

The Challenge of Resource Management

Knowledge checklist

Key ideas	How secure is my knowledge?		
Resource Management			
<ul style="list-style-type: none"> • What are resources? The three most important ones we will cover in this unit are food, water and energy. • Distribution of resources globally and their significance to economic and social well-being. Understand inequalities around the world. • Resources in the UK: <ul style="list-style-type: none"> - Food demand in the UK is changing- we export more and more food from low income. - Food miles add to our carbon footprint and local sourcing, seasonal food and organic are becoming trendier. - Agribusiness produces food in intensive farms maximising productivity. - Demand for water in the UK is rising due to population growth. - Water supply in the UK is split; north and west have surplus whereas south and east have deficit of water. Therefore water transfer is needed. - Water quality is managed by the Environment Agency. - Energy consumption in the UK has fallen due to changing industries and efficiency. - Energy mix, meaning sources of energy eg oil and gas or renewables, has changed and the UK is importing more of its energy and this affects our energy security. - When considering energy production, economic and environmental considerations must be taken for example fracking is controversial. 			
Water			
<ul style="list-style-type: none"> • Demand for water resources is rising globally but supply can be insecure. This may lead conflict. • Areas of water deficit globally include many parts of Africa, the middle East and Australia. • Areas of water surplus globally include North America, Europe and parts of Asia. • Regions with no access to sufficient water supplies have water insecurity. This affects the levels of development in those regions. • Water stress means that over 80% of water available is used. • Reasons for increased water consumption are related to increasing economic development. • Many factors affect water availability; climate, geology, pollution, over-abstraction, poor infrastructure and poverty. • The impacts of water insecurity include waterborne diseases such as cholera and dysentery, lower agricultural production due to droughts that can lead to famines, industrial output is affected by water shortages and conflict, even wars, can happen due to water disputes between countries. • Strategies to increase water supply are supply diversion, increasing storage, building dams and reservoirs, water transfers and desalination of sea water. • Sustainable water supplies- the future. <ul style="list-style-type: none"> - Conserving ground water. - Management of ground water to maintain quality and quantity. - Recycling treated domestic water for agricultural or industrial purposes. 			

<ul style="list-style-type: none"> - Use of grey water, from sinks, baths and showers, for irrigation and watering gardens. • Case study: The Wakel River Basin Project in India. <ul style="list-style-type: none"> - Issues in the area. - Aims of the project. - How it is Increasing water supply using taankas, johed, pats. 			
<p>Food</p> <ul style="list-style-type: none"> • Demand for food resources is rising globally but supply can be insecure, which may lead to conflict. • Areas of surplus (security) and deficit (insecurity): global patterns of calorie intake and food supply. • Reasons for increasing food consumption: economic development, rising population • Factors affecting food supply: climate, technology, pests and disease, water stress, conflict, poverty. Impacts of food insecurity – famine, undernutrition, soil erosion, rising prices, social unrest. • Different strategies can be used to increase food supply. • Irrigation, aeroponics and hydroponics, the new green revolution and use of biotechnology, appropriate technology. • An example of a large scale agricultural development to show how it has both advantages and disadvantages. • Moving towards a sustainable resource future: the potential for sustainable food supplies: organic farming, permaculture, urban farming initiatives, fish and meat from sustainable sources, seasonal food consumption, reduced waste and losses. • An example of a local scheme in an LIC or NEE to increase sustainable supplies of food. 			
<p>Energy</p> <ul style="list-style-type: none"> • Demand for energy resources is rising globally but supply can be insecure, which may lead to conflict. • Areas of surplus (security) and deficit (insecurity): global distribution of energy consumption and supply. • Reasons for increasing energy consumption: economic development, rising population, technology. • Factors affecting energy supply: physical factors, cost of exploitation and production, technology and political factors. Impacts of energy insecurity – exploration of difficult and environmentally sensitive areas, economic and environmental costs, food production, industrial output, potential for conflict where demand exceeds supply. • Impacts of energy insecurity – exploration of difficult and environmentally sensitive areas, economic and environmental costs, food production, industrial output, potential for conflict where demand exceeds supply. • Different strategies can be used to increase energy supply. • Overview of strategies to increase energy supply: renewable (biomass, wind, hydro, tidal, geothermal, wave and solar) and non-renewable (fossil fuels and nuclear power) sources of energy. • An example to show how the extraction of a fossil fuel has both advantages and disadvantages. • Moving towards a sustainable resource future: individual energy use and carbon footprints. • Energy conservation: designing homes, workplaces and transport for sustainability, demand reduction, use of technology to increase efficiency in the use of fossil fuels <ul style="list-style-type: none"> • an example of a local renewable energy scheme in an LIC or NEE to provide sustainable supplies of energy. 			

Section I

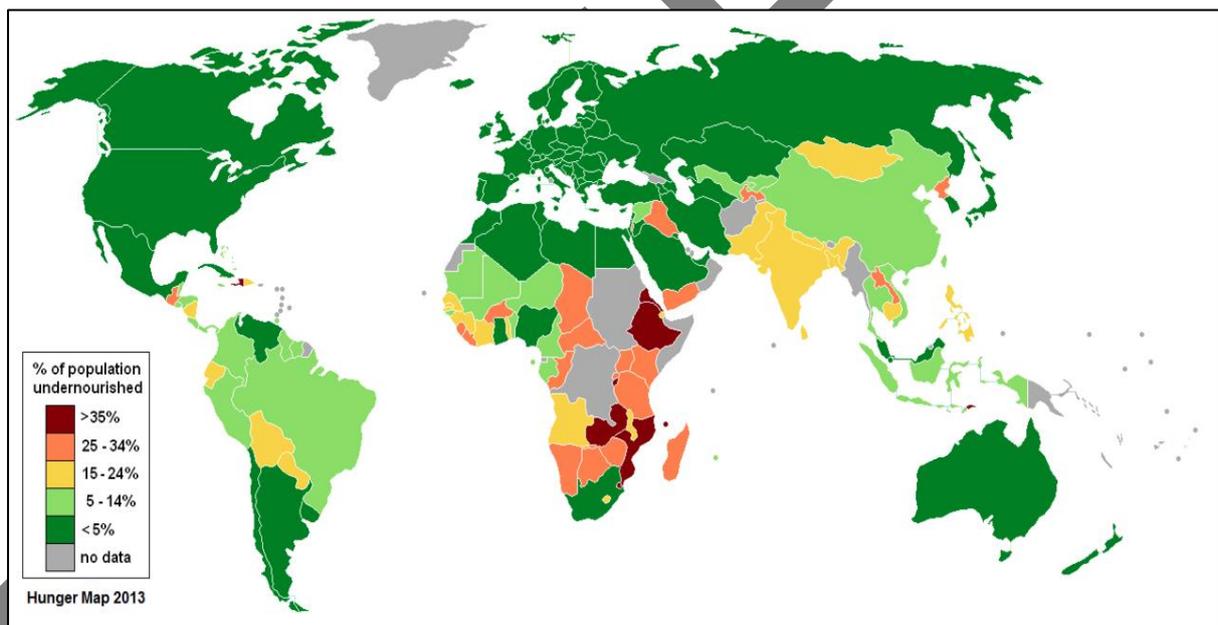
Resources

“A **resource** is a stock or supply of something that has a value or purpose. The three most important resources are food, energy and water. Adequate supplies of these resources are essential for a countries development.”

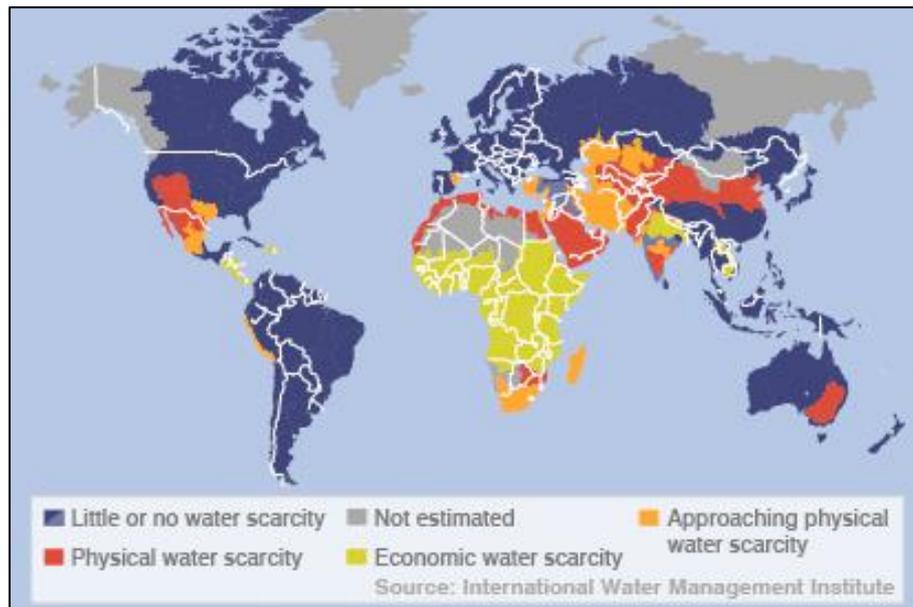
Distribution

- Most of the worlds resources are unevenly distributed
- Most HICs have plenty
- Many of the worlds poorer countries have few resources

Malnourishment

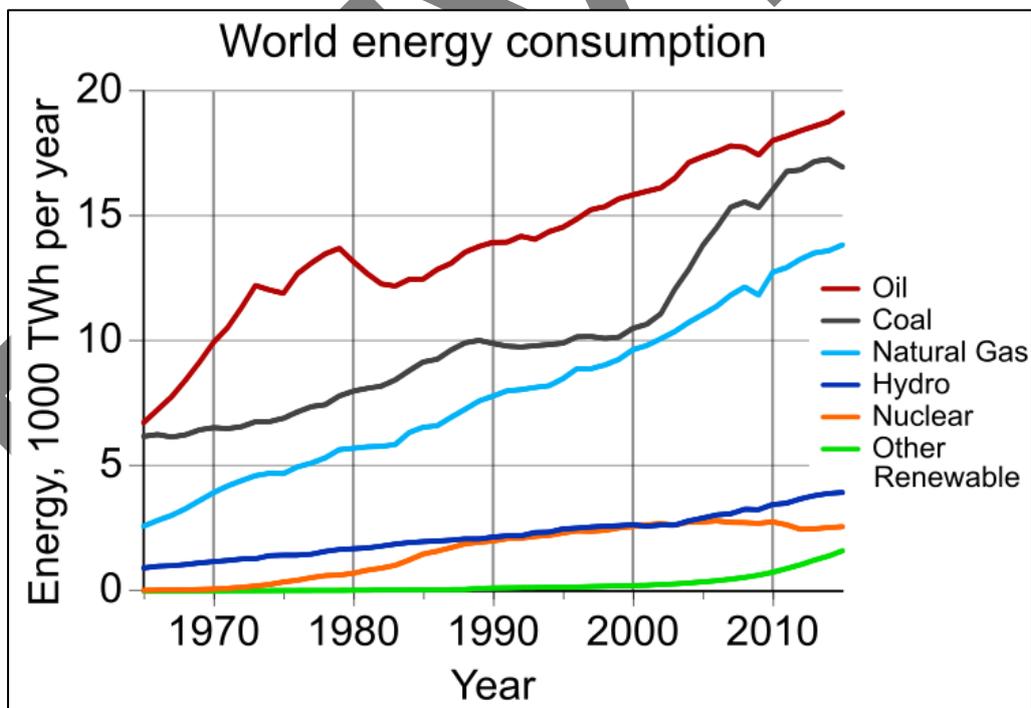


Water Scarcity



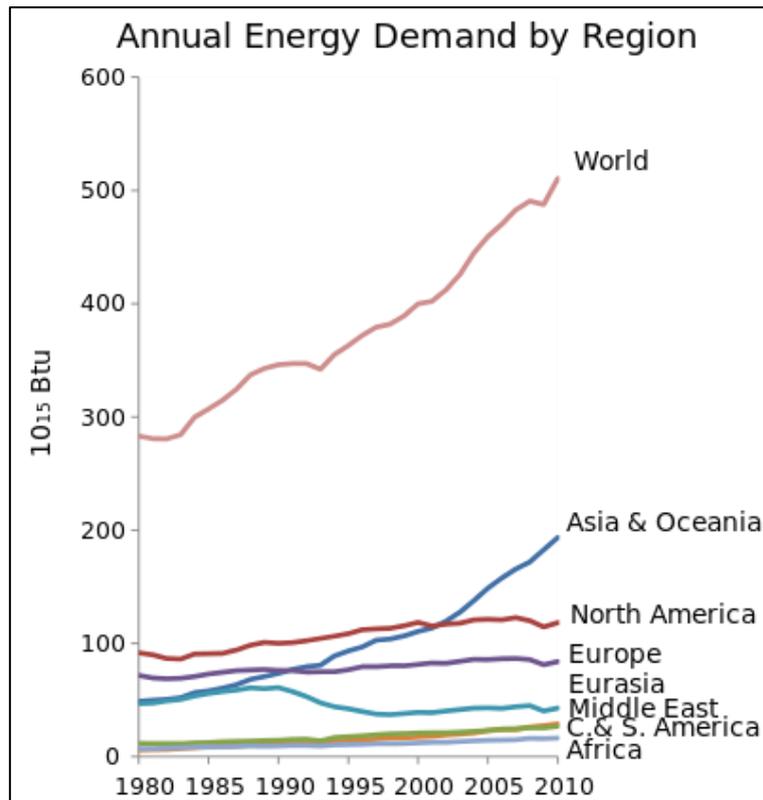
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World Energy Consumption



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World Energy Use



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Provision of food in the UK

Blueberries – USA (5300km)

Mangoes – Brazil (9200km)

Rice – India (7500km)

Coffee – Kenya (6800km)

Changing demand

- The current UK population size is 61 million.
- This is expected to rise to 73 million by 2037.
- The UK is far from being self sufficient and imports about 40% of its food.

Mangetout

- Mangetout is growing in popularity in the UK.
- It is mainly imported from Kenya, 6800km away.
- The distance food travels is known as food miles.
- This adds to our carbon footprint.
- Vegetables are Kenya's biggest source of income.
- The cost of air transport to keep the food fresh is high.
- Generally food that is out of season will be more expensive in the UK.

• Stage	• Price per tonne (£)	• % of final price
• Producer	• 630	• 12
• Exporter	• 290	• 6
• Packaging	• 280	• 5
• Air freight	• 1040	• 20
• Importer	• 620	• 12
• Supermarket	• 2500	• 45
• Total price	• 5360	• 100

UK response to challenges

- The UK needs greater food security.
- People in the UK are being encouraged to eat seasonal British food.
- There are two major trends in farming.

Agribusiness

- This is intensive farming aimed at maximising output of food.
- Farms are run as a commercial business.
- High levels of investment.
- Modern technology and chemicals used in production.

Agribusiness – Lynford House Farm

- This is a farm in East Anglia.
- It has a high input of chemicals and machinery.
- The land is very flat and fertile.
- Main crops – wheat, sugar beet and potatoes.
- Chemicals used as pesticides and fertilizer.
- Machinery costs are high but leads to less workers.
- It has a huge reservoir to deal with water shortages.

Organic Produce

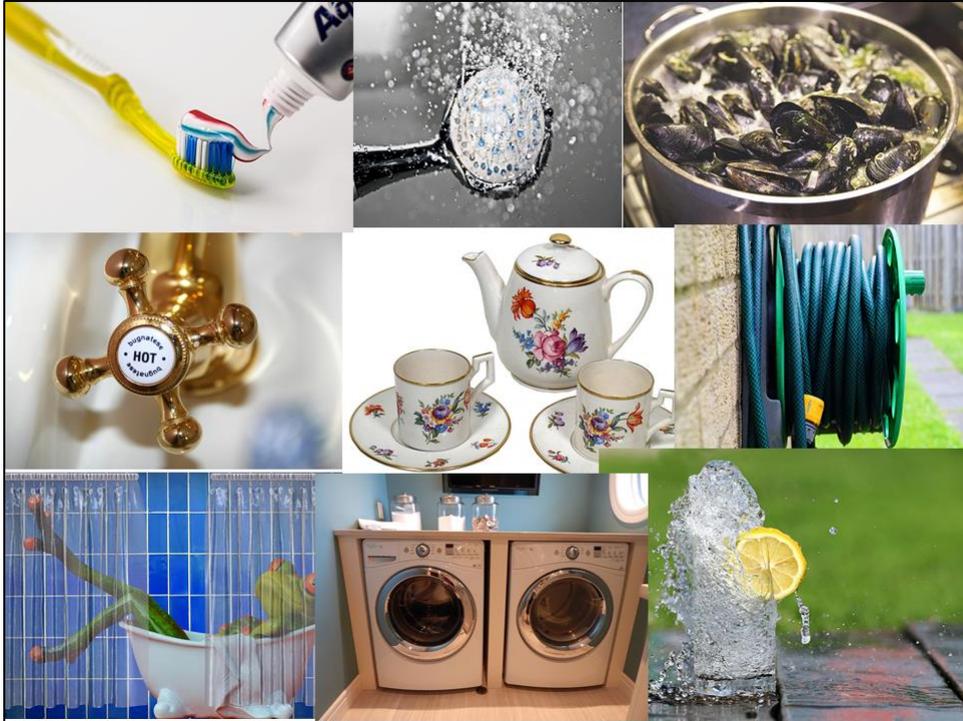
- Growing food without chemicals.
- It is becoming increasingly popular and can be sold for more money.
- Labour costs are high.
- Often local produce and seasonal.

Riverford Organic Farms

- Located in rural Devon.
- Organic food and dairy farm.
- Supplied to local people through box deliveries.
- Expanding area of delivery.

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- Provides local employment, supports local farms, reduces food miles and builds links between the producer and consumer.

Provision of water in the UK



UK Water

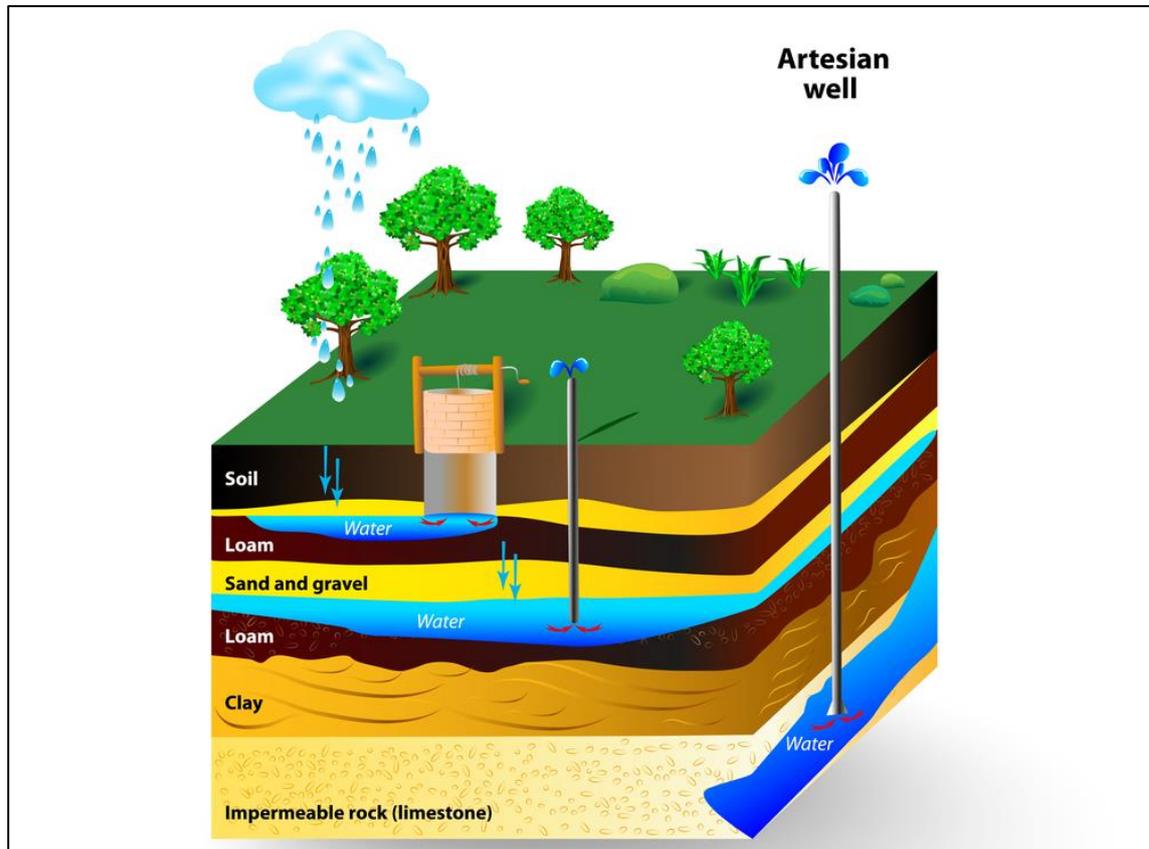
- Almost 50% of the UK's water is used in the home.
- Almost 21% of the UK's water is lost through leakage.
- UK water demand is rising.

Rising demand

- Growing population.
- More houses being build.
- Increase in water intensive appliances e.g. coffee machines, dishwashers.

Supplying water

Aquifer



Water Stress/Surplus

- In the UK the North and West of the UK has a surplus of water due to high rainfall, low evaporation and plenty of sites for reservoirs.
- In the South and East there is a water deficit, this creates water stress – where demand exceeds supply. This is due to less rainfall and it being the most densely populated part of the UK.
- Drought make this worse.

Saving water

- Water can be saved by:
- Using water meters.
- Using recycled water.

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- Using more efficient appliances.

Water Transfer

- In 2006 the government proposed transferring water from areas of surplus to areas of deficit.
- However, the huge cost of this largely stopped it happening.
- There is a growing need for water transfer but people resist due to the impact of land and wildlife, high cost and the amount of greenhouse gases released in the process of pumping water long distances.

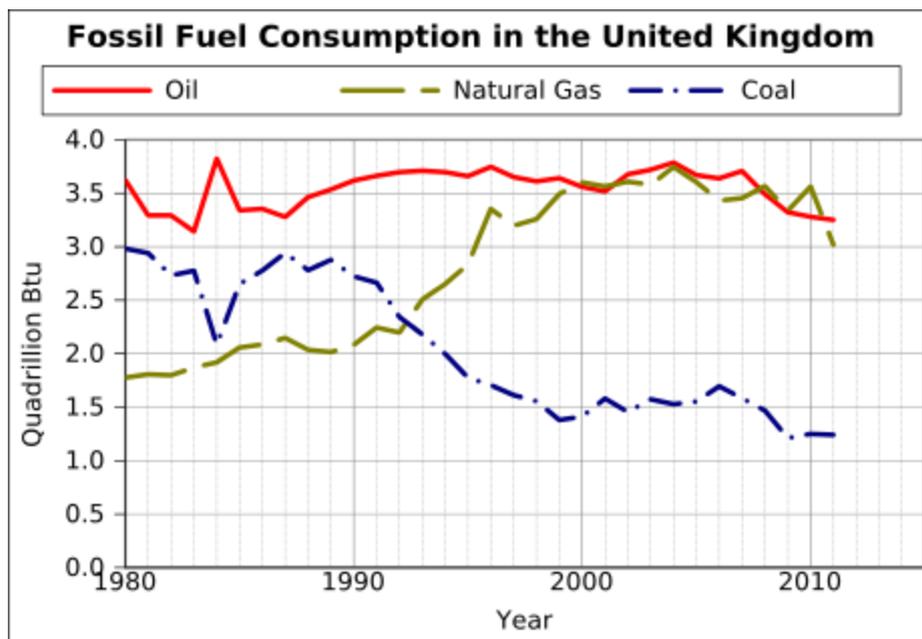
Water quality

- Water quality is very important.
- The Environment Agency measures UK water quality.
- River water quality is measured.
- Chlorine is added to the water supply.
- Sediment is removed.
- Recreational use is restricted.

Some issues still occur with our water due to:

- Leaching from old mines.
- Discharge from industrial sites.
- Runoff from chemical fertiliser from farmland.
- Water used for cooling power stations released back into rivers.

Provision of energy in the UK

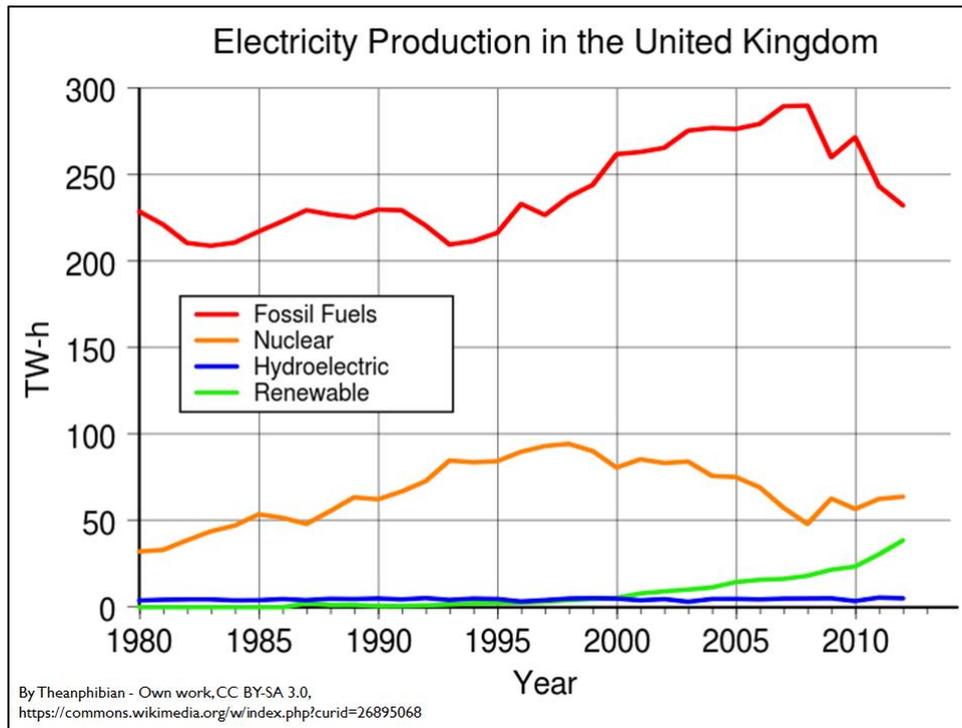


UK energy demand

- Demand for electricity is increasing.
- However overall demand for energy has reduced due to the decline of heavy industry, improved low energy appliances and more fuel efficient buildings and cars.
- Industry use has drop around 60% in the last 30 years and domestic 12%.

Changing energy types

- In the last 25 years use of fossil fuels has reduced and renewables has increased.
- However, government subsidies for wind and solar have been faded out.

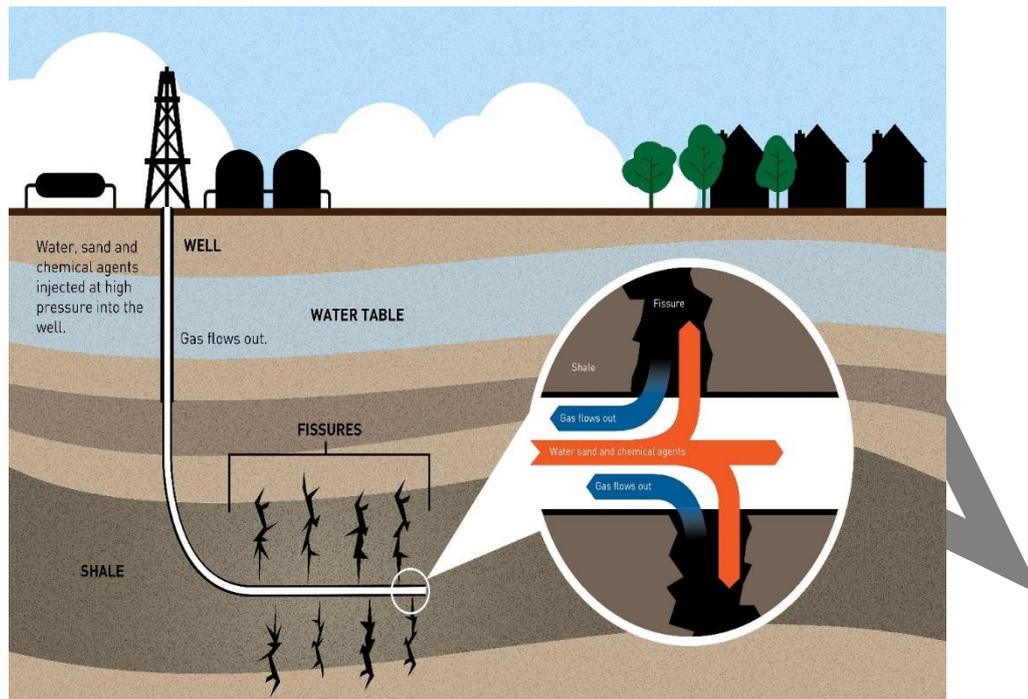


Energy Security

- The UK is not energy self sufficient.
- By 2020 about 75% of the UK energy will be imported.
- This effects our energy security.

Fracking

- The UK has rich reserves of trapped gas.
- This could help our energy security.
- People don't like it because of the environmental risks associated with it.



Two visions of the future

Malthus, Boserup and the Club of Rome

OVERPOPULATION

Too many people in an area relative to the number of resources and the level of technology available locally to maintain a high standard of living.

Therefore with no change in the level of technology or resources a reduction in population would result in a rise in living standards.

As long as there is over population the quality of life will decline through unemployment, pollution, degradation of the environment.

Characterised by:

- Low per capita income
- High unemployment
- Under employment
- Outward migration

UNDERPOPULATION

Too few people in an area to use the resources efficiently for a given level of technology.

Therefore if population were to increase, resources would be used more efficiently and living standards would increase for all people.

An increase in population would lead to an increase in quality of life.

Characterised by:

- High per capita incomes
- Low unemployment
- Inward migration

OPTIMUM POPULATION

The theoretical population which, working with all the available resources, will produce the highest standard of living for the people of that area.

CARRYING CAPACITY

The maximum population that the resources of an area can support.

- The reality of achieving OPTIMUM population is difficult in practice because of 2 main reasons:
 - Population sizes are not static but DYNAMIC and grow or shrink over time.
 - Technology changes, allowing the exploitation of natural resources that might not have previously been available (e.g. technology has allowed us to farm increasing amounts of land in the UK that 200 years ago would have been inadequate for farming).

Malthus(1766-1834):

- Population growth would be geometric.
 - 1,2,4,8,16,32
- Food production would be arithmetic.

- 1,2,3,4,5,6
- Population would grow until food supply reached its limit.
- After this there would be poverty and famine.
- However.....
 - He recognised that fertile land could be made more productive.....BUT this would reach a point where ' the law of diminishing returns kicked in'.
 - Farmers would therefore still reach maximum output.
 - He created 'checks' on population growth, so once numbers exceeded food supply the population would NEVER increase.

Positive checks	Preventative checks
<ul style="list-style-type: none"> - Inadequate food supply - Famine - Disease - war = DR INCREASED	<ul style="list-style-type: none"> - Delayed marriage - Abstaining from sexual relationships - Reduction in fertility rate = BR DECREASED

- The accelerated population growth in LEDC's in 1950s renewed Malthusian fears.
- Supporters now believe the day of reckoning has been delayed.

Club of Rome

- Clubofrome.org.
- Pro-Malthusian ideas.
- rote 'The limits of population growth'.
- Idea that growth limit will be reached in the next 100 years.
- Decline in population and industrial capacity by 2100 will result in:

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- Decline in food supply
 - Depleted resources
 - Increased DR
 - World population decline
- It doesn't account for human dimension:
 - Technological advances
 - Human responses to resource depletion etc
 - Malthus theory is 200 years old.
 - There are still the Neo-Malthusian theories.

Boserup (1965)

- Malthus theories had not occurred.
- Population growth had been a driving force for innovation and technology.
- Population growth provided incentives for increasing agricultural output improvement and change.
- Human invention was a response to needs.
- 'Necessity the mother of invention'.
- Agreed that growing populations can exhaust resources, but people find substitutes.

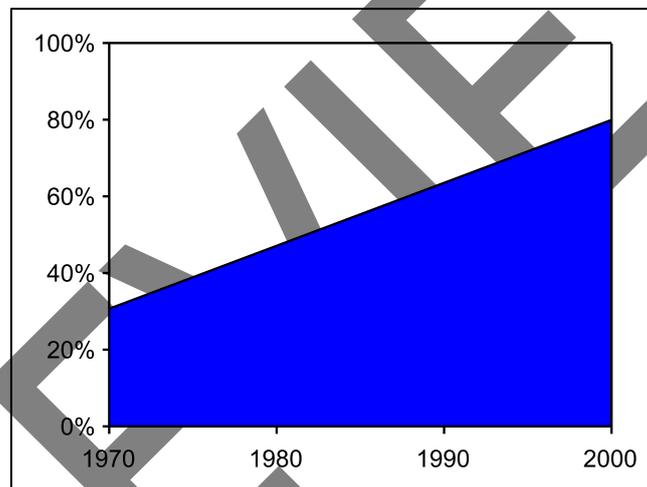
Section 2

Water Management

Global Water Supply

- Water surplus = plentiful supply
- Water deficit = lack of water
- Regions with high rainfall usually have a water surplus but this is also effected by population size.
- High concentration of industry will also impact the level of water security.

Global access to drink water



- Water security is having enough access to clean water.
- If this is not the case you have water insecurity.
- Water security leads to:
 - Reduced poverty levels
 - Improved education
 - Better living standards
- When over 80% of a countries water supply is used in a given year.
- Common uses:
 - Agriculture

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- Industry
 - Domestic
 - Reservoirs (evaporation)

Increasing consumption

- World's population growing by approximately 80 million people per year.
- Changes in lifestyle.
- Irrigation of crops.
- Industry requiring water.
- Urbanisation.

Water availability

- Factors affecting water supply.
- Geology – infiltration of water.
- Climate – more or less rainfall in a year.
- Over-abstraction – E.g. in urban areas.
- Pollution – water borne diseases.
- Limited infrastructure – e.g. to build pipes.
- Poverty – lack of access.

The Impact of Water Insecurity

Waterborne diseases & pollution:

- Occurs in countries with limited infrastructure.
- Areas of little or no sanitation.
- Open sewers.
- High levels of pollution.
- Diseases include cholera and dysentery.

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- In Dharavi, the most densely populated shanty town on earth, up to 1200 people share a single toilet.

Access to water

- In areas where people have to walk long distances for water or spend lots of time waiting to access water, there is huge economic inefficiency.
- Think about what else these people could be doing with their time!?
- Lack of water restricts productivity.

Food production

- Increased food production and population is affecting water supply.
- Agriculture uses about 70% of the worlds water supply.
- Increased droughts is seriously affecting food and water supply.

Water conflict

- Conflict between countries, states or groups over water supply.
- Rivers that cross several countries are often at the centre of this e.g. Nile, Danube.

How can water supply be increased?

- If supply is limited you need to look elsewhere for water.
- Much of the water in London is piped in from Wales.
- Water can be stored in reservoirs or in aquifers.
- Dams allow us to control the flow of water but are very expensive!

Desalinisation

- It is possible to remove the salt from seawater to make it suitable to drink.
- This is however, very expensive and is only used where there is a serious shortage and lots of money e.g. Saudi Arabia and the UAE.
- Desalinisation has a huge environmental impact, uses a lot of energy and needs to be transported to the area of need.

Sustainable Water Supply

Population and water stress

- Population growth alone is putting huge stress on water supplies.
- Add climate change and increasing development levels in the mix and we have a big problem.
- We need to reduce waste and excessive demand.
- This is about cutting unnecessary use:
 - Reducing loss through leakage (accounts for up to 30% of global loss)
 - Monitoring illegal connections
 - Water tariffs
 - Improving public awareness
 - Water meters
 - Preventing pollution

Groundwater management

- Groundwater stored in aquifers has to be managed to maintain quality.
- They can easily become contaminated.
- This is a big problem in LICs.

Recycling water

- For domestic and industrial use.

Grey water

- Using water from bathrooms and kitchens to do things like water plants.

The Indus Basin Irrigation System (IBIS)

- The Indus Basin is a very developed watershed in that it has a lot of storage and management infrastructure.
- Very important water system for NEEs India and Pakistan.

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- In 1960 the Indus Water Treaty was agreed so both countries could benefit from the drainage basin.
 - The drainage basin is fed by mountain rivers, which in turn are fed by heavy rain and snow melt.
 - It is the largest continuous irrigation system in the world.
 - It consists of three large dams and hundred of smaller dams that regulate water flow.
 - It has over 64,000 canals.
 - Over 1.6 million km of ditches and streams to provide irrigation.

PREVIEW

Section 3

Food

Global food supply

- **Famine** - A widespread, serious, shortage of food. In the worst cases it can lead to starvation and even death.
- **Food insecurity** - Being without reliable access to a sufficient quantity of affordable, nutritious food. More than 800 million people live every day with hunger or food insecurity.
- **Food deficit**- Being without enough food in a given country.
- **Food security** - When people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life.
- **Food surplus** - When a country produces more food than it needs.

Factors effecting food supply

- Climate restricts the type and amount of food that can be grown.
- Weeds and pests thrive in warmer conditions.
- Technology effects yield. HICs have greater access to technology.
- Lack of water is a huge issue in food production.
- Conflict can lead to food being destroyed.
- Poverty restricts people's ability to farm.

Impact of food insecurity

- Many of the poorest people in the world live on less than \$1 per day. This seriously impacts food security.

Famine

- Famine is the widespread shortage of food. It often leads to malnutrition, starvation and death.
- **Major famines**

- Soviet Union = droughts and crop failures led to 9 million deaths in the 1920's and 1930's.
- China = droughts and political decisions led to over 15 million people dying from 1928-1959.
- Ethiopia – In the 1980's over 400,000 people died.



Undernourishment

- This is the lack of a balanced diet and includes deficiencies in minerals and vitamins.
- Between 2012 and 2016 it is estimated by the Food and Agriculture Organisation (FAO) that over 800 million people suffered from undernourishment – this causes an estimated 300,000 deaths per year.
- Southern Asia and sub Saharan Africa are most effected.

Soil Erosion

- This is the removal of fertile top soils by wind and water.
- Main causes:
 - Overgrazing by animals reducing the amount of vegetation and leaving the soil exposed.

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- Over growing crops. Taking away nutrients and the land becoming infertile.
 - Cultivation of marginal land to try and increase food production.
 - Deforestation which removes the protective tree covering and increases surface run off.

Increasing food supply

- Hydroponics – plants grown in gravel or mineral rich water.
- Aeroponics is a system wherein roots are continuously or discontinuously kept in an environment saturated with fine drops (a mist or aerosol) of nutrient solution.

The green revolution

- The **Green Revolution** refers to a set of research and development of technology transfer initiatives occurring between the 1930s and the late 1960s.
- The initiatives resulted in the adoption of new technologies, including:
 - Machines
 - Chemicals
 - New strains of plant

The “new” green revolution

- This focus on sustainability and community.
- The Indian government spurred this in 2006 and as a result doubled its annual rice yield in the region of Bihar.
- Techniques include:
 - Water harvesting
 - Soil conservation
 - Irrigation
 - Improving seed and livestock quality

Sustainable food production

- ...ensures that fertile soil, water and environmental resources are available for future generations.
- If we are to increase global food supply, this must be at the heart.

Organic farming

- Growing crops and rearing livestock without the use of chemicals.
- As a result production costs are often higher.
- However, some people are happy to pay more for organic produce.

Permaculture

- Permaculture is a system of agricultural and social design principles centered on simulating or directly utilising the patterns and features observed in natural ecosystem.
- It aims to be sustainable, non-polluting and healthy.
- It uses natural rainfall, crop rotation and manages the land.

Urban farming

- Food close to where it is needed.
- Great choice and a healthy diet.
- Trendy!
- Creates jobs in deprived urban areas.
- Improves the urban environment.
- Attracts wildlife such as birds and butterflies.
- Social benefit from communities working on projects.

Fish

- Over 90% of the worlds fish areas are over exploited.

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- Increasing demand for food and improved technology has led to more fish being caught.
 - The methods are unsustainable and destroy ecosystems.
 - Sustainable fishing means running quotas and monitoring breeding.

Meat

- Intensive livestock production can be unsustainable.
- Large amounts of heat and light used for indoor rearing.
- Chemicals used to maximise production.
- High numbers of animals can damage soil.
- Sustainable farming involves small scale rearing, using free range and organic methods and meeting animal welfare standards.

Sustainable food production – managing food supply

Historically

- Local shops.
- Regularly buy food due to limited storage (think about life before fridges and freezers).
- People bought seasonal food.
- It was expensive for food to travel.

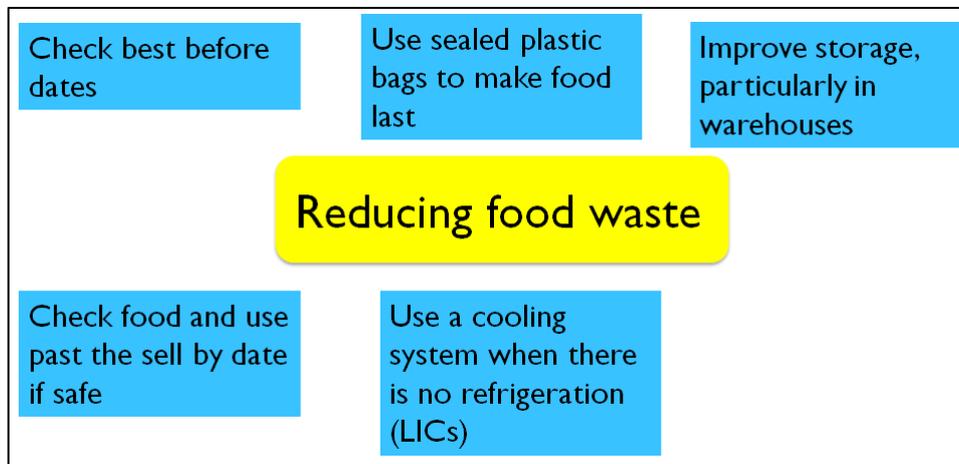
Now...

- Food is far cheaper due to technological advancements.
- People want all food all year around.
- Supermarkets and online shopping have replaced local shops.

Seasonal local food

- Reduces the energy expelled in the travel of food – reducing carbon food print.
- It supports the local economy.

- It follows the natural seasonal cycle.
- It is often fresher.
- Excessive packaging is rarely used, unlike the supermarket.



Food waste

- 32 % of all food produced is wasted.
- Almost 50% of fruit and vegetable produced are thrown away.
- Improving waste could significantly help close the food supply and demand gap globally.

Kenya – Sustainable food

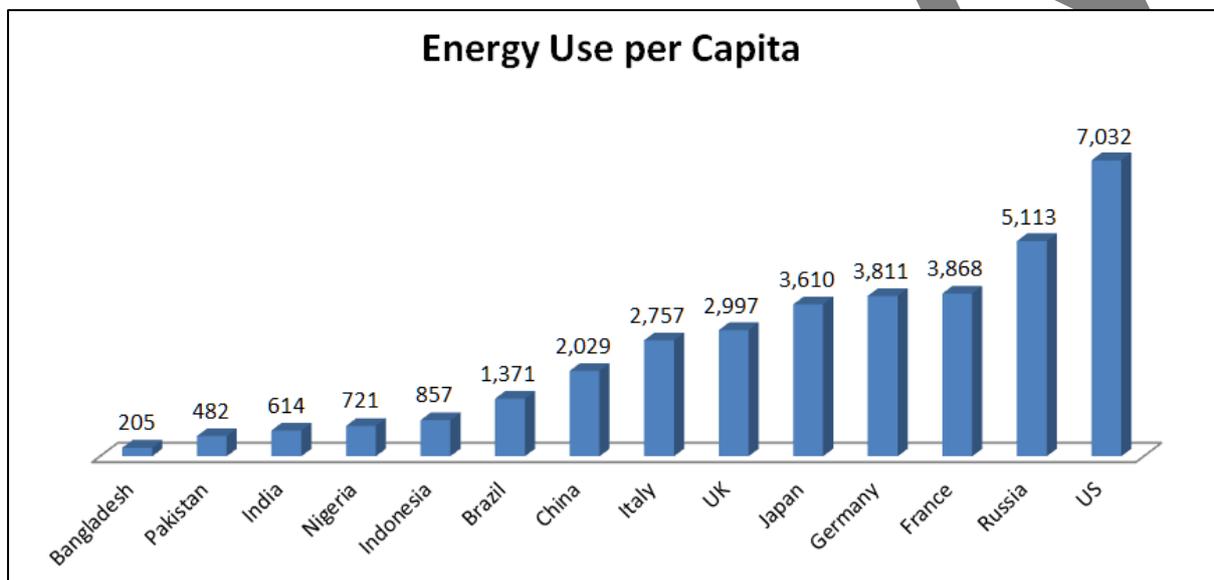
- Makueni in Kenya is increasing sustainable food supplies.
- Clean and safe water supply.
- Utilising rain water.
- Training local farmers.
- Growing trees to reduce soil erosion.
- As a result – increased crop yields, water borne diseases reduced and improved education.

Section 4

Energy

Energy security

- Security = $\frac{\text{supply (production)}}{\text{demand (consumption)}}$
- If supply exceeds demand a country has an energy surplus.
- Energy insecurity is when demand exceeds supply.



Impacts of energy insecurity

- Many countries have energy insecurity.
- As a result they may:
 - Try to further exploit their own energy resources.
 - Agree to import from other countries.
 - Reduce energy consumption.

Impact of energy insecurity on food production

- **Food insecurity** - Being without reliable access to a sufficient quantity of affordable, nutritious food. More than 800 million people live every day with hunger or food insecurity.

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- If a country cannot supply enough food there are serious economic, social and environmental impacts.

Famine

- Famine is the widespread shortage of food. It often leads to malnutrition, starvation and death.
- **Major famines**
 - Soviet Union = droughts and crop failures led to 9 million deaths in the 1920's and 1930's.
 - China = droughts and political decisions led to over 15 million people dying from 1928-1959.
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Energy and food

- Food production uses 30% of global energy in its production.
- Biofuel is also generated by agriculture.
- In some LICs such as Tanzania firewood is the main source of energy. In these cases people spend more time collecting wood than farming. This seriously impacts food security.

Impact of energy insecurity on industry

- Energy is essential to powering industry.
- Some country's have a shortfall of energy and this leads to blackouts. E.g. South Africa.
- This will deter other companies from investing in the country.

Potential for conflict

- Energy shortages can lead to political conflict.
- E.g. Russia holds the supply of 25% of the worlds natural gas. Much of this is supplied to Europe.

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- The Middle East produces 40% of the world's gas and 56% of the world's oil.
 - Many believe the 2003 Iraq war was driven by oil.

Strategies to increase energy supply

Fossil Fuels

- Energy formed from organic matter created millions of years ago.
- Still the most popular energy source in the world.

Natural Gas

- **Natural gas** provides around 20% of the world's consumption of energy, and as well as being burnt in power stations, is used by many people to heat their homes. It is easy to transport along pipes, and gas power stations produce comparatively little pollution.
- 60% of the known gas supply is in Russia, Iran and Qatar.

Sustainable energy use

- Sustainable energy means that we balance supply and demand.
- This can be done through energy conservation.

Marriott Hotels

- Marriott Hotels spends £60 million on energy for its hotels in the UK and Europe alone.
- They have tried several methods to reduce this bill.
- They now use energy efficient bulbs.
- They have systems to automatically reduce air-conditioning systems.

Advantages/ Disadvantages

- Advantages are likely to include:
- Small and so relatively easy/cheap to set up.
- Use home grown technology – not dependent.

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- Specifically designed to meet local needs.
 - Involve local people thus more chance of acceptance/success.
 - More sustainable than top-down projects?
 - Disadvantages may include;
 - Unable to address national issues on their own (water, drought, conflict).
 - Doesn't provide larger needs: jobs, services, roads, investment (schools, farming).

PREVIEW