

Resource Reliance:

The Situation in Tanzania:

Eastern Coast of Africa, 800 kms coastline, 58.5 million population. Labour force in Agriculture – **67%**.

The average salary in Tanzania is very low (43.5% lived off of <\$1.25 in 2012, but over time it has likely improved), and because Tanzania is highly vulnerable to climate change, there is a drought and/or a flood in some parts of the country, and farmers cannot develop as they are subsistence farmers (farmers who cultivate the bare minimum for their needs only) and have a very low income, so aren't able to develop their farm, and as a result of low salary and climate change destroying people's farms, food insecurity is more likely in rural areas. <10% of Tanzanians hold legal ownership of their land, and land ownership is often contested, making developing a plot of land quite difficult.

Mortality dropped by 12 % from 18 to 6. GHI score – 42% (medium alarming) - 28.6% (medium serious)

Goat Aid, Tanzania (small-scale attempt to achieve local food security):

Farm Africa imported Toggenburg goats to Tanzania, as they can produce up to 3 litres of milk a day. Each goat cost £400, but they were given to small groups of villagers who were 'on credit' for free, but they had to pay for the costs later.

Farmers who were involved in the charity earned up to 3 times more than those who weren't, which gives them a financial boost to grow in other area such as farming, and they can sell goats to other communities once they've been bred. 25% of the money earned by people from the goats was spent on their children's education, which would benefit them in the long term as the child would be more likely to get a job later which would also further help improve food security in the family.

However, goats can be quite expensive to deal with if they are sick , as veterinary bills can be quite expensive, and as it can be sudden and unexpected, morale could decrease. The goat also needs food, which decreases the total amount of food that the family gets, which is not healthy for them. However, overall it would be a good thing for them in the long term, as they would benefit from the profit they would get when the goat starts making milk, and the reduction in food that the family gets is also mainly in the beginning.

Canada Wheat Programme, Tanzania (past attempt to achieve food security at a national scale):

Canada committed \$544 million in Tanzania in 1970 to farm wheat. They sent machinery and equipment to Tanzania and helped develop seeds and taught Tanzanian farmers how to use them. They could pay off the money of the machinery when the farm was profitable (yield increased and area of production as well), and they could buy their own equipment.

It was fairly successful as in 9 years (1980 -89) they were able to produce over half the countries' yield in one area of the country without using any chemicals, so there was no damage to the environment. Road, rail and electricity conditions were also improved as a result, which offers a better quality of life to Tanzanians and is helpful in the long term. 121 Tanzanians received training in wheat production, which can then be passed down to generations to come so they can maintain it too.

However, it can also be viewed as a failure. Most Tanzanians don't have wheat in their diet, and getting them to shift to it and use it wasn't working as bread was still quite expensive, and people would be better off sticking to their current diet. Even though jobs were created, it was not much considering the \$544 million that Canada invested, and it would have been much better if there was more jobs. As only wheat was being grown, the soil became less fertile and biodiversity decreased as a result, and rain washed away the topsoil which affected the yield.

SAGCOT (Southern Agricultural Growth Corridor of Tanzania) (present attempt at achieving food security in Tanzania):

Started in 2010, 20-year project. Located in Southern Tanzania, in a strip of land called a growth corridor. This location was chosen because of a major river system and good conditions for growing crops compared to other parts of Tanzania, and because there are international highways and big cities which make it easier to export food produced.

Hub and out-grower model:

1. Government improves road and electricity conditions.
2. Big international commercial companies will then come
3. They can produce food in an intensive scale
4. They can then help local farmers – can connect to electricity and water supply
5. Can help with food security in the local areas, and can export the food which will help economy

In 2018, there were 34 full time employees and 2 established offices. Growth from 20 partners in 2011 to 115 in 2017.

Landscapes:

Dorset Coastline:

Chesil Beach: Formed by longshore drift (more swash, less backwash). Connects an island to Dorset coast.

Lulworth Cove: Formed by erosion and weathering of a crack formed at a headland on a concordant coastline. Over time becomes a cove, and if it reaches soft rock then it can push through and become even larger.

Swanage and Studland Bay: Formed by erosion and weathering of soft rock on a discordant coastline. Sheltered by headlands on either side of the bay.

Durdle Door: A crack forms on a headland on discordant coastline. Crack becomes larger to form a cave because of hydraulic action and abrasion. After some time, the reaches and erodes through to the other side of the headland, forming an arch.

Old Harry's Rocks: See Durdle Door. Next, due to weathering and biological weathering from plants roots and heavy rainfall, the top part of an arch collapses and a stack forms.

Stump (not in Dorset yet) is formed by the erosion of a stack e.g. Old Harry's Rocks.

Swanage Bay Management:

Swanage has been protected since the 1800's. Main line of protection is 1.84 kms of sea walls. They were placed in the 1880's then readDED in 1930's. Several reviews were conducted in the 90's to put in rock armor to improve stability and reduce slipperiness. In 2000, 18 new groynes and 90,000 meter cubed of sand using sand dune regeneration. All of this cost £2.2 million. Another 40,000 meter cubed of sand will be added in 2025.

River Clyde:

- Source: Lowther Hills
- Mouth: an estuary on the west coast of Scotland
- Length of river: 160km
- Waterfalls: 4 in total, highest being Corra Linn (27m)
- Meanders: Between Motherwell and Glasgow
- Oxbow Lakes: Forming near the village of Uddington
- Flood plain: Glasgow is built on the flood plain of the River Clyde, 5m higher than the river on both banks
- 259 billion litres of water can be stored when combined with flood storage and hydrobrakes. Hydrobrakes: Limits flow of water downstream, can reduce the water flow by up to 45%.
- Pretty well protected by hard and soft engineering.

Global Hazards:

Drought, UK, 2012:

- 2/3 of England was in drought. Birmingham was in high risk of a drought, London, Norwich and some parts of the north were in drought.
- Economic effect: food prices went up.
- Social Effect: Farming going down, water shortages made it difficult to find water for crops and livestock.
- Environmental effects: Bewl Water Kent at 60% capacity. 72% of average rainfall received. Animals died. Wildfires, 17 acres in Suffolk were ablaze.
- Response to drought: Built massive pipes from reservoir to towns, 1/3 wasted – not very successful. Campaign to have 4 minute showers. Hose pipes ban, 1000 pound fine if anyone is caught using it, 20 million weren't allowed to use it. Switch off water when brushing your teeth, can save 6 litres of water per minute.

Cyclone Aila, India and Bangladesh, 2009:

Path of storm: Forming over Bay of Bengal, travels through Kolkata and finishes in Bangladesh just before Nepal.

Causes: Warm tropical water (26.5 degrees Celsius or higher), low pressure, 60m water depth, cold atmosphere. 5 and 20 degrees north or south of the equator. Bay of Bengal funnels storm into Bangladesh.

Primary Effects:

- 400,000 people were isolated.
- 1 million people had nothing to drink.
- 179 fatalities from flooding.
- Dozens of people reportedly missing.

Secondary Effects:

- Diseases spread
- Jobs taken away
- May 2010, 200,000 people lived in temporary shelters.
- Impossible to grow crops, too salty for anything

Short term responses: Donations by charities and organisations i.e. dry food from Oxfam and Christian Aid. Basic necessities distributed ASAP. There was an advanced warning of the storm, 35 stations got information, who passed it to volunteers who spread the information using flags and/or megaphones.

Long term responses: Water rationing card, better weather systems, better houses (more resilient to cyclones)

Nepal Earthquake, 2015:

7.8 magnitude earthquake

Effects:

- 500,000 homes destroyed
- 12,000 schools damaged
- 8,500 deaths
- 23,000 casualties
- 3 million homeless, over half were children
- 'Dharahara' UNESCO world heritage site crumbled to pieces.
- Monsoon rains meant that landslides became a major hazard, with over 3,000 recorded in the six weeks after the earthquake.

Immediate responses:

- Rescue from neighbouring countries
- "Cash-for-work projects" – aims to provide jobs and an income to survivors while simultaneously providing immediate relief to earthquake-stricken areas

Long term responses:

- Billions required to rebuild buildings
- \$415 million to fund necessary relief efforts for Nepal

Nepal suffered so much because architecture wasn't made to cope with earthquakes. All buildings destroyed.

Urban Futures:

Mexico City:

Location: Located in North America in Mexico, in the centre of Mexico.

Social:

- Mexico has approximately 835 illegal slums. Has the worlds largest slum with 4 million people.
- 5.5 million riders on a system designed to accommodate 4.5 million riders.
- Most congested city on the planet.
- Worst smog levels in Mexico City, problem intensified in winter (thermal inversion, air trapped, pollution stays on ground)

Environmental:

- 70% of city has fewer than 12 hours of running water per day

- Approx 200,000 cars registered in Mexico City each year
- Commuting time 59% longer than what it should be because of traffic.
- 40% of water in the system is lost through leaks.

Economic:

- Extreme poverty in slums
- 56% of workforce are in informal economy (insecure, limits to tax collection)

Ecobici:

Aims: Reduce pollution and decrease traffic in Mexico City. Provides users chance to enjoy exercise and socializing.

Socially sustainable because allows people to socialise with others, beneficial if they have long working hours.

Economically sustainable because it saves people money from having to run a car because of busy traffic, much faster to ride a bicycle than go by car.

Environmentally sustainable because it saves releasing high amounts of smoke into atmosphere. Less cars on road, less chance of accident.

- System included protected bike lanes and traffic lighting.
- Ecobici boasts 258 stations with 3680 bicycles, attracted 100,000 members who nearly take 10,000 trips daily, accumulating to over 11 million trips to date.

Leeds:

Location: Major city near West Yorkshire and lies at the heart of a conurbation, north of England.

Housing:

- Students live in 'studentified' area, cheaper housing divided into shared spaces, rented accommodation. Living near Hyde Park.
- High earners settle in wealthy areas such as Mosely Wood, Cookridge and Weetwood, gated communities, increase house prices.
- Low earners settle in crime areas like Holbeck and may even be homeless

Challenges:

Affordable housing – House prices are rising 17% in last 10 years

Unemployment – Higher unemployment than UK average

Air/Water Pollution – 700 die per year from air pollution (health problems)

Social inequality – Life expectancy differs from 10 years between different areas.

Student caused issues – Crime in student areas, seasonal jobs

Clarence Dock:

Used to be an area of coal mining, but it is not anymore. The closure of industrial buildings led to unemployment and led to emigration, the area was derelict.

Between 1996 and 2007, Clarence Dock was developed as a £250 million mixed-use development (with shops, businesses and housing). The area includes the Royal Armouries Museum – attracts 1.5 million people a year.

Social benefit: Provided affordable rental prices to attract young people who want to work and live
Improved lighting and environmental conditions makes people's homes feel safer
New pedestrian and cycle routes and shopping and recreation facilities

Economic benefit: Restoration of old buildings into museum is good for tourism, makes more money
Local employment in the Clarence Dock shops – might increase incomes
Multiplier effect – money earned from taxes here can be spent on other areas

Environmental benefit: Waterways and canals cleaned to encourage aquatic life to return
Landscape architects employed to design public areas with trees, paving and water features which improved environmental quality of life

Disadvantages:

- More tourists means more traffic and therefore more pollution– tourist litter
- More crime
- More homes being built means more people attracted to move in – people already living in the area may be forced out as prices for rent increase
- Divide between rich and poor

Random Facts:

- Get baked! 24/7
- Rich areas like Mosely Wood and Weetwood have 0.2% jobseekers
- Poor areas like Holbeck have 15% jobseekers.

UK in the 21st Century:

Leeds:

Ethnic diversity in Leeds: 64% European, 9% Sub Saharan African, 11% South Asian, 18% from other parts of the world.

Where are migrants moving to within Leeds? – Centre: A concentration of migrants from Europe as well as Indian, Spanish, Chinese and Nigerian nationals.

Inner-East: Concentration of European nationals where there is conflict or instability from where they came from.

Inner-South-West: Concentration of European nationals.

Outer-East: Concentration of European nationals based here for agricultural work.

Impacts of migration

- Grows the economy
- Can create diasporas/areas with a higher concentration of an ethnic group – culture differences
- More houses occupied, increases price of remaining homes
- More migrants means more pollution – more vehicles added to the road

Oxford

Located in central England, surrounded by the counties West and South Oxfordshire and Cherwell. Served well by road and rail – 40 miles from Heathrow and 50 miles from London. Significant economic hub to its region.

Key industries in Oxfordshire:

- Racing
- Academic – University of Oxford
- Medical research
- Astrological research

Oxfordshire has the city of Oxford, which has a long tradition as a centre for the UK motor industry – several Formula 1 companies have research and development facilities in the region.

The Oxfordshire high-tech companies bring a lot of prestige to the country, being some of the most highly respected and innovative companies in the world in biotechnology, medicine and motorsports.

UK's Political Role In The Somalia Conflict:

Located in the far east of Africa, and is sometimes called the 'Horn of Africa' due to its shape.

Where and why is the conflict happening? – Happening in the north of Somalia between Somaliland and Puntland. In 1991, the President was overthrown and the country was thrown into chaos – for 2 decades no government.

UK has 85 military personnel in Somalia, and they are training the Somali National Army. They are building training grounds the size of 6 football fields. Teaching basic water education.

The UK is part of the UN, and troops were sent in to monitor, with a ceasefire in 1992. But in 1995, they withdrew, and left the warlords to fight on.

UK's Department for International Development is working with the Somali government to address shortages in food, employment and healthcare, with programmes like the Joint Health and Nutrition Programme aiming to save thousands of lives. Estimated £500 million cost (2012-2017)

2013 – UK government sends in troops to combat against human rights abuses. Additional £50 million pledged to build up anti-piracy naval force and to refurbish Mogadishu (capital of Somalia's) central prison.

500,000 refugees taken into the UK.

Several UK charities work in Somalia to help reduce poverty.

What has been the impacts of the conflict? – Estimated 500,000 people died as a result of the famines of 1992 and 2010-12; tens of thousands fled to Kenya and Ethiopia in search of food. 1.1 million have been displaced.

The contribution of Indian, Bangladeshi and Pakistani groups to the culture of the UK:

- Brick Lane (East London): Lots of Indian, Bangladeshi and Pakistani restaurants – lots of tourists
- Balti triangle (Birmingham): Lots of Indian, Bangladeshi and Pakistani food. Only has 4 Balti restaurants remaining out of 50 previously. Balti triangle serves up to 20,000 meals a day

Dynamic Development:

Myanmar:

- Most people are between 20-24 years of age. Suggests high death rate – healthcare is an issue, only 2.3% of GDP spent on healthcare.
- Imbalance between imports and exports, more money gained from imports than exports
- 19.4% of population are without clean water
- 48% of population are without access to electricity
- High infant mortality rate 42.2 per 1000
- 0.57 physicians per 1000, cannot access doctors

1948 – Burma (Myanmar) gained independence – declined to become part of the Commonwealth, could get good international links and trade which could lead to more development.

1974 – Militant government

1989 – US suspends trade benefits for poorer countries for human rights abuses, Not lifted until 2016

2007 – Saffron revolution following increase in petrol + diesel prices. Government cracks down harshly and many Buddhist monks leading the revolution are killed. International condemnation and economic sanctions follow.

2008 – Cyclone Nargis: Killed at least 138,000 people, with \$10 billion in damage.

2015 – First non-military government

Rostow's Model – Myanmar between stage 2 and stage 3. Stage 2 because most of its workforce is in still in primary employment (70%) and there are a number of different TNCs operating in Myanmar – shows manufacturing, trade and exports are taking place, suggesting it is in stage 2 (pre-takeoff). However, percentage of access to mobile phones is quite high at 85% in 2016, and electricity consumption is quite high – people have access to internet and wider world, encouraging more international investment + multiplier effect, showing Myanmar in stage 3 (takeoff) in Rostow's model.

Millennium Development Goals (MDG): Most important is education -> Good education leads to more long term development because of better government, services and infrastructure in the future. Better education means better understanding on public health and preventable diseases, so longer lifespan in the future.

Myanmar has somewhat met its goals for most, except reducing preventable diseases like HIV, where instead it has increased, and improving environmental sustainability – CO2 decreased but not by much + forest area decreased by 10%

Trade – Military/junta control Kachin State – has most valuable Jade deposits on the planet. They are mining the jade, and have generated \$126bn in the last decade alone. Most of the exports are going to Thailand and China, however the money generated is not going to Myanmar, but instead staying with the rich, so not helping Myanmar's development.

Extra Facts:

1. 3.6% of all exports are petroleum gas (US\$4.4bn in value)
2. 20% of natural gas produced is being sold to Thailand and China through gas pipelines
3. Rice is produced in 60% of cultivated land and a big export

TNC – Coca Cola/Swan Yi Program (started in Myanmar in 2012) has given 25,000 women a 3 year education in financial literacy, entrepreneurship and management to start their own business. Money from Coca Cola bottling factories are owned locally so most of the income will stay in the

country, improving infrastructure in the area. Invested \$200m and employ 1343 people directly (only 17 non-residents), hope to fuel job creation of 22,000 across the whole chain over 5 years. Coca Cola WASH (Water and Sanitation for Health) – 3 local villages are having their water and sanitation access improved.

Generally, TNCs bring wealth/foreign currency to local economies when they buy local resources, products and services – providing resources for education, health and infrastructure.

Tax income from employees to country – aids development.

Aid and Debt: 60% of Myanmar's population are at risk of malaria.

Christian Aid – 88% of target households now own at least one insecticide treated net – 29,500 nets.

Malaria deaths fell from 3.5 per 1000 in 2010 to 2.4 per 1000 in 2013.

Largest advantage of aid: Potential long term-development it can bring because of the money being invested into services like healthcare and education. Not only the short term benefit of money being invested, but if it is invested in the right places, like education, the children will earn even more in the future, which will also contribute to the economy as more money can be collected through taxes. Largest disadvantage of aid: A country could become reliant on it or even corrupt. E.g. if a country receives aid, the government may not use it effectively, and they may become reliant on it.

Corruption can also hinder development, as if a government official takes the money for themselves instead of using it for the country, the country will not develop at all.

Top-down development strategy – Sembcorp Myingyan Gas IPP (Independent Power Plant).

Supported by Asian Development Bank and other banks. Plant one of the largest, most efficient and minimal greenhouse gas emissions in Myanmar.

Generates around 1,500 gigawatt hours of electricity per year, helps to meet needs of around 5.3 million people. Creates employment + international recognition for company.

Less sustainable as gas powered + IPP owned for 25 years before given to government from company – potentially earn less money. Lots of money goes to company, money leaking from Myanmar's economy.

More power generated > Better access to electricity > People can set up local businesses > Better access to internet > Can start to research different skills > Jobs diversified and economy more stable.

Bottom-up development – The Australian Embassy in Yangon provided USD\$10,000 for garden towers. Designed to strengthen food security and raise 600 household incomes in Myanmar's impoverished 'dry zone' in the arid centre of the country. Farmers have used lots of money on fertilisers, and they haven't worked. The 150L plastic barrel with holes on its sides to allow the planting of crops, utilizes an integrated compost system to fertilise the plants.

Drives development because they occupy little space and have improved the livelihood of landless farmers, the elderly and people with disability, as it allows them to work and produce crops as they could not before. Towers are also being provided to schools – children educated in the fundamentals of farming, which aids development in the future. Use 90% less water than a normal crop and produces lots of crop, kitchen waste added in at the top so it is cheap and sustainable.

More people being able to work means they can be self-sufficient, or even sell crop, which they can use to improve living conditions, and they can grow a business and teach skills to others which will help them, so it will constantly grow and help lives.

Sustaining Ecosystems:

Ecuador – Sustainable Management of the Rainforest:

Sustainable management: The use of land that meets the needs of the current population without compromising the needs of the future generations.
Remember 'sustainable' is not just the environment, it is social and economical too.

Limoncocha Park (example of ecotourism):

Ramsa site: Ramsa treaty protects and conserves internationally important areas across the world.
Located on the edge of the Amazon rainforest in Ecuador.
Lots of biodiversity in the area, with more than 420 bird species.
4603 hectares.
Limit development, more biodiversity.
They run courses and training to help locals develop skills in tourism.
10,000 tourists attracted per year.

Yachana Lodge (example of ecotourism):

Tourist destination above River Napo in the rainforest.
Small-scale development – minimises environmental damage.
14 cabins made from local sustainable sourced trees for 30 people.
Doesn't stand out in the environment.
Electricity generated from solar power.
Showers and toilets use rainwater.

- Tourists can only access a small part of the rainforest, leaving the rest undisturbed – helps preserve biodiversity.
- Fish comes from small-scale local farmers and producers – impact on local economy.

Forestry Stewardship Council – certifies certain hardwoods that have been sustainably sourced, encouraging consumers to only buy these types to reduce illegal logging. Helps protect the rainforest, and encourages people to buy other types of wood instead of just the tropical forest hardwood – helps in the replanting of trees.

Selective logging: When logging is planned before and the direction they fall as to not affect too many other trees. Trees are then replanted and what trees have fallen are checked. Important to monitor and preserve the rainforest as much as possible.

Antarctica:

Antarctica is divided into 2 main areas and ice sheets; east and west along the Transatlantic mountains. These stretch 3,500km across the continent.
Antarctic or Polar Plateau – large area of East Antarctica which has a diameter of about 1000km.
Average elevation of about 3,000 meters.
Temperature highest in January and December months. Precipitation consistently around 2mm per month.
Example of fauna: fish, penguins and killer whales.
Example of flora: Antarctic hair grass or pearlwort.

The Arctic:

The Arctic is basically ocean, surrounded by land belonging to 8 nations that form the Arctic Council. Much of the land is permafrost (permanently frozen ground), making crop/plant growth impossible for most of the year. In the summer, the top few centimeters thaw, enabling growth of small, low plants like Arctic Willow.

Temperature highest in the middle of the year in July. Precipitation follows similar trend – highest in the middle of the year at around 50mm per month, reducing at the end of the year.

- In Antarctica, some vegetation can grow in some parts of the year, whereas in the Arctic no vegetation can grow.
- The Arctic is mostly an ocean with more sea ice, however Antarctica is mainly land mass.
- Antarctica is much colder than the Arctic as it has an altitude of 3000m (has no permanent residents), whereas the Arctic is warmer.

The Inuits are a group of people inhabiting the Arctic regions of Canada, Denmark, Russia and US (Alaska). Inuit means 'the people' in the Inuktituk language.

Their houses are built on stilts to avoid floods as ice melts in summer and avoid being too close to the soil to melt the permafrost earlier – if it did melt their houses would collapse.

They feed their sled dogs walrus meat as it is fatty and releases energy over a long period of time.

Interdependence: The Arctic climate is different in the winter, where there are very harsh, cold conditions, and in the summer, where temperatures increase, although very mild. Climate impacts soil as in winter, the soil freezes to become permafrost, and in the summer, an active layer can form where small plants can grow. Climate also impacts ice cover as in the winter, it can increase, and decrease in the summer. This impacts animals as more ice means more land to live in, and prey could be harder for predators to find. This impacts people as larger ice cover means more animals can survive, meaning more food to eat.

Small-scale example of sustainable management: Clyde/Ninginganiq River Wildlife Sanctuary:

A marine wildlife sanctuary is a special area that protects the ecosystem and its wildlife in a body of water.

Located on Clyde River (renamed to Ninginganiq) on the coast of Baffin Island in northern Canada, became the country's first marine wildlife area. It extends 12 nautical miles from the coast and covers 3360km².

Set up in 2008, with a community of around 1000 Inuit, and has 2 deep ocean troughs that are rich in zooplankton.

It is now a sanctuary for the conservation of Bowhead whales, and up to 2000 bowhead whales stop on the northern coast of Canada annually.

It also benefits other whales, polar bears, seals, fish, geese and ducks.

External people need permits to access, reducing problems.

Some disadvantages:

Needed to International Whaling Commission to help it – wouldn't have been successful without it.

It is quite small, and only helps the whales during the migration period, which is not long.

Small-scale – only supports one of the 17 whale species, so lots of other whales are killed. Can be viewed as unsuccessful.

Global example of sustainable management: Arctic Council and Earth Summits:

Formed in 1996 with 8 nations and 6 indigenous communities in the Arctic.

Aims to: Protect the Arctic peoples (socially and economically).

Protect Arctic waters.
Protect Arctic biodiversity.

3 agreements to keep the region sustainable:

1. Members will work together on scientific research. (2017)
2. Members will work together to tackle oil spills and monitor water pollution in rivers and lakes. (2013)
3. Members agree to help monitor ships and transport through the region without conflict. (2011)

A disadvantage is that council has no legal powers to enforce the agreements as there is no international treaty.

Changing Climate:

Paris Agreement: Aimed to reduce impacts of climate change.

Evidence for climate change:

Sea ice positions: We can use satellite observation to look at the extent of sea ice each year. Very reliable, however records exist only since 1979.

Ice cores: Each year, a new layer of ice forms on top of the existing layer. We can analyse the gases in the ice cores to infer the temperature of the Earth, and we can do this up to 650,000 years ago.

Global temperature data: We can compare the temperature changes directly which is a factor of climate change. However, records only go back a few hundred years.

Paintings and diaries: We can see historical interpretations of the climate, however not that reliable as there are a lot of different interpretations.

Milankovitch Cycles:

- Eccentricity (orbit): Earth's orbit around the Sun can be elliptical or circular, meaning sometimes depending on the orbit, the Earth could receive more or less sunlight. It changes on a period of 100,000 years.
- Precession (wobble): As the Earth spins on its axis, it wobbles (caused by gravity from the Sun and moon), causing a change in severity of seasons. Changes on a period of 26,000 years.
- Obliquity (tilt): The angle of the Earth towards the Sun shifts from 21.5 to 24.5 degrees, meaning some areas get more sunlight. Changes on a period of 40,000 years.

Volcanic Eruptions:

- When they erupt, it releases huge amounts of ejecta (containing ash, sulfur dioxide, carbon dioxide and water vapour) which can have an impact on the environment.
- Short term cooling – this ejecta can block sunlight and result in cooling. Will stay in the atmosphere for a few weeks at most.
- Long term warming – Eruptions contain greenhouse gases, contributing to the greenhouse gas effect.

Sunspots:

They are large irregular spots that are cooler than the surrounding area – generally short lived.

- Low sunspot activity means more extreme weather, and lower temperatures due to less solar flares.
- High sunspot activity means more stable conditions, and warmer temperatures due to more solar flares.

Global impacts of climate change:

Asia:

- Sickness and death due to diarrheal diseases will increase due to changes in the hydrological cycle.
- Crop yields could increase up to 20% in Southeast Asia. Decrease up to 30% in central Asia.
- Glaciers are melting at the fastest rate ever documented, higher risk of flooding. Decreased freshwater availability.

Africa:

- By 2050, 350-600 million people will experience water stress.
- Climate variability will severely compromise crop yields.
- Ecosystem degradation, e.g. fish communities.

Europe:

- 35,000 died in summer heatwave of 2003 in Europe.
- Unprecedented 2003 France heat wave was devastating to wine production. France suffered roughly 1/3 of the resulting \$16bn in agricultural losses.
- Retreating glaciers, longer growing seasons, more species range shifts and heatwave related impacts have already been recorded.

UK:

Threats:

- Cairngorms ski resort may be forced to close due to no snow.
- Insurance costs will increase; by 2080 annual damages could reach £12bn.
- Sea defences like the Thames Barrier will need to be upgraded, which is expensive – could lead to less people visiting due to less natural beauty so less money generated.
- £120bn worth of infrastructure at risk from coastal flooding. £0% of the UK's population 10 miles from coast – many people displaced.

Opportunities:

- Increased yields of wheat, sugar, beet and potatoes – more money generated for farmers.
- Fewer deaths to cold.
- Opening of Arctic navigations due to ice melt, improving transport and trade with Asian countries – better international links.
- If agricultural productivity increases, there will be greater food security.
- Commercial crops can be grown further north – more money generated.