

AQA GCSE GEOGRAPHY NOTES

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Tourism

Growth of Tourism

- Today it is the world's largest industry
 - Worth \$500 Billion
 - 940 million international tourism arrivals in 2009. Set to rise to 1.6 billion by 2020. Domestic tourism is normally between 4 and 5 times higher than international tourism.

A Countries with the largest tourist receipts, 2009

Country	Annual tourist income (\$ billions)
USA	110.1
Spain	61.6
France	55.6
Italy	45.7
China	40.8
Germany	40.0
UK	36.0
Australia	24.7
Turkey	22.0
Austria	21.8

B Countries with the most tourist arrivals, 2009

Country	Number of tourists (millions)
France	78.5
USA	57.9
Spain	57.3
China	53.1
Italy	42.7
UK	30.1
Ukraine	25.5
Turkey	25.0
Germany	24.9
Russia	23.7

A International tourist arrivals (millions)

Region	2006	2010	Percentage change 2006–10	Percentage of world tourism (2010)
Africa	50	49	-2.0%	5.2%
Americas	136	151	+11.0%	16.1%
Asia and Pacific	168	204	+21.4%	21.8%
Europe	461	471	+2.2%	50.5%
Middle East	41	60	+46.3%	6.4%
World	856	935	+9.2%	100.0%

- One of the greatest providers of jobs and income. Caribbean countries are 50% of GDP.
- Top 6 countries for tourism: France, Spain, USA, China, Italy and UK. Germans spend the most on holiday, followed by the Americans, British, French, and Japanese.

Factors affecting tourism's growth

- *Social and Economic Factors*
 - People have become wealthier.
 - People have more leisure time and so can go on holiday. Holiday time has increased from two weeks a year, to about 4-6 weeks a year
 - Life Expectancy has risen, → so more people are retired and can travel.
- *Improvements in Technology*
 - Travel today is quick and easy → motorways, airports. Flying has become cheaper and booking online is quick and easy.
 - However, when oil prices increased, e.g. in 2008, more people take domestic travel in order that they save money.
- *Expansion of holiday choice*
 - Package holidays and cheap European holidays mean that people can afford to travel more easily. Ecotourism and danger tourism are expanding.

How important is tourism in different countries?

- Countries rely significantly on tourism, and without it they would have issues with income.
 - France has more tourism than any other country in the world and they cater for any type of tourism.
 - USA earns more money from tourism than anyone else. When Europeans visit USA, they tend to stay longer and spend more.
 - Richer countries tend to have well balanced economies, of which tourism could be a large part, while poor countries tend to be less balanced. In the Caribbean, several small islands rely heavily on tourism to provide national income and income.
 - 80% of Barbados' national income comes from tourism.

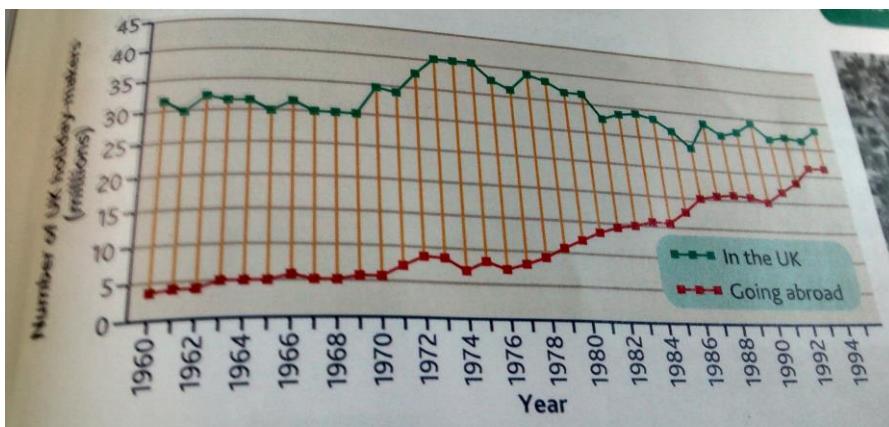
Benefits of tourism in poorer countries

- People are employed to serve tourists, waiters, tour guides etc.
- Tourists spend money in pounds, euros, dollars. This foreign exchange is very important to the countries, as this can be used to pay these countries for imported goods.
- Governments earn money from taxes on goods they buy.
- Extra jobs are created indirectly, hotels buy some produce from local supplies to feed the visitors.
- Many small businesses have been started up to serve the tourists themselves, and supply the services they demand.
 - This creates jobs, and the infrastructure created, also can be used by the residents themselves, thus increasing the quality of life.

How do we manage tourism in the UK?

- Almost all tourism in the UK used to be domestic, and this increased even more and more through the 1950s and 1960s —> higher pay and more holiday time. Seaside resorts boomed through the 1970s, with 40m visitors annually.

Dubai: Easily accessible from Europe and Asia and Africa. 120 Airlines fly to Dubai. Hotel revenue up by 22% of in the First Quarter of 2008. 2.8 million People visited the area in 2000, 4.9 million in 2003, 5.4 million in 2004. Grow to 15 million in 2015. Well known for shopping districts, huge malls, with reasonable prices. Lots of water sports. Lots of wetland mudflats regions nearby, with biodiversity, over 400 species.



- Numbers of UK residents holidaying in the UK and abroad, 1960–95
 - After that, Britain's seaside resorts declined as package holidays abroad grew in number and affordability.

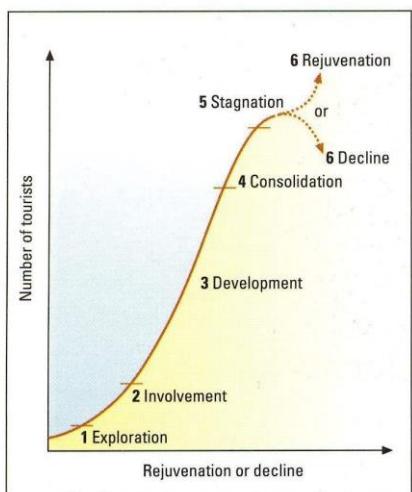
External Factors affecting UK tourism growth

- Terrorism
- Currency Fluctuation.
- UK tourism —> £114 billion (2008). International visitors are £13 billion of this sum.
 - £20 billion - hotels
 - £16 billion - restaurants
 - Around 1.1 million tourists travelled to London for the Royal Wedding in 2011.

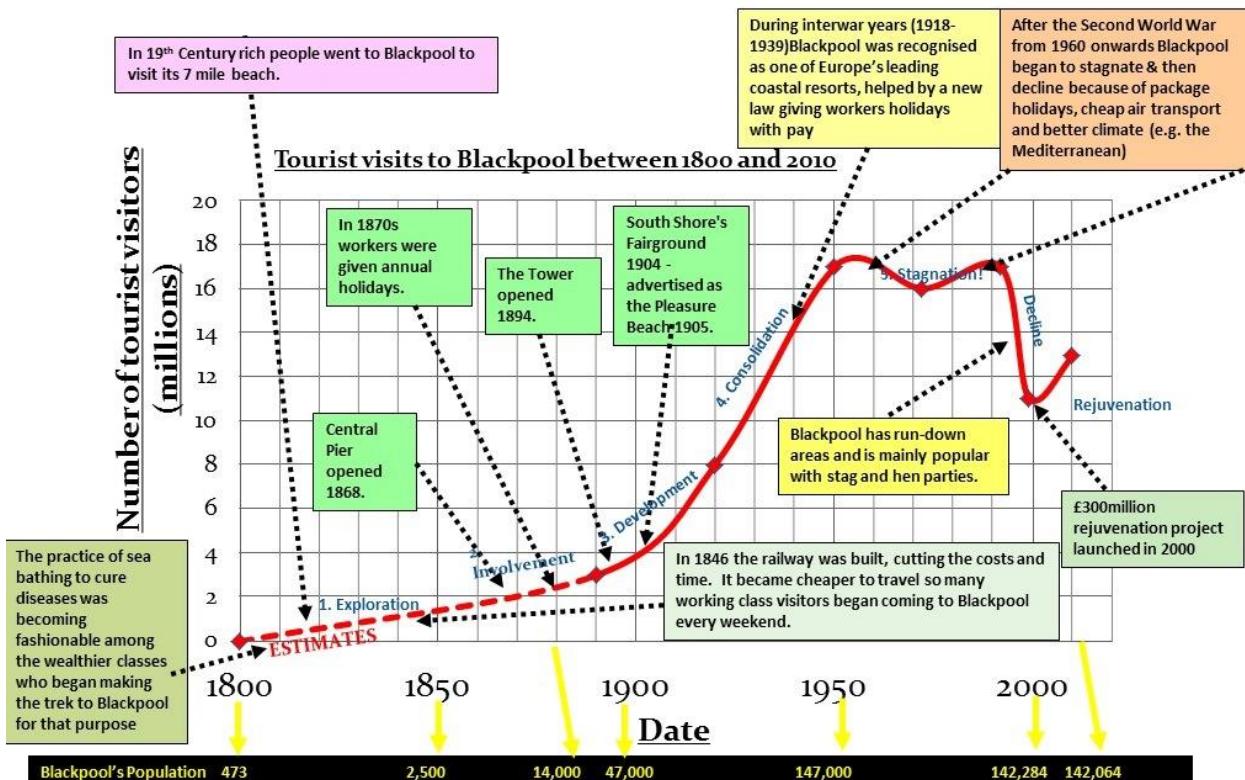
Butler Model

- Exploration
 - Small number of people are attracted by something particular, e.g. beaches. Local tourist facilities are not yet developed.
- Involvement
 - Local population sees the opportunities and starts to provide accommodation etc.
- Development
 - Large companies start building hotels and leisure complexes and advertise package holidays. Number of tourists increases significantly. Jobs increases a lot. Brings both advantages and disadvantages.

- Consolidation
 - Tourism is a large part of the local economy and perhaps damaging other types of development. Number of visitors starting to stagnate. However, some places are starting to look old and aged. Rowdiness becomes a problem.
- Stagnation
 - Resort becomes unfashionable and numbers of visitors starts to decline. Businesses change hands and often fail.
- Decline or Rejuvenation
 -
 - Decline: Visitors prefer other resorts, and numbers continue reducing.
 - Rejuvenation: Investment is put into the place, and the numbers of people visiting the area start to increase again.



Blackpool



Blackpool's Growth and Stagnation

- It is located on the Lancashire Coast

- Served the inhabitants of Northern Industrial Town, in 19th Century. Factory workers could increasingly afford to go on holiday, through the train.
- Boomed between 1900 - 1950. However, as people's disposable incomes increased, they increasingly decided to go elsewhere. Package holidays meant that there was huge competition, from places with better climate.

Responding to the decline.

- **Success**
 - Attracted local investment and local grants to upgrade hotels, turns outdoor pools into indoor leisure pools.
 - Small, failing hotels, were turned into self-catering holiday flats. Blackpool's attractions were refurbished. Blackpool tower was redone, and a zoo and sea life centre was made. Blackpool Illuminations have been upgraded.
 - Lost much of its charm with Stag and Hen parties, but trying to change their image.
 - Creating a super casino —> Sea-Front site. 20,000 jobs, £2 billion of investment. However, they lost this attempt to get planning permission.
 - New airport terminal in 2006 - part of a regeneration of general public transport improvement effort
 - Blackpool Masterplan. Promoting itself as a shopping and conference centre. Ideal 'short break'. Winter Gardens are being redone, department stores being made. Spanish Steps. Lighting throughout the city.

Strategies to deal with large numbers of tourists in Blackpool.

Successes

- Able to deal with large numbers of tourists, through the creation of a new airport terminal in Blackpool in 2006 (£2m) - + general investment in public transport
- Able to accommodate large numbers of tourists, 13m last year - 4 new hotels, 12,000 seat arena for large events and concerts.
- Huge events
 - World Fireworks Championships
 - Blackpool Dance Festival
 - Armed Forces Week
 - Christmas Lights

Failures

- Lots of crime in events - brawl at World Fireworks Championships.
- Lack of parking
- Alcohol related crime - highest numbers of off-licenses.

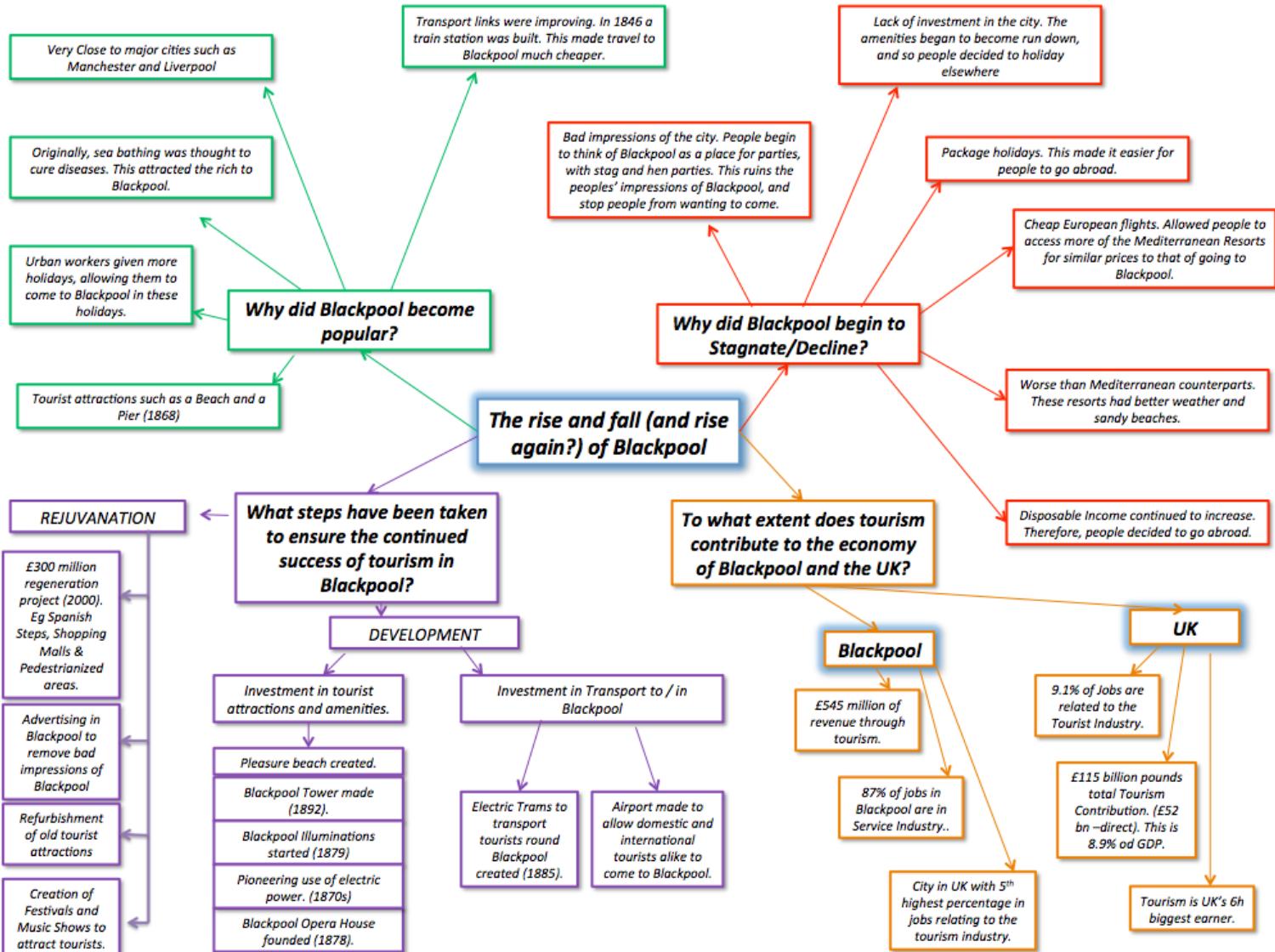
To what extent are authorities doing enough to ensure that tourists continue to want to visit Blackpool in the future?

They are doing enough

- Increase in tourism in past decade from 10m to 13m - increasingly attractive.
- Innovative events are attracting people in the future
- World-class shopping
- £300m Regeneration is increasing facilities for tourists
 - Blackpool tower complex regeneration
 - Tourist Information Centre
 - Madame Toussades
 - Floral Hall regenerated
- Generated £1.2bn in tourism revenue each year - tex revenue went towards the remodelling of the sea front with attractive sculptures.

They are not doing enough

- Very negative media image
 - High Deprivation, alcohol related crime
- Few international tourism, too little money is spent on international advertising.
- Tourist numbers still down from 17m in 1980s.



Mass Tourism

- Advantages and Disadvantages

Advantages

- Brings jobs - Multiplier Effect
- New infrastructure
- Leisure facilities for locals as well as tourists
- Economy benefits through taxation

Disadvantages

- Seasonal
- Dominated by large companies
- Dominated by lower and middle class families
- Locals are not paid well
- Investing companies are foreign so do not benefit the home country

- Land required
 - Farmers tempted to sell land
 - Lower local food production
- Tourists bring alcohol and drug problems

Jamaica

- Over 3m visitors in 2011 - 1.1m cruise passengers
- 262,000 Jamaicans in tourism sector (1/3 people on island directly or indirectly in industry)
- **Mass Tourism**
 - *Why are people attracted to Jamaica?*
 - Unique and famous attractions - Blue Hole, White Witch Golf Course, Montego Bay, Mayfield Falls, Beautiful Beaches
 - Exciting activities - Tours of the slums of Kingston, carving in the cockpit country
 - Weather
 - Media - Films and celebrities filmed, or originate from there - Usain Bolt, Dr No, Bob Marley.
 - *Does Mass Tourism Bring Benefits to Jamaica?*

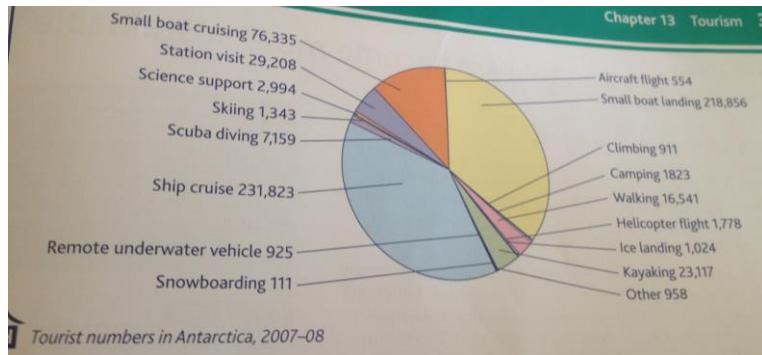
	Positive	Negative
Economic	<p>Jobs - 1/3 people in Tourism (Directly or indirectly)</p> <p>Very important to the GDP of the nation - 25%.</p> <p>Community Tourism: People stay in local families' houses. Families provide B&B facilities. Rely upon local things such as restaurants. Money goes directly to people not to large international businesses</p>	<p>Leakage: 80% of tourism income lost to international tourist chains and importation of tourist luxury items.</p> <p>Local Exclusion from Tourism Revenue: 3/4 of tourists stay in hotel enclaves, so revenues are not well split around the island → Can cause resentment from locals.</p>
Environmental	<p>Preservation of marine environments The tourism to the unique environments have led to governments paying more attention to the area. (Negril Marine Park - 1998)</p> <p>Ecotourism - Utilises inland part of the island Blue mountain as well as some parts of the coast Nature reserves are increasing, and eco-lodges are being built. Tourist densities are low, keeping pressure off environment.</p>	<p>Destruction of habitats and coastal erosion New developments affect the local ecosystems.</p> <p>Marine Wildlife Dredging to allow for larger ships, especially cruise ships are having bad impacts on marine wildlife.</p>

Extreme Tourism

- Involve dangerous landscapes often with a difficult climate
- Tourism on a large scale to one country or region. Linked to consolidation and rejuvenation of the Butler model.
- Remote places, sparsely settled
- Include:
 - Deserts
 - Forests
 - Caves
 - Poles

- Glaciers
 - Attract young, risk-taking individuals with a thirst for adrenaline. Unmarried, without children. Trips are expensive, so must be in a good job.
- Antarctica**

- in 1950s small scale tourism in Antarctica began
- 9,000 tourists in 1992-1993. 33,824 in 2010-2011.



E Antarctic tourist numbers (2010-11)		
Country of origin	Numbers	Percentage of total
USA	12,629	37.4
Australia	3,220	9.5
UK	2,763	8.1
Canada	2,531	7.5
Germany	2,378	7.0
Japan	936	2.8
Netherlands	889	2.6
Others	8,478	25.1
Total	33,824	100.0

- Tourists spend short time ashore, but still cause lots of problems. Animals are disturbed by more than a few people.
- They may abandon young or eggs
- Accidents when ships hit uncharted rocks or ice flows. Oil spills wreck the environment.
- *How to try and deal with tourism in Antarctica*
 - All tour operators are members of IAATO, which directs tourism to be safe and environmentally friendly. Visitors are not allowed to visit SSSIs.
 - No big ships
 - Permits required for any visits

Ecotourism

- *Type of Sustainable Tourism*
 - *What is sustainable tourism?*
 - According to the United Nations World Tourism Organisation
 - tourism which meets the need of present tourists and host regions while protecting and enhancing opportunities for the future
- Stewardship is the idea behind ecotourism
 - *The personal responsibility of us all for looking after things, in this case the environment. No one should damage the present or future environment.*
- Environmentally friendly tourism
- Undertaking activities to see wildlife in natural form
- Small scale accommodation
- Energy use, sustainable
- Little impact on environment
- Eat local food
- Price is high
- Benefits
 - Environmental - Place gets lots of money to help the environment even further and help to preserve it.
 - Economic - Local jobs as guides or other small businesses are created and they earn money

- Problems
 - Honeypot sites - some sites may be overused.
 - Pollution - oil pollution from boats

Galapagos Islands

- 50 Volcanic islands, 1000 km off the coast of South America in the Pacific Ocean, belonging to Ecuador. Here the Theory of Evolution was worked out. 90% of islands are national parks or marine reserves
- Rich Biodiversity. Fragile and precious ecosystems. First UNESCO World Heritage Site in 1979.
- Tourists only under strict rules
 - Arrive in small ships
 - Allow people onshore only in specific locations in specific numbers
 - Tour boats owned by locals and take 10-16 tourists each
 - Visitors are given accurate information and prevented from causing damage
- Benefits of Tourism to Galapagos Islands
 - Environmental. Galapagos Conservation Trust receives money for conservation work on the island
 - Economic, Provides income and jobs for local residents, who rely upon tourism for their livelihood. This is both directly and indirectly.
- Negatives of tourism
 - Honeypot Sites - Though tourism is controlled some sites are over-used and showing signs of environmental stress
 - Pollution - Oil Pollution affects fragile marine ecosystems.

Globalization

Rise of the Global Economy and Manufacturing

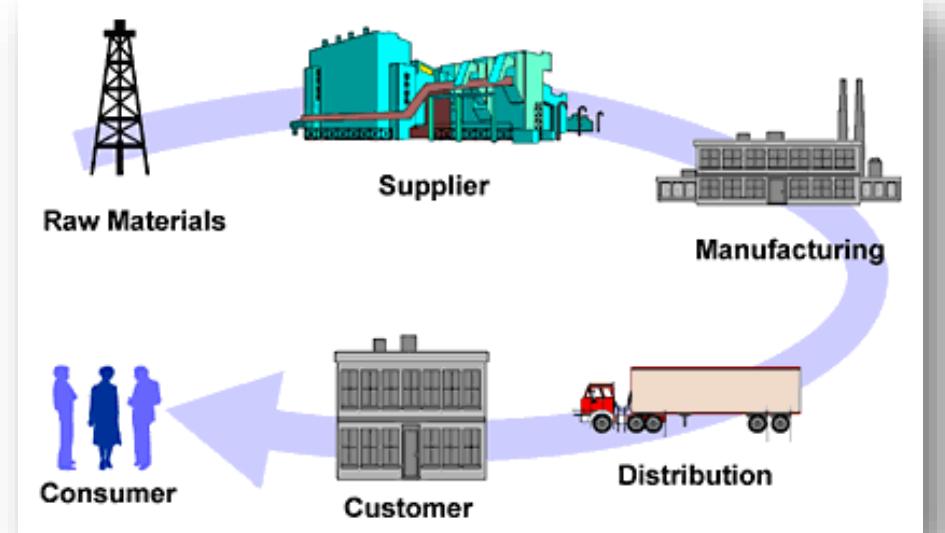
Globalisation Definition:

- the increasing links between different countries throughout the world and the greater interdependence that results from this.

Example

- Salmon is now farmed in Norway, shipped to China where it is filleted (cheap labour) and shipped back to Europe and sold in the UK. Slazenger tennis balls used to be made in south Yorkshire, but since 2002 they have moved production to the Philippines to cut costs.

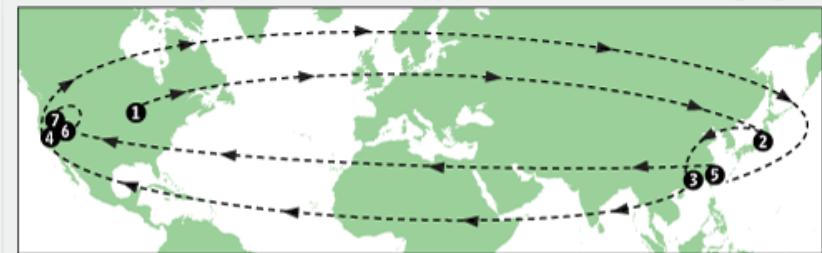
Product Manufacture



Where do these occur?

In the past it was simple. The developed world took resources from the developing world and manufactured produce back in the developed world, before selling it at home and abroad. Now, not only have we moved lots of manufacturing abroad but we are getting resources from wider afield so the whole *production chain* has been stretched...

Life of a DVD Player | How the tech supply chain makes the world's gadgets



Causes of increases in trade:

Technological innovation

- design patents can now be accessed around the world; cheap advanced machinery can easily be built and sent abroad (and also made abroad);
- The development of Submarine cables allow global operations for both manufacturing and service industries
 - Link W Europe with SE Asia, Middle East and Australia with very high speeds

Communications innovation

- the ease of contact allows businesses around the world to liaise and organise production; the cost of a 3 minute phone call from the US to UK was \$75 in 1927, it is now \$0.01.

Foreign Investment (FDI)

- this is not the same as buying shares. Instead you purchase either the whole or part of a business abroad, often factories or mines/oil fields. Although ownership might be by foreigners the locals benefit from new job opportunities, higher wages and the opportunity to learn new skills (which they could take and use to start their own business). Increasingly it is moving to new locations,

but investors still prefer known locations - almost half the FDI in 2012 went to just five countries (USA, China, Brazil, UK and France). Only \$50bn went to Africa out of a total of \$1.4 trillion.

Aid

- There are lots of types of aid, but they broadly fit into two types: humanitarian aid (used during emergencies to help a country recover) and development aid (also known as structural aid which aims to give an injection of resources into health, education, infrastructure etc. to help the country develop).

Labour:

- The development of the *New International Division of Labour* means that Transnational Corporations can now locate in a range of different countries. These countries actively encourage foreign corporations to employ their workers, often at vastly reduced hourly wages compared to back home (the average Chinese income is \$2,100 a year compared to \$51,000 in the USA).

Modern Transport:

- Many people regard the humble container as being the biggest facilitator of globalisation and global trade. They are make it quicker to move goods (no need for one man one sack offloading) and can be lifted off ships straight onto the back of trains and taken swiftly to the consumers.

Impacts of Globalization

Fig 5. The impact of globalisation

Economic	Under the auspices of WTO world trade has expanded rapidly, especially between MEDCs and MECs and NICs. Most LDCs feel excluded from benefits
Socio-cultural	Western culture has diffused around the globe – for example global brands of drinks, shoes and clothes, global sports stars have emerged. Yet other cultures such as Islam have become global too. Cultural diffusion is a multiway process and leads to genuine fusion (cooking etc.)
Linguistic	English (American is now dominant as a world language at the expense of many native languages in the global village)
Political	The power of nation states has diminished at the expense of trade blocs. Many nation states have smaller economies than TNCs. New institutions such as EU, and a reinvigorated UN develop
Demographic	Global migrations are increasing leading to more and more multicultural communities. Economic migration underpins globalisation
Financial	A global network of world cities has evolved. Sophisticated mechanisms allow for global movement of capital / technology. Global terrorism can be financed from money laundering.
Environmental	Many environmental problems such as global warming or ozone depletion are truly global. Some international action is possible but slow to work e.g. kyoto
Media	Global village prevails with many sporting and cultural events genuinely global e.g. 2004 Athens Olympics, World Cup etc.

Transnational Corporations (TNCs)

What is a TNC? It is a company that operates in two countries or more, often having its HQ, R&D, production and sales teams spread out across the world. They are not all manufacturing companies, many are in resource extraction (oil, gas, metals etc.) while some are involved in services (films, music, legal & financial services).

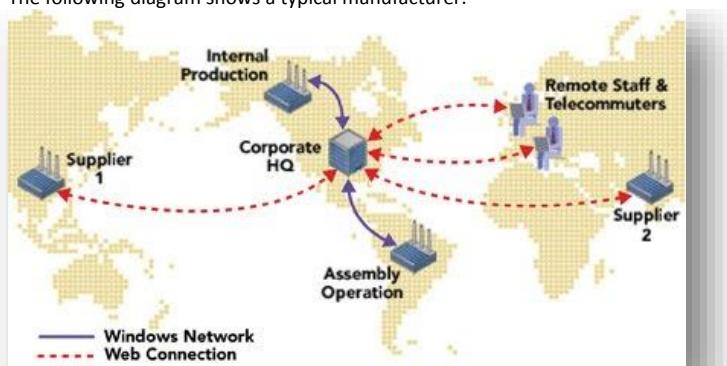
How are TNC organised? Large firms are divided into three organisation levels:

Headquarters – policy decisions with a largely managerial and secretarial workforce. Majority located in capital cities and core regions. But where else might headquarters locate?

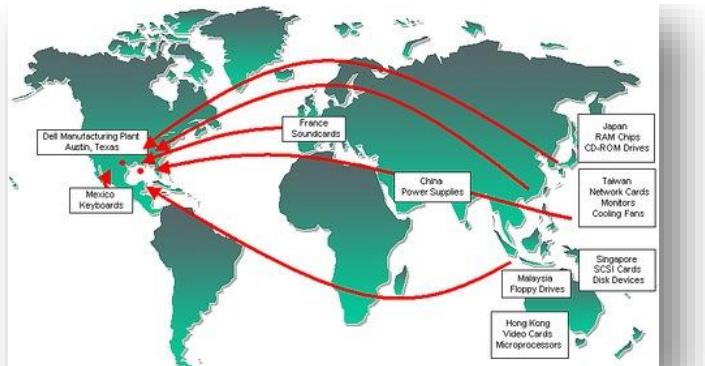
Research and development - highly qualified professional and technical staff, often located in core regions but also semi-rural locations such as Science Parks.

Branch Plants – employ skilled or semi-skilled workers in peripheral locations of low labour costs and high government support.

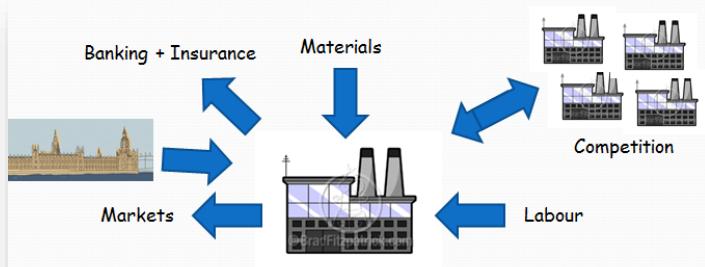
The following diagram shows a typical manufacturer:



Below shows you where all the components of a Dell computer come from:



What factors determine where a TNC locates?



* The Environment for the owner * Land availability/suitability

Ilbery argued that the most important factor in location is stable markets with demand.

What are the advantages and Disadvantages of TNCs locating in host countries?

ADVANTAGES

- TNCs create jobs.
- TNCs bring capital, technology, knowledge, expertise and skills.
- TNCs establish industries not present in host country.
- Encourage improvement of the transport infrastructure.
- Increase exports.
- Multiplier Effect ("Spin-offs") - establish industries needed for their production (e.g. engineering and chemicals).

DISADVANTAGES

- Few jobs in capital intensive industries and those that depend upon technology.
- Low wages.
- Some TNCs avoid paying local taxes.
- TNCs are often export led, so global problems could impact host countries.
- TNC industries are not always chosen for the best needs of the host country.
- Some TNCs invest abroad because of poor safety/pollution controls.

HOWEVER, ISSUES OCCUR BECAUSE OF TNCs: DEEPWATER HORIZON OIL SPILL IN GULF OF MEXICO



Case Study Nike in Vietnam:

Overview: Nike Employs 650,000 workers in 700 factories worldwide. There are 73 Nike supplier plants in Vietnam, producing 75 million pairs of shoes. Nike's country offices are located in Ho Chi Minh City. In 2007, 2008 and 2012 there were strikes in Nike's supplier factories over pay and conditions.

ADVANTAGES FOR VIETNAM

- Employs 312k workers
- Pays Higher wages - 3x higher than government jobs
- 81% of workers are female – higher disposable income and overcomes gender disparities
- Improves Skill base of local population
- Has attracted other TNCs to locate there (due to the process of cumulative causation)
- Has set new standards in efficiency – in 2011 it vowed to outlaw excessive overtime in supplier factories
- Pays taxes which helps improve local infrastructure and pay of health & education services

DISADVANTAGES FOR VIETNAM

- Conditions in factories used to be considered poor – workers in 1997 exposed to cancer causing carcinogens, made to work 65 hours a week (longer than by law)
- Workers are low paid in comparison to the profit per pair of shoe produced
- Nike could easily move production at short notice
- Strikers in 2012 complained they were paid on average 3 times less than workers in China.

Case Study of India and China's changing role in the global economy: reasons and consequences

China

Overview

- For much of the 20th Century China lagged behind other countries in the world and especially in the region. In 1990 its GDP per capita was \$300 compared to British controlled Hong Kong's \$13,000.
- China's economy was largely agricultural and trade was limited. It was run as a strict Communist country.
- China was not open to foreign investment (only \$0.057bn in 1980), TNCs were not allowed to operate and Chinese workers were too poor to afford Western Products so little imports.
- Chinese citizens were not free to travel abroad.

Current Role in the Global Economy

- China is now one of the leading manufacturers in the world. It produces over 90% of the world's personal computers, 70% of mobile phones, 63% of shoes
- In 2010 it overtook the US in manufacturing output.
- In 2012 it attracted more FDI than any other country in the World (1 in 5 dollars).
- China has now become an investor itself in other countries,
- China is now the 3rd largest economy in the world, with almost 15% of the global GDP.
- Chinese citizens are now travelling outside of its borders - 83m of them in 2012, though this is expected to rise to 200m in 2020.
- China is now a major political and military force in the world.

Reasons for the Changes

- The Government realised that the system of Communism was failing to create prosperity for its people. Led by Deng Xiaoping, China experimented between 1980-94 with capitalism in 'Special Economic Zones' - these were so successful they decided to expand to other areas in East of the country.
- Peasants were allowed to migrate from the rural west to provide a low-cost and young labour force for the factories in the East. Mass Migration – Industrialisation
- Luck – changes in western countries meant that manufacturing was becoming expensive

Consequences of the Changes

On the Global Economy

Positive

1. Low-cost China has helped keep the price of consumer goods low
2. By moving manufacturing to China many developed countries have been able to diversify their economy and become more focused on higher-paid tertiary work.
3. China's growing middle class is now able to purchase Western goods
4. China is now sending many more tourists abroad

Negative

1. China is also investing heavily in other countries, especially in Africa, in return for preferential access to new markets for their goods as well as resources
2. Some countries have seen job losses in their manufacturing sector. It is estimated that China has eliminated or displaced 2.7m US jobs between 2001-2011.
3. China uses a lot of fossil fuels to create the energy needed to run its factories. It now emits 23% of global Co2.
4. China's growing economic might has seen it flexing its military in the region - some are worried it could start a war.
5. China is so integrated into the global economy that any slowdown in growth impacts other countries and companies.

On China

Positive

1. With economic growth averaging 10% per year over the past 20 years, 500 million Chinese people have been pulled out of poverty.
2. China has reclaimed its sense of national pride.
3. Many manufacturing plants employ more women than men, which has helped to address the gender discrimination.
4. By reducing the labour supply in rural areas, farms have been forced to become more efficient which has raised yields

Negative

1. In recent years, having learnt from TNCs, Chinese entrepreneurs are starting their own companies.
2. The growth of incomes has not been evenly distributed (especially between rural and urban areas).
3. The total cost of environmental degradation in China is estimated to be \$230bn a year.
4. China's overuse of coal has led to very poor air quality
5. Water is used extensively in manufacturing and agriculture and most of Northern China now faces severe water stress.

India

Overview

- For much of the 20th Century India was a small player in the Global Economy. Its large agricultural sector dominated the economy and kept wages low - GDP per capita in 1990 was about the same as China at \$375. Some trade was done with other countries, but it was predominately in agricultural produce.
- Money flowing into India was in the form of Aid or remittances (from overseas migrants) with very little opportunities for FDI.
- The Indian middle class was very small and rarely travelled outside of the country.

Current Role in the Global Economy

- India is now seen as one of the up-and-coming countries, though nowhere as significant as China. In fact India's total GDP is only 21% of China's.
- Although it is becoming increasingly popular for TNCs to operate there the high levels of tariffs, regulation, corruption and bureaucracy, as well as poor education and limited investment in infrastructure, make it less appealing than other locations.
- However, it has carved its own niche in outsourcing IT services (especially Business Process Outsourcing)
- India's impact on the global economy has been much more regional, with greater impact on the economies of North America and Europe, than on its neighbours in Asia.
- In recent years India has bolstered its manufacturing sector, yet it still only accounts for about 20% of the economy.
- India has though invested in new agricultural technology, and has become the world's largest exporter of rice, the largest producer of wheat, and the second largest producer of fruit and vegetables.
- A growing Middle Class (only 25m in 1996 compared to 160m in 2013) has made Indian consumers large purchases of foreign goods.

Reasons for the Changes

- Expertise and English skill – call centres formed
- The drop in the cost.

Consequences of the Change

On the Global Economy

Positive

1. With India providing outsourcing opportunities it has helped keep the cost down of many services, thus increasing productivity.

Negative

1. Companies that outsource to India have fired people in Western countries - Npower outsourced 1,200 jobs – got rid of 1200 in UK.

On India

Positive

1. As a result of development the share of the population living below the poverty line has fallen from 45 percent in 1994 to below 30 percent in 2010.

Negative

1. Offshoring units of large foreign banks, insurance companies and retailers contribute \$14 billion to India each year. There is growing concern that by focusing so much on the service sector there are not enough jobs for low-skilled workers who in other countries could have found work in manufacturing.
2. The dominance of the agricultural sector (53% still work in farming) means that many have not enjoyed a significant rise in wages.

Localised Industrial Regions

Motorsport Valley



- Area is between Northhampton and Oxford in the British Midlands
- Companies include:
 - Aston Martin
 - Cosworth
 - Force India
 - Fortec Motorsport
 - Lotus Renault
 - Mercedes AMG Petronas
 - Prodrive
 - Red Bull Racing
 - Ricardo
 - Williams F1
- Over 40,000 people are employed – 25,000 engineers
- 2,200 businesses related to design, research and development
- Over 80% of world market in high performance engineering
- Sales of around £6 bn – 60% exports
- 1/3 of revenues to R&D

WHY?

- Due to high class education – good universities for sources of employees
- Good transport – nearby lots of motorways and airports
- Old, abandoned WW2 runways which can be used for testing.

Development of Call Centres in India

Why?

- 10% of the population speak fluent English
- 80% of 787mn people in towns are literate and 18% are graduates
- Operating costs are 60% lower
- Salaries are 1/10 of those in the UK
- Low staff turnover
- Development of ICT allows for fast and clear communication

Reasons for changes in Manufacturing Industry

1) Government Legislation

- Includes setting up areas – enterprise zones, where conditions are favourable for new industry such as through lower taxes
- Providing advanced factories of various sizes
- Offering retraining and removal expenses
- Ensuring educational reform

2) Health and safety regulations

- The legislation in Western countries mean costs are very expensive and mean that it becomes further cheaper to go to other countries where the safety legislation don't exist
- UK Rights:
 - 6 hours = 20 minute break
 - Right to training
 - Right to medical aid
 - Right to emergency training
 - Right to be supplied with protective clothing

3) Prohibition of Strikes

- People in developing countries are not allowed to join trade unions – therefore cannot strike.
- Eg. In Sri Lanka, trade unions do exist – but people are threatened if they join one.
- Toyota only entered UK on the condition that strike action would not be allowed – since they were scared of this

4) Tax Incentives and Tax-Free Zones

Reasons for changes in China

- 1) Legislation
 - 1977 – Stimulation of FDI
 - 1980 and 1994 – Special Economic Zones set up
- 2) The home market
- 3) Olympics
- 4) Energy
 - 2/3 is from Coal Fired Power Stations
 - HEP = 13.9% - Three Gorges Dam = 22,500mW
- 5) Cheap Labour – Wages 95% lower than in the US

Energy

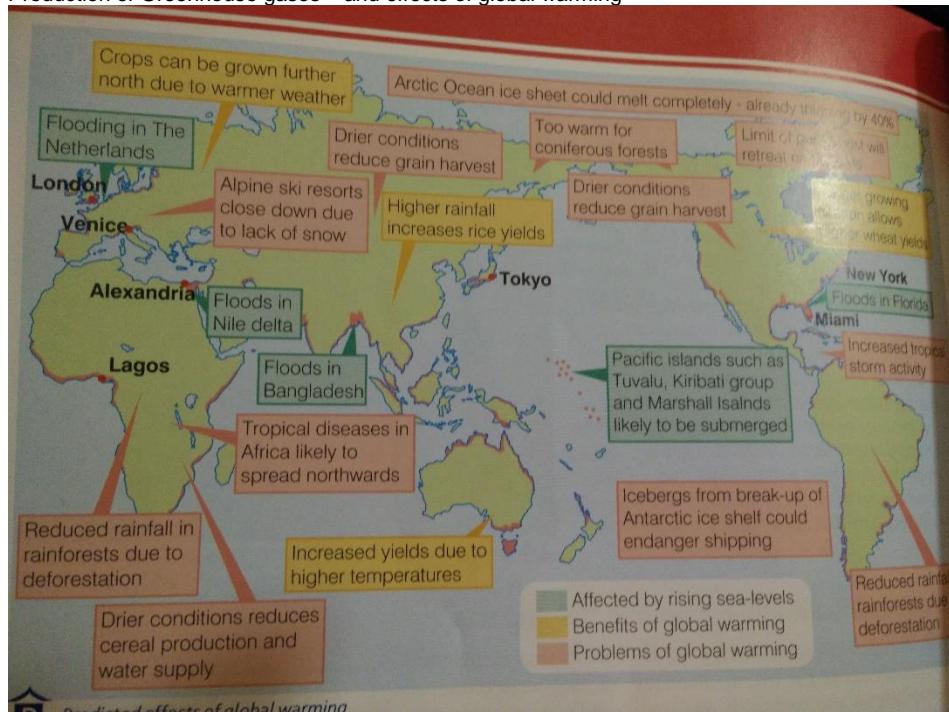
Why is there an increasing demand for energy?

- 1) World Population Growth
 - a. 0.79bn (1750) => 8.91bn (2050)
- 2) Increased Wealth
 - a. Average wages increases lead to people wanting more products that require more energy
 - b. Average wage in China has quadrupled since 1995
 - c. Increase of 26mn cars since 1997
 - d. In 2009 – UK – more people owned two cars than no cars
- 3) Technological Innovation
 - a. Has led to more and more products that are cool and interesting and people want to buy – however, each product requires lots of energy – both during manufacture and during use.

Impacts of Energy Production

- Health
 - Bronchitis and Lung related diseases occur in Industrial areas where coal is processed (and removed)
 - Issues also occur in cities where the air quality is incredibly poor

- Increased requirements for energy mean, while the production remains the same, the demand increases while supply does not. By supply-demand, this leads to an increase in prices of energy.
- Environmental Impacts
 - Dust Production
 - Production of Greenhouse gases – and effects of global warming



- Production of Brownfield Sites
- Also spoil heaps, next to coal mines where material has been dumped
- Exxon Valdez (1989), Deepwater Horizon and other water related catastrophes

Sustainable Energy

Wind Power in the United Kingdom of England, Scotland, Wales and Northern Ireland (+ tiny, pointless islands)

- AIMS
 - To be 1/3 of electricity generated, helping to make up a largely sustainable route to producing the majority of electricity.
 - July 2011 – 206 Wind Farms and Turbines – mostly onshore
 - Future plans include increases in offshore turbines, with over 8GW to be generated by 2016
- Where
 - Future plans will involve seeing the majority of wind farms in the shallows – nearby the south west, where there is lots of wind so lots of electricity could be produced.
- FOR WIND POWER
 - Cheap
 - Efficient
 - Can provide electricity to remote areas
- AGAINST WIND POWER
 - High start up costs
 - Eyesores
 - Sound
 - Killing birds

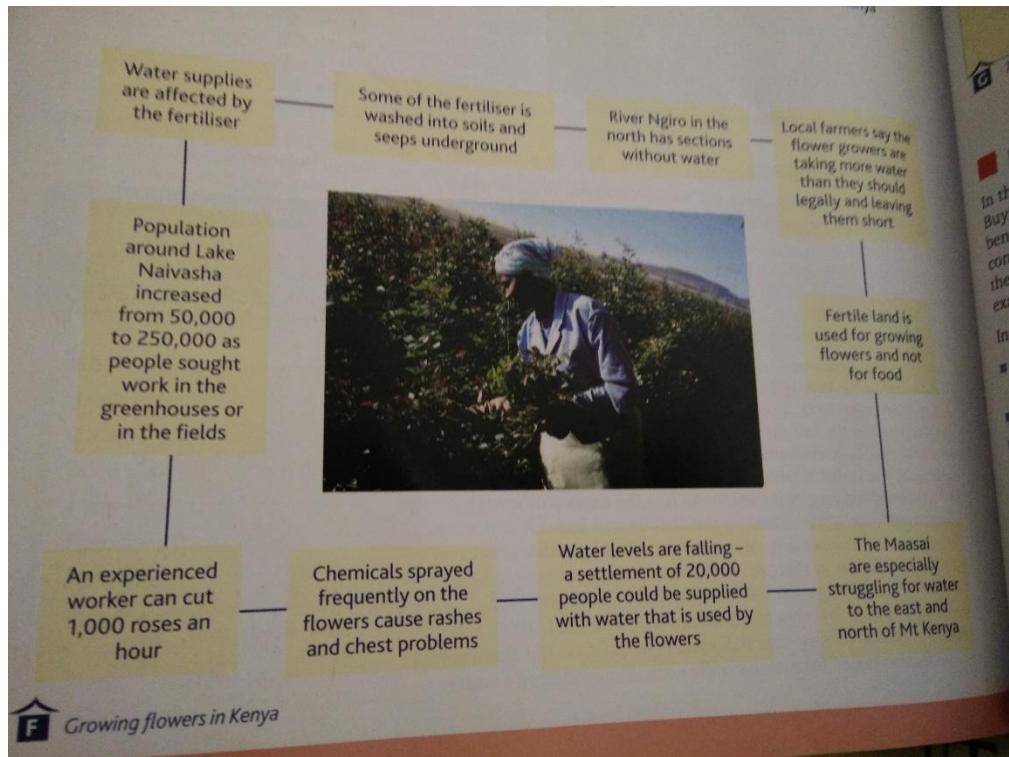
Directives

- INTERNATIONAL
 - Earth Summit in Rio de Janeiro in 1992 – discussion but no formal agreements
 - KYOTO PROTOCOL – 1997 – Greenhouse gas emissions to 5% lower than 1990 levels between 2008 and 2012
 - Became legally binding in 2005 – when 55% of the emissions countries had agreed
 - HOWEVER, USA and China never signed the agreement
 - AND
 - Developing nations were not required to meet the agreements since this would compromise their development
 - Set up the idea of Carbon Credits – trading the ability to emit Carbon Dioxide and other pollutants
 - Bali Conference – December 2007 – new targets attempted to be found – however, there were no agreements

- Durban Conference – December 2011 – agreed a new legally binding agreement, also signed by USA, China and India – due to be put in place in 2020.
- LOCAL
 - 'Think globally, act locally'
 - Propaganda to increase the amounts of recycling
 - Also promotion of:
 - Conservation
 - Conserve water, electricity, plastics, paper
 - Recycling
 - Only 35% of waste to go to landfill sites by 2015

Food – Impacts

- Globalisation has led to an increase in long distance food demand – throughout the year, which means lots of food is imported from around the world
- $\frac{1}{2}$ vegetables and 95% of fruit is imported
- 1% of food imported by air
- Leads to 11% of carbon emissions due to transportation of food.
- HOWEVER, 'driving six and a half miles to buy your shopping emits more carbon than flying a pack of Kenyan green beans to UK'
- **Environmental Degradation in Developing Nations**
 - Lots of the farming which occurs to meet these needs occurs on marginal land – which creates lots of issues
 - Land becomes of an even worse quality
 - Quality of food produced is quite poor.
 - Political Impacts
 - RIVER INDUS – INDIA + PAKISTAN
 - Very seasonal – full during the summer, empty in the winter.
 - Valuable to large parts of the population who rely upon it for the agricultural industry on the valuable and fertile land in Punjab
 - LAWS
 - INDUS WATER TREATY in 1960
 - Pakistan has western flowing rivers, India eastern flowing rivers
 - Jhelum and Indus River dams gives Pakistan independence from India
 - HOWEVER, there is lots of resentment from Indians who think that Pakistan are stealing their irrigation.
 - Wuller Barrage – June 2006 – Jhelum River – Prevent lots of water reaching Pakistan.
 - SOCIAL ISSUES
 - Growing cash crops are a source of economic prosperity, coming out of the dire situations that people were perceiving as a way out of poverty.
 - EG: Areas around Lake Naivasha in Kenya



- **ECONOMIC IMPACTS**
 - People aim to produce cash crops in order to rise out of sustenance.
 - They require investments
 - Increased crops means more pesticides and fertilisers – more investment
 - This creates a vicious circle – especially if there is a single failed harvest.
 - Creates Rural Debts.
 - Loans → fertilisers → higher yields → sold crops → paid back loans with interest → increased loans to pay for interest as well
- **BUYING LOCALLY PRODUCED FOOD**
 - Farmers in the UK benefit from local food
 - **HOWEVER**, this harms those who need the money the most, in Developing nations.
- How to support local produce:
 - Advertising
 - Celebrity promotion – Gordon Ramsay
 - Specialised local shops
 - Farmers markets

Urban Development

Urbanisation

- Process by which an increasing proportion of people live in urban areas, moving from rural areas, generally.
- Today, this process is occurring faster than ever, around the world. For the first time, over 50% of the population is living in cities.
 - UK – 80%
 - USA – 80%
 - China – 50.6%
 - India – 31%
 - Generally LIC's are more ruralised, however, there is a significant movement over a period of time.
- Unprecedented growth
 - World bank – 'cities are growing at unprecedented and challenging speeds'

Why?

- Better economic opportunities
- Better quality of life
 - Better healthcare, is often a large factor, and leads to people wanting to move.
 - Nicer buildings
 - Better infrastructure.
- Lack of enjoyment in rural areas, especially compared to urban areas.

What does this mean for cities

- Huge variety in quality of urban management of cities.
- BEST
 - CITY – POPULATION – GDP PER CAPITA
 - Hong Kong – 7.1mn - \$38,000
 - Singapore – 5.4mn - \$55,000
 - Zurich – 383,000 - \$93,000
- WORST
 - Mumbai, 11.98mn, \$2,800
 - Lagos – 17.5mn, \$2,700
 - Dhaka – 14.4mn, \$1,600

Land Use

- 3 main theories

Burgess Concentric Zone Model

- Based on Chicago
- 1924 – Made of multiple concentric circles – CBD, Inner City (Zone in Transition), Inner Suburbs, Outer Suburbs, Rural-Urban Belt
- Many flaws in the system, though is the most simple, and thus very useful to analyse lots of cities, especially LICs

Hoyt Sector Model

Harris and Ulman, - Multiple Nuclei Model

Different parts of the city

	Function	Characteristics	How is it changing
Central Business District (CBD)	Tertiary and Quaternary Sector, highly lucrative commercial services.	<ul style="list-style-type: none"> • High Vertical Density • Great accessibility • Largely commercial • High population density 	<ul style="list-style-type: none"> • Growing, movement – creation of new CBDs in different places. • Regeneration • Lateral and Vertical Growth
Inner City	Highly Residential – working class with light industry	<ul style="list-style-type: none"> • Highly residential <ul style="list-style-type: none"> ◦ Working class ◦ Light industry exists, though • Very tightly packed housing • Typically poorest part of the cities • Associated with Ghettos and segregation <ul style="list-style-type: none"> ◦ Crime • Grid-like structure 	<ul style="list-style-type: none"> • Deindustrialisation • Gentrification • NINE ELMs REDEVELOPMENT
Suburbs	Middle to higher class, residential areas. No industry, with parks, education, recreation facilities, public services.	<ul style="list-style-type: none"> • Lower population density • Mainly semi-detached housing • Houses tend to be bigger • Price of land is lower • Higher rates of house and car ownership • Garages and gardens • Better infrastructure and transport. 	<ul style="list-style-type: none"> • House prices increasing, extension of infrastructure – Crossrail in London
Rural-Urban Fringe	Higher class – detached housing => residential with light industry and business parks.	<ul style="list-style-type: none"> • Cul-de-sacs • High class • Low density of population and housing • Lots of greenery • Detached housing 	<ul style="list-style-type: none"> • New business parks • More industry <ul style="list-style-type: none"> ◦ Quaternary Industry

		<ul style="list-style-type: none"> • Large business parks, • Light industry • Land is cheap • Good accessibility 	
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Issues for HIC cities

1) Housing

- a. See timeline for changes in housing in the UK,
 - i. **MOST IMPORTANT CHANGES**
 - ii. Inter-war => Large scale estates built
 - iii. Post-war => Large estates continued to fill over-crowding.
 - iv. 50s and 60s => people moved towards south, as industry started to slow.
 - v. 60s and 70s => terraced housing continued to be replaced with estates
 - vi. Deindustrialisation – Production of urban ghettos and social deprivation in inner cities.
 - 1. ‘We must win back the inner cities.’ – Margaret Thatcher.
 - vii. Since then – Much unrest throughout inner cities, with times of failing economies, and high unemployment – Social unrest (riots) – throughout the country.
- b. **Population has increased by 10.5% since 1971 and growth rate is predicted to continue**
- c. **Households risen by 30% since 1971 – More people living alone**
 - i. People leaving home to rent or buy earlier than previously
 - ii. Marrying later
 - iii. Getting divorced
 - iv. Living Longer
- d. Shoddily built housing during the 50s and 60s required large scale redevelopment
- e. Where to build to fulfil this need for housing
 - i. Greenfield Sites
 - ii. OR
 - iii. Brownfield Sites

Greenfield Sites vs Brownfields Sites Table

	Advantages	Disadvantages
Brownfield Sites	<ul style="list-style-type: none"> • Tend to be inside cities, availability of transport is good • More sustainable • Can bring new vibrant communities <ul style="list-style-type: none"> ◦ Does not contribute to urban sprawl ◦ Gentrification of the area brings advantages such as reductions in crime rates • Infrastructure is already present • Work removing toxins is often subsidized by government • Eases pressure on greenfield sites, whose redevelopment damages environment • New jobs • Large availability <ul style="list-style-type: none"> ◦ 30,000 hectares across England 	<ul style="list-style-type: none"> • Sites may be contaminated <ul style="list-style-type: none"> ◦ Expensive and time consuming to be cleaned • Land is expensive • Gentrification can stop locals from living in the area • Issues with urban areas. <ul style="list-style-type: none"> ◦ Traffic ◦ Noise and air pollution ◦ High cost of living
Greenfield Sites	<ul style="list-style-type: none"> • Better quality of life <ul style="list-style-type: none"> ◦ Less congestion ◦ Lower noise and air pollution • Land is cheaper • Workers prefer these areas • Areas are easier to build on • Few toxins • New vibrant, ‘garden cities’, could act as the new areas for development <ul style="list-style-type: none"> ◦ Milton Keynes, Welwyn Garden City or Ebbsfleet <ul style="list-style-type: none"> ▪ Highly planned by nature ▪ Modern developments with sustainable development at the forefront of the design ◦ Act as the centres for quaternary industry ◦ EG → Gurgaon in New Delhi 	<ul style="list-style-type: none"> • Garden cities are expensive to build • Infrastructure needs to be built • Poor for the environment <ul style="list-style-type: none"> ◦ Contributes to urban sprawl ◦ Deforestation ◦ Destruction of natural habitats ◦ Increases in Greenhouse Gas emissions • Reductions in agricultural land available <ul style="list-style-type: none"> ◦ Growth in population as well as few changes in growth of agriculture leads to Malthusian catastrophe • Lead to demise of current cities • Excess pressure on rural-urban fringe.

2) Inner City Development

- f. Demand for housing can be satisfied by inner city areas. In 60s and 70s cheap high rise flats were considered the best approach
- g. Demolished in the 80s when quality was found to be poor.
- h. 3 Main strategies
- i. Often fixed through Gentrification – **Not a strategy, an organic process.**

Urban Development Corporations (UDCs)

- I. Bodies set up by England and Wales Governments, charged with the regeneration of an area, (with large scale regeneration) outside of the system of town and county planning in the UK.
- II. Money comes from both private and public sources.
- III. Strategy introduced in 80s, with 13 large scale projects

LONDON DOCKLANDS DEVELOPMENT CORPORATION → LLDC

- A. \$10bn in investments
- B. 17 years project – (1981 – 1998)
- C. 431 ha of land for development
- D. 144km of new and improved DLR
- E. 2.3km² of commercial floorspace built
- F. 2,700 new businesses trading
- G. 85,000 people now work in London Docklands

City Challenge

- I. Smaller scale regeneration projects, compared to UDCs, but involves a wider range of agencies and organisations
- II. Local authorities, private companies and the local communities all work together to effect regeneration
- III. **HOLISTIC APPROACH**

HULME, MANCHESTER

- a. Was a huge estate formed of giant concrete social housing shaped like crescents
- b. Through City Challenge, received £37.5mn.
- c. Used for
 - i. Demolishing 1960s crescents
 - ii. Retaining and repairing some of the older buildings
 - iii. Designing homes to be sustainable and energy efficient
- d. One of Europe's largest regeneration projects
- e. Main advertisements
 - i. Hulme Bridge
 - ii. New road infrastructure
 - iii. Birley Field Business Park
 - iv. 2000 new homes
 - v. New park
 - vi. Youth centre

Sustainable Communities.

- I. Allows people to live in *good enough* quality of life.
- II. Focus is not splendid architecture and good designs, but providing basic components necessary for decent quality of life.
 - a. Jobs
 - b. Education
 - c. Healthcare

New Islington Millennium village

- d. Rebranded from 'Cardroom'
- e. New Homes
 - i. 66 homes
 - ii. 1300 apartments
 - iii. Refurbished hospital
 - iv. New office space
- f. Waterways and parks
 - i. 3,000m of canalside
 - ii. 12 bridges
 - iii. 50 moorings for narrow boats
 - iv. 3000 new trees
 - v. 2 garden islands
- g. Urban amenities
 - i. Play areas and climbing room
 - ii. 10 new shops
 - iii. Metrolink public transport
 - iv. Bus stops and lines
- h. Community facilities
 - i. Primary School
 - ii. Health Centre
 - iii. 2 workshops

- iv. Crèche
- v. Football Pitch
- vi. Village hall
- i. Sustainability agenda
 - i. Boreholes – 25l/s of naturally filtered water.
 - ii. Central heat and power
 - iii. Recycling collection points

3) Traffic

- j. Congestion and Traffic linked to HICs and LICs

Issues with excess traffic

- i. Congestion is bad for business
- ii. Environmental pollution
- iii. Noisy
- iv. Stress
- v. Maintenance Costs

Strategies

- vi. Mass underground metro systems and expansion
- vii. Taxing people in inner areas => automated systems for payment collection
- viii. Extensive bus routes
- ix. Expensive parking – Red Routes
- x. Bike Sharing Schemes => Cycle lanes, cycle super highways, tax rebates
- xi. Pedestrianized city centres
- xii. **Two main categories**
 - 1. Promoting Public Transport
 - 2. Discouraging cars

4) CBD Development

- k. During 60s and 80s, CBDs failed to attract businesses

- i. Poor air quality
- ii. Buildings ugly, inefficient, overcrowded.
- iii. **Regeneration takes place.**

Paternoster Square

- 1. Original Buildings destroyed in WW1, replaced by cheap ugly buildings in 60s.
- 2. 80s attempted to get the area redevelopment again, however, plans only occurred in the 90s, finishing in 2003.

5) Multicultural Mix

- l. Urban Social Segregation is a problem which affects many HIC cities, which have an adverse racial, religious and ethnic population
- m. Segregation occurs.

- n. Can be voluntary or involuntary

- o. Reasons for voluntary segregation

- i. Support from others
- ii. A familiar culture
- iii. Specialist facilities
- iv. Safety in numbers
- v. Generally poor and have low paid jobs, so live in poorer areas of city

- p. Involuntary Segregation

- i. White flight
 - 1. SA and USA.

- q. Why London has lots of integration

- i. Improving Educational Provision in Deprived Areas – Teach First
- ii. Increasing Employment through initiatives – Rooney Rule (USA)
- iii. Increasing community involvement by ensuring the needs of minority groups are understood and met.
- iv. Providing facilities that encourage meetings of all sections of the communities.

Squatter Settlements

- Illegal improvised and shoddily built areas, often built on marginal land

Characteristics

- Illegally built
- Poor sanitation and hygiene – open sewers
- Highly compacted buildings
- Poor safety levels
- Lack of amenities (water, education)

- **Rocinha**

- Rocinha is one of the largest favelas in the world
- 96,000 people, mainly wooden huts
- 80% in extreme poverty
- 2 schools
- Sewage water mixes with drinking water.
- 500 cases of TB per year
 - 500/100,000 a year

- Large footbridge built, very expensive, not because of money requirements,
- Forced evictions
- Largest favela in South America.
- *Why they form*
 - The pushing and pulling forces of migration
 - Natural Disasters – sustained ecological changes , low incomes
 - Better job prospects, education, health facilities, freedom from restrictive social or cultural realities.
- *How they earn money.*
 - Earn money through the informal sector
 - Requires little capital to set up
 - Requires few skills
 - Can be done from people's homes
 - Labour intensive
 - Small-scale
 - Do not pay tax
 - Mostly illegal
 - Most common jobs
 - Selling fruits and vegetables
 - Clothes sales
 - Water kiosks
 - Small manufacturing
- *How to improve squatter settlements*
 - Bottom Up
 - Community projects
 - De-centralised organisations
 - Civil society controlled
 - Engage local networks
 - Appropriate and repeatable impacts
 - Pro-poor reformations
 - Influence government
 - Top Down
 - Government Programs
 - Centralised Institutions
 - Build state capacity
 - Large-scale impact
 - Established funding mechanisms
 - Collaborate with community.
 - Do it yourself:
 - Allow changes to occur at a natural speed -> Rochina in Rio
 - Clearance and Large-Scale Redevelopment
 - Very unpopular
 - Occurring in Dharavi,
 - Self-Help Housing
 - Provision of materials for construction and redevelopment of the area, eg, Brazilian government provision of Breeze-blocks.
 - Gives people the chance to rent or buy the piece of land
 - Gives them some kind of legitimacy, and care more about their house and their area.
 - Land is connected to city by transport links and has access to essential services (eg Water). People build their own houses using low-interest loans.
 - SITE AND SERVICE
 - Brazilian Government has moved lots of people out of Shanty towns and into low-cost housing, basic, nearby. Housing is fairly cheap for people.
 - Kenya has followed suit.
- *KIBERA*
 - Largest slum in Africa
 - Nairobi, in Kenya
 - Approx. 1 mn people
 - Most people in extreme poverty
 - High unemployment rates
 - Large scale AIDS
 - Assault and Rape common
 - Few schools
 - Clean water is scarce
 - Residents lack basic services
 - Electricity
 - Running water

- Healthcare
- Solutions
 - **Slum Clearance**
 - Authorities began, in 2009 to move residents out of Kibera
 - 2-5 year process
 - People rehoused in 300 newly built apartments paying \$10 per year
 - **External Intervention**
 - British charities, UN, World Bank – all provide infrastructure and improve conditions.
 - **Bottom Up**
 - Funding of 15 stand-alone toilets
 - Kibera Community and Sanitation Project
 - Rotary Club
 - International NGO Practical Action
 - **New Technologies**
 - Practical Action – Development of very low cost roofing tiles.
 - UN provide electricity to some parts at low cost.
 - Water Pipes being built by the world bank.

Issues regarding rapid urbanisation in LICs

- *Environmental Disasters*
 - Bhopal Accident
 - 3rd December 1984 – World's Worst Industrial Accident – Poison escaped from chemical plant, and killed over 3,000 people. 50,000 people suffered permanent disabilities.
 - Poor regulation in LICs to promote international trade furthers the problems.
 - Employment of Western Companies to clean up any sites with toxins, with the correct skills
 - Better regulation
 - Consultancy from western companies, for advice regarding safety in industrial activity.
- *Electronic Waste*
 - Toxic chemicals inside electronics can cause large problems- leading to health issues inside people.
 - Large companies starting to take more responsibility → being forced by the government, taking responsibility for the disposal of electronic waste.
- *Water Pollution*
 - Ganges river contains untreated sewage, cremated remains, chemicals, and pathogens. Cows wash.
 - People bathe and drink from it => very bad effects on their bodies.
 - *Ganges Action Plan – 1986*
 - Failed – large increases in population.
 - World Bank Loan (\$200mn for Suzhou and Huangpo)
- *Waste and Pollution*
 - Shanghai – 30,000 tonnes of waste every day
 - Electricity produced from coal-fired power stations.
 - Pollution and waste leads to 400,000 deaths every year.
 - Allowing people to recycle as much of the waste as possible
 - This leads to lots of health issues.
 - In Shanghai, solid waste disposal unit fitted in most homes, the resultant material is used as a fertiliser in agriculture.
 - *Air Pollution*
 - Carbon Taxes
 - Introduction of Low-Sulphur Coal
 - Reduction of traffic
 - Mexico City – Half cars each day
 - Public Transport
- **SOLUTIONS**
 - See Yellow

Sustainable Living

- Significant issue in UK and globally
 - Ensuring that cities and towns have a minimal carbon footprint
 - Don't pollute too much
 - Don't consume too many resources
- Sustainable City
 - *Improving the quality of life in a city, including ecological, cultural, political, institutional, social, and economic components, without leaving a burden on the future generations. A burden, which is the result of a reduced natural capital and an excessive local debt.*
 - Could be defined using 3 Es: Economy, Ecology, Equity.
- Characteristics of a sustainable city
 - Conserving the historic environment both buildings and sites
 - Liverpool Maritime Mercantile City
 - Conserving the natural environment
 - Reducing and safely disposing of waste material.

- Providing adequate open spaces.
- Bottom up approach for local planning issues
 - Provision of local associations for people to have a voice.
- Efficient public transport.
 - Improvement of it → see Traffic in the inner city development section.
- Often build on Brownfield Sites
 - Also include green belts, areas on the edge of the built up area, rural-urban fringe, where restrictions apply to prevent excess building.
- Example is Olympic Park in Stratford
 - Built on brownfield site
 - Most things occurring from one site => reduce traffic
 - No car parking => promotion of public transport.
 - Use of recycled materials
 - Designed for minimal energy use.
 - Collection of rainwater
 - Creation of large green spaces
 - Large legacy plans
 - Stadiums will be used for sports for long period after the Olympics.
 - Most will be available for the use of local residents.
 - Housing for locals will be created.
 - Lots of jobs
- Curitiba
 - Capital of Paraná (Brazilian state)
 - Population of 2mn
 - 1968 – Curitiba Master Plan – control urban sprawl, improve public transport, reduce traffic, creating a higher quality of life for the residents, with concern for the environment.
 - 28 Riverside Parks
 - Used as floodplain.
 - 100 miles of riverside trails.
 - Lakes created inside parks.
 - Recycling of litter in exchange for bus tickets, especially for the poorer parts of society.
 - BRT (Bus Rapid Transport) System
 - Direct Line Buses operate from key pick-up points
 - 'Fast' Buses
 - Inter-District Buses only go to outskirts.
 - Mini-Buses pick people up from residential areas.
 - Housing
 - Everyone has the right to good quality housing
 - Even the poorest parts of society that used to live in slums will get decent quality housing - => 50,000 homes for the urban poor have been created.
 - Education
 - Free 'Lighthouses of Knowledge'.

Rocks, Resources and Scenery

ERA	PERIOD/ SYSTEM	MILLIONS YEARS AGO	PREDOMINANT ROCK TYPES IN INDIANA	PRINCIPAL FOSSIL TYPES IN INDIANA
CENOZOIC	QUATERNARY	2.6	Unconsolidated deposits - glacial till, sand, gravel, silt, marl, clay, and peat deposited during and after continental glaciation	Mastodon, mammoth, peccary, dire wolf, saber-toothed cat, gastropods, pelecypods, plants, and pollen
	TERTIARY	65.5	Unconsolidated sediment consisting of clay, mud, gravel, sand, and silt	Short-faced bear, peccary, camels, snakes, rodents, fishes, birds, and turtles
MESOZOIC	CRETACEOUS	145.5	None present	None present
	JURASSIC	199.6	None present	None present
	TRIASSIC	251	None present	None present
PALEOZOIC	PERMIAN	299	None present	None present
	CARBONIFEROUS	PENNSYLVANIAN	Shale, sandstone, mudstone, clay, coal, limestone, and conglomerate	Lycopods, <i>Calamites</i> , seed ferns, true ferns, <i>Cordaites</i> , and amphibians
		MISSIS-SIPPAN	Shale, sandstone, siltstone, limestone, and gypsum	Crinoids, brachiopods, cephalopods, corals, molluscs, trilobites, bryozoans, fishes, arthropods, and foraminifera
	DEVONIAN	359.2	Upper part: carbonaceous shale Lower part: limestone, dolostone, and shale	Corals, brachiopods, cephalopods, trilobites, pelecypods, and bryozoans
	SILURIAN	416	Dolostone, limestone, siltstone, and shale	Corals, stromatoporoids, bryozoans, brachiopods, trilobites, gastropods, pelecypods, crinoids, and eurypterids
	ORDOVICIAN	443.7	Upper part: shale and limestone Lower part: limestone, dolostone, and sandstone*	Cephalopods, trilobites, brachiopods, bryozoans, crinoids, pelecypods, and gastropods
	CAMBRIAN	488.3	Sandstone and dolostone*	Trilobites, brachiopods, and sponges
	PRECAMBRIAN	542	Granite, marble, gneiss, and other igneous and metamorphic rock types*	Microbes
		4,600		

- Granite - formed about 280 million years ago
- Carboniferous Limestone -> formed some 340 million years ago, through to the Carboniferous Period.
- Chalk -> Formed during the Crustaceous Period
- Clay -> Formed on many occasions throughout geological time but especially during the Jurassic, Crustaceous and Tertiary Period.

Formation and characteristics of igneous, sedimentary and metamorphic rocks				
Rock type	Formation	Characteristics	Examples	Photo
Igneous	Formed by the cooling of molten magma either underground (intrusive) or on the ground (extrusive) by volcanic activity.	Igneous rocks are composed of interlocking crystals (they are said to be crystalline). They are generally tough rocks and are resistant to erosion.	Basalt, andesite and rhyolite are examples of extrusive lavas. Granite, gabbro and dolerite are intrusive rocks.	
Sedimentary	Formed by the compaction and cementation of sediments; usually deposited in the sea. Also includes organic material (e.g. coal) and rocks precipitated from solutions (e.g. limestone).	Sedimentary rocks usually form layers called beds. They often contain fossils. Although some rocks can be tough (e.g. limestone), most are weaker than igneous and metamorphic rocks.	Common sedimentary rocks include sandstone, limestone, shale, clay and mudstone. The rock chalk is a form of limestone.	
Metamorphic	Formed by the alteration of pre-existing igneous, sedimentary or metamorphic rocks by heat and/or pressure.	Metamorphic rocks are also crystalline. They often exhibit layering (not beds) called cleavage (as with the rock slate) and banding. Metamorphic rocks tend to be very tough and resistant to erosion.	Slate is one of the most common metamorphic rocks. Other examples include gneiss (pronounced 'nice') and schist.	

Rock Types

Igneous

- Formed from the cooling and solidification of magma or lava. Magma is inside the earth and lava is outside the earth
Intrusive / Plutonic

WITRAKOV / Tatarski

- Magma cools slowly
 - Large crystals form. The slower things cool, the larger the crystals.
 - e.g. Diorite and Granite

Extrusion

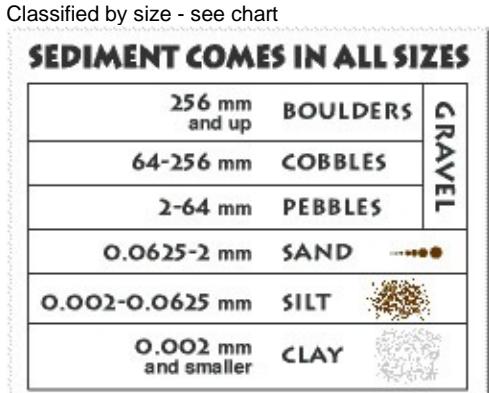
- Lava cools extremely quickly
 - Small crystals form
 - May be vesicular, contains air bubbles.
 - eg. *Pumice, Basalt*

(Date can

- Form from compaction and cementation of sediments - fragments of rocks - broken down as a result of weathering - ice, water, wind

Form II Deposit

- Compacted sediments



- eq. Shale, Siltstone, Clay and Chalk

Organic / Crystalline

- Contains evaporates, precipitates and biological matter.
- eg. Rock Salt and Carboniferous Limestone.

Metamorphic

- Rocks that have changed as a result of exposure to intense heat and / or pressure.
- Can be foliated or non-foliated (layered).

Contact Metamorphism

- HEAT

- eg. Quartzite

Regional Metamorphism

- PRESSURE. When plates come together. Leads to rock in the middle to contract.
 - eg. Gneiss.
- Starts off as igneous or sedimentary rocks, slowly become more compacted
 - eg. Shale —> Slate —> Phyllite —> Schist —> Gneiss

Weathering

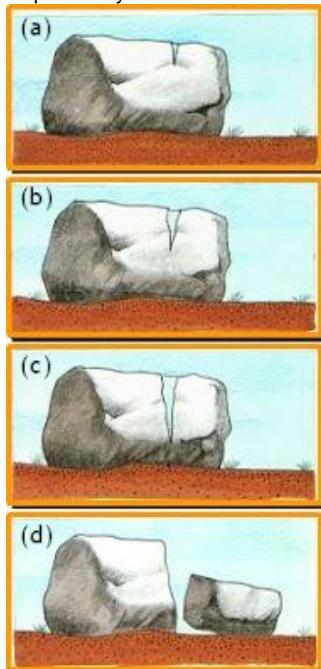
- **The disintegration or decay in situ at or close to the ground surface, largely caused by the elements of the weather such as rainfall and changes in temperature.**

Mechanical

- Also known as physical weathering. Without any chemical changes taking place. Results in piles of angular rocks called scree found at the foot of bare rocky outcrops.

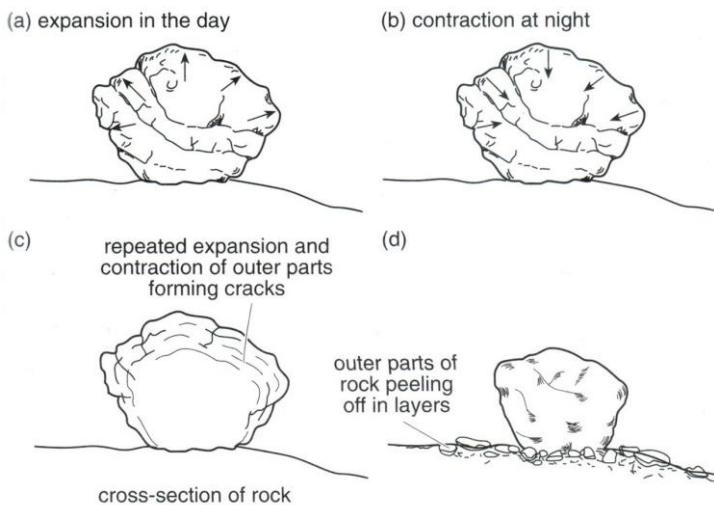
Freeze-Thaw Weathering

- Liquid Water collects inside pores.
- When it becomes night, the water freezes and expands by 9%.
- This creates stress within the rock.
- As the temperature increases, leads to the ice melting and more water seeping in.
- Repeated cycles of freeze-thaw leads to fragments becoming detached, scree. The process is a fatigue process.



Onion Skin Weathering/ Exfoliation

- Rock is a poor conductor of heat
- Only outer part of the rock heats and cools in response to temperature
- Expands with heat during the day, contracts during the night
- Repeated cycles can lead to the outer skin peeling away from the rest of the rock.
- Presence of water is important for exfoliation, as it weakens the rock.
- Leads to the creation of scree.

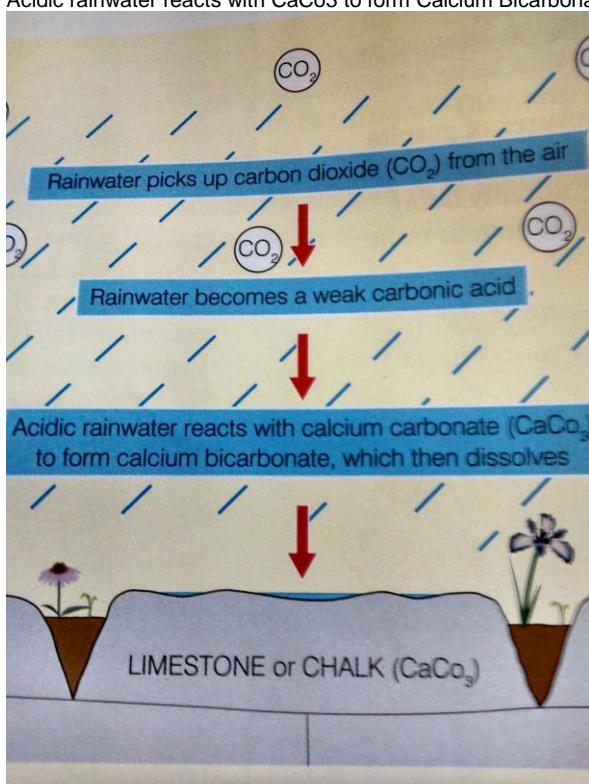


Chemical

- Chemical Change takes place. Rain, being slightly acidic, can slowly dissolve certain rocks and minerals. Those minerals and particles unaffected by chemical weathering are generally left behind to form a fine clay deposit.
- Two main types of Chemical Weathering

Solution

- Some minerals and rocks dissolve in rainwater. This dissolving process is called solution.
- Carbonation**
- Similar to solution in that it involves dissolving.
- Affects rocks made from CaCO_3 , such as limestone and chalk.
- Rainwater picks up CO_2 from the air
- Becomes a weak carbonic acid.
- Acidic rainwater reacts with CaCO_3 to form Calcium Bicarbonate, which then dissolves.



Biological

- Involves the actions of the Flora and Fauna. Plant roots are effective at growing and expanding in cracks in the rocks. Rabbits can be effective in burrowing into weak rocks such as sands.

ROCK CYCLE

IGNEOUS TO SEDIMENTARY

- Igneous rocks are broken apart, eroded then weathered
- Rocks are compacted at the bottom of lake or sea . Organisms can also be compacted adding to sedimentary rocks
- Over time, pressure causes sediment to join together, forming sedimentary rocks.

IGNEOUS TO METAMORPHIC

- Igneous rocks are buried deep inside the crust
- Over time, heat and pressure build up around the rock
- Continued heat and pressure causes the rock to change into a metamorphic rock

SEDIMENTARY TO METAMORPHIC

- A sedimentary rock sits deep in the earth
- Over time, heat and pressure builds up around the rock
- The continued heat and pressure causes the rock to change into Metamorphic rocks

SEDIMENTARY TO IGNEOUS

- Rock is buried deep underground
- Heat and pressure can lead to the rock melting into magma
- The magma cools, and Igneous rocks cool. If it erupts and becomes overground and lava cools, it would be extrusive, otherwise it would be intrusive.

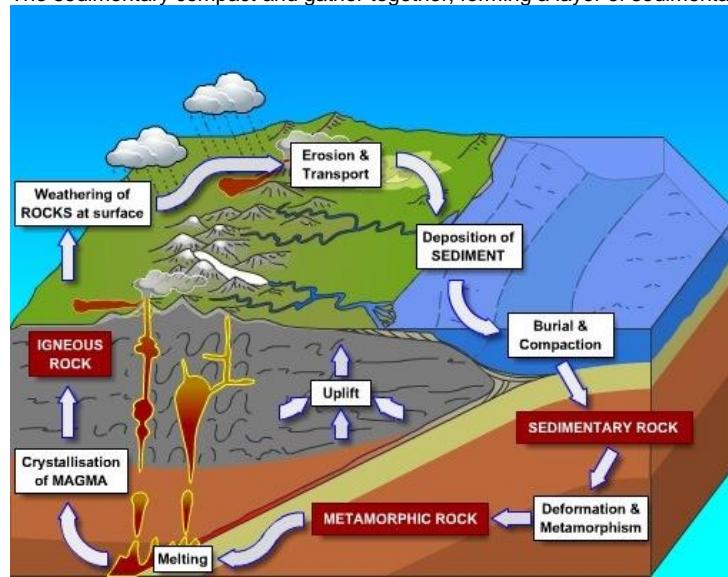
METAMORPHIC TO IGNEOUS

- The rock feels extreme heat and pressure and can melt
- This forms magma under the ground
- Magma cools and forms into Igneous rocks, intrusive or extrusive, depending on whether it erupts or not.

METAMORPHIC TO SEDIMENTARY

- Exposed due to tectonic uplifting, then exposed to weathering and erosion.
- The sediment gathers at the bottom of a body of water

- The sediment compact and gather together, forming a layer of sedimentary rocks.



Landforms of different rocks

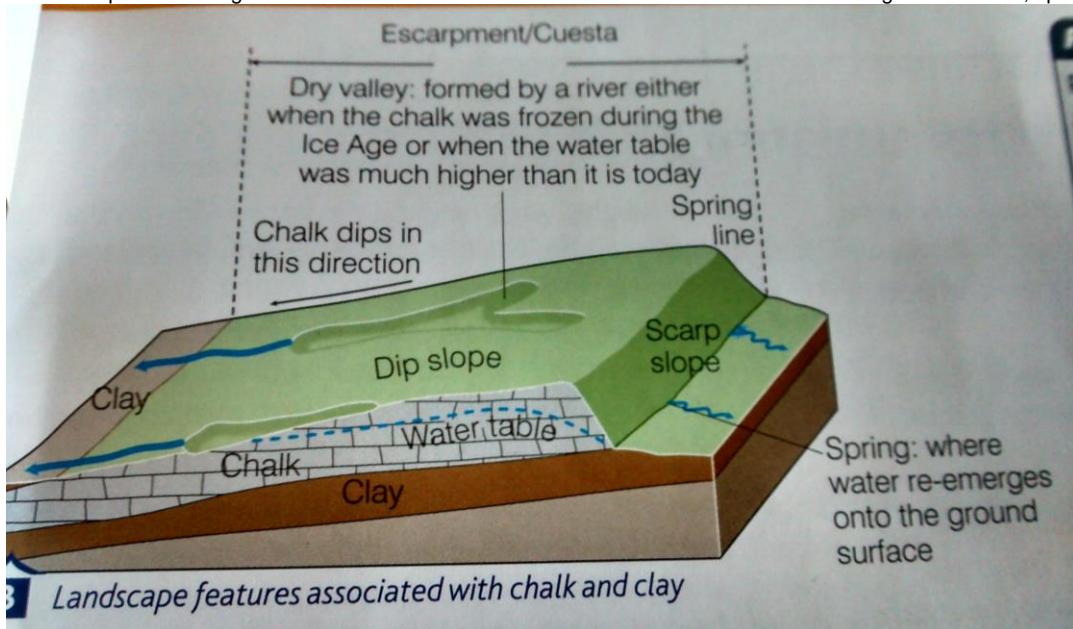
Granite Landforms

- Following uplift and erosion of overlying rocks, bits of granite have become visible on the surface.
- All isolated exposures of granite are actually part of the same Batholith
 - A huge irregularly shaped mass of igneous rock that only reaches the surface when the overlying rocks are removed,
- Granite is a tough rock, resistant to processes of weathering and erosion.

- Contains cracks or joints
 - Cracks that may run vertically or horizontally through rock.
 - Vertical joints formed when the granite cooled and contracted.
 - Horizontal joints formed from pressure release when overlying rocks were eroded.
- Impermeable
- Contains Tors
 - An isolated outcrop of rock on a hilltop, usually in granite landscape.
 - Linton suggested that the spacing of the vertical joints in the granite, varied across the area, and this influenced the effectiveness of weathering.
 - While underground and in a previously warmer and wetter climate, the closely spaced joints were weathered rapidly compared with the zone of more widely spaced joints.
 - As granite became exposed on the surface during the Ice Age, erosion and mass movement (The downhill movement of material under the influence of gravity), removed the broken-up granite, leaving behind the largely unweathered jointed granite to form a tor.

Chalk and Clay Landscapes

- Chalk is generally a tough rock, although not as strong as granite.
- It does form upland areas.
- Partly because chalk is a permeable rock, means that it does not support rivers.
 - Permeable because it contains lots of joints and pores.
 - Rainwater passes through until it reaches the water table. When the water table reaches the ground surface, springs are formed.

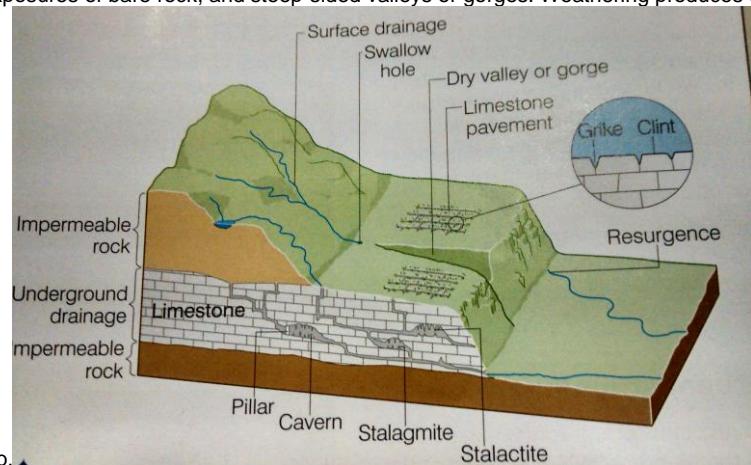


- Clay normally forms low, flat ground called vales.

Carboniferous Limestone Landscapes

- Tough and resistant rock
- Forms upland areas in the UK.
- When exposed at the coast, it forms dramatic towering cliffs.
- Chemically weak, composed Calcium Carbonate, vulnerable to carbonation.
- Well jointed, with horizontal joints called bedding planes between the layers of limestone
- Also mean that limestone is a permeable rock.

- Tends to form high ground, often with exposures of bare rock, and steep-sided valleys or gorges. Weathering produces thin soils that



support grass, used for grazing by sheep.

- Bare rocky surfaces called limestone pavements are common features
 - Blocks called clints and grikes.
 - There are lots of underground features
 - Weathering and erosion creates a number of underground features.
 - As water flows through the joints, weathering and erosion enlarge the joints to create tunnels and caverns.
 - When water, rich in CaCO₃, drips from the roof, over millions of years, forms Stalactites
 - In addition Stalagmites (up from a cavern floor) are formed. Sometimes the two features join to form a pillar. Sometimes curtains can be formed instead of single stalagmites or stalactites

USES OF ROCKS

QUARRYING

- *Limestone Quarrying in the Peak District*

- Limestone has many uses,
 - Building Stone
 - Cement
 - Lime for use in farming
 - Construction industry

Hope Quarry

- One of the largest limestone quarries in the peak district
- On the outskirts of Castleton
 - In the Peak District National Park
- Supplies 2m tonnes of limestone to Hope Cement Works
 - Produces 1.3m Tonnes of Cement a year
- Employs 200 local people
- Local economy benefits a lot.
 - Locally employed people support nearby shops and services.
 - (MULTIPLIER EFFECT)

- Has enough materials for another 30-35 years of extraction

Many initiatives to reduce effects of quarry and cement works to the environment

- Landscaping and tree planting
- Efforts to reduce dust
- £20m to improve traffic
 - Use trains
- Old quarry areas used as wetland reserves
- Sewage pellets used as sustainable fuel.

Quarry Restoration

- Once resources are finished companies are expected to restore or improve on the original qualities of the area.
- Many uses for exhausted quarries
 - Restored to farmland
 - Create courses for motocross or mountain bikes
 - Lakes
 - Wildlife Resources.

Drayton Sands and Gravel

- Even before extraction started on the new site, restoration had begun.
- Hedgerows planted, avenue of oak trees created
- Site is waterlogged, and work being done, to improve lakes.
- Range of habitats being created.
- Site contoured
- small ponds
- Soil loosened, and stones removed.
- Divided into separate parcels of lands, some for pasture, some for woodlands
- Organisms introduced
- 20,000 trees and shrubs put in place
- Footpaths established

Other projects

Eden Project

- Giant Greenhouses, called biomes created. It became a scientific experiment and tourist attraction. Also used to create geothermal energy

Stoney Quarry

- Filled up with spring water, largest inland dive site in the UK.

Case study: Granite, Chalk, Clay and Carboniferous limestone				
Rock type	Resource for extraction	Farming	Water supply	Scenery
Granite	<p>Building stone used throughout Cornwall. Aberdeen is known as the 'city of granite'.</p> <p>Commonly used for kitchen surfaces.</p> <p>In the past, granite contained valuable veins of tin and other metals. Kaolin (china clay) – used in industry as a whitener – originated as granite.</p>	<p>Mainly extensive sheep farming on poor pastures and in harsh environmental conditions.</p> <p>This is because granite forms upland areas.</p>	<p>Impermeable rock. Several reservoirs have been constructed in steep valleys, such as the Burrator Reservoir which supplies Plymouth.</p>	<p>Bleak and windswept, granite forms wild and attractive moorland scenery.</p> <p>Attractive for outdoor activities especially walking, bird watching, mountain biking and climbing.</p> <p>Water sports (fishing, sailing) on the reservoirs.</p>
Chalk	<p>Quarried to be manufactured into cement.</p> <p>Source of lime for industry and farming, to neutralise acidic soils.</p>	<p>Reasonably fertile land used for sheep farming and some arable crops such as wheat and barley.</p>	<p>Important store of underground water (aquifers). Supplies large parts of the south-east of England including London.</p>	<p>Characterised by rolling hills. Popular with naturalists due to rich wildlife, particularly flowers and birds. Opportunities for walking and horse riding.</p>
Clay	Used in making bricks and for pottery.	<p>Fertile soils but with a tendency to become waterlogged. Mostly used as pasture for sheep and dairy cattle.</p>	<p>Impermeable rock. Some reservoirs have been constructed but flat land is not ideal.</p>	Featureless landscape is not especially attractive.
Carboniferous limestone	<p>Quarried to be manufactured into cement.</p> <p>Source of lime for industry and farming, to neutralise acidic soils.</p> <p>Used as a building stone and in dry-stone walls as field boundaries.</p> <p>Popular stone for gardens, which has led to some destruction of limestone pavements.</p>	<p>Generally thin, upland soils (most of the limestone dissolves when weathered) so mostly used for sheep.</p>	<p>Spring water flowing out of the limestone can be a source of water.</p>	<p>Attractive upland scenery is popular with tourists. A number of National Parks and Areas of Outstanding Natural Beauty are on limestone areas, e.g. Peak District and Yorkshire Dales.</p> <p>Many opportunities for walking, mountain biking, climbing and potholing.</p>

Ecology

- An ecosystem is a natural system that comprises plants (flora) and animals (fauna), and the natural environment in which she lives.
- Food Chain —> This shows the links between producers and consumers.
- Food Web —> This shows the connections between producers and consumers in a rather more detailed way.
- Nutrient Cycle —> The cycle of nutrients.
- Change can happen for many reasons, natural factors, or human induced change.

The distribution of global ecosystems.

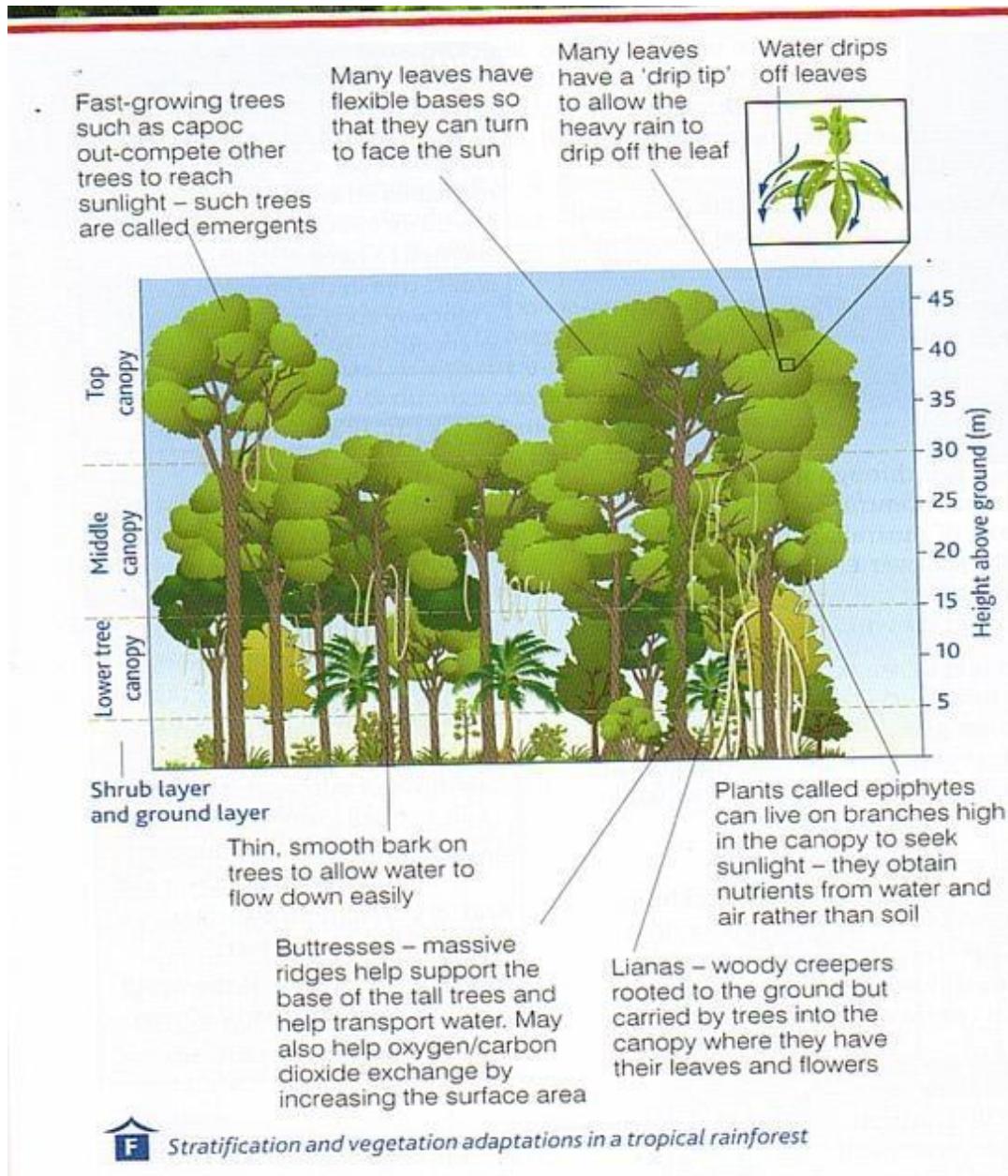
- Known as biomes. The dominant type of vegetation cover usually defines a biome.
- The biome of the UK is the Temperate Deciduous Forest, so naturally we would return to Deciduous Woodland if there are no land management techniques used.
 - Forests made up of broad-leaved trees such as oak that drop their leaves in the autumn.

TEMPERATE DECIDUOUS WOODLANDS

- Found across most of NW Europe, E North America and parts of East Asia. They occur in these regions as they are well suited to the moderate climate.
- Soils that develop under these climatic conditions tend to be rich and fertile.
- Weathering is active, meaning lots of nutrients.
- Main feature is that they shed their leaves in the autumn
- Typically broad leaved - great deal of potential of water loss through the stomata.
- Deciduous woodlands rich in diversity of vegetation and provide great range of habitats.
- Layered:
 - Canopy - Oak and Ash Trees
 - Sub-Canopy - Hazel
 - Herb Layer - Brambles, Bluebells, Wild Garlic, Ivy
 - Ground Layer - Moss
- Much of the year it is quite dark inside woodlands, so not ideal for flowering plants. Most flowering plants such as bluebells flowers in early spring, before the canopies have developed.

TROPICAL RAINFORESTS

- Found in broad belt through the tropics.
- Characterised by plentiful supply of rainfall (over 2,000mm a year) and high temperatures. Climate is perfect for plant growth
- Constant environmental conditions.
- Have extremely lush and dense vegetation. Trees are very tall, often up to 45m. Great variety of species, typically up to 100 in a single hectare.
- Have set stratification
- Majority of animals are found in the canopy.
- Support the most plant and animal species of any biome on the planet.
- Infertile soils. Most nutrients found on surface. Heavy rainfall carries away nutrients (leaching).



CASE STUDY - TEMPERATE DECIDUOUS WOODLAND - WYTHAM WOODS

- Near Oxford. Consists of 390ha of protected woodlands, on the River Thames
- 2 Limestone Hills
 - Rise about 100m above the river.
- 35% is ancient woodland
- 500 species of vascular plants, 1,000 species of moths and butterflies. 1/5 of British Fauna can be seen in Wytham.
- Run by University Forestry Department
- SSSI status
- Have 4 main aims
 - Minimise major disturbances to fauna
 - Allow regeneration of a range of native plants
 - Improve the range of age classes of trees
 - minimise adverse visual impacts
- 20,000 visitors a year
- In recent years, large scale felling of trees.

- 10% limit on non-native canopy cover.
- Issues with large mammals, that exist. Not many, as the area is too small. Deer browsing is a problem.
 - Therefore deer fence created
 - They tried 3 strategies to reduce deer numbers
 - reduce deer numbers overall
 - internal fencing
 - manage habitats to alleviate pressures on the more sensitive areas.
 - **Problems**
 - Diseases
 - Climate Change
 - Drought
 - Acid Rain
 - Grazing

DEFORESTATION IN MALAYSIA

- Malaysia is made of Peninsular Malaysia and Eastern Malaysia which is part of the island of Borneo.
- Natural Vegetation is Tropical Rainforest
- 60% of Malaysia is forested and commercial tree crops, rubber and palm oil occupy 13%.
- 18% of Malaysia's forest is virgin forest
- Support over 5,500 species of flowering plants, 2,600 species of tree, 1000 species of butterflies. Of 203 species of mammals, 78% live in forests.
- Deforestation happening faster than in any other tropical country in the world, increasing 85% per annum

THREATS TO MALAYSIA'S RAINFORESTS

Logging

- Clear Felling is very common.
- Legally selective felling is allowed
- However, illegal felling is widespread
- As well as reducing biodiversity, it threatens indigenous groups.

Energy

- \$2bn Bakun Dam in Sarawak results in the flooding of thousands of hectares of land in order to supply hydroelectric power to industrialised Peninsular Malaysia.
- 230km² of virgin rainforest cut down for the project
- 10,000 indigenous people forced out of homes.

Mining

- Mining widespread
 - Tin
 - Smelting
- Areas of forest cleared for mining and construction of roads.
- Drilling for oil and gas has started in Borneo.

Commercial Plantations

- Palm Oil and Rubber
- Malaysia the world's largest exporter of Palm Oil

Resettlement

- Urban Dwellers used to be encouraged to move into countryside and forests, transmigration, and this harmed the forest incredibly, with areas having to be felled.

Fire

SUSTAINABLE RAINFOREST MANAGEMENT IN MALAYSIA

- National Forest Policy
- Permanent Forest Estates and National Parks
- Forest Stewardship Council
- Developing Tourism
- Recent Worldwide Initiatives
 - Debt Relief

- Carbon Sinks
- Forest products - incentivise the research of medicinal properties of materials inside the TRF
- Biodiversity bribes
- International tourism promotion

Deserts

- Areas that receive less than 250mm of rain every year
- Aridity defines the habitats that the desert provides.
- Can be erg or reg – depending on whether the landscape is mainly rocky or that of a stereotypical desert with sand dunes etc.
- Found at about 30N and 30S – in dry continental interiors
- Soils tend to be sandy and stony – little organic matter due to lack of vegetation – not at all fertile

SONORAN DESERT

- Located in South West USA
- 300mm rainfall per year in some places
- Mainly reg – stony
- Very affluent
- Mainly used for tourism and Retirement Mitigation
 - Though there is some Durum Wheat production
- Marana is a town in the Sonoran Desert which has benefited from economic opportunities
 - Used to have lots of mining.
 - Farming (and mining) have declined however, moving towards more and more housing developments and tourism.
 - Hosts the PGA match play Championship since 2007
 - Affluence allows USA to deal with problems differently to India in the Thar Desert
 - Air conditioning
 - Easy piping of water for irrigation
- Managing the Sonoran Desert
 - Mapping of the area to find both natural and cultural information
 - Development of buffer zones around areas of ecological importance
 - Endangered species of Pygmy Owl was becoming very vulnerable
 - Native plant protection
 - Hillside development
 - Home design recommendations to conserve energy and water
 - Excess water was being consumed – very fast and being very expensive for authorities.
 - Also, this was wasting energy which, generally was produced by polluting the environment, burning fossil fuels.

THAR DESERT

- Located in Rajasthan
- 200,000 sq km
- Temperatures can reach 53C in July
- Very infertile soils and no surface water
- Mainly erg
- Opportunities
 - Subsistence Farming
 - Climate poses great challenges – little rainfall and frequent droughts.
 - Mainly pastoral which requires fewer resources.
 - Kohlis tribe – hunter gatherers
 - Commercial Farming
 - Increased since the production of the Indira Gandhi Canal
 - Constructed in 1958 – 650km long
 - Allows for irrigation for large areas which can now produce excess produce for sale
 - Also has lots of water than is used for drinking water for vast numbers of people
 - Mining
 - Rajasthan is very rich in minerals:
 - Gypsum – used for making plaster for construction
 - Feldspar – used to make ceramics
 - Phospherite – Used for making fertilizer
 - Kaolin – Whitener in paper production
 - Also lots of stones which can be extracted such as Limestone which can be used in industry.
 - Tourism
 - Beautiful landscapes with lots of possible walking has led to the Thar becoming a large tourist attraction

- Desert Safaris on Camels especially have been attractive to people
- Gives jobs and income directly to locals – Multiplier effect also increases the impact of the tourism.
- FUTURE CHALLENGES
 - Population Increases
 - At the moment: 83/sqkm
 - Water management
 - Excessive irrigation has led to salination which means that plants can no longer grow
 - Soil Erosion due to overcultivation
 - Fuel – reserves of firewood are dwindling
- Mass Tourism
 - SUSTAINABLE MANAGEMENT
 - 1977 – Government funded Desert Development Program
 - Promotion of useful plants such as Prosopis cineraria
 - Ber tree
 - Used for:
 - Firewood
 - Fruit
 - Foliage provides habitats for animals
 - Crops appreciate the shade
 - Building materials

Ice on Land

Changes in Temperatures

- Holocene Period
 - We are currently in the Holocene Period – a generally warm period with mainly interglacials
- Pleistocene Period
 - The period before the Holocene.
 - Period of 2 million years with large fluctuations in temperatures between glacial period and interglacials.
 - Evidence from Ice Cores indicate there were about 20 glacial advances
 - Maximum extent of glaciers reached 18,000 years ago – covering:
 - Severn Estuary
 - Scandinavia and North Europe
 - Canada
 - There are two ice sheets
 - Greenland – 1.7 mn sqkm
 - Antarctica – 14 mn sqkm
 - Ice caps are small bodies of ice with an area less than half a square kilometre

Movement of Glaciers

- Inputs - Accumulation
- Snow and avalanches
 - Snow reduces as the temperature increases - while avalanches increase when the temperature is higher
 - However, since snow is a greater input – generally when the temperature increases the glacier recedes
 - Snow falls and becomes compacted as more snow settles on top, expelling air and compressing individual flakes into granular ice crystals.
 - Ice becomes denser and eventually turns into clear glacier ice.
- Outputs – Ablation
 - Calving
 - Removal of chunks of ice.
 - Melting
 - Ice melts as the temperature is higher at the snout than at the head.
 - Can also occur on the top layer of the ice in the summer.
 - Evaporation and Sublimation
- Seasonal changes in Glacial Budget
 - In the winter, there will be a lot of accumulation and less ablation => meaning the glacier advances. In South Cascade Glacier – 2.5m
 - In the summer, there will be more ablation than accumulation => meaning the glacier retreats. In South Cascade Glacier – -4m

SOUTH CASCADE GLACIER – WASHINGTON STATE, USA

- One of three benchmark glaciers that have been monitored by the United States Geological Survey (USGS) for over 40 years. Data has been collected on stream run-off, air temperature, and mass balance. (glacial budget)
- Changes in Glacial Budget
 - All three glaciers have retreated – possibly due to global warming
 - Dropping by around 2m per year today – was dropping at around 0.5m in 1980

GLACIAL PROCESSES

Freeze Thaw Weathering

- Freeze Thaw weathering occurs on the sides of the valleys, leading to a breakdown of the rock producing piles of scree – for details about the process, see (or click) 33

Glacial Erosion

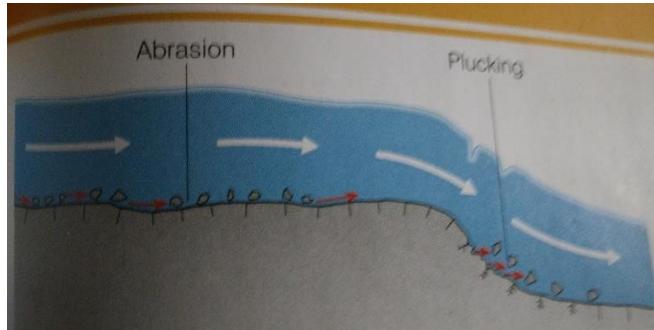
- The scree produced during Freeze Thaw weathering is vital for erosion
- They work their way under the ice enabling the ice to grind away at the valley sides and floor.
- The scree fragments themselves become shattered and pulverized by the ice, turning it into tiny pieces, making the glacial river appear milky.

Abrasion

- Sandpaper effect caused by the weight of the ice scouring the valley floor and sides using the angular scree.
- The abrasion leads to the smoothing of both surfaces.
- Large fragments of rocks can lead to large scratches known as striations

Plucking

- Meltwater between the glacier and the floor freezes bonding the two surfaces. Upon movement, this join is tensed and breaks, bring fragments of rock away with it, leaving a jagged rocky surface.



- **Glacial Movement**

- Basal Slip
- The ice melts leading to meltwater forming, which lubricates the movement of the glacier, enabling it to move downhill easily.
- Rotational Slip
- This is when basal slip occurs high up in the valley, when the movement is more curved.
- Internal Deformation
- Weight of the ice frozen to the rocky surface, leads to the deformation of individual ice crystal forming a plastic like structure, allowing the glacier to slowly move downhill

- **Glacial Transportation**

- Rock fragments resulting from weathering and erosion are transported by the glacier, which acts as a conveyor belt. The sediment, called moraine can be transported on the ice, in the ice or below the ice.

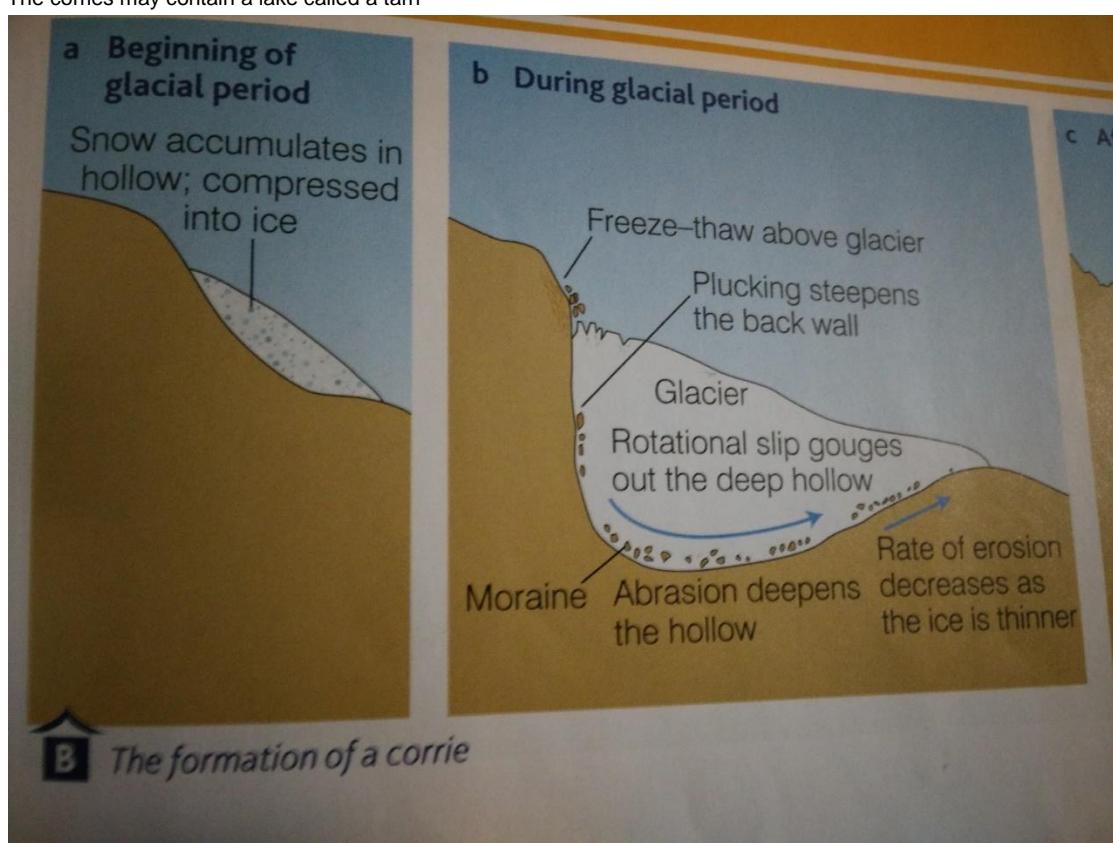
- **Deposition**

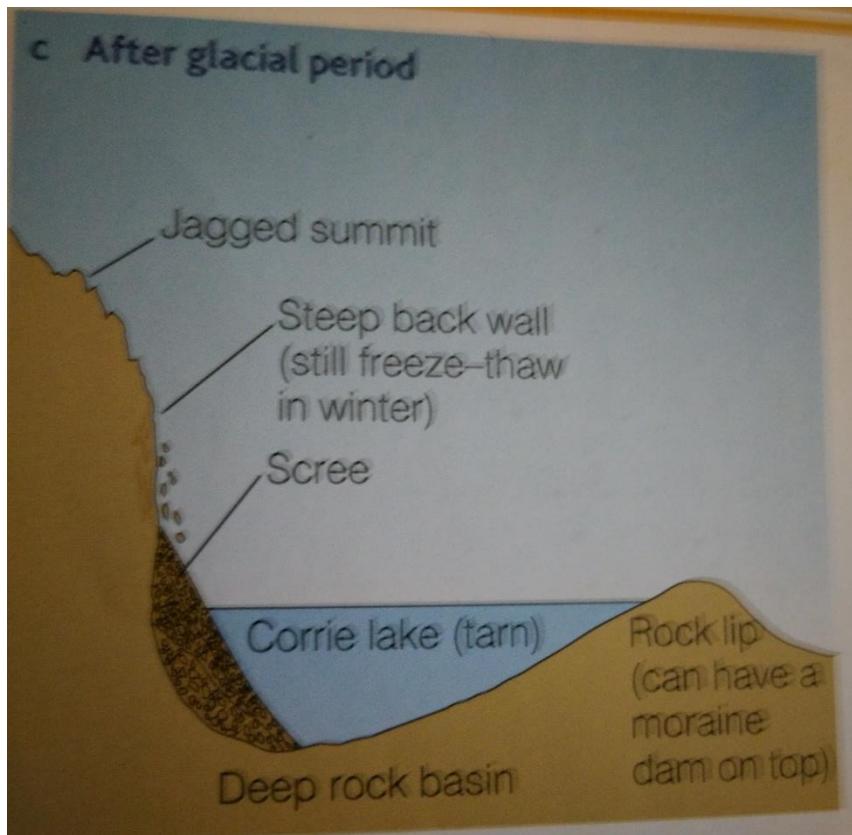
- Most deposition occurs when the ice melts, leaving the rock at the end of the snout of the glacier.
- Renewed forward movement of the glacier pushes the debris further up hill – **BULLDOZING**
- As the glacier retreats it leaves behind a sheet of broken rock fragments and pulverized rock flour. Although some of this may form **hummocks**, most is washed away by rivers.

GLACIAL LANDFORMS

Corries

- Corries are large, hollowed-out depressions found on the upper slopes of glaciated valleys.
- They are characterized by having a steep back wall and a raised lip at the front
- The corries may contain a lake called a tarn





• **Aretes and Pyramidal Peaks**

- Aretes are knife-edged ridges found at the back of a corrie or separating two glaciated valleys.
- They are often narrow features and, although popular with hill walkers, strong crosswinds can make walking along them hazardous.
- Pyramidal peaks form when three or more corries have formed on a mountain, formed by erosion.



• **Drumlins**

- Drumlins are smooth, egg-shaped hills, commonly about 10m in height and up to a few hundred metres in length, often occurring in clusters.
- They are made of moraine material.
- They tend to have a blunt end which faces up valley, and a more pointed end, facing down-valley.

Glacial Valley Landforms

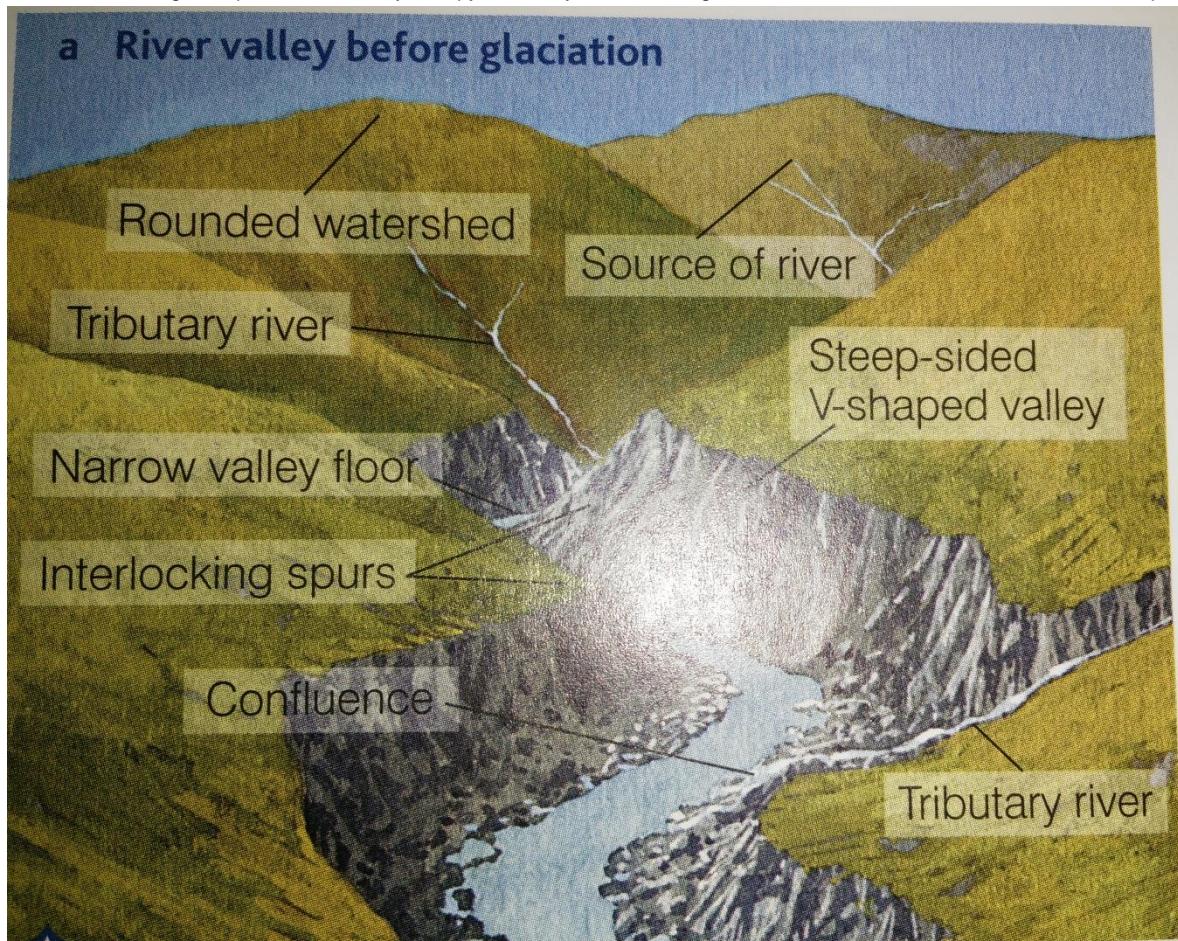
Glacial Troughs

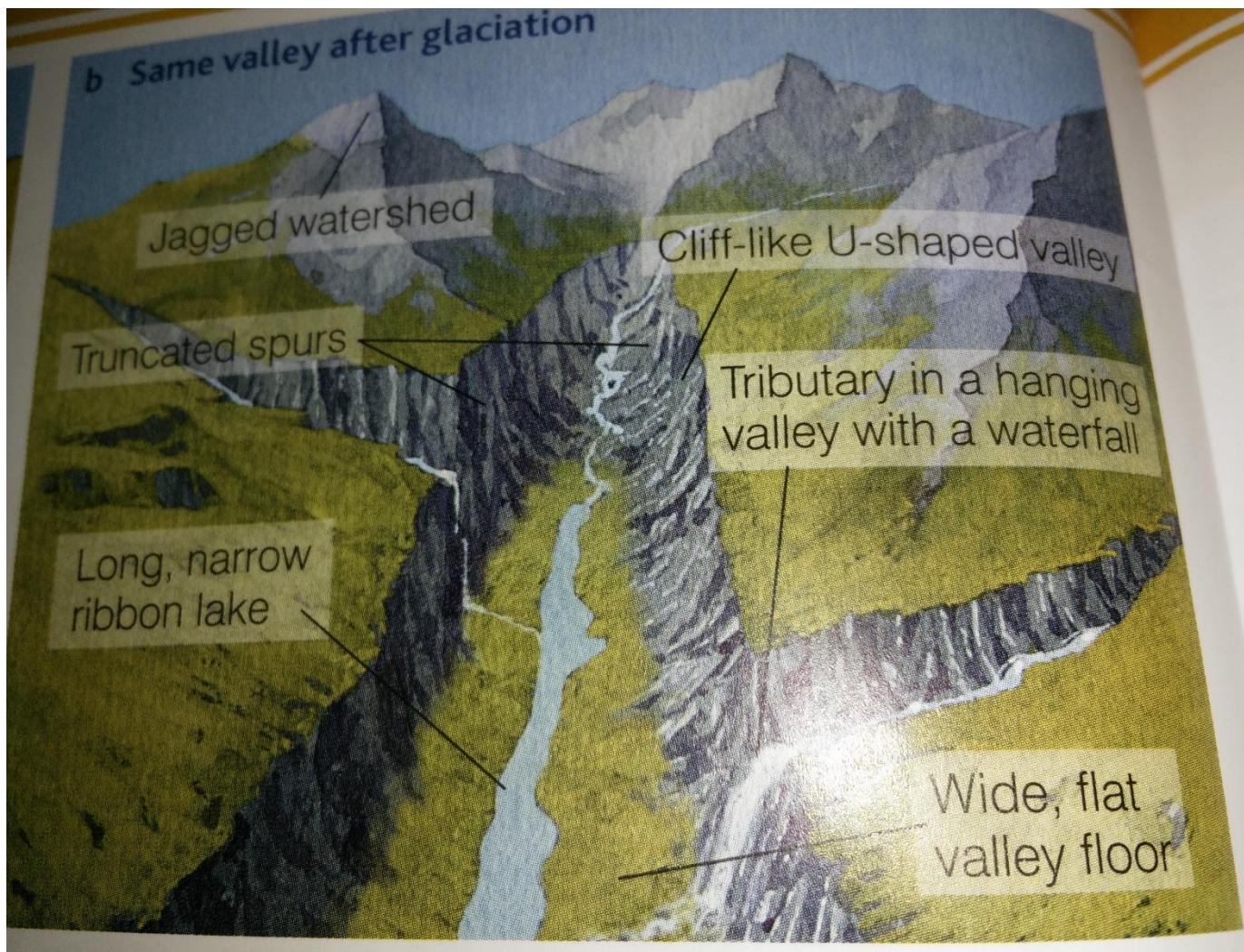
- Steep-sided, wide and relatively flat-bottomed valleys

- Mainly caused by abrasion – the moving glacier grinds into the base and sides of the valley
- Unable to pass through the interlocking spurs, the glacier simply cuts through them, forming **TRUNCATED SPURS**.
- Former tributary valleys, occupied with small glaciers, unable to erode down the same level as the main glacier, are left perched up on the valley side as **HANGING VALLEYS**.

Ribbon Lakes

- At the end of the glacial period, water may occupy the valley to form a long, narrow lake, often several tens of metres deep.





MORaine

- Moraine is the general term given to the largely angular rock material transported and then deposited by the ice.

Ground Moraine

- Material that was dragged underneath the glacier which is simply left behind when the ice melts

Lateral Moraine

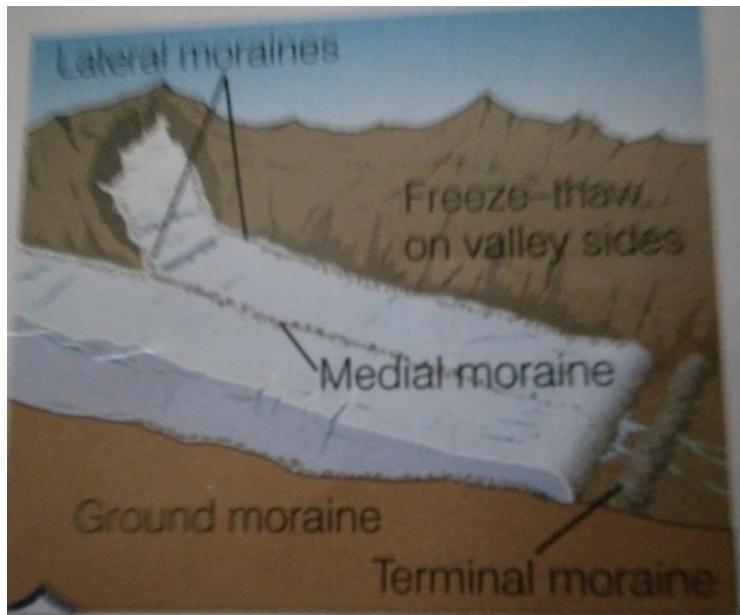
- Forms at the edge of the glacier. It is mostly scree that has fallen off the valley sides following freeze-thaw weathering. When the ice melts, it forms a slight ridge on the valley side.

Medial Moraine

- When the tributary glacier joins the main glacier, two lateral moraines merge to produce a single line of sediment that runs down the centre of the main glacier

Terminal Moraine

- Huge amounts of material pile up at the snout of a glacier to form a high ridge.



CHAMONIX

Attractions – Winter

- Skiing
- Snowboarding
- Train through the glacier – Mer de Glace
- Cross-country skiing
- Museums
- Shops
- Historical Buildings

Attractions – Summer

- 350km of marked hiking
- 40km of mountain bike tracks
- Ice cave
- Mountaineering
- Rock climbing
- Paragliding
- Rafting
- Canyoning
- Pony trekking
- Summer luging

Impacts of Tourism

Benefits

- Economic Benefits – Multiplier Effect
- Employment
- Services
- Taxes
- Bring new amenities which locals can enjoy
- Chamonix is well maintained and safe to ensure tourists are welcome – but this also benefits the locals

Problems

- Noise
- Congestion
- Traffic
- Air pollution
- Footpath erosion
- Money goes mainly to 3rd parties and not to the locals.
- Conflicts
 - Tourists vs Locals
 - Farmers vs Walkers

Managing Tourism in Chamonix

- Promotion of Responsible Tourism

- Clean Energy Buses and Free Public Transport
- Espace Mont Blanc
 - Cooperation between France, Italy and Switzerland on issues of international transport, nature conservation, forests and water resources
- Tomorrow Valley – Bottom Up initiative
 - Bury wiring underground
- Renovating and preserving historic buildings and monuments
- Preserving natural wetlands and peat bogs
- Minimising impact on the environment by planting building and using local building materials
- Maintaining and way-marking footpaths and cleaning rivers – this provides seasonal employment for local people
- Supporting local traditional employment sectors, particularly farming

Impacts of Climate Change

Responses

- Tourists transported to higher up resorts – Austria new ski lifts and cable cars are being constructed to open up the Gepatsch Glaciers to skiers above 3,500m
- Artificial snow using snow cannons
- Resorts reinvent themselves – promoting themselves as summer resorts – with walking, cycling etc
- New ski lifts

ABONDANCE

- Low resort
- Closed in 2007 after 15 years of unreliable snowfall
- Considered two options
- Promoting other winter sports – such as ski-touring, snowshoeing, and snow-mobiling
- To develop summer programme of activities including hiking, water sports and mountain biking

Harming the natural environment

- Road construction and building of ski lifts, houses, and hotels
- Deforestation
- Overuse of slopes for skiing
- Increased levels of pollution lead to a destruction of the picturesque nature of the area.

AVALANCHES

WHAT ARE AVALANCHES

- Masses of snow, ice and rocks that move downhill at speeds of up to 300kmph, occurring naturally in mountain environments and only pose a threat when they impact on people or human activity
- Come in two different types – point avalanche and slab avalanche
- Slab avalanches are where snow is released from a horizontal line
- They are far more deadly
- Point release avalanches occur when the snow is released from a single point of weakness in the snow, causing significantly less damage

Causes

1. Heavy Snowfall
2. Steep slopes
3. Deforestation
4. Temperature fluctuation
5. Heavy rainfall
6. Human factors

Hazards

- Europe, 2006 and 2009
 - 2006
 - 49 people died in off-piste avalanches
 - Due to irregular weather patterns
 - 2009
 - 20 people died
 - Due to heavy snow
- Salang, Afghanistan, 2010
 - Due to a freak snowstorm
 - Led to a series of 36 avalanches
 - Killed 170 people
 - Trapped 2,000 travellers
 - Buried 3.5km of road

Management Techniques

