

Lesson details

Year Group: 9

Subject: Geography

Where I will find my work: In this document

[Sustainable Water Management | AQA GCSE Geography | Water 7 - YouTube](#)

Do Now Questions

1. Define organic farming
2. Define Agribusiness
3. How might climate influence water security?

Engage Water Resources in the UK

LO: I can explain how changing demand for water in the UK creates opportunities and challenges

Keywords:

- **Water Stress:** When the demand for water exceeds the available amount during a certain period or when poor quality restricts its use.
- **Water Transfer:** The movement of water (through pipes or via canals or rivers) from areas of water surplus to areas of water deficit.
- **Water Quality:** A measure used to assess the suitability of water for drinking and for supporting river ecosystems.

Learn

Water Resources and Pollution Management

1. Population and Water Demand

- **Global Trends:** The world population surged from 1 billion in 1804 to 6 billion by 1999. This rapid growth has significantly increased the demand for water.
- **UK Regional Imbalance:** The UK has an **uneven distribution** of water. The North and West (rural uplands) typically have a **water surplus**, while the South and East (areas of high population density and lower rainfall) experience a **water deficit**.
- **Water Stress:** This occurs when demand exceeds supply. In 2021, the Environment Agency rated **15 out of 23** water resource zones in England as having "**serious water stress**". Causes include population growth, climate change-induced droughts, and unsustainable groundwater use.

2. Case Study: Kielder Water Transfer Scheme

- **Purpose and History:** Initial plans began in the late 1960s to support the North East's **booming industrial economy** and projected growth. The reservoir was officially opened by the Queen in 1982.
- **Scale:** Kielder Water is **northern Europe's largest man-made lake**, holding **200 billion litres** of water. It is the centrepiece of the UK's first "water grid".
- **How the Scheme Works:**
 - **Abstraction:** Water is released from the reservoir into the **River Tyne**.
 - **Pumping:** At **Riding Mill**, water is abstracted from the Tyne and pumped through a series of **tunnels and pipelines**.
 - **Transfer:** The water travels an **80-mile journey** to reach and top up the **River Wear** and **River Tees**.
 - **Duration:** It takes approximately one day for water to reach the first pumping station and another 2–3 days to reach Teesside.
- **Opportunities and Benefits:**
 - Makes the North East the **most water-secure region** in the UK, maintaining a surplus of usable water even during extreme droughts.
 - The dam features England's biggest **water turbine**, generating hydroelectric power for roughly **11,000 people**.
- **Challenges and Impacts:**
 - **Social:** Construction required flooding the Kielder Valley, leading to the **loss of numerous farms, homes, a school, and a railway**.
 - **Environmental:** The dam resulted in the loss of **30 miles of salmon spawning habitat**. To mitigate this, **Kielder Hatchery** was established to restock the River Tyne with salmon.

3. Water Pollution and its Causes

- **Agricultural Runoff:** Rain washes fertilisers, pesticides, and animal waste from farmland into rivers across the landscape (a diffuse source of pollution).
- **Industrial Discharges:** Factories may release heavy metals, oils, and chemicals, damaging river ecosystems.
- **Sewer Discharges:** During **heavy rainfall**, systems can be overwhelmed. **Combined sewer overflows** release raw sewage into waterways to prevent homes from flooding.

4. Managing and Improving Water Quality

- **Wastewater Treatment:** A multi-stage process involving **screens** (to remove debris like wet wipes), **settling tanks** (where solids form "sludge"), **aeration** (where bacteria break down organic matter), and **sand filtration** before water is returned to rivers.
- **Regulation:** The **Environment Agency** manages quality through **monitoring** (river sampling), **legislation** (restricting chemical use), and **enforcement** (using heavy fines and potential jail time for bosses as a deterrent).
- **Investment:** Water companies plan to invest **£104 billion over five years** to upgrade aging pipe networks and cut sewage discharges by nearly half.

Build

Describe the distribution of areas of water surplus and water deficit in England (3 marks)

2030



*Regions defined by water resource company areas across England.

- Affinity Water
- Anglian Water
- Bristol Water
- Cambridge Water
- Essex & Suffolk Water
- Northumbrian Water
- Portsmouth Water
- SES Water
- Severn Trent Water
- South East Water
- South Staffordshire Water
- South West Water
- Southern Water
- Thames Water
- United Utilities
- Veolia Water Projects
- Wessex Water
- Yorkshire Water

Source: Environment Agency, Cetr analysis

Cause

How do they cause pollution?

Agricultural runoff

Industrial use and discharges

Heavy rain and sewer discharges

Complete the table describing these three causes of water pollution in the UK.

Apply

Using the data below and your own knowledge, outline where demand for water resources may create a challenge.

Usual resident population, 2021



Population change: 2011-2021



Review:

Build:

Water surplus (low stress) is mainly found in the north and west, including north-west England and parts of the south-west (shown in green/blue).

These areas receive higher rainfall and have lower demand.

Moderate levels occur in central areas (the Midlands), where water availability is more balanced (shown in yellow/orange).

Water deficit (high/severe stress) is concentrated in the south and east of England, especially South East and East Anglia (shown in dark orange/red), where demand is high and rainfall is lower.

Cause	How do they cause pollution?
Agricultural runoff	Rain washes fertilisers, pesticides and animal waste from farmland into rivers and streams, leading to nutrient pollution which harms aquatic life.
Industrial use and discharges	Factories and industrial sites may release pollutants such as heavy metals, oils, and chemicals into nearby rivers and lakes, damaging ecosystems and water quality.
Heavy rain and sewer discharges	During heavy rain or system failures, untreated or partially-treated sewage can overflow into water bodies, polluting them with harmful bacteria, chemicals and solid waste detritus.

Apply:

Regions such as London and the South East have a large and growing population, which increases pressure on water supply. The East of England has a growing population. These regions receive less rainfall than other parts of the UK, leading to an imbalance between supply and demand.

This combination of high demand and low natural water availability makes them particularly vulnerable to **water stress**, especially during dry periods. That said, regions such as the East Midlands and South West also have growing populations, creating specific, local areas where demand creates water stress.

Summary:

- **Changing demand and provision of water in the UK creates opportunities and challenges.**
- **Demand for water is changing due to population growth and there are regional issues matching supply to demand.**
- **There is a need for water transfers within the UK to maintain supplies.**
- **65% of water resource zones within England were rated as having serious water stress in 2021.**
- **There are various causes of water pollution including agricultural runoff, industrial discharges and sewage spills.**
- **Pollution management, such as monitoring and legislation (law-making) is needed to maintain water quality and protect the environment.**