

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

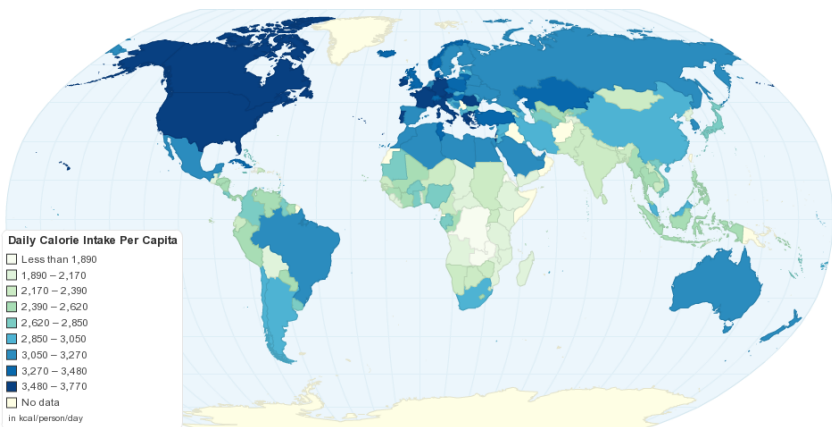
The significance of food, water and energy to economic and social well being

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

Food	Water	Energy
<ul style="list-style-type: none"> Calories provide energy Availability depends on climate, soil and level of technology Malnourishment means disease and death. Can also lead to underperforming at school which decreases economic wellbeing in life More than 1 billion people are malnourished 2 billion are undernourished (poor diet) Obesity is an issue in some areas 	<ul style="list-style-type: none"> Used for survival, washing, food production, industry We need clean safe water otherwise we can get stuck in a cycle of poverty 	<ul style="list-style-type: none"> Traditionally we get energy from oil, coal and wood Many different sources Used for production, heating, transport and for water supply (e.g. wells)

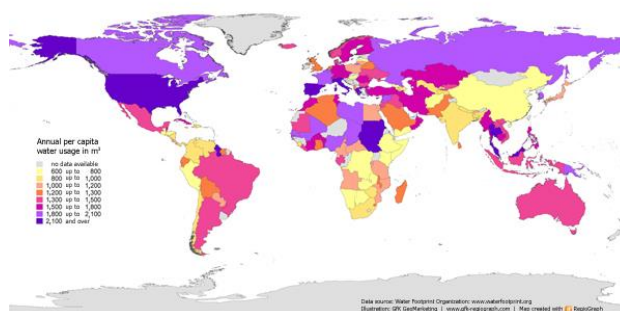
An overview of global inequalities in the supply and consumption of resources

Food	<ul style="list-style-type: none"> UK consume 3200 calories per person per day Somalia 1580 calories per person per day Areas of greatest population growth have highest levels of undernourishment Demand depends on changing diets and increasing population Supply depends on climate, soil and level of technology
Water	<ul style="list-style-type: none"> Fresh water is unequally distributed Water footprint is the amount of water used per day Global average is 1240 l per day Bangladesh is 896 l per day USA is 2483 l per day Water scarcity can be physical or economic 1 in 5 (more than 1.2 billion people) live in areas of water scarcity 1 in 3 (2.4 billion people) have no access to clean drinking water
Energy	<ul style="list-style-type: none"> Richest billion people use 50% of the energy Poorest billion people use 4% of the energy Countries import and export energy Some countries do not have their own sources of energy



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Worldwide water usage – “water footprints” of the nations



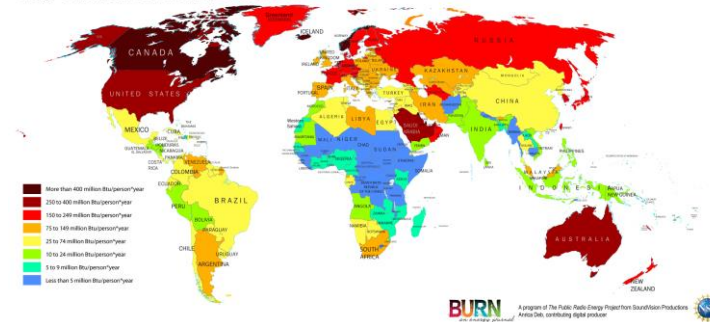
KI : The changing demand and provision of resources in the UK create opportunities and challenges

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"> Used to be seasonally and locally sourced. Now eat globally sourced foods all year In 2013 47% of UK food was imported More disposable income and increased demand for greater choice Can't grow all foods in the UK and foods can only be grown at certain times High value products are five times the price of similar products e.g. Madagascan vanilla, gourmet coffee Positive impacts : Jobs and wages for those in LICs, more tax income leads to a better quality of life Negative impacts – less land for locals, high water use and exposure to chemicals Organic – no pesticides or fertilisers used. Since the 1990s there has been an increase in demand. Worth £2 billion a year
Larger carbon footprints due to the increased number of food miles travelled	<ul style="list-style-type: none"> Grown more cheaply elsewhere Production and transport lead to carbon footprint 17% of the UK's carbon footprint is due to food Tomatoes have less of a carbon footprint being grown in Spain and imported to the UK than if we grew them in the UK Food miles travelled by UK food imports is 18.8 billion. 68% of food imported is from within the EU, 32% from the rest of the world Push now for buying local and having an allotment
A trend towards agribusiness	<ul style="list-style-type: none"> Agribusiness is a farm run as a business with the main aim being profit Big impacts on the environment as often heavy use of pesticides and fertilizers East Anglia has a lot of agribusinesses

Energy Consumption Per Person, by country, 2009.



Water	
Changing demand for water	<ul style="list-style-type: none"> Increasing wealth Hygiene Demand for out of season food Increasing industrial use Increased domestic use Increasing population Increased use in domestic properties since 1975 by 70%
Water quality and pollution management	<ul style="list-style-type: none"> Water quality is managed by legislation, education campaigns, waste eater treatment, building better treatment plants, investing in infrastructure, pollution traps, green roofs and walls Key pollutants are fertilisers, pesticides, heavy metals and acid rain
Matching supply and demand – areas of deficit and surplus	<ul style="list-style-type: none"> Highest population is in the South East (area of deficit) and highest rainfall is in the north and west (water surplus) 80% of Southern England relies on groundwater. 50% are affected by water quality
Need for transfer to maintain supply	<ul style="list-style-type: none"> Lake Vyrnwy scheme moves water from Wales to Liverpool. Wales – sparsely populated with excess supply, Liverpool – densely populated with water surplus. Built a dam and reservoir and transported the water via pipeline 68 miles. 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

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"> Coal 31% Gas 25% Nuclear 19% Renewable sources 22% <p>In 1970 91% was from coal and oil</p> <ul style="list-style-type: none"> UK investing in renewable energy e.g. solar energy and subsidies given by the government Shale gas most recent focus
Decreasing domestic supply of oil, coal and gas	<ul style="list-style-type: none"> In 1980 North Sea oil and gas was discovered Now have decreasing reserves of fossil fuels EU regulations on emissions has meant decrease in fossil fuel use 12% less energy being used in homes since 1970 and 60% less in industry due to energy efficiency, public awareness and increasing costs
Economic and environmental issues associated with the exploitation of resources	<ul style="list-style-type: none"> Cheaper to import coal into the UK than to mine it Nuclear sites being decommissioned and all current plants will close by 2023 – issues of contamination and disposal of nuclear waste Economic issues – costs, jobs, set up costs, research, reliability Environmental costs – ecosystems, waste, noise, aesthetics, emissions, pollution, radiation leaks

Key terms	Definitions
Food security	Having access to enough affordable, nutritious food to maintain a healthy lifestyle.
Food surplus	Countries which produce more food than is needed by their population.
Food insecurity	Countries which do not produce enough food to feed their population and have to rely on imported food have a food deficit . Many of these also experience food insecurity.
Food miles	The distance covered supplying food to consumers.
Carbon footprint	The measurement of the greenhouse gases that each individual produces, through the direct or indirect burning of fossil fuels.
Famine	A widespread shortage of food causing malnutrition, starvation and death.
Under nutrition	Under nutrition is the lack of a balanced diet, and deficiency in minerals and vitamins.
Irrigation	The artificial watering of land
Organic	Growing crops or rearing livestock without the use of artificial chemicals.

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Increasing food supply

Irrigation	<ul style="list-style-type: none"> Irrigation is the artificial watering of land. Irrigation projects can involve the construction of expensive dams and reservoirs, such as in the Indus Valley of Pakistan. They often benefit larger commercial farming. There are smaller schemes such as in Makeuni County in eastern Kenya. Pipelines and storage tanks enable drip irrigation to support domestic food cultivation.
The 'new' green revolution.	<p>The 'new green revolution' focuses on sustainability and community. It uses techniques such as:</p> <ul style="list-style-type: none"> Water harvesting and irrigation Soil conservation Improving seed and livestock quality using science and technology.
Appropriate technology	<ul style="list-style-type: none"> Means using skills or materials that are cheap and easily available to increase output without putting people out of work. Is particularly appropriate for people living in poorer countries. An example is using a bicycle to de-husk coffee beans or corn cobs.
Aeroponics and hydroponics	<ul style="list-style-type: none"> Aeroponics- Plants are sprayed with fine water mist containing plant nutrients. Excess water is re-used. This enables small scale farmers to increase yields and lower production costs. Hydroponics- Plants are submerged in nutrient rich water and kept under specific light and heat conditions.
Biotechnology	<ul style="list-style-type: none"> Uses living organisms to make or modify products or processes. Includes the development of genetically modified crops, which produce higher yields and use fewer chemicals. In the UK, there is opposition to GM crops because of the possible effects on the environment and human health.

Example of a large-scale agricultural development to increase food supply- The Indus Basin Irrigation System.

The Indus River runs from the Tibetan Plateau, through Pakistan to the Arabian Sea. With its tributaries, it supplies water to irrigate the drier agricultural land further south.

What is IBIS (Indus Basin Irrigation System).	<ul style="list-style-type: none"> The IBIS is the largest continuous irrigation scheme in the world. Three large dams and over a hundred smaller dams regulate water flow. Link canals enable water to be transferred between rivers, Smaller canals distribute the water across the countryside. Over 1.6million km of ditches and streams provide irrigation for Pakistan's agricultural land.
What are the advantages?	<ul style="list-style-type: none"> Improves food security for Pakistan, making 40% more land available for cultivation. Irrigation has increased crop yields. Diets have improved as a greater range of food products is available. HEP is generated by the large dams.
What are the disadvantages?	<ul style="list-style-type: none"> Some farmers take an unfair share of water. Poor irrigation techniques mean water is wasted. Salinisation (salty water) can damage the soil. Population growth will increase the demand for water. High costs to maintain reservoir capacity.

Sustainable food production	
A sustainable food supply ensures that fertile soil, water and environmental resources are available for future generations.	
Organic farming	<ul style="list-style-type: none"> Growing crops or rearing livestock without the use of artificial chemicals. Many people choose to pay higher prices for organic produce.
Permaculture	<ul style="list-style-type: none"> A system of food production which follows the patterns and features of natural ecosystems. Permaculture practices include: <ul style="list-style-type: none"> Harvesting rainwater Crop rotation Managing woodland.
Urban farming	<ul style="list-style-type: none"> Urban farming is the cultivation, processing and distribution of food in and around settlements. <p>The Michigan Urban Farming Initiative:</p> <ul style="list-style-type: none"> The Michigan Urban Farming Initiative in the USA aims to address problems of urban decay, poor diet and food insecurity in Detroit. Urban communities are encouraged to work together to turn wasteland into productive farmland, providing jobs and easier access to healthy food.
Fish from sustainable sources	<ul style="list-style-type: none"> Almost 90% of the world's fisheries are fully or over exploited. Sustainable fishing involves setting catch limits and monitoring fish breeding and fishing practices. In Norway, salmon farms are spread out to reduce the possible spread of disease.
Meat from sustainable sources	<ul style="list-style-type: none"> Sustainable meat production involves small-scale livestock farms, using free-range or organic methods. Prices may be higher in the shops but quality and animal welfare standards are higher.
Seasonal and local food consumption	<ul style="list-style-type: none"> In the past, food was bought from local sources when 'in season'. It is now possible in many wealthy countries to eat every type of food throughout the year. Local food sourcing is more sustainable. It reduces both 'food miles' and our carbon footprint.
Reducing food loss and waste	<ul style="list-style-type: none"> Around 32% of all food produced is lost or wasted each year. By halving the amount of food waste, the gap between food supply and demand could be reduced by 22%. <p>Food waste can be reduced by:</p> <ul style="list-style-type: none"> Improved food storage and distribution using refrigerated containers. Clearer food labelling, such as 'best before' or 'use by' dates. Using sealed plastic bags to make fresh food last longer. More sensible approach to using food that is past its 'sell by' date.

Example of a local scheme to increase sustainable supplies of food in a LIC of NEE.

The Makueni Food and Water Security Programme	<ul style="list-style-type: none"> The programme provided direct help to two small villages and Kanyenoni Primary School in Makueni County, Kenya. <p>The programme included:</p> <ul style="list-style-type: none"> Improving water supply by building sand dams for each village. Providing a reliable source of water for crops and livestock A training programme to support local farmers Growing trees to reduce soil erosion. <p>Sand dams store water in the ground, filtering and cleaning the rainwater as it soaks into the soil. They are cost-effective and sustainable.</p> <p>The project has been very successful because:</p> <ul style="list-style-type: none"> Crop yields and food security have increased Water-borne diseases have been reduced Less time is wasted fetching water.
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Global food supply	
Global patterns of food consumption	<ul style="list-style-type: none"> Canada, USA and Europe consume the most calories. In sub-Saharan Africa, daily calorie intake per head is below the recommended daily intake of 2000-2400 calories
Global food consumption is increasing because	<ul style="list-style-type: none"> There are growing populations Increasing levels of development mean people can afford to buy more food Improved transport and storage means there is more food available.
Global patterns of food supply	<ul style="list-style-type: none"> USA, Brazil and UK have high outputs due to intensive farming and investment. China and India have large populations and high agricultural outputs. Sub-Saharan African countries produce less food. They have unreliable rainfall, low investment and a lack of training.
What factors affect food supply?	<ul style="list-style-type: none"> Climate- regions experiencing extreme temperatures and rainfall struggle to produce food. Technology- in HICs, mechanisation and agribusiness give high levels of productivity. Pests and diseases- spread from the Tropics with rising temperatures. Water stress- lack of water affects many areas that suffer food scarcity. Conflict- can lead to the destruction of crops and livestock. Poverty- the poorest people cannot afford technology or fertilisers.
Impacts of food insecurity	
Famine	<ul style="list-style-type: none"> Famine is a widespread shortage of food often causing malnutrition, starvation and death. A famine in Somalia from 2010-2012 caused 258,000 deaths.
Rising prices	<ul style="list-style-type: none"> Food prices are rising, mainly due to increased cost of fertilisers, food storage and transportation. LICs and the poorest people in NEEs are hardest hit by food costs.
Soil erosion	<p>Soil erosion involves the removal of fertile top soil layers by wind and water. There are several causes:</p> <ul style="list-style-type: none"> Overgrazing- animals reduce the amount of vegetation, leaving soil exposed. Growing too many crops- uses up valuable nutrients, reducing soil fertility. Cultivation- using marginal land (poor quality) to increase food production can lead to loss of fertility. Deforestation for farming- removes the protective covering of the trees and increases surface run off.
Under-nutrition	<ul style="list-style-type: none"> Under nutrition is the lack of a balanced diet, and deficiency in minerals and vitamins.
Social unrest	<ul style="list-style-type: none"> Incidents of social unrest (food riots) are often linked to large increases in the price of food. In 2011, the price of cooking oil and flour doubled. In Algeria this led to five days of rioting.