Resource Management

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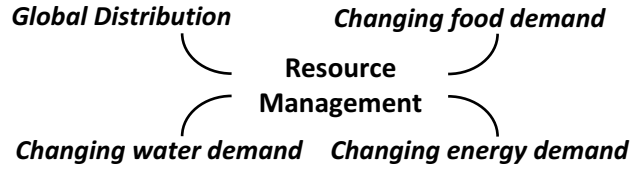
Changing Energy Demand in the UK

quiz

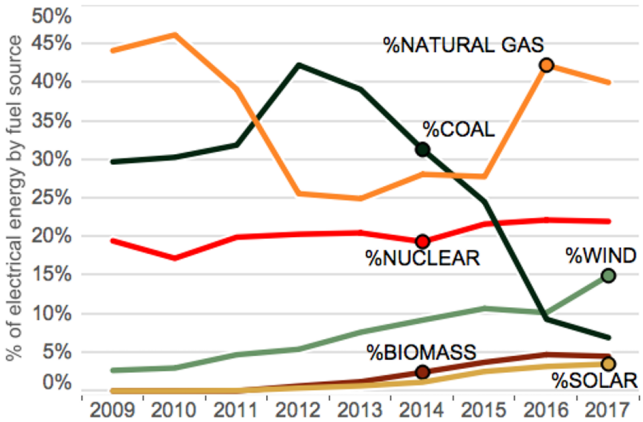
The Big Picture



Changing Energy Demand

The UK consumes less energy than it did in 1970, despite the population being 9.1 million higher. 12 per cent less energy is used by the average household. Heavy industry uses 60 per cent less energy due to its decline. Demand for energy by transport has increased.

UK's Energy Mix



Key facts:

- 2015 – majority of UK's energy mix = fossil fuels
- Nuclear power provides just over one-fifth of the UK's energy mix
- Renewables provide just over 20% of the UK's energy mix
- In 2011 coal use increased as older power stations worked to capacity as they were soon to be closed due to EU regulations on emissions
- Oil and gas reserves have declined.
- Renewable energies such as wind are growing in significance, but are still only a small percentage of energy produced
- Renewables are encouraged to meet targets on reducing emissions

Key Terms

Biomass – a source of fuel or energy using organic materials e.g. wood.

Energy exploitation – Developing and using energy to the greatest advantage.

Fossil fuel – A natural fuel formed in the geological past from living organisms.

HEP – Electricity generated by turbines that are driven by moving water.

Renewable energy resource – A resource which is not diminished when it is used.

Energy Exploitation Issues

Fossil fuels

- Unsustainable, they will eventually become too expensive or run out.
- Costs increase to deal with the effects of climate change and adaption to it.
- CO_2 is released which contributes to acid rain and climate change.
- Fracking for shale gas can cause earthquakes and groundwater pollution.

Nuclear

- Nuclear plants are expensive to build and decommission.
- Transporting and storing nuclear waste is expensive.
- Waste is radioactive for 100 years+ and has to be stored safely to avoid contamination.
- Nuclear accidents have long-term impacts on people and wildlife.

Renewable energy resources

- High set-up costs. Costs increase in remote areas.
- Biomass can reduce land available for food production increasing food prices.
- Low profitability is a concern.
- Biomass reduces biodiversity as only one crop is grown e.g. sugar cane.
- HEP schemes flood land upstream, changing the landscape and wildlife.
- Wind turbines can affect bird migration.

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Changing Food Demand in the UK

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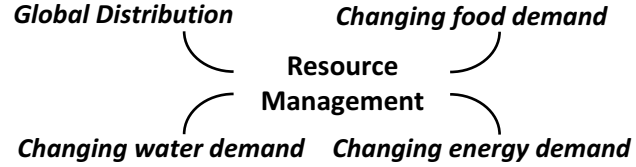
The Big Picture



Changing demand for food

The population of the UK is growing, which increases demand for food. Forty-five per cent of the UK's food was imported in 2019.
Additionally, there is a growing demand for:

- exotic, high value food from abroad
- out of season food being available all year
- more organic alternatives

High-value Food Exports

Despite the increasing food miles, it can be cheaper to import food from low income countries to the UK. A growing proportion of imported food consists of high-value products. Even if the food is produced cheaply in LICs, transport, storage and refrigeration costs can result in high prices. Additionally, specialist products such as Madagascan vanilla can fetch higher retail prices then UK products.
LICs benefit from jobs created in agriculture, packing and transport raising tax revenues that can be invested in services to benefit the population. However, less land is available for locals to grow their own food, there is greater pressure on water supplies and farmers are exposed to chemicals such as pesticides.

Seasonal Food

Historically, most food in the UK was seasonal and sourced in the UK. The UK now demands greater food choice around the year, increasing imports.

Organic Produce

Organic produce is grown without the use of artificial chemicals such as pesticides, herbicides and fertilisers. Demand for organic produce has increased since the 1990s. Organic produce is more expensive because yields tend to be lower and labour costs are higher.

Key Terms

Agribusiness – Application of business skills to agriculture.

Carbon footprint – A measurement of all the greenhouse gases we individually produce.

Food miles – The distance covered supplying food to consumers.

Local food sourcing – A method of food production and distribution that is local, rather than national and/or international.

Organic produce – Food which is produced using environmentally and animal friendly farming methods.

Carbon Footprint

In the UK, food travels over 30 billion kilometres annually. Food contributes 17 per cent of the UK's carbon emissions (11 per cent is due to the transport of imported food). Some UK grown produce have a higher carbon footprint compared to if it had been imported e.g. tomatoes grown in heated greenhouses.

Local Sourcing

Local sourcing reduces carbon emissions by importing only foods that cannot be grown in the UK, eating seasonal UK produce, purchasing food from farmers' markets and consuming home-grown food.

What is Agribusiness?

Treating a farm like an industrial business increases food production by removing hedgerows, combing small farms and increasing mechanism and chemical use. However, employment declines and there is a negative impact on the environment.

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Changing Water Demand in the UK

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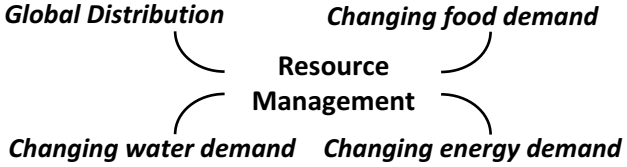
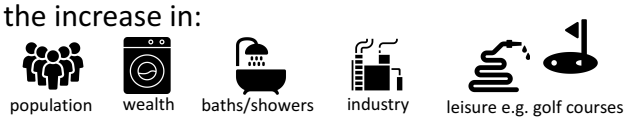
The Big Picture

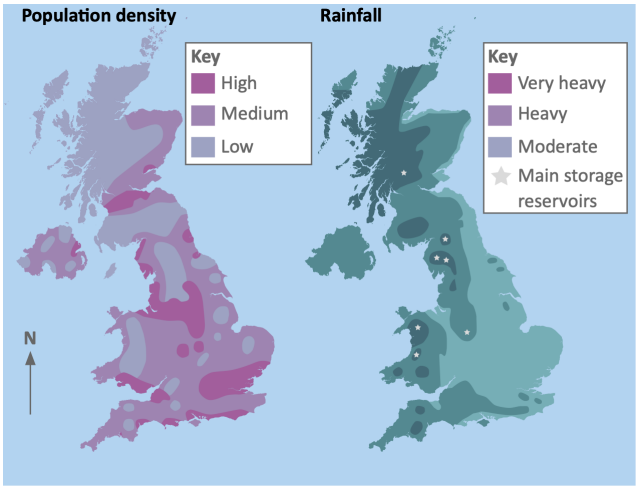


Changing Water Demand

Average household water use in the UK has increased by 75% since 1985. The average person uses 150 litres each day, compared with 47 litres in Africa. The growing demand is due to the increase in:



Water Deficit and Surplus



The UK receives enough rainfall to meet its demand for water. However, rainfall is uneven. Annual rainfall is highest in the west, whereas the east of the UK has a lower than average rainfall. 1/3 of the UK's population lives in the southeast, the driest part of the UK. Therefore, the west has a water surplus, whereas the east has a deficit, leading to water stress.

Need for Water Transfer

The UK has considered a national water transfer scheme to match supply and demand. However, due to the expense, community displacement and CO2 emissions it has not been put in place.

Key Terms

Water deficit – where water demand is greater than supply.

Water quality – the chemical, physical, and biological content of water.

Water stress – demand for water exceeds the available amount restricting use.

Water surplus – where water supply is greater than demand.

Small scale water transfer occurs between Kielder reservoir, pumping water into the North Tyne River.

UK Water Quality

The Environment Agency manages water quality in the UK. Despite improvements since the Industrial Revolution only 27 per cent of water is classified as good.

Causes of Water Pollution

- Agricultural chemicals e.g. fertiliser
- Warm water from industrial cooling
- Oil from ships and boats
- Untreated waste from industry
- Sewage release

Effects of Water Pollution

- Aquatic life killed by pesticides
- Fertilisers cause algae growth, leading to eutrophication (insufficient oxygen in river)
- Wildlife poisoned by toxic waste
- Microbacteria from sewerage spreads disease affecting humans and wildlife

Managing Water Quality

- Strict legislation limits
- Waste water treatment plants remove solids, bacteria, algae and chemicals
- Pollution traps such as reed beds filter pollutants
- Sewers and water mains reduces overflow of current sewers, spills and accidents

Resource Management

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Global inequalities in the supply and consumption of resources

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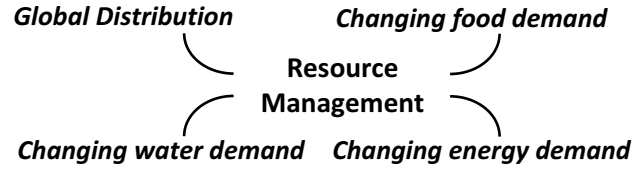
The Big Picture



Overview

The consumption of resources across the world varies significantly. High-income countries (HICs) typically consume more than low-income countries (LICs). The main challenge is not having enough resources, but the existing resources are unevenly distributed. As a LIC develops, so too does its demand for resources. This growth in demand, along with population growth, leads to a shortage of resources.

Food Inequalities

In many regions of Europe, Asia, and both North and South America, favourable climate, fertile soil, and advanced technology contribute to a surplus of food production, allowing the majority of the population to fulfil their daily dietary needs. On the other hand, in Africa, the harsh physical environment, coupled with low technology and political turmoil, result in a less dependable food production system. This leads to widespread undernourishment, as many individuals do not have access to sufficient food, and undernutrition, meaning a lack of a balanced diet and essential nutrients.

Water

The unequal distribution of freshwater around the world is largely due to varying climates. Areas such as Africa and some parts of the Middle East are particularly susceptible to water scarcity and droughts, leading to a disproportionate amount of time and effort spent on procuring water. This can have a substantial impact on both economic growth and overall social well-being.

Energy

The distribution of energy resources, particularly fossil fuel reserves, is highly unequal. The presence of coal in Europe played a major role in supporting early economic growth and enhancing social well-being. While renewable energy sources such as wind, solar, and water are more evenly distributed in theory, the high cost of development has made it difficult for many low-income nations to take advantage of these resources.

Summary

The global trade of food, water, and energy helps to balance supply and demand. However, this mainly involves HICs that are able to afford imports. In contrast, many LICs particularly those in Africa, have not seen significant benefits from the redistribution of resources.

UK Resources

The UK is privileged to possess a resource surplus, which has been a major contributor to its early and sustained economic development and relatively high standard of living for its citizens.

Food: The UK enjoys a temperate climate, with ample rainfall and moderate temperatures. Thanks to fertile soil, mild topography, and advanced technologies, the UK is one of the most efficient food producers in the world.

Water: Although there is an imbalance of supply and demand within the UK (with a surplus in the north and west and a deficit in the south and east), water availability is rarely a concern.

Energy: The UK possesses substantial reserves of fossil fuels (previously coal and now oil and gas), operates several nuclear power plants (utilising imported uranium), and holds potential for various forms of renewable energy including wind, solar, and hydroelectric power.

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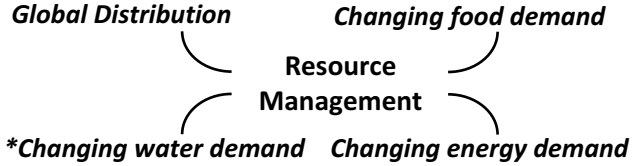
Resource Management

Indus Basin Irrigation System (IBIS)

quiz

The Big Picture



What is the IBIS?

IBIS is the largest unbroken irrigation network worldwide. It began as irrigation canals constructed during British governance from 1857 to 1947 and has continued to grow. It incorporates three large dams and more than 100 smaller dams that manage the water flow. Twelve link canals transfer water between rivers. The system includes 64,000 km of minor canals distributing water throughout rural areas. More than 1.6 million km of ditches and streams collectively irrigate Pakistan's farmland.

Why was it introduced?

The Indus Basin Irrigation System (IBIS) was necessary due to several reasons:

- Large parts of Pakistan and the regions covered by the Indus Basin have an arid or semi-arid climate. The rainfall is low and erratic, which is insufficient for agriculture that most depend on for employment.
- Improved food security for the rapidly growing population as large-scale agriculture was possible. The irrigation system enhanced agricultural productivity, leading to economic growth and development.
- The dams built as part of the IBIS are used for hydroelectric power generation meeting the needs of the population and industry.
- It ensured effective water management as water could be stored during times of surplus (during monsoons or heavy snow melt) and used during times of scarcity.
- Flood Control: The Indus River has a history of destructive floods. With its dams and reservoirs, the IBIS helps mitigate the impact of such floods by regulating water flow.

Key Terms

Water conflict – A dispute about the distribution of fresh water.

Water insecurity – When water availability is not enough to ensure the population of an area enjoys good health, livelihood and earnings.

Water transfer – Water transfer schemes attempt to make up for water shortages by constructing elaborate systems of canals, pipes, and dredging over long distances to transport water from one river basin to another.

IBIS Advantages

- Vast areas of agricultural land (1.6m km^2) now irrigated leading to significant food production.
- Effective water management.
- Increased food security - 40% more land available for agriculture. Crop yields increased (wheat 38%, rice 39% and fruit 150%).
- Diets have improved.
- Employment opportunities in agriculture
- Generation of hydro-electric power
- Improved flood control.
- Supports cooperation between countries like India and Pakistan (Indus Water Treaty).
- Climate change resilience - stable water supply for irrigation, even during dry periods.
- Supports economic growth

IBIS Disadvantages

- Waterlogging and salinity problems in the soil, making it less fertile and productive.
- High summer temperatures = evaporation
- Dams disrupt natural river flows, impacting aquatic ecosystems causing biodiversity loss.
- Sedimentation – dams trap sediment reducing downstream fertility.
- Vulnerable to climate change due to reliance on glacial meltwater.
- High maintenance costs
- Displaced populations
- Risk of Dam Failure.

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Resource Management

Makueni

Sustainable Food Supplies

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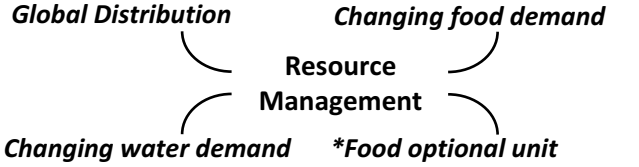
The Big Picture



Where is Jamalpur?

Makueni County is located **200 km southeast of Nairobi, Kenya**. It is a dry, rural region with a population of approximately **885,000 people**. The region experiences low and unreliable rainfall, averaging **500 mm annually**, which makes agriculture challenging.

Why was the scheme needed?

Makueni's population relies heavily on subsistence farming to survive. However, inconsistent rainfall and long periods of drought cause crop failures, food shortages, and water scarcity.

The Makueni Food and Water Security Programme, introduced in 2014, aimed to improve food and water supplies for the local population.

Main features

The project involved the following key initiatives:

Sand Dams

- Sand dams were constructed in villages like Musunguu and Muuo Wa Methovini.
- These dams store rainwater within sand, filtering and purifying it naturally.
- The water can be used for irrigation, drinking, and livestock maintenance.

Rainwater Harvesting

- A rainwater harvesting tank was installed at Kanyenyoni Primary School, providing a clean and consistent water supply for 463 students.

Key Terms

Sand dam– A low-cost water storage structure that captures rainwater in sand, filtering it naturally for drinking and irrigation.

Rainwater harvesting – Collecting and storing rainwater from rooftops for later use.

Sustainable food supply – A food system that meets current needs without compromising future resources.

Subsistence farming – Farming to meet the needs of the farmer's family, with little surplus.

Improving Food Security

- Steady water sources support crop irrigation, improving yields of maize, beans, millet, cassava, and other staple crops.
- Farmers were trained in sustainable farming techniques to maximise output.

Tree Planting

- Trees were planted to prevent soil erosion, boost biodiversity, and produce medicinal products for additional income.

Benefits of the scheme

The project delivered multiple benefits to the people of Makueni:

- **Improved Crop Yields:** Reliable water for irrigation has led to **better harvests** and increased food security.
- **Access to Safe Water:** Reduced water-borne diseases thanks to clean, filtered water from sand dams.
- **Time Savings:** Villagers spend less time fetching water, freeing up time for work, farming, and education.
- **Health Benefits:** Clean water supplies at Kanyenyoni Primary School have improved student health.
- **Environmental Improvements:** Tree planting reduces soil erosion and creates **sustainable ecosystems**.

Resource Management

The Importance of Food, Water and Energy

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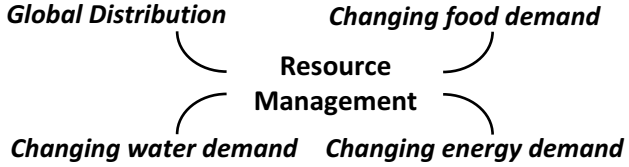
The Big Picture



Importance to well being

Food, water and energy are essential to economic and social wellbeing. Where resources are plentiful economies grow, societies flourish and the population enjoys a good quality of life. Where resources are scarce, the opposite occurs. Resource management can have a significant impact on development.

Food

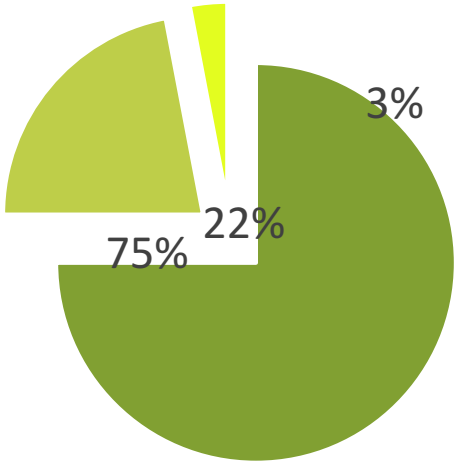
A healthy life is dependent on food, as it provides energy as calories. The guidelines for average daily calories are:

Category	Calories
Men	2,500
Women	2,000
Child (5-10)	1,800
Girl (11-14)	1,850
Boy (11-14)	2,200

People who are very physically active and those living in cold environments require a higher calorie intake. In some places around the world many people consumer far fewer calories, leading to poor well being. This is mostly in LICs. An increasing number of people in HICs consume far too many calories. This leads to obesity and poor well being.

Water

Water is needed for a range of reasons. Humans need to drink water to survive. Water is also required for washing and disposing of waste in industry and manufacturing. The average person in the UK uses 150 litres of water a day. Only 4% of this is used for drinking. In the UK, 75% of water is used by industry.



Key Terms

Resource management – The control and monitoring of resources so that they do not become depleted or exhausted.

Fossil fuel – A natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.

Development – The progress of a country in economic growth, welfare and tech.

Energy

Energy is used in many ways. For example, it heats our homes, manufactures goods, processes food and power transport. Energy use varies depending on where people live and how wealthy (rich) they are. In the past, energy has come from burning wood and fossil fuels such as oil and coal. Fossil fuel is a natural fuel, such as coal or gas, formed in the geological past from the remains of living organisms. Nowadays, more energy comes from renewable energy, such as solar and wind power. Renewable energy often referred to as clean energy, comes from natural sources or processes that are constantly replenished.