Population and the Environment

**Global Population:**

Environmental conditions mean populations are not evenly spread. *Distribution* is the pattern of the population (90% of China live near east coast). *Density* is population divided by size of area people per km2 (Bangladesh = 1200 per km2 whereas Libya = 4 per km2). Global population has risen rapidly from 1800 (1 billion) to 2017 (7.5 billion). Until 1950s population growth was in HICs, but now LICs' life expectancy has increased, and death rates decreased. Urban increasing faster than rural, so populations becoming less evenly distributed. *Exponential growth* means the population is rapidly growing at constant rate.

**Physical Factors Affecting Population:**

* Climate (sparse) - low annual rainfall, high humidity and artic temperatures.
* Climate (dense) - reliable rainfall, no extreme temperatures, lengthy growing season.
* Soils (sparse) - permafrost, leached/infertile, thin, overgrazed.
* Soils (dense) - rich humus, alluvial (floodplains).
* Resources (sparse) - lacking fuel/valuable minerals, restricted access to fresh water.
* Resources (dense) - concentrations of valuable minerals/fuel, availability of water.

**Food Production and Consumption:**

* Food production has increased due to technological advances ('Green Revolution' - pesticides, equipment, irrigation techniques etc).
* Global food production is *unevenly distributed.* East Asia and N. America produce more due to good climate and investments in farming. Central America and Africa produce less due to lack of resource, unsuitable land and climates.
* Global food consumption is also *unevenly distributed.* HICs consume a lot due to higher income, importing power and consumer culture (2600-3,800 kcal per day). LICs consume less as they can't afford as much.

**Agricultural Productivity and Systems:**

* Agricultural productivity – ratio of inputs (labour, capitol) to outputs (food produced).
* Commercial – growing crops/ rearing livestock to make a profit.
* Subsistence – just enough produced to feed farmer's family (common in Africa).
* Intensive – farm size is small compared to large amount of inputs (labour, capitol) required.
* Capitol-intensive – high inputs of money and low labour. May use fertilisers, pesticides, and labour-saving machinery.
* Labour-intensive – doesn’t involve much capital but a lot of labour.
* Extensive – farm size is large compared to inputs (e.g. small numbers of livestock grazing on large areas of land – less food but less impact on environment, better animal welfare).
* Agribusiness – large corporate organisations run farms for profit maximisation.

**Polar Climates:**

Tundra and icecap regions cover more than 20% of earth. Populations in arctic regions is under 4 million – climate can’t support large climate. Winter periods intensely cold (below –40oC) with little precipitation bar snow and strong winds. Tundra regions have permanently frozen ground called *permafrost*. Agricultural productivity is low, mainly *subsistence farming*. Arable farming is almost impossible as plants cannot survive. Diets mostly meat-based: reindeer, fish, small mammals. Reindeer migrate south in winter and some native nomadic groups follow to retain a stable food source. Artificial arable farming is done by thawing permafrost and enriching soil with manure and molasses.

**Tropical Climates:**

Half the global population live in tropical monsoon climates, 6 of the most populated countries: China, India, Bangladesh, Pakistan, Japan and Indonesia.

Summer season – hot, wet winds originating from equatorial ocean blow in from southwest resulting in intense rainfall.

Winter season – cool, dry winds are blown in from the north and northeast of the continent to the south and the ocean, sometimes causing drought.

Rice is the staple food (high in carbohydrate, fibre and vegetable protein). Farming is *intensive,* using all available arable land to cultivate crops whether it be floodplains or steep relief terraces.

**Climate Change:**

* Climates becoming more warm and humid. May increase the range of habitats for pests like mosquitoes and flies and diseases that contaminate crops.
* Water scarcity increases, decreasing water supply for agricultural practices.
* Longer growing seasons in temperate regions.
* Decreased yields due to climate change means price will rise. Fall in cereal and meat consumption.
* Increased need for GM new climate tolerant crop varieties.

**Soil Functions:**

Cycling nutrients – carbon, nitrogen, phosphorous etc are stored and transformed in soil.

Regulating water – helps control where rain, snowmelt and irrigation water goes.

Sustaining plant/animal life – diversity and productivity of living things depends on soil.

Filtering pollutants – minerals and microbes in the soil degrade, immobilise and detoxify.

Stability and support – provides structure for plants to grow in.

**Classification:**

Zonal – mature soils, reflect climatic conditions and surrounding vegetation, dynamic equilibrium with parent material, plant matter and climate. Have clear and distinct profiles.

Azonal - immature and skeletal soil with poorly developed profiles.

**Zonal Soils – Podzols:**

Occur in temperate climates where there is more precipitation than evapotranspiration; in northern hemisphere; usually coniferous woodland or moorland.

O – organic layer of needles or leaf litter.

A – acidic top soil with high organic matter content.

E – leaching of minerals and compounds from A creates pale layer of quartz, sand and silt.

B – reddish-brown layer of accumulated minerals, 'hard pan' of deposited iron.

Arable farming is difficult due to acidity and lack of nutrients. 'Hard pan' can prevent water draining, making soil vulnerable to waterlogging which sinks machinery and damages crops. Extensive artificial fertilisation to reduce acidity. Forestry common as trees grow well.

**Zonal Soils – Latosols:**

Occur in tropical rainforests; high humidity and temperature; rainfall exceeds evapotranspiration meaning more leaching.

O – year-round plant growth results in thick horizon.

A – when leaf litter decomposes, nutrients are absorbed by plants before contributing to soil content, resulting in a thin horizon.

B – leaching of silicate minerals but less soluble iron compounds remain giving it red colour.

Poor agricultural potential due to low nutrient content in 'fertile' A horizon. Deforestation means soil is exposed to weathering by heavy rainfall, leaching the nutrients further. 'Slash and burn' practises clear small areas for growing crops at a time, adding nutrients to soil by burning and left to fully recover during next growing season.

**Soil Water Erosion:**

Sheet erosion – rain loosens topsoil, overland flow transports layer of soil away.

Rill erosion – mini streams form on soil when soil moisture content has exceeded capacity.

Gully erosion – rills erode into larger ditches which are hazardous for farming machinery.

**Soil Wind Erosion:**

Abrasion and attrition – wind-suspended particles fall to ground and impact causes erosion.

Suspension – small particles lifted by wind and carried away from site.

Saltation – particles are lifted by wind and scattered, bouncing along surface.

**Soil Solutions:**

* Crop rotation – rather than leaving fields bare after harvest, plant cover crops to maintain soil during winter.
* Shelter belts – plant hedgerows or trees around fields to prevent wind erosion.
* Contour ploughing – ploughing across slope rather than down to stop fast runoff.
* Mulching – covering inactive field soil with layer of plant material.
* Drainage systems – ditches catch run off which prevents over saturation of soil.

**Major Soil Issues:**

Waterlogging

Cause - pore spaces in soil filled with water. Occurs when precipitation higher than evapotranspiration or hard pans hinder proper drainage.

Problem - insufficient oxygen for plants to respire. Root tissue begins to decompose, stunting plant growth.

Strategies - avoid overwatering; drain soil with pipes or ditches; change soil composition e.g. adding sand to increase infiltration capacity.

Salinization

Cause - build-up of salts in soil to toxic levels. Water flows form areas of low salinity to high. Occurs when high temperatures/rising water table draws water to surface and evaporate leaving behind salt deposits. Irrigation water can add excess salts.

Problems - high salinity means water flows away from roots, dehydrating plants. Toxicity may kill some less hardy varieties.

Strategies - manage rising water table; avoid intense irrigation.

Structural Deterioration

Cause - pore spaces in soil are lost due to heavy machinery or animals compressing soil and high salt content causes clay particles to clump together.

Problem - means plant roots can't penetrate or respire in soil. Reduced capacity for water leads to dehydration. Land is harder to plough.

Strategies - cycle livestock; change soil structure (add sand to clay soils); manage salinization; maintain vegetation cover.

**Food Security –** ‘when all people at all times have access to sufficient, safe and nutritious food to maintain a healthy and active lifestyle’. Attaining security in a country depends on:

Food availability – produce and/or import a sufficient amount of food.

Food access – regularly obtain food by buying and/or by producing themselves.

Food quality and use – consume nutritious food prepared in a way that is hygienic and safe.

(Australia is the most food secure country. 800 million go hungry each day).

**Increasing Food Security:**

Agricultural expansion – more land can be converted to agricultural to increase production. CBA – it will damage ecosystems.

Intensive farming – producing as much food as possible from land available. Reduces clearing of land CBA – artificial chemicals in pesticides damage natural environment.

Provision of technology – Africa only produces 20% of its potential due to poor equipment and lack of fertiliser and seeds. Hydroponics can improve yields in arid climates CBA – it’s expensive so African countries can’t afford it.

GM crops – genetically modified crops can be more durable and produce higher yields. CBA -Not all countries have the means to do this. Questionable ethics. Reduces biodiversity.

Improve access to markets – transport links, lowered tariffs make it easier to export/import. CBA – cheap imports may undercut farmers trying to make a living.

Educating producers and consumers – about food waste, how to prevent loss by pests and disease. Educate distributors and consumers about increasing shelf life, using leftovers.

Local food systems – supporting local producers acts as a buffer against global food crises.

**Health:**

Health – complete physical, mental and social well-being, not just absence of disease.

HALE – healthy life expectancy. Number of years a new born can expect to live in full health without major disease.

Morbidity – rate of disease in a population.

Prevalence rate – total number of cases in a population at a given time.

Incidence rate – number of new cases in a population during a given period.

Disability-adjusted life years (DALYs) - no. of healthy years of life lost to being in poor health.

**Morbidity Patterns:**

* Infectious diseases can be spread (such as Malaria or HIV/AIDS).
* Higher prevalence of infectious disease in LICs due to lack of sanitation, clean water, healthcare, limited education and overcrowded conditions.
* Non-communicable diseases can't be caught (such as cancer, heart disease).
* Higher prevalence of non-communicable disease in HICs due to higher life expectancy so more chance to develop diseases associated with old age, unhealthy diets of processed foods and lack of exercise.
* Incidence rates for cancer are considerably higher in HICs compared to LICs however the % of cases resulting in death are considerably higher in LICs due to lack of availability to treatment.

**Epidemiological Transition – Changing Mortality Patterns:**

Stage 1 *(Age of Pestilence and Famine)* - high death rate from infectious disease. Average life expectancy low e.g. Angola

Stage 2 *(Age of Receding Pandemics)* - deaths from infectious disease fall due to improved conditions. Average life expectancy begins to increase e.g. Haiti

Stage 3 *(Age of Degenerative and Man-made Disease)* - non-communicable disease replaces infectious as main cause of death. Life expectancy continues increasing e.g. Russia

Stage 4 *(Delay of Degenerative disease?)* - non-communicable disease prevented or onset delayed, and death rate reduced due to improved treatment. Life expectancy high e.g. UK

Countries move through stages as they become more economically and socially developed:

* Malnutrition decreases as food availability increases, so does ability to fight disease
* Clean water more widely available, sanitation improves reducing spread of disease
* Better access to healthcare to prevent disease
* Better health education to inform on how to avoid disease

**Geography of Disease:**

 TOPOGRAPHY

* Flood plains have high population density which when flooded can contaminate fresh water supplies leading to spread of waterborne disease.
* Relief results in areas of collected stagnant water which act as breeding grounds for mosquitos carrying disease.

 CLIMATE

* Many disease vectors thrive in wetter climates with high precipitation.
* Many disease vectors can only survive above a certain temperature meaning many infectious diseases are prevalent in tropical climates.
* Intense rainfall leads to flooding which can cause water supply contamination.
* Seasonality affects mental health e.g. seasonal affective disorder where there is lack of sunlight in the Arctic.
* Lack of sunlight results in vitamin D deficiency, overexposure results in skin cancer.

 AIR

* Urban pollution from burning fossil fuels in factories and vehicles can cause respiratory problems, cardiovascular diseases and cancers.
* Poor indoor air quality from mould, smoke and polluting appliances can also.

 WATER

* Disease-causing pathogens thrive in faeces-contaminated water. Disease spread by drinking or bathing. 3.4 million people die from water-borne diseases (e.g. Cholera or Hepatitis A) every year.
* Chemical toxins released by factories and agricultural runoff can cause cancers.

**Biologically Transmitted Disease Case Study – Malaria:**

Malaria is an infectious disease caused by parasites which are transmitted by mosquitoes. Mostly occurs in tropical climates e.g. sub-Saharan Africa. More than 200 million cases worldwide (2015) with 90% in Africa.

PHYSICAL

* Mosquitoes can only thrive in warm countries (between 16oC and 32oC).
* Higher temperatures decrease time taken for parasite to develop inside mosquito. They also breed and feed in warmer temperatures - increase likelihood of infection.
* Breed in still bodies of water. Longer rainy seasons mean more puddles and wetlands providing breeding habitats.
* Altitudes 1500 metres above sea level cannot sustain any Malaria transmission.

SOCIO-ECONOMIC

* Limited education about prevention methods and hygiene. Mosquito net ownership was less likely when head of household did not have a primary education.
* Low income limits buying means of protection/treatment.
* Rural areas are distanced from clinics and can't access treatment.
* Poor quality housing constructed of organic matter and poorly fitted windows/doors leave inhabitants vulnerable.
* Overcrowding spreads disease faster, many infected in one spout.
* Occupations like agricultural workers are more at risk.

IMPACTS

* Symptoms include: fever, chills, nausea, headaches. Can result in organ failure, respiratory problems, coma and death.
* Malaria results in loss of income from inability to work and financial cost of treatment (costs Africa US$12 billion each year).
* Children experience lengthy absences from school affecting education and future job prospects. Can inhibit child's development.
* Decreases tourism.
* Hinders countries development due to preoccupation with treatment and loss of productivity in work force.

MANAGEMENT/MITIGATION

WHO aimed by 2030 to *1)* reduce global Malaria incidence and mortality rates by 90% *2)* eliminate Malaria in 35 countries *3)* prevent malaria returning to Malaria-free countries.

* Spray inside walls of buildings with insecticide CBA - expensive and needs repeating, chemicals could pose health risk, mosquitos could evolve to be resistant.
* Provide insecticide-treated mosquito nets.
* Mosquito coils burnt CBA - pollutants are judged to be a health risk themselves.
* Provision of anti-malarial drugs/vaccines to vulnerable groups e.g. pregnant women CBA - rural areas would see little change.

**Non-Communicable Disease Case Study – Coronary Heart Disease (CHD):**

CHD is the leading cause of death worldwide. Build-up of fatty substances in the arteries means the heart does not get enough blood. More common in HICs however this is decreasing due to improvements in diagnosing, treating and preventing. It is now increasing in LICs as wealth increases, but treatment/prevention is not as accessible.

PHYSICAL

* Air pollution exposes us to pollutants and particulates which are a factor. This factor is not as important in rural areas.
* CHD mortality rates are higher in places with low average temperature and hours of sunlight. Cold/damp climates cause problems for cardio-respiratory system.
* Steeper relief can both improve physical fitness and cause harm to those with underlying cardiovascular issues.

SOCIO-ECONOMIC

* Mortality rate for CHD is 60% higher in smokers.
* 2% of men with CHD in HICs is due to excessive alcohol consumption.
* Poor diets - high in saturated fat, sodium and sugar increase likelihood of CHD.
* Physical inactivity - increases risk of developing CHD.
* Type 2 Diabetes – men with this are 2 to 4 times as likely to get CHD.

IMPACTS

* Causes chest pains, shortness of breath, sweating. Can lead to fatal heart attacks.
* Can affect mental health such as anxiety, depression and strain on relationships.
* Often medication prescriptions are lifelong, and some have electronic devices fitted to regulate heart rate and blood flow.
* Costs NHS approx. £8.7 million a year.
* Loss of productivity and financial cost when take time off work.

MANAGEMENT/MITIGATION

* Lifestyle changes – educating/encouraging people to eat healthy diets, exercise and stop smoking.
* Drugs or surgery – e.g. heart bypass or to lower blood pressure CBA - there is a risk of blood clots in surgery and serious side effects of drugs.
* National strategies – campaigns to reduce tobacco consumption e.g. smoking bans, package warnings. Healthy school meals initiatives for primary school children. Taxation on foods high in fat, sugar and salt to discourage people from buying in favour of healthier foods CBA - people may adjust to higher price of unhealthy foods.

**Role of International Agencies:**

World Health Organisation (WHO) - established in 1948. Aims to promote health by:

* Advising national governments about health issues.
* Working with other international bodies to limit outbreaks of infectious diseases.
* Promoting research into health issues and provides training for health specialists.
* Monitoring deaths, identifying global patterns and where to allocate resources.

SUCCESSES

WHO eradicated the smallpox virus globally between the 1960s-80s with a global immunisation campaign. Recently WHO coordinated the response to the Ebola crisis in West Africa by increasing number of treatment centres in region and implementing measures to reduce transmission between countries (e.g. controls at airports).

CRITICISMS

* Many now curable diseases e.g. Cholera, Tuberculosis and Diarrhoea are the cause of death for thousands of people in LICs. WHO has not done much to prevent this.
* Misuse of antibiotics has caused TB to develop as resistant.
* Some say the organisation is over bureaucratic, lacking practical application to crises.

**Role of Non-Governmental Organisations (NGOs):**

NGOs are non-profit groups, often charities e.g. *Red Cross, Oxfam*. They promote global health research and provide healthcare in LICs, mostly poor remote communities lacking infrastructure/resources. They are often small-scale, relying on donations/aid from HICs.

*Medicins Sans Frontieres* (Doctors Without Borders) - give emergency medical assistance such as vaccinations or surgery. Provide local healthcare professionals with extra training and equipment. Also treat malnutrition with ready-to-use food which possesses nutrients needed for a healthy life and these can be stored for long periods without expiring.

Cancer Research – fund research into causes of cancer and treatments. Helps inform government policies on issues on prevention and diagnosis of cancer. Test Cancer Sooner (2015) campaign encouraged government to commit more funding to ensure patients are diagnosed as soon as possible giving them better chance of recovery.

**Health in Knowsley (Local Area – Physical/Socio-Economic Factors):**

* North-west England near Liverpool.
* Population of around 147,000.
* Increasing number of over 65. Higher proportion of under 14 than national average.
* One of worst areas for premature deaths in UK. Life expectancy lower than average.
* Common causes of death – cancer, circulatory and respiratory diseases.

PHYSICAL/BUILT ENVIRONMENT

*Open Space* – 60% area designated green space. Important recreational and fitness value yet only 10% of residents use green space for exercise and health benefits. 69% of residents classed as obese or overweight – contributes to incidence of heart disease and diabetes. CBA - Knowsley Health and Wellbeing Board encourage residents to engage in more physical exercise.

*Housing –* over 27% failed to meet Decent Homes Standard. Issues with leaking roofs and insufficient insulation or heating. Cold and dampness are implicated in respiratory diseases e.g. pneumonia. CBA - Health Homes Assistance provides grants to help people improve standards of their homes.

*Air Quality –* associated with respiratory problems, cardiovascular disease and lung cancer. Traffic pollution from two major motorways are main cause of poor air quality in Knowsley.

SOCIO-ECONOMIC

*Employment –* high unemployment rates. Linked to unhealthy lifestyles like more likely to smoke. 24% of deaths in over 35s in Knowsley are due to smoking related illness. CBA -Knowsley Council offers free services to help quit. Also encouraging business to invest in area and provide jobs.

*Income –* lower average income. Poorer people have lower life expectancies. Lower income is more likely to create mental health issues like depression. Low income families cannot afford to eat healthy diets as unhealthy options are more affordable.

*Education* – 25% don’t have any qualifications. Has impact on lifestyle. Educated people less likely to smoke or be overweight. CBA - Knowsley Education Commission was launched to attract more outstanding teachers and improve facilities.

ATTITUDES+EXPERIENCES

* Over half of residents think achieving a healthy lifestyle is too hard – less motivated to eat healthy or give up smoking.
* However, around a quarter think it can be enjoyable. Average consumption of fruit and veg is higher in Knowsley suggesting a positive attitude towards diet.
* Few facilities and little sense of community and social cohesion can have negative effects on health.
* Crime is higher than UK average – can cause unhealthy stress and avoidance of public areas which could be used for exercise.
* Knowsley has several leisure centres which can help educate on diet and smoking. Council organises heritage walks to encourage physical activity and engagement with character of local area.

**Natural Population Change:**

Birth rate – number of live births per 1000 per year.

Death rate – number of deaths per 100 per year.

Total fertility rate – average number of children a woman has during reproductive years.

Infant mortality rate – number of children that die before their 1st birthday (out of every 1000 born alive).

Dependency ratio – proportion of the population that must be supported by working population (15-64). Dependant population is young (0-14) and old (over 65) – they must be supported financially.

**Demographic Transition Model:**

STAGE 1: HIGH birth rate + HIGH death rate.

* Population stable but low.
* Births and deaths fluctuate.
* No countries in Stage 1. Tribes in parts of Brazilian rainforests.
* Birth rate high due to no family planning or contraception. Education poor. High infant mortality means more children conceived to replace.
* High death rate and low life expectancy due to disease and poor sanitation/hygiene. Famine and unstable food supply. Poor diet.

STAGE 2: HIGH birth rate + DECLINING death rate.

* Population increases rapidly.
* LICs like Kenya.
* Birth rate high due to same reasons. Also need for family labour. Larger family can work the land and produce more food and money.
* Death rate falls and life expectancy rises due to improvements in healthcare, improved transportation of food and medicine.

STAGE 3: DECLINING birth rate + SMALL DECREASE in death rate.

* Population increases at a slower rate.
* HICs and NEEs like Australia and China.
* Birth rate falls due to birth control and family planning. Improvement to education. Emancipation of women means more focus on career – having children later results in lower fertility rate. Also shift to manufacturing means less need for young farm labour – quality over quantity.

STAGE 4: LOW birth rate + LOW death rate.

* Population plateaus but high. Fluctuation in birth and death rates at low level.
* HICs like most of Europe, USA, Japan etc.
* Birth rate remains low due to increased materialism and therefore raised expense of having children – less is more. Fertility rates low due to later marriage and careers meaning later and few conceptions.
* High life expectancy and low death rate.

STAGE 5: birth rate drops below death rate.

* Population experiences slow decrease. Death rates stable while birth rate declines.
* Some countries like Hungary, Latvia, Lithuania and Japan.
* Death rates remain stable as there is a large ageing population dying of old age.
* Economic stress means people can’t afford children.

**Cultural controls:**

* Role of women – female access to education and employment delays age of starting families. Educated women more likely to make choices about family size. HICs have lower birth rates and lower fertility rates (1.89 in UK compared to 6.6 in Niger).
* Attitudes towards marriage – young marriage culture means more likely to have children sooner and for longer. In Niger ¾ of girls are married before 18th.
* Religion – varying views on birth control and abortion. Catholic church condemns contraception, more likely to have bigger families.
* Policies – population change has forced governments to act. Growth in France is low, so government introduced subsidised childcare to encourage larger families. China experienced one-child-policy to reduce birth rate for over 30 yrs.

**UK – Stage 4 of DTM (Contrasting Physical/Human Settings):**

* HIC. Low birth rate (12.1/1000py) and low death rate (9.4/1000py).
* Growing at about 0.5% per year.

PHYSICAL

* Temperate climate and fertile soils – lots of arable land and reliable food supply.
* Relatively high rainfall means steady water supply for most regions.
* Low-lying flat land makes it easier to grow crops and transport resources.
* Rich in natural resources like coal and various minerals. This helped the country to industrialise and develop a diverse economy.
* Surrounded by ocean – easy access to fish and international shipping trade.

HUMAN

* Education is compulsory until 18 regardless of gender. Low fertility rate (1.9) due to women waiting until after education.
* Female workforce is high (70% have a job) delaying average age of conception.
* Most use contraception due to it being widely accessible and encouraged to use in education – have control over how many children and when.
* NHS accessible for whole population. High life expectancy - 79.5 (men) 82 (women).

**Uganda – Stage 2 of DTM (Contrasting Physical/Human Settings):**

* LIC. High birth rate (43.3/1000py) and lower death rate (10.4/1000py).
* Population increase of 3.2% per year. 5th fastest growing population.

PHYSICAL

* Hot and humid climate and moderate rainfall making it ideal for crops like bananas, sugar and coffee, however north has dry season limiting agricultural productivity.
* Soil isn’t very fertile, meaning food production is low.
* Landlocked – limited access to international trade however borders largest lake in Africa which supports fishing industry.

HUMANS

* Fertility rate high (5.8) due to gender inequalities in education and employment opportunities meaning average age of first conception is 19 years old.
* Lack of access to birth control and government support for family planning services.
* Infant mortality is high due to poor medical care. Parents have more children to make up for this fact.
* Death rate has fallen due to advancements in healthcare/sanitation, but lack of education and family planning means population is rapidly increasing.

**Population Pyramids:**

Population structure – number or % of males and females in different age groups within.

**Demographic Dividend:**

Potential for rapid economic growth in a country as its dependency ratio drops. Normally in stages 2 and 3 of the DTM.

Death rate starts to decrease before birth rate i.e. people still have many children but more survive into adulthood – a bulge in young people.

When they reach working age, there is a large workforce and fewer dependant old/young.

Leads to economic growth e.g. working population pays taxes and can afford to spend more, boosting local economies. TNCs attracted by large workforce, driving investment and employment.

To reach dividend, the country needs to first invest in education and job creation since unemployed and underemployed young adults count as dependant population.

**International Migration:**

*Refugees* – forced to flee own country, unable to return due to fear of persecution and conflict e.g. over 1.8 million fled South Sudan amid violence and hunger.

*Asylum seekers* – fled country but not yet been accepted as a refugee. Can only get formal assistance and legal protection from country they seek sanctuary from once they are granted refugee status.

*Economic migrants* – people moving from one country to another for employment.

PUSH (why people are attracted to host)

* Fewer extreme environmental events
* Better access to healthcare
* Better sources of education
* More job opportunities
* Better quality of life

PUSH (why people want to leave)

* Natural disasters
* Political instability
* Conflict/war
* Lack of employment
* Lack of food
* Economic uncertainty

**Other Factors Affecting Migration Patterns;**

* Government decisions about how many migrants are allowed in. Some have annual limits. When the A8 eastern European countries entered the EU, the UK was one of the few governments that allowed free movement through its borders.
* Barriers to migration involve physical (oceans, travel costs) and human (language).
* Language/cultural ties e.g. Angolans and Brazilians both speak Portuguese.
* *Distance-decay* – number of migrants tends to decrease as distance between country of origin and destination increases.

**Migration Example – European Migrant Crisis 2015:**

Over 600,000 migrants entered Europe from North Africa and the Middle East. Holding centres eventually reached full capacity in Sicily and Lesbos meaning squatter settlements arose in many parts of Europe. Involved migrants dangerously crossing the sea in overcrowded unsanitary boats where many died en route. Also, many smuggled in cramped lorries and ships.

**Implications for Country of Origin Destination (Host) Countries:**

Economic

* Migrants work for longer hours and cheaper labour. More inclined to fill jobs that native population won’t undertake.
* Decreased dependency ratio.
* Take more jobs than are available for native population.

Political

* Pressures to control immigration.
* Rise of anti-immigration parties and racist organisations.

Environmental

* More housing and infrastructure required to sustain larger population.
* Increased resource exploitation and pollution.

Health

* Pressure on healthcare services.
* Migrants can be healthcare professionals like doctors and nurses.

Economic

* Less unemployment.
* Remittances sent from abroad.
* Brain drain.
* Service decline as demand decreases.

Political

* May introduce pro-natal policies that could be rejected or praised.
* Policies limiting freedom of movement.

Environmental

* Reduced resource exploitation or intensive farming.

Health

* Healthcare professionals leave in the brain drain.
* Vulnerable ageing population places pressure on healthcare systems.

Demographic

* If there was a larger ageing population before, it balances out pyramid.
* Increase in birth and fertility rates.

Social

* Cultural diversity.
* Social tensions between immigrants and local people.
* Pressure on schools to make more places.
* Segregation of migrants into certain areas which attract more migrants.

Demographic

* Lowered birth rates as people of childbearing age leave.
* Population imbalance – higher ageing-population.
* Loss of young working-age males.

Social

* Reduced pressure of health and education, however funding may be cut as demand decreases.
* Families can be split up/communities disbanded.

**Population Ecology:**

*Population ecology* – how the dynamics of population interact with the environment.

*Population growth dynamics* – how and why population sizes/structures change overtime.

Limited by environmental factors: climate, soil, geology and topography and resources.

Balance between population growth and resource availability leads to 3 scenarios:

1. Optimum population – where the resources available can be developed efficiently to satisfy the needs of the population. Gives the highest economic return per person and therefore the highest standard of living. However, as technology develops, population can increase due to more resource availability – raised *carrying capacity*.
2. Overpopulation – population is too high for the resources available. Standard of living falls due to shortage in food, water, energy etc. Results in unemployment and out-migration.
3. Underpopulation – not enough people to utilise resources efficiently/to full potential so standard of living falls lower than it could be. Low unemployment rates and in-migration.

Population Ecology Key Terms

* *Carrying capacity* – the maximum number of people that can be supported indefinitely (long-term) by the available resources in a given environment.
* *Biotic potential* – the natural reproductive potential of a species.
* *Environmental resistance* – mortality rates are controlled by environmental factors preventing survival e.g. famine and disease. However, this is not as influential on humans as we have the capability to alter our environment to cater to our needs unlike many animals.
* *Density independent* – environmental *limiting factors* that aren’t influenced by the population size and density e.g. natural disasters will decrease a population regardless of its size
* *Density dependant* – limiting factors e.g. food supply and disease will have more of an effect when population size and density are high.



*Exponential growth* – continually increasing population growth. Due to advances in technology making food production more efficient and vaccines/medicine reducing incidence rates of disease. As a species, we will have overcome limiting factors.

*Logistic growth* – as population size increases, the rate of increase will slow down. Predicted to be due to a rise in environmental resistance e.g. dwindling food and water sources. Population growth will experience a plateau or *equilibrium* (maybe with some fluctuation above and below) at carrying capacity.

**Ecological Footprint:**

* Method of measuring environmental impact of human activity – calculates amount of productive land required to produce goods and services in demand.
* Can be calculated on an individual scale, group scale or global scale.
* HICs have bigger ecological footprint than LICs e.g. Zambia 1 gha vs UK 5 gha.
* As ecological footprint increases, the carrying capacity decreases (more resources needed for each person, the fewer people our environment can support).
* Current rate of consumption, our global population is using equivalent to 1.6 Earths i.e. it takes the Earth over a year 1/2 to regenerate resources being used in one year.
* UN estimates if global population reaches 9.6 billion by 2050, we will be consuming 3 Earths’ worth of resources.

**Population, Resources and Pollution (PRP) Model:**

Natural resources provide goods and services to human populations, but the acquisition and use of these resources disrupt environmental processes and create pollution.

**Population**

**Pollution**

**Resource acquisition**

**Resource use**

Resource use benefits population. However, it can also cause population to decrease as resources are used up.

As population increases, the demand for resources increases.

Resource acquisition e.g. mining and deforestation damages natural environment.

Use of resources produces pollution e.g. burning fossil fuels emits greenhouse gases.

Pollution has negative effect on humans e.g. health issues and climate change etc.

Positive Feedback

* Change leads to processes amplifying original change.
* Population growth increases demand for food > drives an increase in food production > more food availability allows population to increase further > further drives to improve yields and technology > leading to higher food availability etc.
* An increased population results in more extraction of fossil fuels > more fuel supports the transportation of food to places experiencing shortage > decreases malnutrition > allows for further population growth.

Negative Feedback

* Change leads to processes having an opposite effect to original change.
* Growing population causes expansion and intensification of agriculture > leads to increased soil erosion > decreases yields because the soil is becoming less fertile > food production is not sufficient to support population > population declines.
* Increased population leads to increased extraction and use of fossil fuels for energy > increased levels of greenhouse gas emissions create climate change > this can reduce rainfall and crop yields suffer > causes food shortage, reducing population.

**Population Growth Theories:**

Malthus

* Stated a population could grow more quickly than its capacity to feed itself because: populations can grow exponentially (more and more rapidly), and food supply can only increase arithmetically (at a constant rate).
* Predicted when population exceeds carrying capacity, death rates will increase due to the inevitability of famine, war and disease.
* Limitation – OUTDATED. Based on idea that food production cannot increase rapidly, but this has been rejected by technological advances like the ‘green revolution’. Also based on a time when developed countries were experiencing rapid population growth and developing were not, which is reversed in the present day.

Neo-Malthusians

* Rapid growth in 20th century raised worries that resource production was insufficient. They argue rapid population growth is an obstacle to development.
* Club of Rome used computer models in 70s to predict that growth would lead to decline in economic growth by 2070.
* Believe humans can live indefinably on Earth only if they limit population growth and use resources more sustainably.
* Limitation – many believe there are enough resources to support growing population; the main problem is how it will be distributed.

Ester Boserup

* More optimistic view – ‘necessity is the mother of invention’. Believed we will always find a way to produce sufficient resources to meet the needs of a bigger population.
* Farming will become more intensive as population increases and a greater demand for food will encourage the invention of new methods and technology.
* Modern trends have supported the theory e.g. genetic modification of crops.

Julian Simon

* Argued population increase was a good thing. The more people that are being born, the more intelligent people there are to solve problems about resource availability.
* Supported Boserup’s view that human innovation will increase alongside population.

**Health Impacts of Environmental Change:**

Ozone Depletion

* O3 gas mainly found in upper atmosphere. Forms a layer that absorbs UV radiation.
* CFCs are substances found in aerosols and fridges in the past which have contributed to the thinning of the ozone layer, a distinct hole forming over Antarctica.
* Less ozone concentration means more UV radiation reaches Earth’s surface.
* UV exposure increases risk of **skin cancer** where rays cause genetic mutation in skin. Responsible for over 55,000 deaths worldwide in 2012. Australia has highest due to mainly light-skinned population and latitude positioning.
* Also causes cloudy **cataracts** to form in the lens of the eye, causing blurred vision. Caused blindness in over 20 million worldwide.

Rising Temperatures

* Due to global warming is making heatwaves more common and more intense – results in **thermal stress** e.g. dehydration, heat exhaustion and heatstroke.
* **Disease vectors** may spread to new regions e.g. mosquitoes carrying malaria are currently confined to tropical and subtropical regions but warming climates in milder regions may increase range of incidence.

Agricultural Productivity

* Rising evaporation rates causes salinization of soils – decreasing yields.
* Dry areas expected to get drier making it harder to grow crops.
* Seasonal precipitation patterns changing, in Indonesia that rainy season is becoming shorter and more intense reducing length of growing season.
* Extreme weather events becoming more intense, disrupting agriculture.
* Rising sea levels means saltwater intrusion onto farmland land. – decreasing yields.
* Warmer temps in UK is extending growing season for crops like melons and peaches.

Food Production and Nutritional Standards

* Places where climate change is decreasing crop yields are experiencing local **food shortages**. Indonesia’s shortened rainy season has created a ‘hunger season’.
* If climate change continues occur rapidly, availability of some food commodities will be reduced in HICs like the UK. **Changes to diet** can be detrimental to public health.
* Food prices will increase as production decreases. Food becomes less affordable in both LICs and HICs, leading to **malnutrition**.
* In HICs however, **obesity** may increase further as unhealthy foods continue to be more affordable than healthier diets.

**Prospects for Global Population:**

* World population reached 7.4 billion in 2016. United Nations predicts that by 2100 it will reach around 11.2 billion.
* Rate of growth is slowing down. In 2005, it was 1.24% per year but by 2015 it had slowed to 1.18%. Expected to continue this trend.
* Projections based on how fertility rates may change in the future.

High

* Fertility rates = 2.35 children per woman.
* HICs will see population triple. LICs will see an increase of more than five-fold between 2000 and 2300.
* Population will reach 10.63 billion by 2050.

Medium

* Fertility rates = 1.85 children per woman.
* HICs will see population increase of 7% versus LICs 50% between 2000 and 2300.
* Population will reach 11.2 billion by 2100.

Low

* Fertility rates = 1.85 children per woman.
* HICs and LICs have relatively similar decrease of about 64% between 2000 and 2300.

Change in Distribution

* Over ½ of population growth by 2050 will have been in Africa = 2.6% per year.
* 1.3 billion of the 2.4 billion added to global population will be born in Africa.
* Highest population growth in top 48 LICs (27 of which are in Africa).
* 1 in 5 of all people born between now and 2100 will be Nigerian.
* Africa is expected to have almost quadrupled 2100 whereas Asia and Europe projected to have increased and then decreased.

Conflicting Views

*International Institute for Applied Systems Analysis* claims population will peak at 9.4 billion in 2075 and then fall below 9 billion by 2100. Also claims Nigerian population will not quintuple, it will only triple due to better education. They incorporate the projected level of education in a population e.g. education of girls found to be most successful methods at reducing fertility in long term.

Consensus Views

* Global population rate will continue to slow.
* Most rapid growth will be in sub-Saharan Africa.
* Population decline will continue in parts Europe and Japan.
* China, other parts of Asia and the Americas likely to experience decline in future.
* Countries with declining population face new challenges due to an ageing population; life expectancy will continue to rise.
* China will be overtaken by India around 2028 s having largest population.

**Future Population-Environment Relationship:**

* Per capita resource consumption is increasing. As countries become wealthier - the amount of land, energy, food water and materials consumed per person increases as people can afford higher standards of living.

Climate change

As population increases so does need to burn fossil fuels and increase greenhouse gases in the atmosphere causing changing climates, sea levels and weather patterns. Sea level rise threatening low-lying regions like Bangladesh.

Destruction of natural habitats

Within next 50 years, a quarter of the worlds forests will have been lost to deforestation to provide land and resources for growing population.

Water supplies

Over 1 billion in LICs lack access to safe drinking water. Predicted future world conflicts will be driven by population growth and demand for water security. Underground aquifers are being depleted more rapidly than they are being replenished.

Soil erosion

40% of arable soil is being used for farming purposes worldwide and this is being seriously degraded. Increased population density in Uganda will result in major degradation of the very soil they rely on for livelihoods.

Meat production

As LICs grow and become more developed, demand for protein diets like in HICs increases and so does production of meat and clearance of forest for cattle farms. Cattle release methane, a prominent greenhouse gas contributing to climate change.

* However, fertility rates dropping, and population increase is slowing meaning less of a long-term impact on environment.
* Also, resource use is becoming more efficient due to technological advances and regulations reducing consumption e.g. *Paris Agreement* limiting greenhouse gas emissions and waste disposal.
* Although consumption may exceed attempts to regulate and be more efficient, resulting in exhaustion.

**Population Change/Migration Case Study – Poland/UK:**

* In 2004, 8 Eastern European countries including Poland joined the EU as the A8. Enabled free movement of people and labour between member states – UK government estimated over 15,000 migrants from A8 countries to move here.
* UK was one of the few that didn’t restrict migration from the A8 countries.
* By 2006, 447,000 applied to work here from the A8, rather than predicted 15,000.
* At the time unemployment was high in Poland (18.2% and in some rural areas it was 40%). In the UK it was 5.1%.
* Poland’s GDP was considerably lower at $12,700 compared to UK’s $30,900.
* Poland also experiencing housing shortages (300 dwellings for every 1000 people).

IMPACTS ON POLAND

* ‘Brain drain’ as more educated and skilled moved abroad leaving a shortage of these workers. 40% of first wave migrants were university educated.
* 2011 - £600 million worth of remittances sent home from UK to Poland – stimulating Polish economy.
* Unemployment fell from 19% to 9.5% in 4 years due to new job vacancies.

IMPACTS OF UK

* £2.54 billion contributed to UK’s economy by Eastern European migrants.
* 80% of migrants were 18-35, off-setting the trend for ageing population structure.
* Social tensions and hate crimes increased tenfold against migrant minorities.
* Poland is now the most common non-UK country of birth, overtaking India (2016).