the use of disposable items
  - These measures create a framework for responsible waste management practices and encourage individuals and businesses to adopt more sustainable behaviours
- Recycling and reuse programs:
  - Implementing comprehensive systems that promote the separation, collection, and processing of recyclable materials
  - This includes establishing **recycling facilities**, providing accessible recycling bins in public spaces and households, and educating the public about the importance of recycling
  - Emphasising the benefits of reusing items, such as through **secondhand markets** or community swap events, can also help reduce waste and conserve resources

3. Removing pollutants from the environment and restoring ecosystems

- Landfill reclamation:
  - Rehabilitating old landfills by covering them with engineered **soil covers**, installing **gas collection systems** to capture and utilise **methane emissions**, and exploring innovative methods to reclaim landfills for alternative uses
  - This can include transforming former landfill sites into parks, recreational areas, or renewable energy facilities, reducing the environmental impact and maximising the value of previously used

land

- Waste-to-energy programs:
  - Converting solid domestic waste into **energy** through incineration
  - This approach helps reduce the volume of waste that would otherwise go to landfills, whilst also generating **electricity** or **heat**
- Clean-up and restoration:
  - Collaborative efforts among organisations, governments, and volunteers to **remove plastic waste** from oceanic areas, such as the **Great Pacific garbage patch**
  - These initiatives involve the use of specialised vessels, drones, and nets to collect floating debris, preventing further pollution and mitigating the devastating impact on marine ecosystems
- Implementing these waste management strategies requires a **combined approach** that involves individuals, communities, governments, and industries working together
- By adopting sustainable practices, embracing technological advancements, and fostering a collective sense of responsibility, it is possible to **decrease waste generation**, promote recycling and reuse, and restore and protect the environment for future generations


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