

# KI : Food, water and energy are fundamental to human development

Key terms	Definitions
Resource management	The control and monitoring of resources so they don't become depleted or exhausted

## The significance of food, water and energy to economic and social well being

Key for human wellbeing. All lead to social and economic benefits which all increase the standard of living

Food
<ul style="list-style-type: none"> <li>Calories provide energy</li> <li>Availability depends on climate, soil and level of technology</li> <li>Malnourishment means disease and death. Can also lead to underperforming at school which decreases economic wellbeing in life</li> <li>More than 1 billion people are malnourished</li> <li>2 billion are undernourished (poor diet)</li> <li>Obesity is an issue in some areas</li> </ul>

Water
<ul style="list-style-type: none"> <li>Used for survival, washing, food production, industry</li> <li>We need clean safe water otherwise we can get stuck in a cycle of poverty</li> </ul>

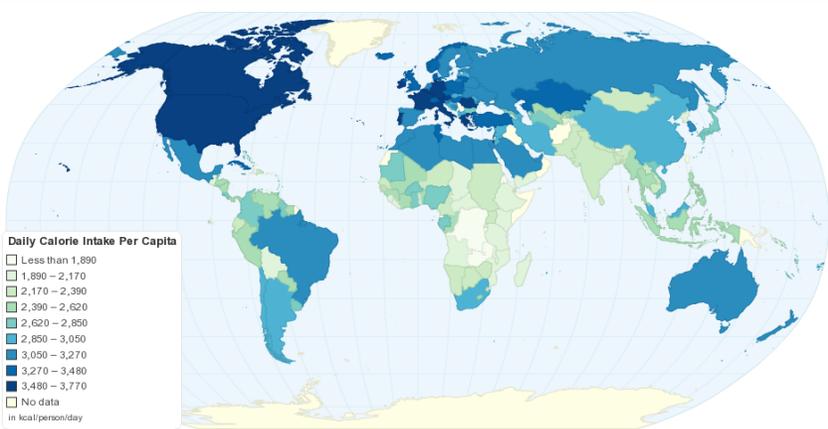
Energy
<ul style="list-style-type: none"> <li>Traditionally we get energy from oil, coal and wood</li> <li>Many different sources</li> <li>Used for production, heating, transport and for water supply (e.g. wells)</li> </ul>

## An overview of global inequalities in the supply and consumption of resources

Food
<ul style="list-style-type: none"> <li>UK consume 3200 calories per person per day</li> <li>Somalia 1580 calories per person per day</li> <li>Areas of greatest population growth have highest levels of undernourishment</li> <li>Demand depends on changing diets and increasing population</li> <li>Supply depends on climate, soil and level of technology</li> </ul>

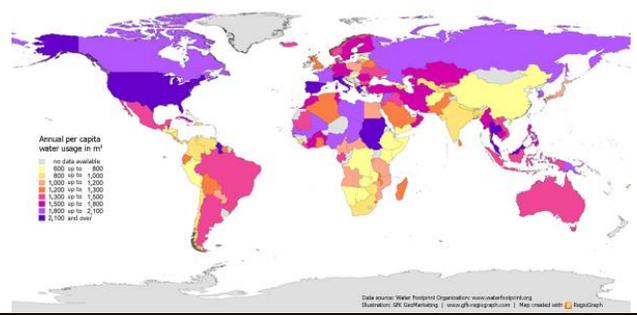
Water
<ul style="list-style-type: none"> <li>Fresh water is unequally distributed</li> <li>Water footprint is the amount of water used per day</li> <li>Global average is 1240 l per day</li> <li>Bangladesh is 896 l per day</li> <li>USA is 2483 l per day</li> <li>Water scarcity can be physical or economic</li> <li>1 in 5 (more than 1.2 billion people) live in areas of water scarcity</li> <li>1 in 3 (2.4 billion people) have no access to clean drinking water</li> </ul>

Energy
<ul style="list-style-type: none"> <li>Richest billion people use 50% of the energy</li> <li>Poorest billion people use 4% of the energy</li> <li>Countries import and export energy</li> <li>Some countries do not have their own sources of energy</li> </ul>



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## Worldwide water usage – “water footprints” of the nations



## KI : The changing demand and provision of resources in the UK create opportunities and challenges

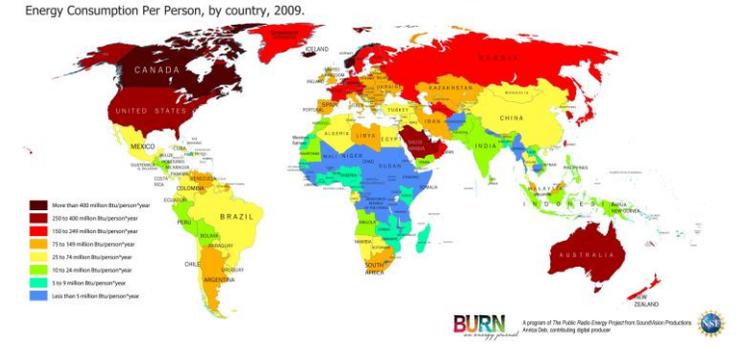
Key terms	Definitions
Agribusiness	Application of business skills to agriculture
Carbon footprint	A measurement of all the greenhouse gases we individually produce
Energy mix	The range of energy sources of a region or country
Food miles	The distance covered supplying food to consumers
Fossil fuels	A natural fuel formed in the geological past from the remains of living organisms
Local food sourcing	A method of food production and distribution that is local
Organic produce	Food produced using environmentally and animal friendly farming methods on organic farms

## Food

The growing demand for high value food exports from LICs and all year demands for seasonal food and organic produce
<ul style="list-style-type: none"> <li>Used to be seasonally and locally sourced. Now eat globally sourced foods all year</li> <li>In 2013 47% of UK food was imported</li> <li>More disposable income and increased demand for greater choice</li> <li>Can't grow all foods in the UK and foods can only be grown at certain times</li> <li>High value products are five times the price of similar products e.g. Madagascan vanilla, gourmet coffee</li> <li>Positive impacts : Jobs and wages for those in LICs, more tax income leads to a better quality of life</li> <li>Negative impacts – less land for locals, high water use and exposure to chemicals</li> <li>Organic – no pesticides or fertilisers used. Since the 1990s there has been an increase in demand. Worth £2 billion a year</li> </ul>

Larger carbon footprints due to the increased number of food miles travelled
<ul style="list-style-type: none"> <li>Grown more cheaply elsewhere</li> <li>Production and transport lead to carbon footprint</li> <li>17% of the UK's carbon footprint is due to food</li> <li>Tomatoes have less of a carbon footprint being grown in Spain and imported to the UK than if we grew them in the UK</li> <li>Food miles travelled by UK food imports is 18.8 billion.</li> <li>68% of food imported is from within the EU, 32% from the rest of the world</li> <li>Push now for buying local and having an allotment</li> </ul>

A trend towards agribusiness
<ul style="list-style-type: none"> <li>Agribusiness is a farm run as a business with the main aim being profit</li> <li>Big impacts on the environment as often heavy use of pesticides and fertilizers</li> <li>East Anglia has a lot of agribusinesses</li> </ul>



## Water

Changing demand for water
<ul style="list-style-type: none"> <li>Increasing wealth</li> <li>Hygiene</li> <li>Demand for out of season food</li> <li>Increasing industrial use</li> <li>Increased domestic use</li> <li>Increasing population</li> <li>Increased use in domestic properties since 1975 by 70%</li> </ul>

Water quality and pollution management
<ul style="list-style-type: none"> <li>Water quality is managed by legislation, education campaigns, waste eater treatment, building better treatment plants, investing in infrastructure, pollution traps, green roofs and walls</li> <li>Key pollutants are fertilisers, pesticides, heavy metals and acid rain</li> </ul>

Matching supply and demand – areas of deficit and surplus
<ul style="list-style-type: none"> <li>Highest population is in the South East (area of deficit) and highest rainfall is in the north and west (water surplus)</li> <li>80% of Southern England relies on groundwater. 50% are affected by water quality</li> </ul>

Need for transfer to maintain supply
<ul style="list-style-type: none"> <li>Lake Vyrnwy scheme moves water from Wales to Liverpool. Wales – sparsely populated with excess supply, Liverpool – densely populated with water surplus.</li> <li>Built a dam and reservoir and transported the water via pipeline 68 miles.</li> <li>Had positive and negative impacts including loss of homes (37 homes and 10 farms), recreational area, 10 deaths during construction, reliable supply of water for Liverpool</li> </ul>

## Energy

The changing energy mix – reliance on fossil fuels and the growing significance of renewable energy
<p>UK Energy mix in 2015 :</p> <ul style="list-style-type: none"> <li>Coal 31%</li> <li>Gas 25%</li> <li>Nuclear 19%</li> <li>Renewable sources 22%</li> </ul> <p>In 1970 91% was from coal and oil</p> <ul style="list-style-type: none"> <li>UK investing in renewable energy e.g. solar energy and subsidies given by the government</li> <li>Shale gas most recent focus</li> </ul>

Decreasing domestic supply of oil, coal and gas
<ul style="list-style-type: none"> <li>In 1980 North Sea oil and gas was discovered</li> <li>Now have decreasing reserves of fossil fuels</li> <li>EU regulations on emissions has meant decrease in fossil fuel use</li> <li>12% less energy being used in homes since 1970 and 60% less in industry due to energy efficiency, public awareness and increasing costs</li> </ul>

Economic and environmental issues associated with the exploitation of resources
<ul style="list-style-type: none"> <li>Cheaper to import coal into the UK than to mine it</li> <li>Nuclear sites being decommissioned and all current plants will close by 2023 – issues of contamination and disposal of nuclear waste</li> <li>Economic issues – costs, jobs, set up costs, research, reliability</li> <li>Environmental costs – ecosystems, waste, noise, aesthetics, emissions, pollution, radiation leaks</li> </ul>

# KI : Demand for water resources is rising globally but supply can be insecure, which may lead to conflict

Key terms	Definitions
Over abstraction	When water is being used more quickly than it is being replaced
Waterborne diseases	Diseases caused by microorganisms that are transmitted in contaminated water
Water conflict	Disputes between different regions or countries about the distribution and use of fresh water
Water deficit	Where water demand is greater than supply
Water insecurity	Where water availability is not enough to ensure the population enjoys good health, livelihood and earnings
Water quality	Measured in terms of the chemical, physical and biological content of water
Water security	Reliable availability of an acceptable quality and quantity of water
Water stress	Demand for water exceeds the available amount during a certain period or when poor quality restricts its use
Water surpluses	Water supply is greater than demand

## Areas of surplus (security) and deficit (insecurity)

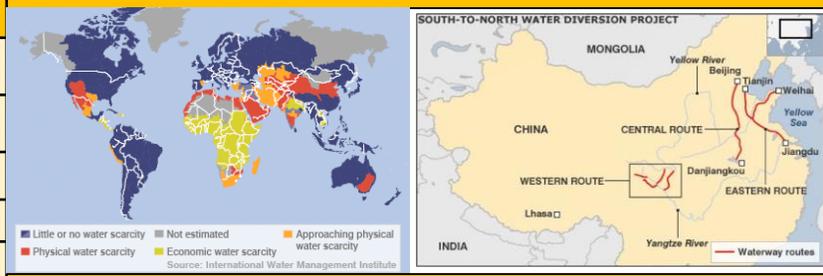
Global patterns of water surplus and deficit	<ul style="list-style-type: none"> <li>Water stress – Africa, South Asia, Australia, Middle East</li> <li>Water surplus – Northern hemisphere</li> <li>Supply and demand balanced in North America and Europe</li> <li>94% of fresh water is stored in aquifers</li> </ul>
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Reasons for increasing water consumption – economic development and rising populations	<ul style="list-style-type: none"> <li>World population increase d to nearly 7.5 billion which has led to an increase in consumption. Mostly in LICs. Led to an increased demand for food</li> <li>To produce 1kg of beef it needs 9500 l of water compared to 1800 l for a kg of wheat</li> <li>Economic development has led to an increase in commercial agriculture, manufacturing industries and living standards. More energy is needed (15% of water use is in the generation of energy)</li> <li>Higher the economic development the higher the standard of living and the more water consumption per capita</li> </ul>
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## Factors affecting water availability

Climate	<ul style="list-style-type: none"> <li>Most water in tropical, temperate humid or mountainous areas.</li> <li>Evaporation rates affect water availability</li> <li>Water can be stored as snow, and ice</li> </ul>
Geology	<ul style="list-style-type: none"> <li>Synclines in rocks often are porous</li> <li>Where porous rocks are between non porous rocks an aquifer forms</li> <li>Non porous rocks good for reservoirs to be created</li> </ul>
Pollution of supply	<ul style="list-style-type: none"> <li>Polluted water is unfit for human consumption</li> <li>Industrial waste has metals in it which people drink making them ill</li> <li>200 children die a day from drinking polluted water</li> </ul>
Overabstraction	<ul style="list-style-type: none"> <li>Causes salt water from sea to be sucked up into ground water contaminating the supply</li> <li>Sinking water tables mean rivers dry up</li> <li>Mexico city has sunk 9m since 1910</li> <li>Demand changes seasonally e.g. tourism</li> </ul>
Limited infrastructure	<ul style="list-style-type: none"> <li>Water lost from leaking pipes</li> <li>Rapid urbanisation can cause the contamination of water supplies as city can not install the infrastructure fast enough to keep up with the population growth</li> </ul>
Poverty	<ul style="list-style-type: none"> <li>Prevents access to safe water – economic scarcity.</li> <li>Need to pay for access to clean treated piped water</li> </ul>

# GCSE The Challenge of Resource Management – Water Management Knowledge Organiser



## Impacts of water insecurity

Waterborne diseases and pollution	<ul style="list-style-type: none"> <li>Chemicals, sewage, waste, ashes, dead animals etc lead to cholera, dysentery, malaria and polio</li> <li>11% of the world's population is water insecure</li> <li>2.6 billion lack access to sanitation</li> <li>Often have to queue or walk miles for water</li> </ul>
Food production	<ul style="list-style-type: none"> <li>Reliant on water</li> <li>Decrease in quality of livestock if not enough water</li> <li>Agriculture is the biggest polluter of water e.g. fertilisers and pesticides</li> </ul>
Industrial output	<ul style="list-style-type: none"> <li>Increase in product price if water cost is too high e.g. chemicals and textiles</li> <li>LICs and NEEs – 70% of industrial waste is untreated</li> <li>Without water there would be no industry meaning less wages and a failing economy</li> </ul>

## Potential for conflict where demand exceeds supply

e.g. India and Bangladesh share the Ganges River; Canada and the USA have the Great Lakes; USA and Mexico have the Colorado river; Israel, Jordan, Syria and Lebanon share the River Jordan. Where this occurs there is the potential for water wars – physical fighting over the use of the water from the rivers especially if those countries nearer the source use all the water

# KI : Different strategies can be used to increase water supply

Key terms	Definitions
Grey water	Wastewater from peoples' homes that can be recycled and put to good use
Groundwater management	Regulation and control of water levels, pollution, ownership and use of groundwater
Sustainable development	Development that meets the needs of the present without limiting the ability of future generations to meet their own needs
Sustainable water supply	Meeting the present day need for safe, reliable and affordable water which minimises adverse effects on the environment whilst enabling future generations to meet their requirements
Water conservation	The preservation, control and development of water resources and prevention of pollution
Water transfer schemes	Systems of canals, pipes and dredging over long distances to transport water from one river basin to another

## Overview of strategies to increase water supply

Diverting supply and increasing storage, dams and reservoirs, water transfers and desalination	<ul style="list-style-type: none"> <li>Diverting supply is expensive, has environmental impacts and can encourage wastage. Often includes HEP scheme and leisure.</li> <li>Water can be stored in aquifers e.g. London and Oklahoma</li> <li>Dams have social, economic and environmental impacts. 50,000 large dams worldwide</li> <li>Desalination is very expensive. Starting to be more common. UAE, Kuwait and Saudi Arabia use it. 98% of Dubai's water supply as more efficient plants than Europe. 1% population worldwide rely on it. £2 per m<sup>3</sup> of water. Brine waste damages ecosystems.</li> </ul>
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## Example of a large scale water transfer scheme to show how it's development has advantages and disadvantages

**Lesotho Highland Water Project.** Southern Africa. Lesotho has high poverty levels and few resources. Growing population. Mainly subsistence farming. Water surplus. Water transfer scheme – 40% of water transferred to South Africa. Includes dams reservoirs and pipelines. Completed 2002. 38km transfer tunnel. 3 dams Polihali, Tsoilke and Ntoahae. Each hold huge amounts of water.

Positive impacts - Lesotho South Africa	Negative impacts- Lesotho South Africa
<ul style="list-style-type: none"> <li>Provides 75% of GDP. Income from the scheme helps development and standard of living.</li> <li>Supplies country with HEP</li> <li>Transport improved to construction sites</li> <li>Improved sanitation</li> <li>Provides water to drought ridden area</li> <li>Safe water for 10% of population</li> <li>Water has less pollution from industry and gold mines in South Africa</li> </ul>	<ul style="list-style-type: none"> <li>Displaced 30,000 people</li> <li>Impacts of wetland ecosystems</li> <li>Corruption prevented money reaching those affected by construction.</li> <li>17 villages displaced by construction of Polihali dam.</li> <li>71 villages lost agricultural land</li> <li>Costs likely to reach US\$4 billion</li> <li>40% water lost through leaks</li> <li>Increased water charges too high for poor</li> </ul>

## Moving towards a sustainable resource future

Water conservation	<ul style="list-style-type: none"> <li>Minimise water footprint</li> <li>Lots of different ways : artificial grass, push taps, mend leaks, hydroponics, drip agriculture, education, water meters</li> <li>Nevada has decreased water use by 23% in 10 years despite population increase by ½ million</li> </ul>
Groundwater management	<ul style="list-style-type: none"> <li>Decrease the amount of permitted pumping</li> <li>Can recharge with reclaimed / grey water</li> <li>Need to decrease the amount of fertilisers and pesticides used in the area and monitor the water levels</li> </ul>
Recycling	<ul style="list-style-type: none"> <li>Can use reclaimed water - sewage water that has been treated and is suitable for irrigation, industry and power plants</li> <li>Coca Cola use 25% of harvested water in bottling plants, washing vehicles and flushing toilets</li> </ul>
Grey water	<ul style="list-style-type: none"> <li>Flushing toilets, irrigation and washing cars</li> <li>Expensive system to put in</li> </ul>

## An example of a local scheme in a LIC or NEE to increase the sustainable supply of water

**Wakel River Basin Project –Rajasthan** –Funded by the Global Water for Sustainability Program (2004-14). Works with local people along the Wakel river to improve their water security and overcome water shortages. Local people involved. Aims 1. to increase water supply and storage using appropriate technology. 2. Raise awareness in local communities of the need for effective water management

Positive impacts	Challenges
<ul style="list-style-type: none"> <li>Encouraged use of rainwater by using techniques to collect. Use <b>Taankas</b> – underground storage 3m wide. Collect surface water from roofs. <b>Johed</b> – small dams to collect rain, helped raise water tables by 6m. Five rivers that used to dry up now flow all year. <b>Pats</b> irrigation channels that transfers water to the fields.</li> </ul>	<ul style="list-style-type: none"> <li>Education needed to increase public awareness.</li> <li>Maintenance of the irrigation channels to avoid them breaking or splitting up</li> </ul>

