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# **GEOGRAPHY STUDY NOTES**

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# Topic 1: Changing Population

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# Syllabus Link

## IB Geography Notes Higher Level

Geographic inquiry	Geographic knowledge and understanding
<p><b>1. Population and economic development patterns</b> Suggested teaching time 7–8 hours</p>	
<p>How population varies between <b>places</b></p>	<p>Physical and human factors affecting population distribution at the global scale Global patterns and classification of economic development:</p> <ul style="list-style-type: none"> <li>• <a href="#">low-income countries</a></li> <li>• <a href="#">middle-income countries and emerging economies</a></li> <li>• <a href="#">high-income countries</a></li> </ul> <p>Population distribution and economic development at the national scale, including voluntary internal migration, core-periphery patterns and megacity growth</p> <ul style="list-style-type: none"> <li>• <i>Two detailed and contrasting examples of uneven population distribution</i> <b>Synthesis, evaluation and skills opportunities</b></li> </ul> <ul style="list-style-type: none"> <li>• <a href="#">China</a></li> <li>• <a href="#">South Africa</a></li> </ul> <p>The relative importance of different influences on where people live and <b>spatial interactions</b> between places at varying <b>scales</b></p>
<p><b>2. Changing populations and places</b> Suggested teaching time 7–8 hours</p>	

Geographic inquiry	Geographic knowledge and understanding
<p><b>Processes of</b> population change and their effect on people and places</p>	<p>Population change and demographic transition over time, including natural increase, fertility rate, life expectancy, population structure and dependency ratios</p> <ul style="list-style-type: none"> <li>• <i>Detailed examples of two or more contrasting countries</i></li> </ul> <ul style="list-style-type: none"> <li>• <a href="#">Ethiopia</a></li> <li>• <a href="#">South Korea</a></li> </ul> <p>The consequences of megacity growth for individuals and societies</p> <ul style="list-style-type: none"> <li>• <b>One case study of a contemporary megacity experiencing rapid growth</b> The causes and consequences of forced migration and internal displacement</li> </ul> <ul style="list-style-type: none"> <li>• <a href="#">Mumbai, India</a></li> </ul>

## IB Geography Notes Higher Level

	<ul style="list-style-type: none"> <li>• <i>Detailed examples of two or more forced movements, to include environmental and political push factors, and consequences for people and places</i></li> <li>• <a href="#">Nigeria</a></li> <li>• <a href="#">Syria</a></li> </ul> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>How the impacts of population change and <b>spatial interactions</b> between places can be categorized and represented graphically</p>
<p><b>3. Challenges and opportunities</b></p> <p>Suggested teaching time 7–8 hours</p>	
<p>Population <b>possibilities</b> and <b>power</b> over the decision-making process</p>	<p>Global and regional/continental trends in family size, sex ratios, and ageing/greying</p> <p>Policies associated with managing population change, focusing on:</p> <ul style="list-style-type: none"> <li>• policies related to ageing societies</li> <li>• pro-natalist or anti-natalist policies</li> </ul> <p>Expressed as multiple case studies such as</p> <ul style="list-style-type: none"> <li>• <a href="#">Pro - Singapore</a></li> <li>• <a href="#">Pro - Russia</a></li> <li>• <a href="#">Anti - China</a></li> <li>• <a href="#">Anti - India</a></li> </ul> <ul style="list-style-type: none"> <li>• gender equality policies and anti-trafficking policies</li> </ul> <p>Expressed as two case studies, specifically</p> <ul style="list-style-type: none"> <li>• <a href="#">Trafficking - Nigeria</a></li> <li>• <a href="#">Equality - Kerala, India</a></li> </ul> <p>The demographic dividend and the ways in which population could be considered a resource when contemplating possible futures</p> <ul style="list-style-type: none"> <li>• <i>One case study of a country benefiting from a demographic dividend</i></li> <li>• <a href="#">South Korea</a></li> </ul> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>How population change may affect the power balance between groups of people at local, national and international <b>scales</b></p>



# Key Terms

## IB Geography Notes Higher Level

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- **Growth rate** -  $= \frac{\text{Population at the end of period} - \text{Population at the beginning of period}}{\text{Population at the beginning of period}}$ , and is expressed as a percentage.
- **Crude birth rate** - Amount of births in a given area, in a given year per 1000 people according to the mid-year population of the same year.  
 $= \frac{\text{number of births per year}}{\text{Total population}} \times 1000$
- **Crude death rate** - Amount of deaths in a given area, in a given year per 1000 people.  $= \frac{\text{number of deaths per year}}{\text{Total population}} \times 1000$
- **Birth rate** - The amount of births per 1000 of the population within a country per year.
- **Death rate** - The amount of deaths per 1000 of the population within a country per year.
- **Natural increase/decrease** -  $= \text{Birth rate} - \text{Death rate}$ , as is stated as the natural increase of a given place per year.
- **Age specific birth rate** - Amount of births in a specific age group per 1000 people i.e. 20-25 year olds.
- **General fertility rate** - The number of births per 1000 women of childbearing age  $\in 15 \leq x \leq 49$ .
- **Total fertility rate** - The total number of babies in average a woman will have in her lifetime.
- **Reproductive age range** - The age that women can bear a child.  $\in 15 \leq x \leq 49$
- **Replacement rate** - The number of children that a couple need to have within their reproductive years in order to maintain themselves. The world average replacement rate is 2.1.
- **Infant mortality rate** - The amount of deaths per 1000 of infants (under 1 year old) in one year.
- **Child mortality rate** - The amount of deaths per 1000 of children under 5 years old in one year.

- **Age specific death rate** - The amount of deaths per 1000 per year in a specific age group i.e. 50-55.
- **Life expectancy** - The average age of death, i.e. the amount of years that somebody is expected to live.
- **Population growth rate** - the increase in the number of individuals in a population in a given time. =  $\frac{(\text{final population} - \text{initial population})}{\text{initial population}} \times 100$
- **Doubling time** - the number of estimated years for a population to double its size at its current population growth rate.  $T = \frac{70}{\text{growth rate (\%)}}$ , E.g. a growth rate of 3.5% represents a doubling time of 20 years ( $70/3.5=20$ )

*Proof.*

Consider the equation

$$2C_p = C_p \times \left(1 + \frac{r}{100}\right)^t$$

Where

$C_p$  is the current population

$t$  is the time in years

Rearranging to solve for  $t$

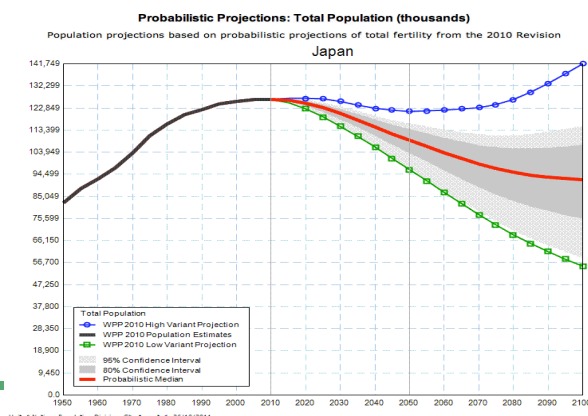
$$2 = \left(1 + \frac{r}{100}\right)^t$$

$$\ln 2 = t \ln\left(1 + \frac{r}{100}\right)$$

$$t = \frac{\ln 2}{\ln\left(1 + \frac{r}{100}\right)} \approx \frac{70}{r}$$

*QED*

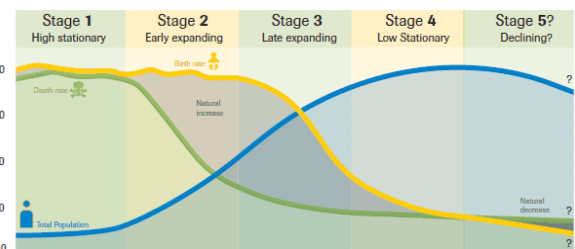
- **Population distribution** - the pattern of where people live at different scales: local, regional, national and global.
- **Population density** - the number of people living/ $km^2$ .
- **Population projection** - a forecast of future population changes based on current trends of natality, mortality, fertility



and migration.

- **Population momentum** - the continued growth of population after fertility rate is equal or below the replacement rate (2.1). This happens if there is a large concentration of people in the reproductive age range.
- **Population explosion** - the rapid increase in the world's human population since the industrialisation.
- **Demographic dividend** - the accelerated economic growth that may result from a decline in a country's mortality and fertility rate, and the subsequent change in the age structure of the population.

- **Demographic transition model** - the model that shows changes in birth rates, death rates and population growth as a country develops.
- **Carrying capacity** (population ceiling) - the number of people that can live at a high standard of living



- **Physical carrying capacity** - the maximum number of individuals that can physically fit into a specific area.
- **Standard of living** - the level of wealth, comfort, material goods, and necessities available to a certain socioeconomic class or a certain geographic area.
- **Quality of life** - a highly subjective measure of well-beings such as personal liberty or environmental quality.
- **Population pyramids** - a structure of a population in terms of sex and age.
- **Population structure** - shows the composition of the population in demographics. E.g. religion, ethnicity etc. however, most are only structured as female, male and age.
- **Sex ratio** - The ratio between the number of males and the number of females in a population.
- **Pyramid age groups** -
  1. Young  $0 \leq x < 16$
  2. Economically active  $16 \leq x < 65$

### 3. Old/elderly: $x \geq 65$

- **Old dependents** - People over the age of 65 (normally retired people)
- **Young dependents** - People under the age of 16 (normally being cared by a third person)
- **Economically active** - People between the ages of 16 and 65 (normally working and paying taxes, creating a product)
- **Age dependency ratio** -  $\frac{\text{Young dependents} + \text{Old dependents}}{\text{Economically active population}} \times 100$
- **Older dependency ratio** - Act as an indicator showing the balance between active population and elderly population
- **Ageing population** - A rise in the median age of the population usually associated with the increased proportion of old people
- **Natalist policy** - a scheme or law that the government may adopt in order to control its country's population.
- **Pro-natalist policy** - a scheme or law that encourages **higher** birth rates
- **Anti-natalist policy** - a scheme or law that encourages **lower** birth rates
- **Low income countries**- are those with GNI per capita, calculated using the World Bank Atlas method, of \$1,045 or less
- **Low to middle income Lower-middle-income countries**- are those with a GNI per capita, calculated using the World Bank Atlas method, of more than \$1,045 but less than \$4,125
- **Middle-income countries** - are those with a GNI per capita, calculated using the World Bank Atlas method, of more than \$1,045 but less than \$12,736
- **Middle to upper income Upper-middle-income countries** - those with a GNI per capita, calculated using the World Bank Atlas method, of more than \$4,125 but less than \$12,736
- **High-income countries** - are those with a GNI per capita, calculated using the World Bank Atlas method, of \$12,736 or more.

## IB Geography Notes Higher Level

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- **Human development index** - a statistical composite index of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development.
- **Migration** - the movement of animals and people from one place to another.
- **Immigration** - a person who **moves** to another country, usually for permanent residence.
- **Emigration** - when a person **leaves** a country. Caused by factors such as war etc.
- **Forced migration** - When somebody has to migrate against their own will.
- **Voluntary migration** - when somebody migrates by their own will.
- **Circular migration** - when a person repeatedly moves between home and host areas
- **Brain drain** - When individuals with technical skills and knowledge emigrate to a more developed country for opportunities, however, this leaves the country behind.
- **Chain migration** - When there is a large amount of migration that comes from the same origin within an extended period of time.
- **Diaspora** - Forced migration on a particularly large scale that causes dispersion i.e. spreads the group of people out.
- **Distance decay function** - the idea that the farther away you are from goods or services, the less likely you are to make use of it. E.g. if you live in a rural area, it's likely that you travel to a bigger city 100 miles even if it offers bigger and better goods and services.
- **Guest Worker** - People who migrate for work to another country temporarily.
- **Pull factor** - a factor that contributes to one's immigration decision. E.g. Higher wage
- **Push factor** - a factor that contributes to one's emigration decision. E.g. war

## IB Geography Notes Higher Level

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- **Intervening obstacle** - An environmental or cultural feature that hinders migration.
- **Intervening opportunity** - The presence of a nearer opportunity that greatly diminishes the attractiveness of sites which are further.
- **Restraining factors** - Factors that make it hard for people to leave their place (family, friends, jobs etc.).
- **Migration transition** - A change in the migration pattern in a society. E.g. from rural-urban migration to counter-urbanisation trend.
- **Migration stream** - The total number of moves made during a given migration interval that have a common area of origin and a common area of destination. (in-migration refers to the destination whilst out-migration refers to its origin)
- **Migration selectivity** - When only certain types of people that share the same characteristics choose to migrate e.g. all people from the age of 20-24 or people with income lower than 5k usd per year.
- **Net migration** - *Number of immigrants* – *Number of emigrants* (in - out)
- **Periodic movement** - A form of human movement that involves a long period, yet temporary movement. E.g. for college
- **Remittance** - A transfer of money, often by a foreign worker to an individual in their home country.
- **Refugees** - a displaced person who has been forced to cross national boundaries and who cannot return home safely (whomst have been accepted from the host country).
- **Asylum seekers** - A forced-displaced person before granting *refugee status* by the host country.
- **Internally displaced person** (a part of domestic migration) - A group of people who have been forced to move out of their homes in large numbers to another territory of their own country. Usually caused by war, violations of human rights etc.
- **Externally displaced person** (a part of international migration) - one who has left his/her home temporarily, crossed an international border, and who

expects to return eventually

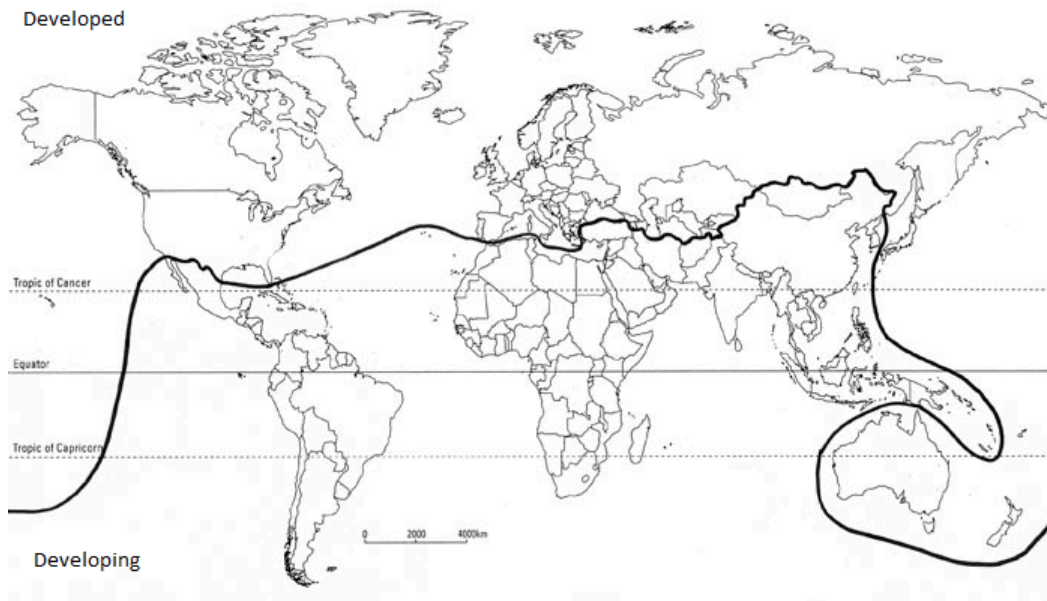
- **Environmental disaster displacees** - A group of people who have been forced to leave their home region due to sudden or long-term changes to their local environment. E.g. Short-term: volcano eruption, Long-term: climate change
- **Development induced displacement/Development displacees** - When people have to move because of things such as building of dams, roads, airports etc. are being built in the location of their homes.
- **Smuggled people** - People who are moved illegally for profit. It includes those who have been forcibly displaced and those who have left their homes in search for a better standard of living.
- **Trafficked people** - People who are moved with the means of deception or coercion for the purpose of exploitation or profit e.g. prostitutes
- **Megacity** - a very large city with a population of over 10 million people.



# Theories

### Brandt's Line

The Brandt Line is a theory developed by Willy Brandt in the 1980s. It divides the South and the North, in an attempt to find a correlation between a country's location in the hemisphere corresponding to its HDI or LEDC/MEDC status. It is recognised as dividing the rich North and the poor South.



### **Ravenstein's laws of migration**

Developed by Ernst Georg Ravenstein

1. Most migrants only go a short distance
2. Migrants who move far tend to choose big cities
3. Urban residents are less migratory than rural residents
4. Most international migrants are young adults
5. Large cities tend to increase by migration, rather than by natural increase
6. Women tend to migrate in their own country, men tend to leave their country

**Lee's push and pull theory**

Lee's push and pull theory divides factors causing migration into two groups of factors: Push and Pull factors.

*Migration*  
**Key Issue 1: Why Do People Migrate?**  
**Lee's Model of Migration**  
 What it might actually look like

**Origin**

Push

- Low Wages
- Political and civil strife
- Limited opportunities

Pull

- Family
- Culture

Origin and Destination Factors and Intervening Obstacles in Migration

The diagram shows two circles representing 'Origin' and 'Destination'. The Origin circle contains several minus signs (-) and a few plus signs (+). The Destination circle contains several plus signs (+) and a few minus signs (-). Between the two circles is a jagged mountain range labeled 'Intervening Obstacles'.

**Intervening Obstacles**

- Lack of money
- Distance
- Fear
- Physical barriers

**Destination**

Pull

- Higher Wages
- More job opportunities
- Education

Push

- Language Barrier
- No Documents

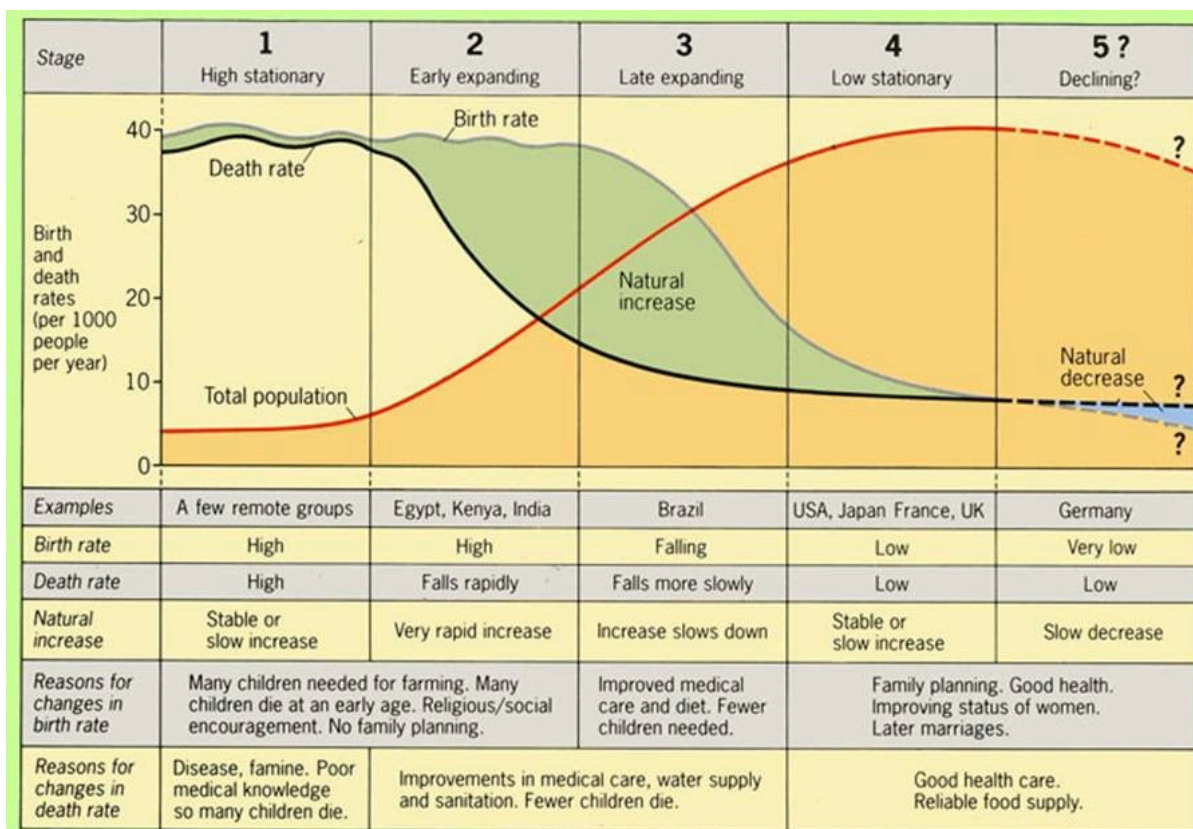
**Intervening Opportunities**

- Jobs
- Common Language

- A person must decide if the pull factors outweigh the push factors

## Demographic Transition model

The demographic transition model shows changes in birth rates, death rates and population growth of a country in total of 5 stages.



1. **Stage 1 (High stationary):** High birth rates and death rates due to less developed society (no contraception, agricultural based economy, poor medical care, etc.). Total Population is still low.
2. **Stage 2 (Early expanding):** Birth rates are still high, but death rates start falling due to introduction of basic medical care. This causes the total population to increase (natural increase).
3. **Stage 3 (Late expanding):** Birth rate start falling due to better education and availability of contraception
4. **Stage 4 (Low stationary):** Low birth rate and death rates. Total population becomes constant.
5. **Stage 5 (Natural decrease):** Estimation that the birth rates start to fall below death rates, causing the total population to decline.

## Population Pyramid & Demographic Dividend

Population pyramids is a pyramid which allows to classify the percentage of a population of an age range. LEDCs tend to have a more pyramid scheme, whilst MEDCs tend to have it flat in a line. Countries with an aging population can be found as a reverse pyramid.

A demographic dividend refers to the acceleration of economic growth which result from improved reproductive health, a rapid decline in fertility, and the subsequent shift in the population structure (fewer young dependents and increased working population)

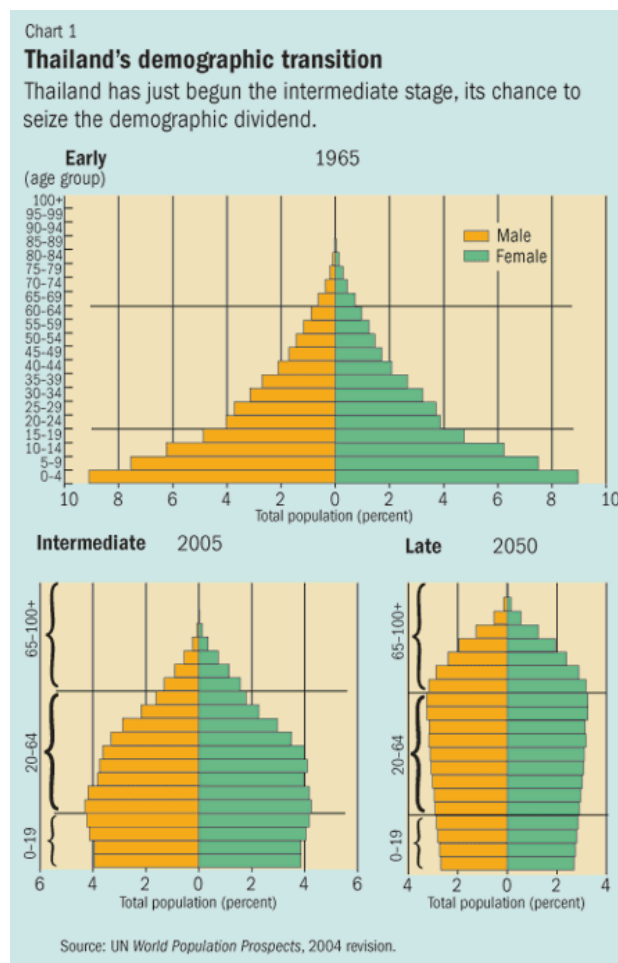


Figure 1: Thailand's demographic transition. It should be noted that this is proportional to the Demographic Transition Model.

### Benefits of demographic dividend:

- Increased labour supply
- Increase in savings due to decrease in dependency
- Decrease in fertility rates result in healthier women and fewer economic pressures
- Causing an extra investment in their children with a higher quality education

- Increasing GDP per capita caused by decreasing dependency ratio, accelerating economic growth

### **After the demographic dividend:**

- The dependency ratio begins to increase again by demographic transition of working population to old dependents
- Lead to a disproportionate number of elderly compared to younger
- Ageing population which weaken the economy
- Seen in developed countries like Japan and Germany
-

### Aging population and dependency ratio

Ageing population is when the proportion of dependents of over age 65 is increasing. The ageing population of a country increases the dependency ratio. Caused by increasing life expectancy and low birth rates after a demographic transition and a demographic dividend. The UN ranks a country as 'ageing' if 7% of its population is over 65.

#### Causes:

- Better medical care
- Better contraception
- Good sanitation and hygiene
- Low birth rates caused by emancipation of women, high cost of children, emigration of economically active i.e. younger

#### Policies and Solutions:

- Pro-natalist policies
- Increased immigration of economically active
- Private healthcare
- Private pensions
- Increased taxation of economically active
- Increased retirement age

#### A & D of Ageing population in a country

Advantages	Disadvantages
Elderly people have a lot of experience and can be valuable in the workplace	Shortage of economically active
Less money spent on schooling and natal medical care	Reduced taxation income for the government
Lower crime rates and less money needed to spend on policing	Cost of providing healthcare and care homes increased
	Cost of paying for pensions



### Gender equality & Trafficking policies

Major gender inequality held in some country:

- Lack of access to finance for women entrepreneurs (starting a business)
- Limited access to procurement and global markets
- Underrepresentation of women on corporate boards
- Women's underrepresentation in political systems and leadership
- Violence Against Women (VAW)

How can gender inequality be reduced?

- Confront gender stereotyping by the popular and news media
- Increase public awareness of reason and consequence of rape and sexual assault, sexual harassment and pornography
- Increase enforcement of existing laws against gender-based employment discrimination and against sexual harassment
- Increase funding of rape-crisis centers
- Bring women's educational standard up to the same as men
- Eradicate gender wage gap through a governmental policy
- Increase women's involvement in politics (increase number of women in parliament)

As defined, **Trafficked people** - People who are moved with the means of deception or coercion for the purpose of exploitation or profit e.g. prostitutes, or organ harvesting

There are several types of groups that are at risk for trafficking:

- People with disabilities
- Stateless people
- LGBTI
- Religious minorities
- Refugees and migrants

Several governments and bodies have attempted to reduce trafficking within an area.

This is done by, but not limited to the following list:

- Increasing public awareness
- Up-to-date registration of births
- Allowing trader unions to keep workers' rights
- Confiscation and harsher penalties as a crime deterrent
- Banning discrimination and offering a range of community-based support for people with disabilities
- Inspecting documentation at workplaces to make sure that everything is legal

## Effects of Migration

### Impacts on host countries

Positive	Negative
Job vacancies and skills can be filled	Depression of wages may occur but this seems to be temporary
Economic growth can be sustained	Having workers willing to work for relatively low pay may allow employers to ignore productivity, training and innovation
Services to an ageing population can be maintained when there are insufficient young people	Increases in population can put pressure on public services
The pension gap can be filled by the contributions of new young workers and they also pay taxes	Unemployment may rise if there are unrestricted numbers of incomers
Immigrants bring energy and innovation	Migrants may be exploited
Host countries are enriched by cultural diversity	There may be integration of people to more security monitoring
Failing schools (with failing numbers) can be transformed	Ease of movement may facilitate organised crime and people trafficking

### Impacts on countries of origin

Positive	Negative
Developing countries benefit from <b>remittances</b> (payments sent home by migrants) that now often outstrip foreign aid	Economic disadvantage through the loss of young workers
Unemployment is reduced and young migrants enhance their life prospects	Loss of highly trained people and healthy workers
Returning migrants bring savings, skills and international contacts	Social problems for children left behind or growing up without a wider family circle

# Case Studies

### Uneven population distribution - China

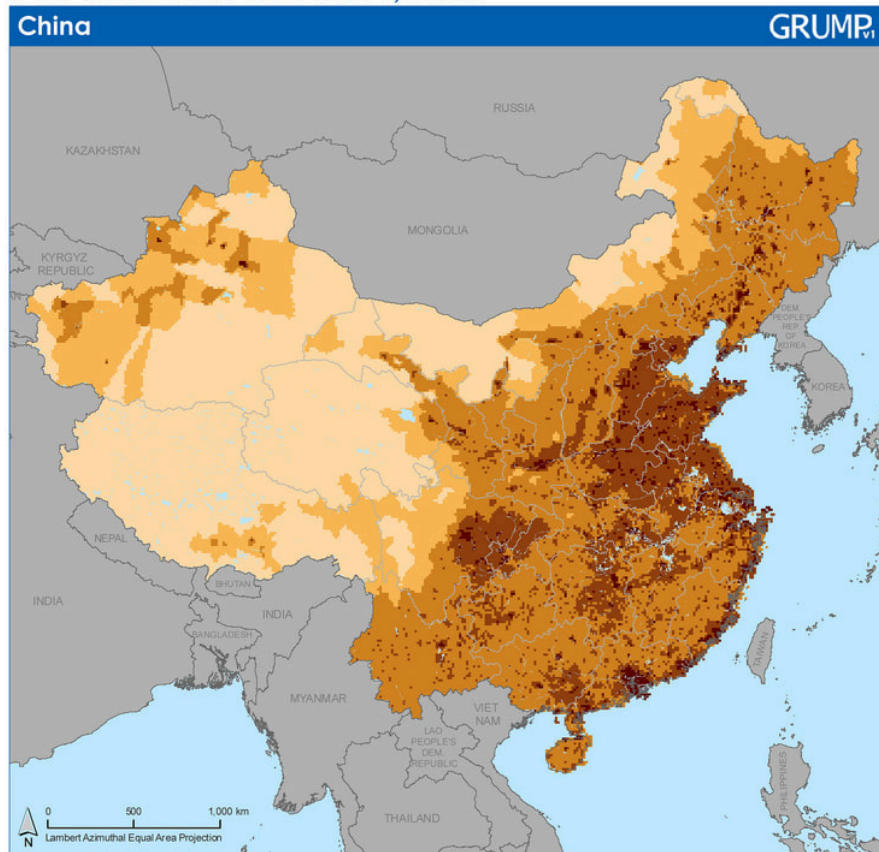
China's population is incredibly concentrated in the eastern half of the country. 94% of the Chinese population is believed to have been living there.

Reason 1: Mountainous areas on the west side, made it hard for people to live. People prefer flat and plain land due to these factors:

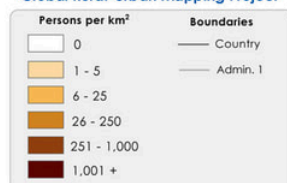
- Easy to build houses
- Easy to grow crops
- Easy transportation

Reason 2: Coastal areas have greater economic opportunities with fishing and trading industries. This allows the area to grow as an urban area where more people migrate to for the seek of better living conditions (**internal migration: rural-urban**).

#### POPULATION DENSITY, 2000



#### Global Rural-Urban Mapping Project



Population density measures the number of persons per square kilometer of land area. The data are gridded at a resolution of 30 arc-seconds.

Note: National boundaries are derived from the population grids and thus may appear coarse.



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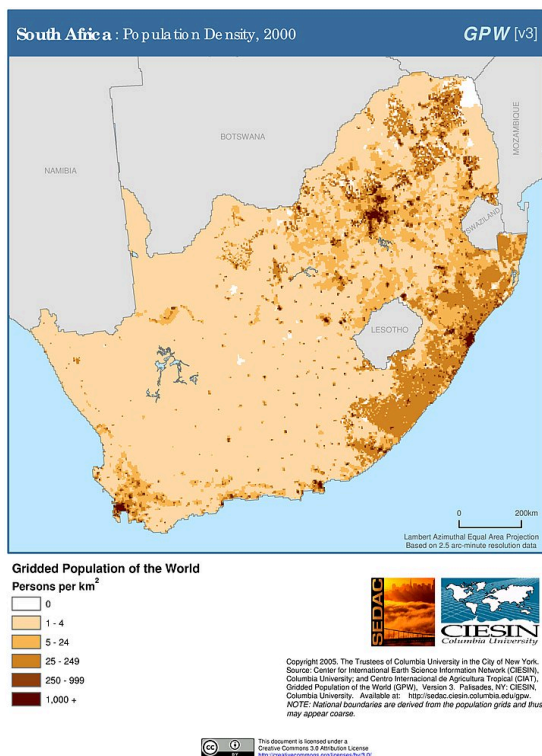
### Uneven population distribution - South Africa

South Africa's population distribution is uneven nationwide. The eastern half of the country is more densely populated than the western half.

Reason 1: Aridity (dry climate) of much of the west, meaning it is hard to grow crops and hence experience a shortage of food. Uninhabitable environment.

Reason 2: Concentration of minerals in the east, which could bring prosperity to the area with mining

Reason 3: Coastal area, which again could bring prosperity to the area with several economic opportunities (e.g. fishing, trading, tourism etc.)

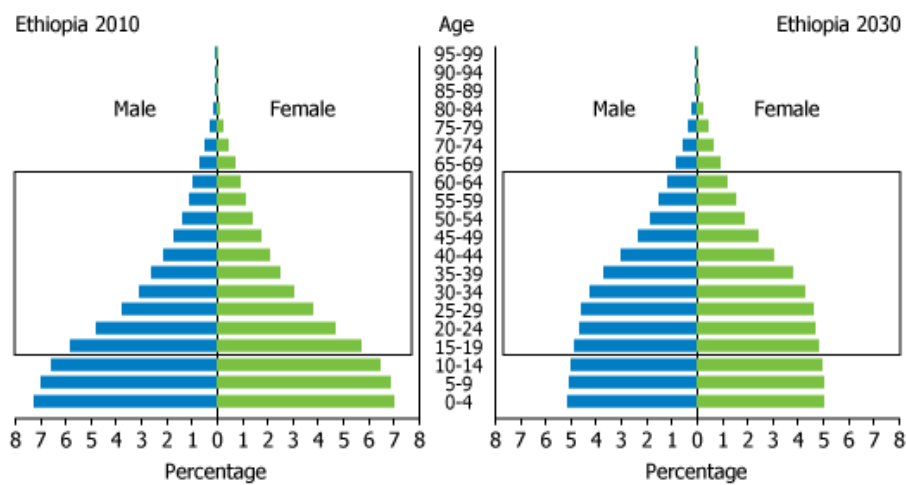


**Circular migration** (when a person repeatedly moves between home and host areas) is a major migration trend in South Africa. People from rural areas around the country are attracted to the urban area for the sake of **labour**. However, their family members usually remain in their rural villages, hence it establishes a pattern of circular migration where those working people repeatedly return to their home areas in order to hand money and see their family members.

In recent years, circular migration has also been carried out to raise children in areas with **better schools**. This has further contributed to an uneven distribution of population, due to the fact that rural areas are now less popular, with majority now being in urban areas which are located within coastal areas.

### Demographic dividend - Ethiopia

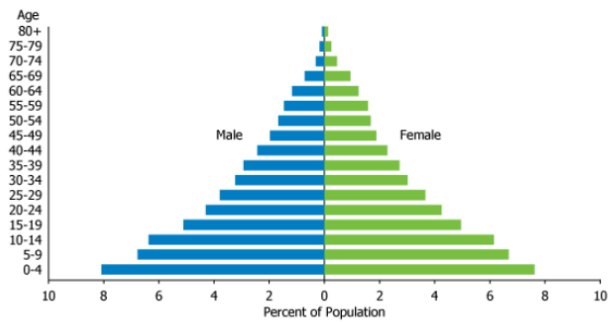
Ethiopia has been developing very rapidly since the 2000s. The use of modern contraceptive methods grew from 6% in 2000 to 27% in 2012. The average fertility rate is now 4.8, compared to 6.5 a decade ago. The capital (Addis Ababa) on average has a fertility rate of 2. However, Ethiopia will have to increase investment in family planning to create the age structure needed for a demographic dividend. 40% of people are under the age of 15. By 2030 predictions it will achieve the optimal age structure to experience economic growth.



## Demographic dividend - South Korea

South Korea was able to rapidly decrease its fertility rates from the 1960s to 1990s, causing economic growth in the country. This was caused by investment into healthcare programs, education, economic policies etc. Moreover, field workers visited homes to provide family planning information and were provided as a service. They have also shifted the education system in such a way that it was focused on 'production'. Previously, only 54% of children were served primary education. The shift in focus resulted in 97% of school age-children attending school in 1990. In an attempt to change its weak economy from farming and fishing, in collaboration with Japan lead to investment capital, strengthening business. They have also addressed unemployment by creating a programme that provided minimum wages for workers involved in construction of infrastructure, leading to growth.

South Korea's Age and Sex Structure, 1950



South Korea's Age and Sex Structure, 1975

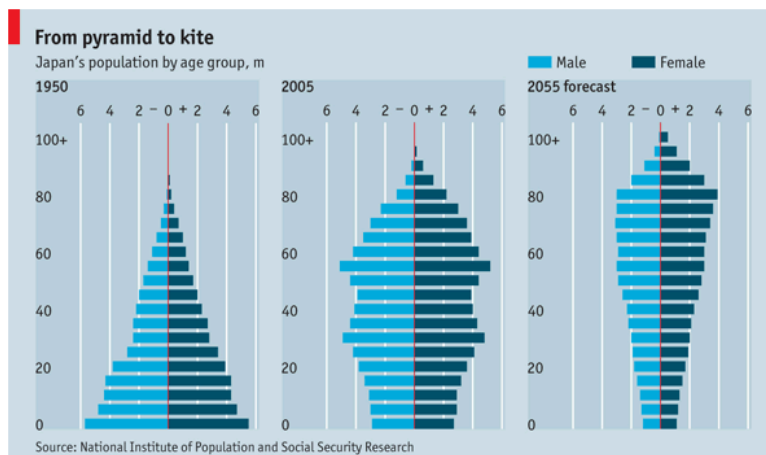


South Korea's Age and Sex Structure, 2005



## Ageing population - Japan

Japan's population is following a decline in population. The proportion of old people is now significantly large and is still increasing. The cause of this is industrialization. Since the 1980s the population has slowed significantly. Its current population is 126.5 million, and it is estimated that it will fall to 121 in 2025 and 100 million by 2050. Japan holds the record for the largest elderly population in proportion.



Population is declining for the following set of reasons:

Economic	Social
Being pregnant is expensive, not covered by health insurance.	Japanese women are not having enough children
After birth, healthcare is only provided for free for infants up to age of 3 (5 in some areas)	Many Japanese choose to marry at a later age, which may mean that they have children later or not at all
The huge costs of schooling and education	Many women decide not to get married and choose to pursue a career
Child benefit paid by the government is low and is not enough	In Japanese culture it is the norm for the mothers to bring up children, and the lack of childcare facilities means that they have to leave their work, and as such it may be too much to have a family.

Problems include, but are not limited to:

- New jobs needed for elderly
- Depletion of the labour force
- In-migration to fuel any increase in the workforce
- A trade deficit
- Inadequate nursing facilities
- Deterioration of the economy



### Growth of a megacity's population and its effects - India, Mumbai

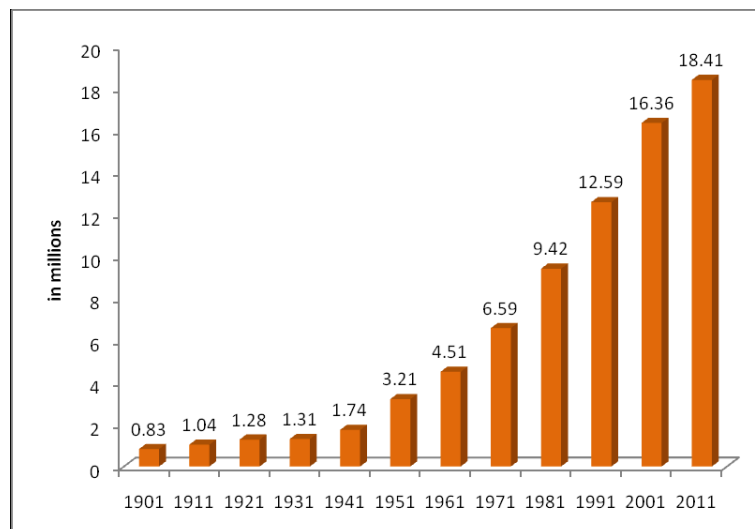
A sudden population boom has many diverse effects on its host country.

#### Causes:

- Industrial revolution
- Mass immigration from nearby countries such as war, or opportunities such as jobs etc.

#### The consequences:

- Air pollution
- Declining water quality
- Unemployment and underemployment
- Limited access to health care
- Limited access to education
- Poor hygiene and access to electricity
- Home to many millions of billionaires
- But it also home to poverty, with a large wealth gap
- Now accounts for 25% of India's industrial output, 40% of its foreign trade and 6% of its total GDP
- And is now a home to many industries such as Tata Group, The reserve bank etc.
- Cheap labour



### Forced migration (external displacement) - Syria

Due to raging conflict and war in Syria, a lot of citizens were granted the Asylum Seeker, Refugee and Internally Displaced status. The war is a push factor, causing a humanitarian crisis.

**Statistics** (<https://www.unrefugees.org/emergencies/syria/>):

- 13.5 million people in need of humanitarian assistance.
- 5.6 million refugees seeking safety in neighboring countries
- 6.6 million who are internally displaced inside Syria.
- 70% of refugees live below the poverty line.
- Turkey holds the most refugees, with around 3.6 million in 2019
- Second is Lebanon, with around 950,000 people in 2019.

### Impacts on host communities, generally:

- An extreme pressure on public resources
- Buffering host economies
- Increased economic contribution if permitted to work
- Creates labour exploitation, child labour and poverty and a race to the bottom wage

### Impact on Turkey:

- A total financial cost of \$4.5 billion
- \$2.3 billion of which are from the central government
- An estimated cost of \$7.5 billion for upkeep of refugees per annum
- Turkey's labour force rose by 1.7 million last in 2014, with several thousands increase per year.

### Impact on Jordan:

- \$62 million per annum to cover demand derived from influx of Syrian refugees
- Short-run public finance strain
- Reduction of dependency ratio
- Full integration to the labor market in the long-run
- \$81.4 million in enrolling 78,500 Syrian children to schools
- No discernible impact on the labour market

(continued)

(continued)

Lee's Model of Migration Analysis

Push	Pull	Intervening
War and Conflict	Better healthcare	Everything is more expensive
Poverty	Better education	Hardly any place to live
Lack of education	Better jobs	Have to leave belongings
Lack of healthcare	Peace	Some degrees are not applicable, hence low paying jobs

### Forced migration (internal displacement) - Nigeria

<https://data2.unhcr.org/en/documents/download/52535>

In Banki, Nigeria a mass internal displacement has occurred due to internal conflict. For years, refugees had been on the run from Boko Haram insurgents.

Over 3.3 million people have been displaced, including over 2.5 million internally displaced persons (IDPs) in north-eastern Nigeria, over 550,000 IDPs in Cameroon, Chad and Niger and 240,000 refugees in the four countries. 3.5 million people remain food insecure in the Lake Chad Basin region and will depend on assistance.

#### Impacts on host communities:

- Pressure on resources on communities which are already extremely vulnerable e.g. water, food, public services
- Environmental degradation due to gathering fuelwood for cooking etc.
- Brought new knowledge and experience to business, handcrafting e.g. new farming techniques
- Mistrust of IDPs and refugees, and as a result possible segregation and lack of integration into new communities

#### Impacts economically:

- Fiscal pressures to allow local governments to provide food, water, and shelter to displaced populations
- Price volatility for specific goods, as a result of an increase in demand (e.g. the demand for food in fast expanding urban areas like Maiduguri in Nigeria) or lack of supply (e.g. the scarcity of water in northern Cameroon)
- Displacement has a significant impact on incomes, increasing the chances of having no income by 41 percent.
- Assuming that those displaced in 2015 do not return to their places of origin, the accumulated cost of displacement from 2013 to 2022 would rise to N465 billion (approximately US\$2.3 billion)—even if there is no further displacement.
- More than 800,000 stopped receiving income after displacement
- Only 53 percent of the individuals who received some income prior to displacement continued to receive any part of it after it.

#### Impacts socio-economically on the IDPs:

- Conflict and displacement lead to direct loss of property for the displaced, particularly farm land, which then translates into a loss of their livelihoods, assets, rights, and business networks.
- Lack of job and financing networks

- Poor health services
- Lack of access to education

**Impacts on protection and physical human security:**

- People who fled their homes due to the Boko Haram insurgency are more likely to abuse alcohol and drugs as a coping mechanism
- Sexual and gen-der-based violence (SGBV) and transactional sex are reported to be significant issues affecting women and children
- Unexploded ordinances have been reported in areas formerly controlled by Boko Haram
- Due to lack of legal ID documents, displaced population encounters various obstacles to accessing justice system and aid

### Pro-natalist - Russia

Russia has had a low fertility rate for a number of years.

**Reasons for low fertility rate:** poor reproductive health care services, widespread and unsafe abortions, high divorce rates, an ageing population structure, infertility and women choosing to have fewer children.

The pro-natalist policy was introduced in 1981, when Russia's fertility rate fell below its replacement level. However, fertility rate had dropped even further to less than 1.3 by 2006. This has led to the addition of pro-natalist measurements:

- An increase in pregnancy, birth and child benefits according to the number of children a family have
- Increased parental leave following the birth of a child
- Increased payments to mothers of a second and third children (up to \$12,500 in 2012)

### Short-term success:

Between 2006 and 2011, fertility rates increased by 21%. The increase in second birth was 40% and third birth was 60%. However, these increases were from a very low starting point, hence it doesn't contribute to the increase in total fertility rate significantly.

### Future projection:

Russia's population decline is likely to continue with the total fertility rate remaining at less than 1.7 (which is below replacement level). It is possible that Russia's population in 2100 will be similar to what it was in 1950: 100 million. This is not only due to the low birth rate, but also due to Russia's high death rate that is partly as a result of smoking, alcohol consumption and obesity.

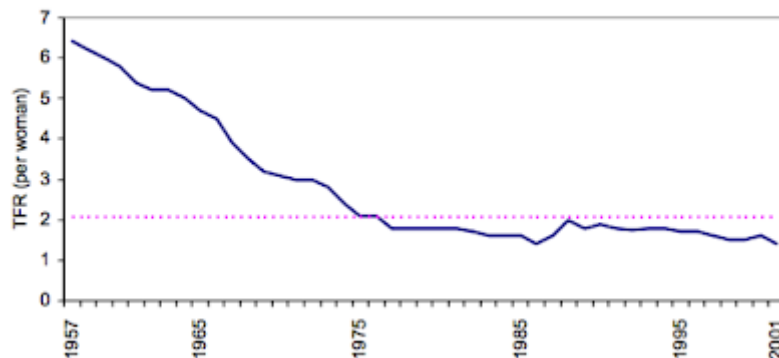
### Possible solution:

- Double the investment on pro-natalist policy
- Increase the immigrant population (although  $\frac{2}{3}$  of the population of Russia is wishing for reduction in number of immigrants)

**Conclusion:** Russia's pro-natalist policy was **unsuccessful**.

## Pro-natalist - Singapore

**Total Fertility Rate 1957-2001**



In 1957, Singapore's fertility rate peaked at 6. Hence, the government introduced the anti-natalist policy in order to manage the population change to achieve sustainable development (to avoid resource scarcity). The slogan was "Stop at Two"

However, the total fertility rate dropped substantially that caused it to fall below the 2.1 replacement level. By 1980, the total fertility rate reached 1.74. This urged the government to change its policy to pro-natalist policy, with a slogan of "Have Three".

### **Main features of 1980 "Have Three" Policy:**

- "Have Three" targeted well-educated young women mainly, because they are more likely to be able to afford children.
- Qualified women receive approximately \$8600 for each of the first three children they have, along with tax exemptions.
- Parents who had given birth to a third child were given allocation priority if they wanted to upgrade to larger/better housing.
- The government organised graduate blind dates, to encourage people with a high caliber to get together.
- Poor or less educated women were offered cash or housing benefits to be sterilised after two children.
- Increased parental leave from 8 weeks to 12 weeks

### **Other strategies:**

1. Counseling: Pregnant women are offered special counseling to discourage abortion or sterilisation after the birth of first or second children.

2. Love boat: provide couples a rest from heavy workloads and the stresses of daily life with massages, nutrition, aphrodisiacs, music and aromatherapy. This encourages couples to make babies.
3. Increase the immigrant population

**Outcomes:**

“Have Three” policy is still present today, since the total fertility rate hasn’t reached the 2.1 replacement level yet. In 2011, the total fertility rate dropped to 1.2 despite the government’s wishes. The birth rate also decreased which was partly caused by the expanding development in Singapore, meaning that women are more career focused and have priority on it instead of family.

The negativity of this policy is that it costs the government a vast amount of money year on year and still it doesn’t lead directly to the increase of total fertility rate.



### Anti-natalist - China

China's **one-child policy** was introduced in 1979, in order to secure resources.

**Incentives for having one child:** loans, materials, technical assistance, free education and healthcare.

**Penalties for having more than one child:** Fines, no education and healthcare provided, and job loss.

#### The main advantage of OCP:

- The fertility rate was decreased to 1.6 births per woman. This has eased strain on community's services and resources (e.g. food, houses, security support, number of doctors & teachers, etc.)
- China's government officially stated that OCP has prevented 400 million births since 1979

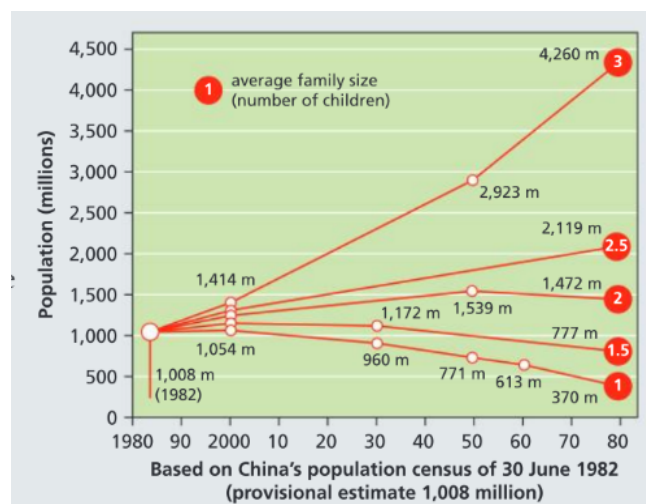
#### The main disadvantage of OCP:

- 4 to 1 problem (the situation in which 1 child has to support 4 parents/grandparents), which means severely high dependency ratio
- Ageing population
- Uneven sex ratio (in 2008, there was 32 million more men than women)
- Increase of Black children (some parents had a second children that is unregistered, meaning illegally existing child)
- Abuse of human rights (often women were forced to do abortion, which could cause damage on mother's body)

#### End of OCP:

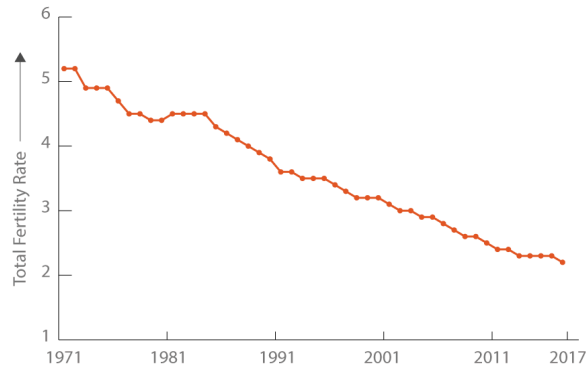
2013 - families in which at least one of the parents was a single child can now have 2 children.

2015 - all families are allowed to have 2 children.



### Anti-natalist - India

The Total Fertility Rate fell from 5.2 to 2.2 children per Indian woman



No government in India has successfully formulated anti-natalist policies since its total fertility rate is still above the 2.1 replacement level in 2017 (2.2). India is predicted to become the world's most populous country in 2030, up from 1.25 billion today to nearly 1.5 billion.

#### Strategy to reduce fertility rate:

Indian government has chosen to operate mass **sterilisation campaigns** in remote villages, instead of teaching poorly-educated women how to use contraceptives. This is because it is a **chapter** option. 1,400 rupees (£14), which is equivalent to nearly 2 weeks wage for a manual labourer, is given to women as an incentive for choosing to have the sterilisation operation.

Meanwhile, only a tiny fraction of men choose to have vasectomies. This is mainly because male sterilisation is viewed as culturally unacceptable in India's male-dominated society.

#### Outcomes:

India has one of the world's highest rates of female sterilisations, with about 37%, compared with 29% in China. According to the Indian government, 4.6 million Indian women were sterilised in 2011 and 2012.

One further problem emerged is an imbalance sex-ratio, arising from selective abortion of girls. In some communities, there are 8 women for every 10 men.

Some experts point out that the India's anti-natalist policy is linked to a series of other problems relating to discrimination against women - gender inequality.

### Literacy and Gender equality policy - Kerala, India

Kerala is a large agricultural state in south-west India. It is the most densely populated area of India but with an even spread of population and no large cities.

Kerala has had remarkable success in improving health, literacy and education, as well as reducing its fertility rate.

Kerala has the highest femal:male sex ratio in India, with 1,084 females to 1000 males.



#### Strategies to reduce gender gap:

- The autonomy and stability of the government
- Long-standing and continuing social reform: diffusion of Indian traditions (male-dominant)
- Girls are educated to the same standard as boys
- Open access to university and colleges for women
- More jobs are opened for women in health and education industries

#### How successful was the gender equality policy?

- The literacy rate of women in Kerala is higher than the rest of India. Higher literacy means more chances of employment, hence it leads to higher socio-economic status of women.
- The inheritance of property rights by daughters has also increased (meaning that the property is equally likely to be given to daughter and son). This allows women to enjoy more status within households.
- However, political and economic power in Kerala are still dominated by men. There is still room for improvements such as by expanding the role of women as equal to men in society.

### Trafficking - Nigeria

<https://www.hrw.org/report/2019/08/27/you-pray-death/trafficking-women-and-girls-nigeria>

There is a huge number of sexual trafficking in Europe for females in Nigeria. Being of the most persistent flows, it accounts for 10% of all trafficking in Western and Central Europe. The women believe that they will live a prosperous new life, by signing a contract with a priest in Nigeria. They are forced into prostitution to usually pay debt, around 40,000 - 70,000 EUR. The UN suggests that blackmailing and corruption is extremely high.

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**Topic 2: Global Climate -**  
**Vulnerability and resilience**

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# Syllabus Link

## IB Geography Notes Higher Level

Geographic inquiry	Geographic knowledge and understanding
<p><b>1. Causes of global climate change</b> Suggested teaching time 7–8 hours</p>	
<p>How natural and human <b>processes</b> affect the global energy balance</p>	<p>The atmospheric system, including the natural greenhouse effect and energy balance (incoming <a href="#">shortwave radiation and outgoing longwave radiation</a>)</p> <p>Changes in the global energy balance, and the role of feedback loops, resulting from:</p> <ul style="list-style-type: none"> <li>• <a href="#">solar radiation variations, including global dimming due to volcanic eruptions</a></li> <li>• <a href="#">terrestrial albedo changes and feedback loops</a></li> <li>• <a href="#">methane gas release and feedback loops</a></li> </ul> <p><a href="#">The enhanced greenhouse effect and international variations in greenhouse gas sources and emissions, in relation to economic development, globalization and trade</a></p> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>The complexity of the dynamic climate system and the <b>spatial interactions</b> of different processes and feedback mechanisms</p>
<p><b>2. Consequences of global climate change</b> Suggested teaching time 7–8 hours</p>	
<p>The effects of global climate change on <b>places</b>, societies and environmental systems</p>	<p>Climate change and the hydrosphere, atmosphere and biosphere, including:</p> <ul style="list-style-type: none"> <li>• <a href="#">water stored in ice and oceans, and changing sea levels</a></li> <li>• <a href="#">carbon stored in ice, oceans and the biosphere</a></li> <li>• <a href="#">incidence and severity of extreme weather events, including drought</a></li> <li>• <a href="#">spatial changes in biomes, habitats and animal migration patterns</a></li> <li>• <a href="#">changes to agriculture, including crop yields, limits of cultivation, soil erosion</a></li> </ul> <p><a href="#">Impacts of climate change on people and places, including health hazards, migration and ocean transport routes</a></p> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>The uneven spatial distribution of effects and uncertainty about their timing, scale and impacts for individuals and societies</p>
<p><b>3. Responding to global climate change</b> Suggested teaching time 7–8 hours</p>	

## IB Geography Notes Higher Level

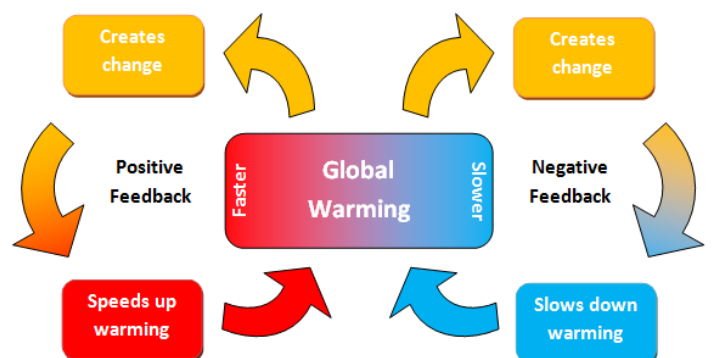
<p><b>Possibilities</b> for responding to climate change and <b>power</b> over the decision-making process</p>	<p><a href="#">Disparities in exposure to climate change risk and vulnerability, including variations in people's location, wealth, social differences (age, gender, education), risk perception</a></p> <ul style="list-style-type: none"><li>• <i>Detailed examples of two or more societies with contrasting vulnerability</i></li></ul> <ul style="list-style-type: none"><li>• <a href="#">Ghana</a></li><li>• <a href="#">Bangladesh</a></li><li>• <a href="#">Switzerland</a></li></ul> <p><a href="#">Government-led adaptation and mitigation strategies for global climate change:</a></p> <ul style="list-style-type: none"><li>• global geopolitical efforts, recognizing that the source/s of greenhouse gas emissions may be spatially distant from the countries most impacted</li></ul> <ul style="list-style-type: none"><li>• <a href="#">carbon emissions offsetting and trading</a></li><li>• <a href="#">technology, including geo-engineering</a></li></ul> <p><a href="#">Civil society and corporate strategies to address global climate change</a></p> <ul style="list-style-type: none"><li>• <i>Case study of the response to climate change in <b>one</b> country focusing on the actions of non-governmental stakeholders</i></li></ul> <ul style="list-style-type: none"><li>• <a href="#">USA</a></li></ul> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>Why <b>perspectives</b> and viewpoints may be different about the need for, practicality and urgency of action on global climate change</p>
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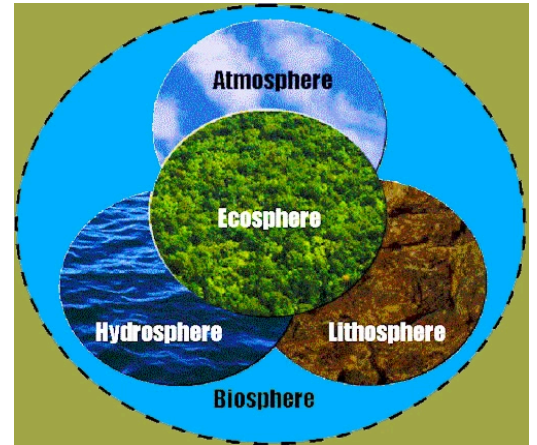
# Key Terms

## IB Geography Notes Higher Level

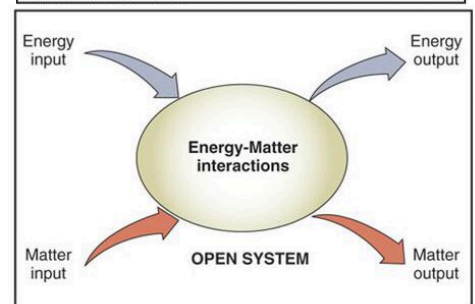
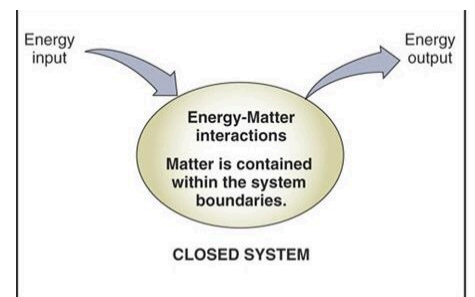
- **Radiation** - The transfer of energy between two objects by electromagnetic waves.
- **Solar radiation/irradiance** - Radiant energy emitted by the sun from a nuclear fusion reaction that creates electromagnetic energy.
- **Insolation** - Incoming solar radiation
- **Convection** - The transfer of heat by the movement of a gas or liquid.
- **Conduction** - The transfer of heat by contact.
- **Planetary Albedo** - The fraction of the incoming solar energy scattered by Earth and reflected to space.
- **Albedo** - is the proportion of the incident light or radiation that is reflected by a surface of any objects (e.g. water, snow, grass, asphalt etc.).
- **Short-wave solar radiation** - Contains a lot of energy that is high enough to pass through the ozone layer.
- **Long-wave radiation** - Contains less energy than shortwave radiation. Solar radiation becomes a long-wave when reflected by the surface.
- **Greenhouse effect** - A natural process that occurs when greenhouse gases in Earth's atmosphere trap the Sun's heat.
- **'Enhanced' greenhouse effect** - The impact of increasing level greenhouse gases in the atmosphere as a result of human activities.
- **Feedback loops** - A process in which the outputs of a system are circled back and used as inputs.
- **Positive feedback** - When an initial warming triggers a feedback to amplify the effects of something.
- **Negative feedback** - When an initial warming triggers a reduction in the effects of something, converging to equilibrium.



- **Global dimming** - A decrease in the amount of sunlight reaching the surface of the Earth
- **Hydrosphere** - All the **waters** on the Earth's surface (e.g. lack, river, sea , etc.)
- **Cryosphere** - the part of the Earth's surface characterised by the presence of **frozen water** (e.g. snow, ice caps, sea ice, glaciers etc.)
- **Glacier** - a persistent body of dense ice that is constantly moving under its own weight.
- **Biosphere** - also known as the ecosphere is the worldwide **sum of all ecosystems**. It is a closed system.



- **Closed systems** - Where there is transfer of energy, but not matter, between the system and its surrounding. E.g. biosphere
- **Open systems** - Where systems receive inputs and transfer outputs of energy and/or matter across the boundaries between them. Most natural systems are open systems.
- **Biome** - a large region of Earth that has a certain climate and certain types of living things.
- **Exposure** - the degree to which people are exposed to climate change.



- **Sensitivity** - the degree to which people could be harmed by exposure to climate change.
- **Adaptive capacity** - the degree to which people could mitigate the potential harm by taking action to reduce their exposure or sensitivity.
- **Erosion** - the breakdown of the continents and the land around you.
- **Mitigation strategy** - a strategy to reduce the severity, seriousness, or painfulness of climate change.

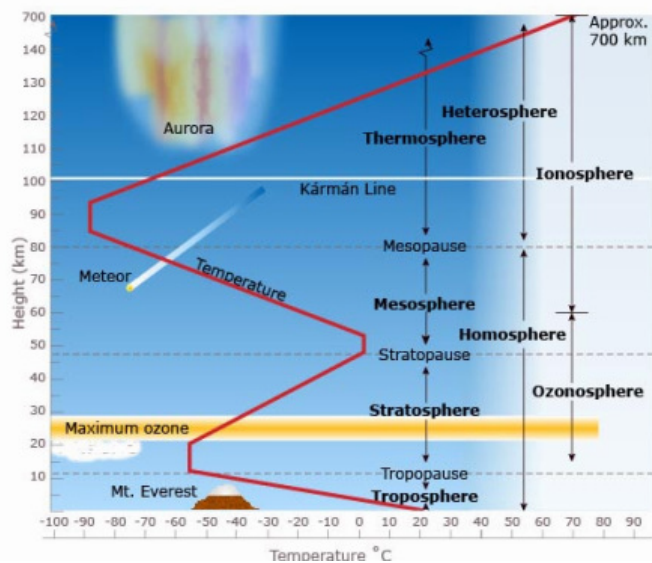
- **Adaptation strategy** - a strategy to increase society's resilience to climate change.
- **Carbon sink** - anything that absorbs more carbon than it releases.
- **Carbon capture and storage** - the process of capturing and storing carbon dioxide before it is released into the atmosphere.
- **Carbon sequestration** - the long-term storage of carbon in plants, soils, geologic formations and the ocean.
- **Ocean fertilization** - a geoengineering technique designed to increase the absorption of CO<sub>2</sub> from the atmosphere to phytoplankton, by dissolving iron or nitrates (nutrients) into the ocean to promote the growth of phytoplankton.
- **Carbon tax** - a government fee imposed on companies that burn coal, oil, or gas in order to reduce greenhouse gases emissions.
- **Carbon offset scheme** - the practice of putting funds towards organisations which help the environment by reducing carbon and other greenhouse gas emissions (e.g. reforestation projects).
- **Carbon trading** - a scheme where companies or countries buy and sell permits to emit carbon dioxide.
- **Carbon farming** - an agricultural method aimed at sequestering/absorbing atmospheric carbon into the soil and in crop roots, wood and leaves. This helps both growing of vegetation and reducing carbon levels in the atmosphere.
- **Biomass** - a renewable source of energy that comes from organic materials

# Theories

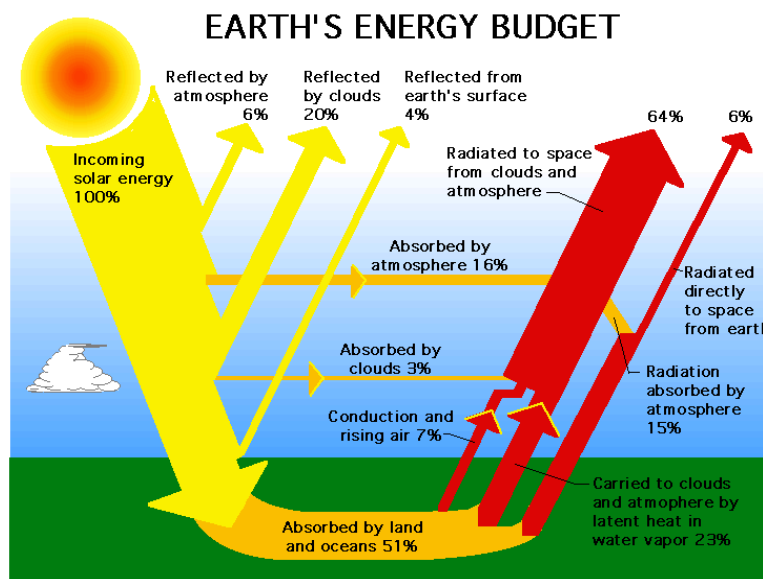
**Atmospheric system, energy balance & budget**

There are several layers in atmosphere:

1. Troposphere (10km from the Earth surface)
2. Stratosphere (40km)
3. Mesosphere (50km)
4. Thermosphere (300km)
5. Exosphere (above 400km from the Earth's surface)

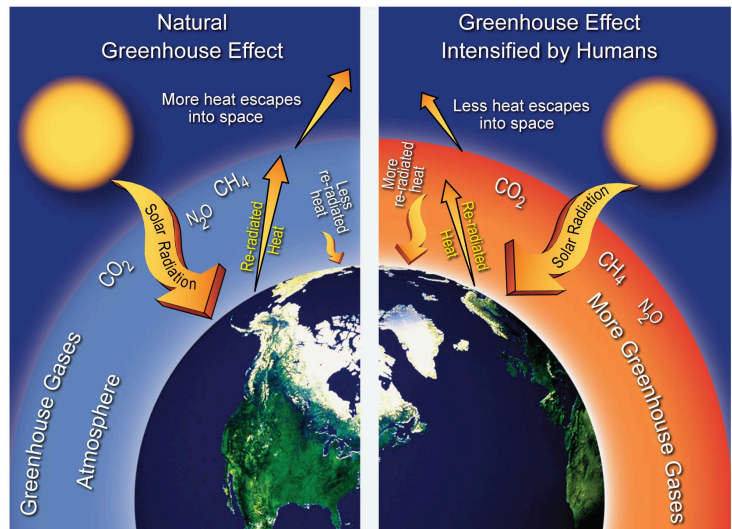


Atmospheric energy balance is the balance between the incoming shortwave solar energy and the outgoing longwave energy from the Earth. When it reaches the Earth, some is reflected back to space as radiation. The rest of the energy is absorbed by the atmosphere and the Earth's surface. Today, the Earth's energy budget is out of balance due to the increasing amount of greenhouse gases in the atmosphere. More heat energy is absorbed by the atmosphere, resulting in global warming.



## Greenhouse effect, the 'enhanced' greenhouse effect and global dimming

Greenhouse effect is a process that warms the Earth's surface and maintains its temperature (allowing the planet to be inhabitable for humans). The process is: some of the incoming sun radiation is reflected on the surface of Earth and some other objects (e.g. clouds), while some are absorbed by the surface and atmosphere (heat is trapped by greenhouse gases); warming up the Earth.

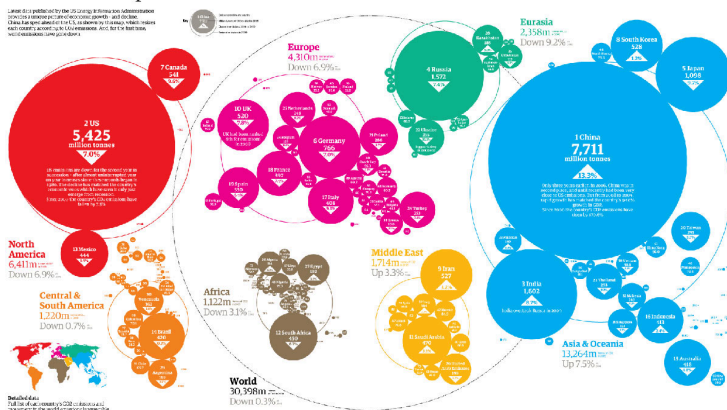


Enhanced greenhouse effect is when there are more greenhouse gases in the atmosphere, meaning more heat energy can be trapped; enhanced warming of the Earth.

Global dimming is caused when there is a higher density of clouds and/or air pollutants (e.g. ashes from the volcanic eruption) in the atmosphere, blocking the sunlight from reaching the Earth's surface. This results in the temperature decrease.

### The International variations in the greenhouse effect:

An atlas of pollution: the world in carbon dioxide emissions



In general, countries with higher economic development (e.g. North America and Asia) tend to have higher GHG emission levels due to higher energy use.

In HICs, **energy** requirements are high because of domestic consumption as well as industry. In MICs that have emerging manufacturing industries, industrial energy use is very high, while domestic consumption is lower. Most of

the MICs rely on fossil fuels because they are inexpensive and widely available. In LICs, GHG emissions are generally low because there are few industries and also small demand for domestic consumption.

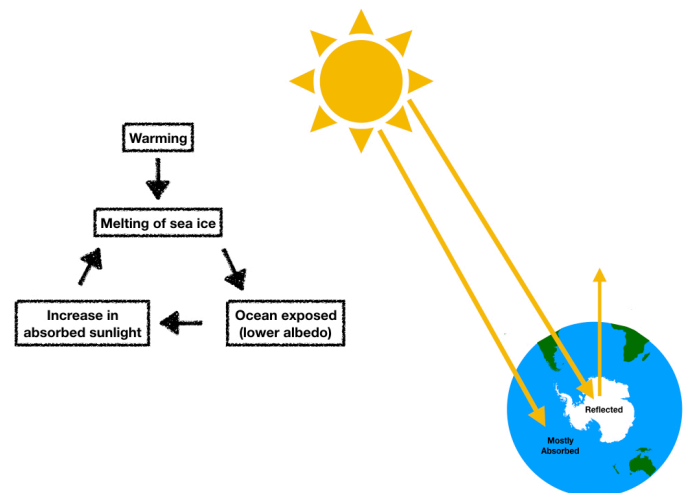
In terms of **trading**: countries that trade more tend to have high GHG emissions because they have a lot of manufacturing industries or high consumption of resources.

### Feedback loops

There are two types of feedback loop. Positive feedback loop and negative feedback loop. Positive feedback loop, by definition, is a feedback loop that diverges. Negative feedback loop, on the other hand, converges. That is, negative feedback loops tend to lessen the effects of something such as global warming, putting it back to its equilibrium state. Positive feedback loop in context of global warming, would diverge in the sense that the heating would continuously increase and increase.

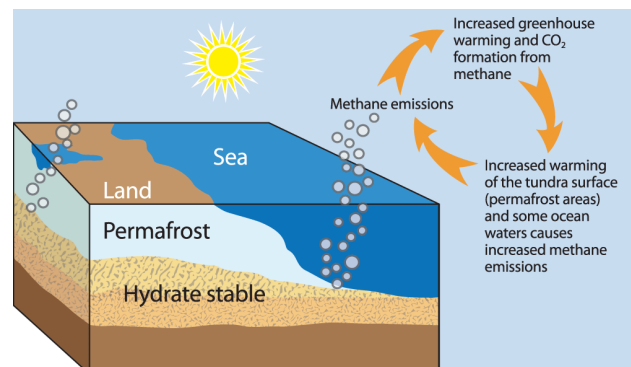
Specifically, terrestrial albedo feedback loop could be referred as the following:

Ice is a material which is known to be very reflective, that is, having high albedo. This means that it does not absorb heat and rather reflects it away, causing it to cool down. This in turn would cause more ice, and result in fact a positive feedback loop. Similarly, however, a positive feedback loop could be caused by the ice melting. That is, water has a higher albedo therefore it absorbs more heat. Hence, more ice caps would also melt as a result.



Moreover, methane gas can also cause feedback loops, that is, the following:

Methane is a greenhouse gas, which implies that its release will cause more heat to be entrapped in the atmosphere. This will result in permafrost melting, which in fact contains methane. The result of melting will release more methane, and as a result be causing more positive feedback.



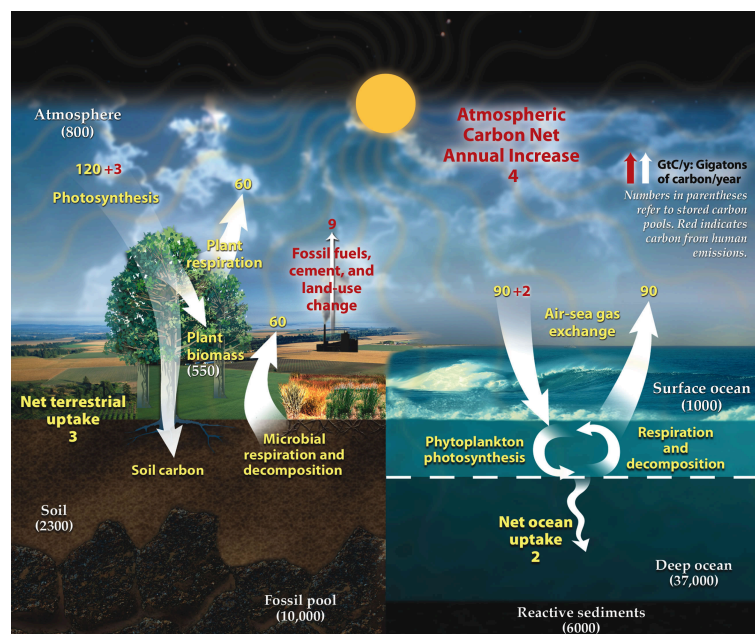


## Changes in Cryosphere, Hydrosphere, Biosphere and Biomes

Cryosphere and hydrosphere are closely related. That is, the cryosphere is the concept of the ice on earth. Hydrosphere being the water content of earth. With increased global warming, the cryosphere is becoming smaller, meaning that ice melts. This can cause a sea level rise, a change to the hydrosphere. Moreover, melting ice can be a hazard for people, as these may float and collide to islands. The declining ice will also cause a change in biome, that is, it may cause animals such as polar bears and penguins to migrate or threaten the existence of their species.

With the melting ice caps, however, it is not just the oceans that are changing. Increased water levels also mean the biosphere changing as coasts become smaller, and the higher amount of water could indeed cause more rains. Specifically, with global warming, there is increased moisture, more rain and intensifies the hydrosphere.

Moreover, the biosphere is an important carbon sink for the planet, that is, it absorbs carbon dioxide and stores it. For example, in forests, a material called peat is present and is caused by the stored ancient life that has been decomposed. Moreover, trees, a natural source of carbon sinks, are present. Hence, the destruction of forests will cause a loss in these carbon sinks and the carbon stored in the biosphere, hurting the carbon cycle.



The cryosphere and the biosphere are also sources of carbon sinks. For example, the ocean stores its carbon through coral life and plankton which in turn absorb carbon dioxide from the air as it fuses with the ocean through waves and wind and releases oxygen. However, acidification of the oceans can hinder this process and further cause feedback loops due to global warming.

Lastly, biomes are rapidly changing due to the climate change as well. With desertification as a result of increased temperatures, it will force many animals and species to run extinct but at the same time will help other desert animals flourish. As

mentioned, places such as the antarctic and arctic will have a loss of biodiversity as ice caps melt and force multiple species such as polar bears and penguins to flee or go extinct. Diseases, such as Malaria due to mosquitoes, may also become more common as these are able to spread out from their current biomes to other biomes due to increased heat.

### Impact of Climate change on people

With the increase in temperature, humans are impacted. For a 2 degree change, Malaria will become more evident within parts of Africa with likely 60 million new cases. Other tropical diseases are also expected to flourish as a result.

Increase in temperature may also lead to increased migration. This has already been evident. Residents of low-lying islands such as Kiribati in the South Pacific have abandoned their homes, while others, such as Kivalina, Alaska are expecting to leave before long.

One benefit, on the other hand, may be the opening of sea routes as ice melts, such as Russia's Arctic Coastline. Tourism is also likely to change as global warming changes weather patterns. Summer seasons may be extended and resorts selling coastal sunshine, sea etc. may be extended to further north. Winter sport holidays, however, may be stopped due to a lack of ice and snow. Reduced precipitation moreover may make some already popular areas uneconomic due to lack of water.

Moreover, climate change may lead to hunger and conflict, having implications for economic development. These changes are likely to affect LICs more than HICs, as LICs are less able to technologically cope with the changes. And this is already evident, e.g. Bangladesh has 25% GDP and 65% of the labour force already working to prevent flooding in low areas.

Coastal flooding caused by melting ice caps and the thermal expansion of the oceans will particularly affect countries below sea level e.g. Netherlands. Climate change also may lead to a loss of ecosystem services which provide a range of services such as primary productivity, pollination, flood control, provision of timber products etc.

### Potential impacts of temperature increase

#### - 1°C increase

With a 1°C global average temperature rise, the Arctic sea ice is expected to disappear completely during the summer season. Heatwave and forest fires will become more common in subtropical regions (especially worse in the mediterranean region, southern Africa, Australia, and the south-west US).

#### Other possible major impacts:

Disappearance of coral reefs (including Great Barrier Reef)

Melting of glaciers that are essential drinking water for 50 million people

Increase in climate-related disasters (e.g. malaria and diarrhoea) that will affect 300,000 people every year

#### - 2°C increase

Heatwaves will be common in Europe, which may kill tens of thousands of people. Southern England will experience around 40°C every summer. The Amazonian rainforest will turn into desert and grasslands, which will lead to increasing CO<sub>2</sub> levels in the atmosphere. This will cause the world's oceans too acidic for any remaining coral reefs (leading it to extinct) and other marine life forms. More than 60 million people, mainly in Africa, will be exposed to higher rates of malaria. Agricultural yields will drop worldwide, exposing half a billion people to a greater risk of starvation. Continuous melt of ice in Antarctic and Greenland, causing the world's sea level to rise by 7m over the next 100 years. Also, glaciers all over the world will recede, hence there will be reduction in the freshwater supply for major cities including Los Angeles. Further major impacts are: coastal flooding and extinction of third of the world's species

#### - 4°C increase

The Arctic permafrost would enter the danger zone, releasing much more of methane and CO<sub>2</sub> into the atmosphere. At the arctic itself, the ice cover would disappear permanently, hence extinction of polar bears and other species that rely on the presence of ice. The ice melt also leads to a further 5m rise in sea level, submerging many island nations. Italy, Spain, Greece and Turkey would become deserts and central Europe would reach almost 50°C (desert temperature) in summer.

### Mitigation and Adaptation strategies

Government led adaptation and mitigation strategies can be found in the Kyoto Protocol, Paris Agreement and UN Framework convention in the case studies section below.

Mitigation strategies include, but are not limited to:

- Reducing energy consumption
- Reducing emissions of nitrous oxides and methane from agriculture
- Using alternatives to fossil fuels
- Geo-engineering
- Carbon trading
- Carbon offset schemes

Mitigation strategies for carbon dioxide removal (CDR techniques) include:

- Protecting and enhancing carbon sinks through land management
- Using biomass as a fuel source
- Using carbon capture and storage
- Enhancing carbon dioxide absorption by the oceans, either by fertilising oceans with nitrogen, phosphorus and iron to encourage the biological pump or by increasing upwelling to release nutrients on the water

Geo-engineering is an idea to release sulphate aerosol particles in the air to dim the incoming sunlight and hence cool the planet. Another idea is to place giant mirrors in space to deflect some incoming solar radiation.

Carbon trading is an attempt to create a market in which permits issued by governments to emit carbon dioxide can be traded. In Europe, carbon permits are traded through the Emissions Trading System (ETS). Governments set targets for the amount of carbon dioxide that industries can emit, divided between individual plants or companies. Plants that exceed that limit are forced to buy permits from others that do not. Targets are set to reduce pollution, but through a market system. It is working by putting a limit on total emissions, but critics argue that the targets are too generous.

Carbon offset schemes are designed to neutralize the effects of the carbon dioxide human activities produce by investing in projects that cut emissions elsewhere. Offset companies typically buy carbon credits from projects that plant trees or encourage a switch from fossil fuels to renewable energy. They sell credits to individuals and companies that want to go “carbon neutral”. Some climate experts

say offsets are dangerous because they dissuade people from changing their behaviour

### Civil Society and corporate strategies to address climate change

Civil society is 'the associational activity of citizens that is entered into voluntarily to advance their interests, ideas, ideals, and ideologies. It doesn't include activities for profit or governing the state/public sector', according to the United Nations.

The examples of strategies taken by World Wide Fund for Nature (WWF) to tackle climate change are:

- Pressurising major mature economies and emerging economies to reduce greenhouse gas emissions
- Calling on governments to sign up to international agreements to: reduce the use of fossil fuels; conserve forests; work towards 100% renewable energy by 2050; reduce emissions from aviation (flight transportation)
- Trying to encourage people to use new technologies, have greener lifestyles and to call for climate-smart legislation

One of WWF-UK's schemes: **One in Five Challenge** aims to encourage companies and government agencies to reduce the environmental impact from their business travel (mainly flights) and other activities. WWF-UK argues that it benefits both the environment and the companies/organisations. The benefits include:

- Financial savings through reductions in flights and accommodation
- Time savings on travelling, giving more time for working
- Improvements in productivity as it's easier to work in an office or a train than on a plane
- Improvements in family life with fewer business trips
- Higher staff retention due to improved working conditions

One company that took the One in Five Challenge was Vodafone, through the use of video-conferencing, voicemail, instant messaging and web software to facilitate communications between its staff. In the first 5 months after the investment in video-conferencing facilities, the number of business flights was cut from 14,379 to 10,630km, resulting in reducing CO<sub>2</sub> emissions by 617 tonnes. The company, in result, saved about one third of its previous costs of air travel.

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### **Agriculture and varying extreme weather**

A 3 degree celsius increase is predicted to cause a 35% decrease in crop yield. A 200 celsius increase would cause 200 million to be exposed to hunger. Viticulture – the growing of grapes to produce wine – will move polewards, as will corn and wheat. (Past evidence suggests that vineyards existed in the north of England in the 1300s.) Recent models predict dramatic changes to the wheat-growing regions of the USA, with many becoming unviable by 2050. Scientists project a northward shift of wheat-growing in North America, with a decline in the USA's grain belt but an increase in Canada's growing season. This would have serious effects on the US economy. Similarly, wheat yields in the north of the UK are predicted to rise by 30 per cent and those in the south of the country to fall by 30 per cent. Since drought reduces crop yield, the reduction in water resources will make it increasingly difficult for farmers in many areas to irrigate elds. Crop types may need to change and changing water resources will either limit or expand crop production depending on the region and local weather patterns.



# Case Studies

### **UN Framework convention on Climate Change (UNFCCC)**

In 1992, the UNFCCC was signed and adopted by 154 states at Rio de Janeiro. Its ultimate objective is the “stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”.

UNFCCC entered into force in 1994, but failed in slowing down GHG emissions. Later in 1997, The Kyoto Protocol was signed. It was the first major attempt to implement the treaty (written agreement with international laws). HICs were required to cut their carbon emissions by 20% by 2012, compared with their 1990 emissions. LICs were not obliged to meet specific targets. The USA, hence, didn't sign the treaty since they thought it would give China a competitive edge in world trade. Canada and Australia signed, but they didn't implement it.

The UNFCCC encouraged HICs to lead the way in climate change mitigation. This was because:

- They have technologies
- They are better able to bear the costs of low-carbon energy developments
- They have caused a disproportionate amount of historic CO<sub>2</sub>
- Low-income countries need time to develop their economies

### **Kyoto Protocol**

In 1997, Kyoto, Japan, 183 countries signed an agreement about the stabilisation of greenhouse gas emissions, which aimed to reduce gas emissions by 5% of their 1990 levels by 2012. The protocol came into effect in 2005, was due to expire in 2012 but was extended to 2015. Within the agreement, countries were limited to how much carbon dioxide they could emit. Countries with extra emissions units were allowed to sell it to other countries. This carbon trading now works like any other commodities market and is also known as the carbon market.

The Kyoto protocol encourages the use of energy which is clean, avoiding fossil fuels by using hydroelectric, solar and wind powers. Other countries such as France deemed nuclear power to be 'healthy', however, this is controversial due to the nuclear waste that is produced. Incidents such as the Fukushima Daiichi disaster, however, have also made nuclear power less attractive to countries. The Kyoto Protocol of inference parties holds a meeting every year to discuss progress in dealing with climate change.

### Paris Agreement

The Paris Agreement is the latest international treaty within UNFCCC, signed in 2015 by 194 states.

The key objective is to limit global warming to 2°C compared with pre-industrial levels. It also seeks for zero net anthropogenic GHG emissions between 2050 and 2100.

Unlike the Kyoto Protocol, there are no country-specific goals or a detailed timetable for achieving the goals, hence there are no any measures to penalise countries if their targets are not met.

The 2015 conference wanted to achieve a binding and universal agreement on climate change from all the world's countries. The USA and China both agreed to limit GHG emissions.

### The 'three amigos' summit (Case study)

In 2016, the USA, Canada and Mexico had the summit regarding agreement of a set of initiatives covering climate change actions, involving an integration of their domestic policies on the electricity sector, transport and pollution.

#### Aims:

- To achieve 50% clean energy use by 2025 as well as improving their energy efficiency Cross-border cooperation will be essential and modernisation of the electricity grid will be a major requirement.
- The USA and Canada agreed to reduce their methane emissions by 40-45% by 2025 (since North America is responsible for 10% of global methane emissions).
- To reduce and regulate the use of hydrofluorocarbons (HFCs), which are among the most rapidly increasing GHG that is used as refrigerants.
- To tackle vehicle emissions and to align fuel efficiency by 2025-7.

### **Flooding, Bangladesh**

Bangladesh has a delta that is derived from three main rivers, which periodically burst their banks and flood the land. The flooding has some advantages such as watering the crop and increasing the soil fertility. However, since 1970, the scale, intensity and duration of the floods have increased. Furthermore, a continuous rise in temperature is assumed to cause flooding more often.

#### Impacts of flooding on Bangladesh:

- Human deaths from drowning and diseases.
- Loss of income
- Loss/unavailability of fuelwood and gas
- Damage to buildings and infrastructure
- Loss of livestock
- Damage to vegetation

A number of government and non-government organisations have been involved in initiatives to reduce the impacts of floodings. For example, in 1988, the government of Bangladesh developed its Flood Action Plan, with the aim of protecting the country from the effects of future flooding.

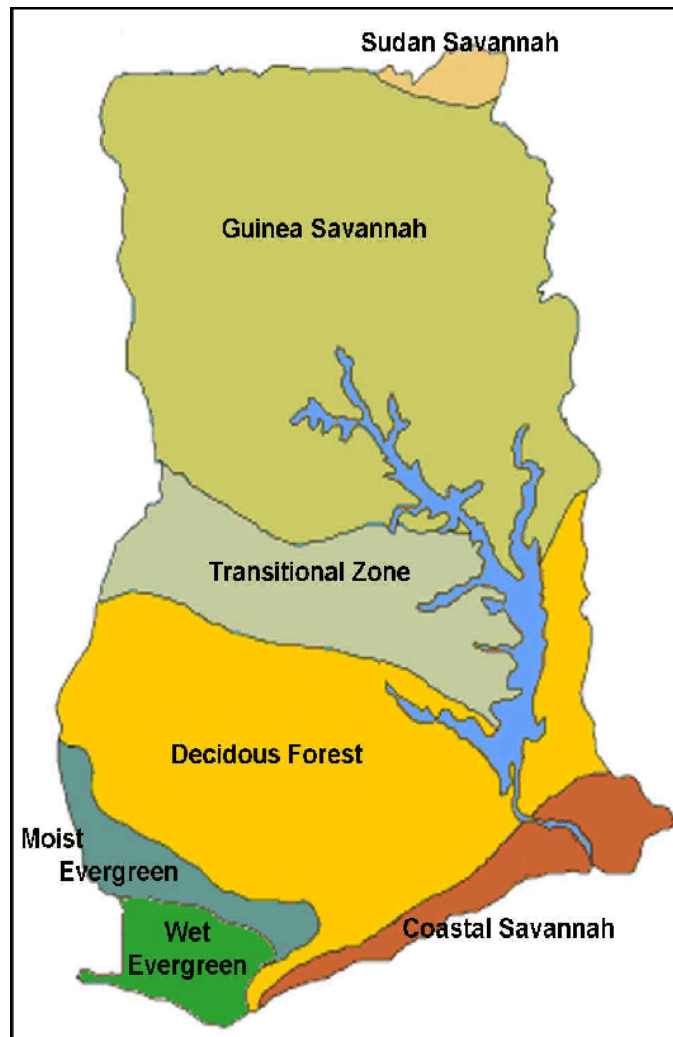
#### Following are number of actions took place:

- Construction of Sluice gates (which control water levels and flow rates of river)
- Construction of 5,700km of embankments (4000km of them along the coast)
- Construction of 200 flood shelters on stilts for the evacuation
- Installation of brick toilets with septic tanks to reduce water contamination

#### Number of factors that makes Bangladesh vulnerable:

- Flood-prone settlements (many settlements are in the flood-prone area)
- Unprotected settlements (mostly made of sand and mud; vulnerable to floods)
- Low level of education
- Limited access to basic needs
- Limited access to medical services
- Low level of income
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## Vulnerability and Adaptation in Ghana



Number of adaptation responses to climate impacts in different areas in Ghana, West Africa:

### 1. Guinea Savanna

Climate change impacts:

- Increased disease prevalence
- Increased vulnerability of the poor
- Increased emmigration and loss of human capital

Adaptation responses:

- Strengthening public health-care delivery
- Increasing investment in urban social services

### 2. Transition Zone

Climate change impacts:

- Increased demand in basic services (e.g. water and energy)
- Decreased income for people in fish industry
- Increased emmigration
- Food scarcity
- Potential conflicts and social tensions

Adaptation responses:

- Promoting conflict management mechanisms
- Providing social safety nets for communities and migrants

### 3. Deciduous Forest

Climate change impacts:

- Decreased food security
- Dry-up of water bodies fo and underground water
- Pressure on land

Adaptation responses:

- Providing small-scale irrigation
- Improving social services to poor people

### 4. Coastal Savanna

Climate change impacts:

- Decreased water availability and quality
- Increased migration
- Increased cholera (disease)

Adaptational responses:

- Recycling and total rainwater harvesting
- Improving safety nets
- Social protection for immigrants
- Increasing accessibility of health care
- Education and raising awareness of health issues

### **The destruction of forests, USA**

Climate change is causing devastation in America's dense forests, which is responsible for absorbing 13% of GHG that the US emits through burning fossil fuels, owing to fire, insect infestations, and drought. All these threats are leading to a warming climate.

#### Forest Fire:

In 2013, Yosemite National Park was affected by California's third-largest wildfire ever, which burned over a quarter of a million acres.

In 2015, over 10 million of America's 766 million acres of forests were consumed by wildfires, costing the US government over \$2 billion.

#### Drought:

Climate change is believed to have made California's drought 15-20% more severe. By the acceleration of melting of winter snow, hotter temperatures have made the fire season longer, from an average duration of 50 days to 125 days since 1970.

#### Insects:

The devastation of forests by insects is ecologically as dramatic as wildfires. The United States Forest Service (USFS) claimed the insects as well as drought killed 26 million trees in California. Such destruction, partly caused by global warming will enhance warming. Warmer, drier weather, including milder, shorter winters, has led to an increase in insect populations as well as in the number of stressed trees they infest.

### **Mitigating the effects**

Mitigating the effects of forest devastation would require a massive intervention to clear dead trees and plant new ones, which is currently unthinkable and looks impossible.

Since 2000, partnerships have been formed in many cities to improve management of their forested watersheds. Places such as Ashland have introduced new taxation systems, i.e. water taxing. Other cities and states, such as Flagstaff, Denver and Santa Fe offer provisions for downstream water users to pay for forest management.



### Retreating of glaciers, Switzerland

Glaciers in Switzerland are predicted to recede at an accelerated rate. Such a process will lead to a massive change in the landscape and changes in water balance, glacial lake outbursts, mudslides and debris slides. The glaciated surface of the Swiss Alps declined 1800 km<sup>2</sup> in 1850 to 1300 km<sup>2</sup> in 1971, a loss of  $\frac{1}{3}$ . The surface area decreased from 4.4% to 3.15% a loss of 1.3%.

For example, the Gorner Glacier between 1882 and 2015. In 1882, the glacier was 15 km long. Between 1883 and 1885, the glacier grew slowly, 4m. It remained steady for a few years, until it started to retreat 26m per year. It then retreated more slowly, by less than 10m/year in 1920. It then gradually increased, until peaking in 1950 where it decreased by 186m. In 2007/2008, it peaked once more, with about 290m decrease. It retreated a total of 2.5km in the last 130 years. Large glaciers, including Gorner Glacier, had the greatest amount of recession in surface area, volume and length in absolute terms, but their relative losses (120–125 %) were less than those of the medium glaciers (30–50%) and the small glaciers (50–80%).

### Corporate change mitigation efforts, USA

The climate change performance index of the USA was 54th of 60 in 2011. In 2016, its position was 34th. This was a result of corporate initiatives. Large companies have strategies for CO<sub>2</sub>, especially in California, Connecticut, Maryland, Maine and Massachusetts. With ambitious plans in California, Florida and New York, which have legislation to reduce gas emissions by 80 per cent, compared with 1990 levels by 2050.

The USA is now one of the largest sectors of the wind, solar, biomass and waste-from-energy sector, desiring to replace fossil fuels. Companies that are not associated with renewable energies also look into reducing CO<sub>2</sub> emissions. 28 Companies formed the US Climate Action Partnership (USCAP), including Chrysler, General Electric, General Motors, Rio Tinto, Shell and Siemens. USCAP has lobbied the government to set legally binding emissions targets and has called for a reduction target of 80% by 2050. This suggests a “cap and trade system”, carbon capture and storage (CCS). However, it is also argued that USCAP has no power and that its role is primarily one of public relations for the companies involved.

In 2008, companies such as Starbucks, Levi Strauss, Nike and others joined the Coalition for Environmentally Responsible Economies to form Business for Innovative Climate and Energy Policy (BICEP). BICEP calls for a reduction in greenhouse gas emissions to 25% below 1990 levels by 2020, and 80%. It also calls for increased energy sufficiency, investments in low-carbon energy and contribution of green energy resources to increase 20% by 2020 and 30% by 2030 as well as limit on the construction of new coal-fired power stations unless they have the technology to capture and store carbon.

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## **Topic 3: Global Resources** **Consumption and Security**

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# Syllabus Link

## IB Geography Notes Higher Level

Geographic inquiry	Geographic knowledge and understanding
<p><b>1. Global trends in consumption</b> Suggested teaching time 7–8 hours</p>	
<p>How global development <b>processes</b> affect resource availability and consumption</p>	<p><a href="#">Global and regional/continental progress towards poverty reduction, including the growth of the “new global middle class”</a></p> <p><a href="#">Measuring trends in resource consumption, including individual, national and global ecological footprints</a></p> <p>An overview of global patterns and trends in the availability and consumption of:</p> <ul style="list-style-type: none"> <li>• <a href="#">water, including embedded water in food and manufactured goods</a></li> <li>• <a href="#">land/food, including changing diets in middle-income countries</a></li> <li>• <a href="#">energy, including the relative and changing importance of hydrocarbons, nuclear power, renewables, new sources of modern energy</a></li> </ul> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>How different patterns and trends are interrelated and involve <b>spatial interactions</b> between different places</p>
<p><b>2. Impacts of changing trends in resource consumption</b> Suggested teaching time 7–8 hours</p>	
Geographic inquiry	Geographic knowledge and understanding
<p>How pressure on resources affects the future security of <b>places</b></p>	<p>The water–food–energy “nexus” and how its complex interactions affect:</p> <ul style="list-style-type: none"> <li>• <a href="#">national water security, including access to safe water</a></li> <li>• <a href="#">national food security, including food availability</a></li> <li>• <a href="#">national energy security, including energy pathways and geopolitical issues</a></li> </ul> <p>The implications of global climate change for the water–food–energy nexus</p> <ul style="list-style-type: none"> <li>• <i>Detailed examples of two countries with contrasting levels of resource security</i> <ul style="list-style-type: none"> <li>• <a href="#">Hindu Kush Himalayan Region</a></li> <li>• <a href="#">South Africa</a></li> </ul> </li> </ul> <p>The disposal and recycling of consumer items, including international flows of waste</p> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>How <b>perspectives</b> on, and priorities for, national resource security vary between places and at different <b>scales</b></p>
<p><b>3. Resource stewardship</b> Suggested teaching time 7–8 hours</p>	

## IB Geography Notes Higher Level

<p><b>Possibilities</b> for managing resources sustainably and <b>power</b> over the decision-making process</p>	<p>Divergent thinking about population and resource consumption trends:</p> <ul style="list-style-type: none"><li>• <a href="#">pessimistic views, including neo-Malthusian views</a></li><li>• <a href="#">optimistic views, including Boserup</a></li><li>• <a href="#">balanced views, including resource stewardship</a></li></ul> <p>Resource stewardship strategies, including:</p> <ul style="list-style-type: none"><li>• <a href="#">the value of the circular economy as a systems approach for effective cycling of materials and energy</a></li><li>• <a href="#">the role of the UN Sustainable Development Goals and progress made toward meeting them</a></li></ul> <p><b>Synthesis, evaluation and skills opportunities</b></p> <p>Different <b>perspectives</b> on global resource use and the likely effectiveness of management actions at varying <b>scales</b></p>
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# Key Terms

- **Ecological Footprint** - The impact of human activities measured in terms of the area of biologically productive land and water required to produce the goods consumed and to assimilate the wastes generated, measured in global hectares (gha)
- **Multi-cropping** - The practice of growing two or more crops in the same land during one growing season instead of just one crop.
- **Tidal energy** - renewable energy powered by the natural rise and fall of ocean tides and currents
- **Nuclear power** - non-renewable energy obtained from nuclear fission, nuclear decay and nuclear fusion reactions in nuclear reactors. Primarily uses Uranium, to be bombed with neutrons.
- **Solar Energy** - renewable energy from the sun that is converted into thermal or electrical energy
- **Wind Energy** - the use of wind to provide mechanical power through wind turbines to generate electricity.
- **Biofuel Energy** - renewable energy sources made from organic matter or wastes; help in reducing CO<sub>2</sub> emissions.
- **Virtual Water / Embedded Water** - Water that is used which is hidden from sight, i.e. creating a ton of steak in fact costs 16000 tons of water.
- **Physical water scarcity**: Water scarcity is when physical access to water is limited such that water consumption exceeds 60% of the usable water supply. This is when the demand for water exceeds the supply for water
- **Economic water scarcity**: This is when a population lacks the supply of water even though it is available as it is not accessible due to economic reasons. This may be due to lack of the necessary monetary needs to utilize an adequate source of water.
- **The water-food-energy Nexus** - The interrelationship, interdependence and interactions between water, food and energy
- **Carrying Capacity** - the maximum number of individuals of a given species that an area's resources can sustain indefinitely without significantly depleting



or degrading those resources.

- **Energy security** - Access to clean, reliable and affordable energy sources for cooking, heating lighting, communications and productive uses
- **Food Security** - The availability and access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life.
- **Water security** - Continuing access to safe drinking water and sanitation
- **Domestic Waste** - the waste that is produced by a regular household. In the US, this is typically composed of 30% food scrap, 14% food waste, 12% plastic and 13% yard trimming
- **Recycling** - is reusing the material of a product once more in production, helping reduce resource consumption and pollution. In Europe, the rates of recycling are high, whilst in the US 60% of domestic waste material could be recycled
- **Reduce and Reuse** - reuse is usually more energy efficient than recycling, and can be typically seen in containers, plastic bags, pots etc. Reducing refers to not using extra energy when not needed e.g. turning off lights.
- **Composting** - the process of decomposition of biodegradable material. This allows us to introduce valuable nutrients to the soil for plants to grow.
- **Landfill** - a cheap, but arguably not a healthy method of keeping waste away. Research shows that living near a landfill increases health problems, may contaminate water supplies and can cause a shortage of space. Moreover, biodegradable things decompose anaerobically, releasing greenhouse gases.
- **Incineration** - refers to burning of waste in order to produce energy. This heat can be used to generate electricity. However, with burning a great deal of air pollution is released, and is expensive.
- **E-waste** - electronic waste. These are wastes which are produced from technological components. This is caused by an increase in innovation. The recycling of e-waste is typically done in Chinese homes, to extract things such as gold, zinc, copper etc. from motherboards. It also increases lead poisoning, cancer causing dioxins and miscarriages.

## IB Geography Notes Higher Level

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- **Malthusian View** - Malthusian view believes that the population growth will outweigh the food capacity, and is a pessimistic view. That is, it believes that the population growth is exponential, whilst food capacity is a linear graph.
- **Boserup View** - This is an optimistic view of food and population growth. She believes that there are sudden spikes in food capacity thanks to evolving and advancing technologies.
- **Emile Durkheim View** - Adding to Malthusian view, Emile Durkheim believed that population growth and industrialisation was necessary to achieve division of labour.
- **Optimum Population** - is the number of people who, when working with all the available resources, will produce the highest per-capita economic return. It is the highest standard of living and quality of life.
- **Overpopulation** - when too many people are present in comparison to the carrying capacity of a location. E.g. Somalia, Brazil etc.
- **Underpopulation** - when there are far too many resources in comparison to the amount of people in an area. E.g. Canada, Australia.
- **Resource Stewardship** - is the idea that humans can use resources that can be used to support future generations. That is, not only environmental sustainability, but also social equity. E.g. the fish and the pond, if it is outfarmed then it will go extinct, underfarmed it will flourish, farmed just the right way, it will stay the same.
- **Tragedy Of Commons** - a situation in a shared-resource system where individual users, acting independently according to their own self-interest (being ego), and as a result ultimately causing depletion of that particular resource.
- **Circular Economy** - an economic system aimed to eliminate waste by the continual use of resources. Circular system employs reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system.
- **Extreme poverty** - when a person's daily income is below \$1.90
- **Absolute poverty** - a condition where household income is below a necessary level to maintain basic living standards (e.g. food, shelter, housing)

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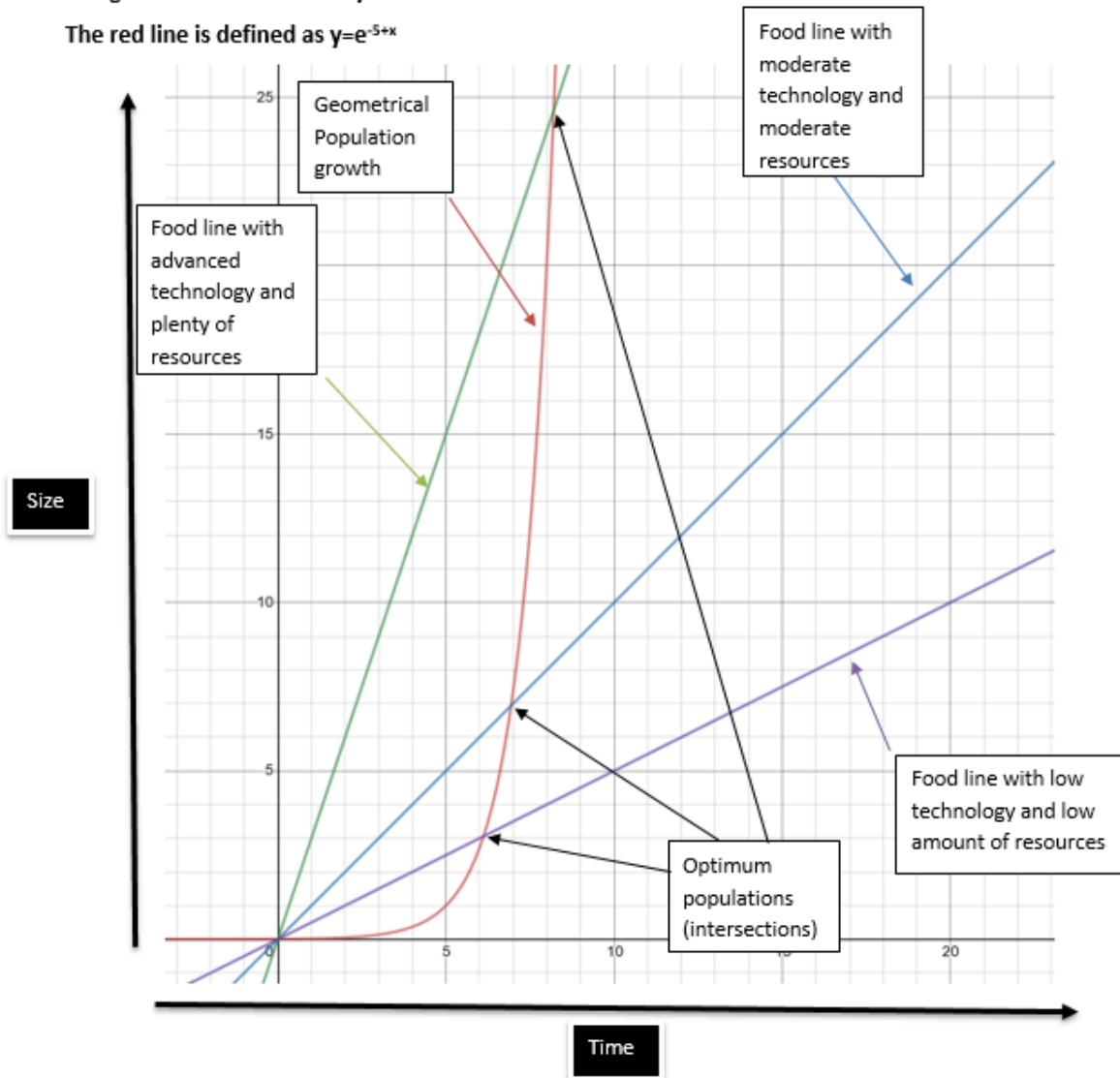
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- **Relative poverty** - a condition where household income is a certain percentage below median incomes (the place where you live matters; being relatively poor in Singapore doesn't mean poor in Sub-African countries)
- **New Global Middle Class (NGMC)** - the emerging middle class with discretionary income, earning between \$3,650 to \$36,500 per annum.
- **Fragile Middle Class** - also known as lower middle class who earn between \$2 and \$10 per day. They have escaped poverty but have yet to join NGMC.

# Theories

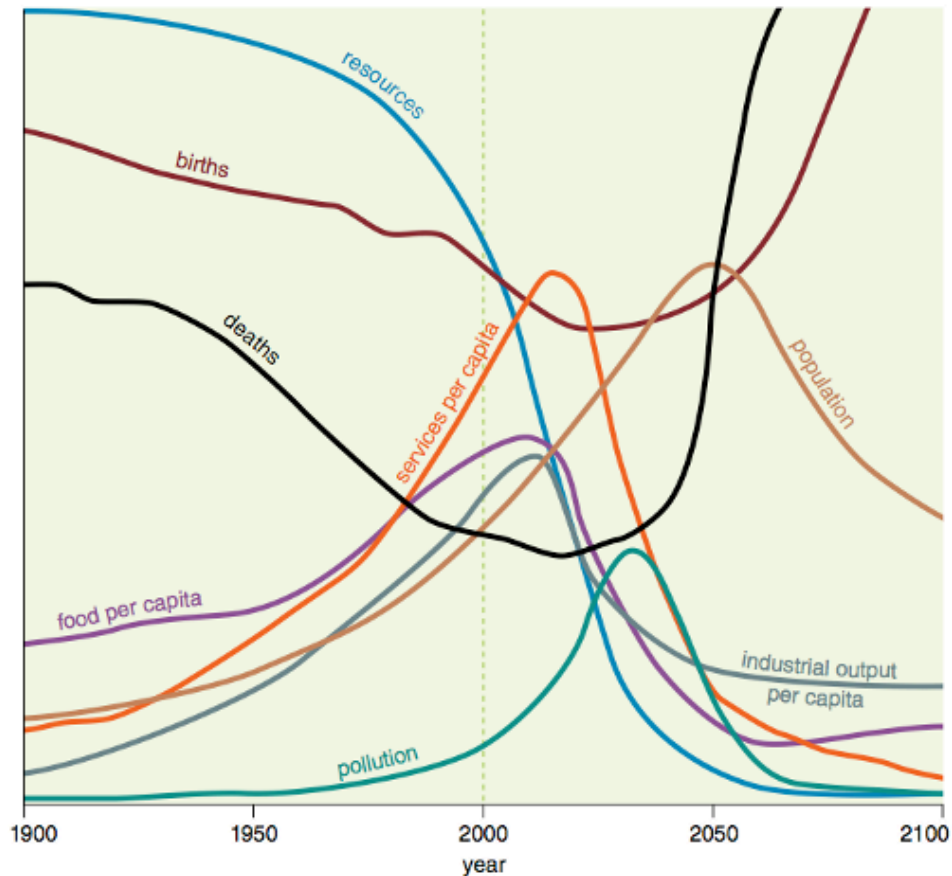
The Three Views

Malthusian view



The above figure demonstrates the Malthusian view of the food line and population growth.

The Malthusian is a pessimistic view which works with what it defines as 'positive' and 'preventive' checks. The 'positive' checks stand for things that keep the population in check, such as war, disease and not planned. Preventive checks on the other hand refer to measurements that humans take in order to prevent a crisis. That is, anti-natalist policies, family planning etc. This ideology is old, as it was developed in 1798. In order to make it more fitting to the current population, a neo-Malthusian view was developed.



The figure demonstrates what a neo-Malthusian would view the upcoming population growth.

It was developed by Club of Rome and Paul Ehrlich.

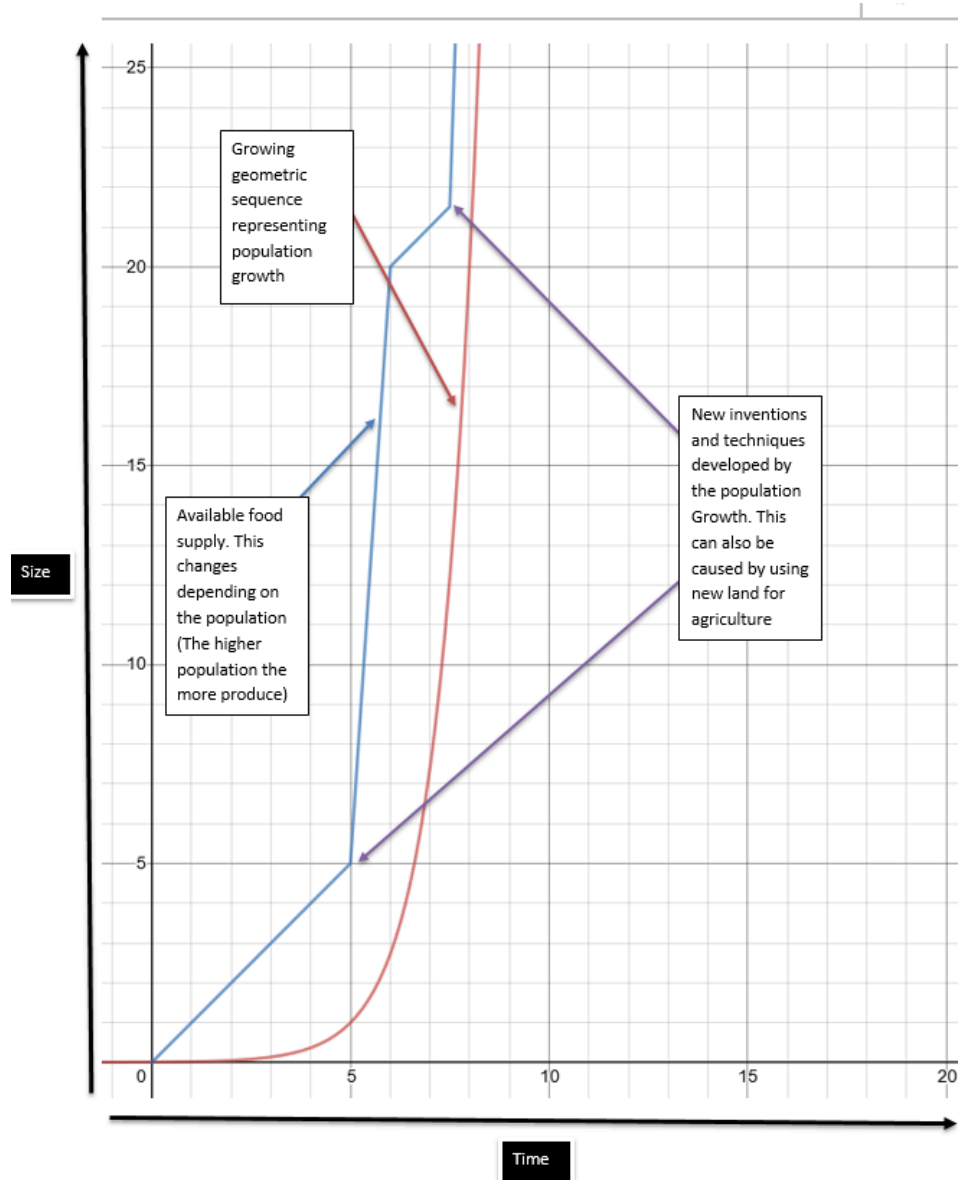
Disadvantages of Malthusian view:

- Population has not increased as rapidly as predicted by Malthus; on the other hand, production has increased tremendously because of the rapid advances in technology. As a result, living standards of the people have risen instead of falling as was predicted by Malthus.
- Moreover, the rate of production of food is in fact greater than population growth in the most advanced countries. Even in India, the food production is greater than population growth thanks to the Green Revolution.
- It does not take in all types of production. That is, even if a country has a problem with food production, it could compensate this with exports and imports e.g. Britain and coal, iron.
- No proof that population is geometric and food is an arithmetic progression

### Ester Boserup

Ester Boserup views the population growth to be more optimistic. She believes that through inventions and new farming techniques, the food line will rarely if ever meet the population line.

However, she also believes that the new techniques and inventions would only occur if the population continued to increase. Boserup's theory was based on the idea that people knew the techniques required by a more intensive system, and adopted them when the population grew. If that knowledge was not available, the agricultural system would regulate the population size in a given area.



Disadvantages of the Boserup view:

- Boserup has absolutely ignored the unfavourable effects of growing population on agriculture. In backward economies where land frontiers have already been reached, the subdivision and fragmentation of holdings must follow. Thus, small farmers in turn will obstruct the use of improved technology and the growing population may adversely affect the process of capital formation.
- The major criticism levelled against Boserup theory is that it is not applicable to those economies where the urban industrial sector is less developed, The U.S. A. or Canadian economies even, if it is sparsely populated as compared to many other economies is, thus, no longer a test case for this theory.

### Resource Stewardship

Is the ethical principle that views managing resources as a responsibility undertaken as a privilege on behalf of others. In other words, resources are managed with the needs of the wider (and even global) community in mind, taking into account resource availability for future generations. Stewardship is thus quite different to exploiting resources for immediate profit as an avaricious owner might do. Resource stewardship encourages a sustainable and responsible approach to managing resources that looks towards the needs of future generations rather than seeking immediate, short-term outcomes.

The balanced views have been suggested as a strategy for sustainably managing natural resources. This involves using conservation and preservation of natural resources whilst depending on human ingenuity or technological advances to find sustainable solutions to resource management.

On the other side of the spectrum, improved governance of natural resources could also lead to sustainable management of existing resources. This could involve:

- This is the need for *international organizations, governments, as well as financial institutions* such as the World Bank and the International Monetary Fund, to ensure that individuals, businesses and organizations do more, as stewards of natural resources, to promote conservation and preservation principles. Hence, the balanced approach is a combination of resource conservation and resource preservation strategies.
- They could also be *policies* that ensure fairness and equity in the distribution of resources at the global scale. Food, for instance, should be made cheaply available to people in developing countries, where the population is rapidly increasing.



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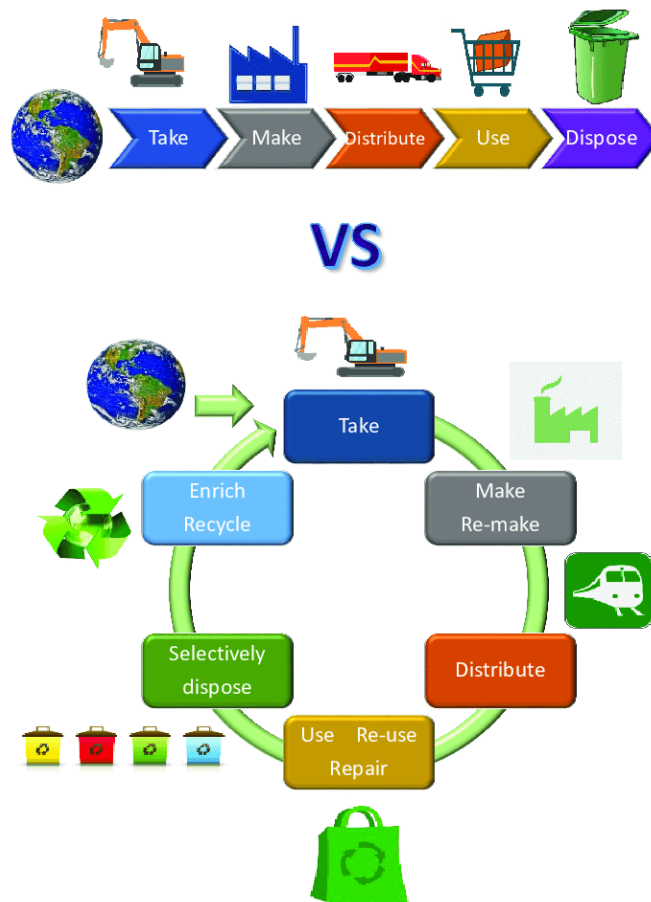
*Conservation:* refers to the process of protecting and managing a resource in such a way that it will not be degraded or damaged. This can be done through a reducing the use of the resource e.g forest resources can be protected against irresponsible lumbering or by encouraging afforestation. In terms of energy conservation, existing energy resources can be used in such a way that future generations can benefit from it, resulting in little or no environmental damage.

*Preservation:* attempts to maintain resources in their present condition in areas untouched by humans. This emanates from the fact that mankind is encroaching on the natural environment in an unprecedented manner; a rate at which many unprotected landscapes are being exploited for agriculture, industry, housing, tourism and other human developments.

### Circular Economy

In order to understand circular economy, it would be wise to understand the linear economy first. The linear economy refers to a system which focuses on production without making re-use. That is, a take-make-dispose system. Resources are used to create a product, the product is then made, used and finally disposed of in a landfill or something similar. The circular economy, on the other hand, is an attempt to make sure to use every bit of resource again before it is unusable and finally wasted. That is, a reduce-reuse-recycle system.

Consider the following diagram



### UN Sustainable Development Goals (SDGs)

SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030, adopted by all UN member states in 2015. There are 17 goals in total.



Goal 1: To end extreme **poverty** (an income below \$1.90 per day) by 2030.

Goal 2: To end **hunger** and malnutrition by achieving sustainable food production by 2030.

Goal 3: To improve reproductive, maternal and child **health**, reducing epidemics of infectious diseases (e.g. HIV and malaria), lowering the incidence of degenerative diseases (e.g. alzheimer) , and improving access to health care.

Goal 4: To improve **education** and training, and enable all children to access school (there were around 60 million primary school children who didn't attend school in 2013) by 2030.

Goal 5: To empower **women and girls** to achieve their full potential.

Goal 6: To ensure the availability and sustainable management of **water and sanitation**.

Goal 7: To promote access to affordable **energy**, and to increase the use of renewable energy sources.

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Goal 8: To promote sustained, inclusive and sustainable **economic growth**, full and productive employment, and decent work for all. Also, it aimed to eradicate forced labour, human trafficking and child labour.

Goal 9: To promote sustained **infrastructure** development, sustainable industrialisation and innovation.

Goal 10: To reduce **inequalities** (wealth, gender, age, race, class, ethnicity, religion and opportunity) within and between countries.

Goal 11: To make settlements more sustainable and to promote **community** cohesion, personal security, innovation and employment.

Goal 12: To shift to the **circular economy** (sustainable consumption and production patterns)

Goal 13: To take urgent action to **combat climate change** and its impacts

Goal 14: To promote the conservation and sustainable use of the **oceans, seas and marine resources**.

Goal 15: To manage forests sustainably, restore degraded **lands**, combat desertification, limit the degradation of natural habitats and reduce biodiversity loss.

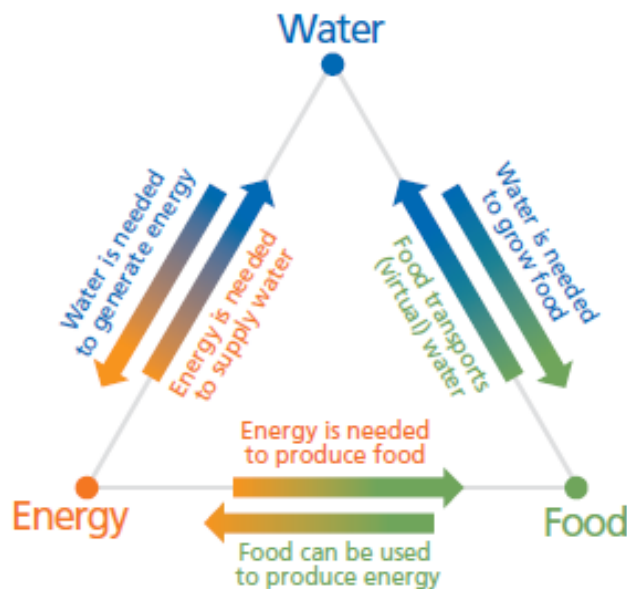
Goal 16: To promote peaceful and inclusive societies for sustainable development, provide access to **justice** for all and build effective, accountable and inclusive institutions at all levels.

Goal 17: To call for **partnerships** to strengthen the means of implementation of the SDGs (finance and technology).

### The Food-Water-Energy Nexus

The food-water-energy nexus refers to the very close links between these three sectors and the ways each of them has an impact on one another. How do its complex interactions affect the following factors?

- **Water security** is defined in the SDGs as “access to safe drinking water and sanitation”.
- **Food security** is defined by the FAO as the “availability and access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life”.
- **Energy security** refers to having access to clean, reliable and affordable energy sources for cooking, heating, lighting, communications and productive users.



There is a range of interaction between water, food and energy.

For example, water is essential for the mining, extraction (of oil), refining and transport of energy sources, as well as for the production of crops and rearing of livestock.

Food production is the world's largest single user of water, accounting for about 70% of water usage, while it may affect water extraction, water pollution (e.g. eutrophication, in which chemical nutrients flows into water, leading to massive plankton growth. Water surface is covered with planktons and hence fishes die out) and land-use changes.

Energy is needed for farming (e.g. ploughing, chemical fertilisers and machinery), while food can produce energy (e.g. biofuels)

Climate change could influence the water-food-energy nexus in many contrasting ways. For example, in some areas it may reduce agricultural productivity (crop yields), whereas in other areas it may increase it. Water supplies will diminish in some areas but increase in others. The demand for energy will also change respectively (due to their interconnections and interdependence)

Climate change will influence food availability, crop yields, water availability, and the need for irrigation. It will also influence the distribution of pests and diseases. Higher temperatures and evapotranspiration rates will reduce water supplies and increase the need for additional water provision. Energy demand may rise as a result of the increased need for the pumping or purification of water, and there may be increased competition between the agricultural and energy sectors for scarce water resources.

Moreover, attempts to limit climate change may have an impact on the water–food–energy nexus. The production of biofuels and hydroelectric power may create new demands for water resources. Some methods of adaptation to climate change, such as the use of drip irrigation and desalination of seawater, are very energy intensive. Increased groundwater use would also require extra pumping and therefore energy resources.

▼ **Table 3.5:** Synergies between the climate change adaptation and nexus approaches

Sector-specific adaptation measures	Positive implications for the sector	Potential for synergies across the nexus
<b>Water</b>		
Increasing water use efficiency	Reduced water per capita	Increased availability of water for energy and agriculture
Switching from use of freshwater to waste water	Reduced freshwater use per capita	Increased availability of freshwater for food, energy and other uses
Switching from wet to dry cooling at thermoelectric power plants	Reduced water use and associated thermal pollution	Increased availability of water for energy and agriculture
Desalination	Increase in brackish and freshwater supplies	Increased availability of freshwater and overall water supply for energy and agriculture and other uses
New storage and conveyance of water to serve new demands	Increased water supplies to meet demand	Increased availability of fresh water and overall water supply for energy and agriculture and other uses
Watershed management	Increased water supplies to meet demand	Increased water supply for energy and other uses, improved water quality, reduction in flood potential
<b>Land</b>		
Switching to drought-tolerant crops	Increased/maintained crop yields in drought areas	Reduced water demand
Using waste or marginal lands for biofuels	Increase in renewable energy	Reduced pressure on non-renewable energy as some fossil fuels are replaced with biofuels
<b>Energy</b>		
Increasing transmission capacity	Reduced economic and social impacts	Potential for reduced emissions if new transmission and wind/solar power supplied to the grid
Increasing renewable energy, e.g. solar, wind, biogas, bioenergy	Increased clean energy and reduced pressure on energy	Reduced GHG emissions, reduced water demand for cooling, thermal power

**Global Patterns and Trends in availability and consumption**

Embedded / Virtual Water

Virtual water (also known as embedded water) is water that is hidden from sight.

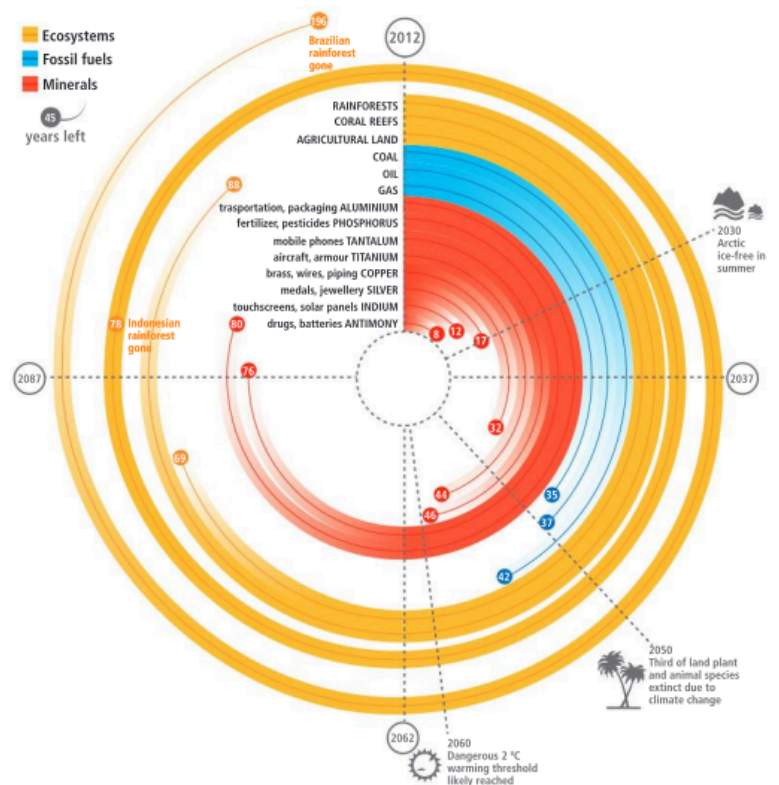
Food Item	Serving Size	Water Footprint
Steak (beef)	6 ounces	674 gallons
Hamburger	1 (includes bread, meat, lettuce, tomato)	660 gallons
Ham (pork)	3 ounces	135 gallons
Eggs	1 egg	52 gallons
Soda	17 ounces	46 gallons
Coffee	1 cup	34 gallons
Wine	1 glass	34 gallons
Salad	1 (includes tomato, lettuce, cucumbers)	21 gallons

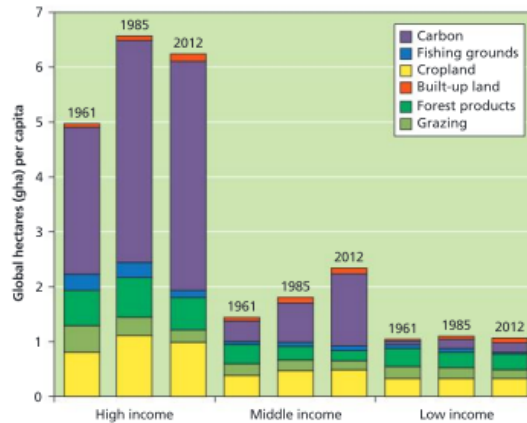
Developed countries tend to have high per capita water consumption. According to Water Footprint Network, “In the USA, the average water footprint per year per capita is as much as the water needed to fill an Olympic swimming pool (2,842 cubic metres), that is an average of 7,786 litres of water per person per day. In China, the average water footprint is 1,071 cubic metres per year per capita, or 2,934 litres of water per person per day” ([water footprints.org](http://waterfootprints.org)). More water is needed by advanced countries for industrial use whilst in LICs, it is mostly used for agriculture.

Ecological Footprint

An ecological footprint is the hypothetical area of land required by a society, a group or an individual to fulfill all their resource needs and assimilate all their wastes. It is measured in global hectares. A country described as having an ecological footprint of 3.2 times its own geographical area is consuming resources and assimilating its wastes on a scale that would require a land area 3.2 times larger than the actual size of the country.

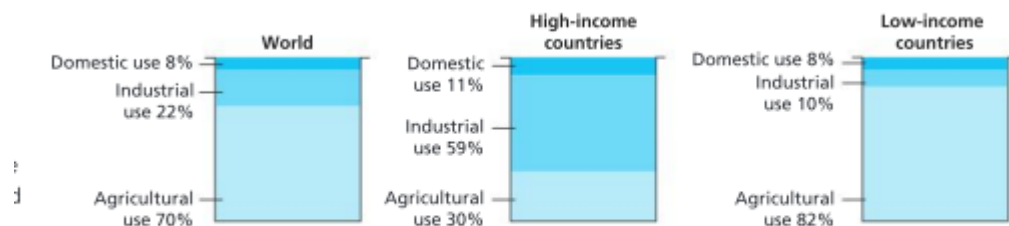
Estimated remaining world supplies of non-renewable resources





The above figure demonstrates the amount of ecological footprint released depending on a country's economy and year. As seen, the lower the income, the less the ecological footprint.

Moreover, consider the following diagram with water consumption in various economical countries:



In terms of consumption, meat consumption has increased. Between 1964 and 1999, meat consumption per capita increased by 150 per cent in LICs, and consumption of milk and dairy products rose by 60 per cent. Global meat production rose from 218 million tonnes in 1998–9 and is predicted to reach 376 million tonnes by 2030. Food consumption is price dependent: following a decline in meat prices, consumption increases, especially among poorer households. However, demand is “inelastic”, which means that a person's consumption of food will only increase up to a certain point, even if they have more money available to pay for it.

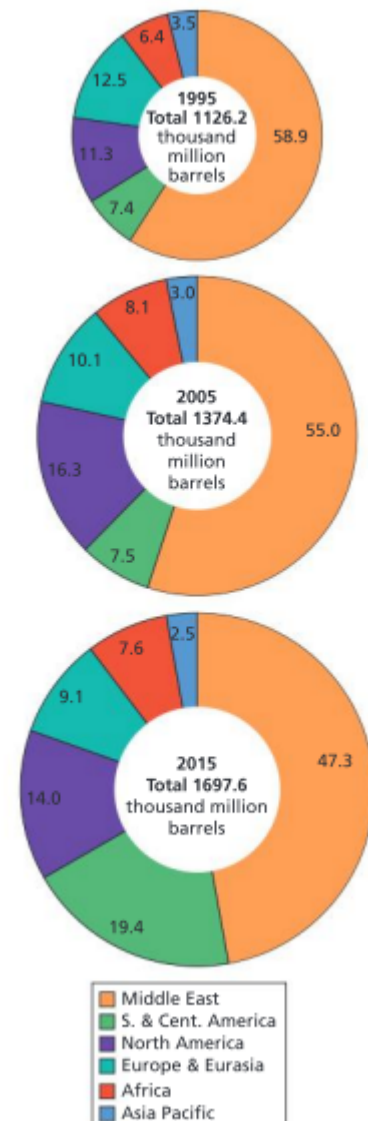
In recent years, the growth rates of food production and crop yields have been falling. Some of this reduction can be put down to natural hazards (res, oods, drought), global climate change, and the use of land to produce biofuels. Food shortages have led to riots in Indonesia, Egypt and across North Africa. Some of these in turn have led to widespread protest, and in the case of the MENA region, the Arab Spring. There are three main ways of increasing crop production:



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- expanding the area farmed
- multicropping, often using irrigation
- using high-yielding varieties or genetically modified organisms.

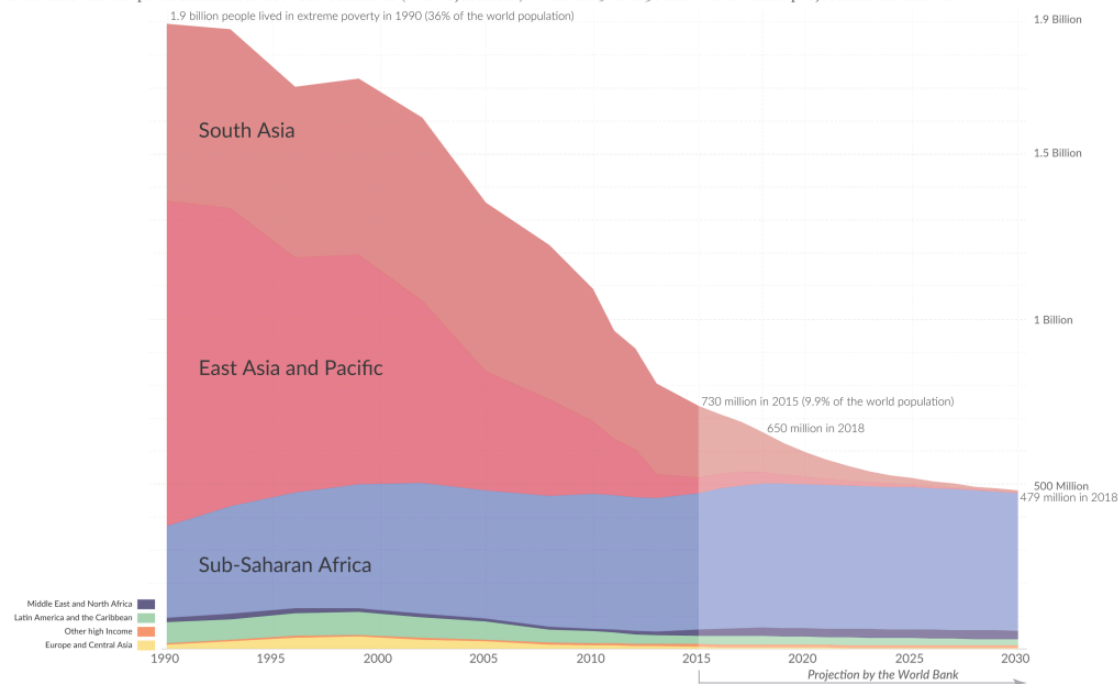
Lastly, energy insecurity is on the rise. For most consumers, a diversified energy mix offers the most energy security. Depending on a single source, especially from a single supplier, is more likely to lead to energy insecurity. The Middle East controls about 50 per cent of the world's remaining oil reserves. Saudi Arabia alone controls over 20 per cent. On the other hand, the USA, for example, consumes over 200 million barrels of oil per day but possesses less than 2% of the world's oil reserves. This means that the USA has to source much of its oil from overseas, notably the Middle East. This gives the Middle East an economic and political advantage – countries that want oil may have to stay on friendly terms with those that supply it. (There are obvious exceptions, such as the US–British invasion of Iraq and the Iraq invasion of Kuwait.)



### Poverty reduction and global middle class

#### The number of people in extreme poverty – including projections to 2030

Extreme poverty is defined by the 'international poverty line' as living on less than \$1.90/day. This is measured by adjusting for price changes over time and for price differences between countries (PPP adjustment). From 2015 to 2030 the World Bank's projections are shown.



Data source: World Bank data from 1990 to 2015. The projections from 2015 to 2030 are published in the World Bank report *Poverty and Shared Prosperity 2018*. This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing. Licensed under CC-BY by the author Max Roser.

One of the main successes of the Millennium Development Goals (MDGs) was the global reduction in extreme poverty between 2000 and 2015.

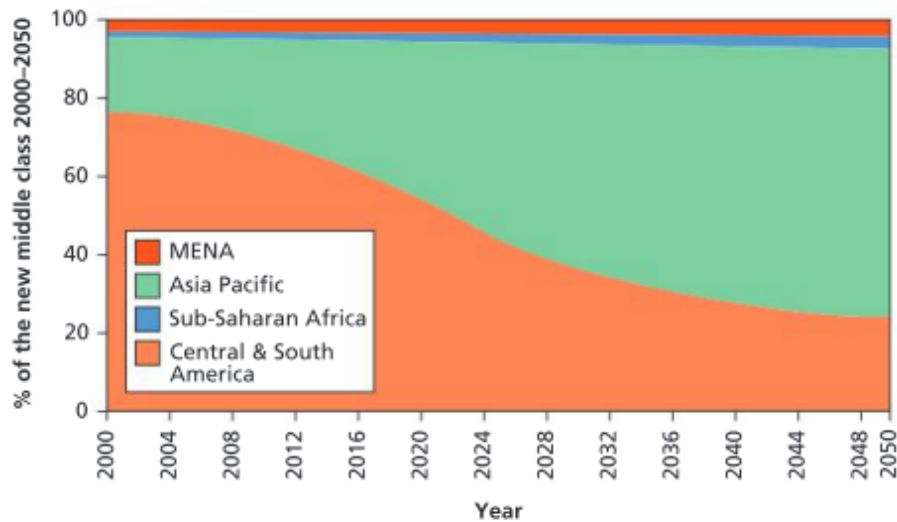
About one billion people have graduated out of extreme poverty (i.e. living in less than \$1.90 a day) in the past two decades, especially in Asia and Latin America.

#### Reasons for global poverty reduction:

- The introduction of Millennium Development Goals (MDGs) assisting in the reduction of extreme poverty between 2000 and 2015
- Government invests on healthcare delivery, education and sanitation, as well as reducing unemployment rate and improving the quality of life and standards of living of people
- Globalisation; increasing access to emerging markets by TNCs, helping their economic growth
- Rising income and changing lifestyles, leading to an increase in the demand for high-value manufactured goods
- Technological advancement, leading to job creation

This emerging group of income earners are known as **New Global Middle Class (NGMC)**, which are defined as people with incomes ranging between \$3,650 and \$36,500 a year.

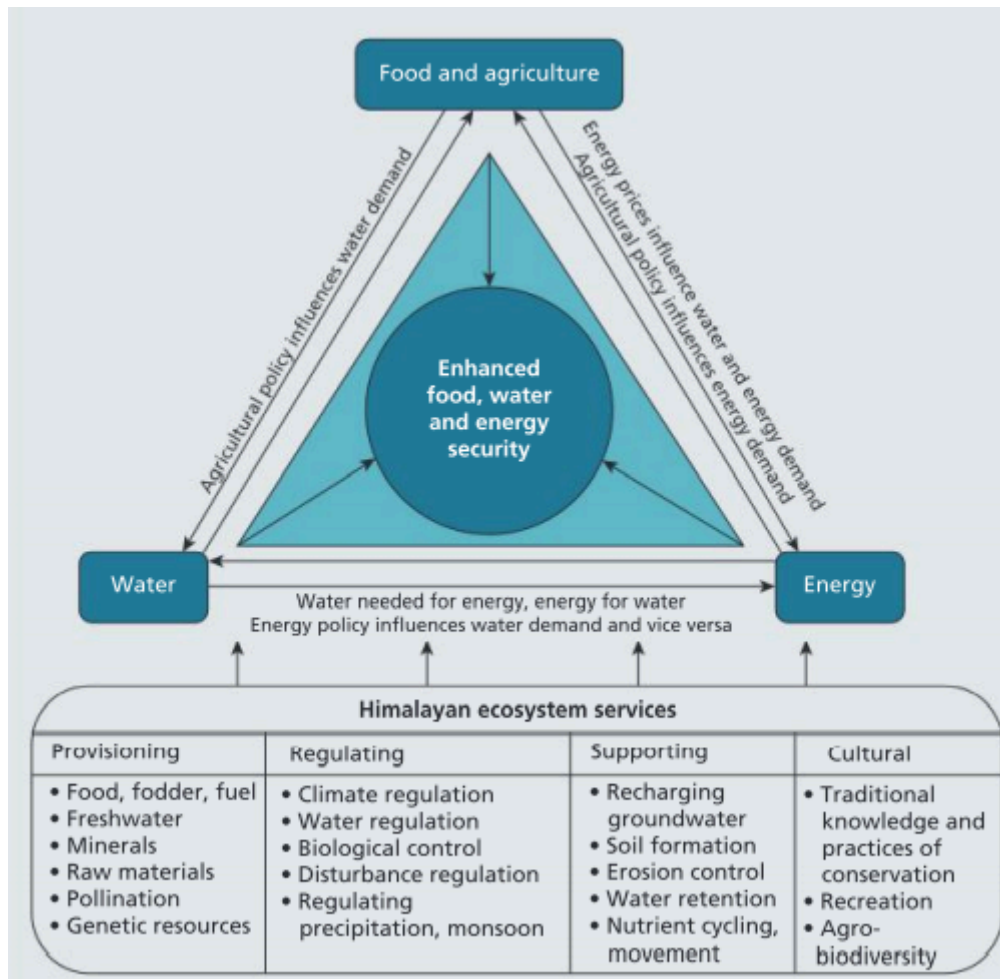
However, not all the middle class have economic security. The **fragile middle class** (or the lower middle class), constituting about 2 billion of the world's population, are those who have escaped extreme poverty but have not yet joined the NGMC. They earn between \$2 and \$10 per day. Most countries in Sub Saharan Africa, including Ghana, are in this category of economic group.



▲ **Figure 3.2:** The growth of the middle class by world region

# Case Studies

**Resource Security: Hindu Kush Himalayan Region Case Study (Afghanistan, Bangladesh, India and Pakistan)**



Asia accounts for 66% of the world’s population and 59% of the world’s water consumption. South Asia alone accounts for 3% of the world’s land, but 25% of the world’s population.

Key characteristics	Adaptation challenges	Interface among food, water and energy resources and adaptation to climate change
<b>Food security</b>		
<i>Huge, chronically undernourished population</i>		
About half of the world’s poor (46%) and 35% of the world’s undernourished live in South Asia	Provision of food, water and energy to a large malnourished population without degrading the natural resource base and environment	To meet the nutritional needs of all, food production to double in the next 25 years
<i>Burgeoning human population</i>		
About 25% of the world’s population (projected to amount to 2.3 billion by 2050) lives in just 3% of the world’s land area	To feed the growing population, agricultural production will have to increase by 70%, energy by 40%, and water by 57%	Increased pressure on land, water and energy to meet demand
<i>Declining cropland</i>		
Per capita arable land continually declining due to population growth, urbanization and increasing biofuel cultivation to meet energy demand	Limited option for growing more food grain by expanding crop area	Competing demand for land for food, bioenergy production and ecosystem services

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Key characteristics	Adaptation challenges	Interface among food, water and energy resources and adaptation to climate change
<i>Intensive food production</i>		
Food production becoming increasingly water and energy intensive	Adapting to the declining groundwater table	Agricultural growth constrained due to shortage of energy and water
<i>Changing food preferences towards meat</i>		
The meat production process requires more energy and water	About 7 kg of grain equivalent required to produce 1 kg of meat	Increased pressure on water to meet the food requirement
<i>Sensitivity to climate change</i>		
Food production highly vulnerable to climate change due to rising temperatures, accelerated glacial melting, increased evapotranspiration and erratic rainfall	Uncertainty in water availability due to rapid glacier melt and changes in monsoon pattern in the Himalayas	Climate change likely to be a critical factor in increasing water and energy demand for food production and land demand for biofuel production
<b>Water security</b>		
<i>Growing water stress</i>		
Growing water demand for agriculture, energy, industry and human and livestock use; annual water demand predicted to increase by 55% compared with 2005	Providing access to safe drinking water in the face of increasing variability in the water supply	Water-intensive adaptation practices leading to increased water pollution and waterborne diseases, high child mortality, poor human health
<i>Upstream–downstream dependence on water</i>		
High dependence of downstream communities on the upstream for water to grow food and generate hydropower	Need for enhanced upstream–downstream coordination and cooperation for sustainable development of Hindu Kush Himalayan (HKH) water resources	HKH rivers are the lifeline for dry-season water for irrigation, hydropower and major economic activities
<i>Increasing dependence on groundwater for food production</i>		
About 70–80% of agricultural production dependent on groundwater irrigation	Adapting to declining water tables	Groundwater pumping for irrigation requires excessive energy, further increasing electricity demand
<b>Energy security</b>		
<i>High energy poverty</i>		
About 63% of the population without access to electricity; 65% use biomass for cooking	Providing adequate and reliable energy to a large population without increasing pollution	Growing demand for water and land for energy production
<i>Under-utilized potential for hydropower and clean energy</i>		
Hydropower in the Himalayas limited in places due to the risk of causing landslides	Restricted adaptation options	Energy diversification to meet growing demand for food, water and economic growth

Afghanistan, Bangladesh, India and Pakistan, are home to 40% of the world's poor population, and over half the population is food-energy decient. About 20% of the population lack access to safe drinking water.

**Resource Security: Food in South Africa**

The potential impact of climate change on agricultural activities in South Africa:

Impact of climate change	Direct consequences
Impacts on crop productivity	<ul style="list-style-type: none"> <li>The increase in temperature and changes in the timing, amount and frequency of rainfall may have severe effects on all agricultural systems in South Africa.</li> <li>In the dry western areas, crop production will become more marginal, while in the high-potential eastern areas there may be a slight increase in production.</li> <li>The AVOID programme agreed over the possibility of decreased yields for nearly all cropland in South Africa, but cautioned that there is a high degree of uncertainty.</li> <li>While the possibility exists that nearly all croplands could experience early and sustained declines in suitability, even under the mitigation scenario, there is a high degree of uncertainty among projections regarding the amount of area undergoing decline.</li> </ul>
Impacts on food production	<ul style="list-style-type: none"> <li>Yields could potentially increase for rice and groundnuts, although confidence is limited by the small number of studies. In the case of groundnuts, rain-fed groundnut production is likely to increase. This is interesting from a protein food security perspective because groundnuts are currently a relatively minor crop in the country. Moreover, while nutritionally rich, groundnuts do not form a major dietary component for the country.</li> <li>Sugar cane appears to be the most resilient to climate change. Both yield and harvested area are projected to increase. Yield is projected to increase by about 55% and area by about 16%, increasing total production by about 80%. The difference in yields between the least favourable and the most favourable climate models is only about 5%, as is the difference in yields between the pessimistic and optimistic scenarios.</li> <li>For barley, yield reductions of 20–50% are predicted for warmer regions, but this effect might be somewhat compensated for by rising atmospheric CO<sub>2</sub>, suggesting a reduction in the order of 10–40%. Warming will also lead to a reduction in malting quality.</li> <li>In the case of hops, responses are presently unknown, but are likely similar to those of barley in terms of production and quality. However, given the fact that hops are an irrigated crop, rainfall deficit and variability would subject farmers to greater irrigation costs.</li> <li>Sorghum is likely to benefit from increasing temperatures and higher atmospheric CO<sub>2</sub> levels, but no estimates are available yet.</li> <li>Soil type is a significant determinant of the impact of climate change on food production. Certain soil types, such as vertisols and xerosols, are less productive and therefore affect crops negatively in the face of climate change; other types, such as acrisols and arenosols, have a positive effect on crops and may help control adverse climatic effects.</li> <li>A look at the distribution of crop farming in the country suggests that large portions of field crop farming are located in the arid zone of the Free State (32%), the North West (17%) and Mpumalanga (14%) provinces. The implication is that if the arid zone becomes even warmer, the majority of field crop production in the country will be displaced.</li> <li>The agricultural sector consumes 60% of the total water resource in the country. Only about 10% of farms are under irrigation. This means that if climate change obliges farmers to irrigate more, especially in the western parts of the country that are arid and desert zones, further pressures will be put on the country's already scarce water resources. This could have trade-offs for (a) agricultural activities elsewhere in the country or (b) for water resources for different uses, such as energy production, that could compete directly with food production.</li> </ul>

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Impact of climate change	Direct consequences
Impacts on food quality	<ul style="list-style-type: none"><li>• Rising minimum temperatures are a problem for the fruit industry, especially for apple farming, in terms of fruit quality.</li><li>• An accelerating increase of minimum temperatures during autumn (1–2° C since the 1960s) has led to reduced fruit quality due to sunburn and heat stress. This appears to have decreased the country's critical export-grade apple production.</li><li>• In the case of apples, a certain number of chilling units during autumn and winter are needed to ensure coordinated budburst and subsequent harvest. In their absence, hormone sprays are used to ensure this coordination. But EU countries demand that these be phased out within the next few years, due to possible health concerns. Developing and replanting appropriate cultivars that are less sensitive to this effect may take several years.</li><li>• Heatwaves cause sunburn of apples and induce water stress in trees, which leads to smaller fruit size.</li></ul>
Impacts on livestock	<p>Livestock farming will be affected in terms of greater water requirements for livestock and livestock heat stress.</p> <p>The Northern Cape, which is a desert zone, accounts for the largest proportion of livestock (44%) in the country. It is followed by the Eastern Cape (14%) and the Free State (12%), both in the arid zone. The Western Cape, which falls in the winter rainfall zone, is the next largest. This suggests that if climate change exacerbates water shortages in the desert or arid zones, livestock farming will be affected.</p>

### Measures of adaptations taken by farmers are:

- Diversification (a strategy to reduce portfolio risk by avoiding excessive concentration in one crop)
- Substitution of crops
- Changes in planting times
- Greater use of shade crops (a crop that can grow in a shade so indoor)
- Shift from flood irrigation to sprinkler irrigation (which is the most favoured adaptation since water is the main limiting factor in South Africa)
- Soil conservation measures



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# Option G: Urban Environments

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# Syllabus Link

Geographic inquiry	Geographic knowledge and understanding
<p><b>1. The variety of urban environments</b></p> <p><b>Suggested teaching time 6–8 hours</b></p>	
<p>The characteristics and distribution of urban places, populations and economic activities</p>	<p><a href="#"><u>Characteristics of urban places, including site, function, land use, hierarchy of settlement (including megacities) and growth process (planned or spontaneous)</u></a></p> <p><a href="#"><u>Factors affecting the pattern of urban economic activities (retail, commercial, industrial), including physical factors, land values, proximity to a central business district (CBD) and planning</u></a></p> <p>Factors affecting the pattern of residential areas within urban areas, including physical factors, land values, ethnicity and planning</p> <p><a href="#"><u>The incidence of poverty, deprivation and informal activity (housing and industry) in urban areas at varying stages of development</u></a></p>
<p><b>2. Changing urban systems</b></p> <p><b>Suggested teaching time 6–8 hours</b></p>	

<p>How economic and demographic processes bring change over time to urban systems</p>	<p>Urbanization, natural increase and centripetal population movements, including rural–urban migration in industrializing cities, and inner city gentrification in post-industrial cities</p> <p>Centrifugal population movements, including suburbanization and counterurbanization</p> <p><u>Urban system growth including infrastructure improvements over time, such as transport, sanitation, water, waste disposal and telecommunications</u></p> <ul style="list-style-type: none"><li>• <u>Case study of infrastructure growth over time in one city</u></li></ul> <p><u>The causes of urban deindustrialization and its economic, social and demographic consequences</u></p>
<p><b>3. Urban environmental and social stresses</b></p> <p>Suggested teaching time 6–8 hours</p>	

The varying power of different stakeholders in relation to the experience of, and management of, urban stresses

Urban microclimate modification and management, including the urban heat island effect, and air pollution patterns and its management

- Case study of air pollution in one city and its varying impact on people

Traffic congestion patterns, trends and impacts

- *Case study of one affected city and the management response*

Contested land use changes, including slum clearances, urban redevelopment and the depletion of green space

- *Detailed contrasting examples of two affected neighbourhoods and their populations*
  - *Example 1*
  - *Example 2*

Managing the impacts of urban social deprivation, including the cycle of deprivation and geographic patterns of crime

#### 4. Building sustainable urban systems for the future

Suggested teaching time 6–8 hours

Future possibilities for the sustainable management of urban systems

Urban growth projections for 2050, including regional/continental patterns and trends of rural–urban migration and changing urban population sizes and structures

[Resilient city design, including strategies to manage escalating climatic and geopolitical risks to urban areas](#)

- *Two detailed examples to illustrate possible strategies*
  - [Example 1](#)
  - *Example 2*

[Eco city design, including strategies to manage the urban ecological footprint](#)

- *Two detailed examples to illustrate possible environmental strategies*
  - [Example 1](#)
  - *Example 2*

[Smart city design and the use of new technology to run city services and systems, including purpose-built settlements and retrofitting technology to older settlements](#)

Synthesis (Sy), Evaluation (Ev) and Skills (Sk) opportunities

<p>These suggestions can be integrated into the study of the above. No additional teaching time is required.</p>	<p>How urban changes over time are affected by a place's economic and demographic spatial interactions with other places [Sy]</p> <p>Contrasts in the scale of changes and challenges facing different urban areas [Sy/Ev]</p> <p>Varying perspectives of different social groups on the costs and benefits of different urban strategies, and priorities for action [Ev]</p> <p>How urban patterns, movements, flows and trends/temporal changes can best be represented graphically [Sk]</p>
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# Key Terms



- **Natural Increase** - An increase in population with excluding the effect of migration
- **Gentrification/Rejuvenation** - Improvement of residential areas by immigrants and the residents themselves, with an economic dimension such as the development of retailing and other services, It's common in areas where they may be brownfield site (adandoned, derelict or underused industrial buildings and land)
- **Urban renewal/re-urbanisation** - A Revitalisation of urban areas and a movement of people back into these areas. The development of activities to increase residential population densities within the existing built-up area of a city
- **Suburbanisation** - The outward growth of towns and cities to engulf surrounding villages and rural areas, which mainly due to the improvement of suburban areas.
- **Counter-urbanisation** - A process involving the movement of the population away from larger urban areas to smaller urban areas, new towns, new estates, commuter towns, or villages on the edge or just beyond the city limits or the rural - urban fringe. This occurs when the urban areas are deprived.
- **Push Factors** - Factors that drive people to emigrate from their home countries
- **Pull Factors** - Factors that attract people to new areas
- **Urban Decline** - The deterioration of the inner city often caused by the lack of investment and maintenance.
- **Zone/area based scheme** - A holistic and balanced approach to improving a defined area of natural environment, built environment or peri-urban landscapes.
- **Self-help scheme** - A small scale project which allow local people to use their skills to help improve their local area
- **Urban Circular System** - A sustainable city in which there are recycling, reuse and reduction processes, renewable forms of energy, and measures taken to reduce the ecological footprint of the city.

- **Urban Ecological Footprint** - The amount of land required to sustain a population with the resources they need, and to assimilate their waste
- **Sphere of influence** - The area that people travel from to use a service
- **Megacity** - a city with a total population of over 10 million people.
- **CBD “Central Business District”** - The commercial and business centre of a city.
- **Deprivation** - Standard of living below that of the majority in a particular society that involves hardships and lack of access to resources. Places suffering from urban deprivation have visible differences in housing and economic opportunities being the rich living alongside poor people.
- **Cycle Of Deprivation** - “The poor breed the poor”, the idea that the poor people are unable to escape poverty either because they may become too state dependent, or they are not given enough opportunities to raise the status.
- **Shanty town/spontaneous/squatter settlement** - An area of poor-quality housing, lacking in amenities such as water supply, sewerage and electricity, which often develops spontaneously and illegally in a city, in an LEDC.
- **Favela** - ‘An informal, shanty-type settlement’ in Brazil
- **Dual Economy** - the dual economy of the developing world consists of the formal sector, which includes things like factories, commercial buildings, offices etc. This formal sector is most of the time foreign owned and produces goods and services for the elite. The second economy is called the informal economy and consists of things such as maids, cleaners, taxi drivers etc. and requires much more labour.
- **Bazaar Economy** - A sector of the informal sector. Mainly consisting of shops like bazaars, small trade, craft workshops etc. Many Bazaars are family enterprises and they therefore can employ people like children and elderly. They account for ~45% of employment in a city, producing cheap goods and services for low income households. The competition between rivals keeps the prices low.
- **Street Economy** - A sector of the informal sector. This includes people like beggars, shoe shiners, thieves, prostitutes etc. They account for about ~40%

of a city's employment. Earnings and standard of living is low for this economy.

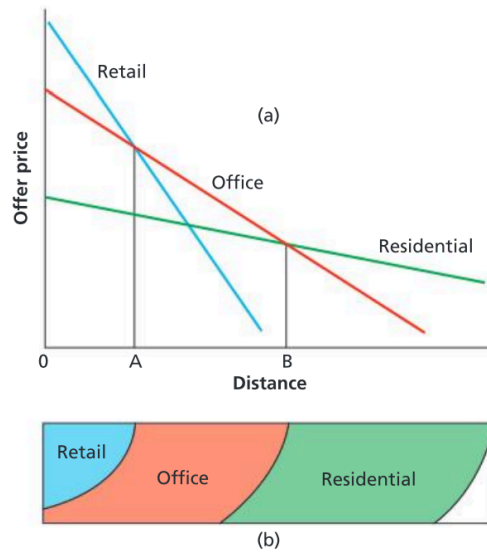
- **Deindustrialisation** - A process in which the industrial activity in a country or region is removed or reduced
- **Urban Microclimate** - The local climate observed in urban areas, which can be significantly different from the climate of surrounding rural areas
- **Urban Heat Island** - an urban area that is a lot warmer than the rural areas surrounding it. The heat is produced by human and their technologies (e.g, air conditioner)
- **Linear Metabolism** - An urban world process that has a clear resource input and waste output. Here, the products are not reused or recycled.
- **Circular Metabolism** - every output can be used as an input for another process. This is done through production in which the items can be recycled or reused in some way.
- **Smart city** - is a city that performs well in the six categories: “economy, environment, people, living conditions, governance and mobility”. A smart city is defined as “smart” when the technological infrastructure and the social, human capital enables sustainable development and a high quality of life. Availability of information and communication plays a big role, as well as the physical technological infrastructure in the city, roads, for example.
- **Resilient City Design** - cities are required to adapt with the changing population. I.e. water supplies, transporting methods etc. They must also allow social mobility otherwise protests may happen. They need to find ways to make things more efficient and compact in order to adapt to the high population.
- **Congestion** - is the blockage and the lack of mobility of something. A traffic congestion would refer to a blockage of traffic.
- **Positive Segregation** - When population of given groups concentrate in areas to increase job opportunities and other social benefits for themselves
- **Negative Segregation** - When population of certain ethnic or religious groups become excluded from socio-economic functions

- **Centrifugal Population Movement** - Movement of people out from the centre of the urban area
- **Centripetal Population Movement** - Movement of people in the direction of the centre of the urban area, or from the surrounding rural areas into the urban area
- **Mitigation Strategy** - It is the prevention of an event happening from the future. For example, the mitigation strategy of floods could be building
- **Reduction Strategy** - Reduction strategies include lessening the effects of an event that has already happened/occurred . For example, the reduction of the effects of global warming.
- **Conurbation** - When two or more cities merge
- **Millionaire city** - A city with a population more than 1 million
- **Metacity** - Large-scale city regions e.g. China's Pearl River Delta
- **Megalopolis** - When cities sprawl and merge into one
- **Low order functions** - basic necessity functions such as bakeries, sub-post offices, corner shops, pubs etc.
- **High order functions** - more complex functions such as technological shops, car shops - these are luxurious and innovative.

# Theories

Land Value, Bid Rent, and Hoyt Model

Bid Rent



Offer prices of retail, office and residential uses with distance from the city centre:  
 (a) Section across the urban value surface.  
 (b) Plan of the urban value surface.

Figure 1: Bid Rent Values With Respect To Distance

As seen, the value of retail overtakes any other value when closest to the CBD. As the distance increases, the slope of retail follows to be most negative, therefore it decreases at the highest rate. At Point A, retail has the same value as an office. Office then overpowers with value, and is the most expensive land between distances A and B. Residential areas have the most positive slope, therefore after some time it will always overpower retail and office. Indeed, after point B, the intersection between office and residential, the residential starts overpoint for residential > B.

Variations in Land Value

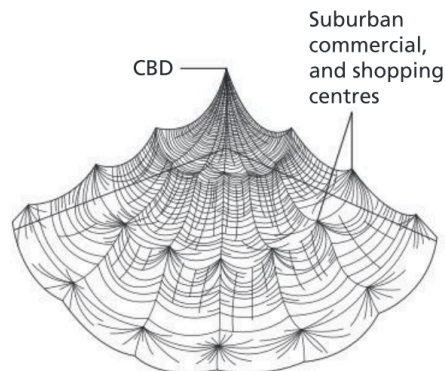


Figure 2: Variation in Land Value with accessibility

Land at the centre of a city is most expensive for two main reasons: it is the most accessible land to public transport, and there is only a small amount of it available. Land prices generally decrease away from the most central area, although there are secondary peaks at the intersections of main roads and ring roads (= the area has high accessibility).

## Megacities

Megacity is a city with a population of over 10 million people. It grows as a result of economic growth, rural-urban migration, and high rates of natural increase. This is because of the high birth rates associated with a younger population, who originally migrated to the city in search of jobs.

The first megacity was Tokyo, which now has a population of about 35 million people (larger than Canada's total population). By 2017, other megacities started to appear: Mumbai, Delhi, Mexico city, São Paulo, New York, Dhaka, Jakarta and Lagos. By 2020, all but four of the world's megacities are expected to be in developing regions.

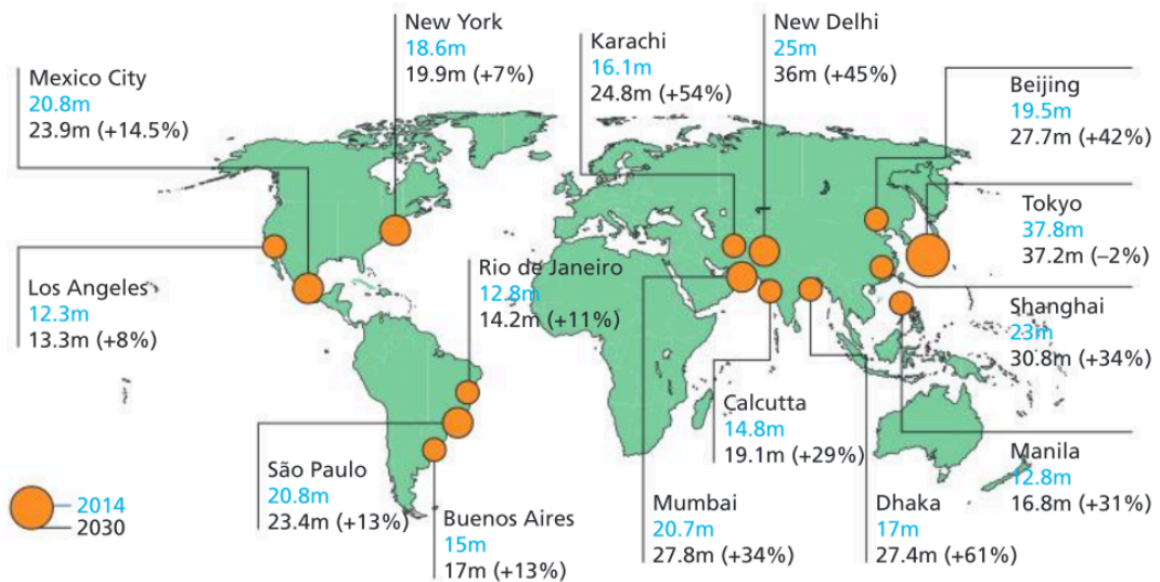


Figure 3: Population growth in the world's megacities, 2014-2030



### **Centripetal Population Movements, Natural Increase and growth of Megacities**

Urbanisation is primarily caused by **rural-urban migration**, **higher rates of natural increase in urban areas**, or **reclassification of rural areas as urban areas** (due to urban sprawl)

**Rural-urban migration** - the movement of people away from the countryside to towns and cities. This occurs when people believe they will be better off in urban areas than in the rural areas.

- Example of **push factors** in this case: limited job availability, low wage, lower quality and limited availability of public services (hospitals, schools) in rural areas. On contrary, possible **pull factors** would be: job availability, higher wage, better quality of life, higher quality and availability of public services.

**Natural increase** - this often occurs in urban areas because of its youthful age structure. Urban areas attract many young migrants and this makes the age structure younger. In contrast, the rural areas that they leave behind develop more of an ageing population (meaning its birth rates are likely to decrease)

**Gentrification** - refers mostly to an improvement of residential areas and economic dimensions. Commonly, this takes place in areas where there may be brownfield sites (abandoned, derelict or underused industrial buildings and land, which may be contaminated but has potential for redevelopment). The settlements will not be deconstructed, but refined.

- Gentrification may lead to the social displacement of poor people, since house prices rise and the poor are unable to afford the increased prices. They will be replaced with young, upwardly mobile populations.

**Re-urbanization/Urban renewal** - a revitalization of urban areas and a movement of people back into these areas (Example is the re-urbanisation of Barcelona and the use of the 1992 Olympic Games to re-establish the city). Deconstruction of the old settlements involved.

### **Centrifugal Population Movements and Counter-Urbanisation/Decentralisation**

**Suburbanisation** - refers to expansion of an urban area towards the edge of cities. This is caused by the improvement of the transport system, thus people can now afford to live further with a better quality of life. This was caused during the 20th time of optimism in which wages have significantly increased, the costs of living lowered, low interest rates, better transport etc

**Counter-urbanisation** - is a process involving the movement of population away from larger urban areas to smaller urban areas, new towns etc. There are several reasons on why this could happen, for example:

- High land prices
- Congestion
- Pollution
- High crime rates
- A lack of community
- Declining services

**Urban sprawl** - this refers to uncontrolled growth at the edge of cities. However, the existence of green belts can prevent this from happening. This belt can be seen in cities such as London, UK. Other cities such as Tokyo, Seoul and Mexico city all have been characterised by urban sprawl.

**Urban system growth** - With the increase of urban areas, they require more water, sanitation and waste disposal. If these are not met, then the risk of things such as diseases is increased. For an urban system to grow, they also have to expand their telecommunications and transport facilities. Without these, a city cannot grow and can cause counter-urbanisation (See [Shanghai](#)).

### Hierarchy of Settlements, Land Use

Settlement size is measured in a hierarchy. Things that determine the position of a settlement:

1. Range - maximum distance people are prepared to travel for a good or service
2. Threshold - minimum amount of people required for a business to stay alive
3. Low-order goods - necessity goods or convenience goods that are bought frequently e.g. bread
4. Higher-order goods - luxury goods or products that are bought infrequently e.g. cars
5. Sphere of influence - the area served by a settlement, also called a hinterland.

Different-order centres can also be measured by

- Their types
- Number of functions
- Market area
- Employment
- Population size

In a place like hamlet only low-order functions can be found e.g. general store, pub, sub-post office . In a village these functions are more specialised - more higher-order e.g. furniture shops, technological shops, car shops etc.

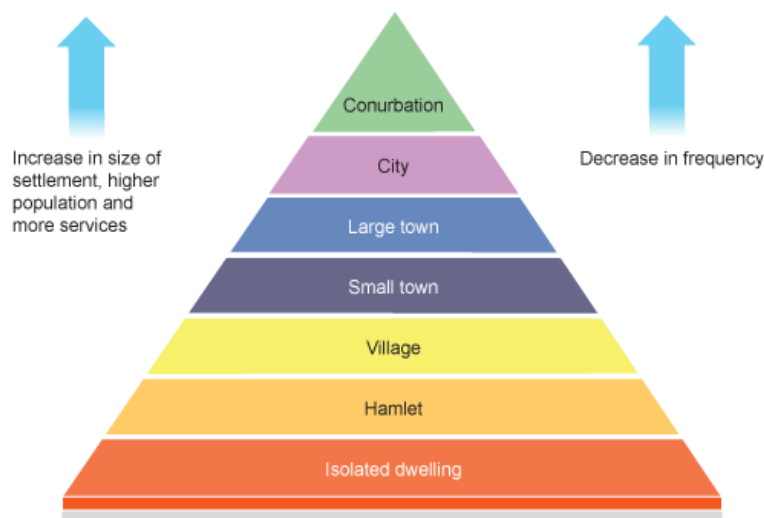


Figure 4: Hierarchy of Settlements

### **Commercial land use - CBD**

The commercial and economic core of a city. The main features of CBD are:

1. high land value
2. high availability of public transport which leads to high accessibility.

### **Industrial activity and land use**

The location of industrial zones are mostly:

1. Inner-city areas close to railways and/or canals for the purpose of imports and exports
2. Brownfields suburban sites close to airport

### **Retail land use**

A central place-type hierarchy was seen:

1. Low-order goods concentrated in neighbourhood stores and shopping parades.
2. High-order goods in high street shops, department stores.
3. Out-of-town superstores and retail parks

### Urban Poverty, Deprivation and Informal activity

Deprivation of an urban place refers to a lower quality of life in comparison to the rest of the general population, and are generally poor. Deprivation is measured by the following:

1. Physical indicators - quality of housing, levels of pollution, incidence of crime, graffiti etc.
2. Social indicators - crime (fear of), health and access to health care, standard of education, proportion of families on benefits e.g. unemployment, disability etc., proportion of lone parent families
3. Economic indices - Access to employment, unemployment, underemployment, income
4. Political indices - opportunities to vote and take part in community organisation

Such deprived are usually called slums. Around 32% of the world live in slums, whilst around 78% of people in the urban population of LICs live in slums. Slums are usually built in dangerous areas, with undesirable land. These are prone to landslides, floods etc. The UN defines a slum as a household as one or group of individuals living the same roof in an urban area, lacking one or more of the following:

1. Durability - housing that can provide protection against climatic conditions
2. Sufficient living space - no more than 3 people sharing a room
3. Access to water - sufficient, affordable and can be found without difficulties
4. Access to sanitation - a private toilet or a public one shared with a reasonable amount of people
5. Secure tenure - protected against forced eviction

They also cause **dual economy**, **bazaar economy** and **street economy**. Slums also suffer from exploitation, that is, because they mainly work in the informal sector. It allows very cheap labour for entrepreneurs who are a part of the formal sector.

Each city has a formal and an informal sector. This is called the **dual economy**.

The **formal economy** consists of offices, factories and commercial buildings.

The **informal economy** consists of taxi drivers, prostitutes, maids, gardeners etc.

The informal sector is also divided into two:

The **bazaar economy** - this mainly consists of family businesses such as service establishments, workshops, small trades etc. They can also sometimes employ children. They generally make up or 45% of employment in a city, producing cheap goods and services for low income families. Intense competition in the bazaar economy keeps the price low.

The **street economy** - this includes street beggars, hawkers, thieves and prostitutes. They may account for up to 40% of the labour force in a city. Earnings and living standards of these workers are usually low.

Some governments attempt to lower the informal sector by introducing self-help schemes.

### Deindustrialisation

This is usually caused by a decline in employment and jobs. These can happen for a number of reasons, for example:

- Exhaustion of resources
- Increasing costs of raw materials
- Automation and new technology
- Introduction of a rival product
- Fall in demand
- Rationalisation
- Rise in costs
- Lack of capital
- Removal of a subsidy
- Overseas competition from NICs

A lot of older industrialised cities are suffering from deindustrialisation. Whilst it may cause some short term advantages, such as lower prices of insurance and better deals in finance and banking, the loss in production outweighs in terms of job opportunities. These are all resulting because of disinvestment into these cities, causing outflows of capital and labour. However, it is worth noting that there are 2 different types of deindustrialisation, mainly:

1. Positive deindustrialisation - reduction of workforce due to increased mechanisation and rationalisation, as a result increased productivity, making industries more competitive
2. Negative deindustrialisation - occurs when the decline in workforce is not compensated by any rise in productivity or mechanisation

### CBD Decline

Factors that influence the decline of CBD are:

- Rise in car ownership, which can lead to increased personal mobility and rise of leisure shopping
- Investors and businesses/companies are attracted to suburban/rural areas that have good access and environments, and often lower land value
- Costs of development and upkeep of CBDs are high (business rates, rents and land costs)

## IB Geography Notes Higher Level

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- Investment in CBD often lacks a coordinated plan
- Congestion, which reduces accessibility of CBDs
- Progressive suburbanization and urban sprawl; CBD might become less valued
- CBD are perceived as dirty, unsafe, with an ageing environment and poor infrastructure
- Planning policies can encourage urban expansion and provide 'out-of-town' developments
- City councils often offer greenfield sites for development of new industries



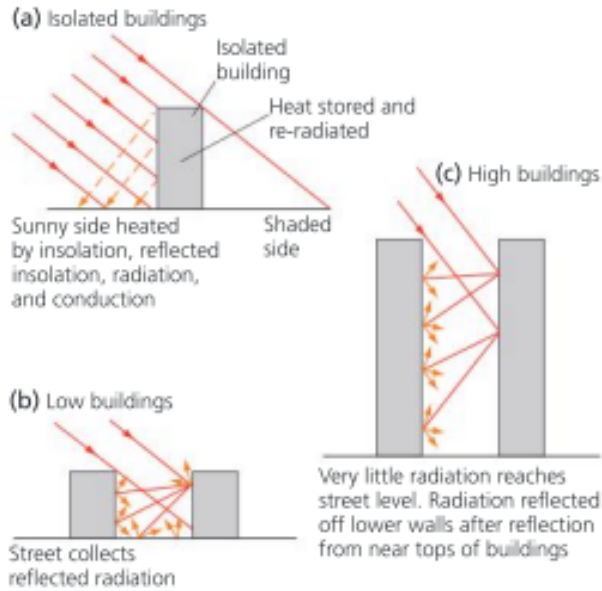
### Urban Microclimates

Urban buildings and skyscrapers affect the local climate.

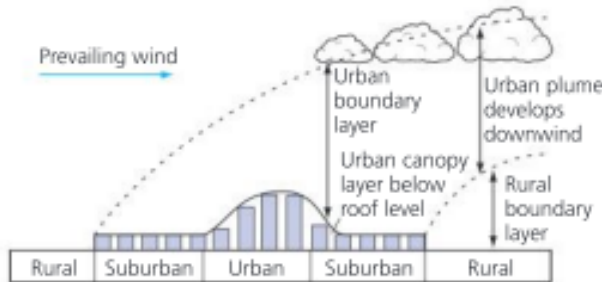
1. Radiation and Sunshine
  - a. Reduced visibility from industrial haze
  - b. Higher absorption of longer waves but scattering of shorter waves due to dust.
2. Clouds and Fogs
  - a. Thicker clouds in summer and thicker smogs in winter cover due to increased convection and air pollution
  - b. Day temperatures are 0.6C warmer in average
3. Temperatures
  - a. Creation of heat islands due to large amounts of engine combustion, and energy release in busy areas
  - b. Up to 1.5C warmer during winter nights
  - c. Heating from below causing air mass instability, especially noticeable during summer times.
  - d. Big local contrasts between shady areas and sunny areas, especially in spring
4. Pressure and winds
  - a. Turbulence around tall buildings causing strong local air pressure
  - b. Deep, narrow streets much calmer unless it allows funnel flows, like a “canyon”, thereby sometimes being called the “canyon effect”
5. Humidity
  - a. Decrease in relative humidity due to increase in temperature
6. Precipitation
  - a. More intense storms, especially during the summer and nights due to stronger convections
  - b. Higher incidence of thunder

- c. Less snowfall and briefer covers, even when uncleared

**The effect of city morphology on radiation received at the surface**

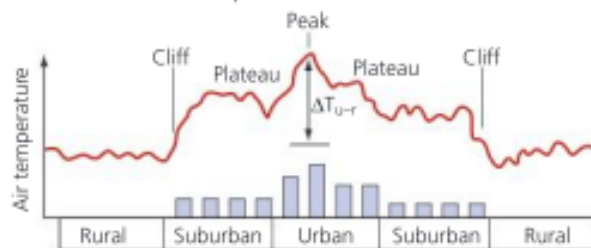


**The structure of the urban climatic dome**

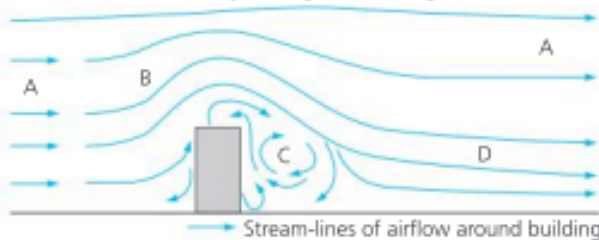


**The morphology of the urban heat island**

$\Delta T_{u-r}$  is the urban heat island intensity, i.e. the temperature difference between the peak and the rural air



**Airflow modified by a single building**



### Urban Stress

Types of urban stress:

- Pollution (air and noise)
- Traffic congestion (correlated with noise pollution)
- Depletion of green space
- Contested land
- Urban crime

Pollution management strategies:

- 1) Reducing transport emissions, which there are number of ways to do:
  - Burn less fossil fuels and use more energy-efficient technologies such as hybrid/electric cars
  - Use public transport rather than private cars
  - Use a car pooling scheme (= car-sharing)
  - Encourage cycling or more walking by building more pedestrian street
  - Use catalytic converters to reduce emission of nitrogen oxides
  - Increase enforcement of emission standards/policies (e.g. Zero Emission network in east London)
- 2) Green space and tree

They help to reduce the effects of the urban heat island, reduce noise levels and filter and clean the air.

Trees help to lower air temperature in urban areas by increasing evapo-transpiration. This reduction of temperature not only lowers energy use but also improves air quality, since the formation of ozone layer is dependent on temperature.

Air pollution management is carried in countries such as China and Mexico.

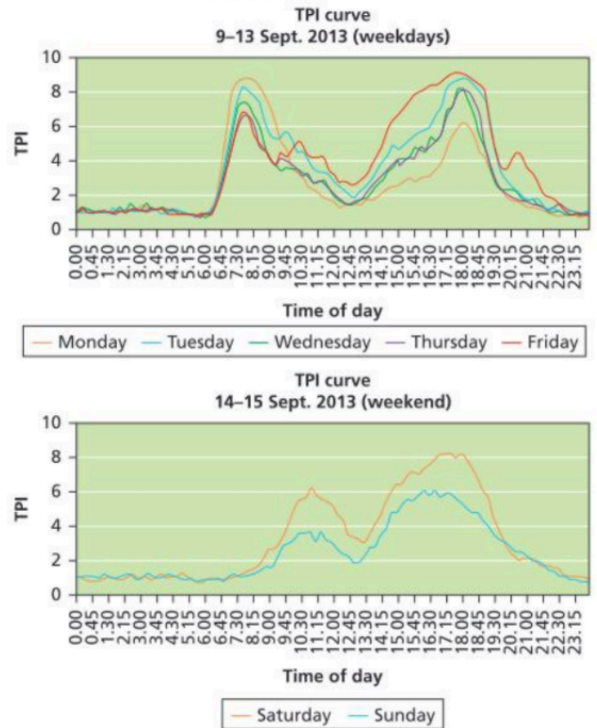
Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Very tolerant of air pollution: hairs on young shoots and leaves help to trap particulate pollution</li><li>• Rarely affected by disease and pests (although some shoots are killed each year by fungal infection)</li><li>• Very tolerant of poor soil conditions including compacted soil (although some stunting of growth is caused by road salt)</li><li>• Grows vigorously and tolerates pruning</li><li>• Trees rarely blow over or shed branches</li><li>• Open canopy produces light shade. Will intercept some rain, especially when in leaf</li><li>• Provides valuable nesting sites for birds</li><li>• Sufficient light below canopy to allow significant plant growth</li></ul>	<ul style="list-style-type: none"><li>• Leaves, fruit and bark need clearing from streets and pavements</li><li>• Its enormous ultimate size makes it too large for some locations</li><li>• Due to their water uptake, roots can cause problems in foundations of buildings on clay soils</li><li>• Fine hairs on young shoots, leaves and fruit may cause irritation and even allergies in some people</li><li>• Estimates suggest that its VOC emissions are relatively high</li></ul>

### Traffic congestion patterns, trends and impacts:

Urban traffic congestion varies with days of the week, time of day, weather and the seasons.

General pattern and trend of traffic congestion:

- A city's transport performance index (TPI) varies from 0 (excellent traffic flow) to 10 (serious congestion).
- Traffic is usually more congested on weekdays, especially during the peak flow times of morning and evening (the time of commute to school/company)
- In contrast, on weekdays the TPI pattern curve has smaller but more prolonged peaks.



Impacts of traffic congestion: Noise pollution

Noise disturbance may cause people in urban areas to move or consider moving from cities of high population to quieter environments. Noise from road traffic and other sources could also lead to raise of blood pressure, coronary heart disease, psychological stress and annoyance, as well as sleep disturbance.

### Contested land:

**Contested land** refers to highly desired land due to its accessibility and/or situation (what surrounds the area e.g. river, roads). Hence, it causes a territorial competition. Contested land use leads to the displacement of communities due to the tearing down and replacing of affordable government housing with newer residential or commercial buildings. In some cases, forced relocations occur when cities take on large-scale reconstruction projects such as the Olympic Games.

Example of contested land:

- Clearance of slum in Rio de Janeiro for Olympic Games
- The Dharavi slum in Mumbai, which developers are competing to achieve the land for its economic prospects

### Depletion of urban green space:

Open spaces are important for both physical and mental well-being, but the amount of open space in urban areas varies enormously.

E.g.

India's national building code recommends at least 4 acres of open space per 1,000 residents, but Mumbai has just 0.3 acres of open space per 1,000 residents. Mumbai now has the second-highest childhood obesity rate in India, and some 68% of the city's children are said to have sedentary lifestyles.

### Urban crime:

The majority of criminal activity is concentrated in the most urbanized and industrialised areas, and within these, the poorest working-class neighbourhoods. Some crimes, such as fraud and sexual offences, are relatively more common in less-dense areas with plenty of open spaces and a limited police presence.

Factors that influence the development of a crime hotspot (where crime rate is high):

- The presence of crime targets
- Site features such as easy access and lack of security
- The presence of a higher number of offenders and sufficient incentive and ability to commit crime
- A high level of residential land use
- A lack of health centres, school and recreational areas in a settlement
- Lack of a police station

**Resilient City Design, Smart Cities, and Eco-cities**

**Resilient City** design refers to large cities which were forced to adopt efficient methods so they can sustain the increasing population and the urban stress. Generally speaking, resilient cities follow the rogers model of city systems (obviously the efficient one), with reduced wastes and more innocent.

Rogers model of city systems is a part resilient city design

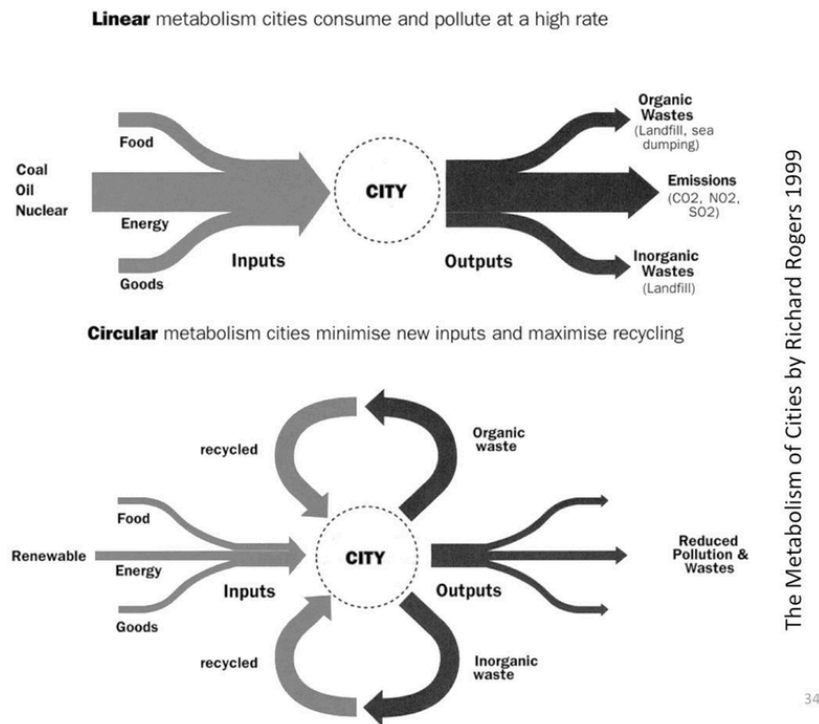


Figure 6: Rogers Model of City Systems

And it is said that resilient city designs follow the second model, that is, they recycle the organic and inorganic waste to reduce the waste and pollution outputs.

**Eco-cities** actively look to reduce their pollutants and reduce ecological urban footprint

Pollution reduction

Cities can adopt various strategies in an attempt to reduce pollution and waste emissions. Consider the following examples:

- Environmental friendly housing
- Implementation of green energies
- Recycling materials
- Reusing materials

## IB Geography Notes Higher Level

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- Improving public transportation, e.g. introduction of bus lines can make people use more public transportation which is more efficient than cars, introduce biking lanes, encourage switching to electric cars etc.
- More efficient outdoor lighting
- Make water supply and infrastructure more efficient
- Special policies that are dedicated into saving energy e.g. Car free days in Mexico

Other things can also include using stuff such as waste in landfills, in burning to create energy, recycle things such as plastic bottles, reusing clothing, plastic bags etc. Other methods can include composting, biogas generation etc.

Smart cities actively look to integrate technology into their cities to improve life quality

# Case Studies



**Rejuvenation and Regeneration - Inner City Decay in London Docklands**

**Urban gentrification - Glasgow**

**Resilient City Design - Brazil Rocinha/Rio de Janeiro**

**Informal economic activity - India**

**Land Use - New York**

**Air Pollution - China**

### Eco city design - Mexico City

The main strategies to combat air pollution in the Mexico City Metropolitan Area are:

1. **One-day-stop programme;** the government set the date when all citizens are prohibited to use private vehicles. If anyone found driving on this day, their car plates would be taken away and forced to pay a fine of 20 days' pay based on the Mexico City minimum wage. Stopping days are randomly distributed to encourage car owners to use more public transport frequently and/or adopt car-pooling.
2. Enforce engine maintenance standards to keep vehicles in good condition.
3. Improve fuel quality by reducing its lead and sulphur content.
4. Make catalytic converters compulsory.
5. **Green roofs project;** The green roofs do far more than simply purify the air; they reduce the heat island effect, as well as help educate children about the importance of nature in the city. The project increased the total area of green roofs in hospitals, schools and government buildings to over 20,000 square metres in 2014.

Eco city design -



**Urban Deindustrialisation - Detroit**

### New planned city (Decentralisation) - Putrajaya

Putrajaya is a totally new planned city that is built 25km south of the Malaysia's capital city: Kuala Lumpur

The mission of Putrajaya Corporation is to:

- Reduce the concentration of population in the capital city
- Provide an efficient and effective administration
- Provide quality services to ensure customer satisfaction
- Provide infrastructure and amenities towards creating an ideal environment for living and working

The Corporation's function include:

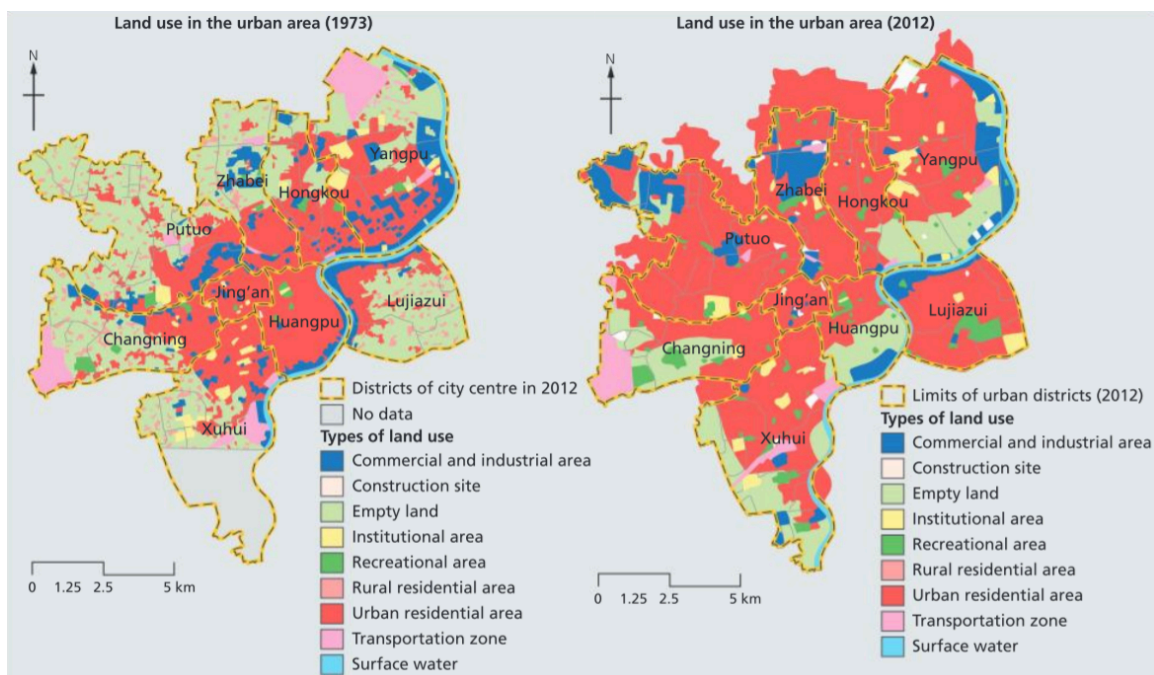
- Local government in the Putrajaya area
- Promoting/stimulating/facilitating/undertaking of economic and social development in the area (which include commercial, infrastructure and residential development)



The location of Putrajaya

## Urban System Growth - Shanghai

Shanghai has been growing at a steady rate since 1973, both in population and its urban size. From 1983 to 2012, the majority of the empty land in the north of Shanghai was developed into urban-residential and commercial/industrial areas.



### Changes in transport infrastructure in Shanghai:

Shanghai's integrated transport system is developing a transport infrastructure that will deal with increased traffic volumes. The transport system focuses on two ports, two highways, and three transport networks.

Rail transport is the key feature of Shanghai's public transport. The urban rail network developed is over 400km long and has 13 metro lines, which together carry over 5 million passengers daily. The main improvements include: increase of carrying capacity and shortening of journey times (e.g. to Hangzhou journey time fell from 90 to 30 min).

The practical targets of Shanghai's transport strategy are that:

- Public transport between any two parts of the city centre should take less than 60 minutes
- Public transport between any two parts of the city centre should take just one bus ride.

### Access to water and sanitation in Shanghai:

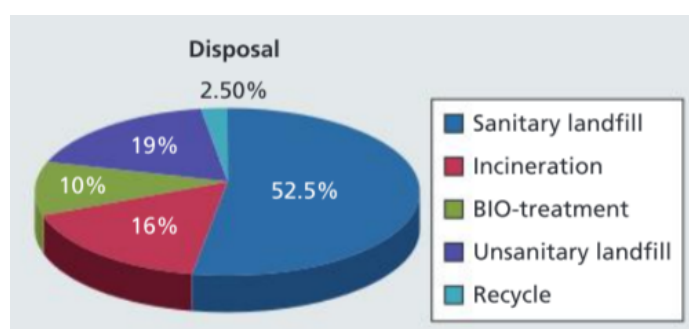
There are high levels of water stress in Shanghai. Increasing demand, pollution and saltwater intrusion all threaten the city's water security. For example, agricultural practices have led to fertilisers and insecticides getting into the urban water system = polluting water. Furthermore, the relatively low capacity of the sewage treatment system has led to some industrial and residential waste being discharged directly into rivers. Saltwater intrusion, on the other hand, is a seasonal problem in the winter and the early spring dry season.

To combat the need for more fresh water, Shanghai built the Qingcaosha Reservoir, designed to provide water for up to 68 days (the theoretical maximum extent of saltwater intrusion in shanghai)

### Waste treatment in Shanghai:

In the past, most of Shanghai's rubbish ended up in landfill sites, which caused the contamination of the land and groundwater by methane. Plastics were carried into the rivers, and from them into the ocean.

Yet landfilling is still a popular waste disposal method in Shanghai, there is an increasing demand of "incineration" - combustion of wastes and generating electricity. The waste is burned at high temperatures (over 850 degree celsius) to destroy toxins. This heats water to produce steam that in turn drives turbines to generate electricity. The new incinerators at Laogang will burn 9,000 tonnes a day. The aim is to increase the proportion of domestic waste incinerated from 35% to 75%.



### Telecommunication:

Shanghai was one of the first centres in China to develop telecommunication services. It was developed from a fixed-line, mobile phone and to the internet type of telecommunication, since the year 1871. Chinese leaders realised that telecommunications would be an important aspect of developing its economy, and encouraged foreign investment in high-tech products to Shanghai.

### Contested Land & Informal Sector - Dharavi, Mumbai

Dharavi is a slum in Mumbai, India. The area is connected by all three of the city's railways and the Indian property developer, Mukesh Mehta, wants to develop Dharavi into an international business destination.

Dharavi is home to thousands of micro-industries, which account for \$650 million annually. Nevertheless, Dharavi is considered as a slum because of its illegal buildings and low standard of living. Dharavi is also described as an "informal city" that attracts labour. Experts suggest that the informal economy accounts for the overwhelming majority of India's economic growth and almost 90% of employment in India.

The area is contested because developers such as Mukesh Mahta could make a huge fortune from developing the area as a financial or service district. However, this requires the relocation of millions of people living in Dharavi to the edge of the city, which offers fewer economic prospects.



### Gentrification - Cape Town, South Africa

**Gentrification** is when there is an improvement in residential areas with an economic dimension (development of services e.g. retailings).

In South Africa, the phenomenon of gentrification is commonly associated with the rebirth of downtown Johannesburg and Woodstock, an inner city suburb of Cape Town.

Location of Woodstock: 1km east of the city centre, between the docks of Table Bay and Devil's Peak.

Woodstock covers an area of less than 5km<sup>2</sup> and has a population of over 11,500. Woodstock experienced a rapid growth in the 1870-80s due to its ease of access to the harbour, improved transport and increased industrialisation.

By the 1950s, Woodstock had ceased to be a seaside resort, but it managed to remain integrated during the apartheid era. As a "grey" area (allow mixed-race), many coloured and black people started to move into Woodstock during the 1970-80s, creating the foundation for the urban renewal that started in the late 1990s.

Gentrification (Urban renewal):

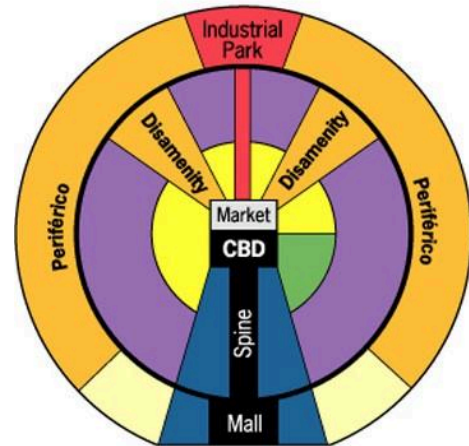
Many of the lower parts of Woodstock became run down in the second half of the 20th century, with litter, crime and drugs. Young professionals have taken advantage of affordable Victorian semi-detached homes, many of which have been renovated and restored. Warehouses and abandoned buildings were converted into fashionable restaurants, ICT, businesses and offices.

### Cities in Latin America

Many cities in Latin America have a unique city structure. In Latin America the CBD developed around the colonial core, and a commercial avenue extended from it. This then became the spine of a sector containing open areas and parks, and homes for the upper and middle class people.

Squatter housing is found at the edge of the city and there are also some sectors of older, more established shanty housing that extend in towards the CBD. Conditions of squatter settlements near the CBD are better than in suburb areas.

Industrial areas are scattered along major transport routes, with the latest developments at the suburb.



**Microclimate Restoration - Seoul, South Korea**



