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## CAIE AS LEVEL
# GEOGRAPHY (9696)

SUMMARIZED NOTES ON THE CORE MODEL ANSWERS SYLLABUS

# 1. Paper 1 - Atmosphere and Weather

## 1.1. The causes of global warming are only a result of human factors. With the aid of examples how far do you agree? [15] 2020-M/J-11

Human factors appear to one of the main causes of global warming-there are also physical factors that can also effect the progress of global warming. However, there are also physical factors that may appear to impact global warming but they are clearly have less significant than the human causes of global warming.

- **The human factors causing global warming:**
  - **Deforestation of the Amazon Rainforest:**
  - The AF is a carbon sink used to absorb $CO_2$ and convert it to $O_2$ (traps $CO_2$)
  - It is shown deforestation reduces the effectiveness of $CO_2$ being absorbed (2 billlion tonne loss)
  - This will lead to an increase in $CO_2$ (and other gas concentrations)
  - This is often cleared for mining (eg: Carajas Iron Ore Mine) or farming land
  - **Enhanced green house effect (mainly resulting from increase in $CO_2$, although there are other gases that can also increase/amplify the warming effect of $CO_2$ as well):**
  - $CO_2$ has 2x the warming effect that water vapour has (eg: a 1 degree increase of water vapour, will lead to a 2 degree increase when $CO_2$ is added onto it)
  - Partial transparency: 8-14 micrometers
  - Full transparency: 12-13 micrometers
  - $CO_2$ full absorbance: 10 micrometers
  - **Industry and farming:**
  - Gases such as CFCs are shown to have 10x the warming effect compared to $CO_2$. This is often produced in industry (especially in China's steel/iro industry) and lasts for 10000 years in the atmosphere
  - $CH_4$ (another harmful GH gas) is often produced from cow farts for farming as well (people in the Amazon Rainforest often clear land for diary farming)-these last for 10-20 years but they have a 86x more warming effect
  - Also China's steel + iron industry contributes $SO_2$ (Beijing produces 20,000 T of $SO_2$ per year) . These produce aerosels which reflect and absorb sunlight, these form acid rain. These act as a condensation nuclei for clouds to form, also creating higher precipitation.
  - Nitrous oxide has 300x warming than $CO_2$ and lasts in the atmosphere for 114 years (this is also contributed from industry)

Natural human (important to note that these factors are much less significant than human factors causing):

- **Volcanic activity:**
  - $SO_2$- a poisonous gas can be released into the air. $SO_2$ can be turned in $H_2SO_4$ when it condenses rapidly into the atmosphere.This can form aerosels which increase radiation and can cool the climate
- **Sun cycles:**
  - The earth angles 24-24.5
  - Tilt can change the amount of radiation hitting the Earth's surface
  - Tilting near the poles can increase radiation
  - Ellipse=circular or elliptical: can change how radiation hits the top of the atmosphere
  - Axial=tilt of how Earth wobbles around the Earth's surface
  - Elliptical=Earth orbit shift slight at Earth where Earth passes closely to them

NOTE: clouds can delay climate change
clouds are shown to have an overall cooling effect (cools and reflects sunlight)  but it can also be shown to trap heat in as well and provide an insulating layer

## 1.2. Latitude is the most important factor in explaining seasonal variations in temperature. With the aid of examples, how far do you agree? [15]

Overall: latitude is clearly an important factor,but there are other factors that can also influence season variation (eg: ocean currents, continentality, position of ITCZ)

- **Latitude:**
  - position/passage of overhead sun over tropics, sun closer to south hemisphere in summer->hotter temperature, further from north hemisphere->colder temp (vice versa),
  - Usually affected by **Sun's angle** and **atmosphere thickness**
    - Equator, more overhead (insolation/energy is better) than the poles (energy recieved is poor)
    - Poles→more dust, atmosphere, aerosels + ice caps have a high amount of albedo/reflectivity than at the equator→there is an excess, high amount of dark, dense vegetation→absorbs more energy, less dust, atmosphere + aerosels
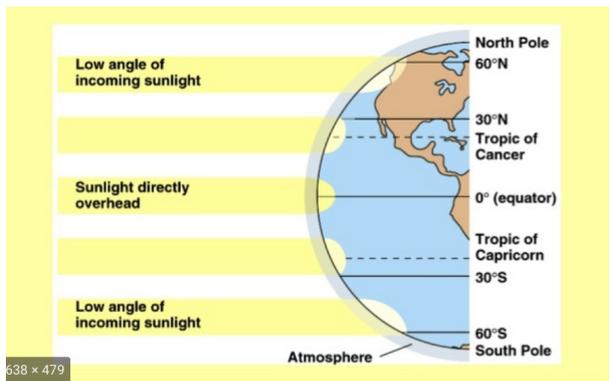
- **Altitude**: Higher land especially near mountains tend to have a lower temperature,
- Higher pressure=temperature decreases over time (adiabatic lapse rate=change in altitude of air parcel without gaining/losing heat surrounding parcel)
- Leads to air decreasing pressure as it increases with height (air rising, expanding, cooling water vapour condenses out releasing latent heat that is previously realsed or temperature falling as rapidly with height)
- **Wind systems**: Hadley, Ferrel, Polar cells (Ferrel and Polar Cells are included for completion and may not need to be as focussed on as the Hadley Cell)
  - **Hadley cells:**
    - low pressure on inside,
    - there is insolation converted to long wave radiation,
    - 60n to 60s polewards + it acts as a low pressure convergence zone,
    - inside the Hadley cell there is hot, ascending air + a desert created on the outside as the dry descending air sinks
    - , the edge of tropopause formed by NE and SE trade winds
    - NE often bring wet/cold conditions during July (by picking up moisture + bringing heavy rainfall)
  - ~~Polar cells: warm air rises, low pressure created + sinks at poles~~
  - ~~Ferrel cells:~~
    - ~~Open loop cells~~
    - ~~Air rising at 60N creates polar cell,~~
    - ~~Rest collides with Hadley cell at 30S,~~
    - ~~Strengthens high pressure ridges,~~
    - ~~Westerlies air found below the Ferrell cell,~~
    - ~~these westerlies bring warm air/heat energy from the ocean (ocean retains heat)~~
  - Also note that high and low pressure wind systems vary all year round and tends to vary on the hemisphere you are located in
  - Also they vary from season to season in north v. south hemispheres (more ocean in south)
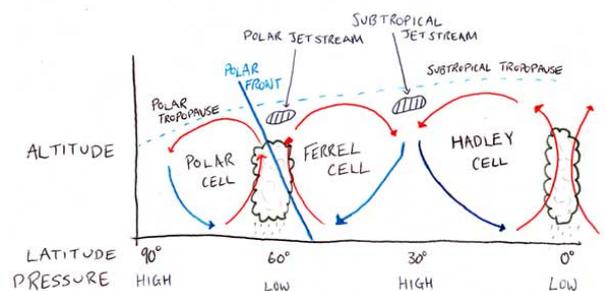


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- **Jet stream:**
  - goes up at 10km and warm air travels at a fast to higher latitudes
  - higher pressure around 30N and air goes down at this point
- **Rossby waves:**
  - high fast moving winds westerly
  - strong fast wind
  - north to south temperature gradient
  - moves in a river and trough pattern
    - troughs-lower pressure
    - river-higher pressure systems
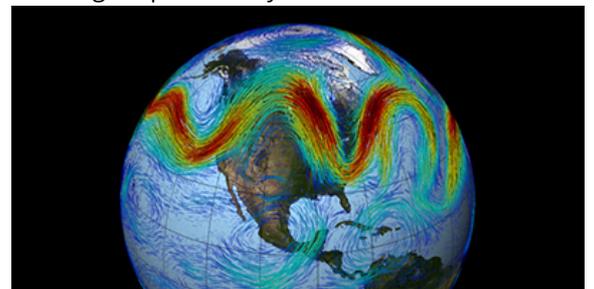


- **Ocean currents:**
  - retains heat in oceans, transport warm air via. warm westerlies,
  - land/sea area=>mixing of air (warm + cold air)=>leading to clouds being formed, ocean->also **specific heat capacity** leads to ocean heating slower/cooling slower v. land which heats/cools more rapidly, note: in summer, land retains more heat, winter less (sea is other way around)
- **Land/Sea dist (London and Russia)**
  - **London(15):**
    - Continentality: oceans retain more heat
      - This is because it is more clear, the Sun's ray's penetrate to get more depth and distribute heat over a larger area
      - Tides and currents cause heat to be further distributed
    - Gulf stream bring warm air via. coastal westerly winds in winter
  - **Central Russia (25)**
    - there is no ocean current to moderate temperature, and the position of the sun is more over head
  - Also the position of high + low pressure systems also further accentuated by this effect (position of these systems are determined by ITCZ (refer to below)
    - land tends to vary more in pressure/temperature than oceans

- more low pressure in summer for land than in winter which has a higher pressure, low pressure in summer because of overheating especially in continental areas as well
  - during winter, relatively warm air is more likely to sink + a higher pressure than warm air=higher atmospheric pressure (vice versa)

## ITCZ-maybe the most significant factor influencing season temperatures
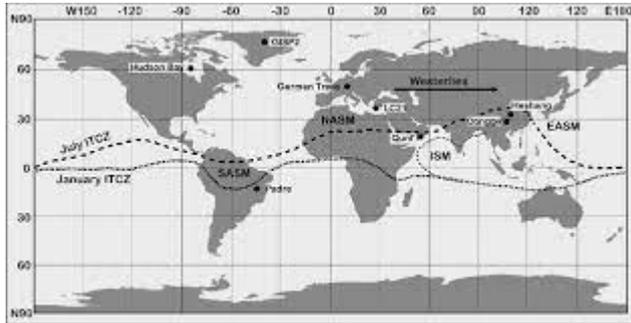


### About the ITCZ:

- discontinuous zone of convergence of NE and SE trade winds close to the equator and moves further South in the hemisphere + the movement is dependent on the movement of the sun. it occurs as a result of solar flux via. wind patterns
- unequal insolation causes cell movement
- rises at 10km and descends as stable air mass
- pressure is cooler and descends as air mass
- cause wind to fall and to be deflected more
- ITCZ also causes the location of wind cells and pressure belts to be shifted (as it is moved by the position of the overhead sun)
- Moves further South in January and further North in July

### General variations in ITCZ (and pressure systems to note, that occur seasonally):

- during July, monsoons more likely to occur over India due to the presence of high pressure systems, bringing high amounts of precipitation + forcing the formation of rain via. rainfall (air is forced to rise by warming, rises and cools adiabatically, becomes fully saturated at dew point, etc)
  - Monsoon reverses wind systems (SE trades cross equator from South Hemisphere in July) which is influenced by the reversal of land-sea temperatures between Asia and Pacific
  - Winter surface temperatures in Asia: -20 degrees Celcius + surrounding 20 degrees Celcius
  - Land-sea breeze created from cooler sea (high pressure) to warmer land (low pressure) in summer and cooler land (low pressure) to warmer sea (high pressure)
    - Leading to the creation of land + sea breezes
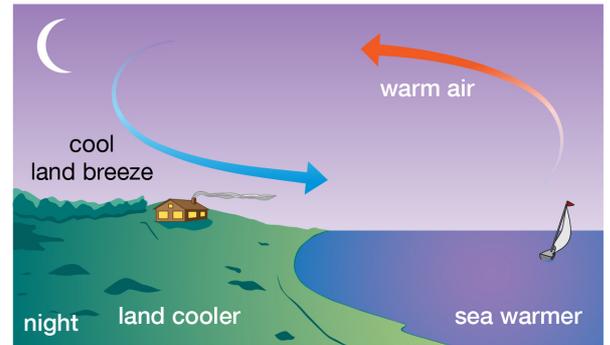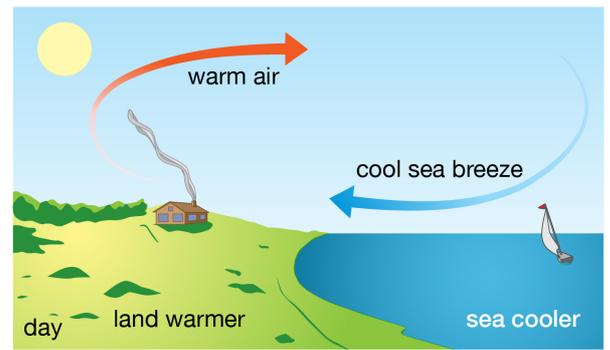


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## 1.3. With the aid of examples, assess the extent to which absorbed energy is the most important factor in determining the diurnal energy budget. [15] 2019-M/J-13

- Absorbed energy and it's impact on the diurnal energy budget-partial extent (can be affected by albedo of surface, during daytime-amount of heat transferred into the soil usually returns to the surface at night time, but it can be altered by other factors by pollution and other factors that can also trap long wave radiation from escaping)
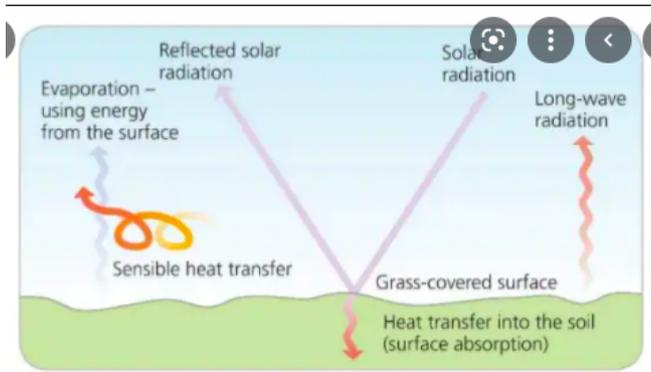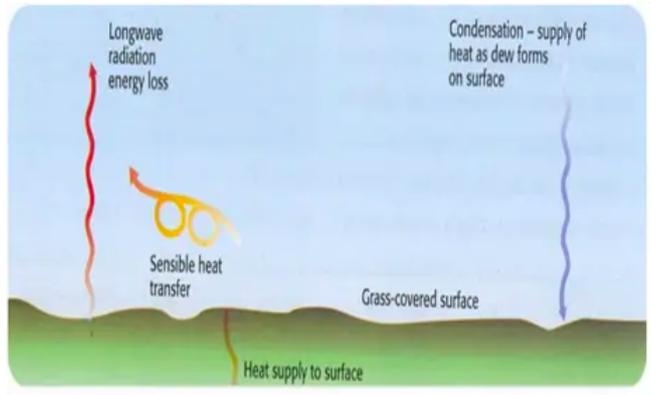
Figure 2.3 Local energy budget – daytime

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- Absorbed energy can often be reheated by the surface and allow for processes such as condensation, sensible heat, and evaporation to occur as well on the surfacer
- In the night energy budget, heat absorbed by the surface, returns to the surface. Latent heat (or heating of the surface) creates dew (or condensation on the ground.
- Absorbed heat at night can also be released through longwave radiation as well and can cause water to be evaporated from the surface
- It creates a warming effect on the surface->can also cause "thermal inertia" where energy is retained in the surface (especially in concrete surfaces/in rural areas) and is released at night
  - It also allows for thermal radiation (long wave radiation) to be given off as well (terrestrial radiation-long wave radiation given off from the earth's surface following heating by incoming solar radiation)
- **Convection**-upward moving of air caused by surfacer heating, absorbed heat returns to the surface at night
- **Clouds/albedo-** Energy can also be absorbed in the atmosphere by clouds as well (cumulus->shown to absorb 80% and cirrus). Cumulus are lower and thicker-also have higher reflectivity compared to cirrus.
  - Some surfaces (eg: ice-80-90%, grass-10-20%)-more reflected radiation and less radiation absorbed (or outgoing solar radiation as well)
  - At night, there are less clouds and more heat can escape into the atmosphere
  
  **Pollution altering the energy budget**
- **Aerosols**-reflect and absorb sunlight
- **Smog**-Can trap heat/incoming radiation in-leading to less heat escaping

- At night, there might be more heat returning to the surface (or escaping) through the form of LWR
  **Also: GH gases can increase temperature as well via. the enhanced greenhouse effect**
  - $CO_2$/CO/CFCS in atmosphere close the "water vapour window"
  - Water vapour window typically left open for spec gases of 10 micrometers
  - Partial absorbance of $H_2O$: 8-14 micrometers
  - Full absorbance of $H_2O$: 12-13 micrometers
  - $CO_2$ absorbance: 10 micrometers
  - $CO_2$ closes this, this leads to 2x the increase in temperature as well, less outgoing heat (typically water vapour etc.)
  - More heat trapped by ozone
  
  **Incoming/outgoing heat**
  - only occurs during the daytime, not at night
  
  **Svalbard, Norway (Artic)**
  - 15% net radiation used up by thawing
  - Polar night in winter=net long wave radiation dominant energy loss channel mainly compensated by sensible heat transfer + the top layer freezes&thaws
  - Avg. sensible heat transfer -6.9 Wm2
  - But 6.8 Wm -2 latent heat compensates sensible heat transfer in annual average
  - Covered with a high amount of ice caps→but latent heat/sublimation doesn't induce any temperature change in the energy budget and is insignificant in the energy budget
  - Strong evaporation and snowmelt during autumn
  - **



Figure 2.7 Energy budgets for Svalbard
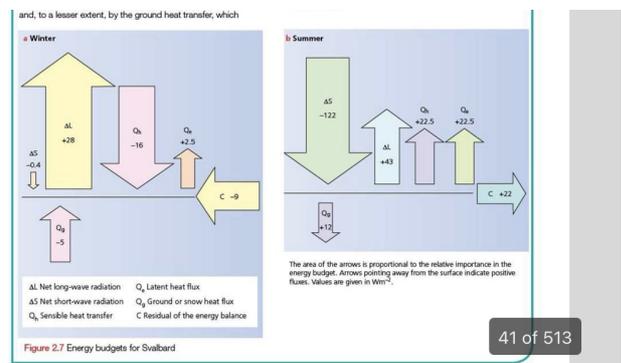
  **
- **Arctic**
  - Melting of glacier=less absorbed energy/energy that is also being reflected back into atmosphere (ice caps typically have a high amount of albedo)
  - Leads to an increase in temp
  - Shown to have 3x increase in temperature 1979-2019 (also increase in temperature might be due to an increase in pollutants + climate change→link to previous points about greenhouse gases and pollutants altering energy budget)

**1.4. With the aid of case study, assess the extent to which human activity affects the climate of an**

## urban area [15] 2019-O/N-13

Human activity carries a large amount of significance on the climate of urban heat islands including an increase in precipitation, temperature and humidity.

**Urban climate: general characteristics**

- higher temp (usually) than rural areas
- Vancouver characteristics: 17-27 degree Celcius temperature diff from urban to rural
- higher humidity: 2% increase in humidity in Berrard Inlet
- higher rainfall: 100m change in altitude, 100mm more rainfall, 10% increase in cloudiness, 1 inch rainfall
- Cold areas: Farrard river and valley
- Warm areas: airport, sky scraper dome making boundary of urban heat island

**Human activity as an impact on rural areas**

- *Anthropogenic heating*
  - Higher amount of anthropogenic heating (eg: cars, motorbikes etc.) release excess latent heat in the atmosphere contributing to an increase in temperatures
- *Pollutants*
  - **Greenhouse gases**-can encourage hydroscopic nuclei to form=the formation of clouds (cloud droplets condense onto the hydroscopic nuclei, become heavy=formation of rainfall??)
  - Eg: Ozone in Vancouver leading to a higher formation of hydroscopic nuclei
  - 75% more pollutants in Vancouver than rural, 200x for gaseous pollutions, 7x more gaseous particulates
  - Gaseous particulates/aerosels also can have a cooling/warming effect (insolation + radiation) also leading to higher temperatures in rural areas as well
  - Also increase in greenhouse gases concentration: CO2, CH4, ozone= closes the water vapour window-closing of the water vapour windows leads to a higher amount of gh gases being trapped (200nm wavelengths of gases are allowed to escape the water vapour window + this is closed
  - More scattering of shortwave radiation by dust
  - Vancouver experiences smog due to photochemical concentration
  - In summer, higher incidence of thicker cloud cover
- *Urban structures*
  - **Tall buildings**
  - Leading to eddying on building
  - deep narrow streets are calmer unless aligned with prevailing wind=canyon effect
  - Frictional drag created=building acts on the wind itself leading to a lower amount of wind + wind skims over the top
  - High to low pressure gradient created (low pressure typically where there is rural areas)
  - Less wind=less heat dispersal
  - In example of Vancouver: wind corridors are created=speeding up of wind (0.5 mph difference between Richmond and Vancouver-6.6mph and 7.1mph)



Airflow modified by a single building
Stream-lines of airflow around building
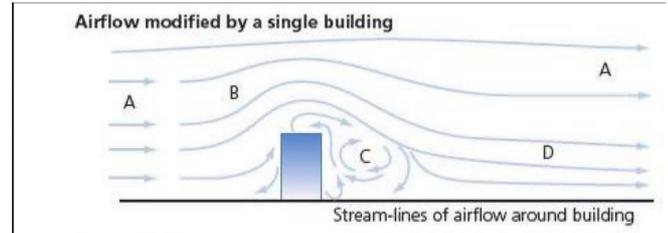
- **B**-building acts on wind by itself by friction
- **C**-wind eddying
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**Sewage**

- Sewage takes away overland flow/percolation
- High impermeable surface=more overland flow (that is taken away by sewage)
- Higher humidity
- Lack of moisture
- Leading to greater atmospheric instability and convection (more thunder)
- **Concrete/tarmac**
  - Darker tarmac surfaces lead to more heat being absorbed and retained
  - 5-10% tarmac and 20-30% grass
  - At night this is released-higher temperatures at night
  - Due to lack of vegetation, there is less evapotranspiration rates (typically excess heat is dispersed by winds or they leave via. the process of evapotranspiration)=excess heat is typically converted into latent heat leading to an increase in temperature
  - Combination of some of these factors=higher temperatures and cloud formation/higher rainfall
  - Higher amount of temperature forcing air to rice, cool adiabatically, condense etc.
  - Also tall buildings can also contribute to orographic rainfall (air hits building, forced to rise and cool adiabatically, condenses to a dew point etc.) or it is created by the process of convective uplift (creating a system of low pressure)
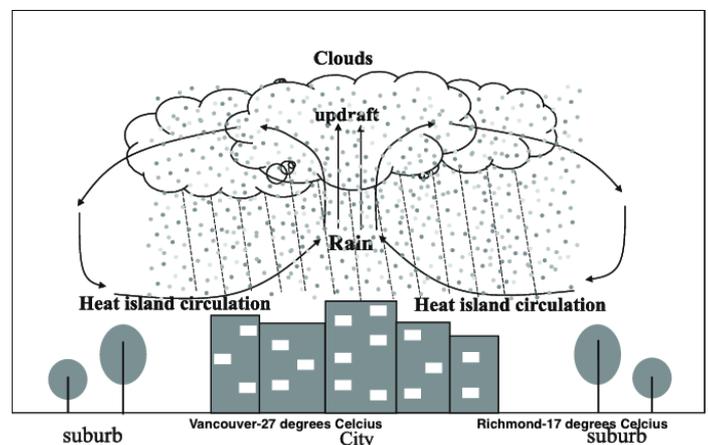


**1.5. With the aid of examples, evaluate the possible causes and atmospheric impacts of the enhanced**

**greenhouse effect. [15] 2018-O/N-11**

- **The human factors causing global warming:**
- **Enhanced green house effect (mainly resulting from increase in CO2, although there are other gases that can also increase/amplify the warming effect of CO2 as well):**
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  - Nitrous oxide has 300x warming than CO2 and lasts in the atmosphere for 114 years

**Impacts (unusual weather changes)**

- **La Nino**
  - Brings moist weather conditions in Otago and Canterbury (NZ)
- **El Nino→NZ**
  - Frequent winds in summer and southerlies + previously occurred in 1972-73 and 1982-83
- **Cyclones**
  - Greater instability in the atmosphere
  - Warming of atmosphere leads to ascending air and the creation of low pressure systems
    - Wind blows close to low pressure system + rises in atmosphere when they meet
    - Air rises=rise + cool adiabatically, condenses below dew point, forming clouds etc
    - Due to Coriolis effect low pressure system turn anticlockwise north the equator + clockwise south

of the equator
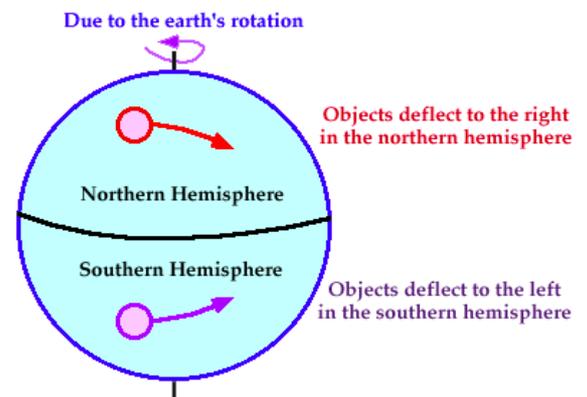


- 5% increase in cyclones in US from global warming
- **Precipitation**
  - Increase
    - More H2O=higher humidity
    - Rain formation
      - Air is forced to rise (via convection=warm air undercuts cold air)
      - Rises and cools via. adiabatic cooling
      - Condenses onto condensation nuclei
  - Decrease
    - Higher temperature, more water vapour evaporated, leading to droughts
- Temperature changes
  - 2020 7th hottests year in NZ reaching 31.8 degrees Celcius in Gisborne
  - Melting in Southern Alp
- Greater CH4 (methane) emissions from Sibereran increases temperatures

## 1.6. Explain the global latitudinal pattern of radiation. s20-12 [8]

General pattern: there is a deficit at the poles (incoming solar radiation exceeds outgoing terrestrial radiation) and an excess at the equator (outgoing terrestrial radiation exceeds incoming solar radiation).
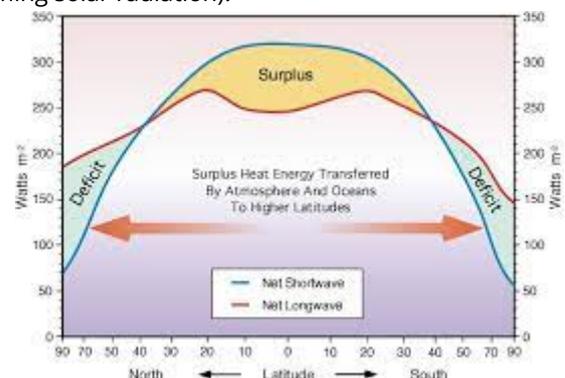
Fig 2.4 Latitude and insolation receipt (at the equinoxes)

- The angle of the sun is more overhead at the equator than at the poles + there is more insolation
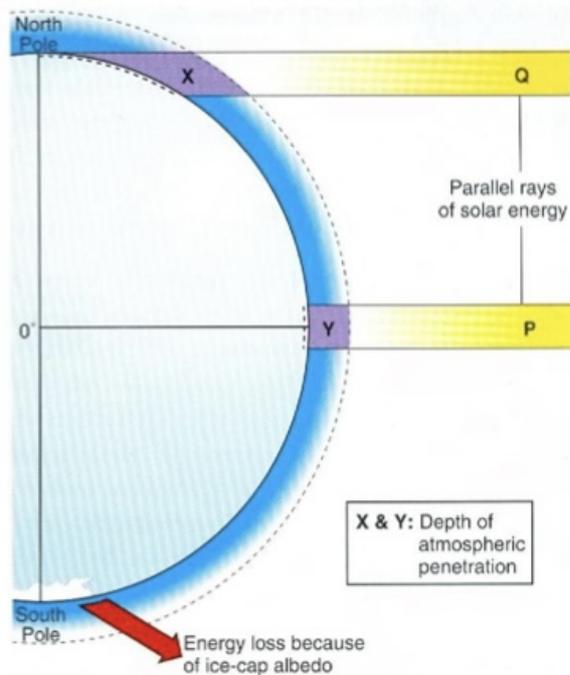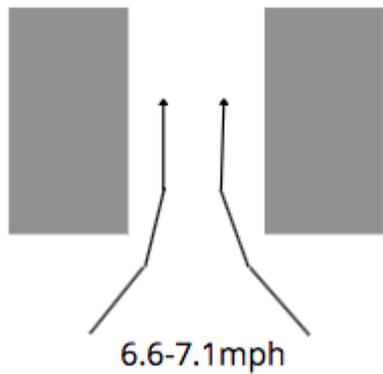  - At the poles, sun's rays are spread over a larger area (this is the opposite for equatorial environments)
    - Energy less concentrated at poles
    - Sun's insolation passes through higher atmosphere area at poles than equator
    - Also there is a higher amount of atmosphere (clouds, water vapour, dust and gases), increasing reflection and decreasing energy
- **Albedo amount**
  - Pole has a higher albedo effect because it is covered in a large amount of ice caps (ice albedo= 0.6-0.9)
  - Dark dense forest in equator absorbs solar energy and adds to surplus (forest albedo=0.15 )

*Describe and explain the extent to which the climate of a large urban area differs from that of the surrounding urban area. w17-11 [15]*
**General**: Urban areas tend to be higher than rural areas + tends to vary largely especially in precipitation, temperature etc due to the presence of urban structures (eg: tall buildings, sewers etc)

- **Urban heat islands formed by an urban boundary**
- Surfaces are heated, evapotranspiration takes place, leading to cumulus cloud and convectional rainfall patterns
- Low pressure caused by rising air ensures rising surface winds drawn in from the surrounding rural fringe (higher wind amounts to disperse excess heat)

- Can lead to **convectional uplift (that Vancouver buildings force)**
  - each 100m height gain results in 100mm precipitation increase., Vancouver is 10% cloudier than rural areas
  - Convective uplift leads to an increase in rainfall which is caused by the effect of greenhouse gases
  - Creates higher amount of condensation nuclei, storm cells intensify due to surface type + storm cells intensify
  - Greenhouse gases create dust/aerosels which can often reflect shortwave radiation and close the water vapour window (allows gases of 10-12 micrometers to escape)
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- **Material in urban areas are non reflective + absorbs heat as well**
  - Surface made of tarmac + concrete which has a large capacity + large amount of heat
  - Rural areas have surfaces that reflect more heat + absorb less (comparison of albedo: grass 10-25% and asphalt 5-10%)
- **Pollutants trap heat**=temperatures will be higher + dark coloured buildings trap heat
  - Build up of this creates an "island" of heat
  - Heat trapped on surfaces during the day will be released
  - Higher concentration of ozone + particulates trap long wave radiation going out
  - *Compared to rural areas with higher vegetation*
  - More evaporative cooling, shading in rural areas, cooler temperatures than in urban areas
  - Example (Richmond)→10 degrees Celcius cooler than CBD as a result of these factors
- **Lack of strong winds to disperse heat** and bring in cooler air
  - Tall buildings provide frictional drag on air movement
  - Drag creates turbulence and changes speed + direction of the wind
  - Windward side tends to have a higher pressure due to air pushing against it creating a pressure gradient=low pressure areas tall buildings scatter and reduce winds,
  - 'wind corridors' are created where two buildings cause the venturi effect (air forced into a smaller space speeds up).
  - Downtown winds are 6.6mph average in winter, and 7.1mph in Richmond – just south of CBD. In spring/summer difference is around 0.3mph.

6.6-7.1mph

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- Rural areas contain less tall buildings + less frictional drag
- More wind is available to disperse heat
- **Closely spaced buildings create friction** causing wind to skim over top and single buildings act on the wind on it's own



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A, B, D-wind acts on building itself
C-eddying
**More cloud cover and insolation in urban**

- Convection currents are more likely to be developed because of higher temperature (less dense air forced to rise, expand + cool via. adiabatic cooling then condensates and saturates, precipitation is formed)
- **Hydroscopic nuclei is larger than rural areas**, resulting from higher amounts of pollution (dust from industry from cars, dust, aerosols and gas)
  - Cloud cover can result from smog (in humid conditions from car engines)
  - Pollutants have a cooling and heating effect + can reduce heat/light
  - Can absorb heat
  - Creates temperature inversion
  - Fraser experiences smog during summer 75% of pollution is from vehicles, 7x number of particulates, 200x number of gaseous pollutants compared to rural areas.
- **Larger evapotranspiration rates in rural than urban areas**
  - 2x demand for latent heat to be used to evaporate surplus heat (little water at surface, rest of surplus heat will be used to increase the temperature)

- **Urban areas usually sewers and gutters available to remove surface water**, less latent heat needed to evaporate surface water and more used as sensible heat to warm atmosphere

# 2. Paper 1 - Hydrology

## 2.1. s21-11 "The intensity of precipitation is the most significant influence on a storm hydrograph." With the aid of examples, how far do you agree?

Edgecumbe Flooding
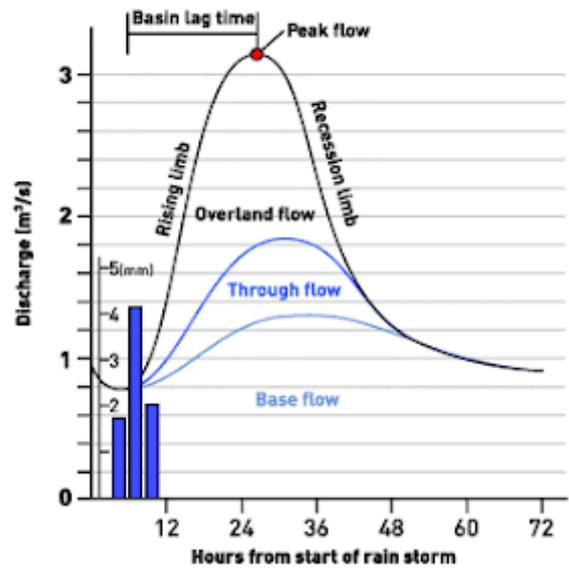


- **Precipitation**
  - High amount of precipitation leads to a high amount of discharge
  - 4500km discharge
  - High peak + steep runoff
  - High amount of **antecedent moisture**
    - Warm humid air crosses the North Island
    - Abnormally high rive lebels
    - Not enough water is stored in the soil
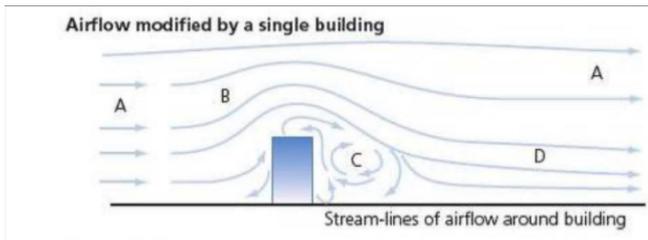    - Less infiltration

**Deforestation**

- 28% native, 2% other, 62% exotic
- Deforestation leads to a high amount of runoff
  - Trees typically store water in roots, intercept + infiltrate
  - Less water is absorbed
  - Retain less rainfall + more runoff
    - Leading to less permeability overall in soils

**Shape + size of drainage basin**→less impact than precipitation, ultimately dependent on land use and the amount of precipitation

- Edgecumbe typically more elongated

- However can be elongated but soils can be extremely permeable
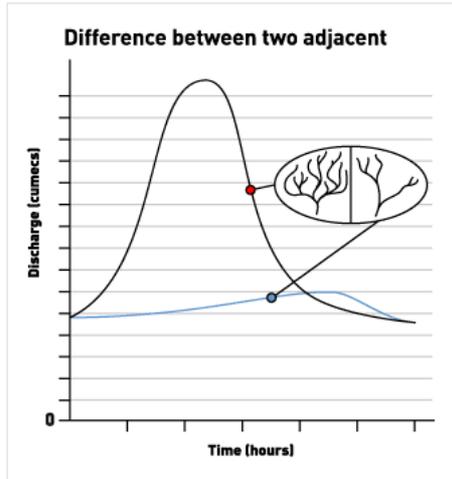


#### Land type + topography

- Lower course is more likely to flood (Rangitaiko river contains 8000km^2 of floodplains)
- Steeper at upper course but flatten out at Rangitaiki (steeper area is more prone to flooding)
- Reduces infiltration
- Flat land at the bottom is more likely to flood
- **Soil types/rock type/type of land-also another significant factor than other factors (but still has equal significance as deforestation)-can have steep land but permeable soils=less runoff, more percolation etc.**
  - Mainly low land, flat plains
  - Soils mainly low permeability=low percolation=low storage of water etc.
  - Has been built up by alluvial soils of sand, airfall ash deposits and peat formation in depressions
    - 8000km^2 of floodplains (in the lower course of river)→easier to flood than in UC

#### Discharge levels

- 750m^3/s high and 4500 km
  - High precipitation leads to runoff
  - Reduces infiltration
  - Low permeability of soils, river and not able to store + also easier to flood **especially for less permeable soils present in Rangitaki**
    - Contains alluvium + layers of ash
      - Sand more likely to be eroded than alluvium
      - Less water infiltration + high amount of water stored inside
        - Lower percolation
        - Low storage
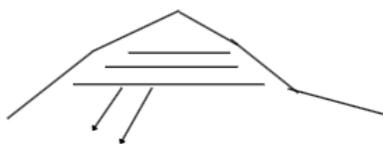


## 2.2. s19-13 With the aid of examples, discuss the view that deforestation has the greatest impact on catchment flows [15]

Deforestation-clearly one of the most significant factor influencing catchment flows but there are also other factors that can effect it as well→can reduce the permeability of soils + increase runoff (mainly for permemable soils), but for less permeable soils, less likely for permeability to be effected

- **Edgecumbe flooding**
  - Geography→8000 hectares of flat land/floodplains
    - Land type: 28% native, 2% other, 52% exotic
  - When did the (main) flood occur?? 15th April 6:30 pm
  - However, floods appear to be a regular occurrence in Edgecumbe→occurs almost early from 1945-2015 (the years where the most floods occurred 1950-1960 where there was 5-6 floods)
- **Deforestation impacting the Edgecumbe/Rangitaiki flood**
  - High amount of deforestation of exotic forests and native forests=higher amount of overland flow
    - less water stored/absorbed
  - Typically exotic forests intercept the water flow
    - Other land intercept and retain less rainfall=greater runoff + flood potential
- **Soil types/rock type/type of land-also another significant factor than other factors (but still has equal significance as deforestation)-can have steep land but permeable soils=less runoff, more percolation etc.**
  - Mainly low land, flat plains
  - Soils mainly low permeability=low percolation=low storage of water etc.
  - Has been built up by alluvial soils of sand, airfall ash deposits and peat formation in depressions
    - 8000km^2 of floodplains (in the lower course of river)→easier to flood than in UC
- **Geology of flood plains and stop banks**
  - Stratification→flood plains are layered
  - Silt, sand, gravel have a higher vulnerability to erosion in comparison to pumice which has a lowered vulnerability
  - filled in river forms tributaries and stop banks
- **Discharge levels**
  - Discharge levels are high in the river 750m^3/s especially near te teko
  - Also river is 4500 km
    - This will lead to a high amt of ppt in river=high runoff (especially because antecedent moisture is exceeded)
  - Also due to low permeability of soils, river is not able to store all of the runoff=more likely to flood
    - 920m^3/s exceeded 2004 flood by 20%
- **Topography**
  - Upper sections are fairly steep but downstream, Matahina dam with catchments flatten out onto Rangitaki plains which become flat and subject to flooding from Teteko to Matahina made outflow at Thorton

- Reduces amount of infiltration in the soil
- Also flat land at bottom, makes it more easier for surface water storages to be formed
  - Can also cause more thoughflow in soil as well
- **High antecedent moisture levels**
  - Warm humid air crossing north island above heavy rain
  - High rainfall caused abnormally high river levels

# 3. # Edgecumbe/Rangitaiki Flooding

## When did it occur

- 16th April, 6:30pm
  **Rangitaiki River flood details**
  - River is 4500km and 90% is below 10m
  - Stretches 155km near Rangitaiki near Napier + Taupo highway
  - Occured 16th April-6:30pm
- **Forecasting system**-a key tool that help with predicting flood and optimise Lake Matahina's operation to minimise downstream flood flow.
  - Accuracy improves as the flood event progresses and the model uses measured rainfall in the upper course
  - The main issue is that these forecasting systems were out of commission
    - Harder to predict outflows of the river and future outflows making it harder to evacuate
- **Increased precipitation**
  - As the flood progresses, there is more measurements in the upper course + the predictions for the flood become more accurate, going downstream to Lake Matahina
  - As a result of increased precipitation, this was seen as prudent + they should've lowered flood levels earlier
- **Accuracy of flood prediction**
  - The gauges at Matahina, Marapura and Lake Aniwha are out of commision
  - Harder to predict outflow
- **Poor communication**
  - Alerted 20 minutes before + there isn't enough time for them to escape
  - Trustpower doesn't match
- **Lowered by 72.6mRL**
  - If it was lowered to 72.6 mRL *constantly*, they could've avoided flooding

Evacuation plan-used to manage risks associated with flood events + provides indicative warning levels for Rangitaiki + Te Teko

- **Warning levels aren't adequate because they are too high** + based on outflow of the river
  - Rangitaiki, the lower course of the Hydro, McCracken and MacCleans river are evacuated at the overtopping of 7.85m^3/s

- Also they are considered as risky as they have detailed monitoring throughout the event + rapid evacuation if issues are spotted
  - Warnings issued to levees on Rangitaiki River, Reid Floodway + closures on Hydro, McCrakens and MacCleans road
  - #1 warning=2.6m of gauge, overtopping=7.48m (1000m^3/s or 1 in 300 years for a flood event)
    - Seen as prudent to provide for smaller than 100 year flood
    - Possibility following Reid + completion of other roadworks
  - Advice given 20m prior to collapse of floodwall at College Wall-not fast enough for evacuation
- **Communication issues**
  - Briefing states that they need to have access to the most accurate information at all times
  - System should be used for flood greater than a flow of 300 m^3/s + specific outflows to specific target levels should be given by the Council
    - Council delayed on giving a decision until 6pm on the 5th of April (should've asked to lower earlier as there is a significant amount of rainfall that had fallen)
  - Warning levels relative to stopbank for Te Teko + Edgecumbe
    - Te Teko (7.44m) and Edgecumbe (7.48m) height
      - 1m higher than curve

# 4. Paper 2 - Population

## 4.1. s21/20 4c "Increasing wealth puts excess pressure on food production." With the aid of examples, how far do you agree?

Partially agree. Increased wealth may lead to higher calorie intake + higher food production. However, technology such as HYVs can be easily adapted to counteract this via. Boserups' law. However, the opposite can be applied to places with high population growth and low food production.

- **Boserup**- the higher the wealth, the higher amount of technology will be developed to keep up with food shortages in hics (or in countries where brs and drs are slowly falling), the introduction of technology has allowed them to increase their wealth (also reduce food insecurity as well) and lead to a decrease in overpopulation this allows for technology to be well exploited→S curve
- **Malthus-a**s the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity-this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve

**General trend:**

- LIC/MIC increase in wealth, diets resemble those of HIC (especially with more meat + higher calories)
- Less land used for production of meat
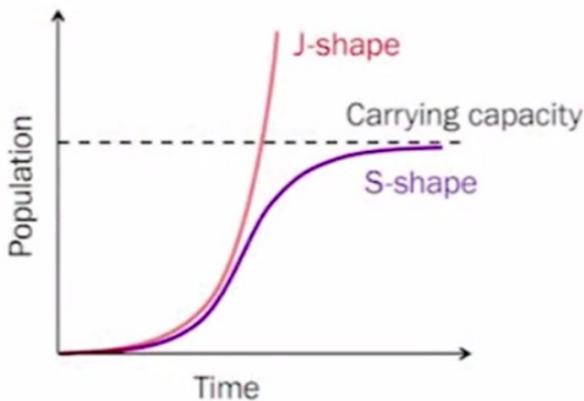


### Boserup's idea

- Higher wealth=more technology being developed=more efficient technology production=easing pressure
- (link green revolution to the idea of boserup)
- Also demonstrated by "S" curve

### Green Revolution

- Green Revolution allowing for the development of high technology
- Allowing GMO to make HYV + make them resistant to diseases
- For example, India⇒investing in agricultural inputs + higher yielding for maize/wheat crops⇒more food available, less food security, food can be delivered more easily , and food supply tripled as well
- Also Kenya⇒green revolution allow it to become biggest tea plant exporter
- Green Revolution also allows for monocultures that allow it to grow large amount of crops for smaller areas
- Commercialisation (change of land use)⇒can increase food production allowing people to produce more food + allowing to produce high value food for export + produce cash crops (this will lead to increase wealth of the country⇒increased wealth=more affordable food/higher incomes??=more food security + less pressure)
- GMO to produce it's own herbicide so other herbicides won't harm it + pests won't eat crops
- GMO food⇒can be modified to prod more=less land use

==Counter argument:== ==Increased wealth=higher calories + higher quantities of food + land is used for other activities==

### The cons of the green revolution

- High use of agricultural input/over irrigation can lead to more food shortages (because land can become waterlogged/stressed??) due to high usage of pesticide, herbicides and fertilisers⇒leading to more food shortages and more pressure on food production

- Change in land use (from subsistence to commercial)⇒smaller farms can often become more bankrupt, leading to rural unemployment and will lead to less food being produced by subsistence farmers and less people needed to employ farms⇒may lead to more pressure on subsistence farmers to produce more food??
- Monoculture lowering food security because there will be an increase in technology leading to rural unemployment

**Population growth leads to higher food quantities (for modern high calorie diets) needed to be produced**

- **eg: USA**
  - avg GDP: 21.43 trillion
  - 32.7 million population growth rate from 1900-2000
  - as a population grows, people start to eat more (and more food needs to be grown to keep up with this demand??)
  - currently consuming more than 3600 calories daily
  - partially due to growth of fast food industry (or companies) such as McDonalds
  - higher calorie "fast foods" are made to suit people (fast foods made for convenience for people who are unable to make time cooking for themselves??)
  - more options of food are provided for a higher population (the country can afford more money to provide these options and people are more wealthy and can afford more options)
  - will often lead to more pressure and costs on food industry who have to grow more crops etc. for these companies (spends 1.1 trillion on packaging, processing, retail etc. of food and the average american spends $6000 on food per year)
  - especially exporting costs to other countries as well ($135 trillion for agriculture industry)
  - also farming land may be used for other activities other than farming as the country grows in wealth (eg: housing)
  - food is more cheap (4 USD for breakfast sandwich)
  - average portion size increased overtime
- **1970's**
  - 2200 calories/person⇒people consumed less meat/higher calorie foods
  - because it was more affordable or available back then, also they consumed less fast food as well
  - people's diets had more vegetables
  - food was more expensive (breakfast cost $4.46)
  - less pressure on food industry (less options provided because it was harder for people to afford)
- ==This can be compared with a country/countries that has a lower calorie consumption (if you have time discuss both countries)-Malthus==
  - **eg: Africa**
    - avg. GDP: 1970
    - even though it has a high population growth, Africa can't afford enough money to be able to produce food for the whole population (or import enough food for their whole population) on a

wider scale (note: also shown in South Sudan, high growth in population + lower calorie consumption=more pressure on industry but lower growth in population, lower calorie consumption=less pressure on food industry)
  - tend to have more subsistence farming
- (to some extent), it *may* have less pressure on the commercial food production system because more people are producing more food to support themselves
- in comparison to HICs, they have a lower calorie consumption (2098 average)
- tend to produce more vegetables/grow more vegetables because it's more affordable (and easier to grow) *costs 0.14 for cabbage*
  - more lower calorie in comparison to HICs which have a more meat heavy diet
- also it's expensive to buy meat/animals for meat production⇒8600 rand for a cow
- eg: **South Sudan**
  - 1318 kilojoules (400 under minimum)
  - High rates of malnutrition means higher vulnerability to diseases (eg: HIV)
- **War and conflict:**
  - War has occurred constantly following the independence of South Sudan following assassination of their president in 2013-2015 between Nuer and Dinka tribes that were constantly broken
  - Can lead to overpopulation which is a result from war-overpopulation leads to **desertification and overgrazing of land**
    - High amounts of people using their land + small amount of land available (resulting from poor land laws and confiscations + conflict over land)
    - Leads to land erosion
  - Can usually inflate prices of food and reduces availability causing famine and unemployment (this can result from **unreliable transport**)
    - 5% roads accessible, remaining 95% is arable and usually muddied during winter
    - Double taxation and tolling→farmer's have reduce the amount of load delivered to urban areas and will have to increase prices in order to pay for transport fees
    - Also lack of urban-rural roads (some are bottlenecked due to conflict) so farmers unable to transport food or access agricultural inputs (eg: fertiliser) to properly optimise the amount of land
- **HIV/AIDs**=typically children are more vulnerable to this
  - 53/1000 death rate
  - 58 years old life expectancy leads to high IMR and high youthful population=overpopulation (people give birth to more children as insurance for high IMR-also because people rely on subsistence

farming, they typically need children as labour + as "pension" in old age)
  - leads to high IMR and high youthful population=overpopulation (people give birth to more children as insurance for high IMR-also because people rely on subsistence farming, they typically need children as labour + as "pension" in old age)
  - Also harder to access medicine (ART-Antiretroviral treatment) + high amount of productive workers needed to take up treatment
**Natural disasters:**
  - Flooding=leads to poisoning of water sources and spreading of diseases such as cholera
  - Early 2019-amyworm wiped out the amount of crops and reduced cereal needs
    **Refugee displacement (resulting from war)**
  - Found themselves displaced because of poorly enforced land laws
  - Continuous eviction due to military confiscations of land and refugees don't have a reliable land plot to plant crops- this becomes more of an issue as a majority of South Sudan relies on **subsistence farming**
    - 90% South Sudan rely on subsistence in order to supply food for themselves

**4.2. s20-22 4a For your case study of one country's policy , outline the difficulties that lead to the policy. [7]**

**Mao has a strong identification with the pronatal movement + slogans/propaganda such as "the more people. the stronger we are."**

- High BR 44/1000
- Population growth: 1.87% + by 1970 it reaches 2.6%
- Population reached 600m
- Death rate: 22/1000
- Life expectancy is low: 41 years
- 20m people dying of famines
- Relationship between population and resources couldn't be maintained (Malthus):
  - **A**s the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity-this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve
  - **Malthus-a**s the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity-this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve
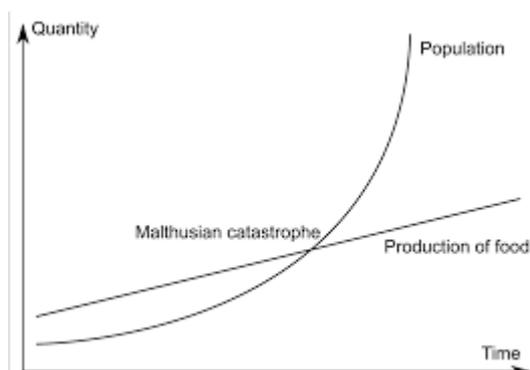
- **Difficulties**
  - Switch from **agricultural to steel production + inefficient food production**
    - Privately owned plots are forbidden, centrally planned
      - Issue: inefficient food production as people are unsure how to sort resources=starvation
      - Need to look after village + family (resulting from **high youthful population**=high costs for family)
        - High youthful population result from high IMR + children needed as insurance for high IMR
        - Working population bears brunt of caring
    - **Agriculture→steel industry change** takes up productive workers + makes it harder for people to produce a large amount of food for a village (more workers need to produce a higher amount of food)=>couple this w/ poverty + lack of access to inputs makes it harder to optimise land
      - Steel produced is weak leading to a decrease in wealth in the economy (result from malnutrition/hunger)

### 4.3. s20-22 4b For your case study of one of the country's population policy, explain the attempted solutions of these difficulties. [8]

Propaganda in 1960's put in place: strong identification w/ antinatalism→"late, sparse, few" by Mao

- Late marriage:
  - Men marry no earlier than 25 or 28 than rural areas
  - Longer spacing beween births + 4 year gap between each child
- Having more than one child carried a financial cost:
  - Hukou (which gave registration + privileges to families with free education, housing) that could be easily taken away (1978 Deng Xiao Ping Policy)
  - Unplanned pregnancies also could be terminated (1978 Deng Xiao Ping Policy)
  - Compensation fee was also paid: 30, 000 yuan
  - Overtime, leading to a change in societal values: children became seen as an economic burden to people (also, partially attributed to the famine where high BR lead to famine as well=high youthful

population may have been seen as a cause-for some people, as a reason for the difficulties as mentioned in 4a)
- "Barefoot" doctors put in place to distribute information about contraception + family planning
  - Introduction of contraception lowers birth rate + allows for people to make their own decisions about their family
    - People become more likely to use contraception to prevent births + allows for abortions

### 4.4. s20/22 For your case study of one country's policy: Evaluate the success of the country's population policy-4c

**Positive outcomes (overall success):**

- Declining from 2.2%
- 250 million births prevented since 1979
- Decrease in birth rate from 45 to 13
- Increase in GNP due to a **reduction in population to $18000**
  - *To an extent*, there's an increase in wages (less youthful population= job opportunities have increased, less youth taking up jobs)
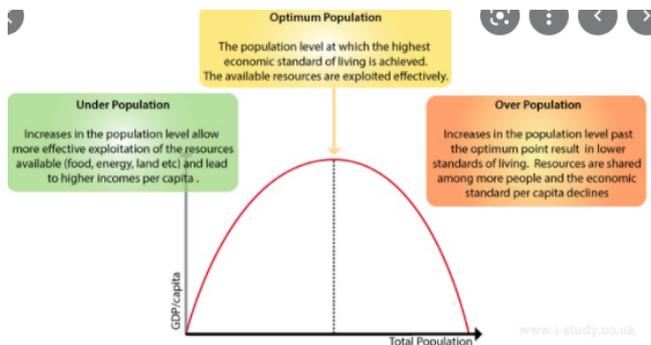
**Why it was easy to implement + why it was an *overall* success:**

- **Family planning**
  - People (especially women) can make their own decisions for themselves and are more likely to focus on their career
- **Greater equality for women**
  - More opportunities for women to gain knowledge
  - Gender-based abortions less common in urban areas
  - Literacy rates increased as there was more investment in children (especially girls in urban areas)
    - 51% in 1982 and 95% in 2018
- **Educational system in China is highly competitive**
  - Many urban families needed to invest in one child (tutoring, extracurriculars) to ensure they have the best opportunities in education + can return their gratitude in old age
- **High costs needed to take care of children**
  - Apartments were small (3.6m^2) and daily efforts needed to take care of children were already time-consuming and were also an economic burden
  - Children weren't needed to work
    **Shortcomings of this policy**
- **Skewed gender ratio**
  - 114 male: 100 female ratio
  - Less men marry women
  - Results from female infanticide
  - Females often forced into marrying against their own will
- **To counteract the decrease in population by the 2 child policy:**

- 2-3 children per family to encourage increasing (pronatal)
- People are questioning the enforcement of this policy given the demographic trend
- Girl only houses also enforced as well
- **Aging population**
  - Approaches stage 5 of the demographic transition model
  - Economic strain on the population
  - 0.59% growth rate of population
  - Rural populations are less lenient
  - GDP is declining (0.5-0.6%)

## 4.5. "The concept of optimum population is important in understanding population-resource relationships." With the aid of examples, how far do you agree?

Partially agree that optimum population is essential to population-resource relationships.



- **Boserup**- the higher the wealth, the higher amount of technology will be developed to keep up with food shortages in hics (or in countries where brs and drs are slowly falling), the introduction of technology has allowed them to increase their wealth (also reduce food insecurity as well) and lead to a decrease in overpopulation this allows for technology to be well exploited→S curve
- **Malthus**-as the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity- this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve
- **Optimum population:** The optimum population of an area where the number of people, when working with all available resources, will produce the highest standard of living / quality of life.
- **Underpopulation:** resources are under exploited and too few people are exploiting
- **Overpopulation:** too much people are exploiting resources and living standard is at the lowest
- **\*\*Carrying capacity:\*\***maximum population size a biological species can be sustained for a specific environment.

**Population-resource triangle:**

- Lower the population, lower development, less technology and resources produced
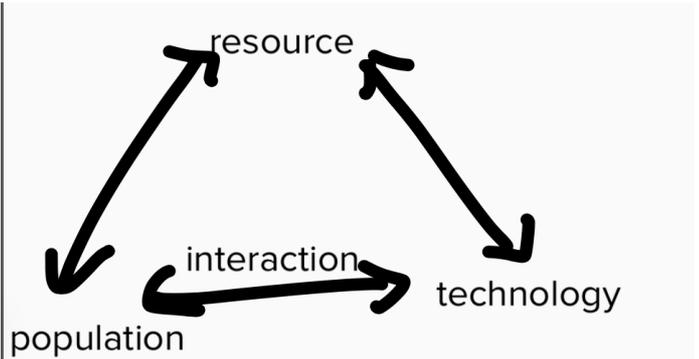


Model applied to places of conflict (can lead to J curve)-overpopulation leads to famine, pests death etc)
**South Sudan→Aligns with Malthus:**

- HIV/AIDs=typically children are more vulnerable to this
  - 53/1000 death rate
  - 58 years old life expectancy
  - leads to high IMR and high youthful population=overpopulation (people give birth to more children as insurance for high IMR-also because people rely on subsistence farming, they typically need children as labour + as "pension" in old age)
  - Also harder to access medicine (ART-Antiretroviral treatment) + high amount of workers needed to manage and takes up workers
- **Natural disasters:**
  - Flooding=leads to poisoning of water sources and spreading of diseases such as cholera
  - Early 2019-amyworm wiped out the amount of crops and reduced cereal needs
- **Refugee displacement (resulting from war)**
  - Found themselves displaced because of poorly enforced land laws
  - Continuous eviction due to military confiscations of land and refugees don't have a reliable land plot to plant crops- this becomes more of an issue as a majority of South Sudan relies on **subsistence farming**
    - 90% South Sudan rely on subsistence in order to supply food for themselves
- **War and conflict:**
  - War has occurred constantly following the independence of South Sudan following assassination of their president in 2013-2015 between Nuer and Dinka tribes that were constantly broken
  - Can lead to overpopulation which is a result from war-overpopulation leads to **desertification and overgrazing of land**
    - High amounts of people using their land + small amount of land available (resulting from poor land laws and confiscations + conflict over land)
    - Leads to land erosion
      \
  - Can usually inflate prices of food and reduces availability causing famine and unemployment (this

can result from **unreliable transport**)
- 5% roads accessible, remaining 95% is arable and usually muddied during winter
- Double taxation and tolling→farmer's have reduce the amount of load delivered to urban areas and will have to increase prices in order to pay for transport fees
- Also lack of urban-rural roads (some are bottlenecked due to conflict) so farmers unable to transport food or access agricultural inputs (eg: fertiliser) to properly optimise the amount of land
- *COVID-19 (good point, but don't include unless you're very familiar with this topic)*
  - Trading routes are bottlenecked especially between Ughanda and China
  - China is a major supplier for South Sudan but COVID 19 has lead to border closures, people may be forced to forgo food
  - **Consequences/Impacts**
    - Leading to famine + malnutrition which increases vulnerability to diseases (eg: HIV)
    - Malnutrition increases vulnerability to diseases
    - 4 million people (40%) are short of food in South Sudan
    - 70000 died from hunger/disease in the ivil war
    - Aid workers stopped WFP
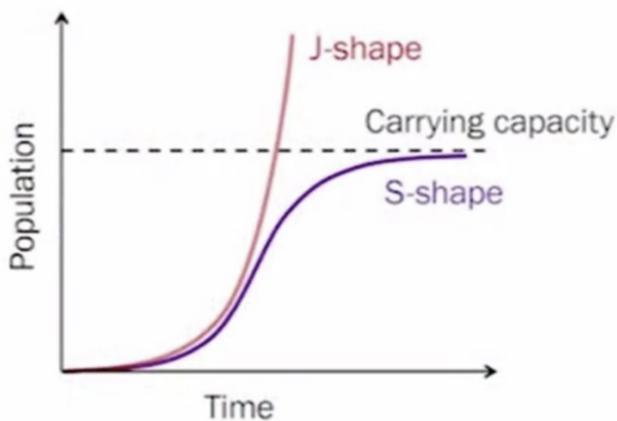


**Green Revolution-technology can improve + increase carrying capacity→aligns with Boserup**
- Green Revolution allowing for the development of high technology
  - Allows for the introduction of agricultural inputs
    - Following 2020 and latest treaty signing, war in South Sudan has slightly subsided + refugees are returning + farming=subsiding of war may allow for irrigation programs and allows for access to agricultural inputs (eventually)
      - Allows people to properly optimise land
- Allowing GMO to make HYV + make them resistant to **diseases + extreme temperatures**
  - India=cereal crops become less vulnerable to extreme temperatures
  - GMO food⇒can also be modified to prod more=less land use

- GMO to produce it's own herbicide so other herbicides won't harm it + pests won't eat crops
- More high yield crops means that it may become more easier to produce a large amount of food for a larger population=this means carrying capacity can become more larger
- For example, India⇒investing in agricultural inputs + higher yielding for maize/wheat crops⇒more food available, less food security, food can be delivered more easily , and food supply tripled as well
- Also Kenya⇒green revolution allow it to become biggest tea plant exporter
- Green Revolution also allows for monocultures that allow it to grow large amount of crops for smaller areas
- Commercialisation (change of land use)⇒can increase food production allowing people to produce more food + allowing to produce high value food for export + produce cash crops (this will lead to increase wealth of the country⇒increased wealth=more affordable food/higher incomes??=more food security + less pressure)→India is able to produce more food to serve it's 1.38b population

## 4.6. 4b Explain the role of constraints to sustaining population [8] s19/22

note trade barriers, pest, natural disasters etc. can reduce standards of living **

- **HDIs for Afghanistan and South Sudan**
  - 0.511 Afghanistan
  - 0.433 South Sudan
- **Afghanistan**
  - ever since 2001, Afghanistan has been stuck in a war torn state
  - following US invading Afghanistan and threw Taliban from power
  - RS soldiers and Afghan Armed Forces fighting over Taliban rule
- **South Sudan**
  - stuck in war torn state
  - many peace agreements have been broken (because of following conflict)
  - 2005 peace agreement signed leading to independence but was broken by Dinka and Nuer tribes
- **Acting as a limit by increasing death rates among young (or very old)=making it harder to maintain a normal amount of working population to exploit resources??**
  - Increased amount of deaths=less population=less people available to exploit resources=less wages??
  - War increases the amount of death rates in youth (families in Afghanistan are unable to get access to medical services→medicine for preventable diseases and nutrition for children due to war restricting access??)
  - **Afghanistan:** 18→20/1000

- 475/1000 BR for youth

**South Sudan**

- Increased death rate to youth: 77% deaths constitute to children under 5 (malaria, diarrhea, pneumonia)
- Lack of access to health or medical services for preventable diseases (due to war or conflict restricting access to certain routes/clinics selling or providing medicine) such as HIV
- Trade barriers (or limited access to market entry)⇒making it harder for certain areas of population to reach food source (or economic resources), also making it hard for people to access and harder for country to evenly distribute resources so it can properly exploit them??**
  - **People are unable to find (or own) land to use for agriculture in South Sudan**
    - Military often end up confiscating land from other people or residents (often leading to displacement?)
    - Displacement population also more vulnerable to face eviction
    - Majority of South Sudan rely on primary agriculture (wheat etc.) to boost their economy
  - **Poor access to road network hinder access to inputs (due to banditry)**
    - Also don't have access to agricultural input (fertiliser, herbicide etc.) and also don't have access to HYV
    - limited fertiliser can deplete soil and reduce potential yield
  - **Limited access to food (or food market) can reduce the standard of living**
    - method/technology (HYV, agricultural inputs) should be reinforced to help overcome these constraints
    - COVID can cause more of a barrier between China and Sudan (increased market prices and a decrease in market power)
    - Bottlenecked trading routes in 2017
- Pests and natural disasters⇒making it harder to maintain a high amount of food (or resources) for the population to ensure it is at "optimum"
  - Early 2020 locust swarms crossed into South Sudan
  - Can reduce the amount of crops for farming
  - May/June 2020 locust swarm may also reduce the amount of crops and may offset decreases in food security that occurred in 2018*
  - Flooding in early 2019, due to lack of irrigation (and inputs)⇒alot of plants experienced moisture stress=lead to wilting of crops (or loss of crops?)
  - **Unreliable access to land**
    - 1.5 million people in South Sudan are displaced
    - 2.2 million are refugees in neighbouring countries→they often move to neighbouring countries to get a better livelihood (get more access to resources etc.)
    - unreliable access to land due to a lack of legal regulations surrounding ownership make it harder to

farm and reduces production in farming
- **leads to continued eviction and displacement (limiting potential of farming in land)**
  - also leading to livestock being moved away and prevents them from using typical grazing patterns
  - Nuer, Dinka, Muer tribes cattle raid lead to a decrease in food product availability
- **How to solve this**
  - Introducing pesticides, herbicides, fertilisers to soil to prevent crop shortages??
  - WFP and Unicef are helping with food assistance by distributing food (or agricultural inputs??) to help with food
  - Refugees returning in 2018 are replanting crops to help with prevention of food crops??
    - However this might be prevented or offset by locust swarms?? and also natural disasters
    - Also, there are solutions of pesticide, herbicide etc. may lead to more unemployment or food shortages as there is less food being produced by subsistence farmers?? and also over irrigation can lead to water logging, salinisation and a decrease in crops produced
  - Population (or migration) control could be used (govt could provide more initiatives to develop agricultural inputs, infrastructure etc.) to ensure there are enough people inside Sudan to maintain optimum??
    - this could be hard as there are many people migrating out
    - hard to keep track because of war and also high death rates??

## 4.7. With the aid of examples, explain the issues of a youthful population. [8] s19-23

**High birth rate, death rate and IMR**

- BR in Ughanda=48/1000 in 2001
- **High infant mortality rate**
  - 91.3 in 2001
  - note: **IMR and high BR + DR are interlinked**, due to an increase in IMR and DR, people will give birth to more children for "insurance" (they often need children for support (especially in old age) and for labour especially as the majority of people in Ughanda rely on subsistence farming
  - high IMR is also resulting from a lack of medical services (and also DR in extension)⇒lack of medical services can lead to high IMR because there is a lack of nutrition for infants, medicine for preventing preventable diseases such as cholera
- Because there is a high birth rates, a lack of medicine to prevent childhood diseases there is a **high dependency rate of youths**
  - this means that there is a high amount of "unproductive" people, meaning that the working age often has to bear the brunt of taking care of youthful population

- need to produce enough for their large families + resources are often stretched between 10-13 children
  - **Leading to land fragmentation**
    - Small land for a large amount of crops to provide for large families
    - needing to divide crops between children
    - 122/km^2 to 55km^2 in 2020
- majority of Ughanda population are youthful dependents
  - 50% under 15, 113 dependency rate in 2001

## High education costs

- High youth population⇒need to pay for more costs for children to go to school
  - Primary school expected to grow from 3.3 million in 1991 to 7.2 million in 2021
- Also need expenditures to pay for teachers, material and equipment
  - This will cost 2 million kenya shillings (20000 USD)
- High costs for education=people are unable to earn enough money to send children to school=lack of education
  - Children grow up being uneducated about contraception or family planning and are unable to make their own decisions about their family (especially women)
    - Women won't focus on education + more likely to marry earlier
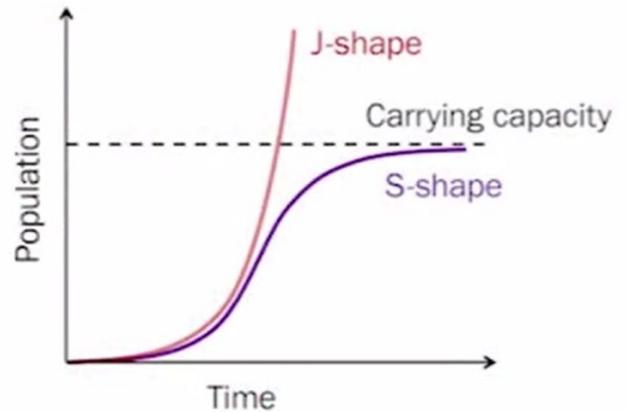
## Housing shortage

- Ughanda has an overgrowth of slums
  - 54% as of 2014 and has a 2.4 million housing deficit
- due to a high amount of population, the government can't keep up with housing (or there aren't enough houses being built for Ughanda's population)
  - also, Ughanda is a poor country and can't afford housing, sanitation, plumbing
  - high amounts of childhood diseases (eg: cholera)

## Insufficient jobs

- high BR⇒high amt of children needed for labour
- very few employment opportunities can be generated in the formal sector and limited opportunities of growth in the economy can increase problems of unemployment, underemployment, crime and rural-urban migration
- workforce expected to double from 1998 to 2021 (to reach 16.8 million)

## 4.8. s19/23-With the aid of examples, assess to the extent to which decreasing death rates are causing overpopulation.

## Boserup and Malthus theories



- **Boserup**- the higher the wealth, the higher amount of technology will be developed to keep up with food shortages in hics (or in countries where brs and drs are slowly falling), the introduction of technology has allowed them to increase their wealth (also reduce food insecurity as well) and lead to a decrease in overpopulation this allows for technology to be well exploited→S curve
- **Malthus**-as the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity-this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve
- Mathus theory is often more applicable to places that are often have low technology, where brs are high and drs are falling such as Afghanistan
- Note: this may vary between countries (LICs/HICs) and also overtime (if BRs start falling, wealth increases, technology and innovation is introduced)
- overpopulation->population exceeds birth rates 2 arguments are provided: decreasing death rate cause overpop and decreasing death rate doesn't cause -
- Argument #1: Decreasing death rates are a cause of overpopulation-
- **Afghanistan (relating to Malthus):**
  - death rates fall (and br still stays high, it could lead to an increase in population?) it's death rates are falling because there has been an improvement in sanitation and healthcare but due to war alot of people are still unable to access it (routes towards certain places providing healthcare have been bottlenecked)
- **Afghanistan DR**: 26.3/1000 (1971) to 6.3/1000 (2021)
- br still remains high: 33/1000
- **poverty**
  - poverty means that people are unable and are unaware of means that will allow them to properly exploit their resources or ensure they are producing enough resources to provide for themselves and others (especially for food)
  - also a low technology state, which means some resources are underexploited as well this is further

- amplified by the impact of war which has displaced many people
  - due to war, many people were displaced and alot of their belongings (they were often stolen off them), also alot of their wealth as well (it was also taken off them)
  - as a result, people are unable to afford education that will enable them to have better access to electricity, safe drinking water and sanitation ⇒76.8% is illiterate
  - 63.8% of people in poverty likely to access electricity, 40.3% safe drinking water, 2.8% sanitation also there is alot of food insecurity due to war (soldiers/conflict in Afghanistan tend to block/restrict areas that allow access to food markets)
  - **also road infrastructure has been ruined by war** (and has been poorly maintained since then)
  - ⇒impacting access to markets as well
  - ⇒constant displacement due to the war also means that there will be a lack of access for reliable land for subsistence farming (that people may need to rely on in order to support themselves)
  - 46.3% of people live in agriculture, 41% are in under employment ⇒esp. in places of poverty (mainly rural areas)-4 out of 5 people live in rural areas -
- **healthcare**⇒poor access to medicine for preventable diseases (especially diseases that children are at risk of)⇒
  - conflict often blocks road/access to roads that allow access to medicine or healthcare

  Counterargument: falling birth rates but in places with falling birth rates, this is not the case in HICs/MICs
- example: Morocco stage 3
  - life expectancy: 76 years
  - dr: 5.06/1000
  - progressed through stage 1 and stage 2 very quickly after gaining independence in 1956
  - stage 2 had a high fr: 6.8 and dr of: 13/1000
  - 1970's decline from 7.4 due to an improvement in status of women and contraception
- Reasons for improvement
  - women are more educated (aware of diseases and prevention, can make more decisions for themselves)=also, more education=less poverty, people are more able to afford basic living costs (electricity=99%, 50% safe drinking water, ,sanitation= 72%, literacy rates=97.7%)
  - can plan for the future (for their own families) →would rather focus on their careers or education and marry later →contraception lead to a overall/steady decrease by continued advances in medicine and public health →high food security GDP 120 billion
  - road infrastructure properly maintained, meaning people have access to food markets as well (not roadnecked by any conflict) ⇒if people wish to work in agriculture in morroco, they will have a reliable access to land so they can grow more food=also able to access agricultural inputs + able to access high amount of fertiliser⇒$16000 in GDP for agriculture

- **==*Green revolution also aids in the increase in distribution of food-this is also part of s18/22 4b (Explain the role of technology and innovation in increasing food production)*==**
- *Green Revolution*
  - 1960's increased use of technology and intense farming methods, higher fertilisation=higher plant growth
  - **Monocultures:** growth of a single area increase demand for population
  - eg: kenya->4th largest export in tea due to monoculture
  - **Green revolution allow for technology for more hyv varieties of crops and gmo** allowing for pesticide resistant plants?? (also more hybrid plants)
  - hyv variety=higher yield of crops, higher fertilisation of crops, leading to higher plant growth as well pesticide resistant plants=make it so pesticides don't harm them also can modify plant so it can produce it's own pesticide
  - *can also become disease or environmental resistant as well drones/other tech*
  - Massey uni uses drone in farming industry can help keep track of crops progress or growth can also keep track of ph in soil⇒ensure plants are growing under optimum conditions
  - **Also ICT controls processing or storage** (ensures food are kept in right conditions and don't spoil) preserving food + usage of refrigerated food (find example)
  - **Fast freezing of food or vegetable can reduce spillage of food** + ensures that more food isn't wasted and can be easily distributed to population use of waste or byproducts of animals worm pee used as fertiliser (from worm farms) for crops and ensure crops grow faster (or grow better)
  - manure also used as fertiliser from cows
  - **Other animal byproducts can be used as protein sources** and is essential to humans?? (providing another food source)
  - introduction of agricultural inputs or technology fertilisation/herbicides lead to higher plant growth stop weed/insects getting to crops
  - Example: *India-* increased investment in irrigation system and high yielding variety of rice has decreased foot shortage leads to an increase in monocultures

**4.9. w19-21 Evaluate the usefulness of the DTM in understanding changes in BR overtime.**

*note- was included in s21 paper as well*

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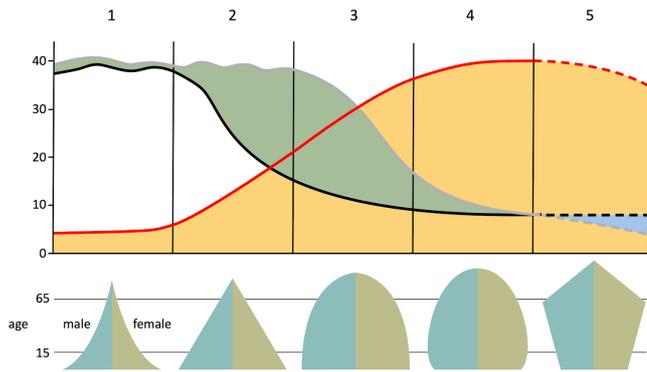


(*=may not be needed because they relate more to DR than BR)

- Eurocentric
  - based primarily of european countries (europe, japan, north america)
  - less historically accurate for other countries that have a strong population and time scale of transition
- **Doesn't take in account countries that don't have data available until mid 20th century**
- **The speed + timescale of transition may differ because of introduction of tech??**
  - some countries transition quicker because technology was introduced more quickly into certain regions
- **All industrialised countries experienced lower birth rates and better living standards (assumption)**
  - due to higher wealth
  - however, there were still other countries that didn't have tech introduced around the same time and it took them longer to transition as a result
  - also, there are still wealthy countries like Saudi Arabia but they still have a high BR (due to govt. policy and limited opportunity for parents to work) + they still have poor social beliefs as well
- Saudi Arabia
  - BR:18.51 per 1000, GDP: 739 billion USD, DR: 3.5/1000
  - **religion/values in Saudi Arabia still contribute to high birth rate**
  - they believe that women should stay home and look after children (still holding traditional belief due to religion) + women with high amounts of children is seen as a positive thing
    - aren't allowed to own their own cars
- **Doesn't take in account wars or conflicts***
  - **Afghanistan** (BR: 35→37/1000, DR 18→20/1000), 1 in 10 children still don't live past the age of 5
  - **countries appear "stuck" in stages due to war or conflict (Afghanistan)**
  - **Afghanistan has a high birth rate but a low death rate**=meaning the population is overall increasing
    - High death rate=more costs needed for medicine
    - High death rate results fom high birth rate (insurance)

- **has good access to sanitation/hygiene but poor social factors**
- **high illiteracy rate and limited education for women** (can't make own decisions etc.)
  - can't make own decisions about future or their own careers
  - less likely to marry later and focus on education
- **even though there is good access, it can be inaccessible to some regions** (especially if some regions have routes that have been bottle necked by war)
  - hard to access nutrition, medicine for diseases etc
  - this inaccessibility to some regions contribute to the high imr and br
  - high br results from high imr because people still need children for "insurance" (for labour, support in old age)
- **Doesn't take in pandemics***
  - COVID 19 and other pandemics severely impacted the DR and BR of many countries (also the growth rate as well)?
    - Has shown to have an overall decrease in BR and FR of many countries overall, shown that in early 2020 1/3 of women have decided to get pregnant later + have fewer children
    - Also the influenza pandemic in 1918 has shown to decrease fertility and birth rates (24/1000→20/1000 for influenza in US) + was predicted to be a 500,000→300,000 births in US from COVID using this data
    - This decrease in BR is temporary (for influenza)=after influenza there was an increase in BR again
      - For influenza, high amount of miscarriages occurred as well, following the decrease in BR there may have been an increase once the pandemic was over due to "insurance" (people gave birth to more children as a result of high DR as they still may have needed them for labour)
- Some countries may have had a bigger base population than others
  - bigger base population may make it harder to transition between stages
- Doesn't take in account reasons BR has changes (often assumes that economic growth=moves to another stage but not other social factors such as anti/pronatal policies, countries becoming wealthier and are able to afford healthcare and the change in status for women.)
  - **antinatal/pronatal policies may alter DTM stages**
  - for the one child policy, it lowered BR + accelerated?? China to late stage 4 (moving to stage 5)
  - *growth rate: 0.59, fr: 6.4 to 2.7 (1965-1979), 1.7 (2018), dr:*
  - **one child policy lead to china's population structure altering (now has a high elderly population)**
  - →27.5% projected to be 65+ or older
  - How the one child policy worked:

- Propaganda was also put in place to encourage people to have less children ("Late, sparse, few"-Mao)
- **Late marriage:**
  - Men marry no earlier than 25 or 28 than rural areas
  - Longer spacing beween births + 4 year gap between each child
- **Having more than one child carried a financial cost:**
  - Hukou (which gave registration + privileges to families with free education, housing) that could be easily taken away (1978 Deng Xiao Ping Policy)
  - Unplanned pregnancies also could be terminated (1978 Deng Xiao Ping Policy)
  - Compensation fee was also paid: 30, 000 yuan
  - Overtime, leading to a change in societal values: children became seen as an economic burden to people (also, partially attributed to the famine where high BR lead to famine as well=high youthful population may have been seen as a cause-for some people, as a reason for the difficulties as mentioned in 4a)
- **"Barefoot" doctors put in place to distribute information about contraception + family planning**
  - Introduction of contraception lowers birth rate + allows for people to make their own decisions about their family
    - People become more likely to use contraception to prevent births + allows for abortions
- **countries became wealthier (able to afford healthcare services, medicine etc.) [**link/similar reason?]**
  - more healthcare investment, leading to lower IMR rates (preventable diseases are easily prevented)
  - able to afford infant care for children (nutrition etc.)
  - able to afford resources for women wanting to take care of children
- ****Assuming only economic reasons cause DTM to change (industrial reasons)**
  - assuming that increased wealth and industrial changes lead to a decrease in birth rate without taking in account social factors (eg: women career goals)
  - example: NZ→early 1950's=women can vote in parliament + they become more educated
- **Women would rather focus on their careers (and marry later)=>Stage 3: Morroco**
  - they saw taking care of children as a time consuming and economic burden
  - they became more educated about contraception methods, family planning etc.
  - able to make their own decisions
  - aware about treatment for preventable diseases
  - this lead to a decline in BR
    - Morroco:
      - life expectancy: 76 years
      - dr: 5.06/1000
      - progressed through stage 1 and stage 2 very quickly after gaining independence in 1956

- stage 2 had a high fr: 6.8 and dr of: 13/1000
- 1970's decline from 7.4 due to an improvement in status of women and contraception
- Reasons for improvement
  - women are more educated (aware of diseases and prevention, can make more decisions for themselves)=also, more education=less poverty, people are more able to afford basic living costs (electricity=99%, 50% safe drinking water, ,sanitation= 72%, literacy rates=97.7%)
    - *note:can also use this stat for **countries becoming wealthier (able to afford healthcare services, medicine etc.)***
  - can plan for the future (for their own families) →would rather focus on their careers or education and marry later →contraception lead to a overall/steady decrease by continued advances in medicine and public health →high food security GDP 120 billion
  - road infrastructure properly maintained, meaning people have access to food markets as well (not roadnecked by any conflict) ⇒if people wish to work in agriculture in morroco, they will have a reliable access to land so they can grow more food=also able to access agricultural inputs + able to access high amount of fertiliser⇒$16000 in GDP for agriculture
- **Initially, there was no stage 5 in the DTM**
  - harder to predict what will happen to the overall population growth and the birth rate
  - unsure what will happen after country passed stage 4 and what will happen after the population becomes aging
- **No immigration**
  - immigration may heighten or increase growth/birth rate in some countries and an increase in certain age groups, changing the shape of the population pyramid depending on the source or destination area→which can mislead (or may not be portrayed in the DTM)
  - For countries that have a high immigration rate (eg NZ + Samoa), immigration has resulted in there being a high amount of working population
    - Leading to the creation of **ethnic enclaves** and in specific regions (eg: South Auckland) they are in Stage 3 of the DTM + Samoa has an indent of working population (slowly moving to stage 3) as people from working population moves out (aka **out migration**)
    - Out migration in *developing* countries alleviates issues of excess labour often due to high youth population, higher resource competition and poor national economic performance but in developed countries this accelerates aging population (example: China-refer to earlier) in the long run
      - Aging population=declining fertility, hgher LE

- EU member states (Romania, Bulgaria, Latvia and Lithuania) may face demographic + eco challenges (with low fertility + high out migration=decreases amount of working population)
- **Ethnic Enclaves**
  - places tend to be built around (or settled around places of high amounts of immigration)
  - built around places of high immigration
  - 78% samoan in urban 1945 and 83% in 1956 (during the first and second initial waves of migration)
  - *Families/close relatives*
    - better facilities of education=more ethnic enclaves
    - often tend to settle around the same area
    - tend to settle around places of high amounts of education and urbanisation??
  - *Places with familiar cultures*
    - High amounts of Pacific Island culture in south auckland: retail shops, market, church, commercial and medical
    - Events held between schools (Polyfest) celebrates these cultures
      - People are often more accepting towards samoans and other races because of festivals like these that celebrate samoan culture (attitude to foreigners)
    - Kidsfirst (hospital for youth) is adapted for the high youth population in ethnic enclaves
    - People feel more at home
    - Helping them settle in more easily with other people especially in places like **churches** which provide a strong platform for Samoan identity + welcomes them
      - Core to their values
      - Their culture is very catholic based??: 75% catholic
      - Often gives people an opportunity to meet new people as it is a new place of gathering
- International migrants take up 4.5% of population globally in developed regions
- Issues of migration + the DTM (and tracking it-which also impacts the accuracy of the DTM)
  - Majority of migration now is temporary + only permanent migration is recorded (so there is still some movement unaccounted for + some changes in population structure that still may not be accounted)
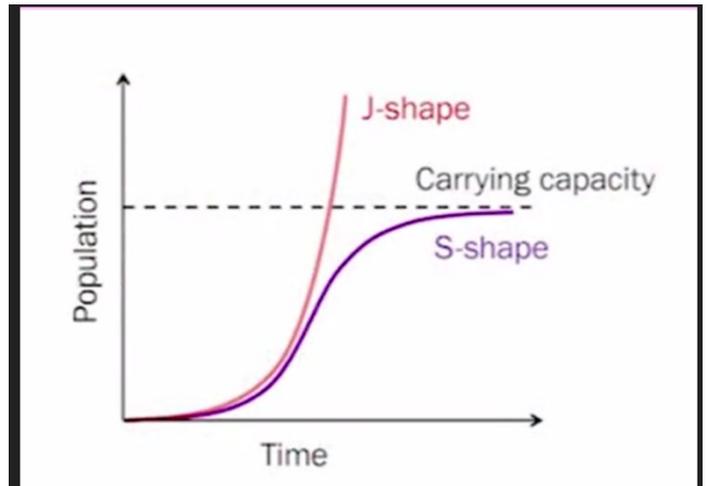
## 4.10. WIth the aid of examples, explain why fertility rates are low in some countries w21-19 [8]

- **Women's career goals**
  - Educated
  - Want to focus on the future and would rather marry later and focus on their careers instead of looking after children (because they see that as costly)
  - Aware of contraception and family
  - They see children as a time consuming economic burden (that take time outside their career?)
  - Example: **NZ-stage 4 population**
    - FR:1.72 per women
    - Literacy rate in NZ:99%
    - (from 2018) 54.9% female able to achieve UE v. 42.6% men
    - 1950's⇒women were given rights to vote, this meant they were more educated and were able to make more helpful decisions for themselves
    - Education of women (or in general)⇒people are more aware of the consequences of over population and of large families as well
- **Success of anti natal policy**
  - China one child policy lasted from 1970-2016 + the birth rate fell from 1.6 to 1.3
- About the **policy**:
  - the antinatal policy only allowed one child per family
  - **contraception was widely available** (also free and accessible as well) and "barefoot" doctors distributed it
    - more access to family planning or birth control
    - made it easier for people to abort (or prevent births) if they didn't want any children??
  - due to propaganda, people were less likely to have more children for labour and they were also seen as an economic burden especially in Shanghai and Beijing (1.6m3 living space), things such as cooking/cleaning are already seen as time consuming efforts people often worked full time and cost for a child was already expensive (191000 yuan)
    - Population fall from 16 million to 12 million
  - During the enforcement of the policy (and after the policy), people became used to living in smaller families
- **Social norms**
  - People became more used to having smaller families as a result of one child policy
    - Less need for children to be used for labour
  - Children are seen as more expensive (or as an economic burden) + time consuming especially for education or medical costs
    - Avg FR in NZ: 1.71 FR
    - 191000 Yuan in China for a child
      - Also high education costs for tutoring, extracurriculars etc.
  - whereas in LICs/other countries (or in stage 2 countries, people are still used to having large amounts of children):

- Afghanistan 20/1000 BR
- religion/culture in Afghanistan tend to encourage large amount of children
- women expected to take care children, nurture, stay at home as per traditional gender roles
- **Investment in healthcare**
  - Allowing for treatment of preventable diseases (esp childhood diseases), ensuring less people will die from easily preventable diseases vs. in LICS which will usually lead/have more deaths due to an increase in childhood deaths (eg: Sierra Leone: 4 in 10 children die from malaria and 77% of the population tend to die from diseases such as malaria, diarrhoea, measles which are all diseases that children are at high risk for)
  - Allow for proper nutrition of infants (when children are first given birth in hospitals, they are given milk etc.) + childcare for children
  - Leading to less DR and less IMR
  - This will lead to people giving birth to less children
  - eg: **NZ**
    - DR: 7 per 1000
    - IMR: 3.9/1000 births
    - Amount govt. spends on health: 20.5 billion
  - compare to **Sierra Leone** death rates:
    - 11.51 deaths per 1000 inhabitants
    - Govt. spends $524 million on healthcare
- **Low stable birth rate**
  - HICs tend to have more stable birth rates because there is less war, famine, disease etc. impacting birth rate
- **HICs are able to afford more money for medicine for preventable disease (link to investment in healthcare)**
  - eg: Afghanistan (currently in stage 2)
    - DR: 6.4/1000 in 2019 and 6.3 in 2020
    - still in war
    - FR still high: 4.47 per women
    - high/fluctuating birth rate due to conflict and poverty
    - people still have bigger families (some people still need children for agriculture work, for support in their old age or for their family)⇒linked to high IMR (previous point) + women still have poor social status (lack of education about family planning + they are unable to make their own decisions)
  - compared to NZ
    - DR: 370/100,000
    - FR: 1.72
    - BR 12.4/1000
    - birth rate is low due to the introduction of contraception + investment in healthcare (previous points)

==w19-22 *"Food shortages can always be overcome." With the aid of examples, how far do you agree?*==
Partially agree- food shortages can be overcome.
Malthus + Boserup and the J + S curves:

- **Boserup**- the higher the wealth, the higher amount of technology will be developed to keep up with food shortages in hics (or in countries where brs and drs are slowly falling), the introduction of technology has allowed them to increase their wealth (also reduce food insecurity as well) and lead to a decrease in overpopulation this allows for technology to be well exploited→S curve
- **Malthus**-as the population grows, the food production will not be able to keep up with the growth in the human population resulting in disease, famine, war and calamity-this conclusion was formed following after England become the first country to enter Stage 2 of DTM in industrial revolution→J curve



**South Sudan:**

- **War and conflict:**
  - War has occurred constantly following the independence of South Sudan following assassination of their president in 2013-2015 between Nuer and Dinka tribes that were constantly broken
  - Can lead to overpopulation which is a result from war-overpopulation leads to **desertification and overgrazing of land**
    - High amounts of people using their land + small amount of land available (resulting from poor land laws and confiscations + conflict over land)
    - Leads to land erosion
  - Can usually inflate prices of food and reduces availability causing famine and unemployment (this can result from **unreliable transport**)
    - 5% roads accessible, remaining 95% is arable and usually muddied during winter
    - Double taxation and tolling→farmer's have reduce the amount of load delivered to urban areas and will have to increase prices in order to pay for transport fees
    - Also lack of urban-rural roads (some are bottlenecked due to conflict) so farmers unable to transport food or access agricultural inputs (eg: fertiliser) to properly optimise the amount of land
- **HIV/AIDs**=typically children are more vulnerable to this
  - 53/1000 death rate

- 58 years old life expectancy leads to high IMR and high youthful population=overpopulation (people give birth to more children as insurance for high IMR-also because people rely on subsistence farming, they typically need children as labour + as "pension" in old age)
- leads to high IMR and high youthful population=overpopulation (people give birth to more children as insurance for high IMR-also because people rely on subsistence farming, they typically need children as labour + as "pension" in old age)
- Also harder to access medicine (ART-Antiretroviral treatment) + high amount of productive workers needed to take up treatment

**Natural disasters:**

- Flooding=leads to poisoning of water sources and spreading of diseases such as cholera
- Early 2019-amyworm wiped out the amount of crops and reduced cereal needs
  **Refugee displacement (resulting from war)**
- Found themselves displaced because of poorly enforced land laws
- Continuous eviction due to military confiscations of land and refugees don't have a reliable land plot to plant crops- this becomes more of an issue as a majority of South Sudan relies on **subsistence farming**
  - 90% South Sudan rely on subsistence in order to supply food for themselves

**Green Revolution (+ = pro, - = con→note, introduction of tech isn't always positive, introduction of tech could also increase the effect of shortages?):**

- Began in 1960s and increase the use of technology and intensified farming methods across the world
- **Smaller farms become more bankrupt [-]**
  - Increase in technology leads to rural unemployment
  - Especially in rural areas=less food produced by subsistence farmers and less people needed to employ farms
  - Technology also might be expensive for subsistence farmers as well
- **Monocultures**
  - Easily can be wiped out by one pest **[-]**
    - Lowers food security
  - Can increase availability of crop to a population **[+]**
- **Change in land uses** from subsistence of commercial **[+]**
  - More access to land and can also increase food production as well
  - Allows for people to product more high value for export and to produce cash crops
  - Kenya: became 4th largest exports for tea as a result of this change
- **Increase in technology: [+]**
  - Allow for the introduction of agricultural inputs that allows for the optimisation of land

- Example: India→investment in agrochemical and irrigation system and HYVs such as wheat and rice succeeded + increased cereal needs
- Allows for the **introduction of GMOs [+]**
  - Increase in technology enables people to produce HYV crops and hybrid seed varieties
  - Can also modify crops to become pest resistant and ensure these crops can produce pesticides
  - Made herbicide and pesticide resistant meaning that farmers are able to use pesticides without harming the plant
  - Can become resistant to disease and to harsh environmental conditions
  - India: resulting introduction of GMOs=>rice/wheat crops became less vulnerable to extreme temperatures in India, also fewer need for pesticides (long-term) for crops and also for maintenance (potentially decrease in money needed to be spent on crops?)

# 5. Paper 2 - Population, Migration and Settlement

**5.1. Assess the impact of rural-urban areas in one or more urban areas in LICs or MICs.- w18/22 [15]**

**General Pattern**

- 10m people from 1960-2001
- ne to se 4m 1960-2001 s to se
- follows a pattern of chain migration and distance decay (usually in short distances)
  **Sao Paulo**
- 65% **urban growth**
  - due to a high population and amt of migrants entering competition for space
  - high amount of population=more dense living in order to fit more housing in resulting in growth of favelas
  - also too little space=high amount of people=over population, poor living standards,
- Housing is **substandard**
  - In Sao Paulo corticos take up
    - 25% favela
    - 15% health problem: cholera is a major health problem
  - Also there is poor hygiene due to housing having a lack of sewage, running water, public services
  - High IMR 53/1000 + there is high IMF 7/1000
    - As a result health has deteriorated
- **High crime rates:**
  - high amount of gangs 900 thefts per day, 5500 murders, 360 bank robberies in 1998 highly unregulated so more possibility for robberies etc. people often partake in robberies in order to get neccesities illegally and also cheaply as well (eg: food/water)

- **High growth of work/cumulative causation**
  - Brazil has 70% of labour in Sao Paulo, 300 000 migrants per year, over 300 000 businesses , this attracts investment, more migrants and industry, promoting growth in other industries, sao paulo has pop over 24m
  - **Sao Paulo has a high GDP** resulting from mainly industry,
    - 744 million economically prosperous area
      - these areas are getting the best talent from work
      - meaning that in the urban NE there is a higher amount of jobs taken up
    **Urban NE economy: agriculture (not subsistence but commercial) will lead to an increase in jobs that have high demand especially because they may have been left behind ("gaps") as a result of chain migration, mainly for commercial agriculture and people fill in these gaps also industry (but this is not as significant as Sao Paulo)**
- **More working population and higher wages there is more migration of working pop** from rural ne to ne most of them are migrating for better pay and want to get out of the cycle of poverty
  - this is seen as "last chance"=>they have the mindset that life can't get any worse than what they have already experienced
- **Most may decide to take on more tertiary jobs after furthering their education in urban ne** (people decide to migrate to urban ne in order to further education to allow them to pursue better more high paying jobs in sao paulo)
  - Average wages in Rural NE: $4500 + UrbanNE$ :9000
  - **Higher pressure on education** (and other resources as well) **in rural NE due to the fact there is a high youthful population**
  - **Many people in rural NE, come to over to NE to increase education in order to ensure they have a better chance to get more higher paying degrees**
    - They may bring family as well through remittances and other factors as well
    - **Later on however, increase of workers in schools**=more money needs to be paid for the education cost for education 2000-10000 each year
      - Urban NE: 22% illiterate and there is 30.3% illiterate in rural areas
- **More traffic/pollution people move to urban areas**, leading to higher wages and more wealth and they **become become more able to afford public transport**
  - Higher amount of **public transport** use
    - More congestion and pollution in urban area (4 out of 10 people choose a bus as a form of transport)
  - Eventually, people may be able to afford private transport as well if they carry on working in these areas, leading to even more congestion
- **Residential segregation**- people may choose to live near the coast of NE and more richer people choose to live

away from state housing or favelas in Sao Paulo (which are located close to industry + near the path of pollution)
  - eg: people who are poorer cannot afford to live in high residential areas thus live in **state housing/favelas**
    - Due to the high amount of migration resulting from cumulative causation there is a high amount of people wanting to live in favelas, meaning that there is more competition for space in the favela + people are forced to live in smaller buildings with poorer conditions
    - It also becomes more costly to live in favelas as well (average cost: $700,000 and there is an average monthly income of 724.10$ R)
    - Because there is more competition for housing as well shanty town/favelas housing on side of mountains all around brazil often concentrated near affluent communities (easy access to work in the city) made of tin and cinderblock-prone to falling??
    - They have become so built up that it is hard to expand/develop favelas (and install new roading/transport) that are also not catered by govt black market and low living standards (resulting from competition for space)
    - 15% unemployment lead to under employment + 4m burden of people
  - **People who work in admin/clinical jobs or service sector jobs live in more high class residential areas** (such as Rio De Jainero which is located close to the coast and away from the path of pollution) depending on where each person/area is located
    - Depending on how much wages they have earned, there may be segregation within urban NE
    - There is already **segregation in NE (between rural and urban areas) as a result of migration**
      - People who are able to earn higher income at urban NE have higher education and have higher paying jobs + less families are involved in subsistence agriculture (also youth living in poverty is significant lower in non-agricultural urban places which is 15% but has fallen to 10% than agricultural families which is 47% in 2003 but has fallen over time to ~33%) meaning they are more able to afford money to live in urban NE

Extreme poverty in Brazil
Youth in poverty
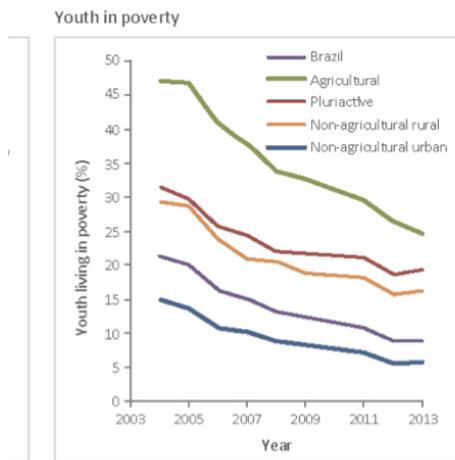
- In comparison to people in rural NE who mainly rely on subsistence farming (36% of subsistence farmers live in poverty and 67% of income in rural NE households really on subsistence agriculture)
- These people may eventually become able to live in Sao Paulo and *maybe* (rare) live in Rio

## 5.2. 5c Assess to the extent at which counterurbanisation impacts the structure of settlements (uses Auckland→Clevedon-counter urbanisation) [15] w20-21

Counterurbanisation doesn't impact the structure of settlements highly (in the case of Akl→Clevedon) as the movement out of Auckland is slow as the government is not willing to invest a high amount of money investing in transport + there are more significant factors influencing the structure of Auckland such as multiple nuclei, functional zones etc.
Demographics/socio economic characteristics compared to Clevedon

- Socio economic characteristics
  - Population
    - Totals: 2583 clevedon, 1 million Auckland
    - Household composition: Clevedon, 70.9% occupied in private, 62% households in family trust
  - Wages
    - Higher wages in clevedon $27600 and auckland$ 29600, Clevedon tends to have a higher wage=more people want to move out
- Aged population
  - 11.5% Auckland, 12.5% Clevedon
  - Auckland has slightly less aging population
- Not too much of a change in urban settlement structure considering that the growth of clevedon is slow
  - only 2583 people live in clevedon, 5.5% increase from the previous census (this is a slow growth)

- Why is there slow growth
  - Government is not willing to invest a high amount of money into investing in transport (262 million needed for investing) and other facilities in Clevedon

### Bid Rent Theory

- Basic theory: distance to cbd is dependent on how much people are willing to pay
  - Urban land uses have different demands thus attract different competition
  - General trend: financial areas tend to be closer to the cbd (banking), retailing and industry tend to be 2nd and 3rd away from cbd, housing is the furtherest
  - Reason for trends: desirability to be close to cbd has decreased by housing buyers because of high cost (so they outbid)
  - This is because cost for cbd settlement is high and it is costly to rent in cbd esp. for apartment
  - Whereas industry: they need flat land for industry (to establish factories etc)
  - Banks, commercial, etc. are willing to pay the most to rent in the cbd (eg: ANZ is located in cbd)→high rise building is needed to maximise land and locate in the periphery in newmarket and some high order sectors willing to pay a high price (to ensure highest growth)
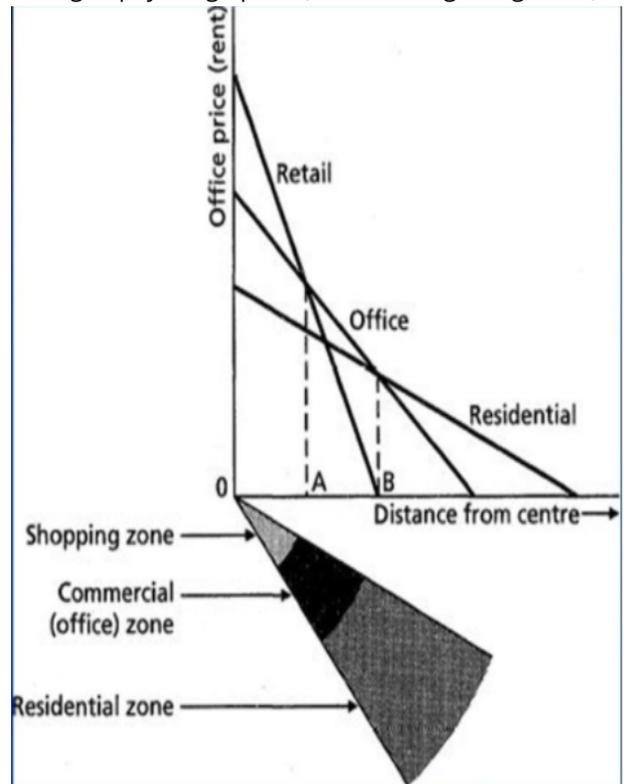


- Sector model
  - Most people have access to cbd
  - Industry follow most attractive
  - Low class forced in less attractive areas and path pollution blown (link to housing market)
  - Clevedon
    - reurbanised area located outside commuter zone

- Growth of services occurring as a result of people migrating outside of Auckland (more customers)
  - **Onehaunga**
    - unable to afford statehousing and are forced in pollution blown areas where industry work
  - **Remuera/Mt Eden**
    - high class residential away from state housing
    - people with high incomes can afford
    - resulting in residential segregation
- **Functional Zones**
  - Remuera/Mt Eden tend to be located away from industrial areas, away from pollution
    - Typically are high cost settlement areas near coastal/sea areas
    - Leads to residential segregation: only people with high earning jobs such as doctors or engineers usually live in these areas whereas people living in onehaunga or rosebank usually have more lower paying jobs in industry (leading to the creation of state housing)
  - Commercial activities want to be in cbd from accessibility
  - Certain activities group together and benefit from cohesion:
    - **retail, commercial and industry**⇒industry can produce materials for commercial,
    - Also they can get more **business, retail and commercial** together=more customers visiting shops=more money
      - Example: Sylvia Park in Mt Wellington (clothing stores-H&M, cinemas-Hoyts, retail stores such as Warehouse are grouped together)
  - Cost: warehousing=large cheap sites and low rent areas: second hand clothing shops and furniture shops
  - State housing is provided in **onehaunga and rosebank** for people who are unable to afford expensive housing
    - often acting as a "buffer" between industrial and residential functional zone
    - often in the path of pollution

  **Multiple nuclei**
- **What it is**
  - Low class housing around industry: state class housing surrounds onehaunga/otahuhu, it's easier for people working in industry to go to work
  - Housing tends to settle around new nuclei-eg: sylvia park since it is located in centre, many houses settle around mt wellington or howick/botany, many of houses settle around botany town centre
  - Higher class avoid industrial land
- **Examples in Auckland:**
  - **Manukau City**
    - Acting as a secondary growth that was established when the government was developing Auckland
    - Admin commercial/industrial growth area
    - Used to reduce congestion within the cbd
  - **Albany Shore**

- Establishing industry
- North Shore contain 50% of employees
- Industrial area was established because there was flat land and agglomeration
- There was also good transport networks
- **Queen Street**
  - Located in CBD
  - Queen street established as centre due to historical factors
    - Earlier on, there was a tramway established at Queen Street at 1901
    - This was eventually demolished for Britomart Transport hub
    - The establishment of this tramway also allowed for the establishment of Epsom (another nuclei) as an urban area-previously, it was a rural area
      - Epsom also is established as a place of development (it has school's such as Epsom Girl's Grammar, restaurants, shops etc)
  - Even now, it is still established as a centre of development + it has restaurants, shops etc
- **Viaduct**
  - Established as a centre of Auckland via. gentrification
    - reason: America's Cup + needed a venue to establish to cope with large amount of population for America's Cup
  - Now part of the centre of the city + contains services such as restaurants etc
- **The housing market in Auckland (Akl)**
  - Housing prices in Akl are high ~$1,000,000 (due to the housing crisis and shortage of housing in auckland for the growing population)
  - Less people want to settle in Akl because they are no longer able to afford it
  - Also people want to move to other places outside of auckland with cheaper prices⇒may be liked to counter urbanisation (people moving out from clevedon)
  - People might want to move away from CBD because it's more expensive and want to move to suburbs

  **Hoyts model**
- **What it is**
- **This model is based off the fact that concentric development sectors can afford the best routes for the delivery of supply**
- Modification of concentric development

**Examples:**

- **Albany**
  - Originally industry but change to commercial zone
  - Flat land, agglomeration (there were other industries established + they wanted to cluster that can attract a large amount of customers) + there were also other factors that came into play

- Otahuhu
  - Is an industry zone (partially)
  - also Britomart transport hub allows for transport between Otahuhu + other parts of Auckland
- Onehaunga or Rosebank
  - established near northwest motorway
  - providing railway to otahuhu train station
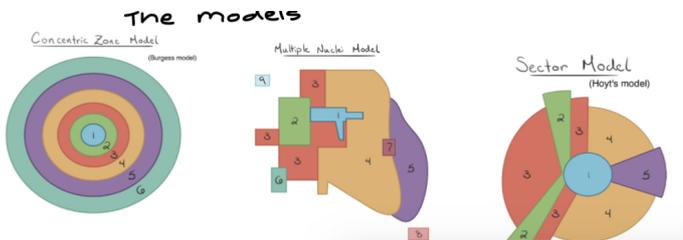


**5.3. s18/21 With the aid of examples, assess to the extent which push factors are more important than pull factors.**

Example(s): Samoa→NZ international migration
Overall: both push and pull are inextricably linked to each other but the reaction between each other is complex but overall pull factors are typically seen as more significant and push factors.

**General characteristics character, scale, pattern of the migration-this is also an answer for w19/23 (Describe the character, scale and pattern for one pattern of one international migration stream[8]):**

**Samoa to NZ** migration stream (voluntary)
*character [C] , scale [S] , pattern [P]*
Demographics
Approximately 1,100 ever since 2002 was let into NZ but due to COVID this amount may have decreased (there has been an overall decrease by 46% in migrant amounts of non NZers migrating to NZ) *[S]*
**Employment/skill set**

- During the first 2 waves (mainly unskilled) *[C]*
  - 1-2% took up tertiary/skilled worker
  - 55% 1945, incr. by 7,4% in 2nd wave roughly 2956
- 2020-2021
  - **now** 12% take up tertiary
  - roughly 20% take up labourers (which includes manufacturing + construction jobs)
- Single *[C]*
  - 58% single
    - Came to nz and often settled down with family
  - 716 samoan in nz and were often between the ages of 16-65 years old
  - 486 never married
  - **however**, during post war people found more time to marry and settle down especially in ethnic enclaves leading to an increase in married people (~roughly 4000:2000 ratio)
- Who the migrants were/currently are *[C]*

- Samoans
- The *initial* waves came over first in the 1945 and second wave in ~1960's *[P]*
  - NZ needed jobs for industry that European NZer's did not need
  - Advertised NZ as a place with alot of employment
- people initially came over for work
- pattern was mainly chain migration and still carries on now in 2020 *[P]*
- Working age *[C]*
  - 14% were under 14 (most likely came with family)
  - 60% were working age 16-65 years old (typically were sent over by family to help with remittances etc etc)
- Came mainly by boat *[C]*
  - airplanes (during 1960's was more expensive than boat)
  - 36% travelled by plane majority travelling by boat
  - many people came from agriculture work
  - not much people working in tert. could pay for airplane or more faster and costly forms of transport at the time
- Remittances *[C]*
  - Average amount paid for remittances: 400 for samoan, 370 for european migrant
  - Often paid for passage fees
  - Ensuring people had a guaranteed job
- Passage costs (how much was typically paid each year for travelling) [C]
  - boat a more popular form of transport
  - 9000:2700 in 1956
  - 0.8 1000: 2.6 1000 by boat in 1947
- Migration declined in 1953 (263 decline) + decline in permanent residency [C]
  - Dawn Raids occurred
    - Samoans seen as an economic burden + were taking up economic opportunities
    - As a result police often went into Samoan's houses and evicted them
      - Shipped over to Easter Island
    - Also permanent residency became harder for Samoan's to apply for: the processes became more lengthy + complicated
    - Despite this, there were still a lot of people who applied for holiday visas then became self settled

Push + pull factors [Key: - →push, + → pull]

- **Employment [-]**
  - Majority of employment dependent on Sawadaki steel + 1 million people lost their jobs as a result
  - Employment opportunities in NZ are typically perceived as more stable and opportune
    - Samoa wages= $24000 NZ wages = 42000$
    - overtime employment has decreased in recent times because of COVID
  - People who want to go into more skilled jobs (eg:Tertiary-which 19% of Samoans do)-68% find that

wages in nz for skilled jobs pay more better than jobs in samoa

- Issue in samoa, there is a high demand for skilled jobs, but most work in subsistence (which pays better)=lower wages for samoans who work in tertiary sector
  - 60% of migrants working in tertiary sector in NZ said their wages matched their skillset
\

### Government benefits [+]

- RSE Benefit allows NZers to come to NZ for up to 7 months to work in horticulture + viticulture sectors
  - Contributed 1 million back to the economy
  - Average 3500 workers
- Samoan quota
  - Minimum requirements for this benefit: need to be aged 18-45, have fluency in english and a job offer that pays them enough to live in nz
  - Can gain residency visa under this benefit
  - Also work visa allows samoans (and other migrants) to stay in nz if they fit labour requirements that can fill in jobs that have high demand in nz (eg: labourers-20% of samoans take up this role)

### Ethnic Enclaves (chain migration) [+]
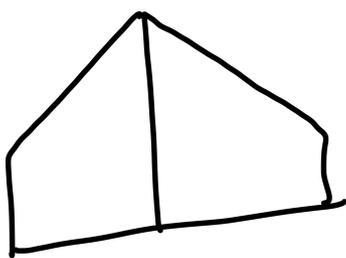


-
- Have a high youth population (high amount of marriages occur when people come to NZ) + ethnic enclaves are in Stage 3 of the DTM
- Places tend to be built around (or settled around places of high amounts of immigration)
- Built around places of high immigration
- 78% Samoan in urban areas in 1945 and 83% in 1956 (during the first and second initial waves of migration)
- *Families/close relatives*
  - Better facilities of education=more ethnic enclaves
  - Often tend to settle around the same area
  - Tend to settle around places of high amounts of education and urbanisation
- *Places with familiar cultures*
  - High amounts of Pacific Island culture in south auckland: retail shops, market, church, commercial and medical
  - Events held between schools (Polyfest) celebrates these cultures
    - People are often more accepting towards samoans and other races because of festivals like

these that celebrate samoan culture (attitude to foreigners)
- Kidsfirst (hospital for youth) is adapted for the high youth population in ethnic enclaves
- People feel more at home
- Helping them settle in more easily with other people especially in places like **churches** which provide a strong platform for Samoan identity + welcomes them
  - Core to their values
  - Their culture is very catholic based??: 75% catholic
  - Often gives people an opportunity to meet new people as it is a new place of gathering

**Education** is highly disorganised + only compulsory for people under 14 years old [-]

- English mainly consumed informally, not academically, impacting people's ability to come to NZ to get better jobs (unable to use English in a formal setting=a requirement for jobs in NZ) [+]
- NZ has a better education + the average age for people who want education in NZ is 16 years old whereas NZ average age for employment is 14 years old
- **Also unis in Samoa vs. unis in NZ: NZ has 10 unis whereas Samoa has 4 unis (SNU, Agricultural Uni etc.)=>NZ unis provide better opportunities + higher qualifications/pathways for people meaning they can pursue higher jobs with better salaries especially in tertiary industries

### Economy:

- NZ Economy
  - 71% services, Manufacturing 12.2% and Primary 7.6%
  - 2000→2007 economy expanded
  - Majority of economy dependent on services + less prone to natural disasters (this has changed because of COVID) where services have had to be closed down especially during lockdown in 2020 and 2021
- Samoa
  - 90% dependent on remittances, 65% agriculture, 29% services, 300m tourism
  - Taro blight 2014 leading to a 1 million dollar loss
  - Still vulnerable to **droughts + other natural disasters** [-]
    - Cyclone Evan 2019 flooding impacted transport and agriculture
    - Tsunami destroyed 25% of hotels near coasts
- **Remittances**
  - Remittances often seen as a good sign of wealth and wages [+]
  - Can help with paying travel fares to help people travel across in the future
    - People encouraged to come across to nz in order to get higher wages + support their own families
      - Remittances can help with starting up businesses, increasing investment in education
        - Increased reliability in remittances means that Samoa's economy may become more

vulnerable to recessions overseas (eg: NZ)
- As of recent, **remittances have shown to decrease especially because of COVID** + the current recession NZ is going through (may discourage people to move over)
  - 20% decline of remittances predicted by WHO from world growth
  - Businesses often struggle to stay afloat in pandemic and =decreased employment (they cut down on workers to cut down on employment and stay afloat)
  - 572 billion decline from 2020

## 5.4. w19/22-Explain migration occurs in many urban areas. [8]

- **Residential segregation** define→segregation occuring due to socio economic factors (eg: race/ethnicity, economy) etc.
- **Social segregation**
  - **Ethnic enclaves**
    - People tend to want to settle in areas close to family following migration into nz
    - More familiar with certain cultures, helping assimilate specific culture in specific areas
    - South Auckland. for Pacific Islanders, Asians in Howick, South Africans on shore
    - Chinese ethic enclaves
      - There are restaurants/stores for other cultures as well
        - Chinese food restaurant + Chinese stores (Tai Ping store in Howick/Botany, also there is a sudden upgrowth of milk tea stores)
      - Easier access to ethnic foods
        - Close to education centres + good education standards (aka Elim Christian College, Botany downs Primary)
      - People tend to stay closer with people with shared language eg: samoan churches, also some chinese churches (Pakuranga Church)
      - Churches and also result of ethnic enclaves helped people settle down in specific areas
      - Also helps with people assimilating with culture
  - **Family status**
    - **Young single adults live in flats**, want to live life in city, easier access to universities (eg: Auckland Uni)
      - easier access to jobs/working place and admin in city

- **Couples live in inner city suburbs such as NewMarket** which allows them to settle down and raise family (link to enclaves)
- This leads to a **huge boom in apartment blocks being built**
  - Auckland City Council changes zoning and allowing old office to be demolished
  - Easier for people who are single (typically uni students) to live closer to uni (Auckland Uni) if they can afford to
  - There used to be train station of queen street but immediately demolished and replaced with Britomart transport hub in core of city
  - Also for one child/small families to live close to work to avoid congestion
  - However, these areas tend to be expensive (1 m average house cost in Auckland).
- **Urban planning/functional zonation**
  - **Rezoning**
    - Also some of the previous areas such as Otahuhu used for industry have been rezoned
    - Newmarket→desirable for high class more accessible for transport and cost
      - Has new cinemas, supermarkets, malls
    - People have settled around new market in order to have access to these services
    - Also train station to Britomart allows for access to different areas as well
  - **Housing types**
    - Houses of similar fashion built in similar areas
    - Bungalows, villas and apartments in inner city and state housing is on the outside of city
- **Economic segregation**
  - Industry/jobs
    - People living in high class residential areas especially Remuera/Epsom tend to be located away from industrial and **state housing areas**
      - State housing is typically where poorer people live
      - It acts as a buffer between areas
      - Examples: Onehaunga/Otahuhu
    - People typically live near these areas because they can afford it (typically doctors, lawyers etc.-30% of population are in admin/professional jobs such as managers or doctors)
    - Highest incomes can purchase in most attractive locations→eg: Remuera/Orakei costs on average 1 million for a house
      - These are typically located near the coast or sea areas

# CAIE AS LEVEL
## Geography (9696)