

Resource Challenges

Resources are things that humans require for life or to make our lives easier. Humans are becoming increasingly dependent on exploiting these resources, and as a result they are in high demand.

Significance of Resources

Resources such as food, energy and water are what is needed for basic human development.

FOOD

Without enough nutritious food, people can become **malnourished**. This can make them ill. This can prevent people working or receiving education.

WATER

People need a supply of **clean and safe water** for drinking, cooking and washing. Water is also needed for food, clothes and other products.

ENERGY

A good supply of energy is needed for a basic standard of living. People need **light and heat** for cooking or to stay warm. It is also needed for industry.

Demand outstripping supply

The demand for resources like food, water and energy is rising so quickly that supply cannot always keep up. Importantly, access to these resources vary dramatically in different locations

1. Population Growth

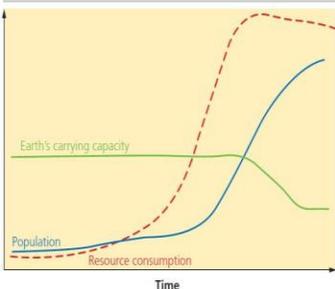
- Currently the global population is **7.3 billion**.
- Global population has risen **exponentially** this century.
- Global population is expected to reach **9 billion by 2050**.
- With more people, the **demand** for food, water, energy, jobs and space **will increase**.

2. Economic Development

- As **developing** and **emerging countries** develop further, they require **more energy** for industry.
- Developing** and **emerging countries** want similar lifestyles to **developed countries**, therefore they will need to **consume more resources**.
- Development means **more water is required** for food production as diets improve.

3. Changing Technology and Employment

- The demand for resources has driven the **need for new technology** to reach or gain more resources.
- More people in the **secondary and tertiary industry** has increased the **demand for resources** required for electronics and robotics.



Resource Management



Water in the UK

Growing Demand

The average water used per household has risen by **70%**. This growing demand is predicted to increase by **5% by 2020**. This is due to:

- A growing UK population.
- Water-intensive appliances.
- Showers and baths taken.
- Industrial and leisure use.
- Watering greenhouses.

Water Transfer

Water transfer involves moving water through pipes from areas of surplus (Wales) to areas of deficit (London). **Opposition includes:**

- Effects on **land and wildlife**.
- High maintenance **costs**.
- The **amount of energy** required to move water over long distances.

Deficit and Surplus

The north and west have a **water surplus** (more water than is required). The south and east have a **water deficit** (more water needed than is actually available). More than half of England is experiencing **water stress** (where demand exceeds supply).

Water stress in the UK



Energy in the UK

Growing Demand

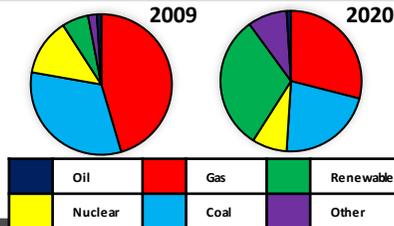
The UK consumes **less energy** than compared to the 1970s despite a smaller population. This is due to the **decline of industry**.

Changes in Energy Mix

- 75% of the UK's oil and gas has been used up.
- Coal consumption has declined.
- UK has become too dependent on imported energy.

Energy Mix

The majority of UK's energy mix comes from **fossil fuels**. By 2020, the UK aims for 15% of its energy to come from **renewable sources**. These renewable sources do not contribute to **climate change**.



Energy in the UK (continued)

Significance of Renewables

- The UK government is investing more into **low carbon alternatives**.
- UK government aims to meet targets for **reducing emissions**.
- Renewable sources include **wind, solar and tidal energy**.
- Although **infinite, renewables** are still expensive to install.
- Shale gas deposits may be exploited in the near future

Exploitation

- Nuclear**: New plants provide job opportunities. Problems with safety and possible harm to wildlife. Nuclear plants are expensive.
- Wind Farm**: Locals have low energy bills. Reduces carbon footprint. Construction cost is high. Visual impacts on landscape. Noise from wind turbines.

FOOD

Food Security is when people at all times need to have physical & economic access to food to meet their dietary needs for an active & healthy life. This is the opposite to Food Insecurity which is when someone is unsure when they might next eat.

Human

- Poverty** prevents people affording food and buying equipment.
- Conflict** disrupts farming and prevents supplies.
- Food waste** due to poor transport and storage.
- Climate Change** is affecting rainfall patterns making food production difficult.

Physical

- The **quality of soil** is important to ensure crops have key nutrients.
- Water supply** needs to be reliable to allow food to grow.
- Pest, diseases and parasites** can destroy vast amounts of crops that are necessary to populations.
- Extreme weather** events can damage crops (i.e. floods).

Daily Calorie Intake



This map shows how many **calories per person** that are consumed on average for each country. This can indicate the global distribution of **available food** and **food inequality**.

Food Supply



This map shows the amount of **food produced** in different countries. Whilst Asia and North America have **high** production outputs, Africa and Central America have **low** production outputs.

WATER

Water security is when people have good access to enough clean water to sustain well-being and good health. Water insecurity is when areas are without sufficient water supplies. Water Stress is when less than 1700m³ is available per person.

Human

- Pollution** caused from human and industrial waste being dumped into peoples water sources.
- Poverty** prevents low income families affording water.
- Limited infrastructure** such as a lack of water pipes and sewers.
- Over-abstraction** is when more water is taken than is replaced.

Physical

- Climate** needs to provide enough rainfall to feed lakes and rivers. Droughts affect supply if water.
- Geology** can affect accessibility to water. Permeable rock means sourcing water from difficult aquifers, whereas impermeable allows water to run-off into easily collected basins.

Impact of Water Insecurity

Food production

The less water available for irrigating crops the less food that will be produced. This could lead to starvation.

Disease and Water Pollution

Inadequate sanitation systems pollutes drinking water causing diseases such as cholera and typhoid.

Industrial output

Manufacturing industries depend heavily on water. A severe lack of water can impact economic output.

Water conflict

Water sources that cross national borders can create tensions and even war between countries.

ENERGY

Energy security means having a reliable, uninterrupted and affordable supply of energy available. Energy insecurity can be experienced by countries with both a high and low energy consumption. Technology is increasing energy consumption.

Physical



Economic



- **Geology** determines the availability of fossil fuels.
- **Climate variations** will affect the potential use of renewable energy.
- **Natural disasters** can damage energy infrastructure.

- **Cost** of extracting fossil fuels is becoming costly and difficult.
- **Price of fossil fuels** are volatile to potential political changes.
- **Infrastructure** for energy is costly, especially for LICs.

Technology



Political



- **New technology** is making once difficult energy sources now reachable/exploitable.

- **Conflict** and turmoil in energy rich countries can affect exports.
- **Stricter regulations** over Nuclear.

Impact of Energy Insecurity



Sensitive environments

Food production

Exploration of energy resources threatens to harm sensitive areas such as the oil drilling in Alaska, USA.

Food production depends on the energy needed to power machinery and transport goods to different markets.

Energy conflict

Industry

Shortages of energy resources can lead to tensions and violence. Conflict can be caused by fear of energy insecurity.

Countries can suffer from shortfalls in energy leading to a decline in manufacturing and services.

Increasing Energy Supply

C.S. UK Fracking



Non-renewables

Fossil Fuels - Conventional power stations can be made more efficient with carbon capture overcoming the environmental impacts.

Nuclear - Once a nuclear plant is built it can provide a cheap and long-term dependable source of energy.

Renewables

Wind, Solar, Biomass - These are examples of environmentally friendly renewable sources that can't run out but cost a lot to install.

Fracking is used to extract natural gas trapped in underground shale rock. It is a method considered by the UK.

Advantages

- Estimated to create 64,000 jobs.
- UK has large shale gas reserves.
- Is far cheaper than natural gas.

Disadvantages

- May cause groundwater pollution
- Is a non-renewable resource.
- May trigger minor earthquakes.

Key words

Natural resource	Any feature or part of the environment that can be used to meet human needs.
Abiotic	Non-living parts of the environment. Examples include minerals, soil, sunlight, precipitation and fresh water
Biotic	Living parts of the environment. Examples include animals, birds, plants, fungi and other similar organisms.
Non-renewable	Those that cannot be 'remade' because it would take millions of years for them to reform. Examples include coal, oil, uranium and natural gas.
Renewable	Those that are potentially inexhaustible and can be naturally replenished in a short time scale. Examples include wind, solar and hydro-electric power.
Exploitation	Using resources
Overfishing	Taking of wildlife from the sea at rates too high for fished species to replace themselves
Deforestation	Cutting down of trees
Agriculture	Art and science of cultivating the soil, growing crops and raising livestock (farming)
Biodiversity	Every living thing, including plants, bacteria, animals, and humans
Stakeholders	Any group or individual who can affect or is affected by the achievement of the organization's objectives
Energy mix	The range of energy sources of a region

Resource Management

Victory Vals



China

Largest contributor of greenhouse gas emissions in the world.

HEP: The Three Gorges Dam

Opened in 2003 costing \$23bn, 1.4 million people were forced to relocate

The power generated by the 34 generators is enormous. It is equivalent to burning 25 million tons of crude oil or 50 million tons of coal

The reservoir that has been created helps prevent flooding in a large area and allows huge ocean going freighters to sail into the heart of China.

Every year, about 265 million gallons of raw sewage are deposited in the Yangtze River. Once the dam is completed, it is believed by some that the sewage will collect in the reservoir

Geothermal: Yangbajain Geothermal Field

The Yangbajain Geothermal Field is in Tibet, China.

It is currently China's largest high-temperature steam geothermal field, and, moreover, one of the largest geothermal fields in operation in the world today. The fluid is heated by magmatic activity not far below the surface.

One geothermal facility can replace 3,000 tons of coal each year, saving over 75 million tons of carbon dioxide and 30 tons of sulfur dioxide.

The geothermal field is also used to operate greenhouses so is beneficial for farming.

Biomass: Kaiyou Green Energy Project

Jiangsu Province is the leading Chinese province for generation of bio energy.

Rice husks are the hard protecting coverings of rains of rice. As well as protecting rice during the growing season, husks can be used as fuel.

Bioenergy is also used at the domestic level in China, both in biomass stoves and by producing biogas from animal manure

Unreliability of supplies of rice husk is a problem and it can be expensive to transport it to the power plant.

Germany

In early 2011, nuclear power produced nearly 20% of Germany's energy. By July 2011 (three months after Fukushima), the German government vowed to shut down its nuclear capability within 10 years and produce 80% of energy from renewables by 2050

Solar: Bavaria Solarpark

The Solarpark is equipped with 57,618 photovoltaic panels installed in three different locations.

Appropriate care was taken in the design and construction of the Solarpark to preserve the natural beauty and environmental quality of the region.

The renewable power project is expected to generate more than 215 million kWh of renewable electricity over its first 20 years of operation.

It is expected to cut more than 100,000t of carbon dioxide emissions over a period of 30 years

Wind: Norses Ost Farm

The wind farm consists of 48 turbines with a total capacity of 295 MW.

Germany's government plans to have wind energy production of around 6500 MW by 2020

The wind farm will generate about 1.1TW-hours of climate-friendly electricity per annum, which is enough to power 320,000 households. It is estimated to offset approximately 850,000t of carbon dioxide emissions a year compared with a modern gas-fired power plant.

Reasons for differences in energy mix

Population	India has population of 1.2billion therefore needs to use all energy sources available. Iceland only has to supply energy to 320,000 people therefore can use fewer sources.
Income and wealth	India's average income is low so people need the cheapest options available. In Iceland, the government and people can afford the higher initial costs of renewable sources.
Availability of energy	Iceland has no fossil fuels therefore imports its oil. India however has high coalfields and about 5.6 billion barrels of oil reserves



Figure 5 Energy mix for India (left) and Iceland (right), 2011