The Challenge of Resource Management

PART A: Food, water and energy are fundamental to human development

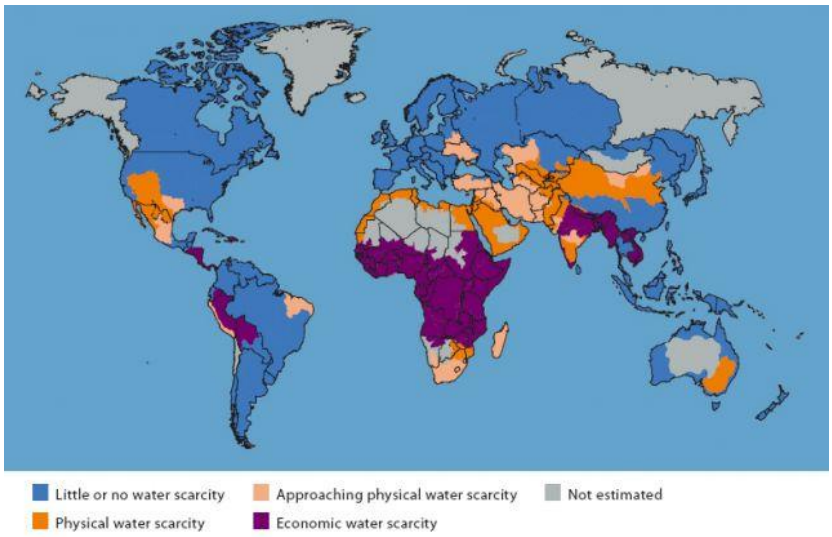
1. What are the key resources for economic and social well-being?

When key resources are abundant (food, energy and water), there are social and economic benefits. Access to resources tends to correlate with a higher standard of living and a better quality of life.

2. How are food, water and energy important?

Food	Water	Energy
Our health is affected by how much we eat. WHO suggests that we need 2000-2400 calories per day, yet 1 billion are below this – malnourished. A further 2 billion are undernourished (malnutrition), with a poor/ imbalanced diet. This can make people susceptible to diseases.	Essential for us, crops, animals and in some cases – power. Rising population is putting pressure on water supplies. Many countries – particularly in Africa – now suffer from shortages of water (water scarcity)	Required for economic development (factories/machinery etc.) Energy requirements have increased (rising population, higher demand as countries become more developed) Huge imbalance across the World in terms of energy consumption

3. What global inequalities exist in the supply and consumption of resources.

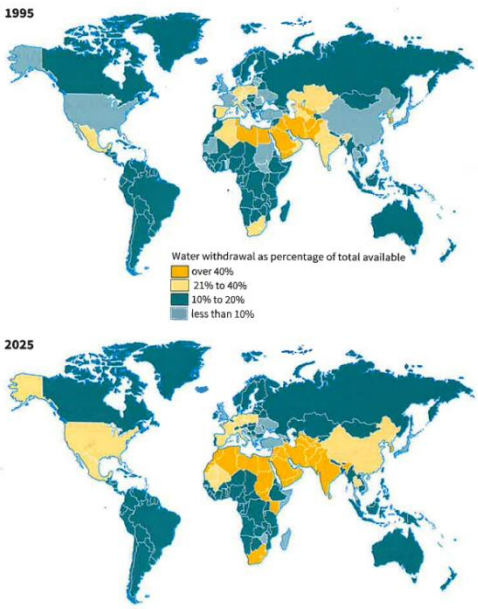


a). **Water**

Physical scarcity = where demand is greater than supply and there is simply not enough water available (climate)

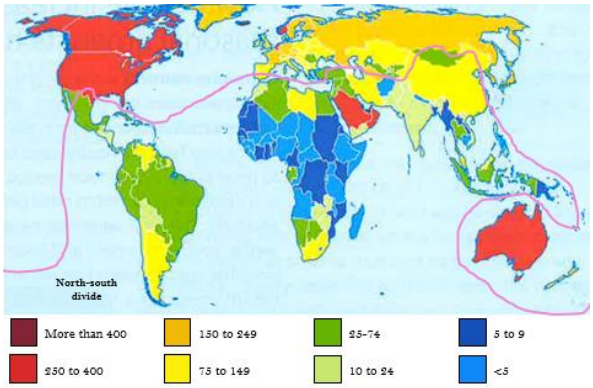
Economic water scarcity = where water might be available, but the country lacks the money required to actually access it.

- HICs tend to use more water (i.e. a larger water footprint) than LICs.
- Look at the map – what do you notice about vast areas of Africa? Where in the World does physical water scarcity exist according to the map?



Water stress is when a water supply is put under pressure – what do you notice about at the areas with water stress in the maps on the left? Which areas are going to be under more stress in 2025 (bottom) than they were in 1995 (top)? Stress will increase due to rising population, changes to climate and also when countries become more developed.

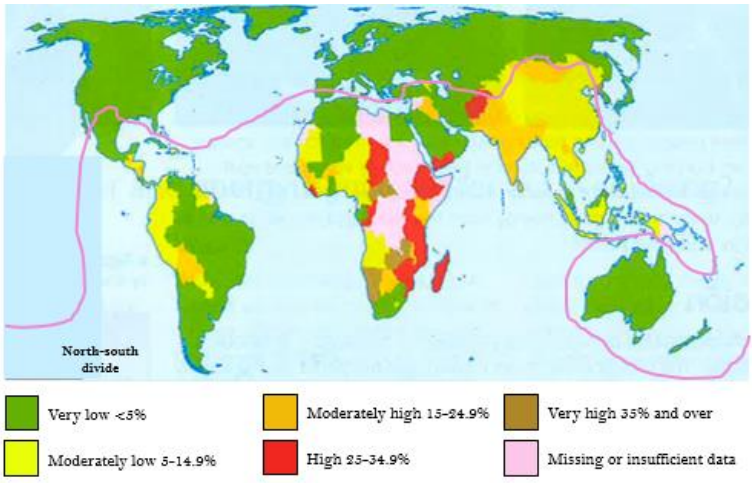
b). **Energy**



Look at the map on the right. Energy consumption varies considerably. 1 billion people in the World consumes 50% of the energy. Which areas consume large amounts of energy (HIC)? Which areas tend not to use a great deal of energy (LIC)? The situation will change in the future as LICs become more developed. NEEs require more energy as they become more industrialised. People want more consumer goods and this uses energy.

c). Food

I don't want to write too much here as we chose 'food' as the topic to study in more detail – more information is provided later. The map on the right shows undernourishment (not enough food). Where in the World is there high levels of undernourishment? Where is undernourishment not an issue? Does the Brandt Line divide the World effectively here?



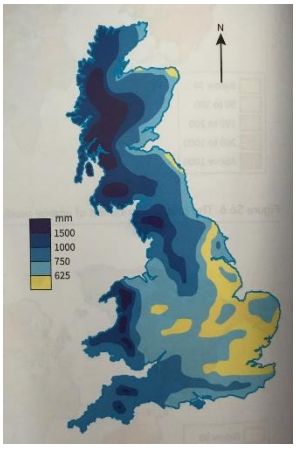
HICs have higher food consumption (UK 3,200 calories) than LICs (Somalia 1,580 calories).

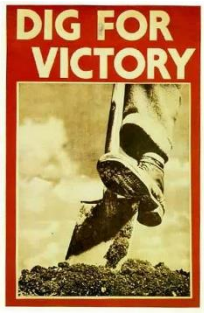
PART B: The changing demand and provision of resources in the UK create opportunities and challenges

FOOD

4. Can the UK grow enough food?

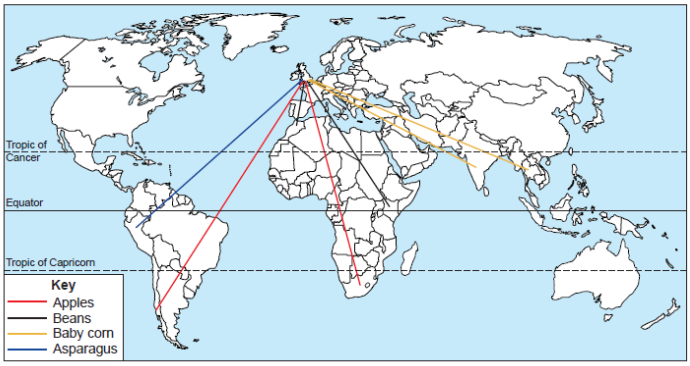
The amp on the right shows how rainfall differs across the UK. Some areas are wetter (not good for arable, but better for pastoral farming) and some areas are drier. If you factor in the relief (shape of the land), you will see that the north and west is not really suited to arable (crops) farming. There, you will find hill sheep farming and perhaps dairy farms. Towards the flatter and drier south and east, you will see more arable (crop) farms, as the growing conditions are better and the flat land allows the use of machinery.





During wartime, we grew much of our own food. However, at other times we have relied on imports due to our links with the commonwealth countries. In the past, we would eat things in season and food would be preserved. Nowadays, we are not SELF-SUFFICIENT. In 2013, 47% of food was imported.

5. How has the UK demand for food changed?



If you look at this map, we import food (that often we can grow ourselves) from all round the World. Why? We have **ALL YEAR SEASONAL DEMAND**, which means just that. We always want to be able to eat what we want – e.g. strawberries in winter, when we can't grow them in the UK.

We also want **EXOTIC** food, which are foods that we can't grow ourselves – people want more choice. These products are often high value.

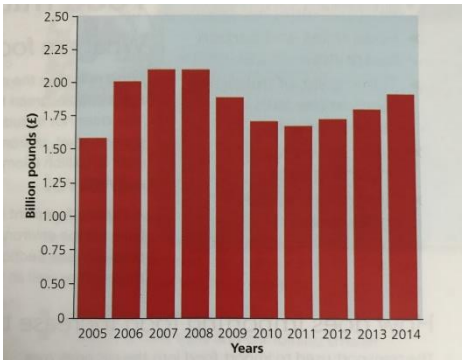
People in UK increasingly want **ORGANIC FOOD** too.

6. How have the changes in Q5 affected LICs?

My group watched a video about Kenya and the impact it had.

Positives	Negatives
- Jobs - Taxes from wages can fund government investment in schools, hospitals etc.	- 'Ghost Acres' – land not being used for locals. - High amount of water needed - High amounts of chemicals and pesticides – pollution?

7. Organic food was mentioned in Q5 – how has the demand changed in the UK and why?



The graph on the right shows the changes in UK demand for organic food (see how it went down after the 2008 recession? – expensive). Organic food doesn't use:

- Pesticides
- Antibiotics in animals
- Artificial fertilisers

Instead, predators are dealt with naturally (e.g. ladybirds for controlling aphids), weeds are controlled mechanically and farmer rotate their crops to maintain soil fertility.

UK consumers are going for organic food as many believe that it is healthier and better tasting. My class watched a video about Riverford farms in Devon – organic food producers and sell directly to consumers with vegetable boxes. https://www.riverford.co.uk/aboutus/ is where you can watch the film.

8. What have been the impacts of our changing demand in the UK – specifically with the importing of food?

- Food miles - distance that food travels from producer to consumer
- Carbon footprint - measure of the impact that human activities have on the environment in terms of the amount of greenhouse gases they produce

Air freight of high value imports creates a huge carbon footprint. All year seasonal demand and our wish to eat exotic goods is making the situation worse.

9. What can be done in response to the trend in the increase of agricultural imports to the UK?

Tariff – tax imports to make them appear more expensive when compared to UK

Agribusiness – more on this later

Allotments – grow your own!

Food labelling – UK flag to encourage people to buy British

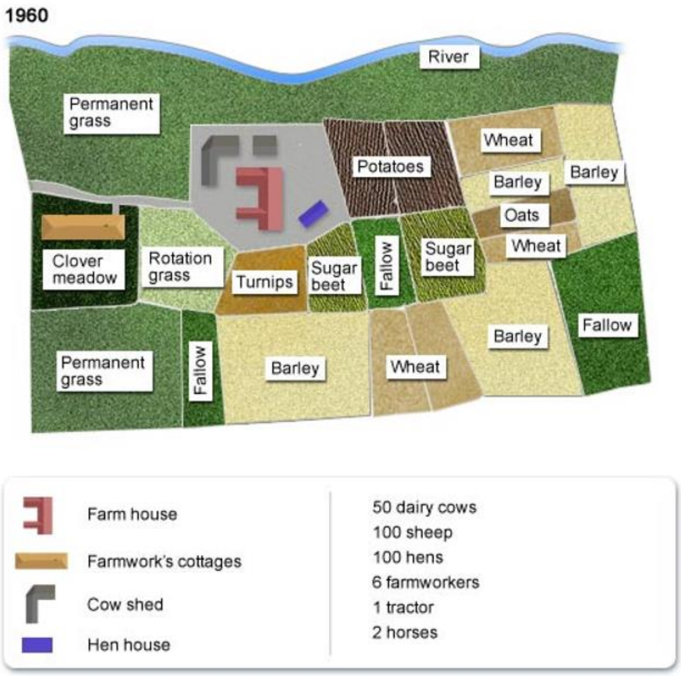
Eating local – e.g. farmer market like the one here in Chichester

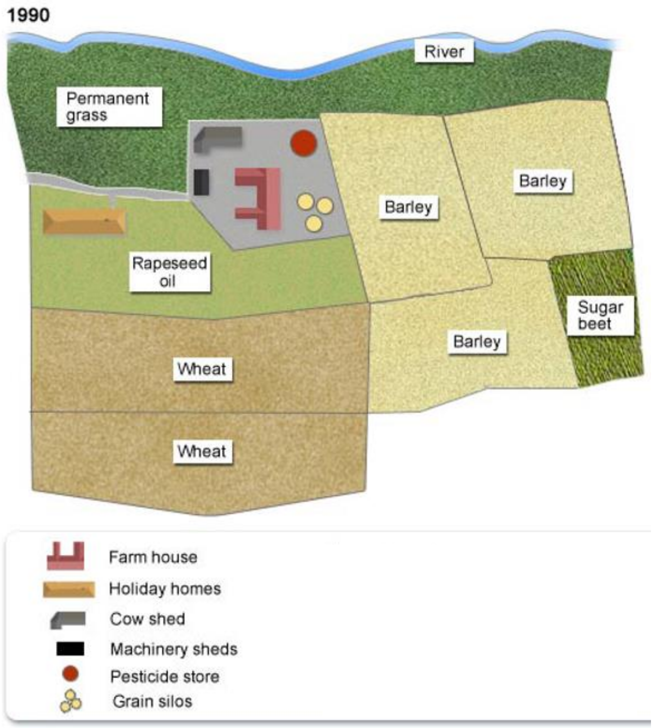
10. In Q9, 'agribusiness' was mentioned. What is it?

If you look at the diagrams of the same farm, 30 years apart, on the next page you can start to see what agribusiness is all about. What changes do you see?

- Removal of hedgerows and larger field sizes
- Modern farming techniques and latest technology (seeds, chemicals, pesticides etc.)
- Machinery

Yields increase, but there are some environmental impacts. However, food miles are reduced.



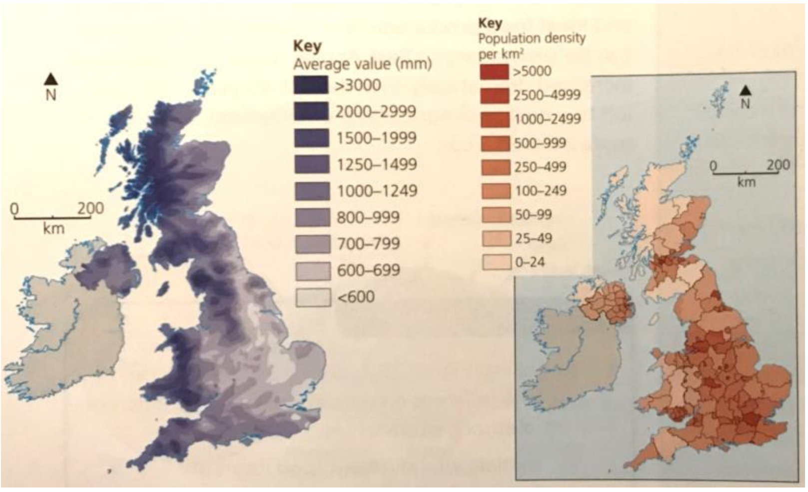


WATER

11. Why is UK demand for water increasing?

The Environment Agency estimates that water demand will rise by 5% by 2020 (it has risen 70% since 1985) because of:

- The growing population
- More houses being built
- An increase in the use of water- intensive domestic appliances.
- Hygiene – changes to shower/bath frequency



12. Does UK supply meet UK demand?

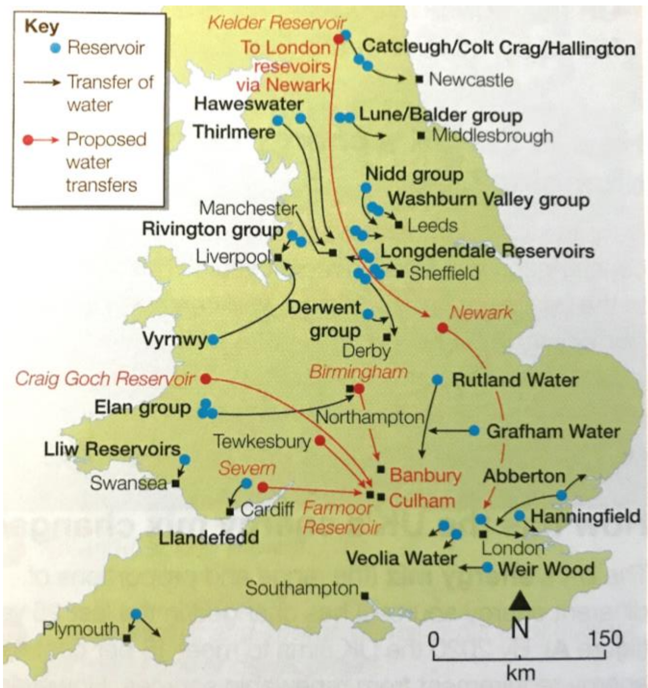
No. Look at the maps on the right. Lowest rainfall matches up to areas of higher population densities and vice versa. So there is WATER DEFICIT in the southeast and WATER SURPLUS in the north and west. Due to the deficit in the SE, we describe this area as being under WATER STRESS.

13. What could be done about the issues discussed in Q12?

WATER TRANSFER SCHEMES. This means moving water from areas of surplus to areas of deficit. The UK government suggested a scheme in 2006, but the cost was going to be huge! Currently, water is transferred as far south as Yorkshire from further north. Further transfers could impact on river levels and wildlife.

It might be better to reduce consumption:

- Water meters?
- Recycled water (grey water)?
- More efficient appliances?



14. What other issues do UK water supplies face?

Water quality. Caused from the following: chemicals from farms/ untreated waste/ runoff from roads/ pollution from boats/ rubbish dumped in rivers (supermarket trolleys, for example).

Collectively, these can damage ecosystems and kill wildlife. Bacteria can cause disease in humans – as drinking supplies could be contaminated. Industry could be impacted – fishermen, tourism etc.

15. How is water quality managed in the UK?

- Monitoring water quality
- Filtering
- Strict regulations
- Using chlorine to purify water
- Building better water treatment plants and investing in new infrastructure

ENERGY

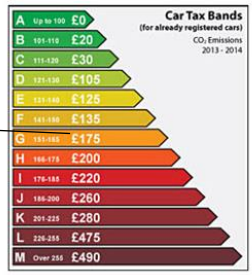
Q16. What are some of the key definitions required for the energy section?

- Renewable - energy from a source that is not depleted when used
- Non-renewable - A natural resource that, once consumed, cannot be replaced
- Fossil fuel - A natural fuel formed in the geological past from the remains of living organisms- coal, oil and gas.
- Energy mix - The range of renewable and non renewable sources used by a country and their proportions

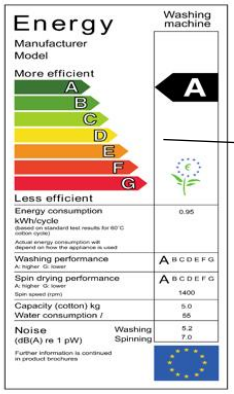
Q17. What are the trends in total energy consumption in the UK?

Interestingly, we now use less energy than we did in 1970, even though we have about 7 million more people in the UK. This is due to the decline of heavy industry and improved energy conservation. See below:

Taxation – more polluting cars taxed more. Encourage people to buy efficient cars



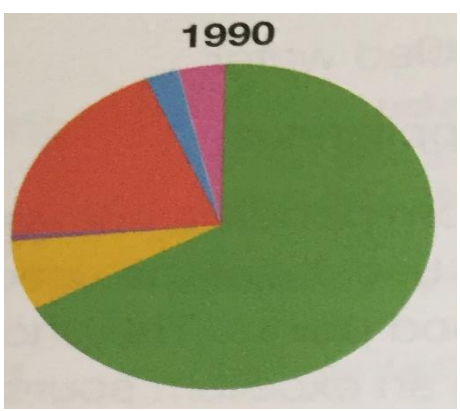
Energy efficiency – e.g. light bulbs and cars

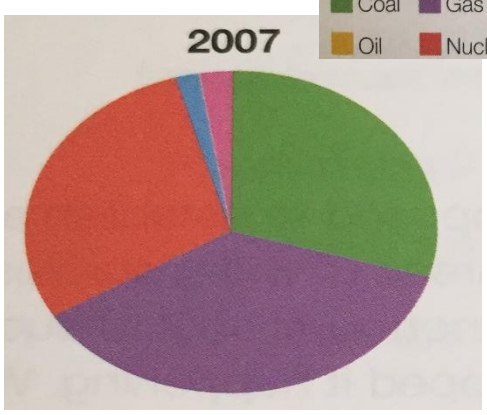


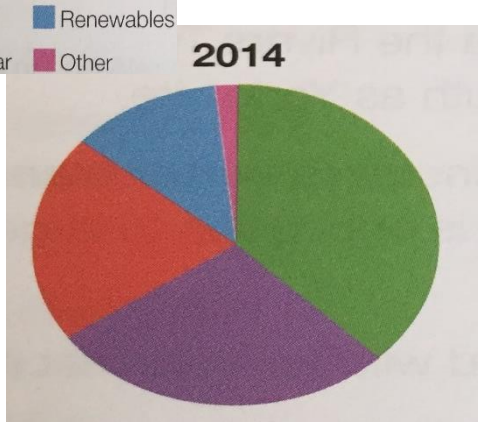
Energy efficient appliances (washing machines etc) – labelling informs consumer decisions

House insulation/ double glazing etc.

Q18. How has the UK energy mix changed over time?







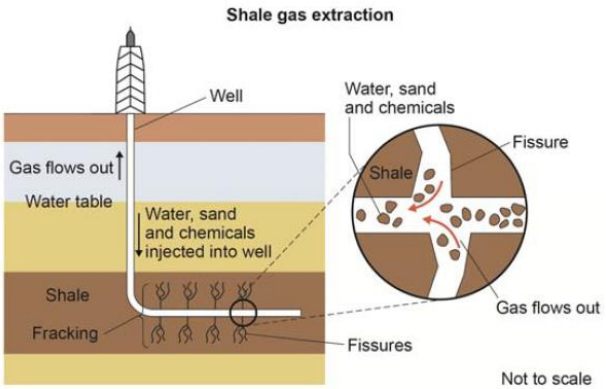
75% of energy from fossil fuels in 1990. By 2007, nuclear increased, coal reduced and gas increased. By 2014, renewables have grown considerably.

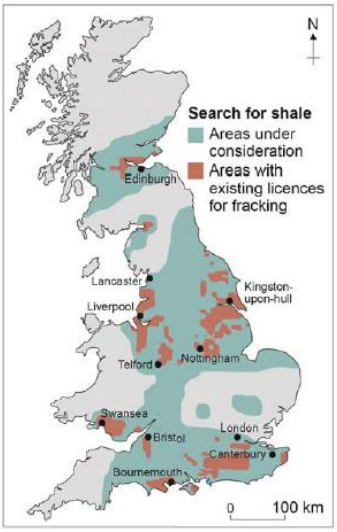
Coal, gas and oil have declined, but there are still supplies that could be exploited. In fact, coal use increased in 2011 as coal fired power stations worked to full capacity in the knowledge that impending environmental laws was going to close them. The UK government has actively encouraged investment in renewable sources such as wind and solar. However, subsidies were reduced in 2014 for these energy sources, so expansion may not be as swift as we would hope. We are likely to importing 75% of our energy by 2020 – energy security?!

Fossil fuels are likely to be important in the future as:
- We have reserves
- Coal imports are cheap
- Shale gas (fracking) may be on the rise – discussed below

Q19. What is the fracking issue in the UK?

Fracking (or hydraulic fracturing) is a process of extracting natural gas from rocks. The diagram on the right explains this.
The map on the right shows potential areas for fracking and where it is under serious consideration.





Yes, it could provide more energy, income and jobs, BUT there are real concerns. Pollution of groundwater from the chemicals (carcinogenic), large volumes of water needed and cause low-level earthquakes. I am not a fan and many protestors agree!

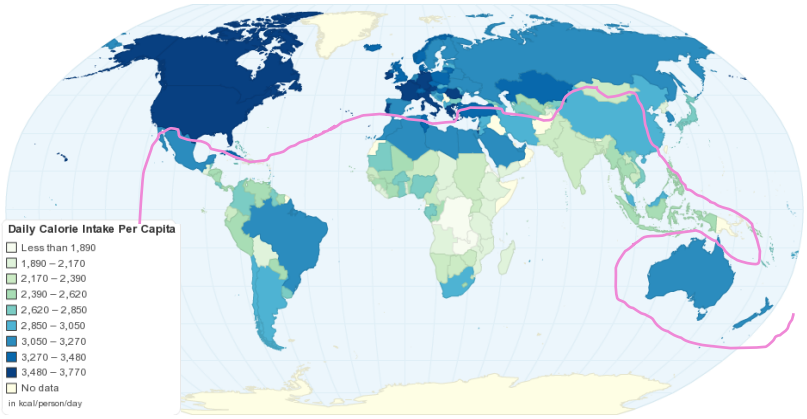
Q20. What are the economic and environmental issues associated with exploitation of UK energy sources?

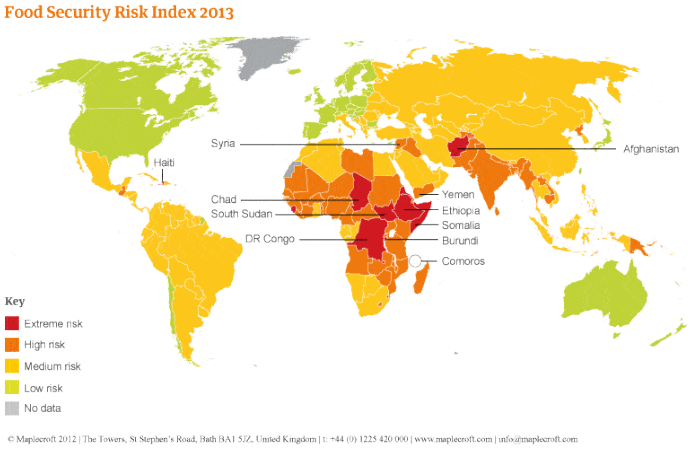
Energy source	Economic challenges	Environmental challenges	Economic opportunities	Environmental opportunities
Fossil fuel **NOT IDEAL!!**	-Remaining coal hard to access -Rely on imports -Cost of dealing with environmental problems (including climate change)	-Greenhouse gases -Acid rain -Mines ugly -Fracking issues (see previous q)	-Jobs -Multiplier effect	- Carbon capture storage (put carbon back into rocks – expensive, but cleaner!)
Nuclear **SOME THINK A GOOD IDEA –** **CHERNOBYL?**	-Cost of decommissioning old power stations (by 2025) -Cost of building new power stations	-Disposal of nuclear fuel? Very dangerous	-Jobs -Cheaper energy once up and running	-Reduce CO2 – cleaner fuel?
Renewables **THE WAY FORWARD - SUSTAINABLE**	-High set up costs -Impact on tourism (not a nice view)	-Wind turbines can affect bird migration -Turbines affect sea life eg. Fish -noise	-Creates new jobs in the manufacturing, research and development	-Low carbon emissions -Farming can still take place around turbines

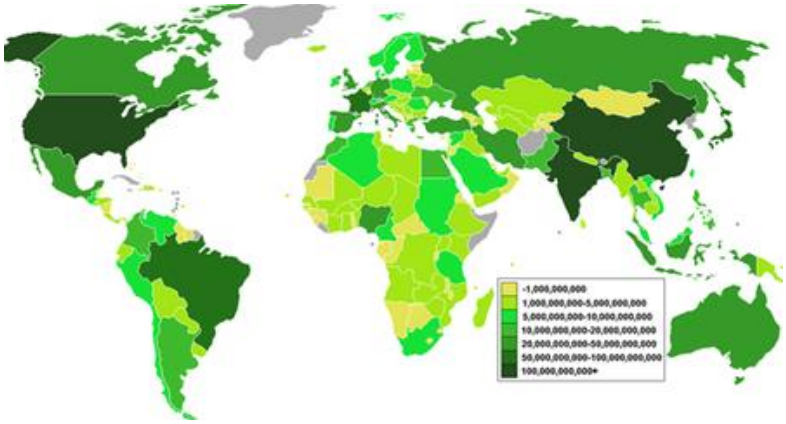
PART C – FOOD TOPIC (WE CHOSE THIS TO STUDY IN MORE DETAIL)

Q21. What are the global areas of food surplus and food insecurity?

Look at this choropleth map – dark blue means high calories intake and lighter colours show lower calories intake. What becomes evident? The pink line is the Brandt Line, which was drawn in 1981 – it separates the richer north and the poorer south. Does it also divide the World by calorie consumption do you think?





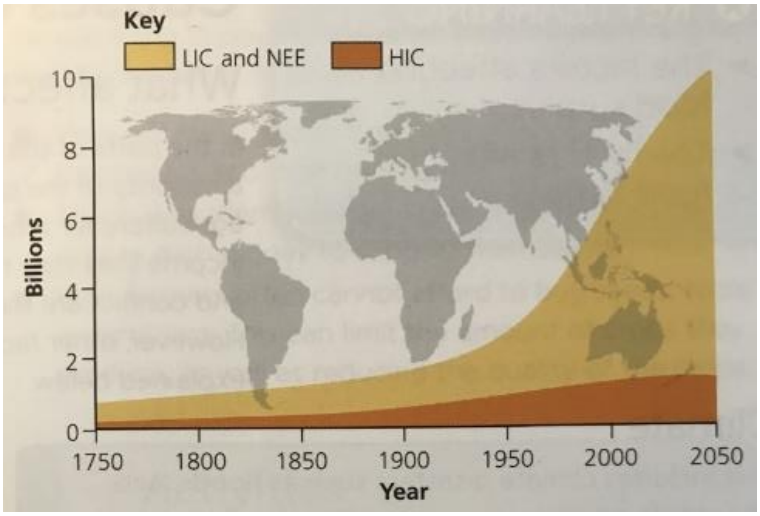


Look at the maps above – the green map shows the value of food production for each country. Dark green means high output and light green means low output. Then compare to the food insecurity map on the left. What do you notice? Do light green areas correspond to areas that have high food insecurity?

Q22. What are the reasons for increasing food consumption?

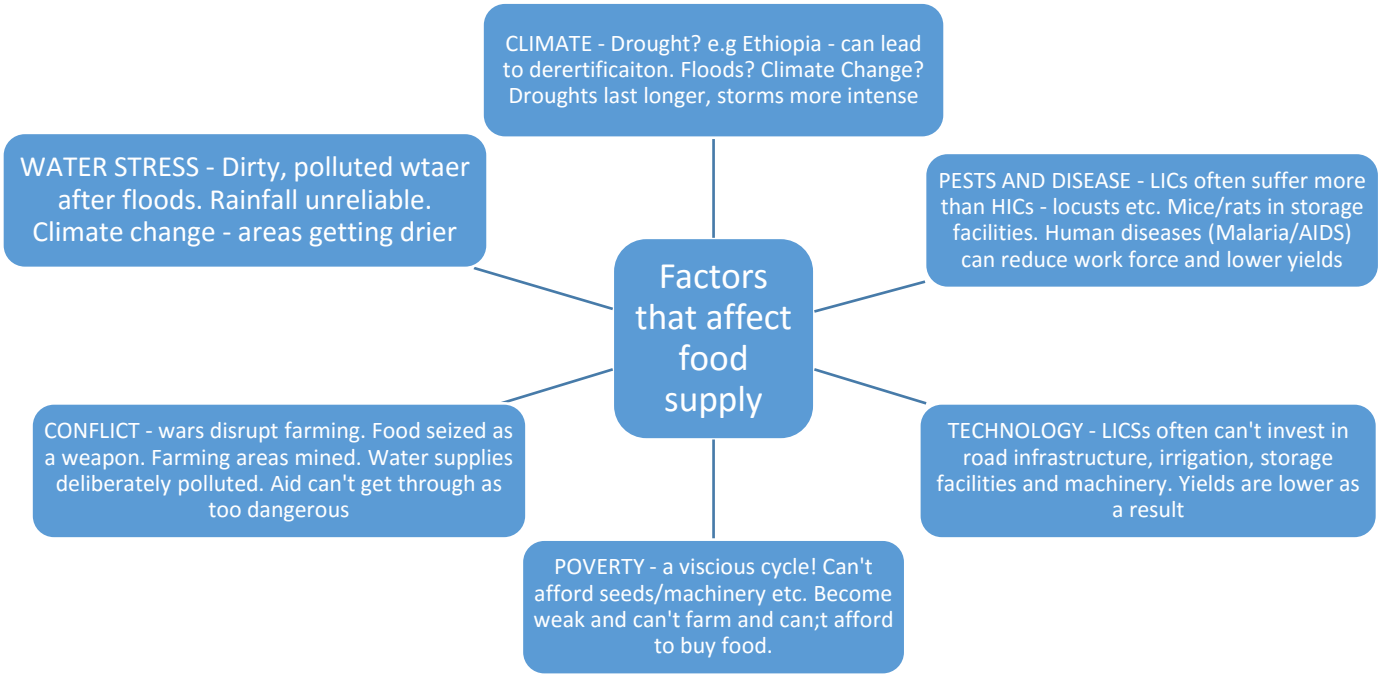
Examine the table on the right, which shows information about China. Can you see that calories intake and meat % has grown considerably? If you look, China has become more wealthy in that time – people can afford more food AND better food. You find similar patterns in NEEs across the World.

Year	Average Calorie intake	Percentage of meat in diet	GDP ($US)
1981	2,165	6	193.30
2011	3,073	17	5,574.20



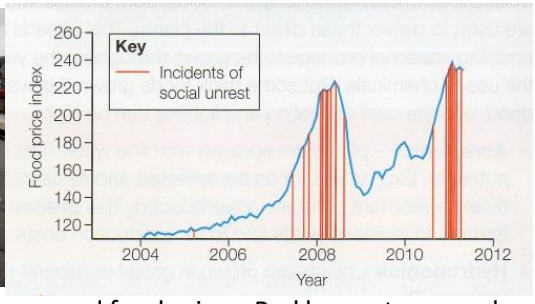
If you look at this graph, you can see that World population has grown rapidly in the 20th and 21st centuries. You can see that it is LICs that have fuelled this growth. This has meant that demand for food has increased.

Q23. What factors affect food supply?



Q24. What are the impacts of food insecurity? (Food insecurity is when a country can't supply enough food for its population)

Soil erosion - Look at the photo (right). They depict: soil erosion, deforestation, overgrazing and over cultivation. People desperate for food try to grow more, but this is not sustainable. Deforestation can leave the soils exposed and the fertile top layers become eroded/washed. Over grazing means vegetation is eaten and the soils are left exposed, which causes erosion. Over cultivation means the soils get progressively worse, unless expensive fertilisers are added.



Social unrest
When food prices are high, poorer people in society find it hard to purchase food. Riots/ civil unrest can occur. The link is clear to see in the graph – e.g. Libya 2011.

Rising food prices – more demand has increased food prices. Bad harvests can reduce the supply, which also increases prices. Increases in the price of oil (transport), fertilisers and animal feed have also increased food prices.

Famine – Famine is defined as *widespread scarcity of food (e.g. Ethiopia 1984).* It is not just about famine – UNDERNUTRITION is also important. People may be able to access food, but it is not of high quality. The UN estimate that between 2012-14, 805 million (1/9 of World population) people suffered undernourishment. 791m were in LICs.

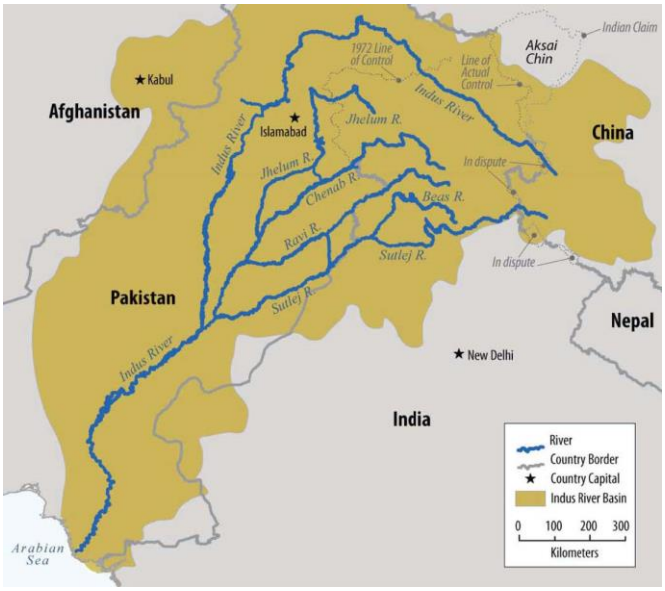
Q25. What strategies can be used to increase food supply?

Method	How	Critique?
Irrigation	Artificial watering of land. See Indus Basin Irrigation System example (large scale commercial farmers). Increases food production. Small scale sand dams (see Makueni county, Kenya) can supply local farmers	Can be used at a variety of scales. Can be expensive Increases yield
Aeroponics/ hydroponics	No soil used. Nutrients delivered by water (hydroponics) or sprayed in a fine mist onto the roots (aeroponics). Done indoors.	Less chemicals Controlled environment – grow all year Quicker growth Cost? Energy?
New Green Revolution	Soil conservation, irrigation, improve seed and livestock using science and technology	Increased food production in Indian state of Bahir
Biotechnology	Genetically modified (GM) crops. Less chemicals (engineer pest resistance), higher yields (engineer-desired traits). Used extensively in USA, soya beans (animal feed) in Argentina.	Frankenstein foods? Health concerns? Not widely adopted in Europe as a result. Expensive?
Appropriate technology	Using skills/materials that are cheap and easily available for poorer people. E.g hand or foot water pumps. Contour stone lines in dry areas etc.	Increases yields and accessible for all. Cheap to employ. Small scale though?

Q26. What example of a large scale agricultural development to show how it has both advantages and disadvantages can I use?

Indus Basin Irrigation System (IBIS)

The Indus river flows predominantly through Pakistan and in the Arabian Sea, but its drainage basin (the area it drains) extends across other countries: Afghanistan, India and China.



What does the system involve?

Largest continuous irrigation system in the World. The British built a series of canals 1847-1947, but has been developed since. Now has 3 large dams and over 100 smaller ones to regulate flow. 12 canals transfer water between rivers. 64000km of smaller canals distribute water across the countryside.

Critique of IBIS

Advantages	Disadvantages
14 million hectares now irrigated	Cost to build/maintain
Crop yields increased	Evaporation in summer
Diets more varied	Water wastage due to poor irrigation techniques
Fish farming in reservoirs provides protein	Unfair share of water taken upstream – less water available for people downstream
HEP	
Increased food security	

Q27. How can we move towards a sustainable resource future?

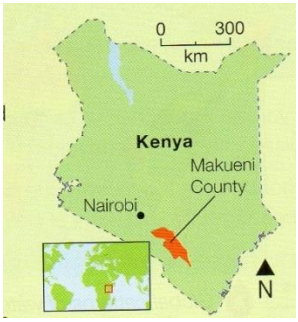
By ensuring that soil, water and environmental resources are used for farming so that they will still be available for future generations – i.e. long-term approach.

Q28. How can food supplies be made more sustainable?

Method	What is it and how is it sustainable?
Permaculture	Food production that co-operate with nature. E.g. use natural predators to control pests (no insecticides – more sustainable. An example could be ladybirds to eat aphids). Effectively it is also about organic farming, buying local, eating in season etc. HICs have started to do it, but LICs still have a way to go.
Urban farming	Gardens created on unused land in urban areas. Community groups/ local involvement (allotments in UK). Source of fresh fruit/veg in LICs. Attracts wildlife/ looks good.
Seasonal food/local food consumption	Eat what is in season. Reduces the need to transport 'summer' foods from the southern hemisphere to meet demands of northern hemisphere consumers in their winter. Reduces food miles and emissions = more sustainable. Less food grown in greenhouses – less energy required. Also, farmland in LICs used to grow food for HICs (e.g. my class watched a film about 'Ghost acres' in Kenya – this land will now be used for people in that country, which will increase food security.
Sustainable meat/fish	MEAT: Intensive farming is not sustainable (animals feed, energy consumption by rearing animals indoors etc.) Sustainable meat and food requires animals to be outdoors and fed on grazing land. Less energy required – e.g. 'Freedom Food' logo with better animal welfare. FISH: quotas to preserve stocks. Intensive fisheries use lots of chemicals – pollution etc? Nets can damage ecosystems. Better to move away from this – smaller scale producers?
Reduced waste/losses	Food wastage is often over 30%! Not sustainable! Steps to reduce can include: clearer best before dates, sealed plastic bags to keep products fresh, better refrigeration/cooling systems, process surplus food to increase shelf life, get consumers to plan food purchases more carefully.
Organic farming	No chemicals (pesticides/insecticides) – see permaculture above/ natural predators etc. Needs more labour to do weeding etc and yields tend to be lower. BUT, less harmful to the environment and workers not exposed to chemicals – health benefits for all?

Q29. What example of a local scheme in an LIC to increase sustainable supplies of food can I use?

Makueni County, Kenya



Where? It is found in the south of Kenya, 200km south east of Nairobi.

What is it like/ what are the issues? 85,000 population, dark volcanic soils (potentially fertile) BUT average rainfall of only 500mm. There have been frequent crop failures over the years. They do grow maize, beans, sweet potato etc.

What has been done?

In April 2014, the charity 'Just a Drop', together with the African Sand Dam Foundation, provided direct help to two small villages – Musunguu and Muuo Wa Methovini (population 800), and to the Kanyenoni Primary School (463 pupils).

- A rainwater harvesting tank on the school roof
- A training programme to help local farmers
- Growing trees to reduce soil erosion, increase biodiversity and provide medicinal products.
- Built sand dams. THE KEY IS TO UNDERSTAND HOW THESE MEASURES HAVE MADE IT SUSTAINABLE!!

CROP YIELDS INCREASED (IRRIGATION) – FOOD SECURITY INCREASED

SAND ACTS AS A FILTER – REDUCES WATER-BORNE DISEASES

MINIMAL MAINTENANCE

SAND STORES WATER

SAND PREVENTS THE SUN FROM EVAPORATING THE WATER

LOCAL LABOUR FOR CONSTRUCTION – REDUCES INITIAL COST. ALSO, LOCAL INVOLVEMENT GIVES THEM A REASON TO LOOK AFTER IT

LESS TIME SPENT FETCHING WATER – CAN FOCUS ON EDUCATION AND WORK