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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education(IGCSE)

IGCSE GEOGRAPHY CLASS NOTE

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Paper 1: Theme 1 Population and Settlement

Topic 1.1: Population dynamics

Key Term:

1. The World population in 2011 was 7.0 Billion

2. **Population**: the number of people living in a particular geographical areas

3. **Population explosion** – the rapid growth of world population is known as population explosion. There was a sudden increase of world population is 1950s.

4. **Population density:** the average number of people in a given area per square kilometer. Or the total number of people living in a square kilometer of land.

5. **Birth rate:** the number of live births per 1000 people in a year
6. **Death rate**: the number of deaths per 1000 people in a year

7. **Natural increase**: the difference between birth and death rate is known as natural increase.
   Natural increase = Birth rate – Death rate
8. **Census:** an official count of the population at a regular interval.

9. **Infant mortality rate**: the number of death in a year per 1000 children below the age of one
10. **Life expectancy:** the average number of year of a person is expected to live

11. **Demography:** the study of human population, their size, distribution and composition.
12. **Population structure:** Age and sex composition of a country population

13. **Population Pyramid:** Is a diagram that shows the proportion of the total population of sex (male and female) and their age group. The population Pyramid helps us to judge and predict about the future population.

14. **Old age group**: the age group of 60 years and above is considered as Old
15. **Young age group:** the age group between 14 year and under is considered as young

16. **Working population**: the age group between 15 years and 64 year is the working population

17. **Ageing population**: A population is considered 'ageing' when the proportion of 'young' people is less than 30% and the proportion of Old people is greater than 6%
18. **Young population:** a population is considered as 'young' when the proportion of 'young' people is more than 30% and the proportion of 'Old' people is less than 6%

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19. **Over population:** when the total number of people living in a country is more than the available resources in a country is considered as over population. Eg: Nigeria
20. **Under population:** when the total number of people living in a country is less than the available resources in a country is considered as under population. Eg: Australia.
21. **Optimum population:** the size of population that permits the full utilization of the natural resources of an area, giving maximum per capita output and standard of living. (the availability of resources are enough for the total population living in a country)

Growth of World population

The world population refers to the number of people living on earth. There are about 7 billion people on the earth in 2011. In 1 AD, the world population was about 200 million. 1000 AD a thousand years later, it was 275 million. By 1800 AD, the world population had reached 900 million. From then on, it increased very rapidly. The population explosion refers to the sharp increase in the world population since 1950, causing concern over the ability of the earth to provide enough resources for humans. From 1960 to 2000, the world population has increased from 3 billion to 6 billion. If this trend continues, the world population is expected to reach *11 billion by 2050*.

World population in 2007 and 2050

2007		**2050**	
Country	Population in (millions)	Country	Populations in (millions)
China	1318	India	1747
India	1132	China	1437
USA	302	USA	420
Indonesia	232	Indonesia	297
Brazil	189	Pakistan	295

Factors influencing population growth

Population change or growth in a country is affected by

- the difference between birth rates and death (natural change) and
- the balance between immigration and emigration (net migration).

Factors that encourages high birth rate

- ✓ **Early marriages** – in some countries, people marry when they are as young as 15 years old. Women who marry young are likely to have more children than those who marry later.
- ✓ **Children are seen as wealth** – in some Asian countries, children are regarded as assets because they can help in the farms and bring in additional income for their families
- ✓ **High number of death among children** – in some LEDCs where health care services are lacking, children die at a very young age. So they have more children in case some die early.
- ✓ **Lack of knowledge on birth control** – people who are ignorant of birth control methods may have more children than they really want. People may be ignorant because they are illiterate or not well- informed if information on birth control is not readily available.
- ✓ **Preference of male child** – some families prefer boys to girls and in their quest to have baby boys, they end up having more children than necessary.

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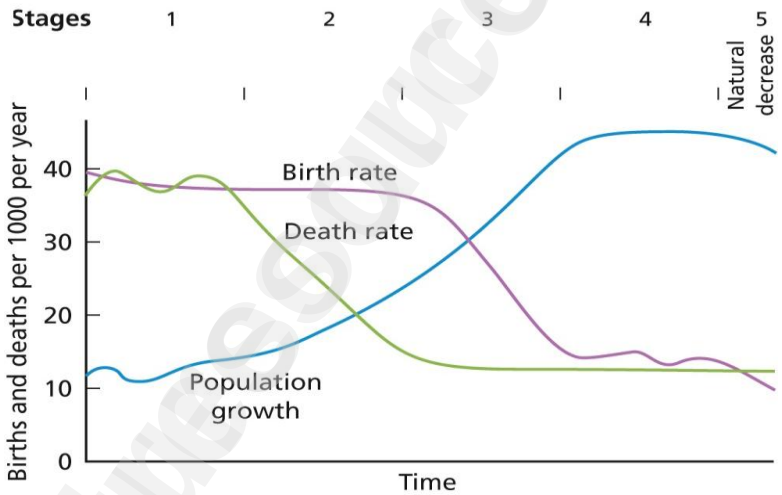
- ✓ **Religious beliefs** – some of the religions do not allow use of contraceptives and abortion. Like the Roman Catholic do not allowed doing abortion and the Muslims allowed to practice polygamy.

Demographic Transition Model

The historical shift of birth and death rate from high to low levels in a population known as Demographic Transition.

The Demographic Transtional Model is a simplification of reality to help us understand the most important aspects of process. It is a broad generalization about population growth since the middle of the eighteenth century.

- No country as a whole retains the characteristics of Stage 1
- The poorest of the less developed countries are in Stage 2
- Most less developed countries which have undergone significant social and economical changes are in Stage 3
- Some of the newly industralised countries (NIC) such as South Korea and Taiwan are in Stage 4.
- Some of the countries in Eastern and Southern Europe experience or pass through Stage 5.



Stage 1: High Birth Rate and High Death Rate

High birth rate

- ✓ No birth control or family planning
- ✓ Religious beliefs encourage growth of families (for example: Roman Catholicism does not allow for abortions
- ✓ Early marriage and polygamy – for example the Muslim polygamy
- ✓ Traditional societies encourage large families
- ✓ Considering children as wealth to work

High Death Rate

- ✓ Diseases like cholera and plague – lack of life saving medicine
- ✓ Famine and poor diet – lack of food crops
- ✓ Poor hygiene, no clean water
- ✓ No sewage disposal – poor infrastructures
- ✓ Lack of medical care – few doctors, hospital and medicine
- ✓ Natural disasters like flood and droughts – lack of disaster management systems.

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Stage 2: High Birth Rate and Falling Death Rate

High birth rate

- ✓ No birth control or family planning
- ✓ Religious beliefs encourage growth of families (for example: Roman Catholicism does not allow for abortions
- ✓ Early marriage and polygamy – for example the Muslim polygamy
- ✓ Traditional societies encourage large families
- ✓ Considering children as wealth to work

Falling death rate

- ✓ Improved medical care through vaccination, hospitals and doctors
- ✓ Improved sanitation and water supply
- ✓ Improvement of food production
- ✓ Improved transportation facility to move
- ✓ Decreasing child mortality
- ✓ Services of charity organization like Red Cross and UN

Stage 3: Falling Birth Rate and Falling Death Rate

Falling Birth Rate

- ✓ Family planning techniques (contraception, sterilisation, abortion)
- ✓ Government population policies (for example: One-child policy of China)
- ✓ Lower infant mortality rate
- ✓ Increasing industralisation and mechanization
- ✓ Improvement in social status for women through education
- ✓ Improvement in prenatal and postnatal care in health centres, reducing infant mortality rate

Falling Death Rate

- ✓ Improved medical care through vaccination, hospitals and doctors
- ✓ Improved sanitation and water supply
- ✓ Improvement of food production
- ✓ Improved transportation facility to move
- ✓ Decreasing child mortality
- ✓ Services of charity organization like Red Cross and UN

Stage 4 and 5: Low Birth Rate and High Death Rate

Low Birth Rate

- ✓ Changing lifestyles (for example, less marriages and cohabitation)
- ✓ Career-oriented women (not ready to spend more time on family)
- ✓ Late marriages decrease fertility period
- ✓ Good health and family planning
- ✓ Increasing incidents of same-sex relationship
- ✓ Availability of birth control techniques

High Death Rate

- ✓ High rates of crimes and spread of viruses
- ✓ Respiratory diseases – like air pollution causes allergies, asthma etc
- ✓ Lifestyle – related diseases such as cancer, obesity, heart problems etc
- ✓ Old age diseases such as Alzheimer's and Parkinson's disease
- ✓ Increasing suicides rates
- ✓ Traffic accidents
- ✓ Clashes, riots, wars etc

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Case Study (anti-natal policy) – One Child Policy in China

The 'One Child' Policy is a population control policy of the People's Republic of China. It officially restricts married couples to having more than one c hild. The Special Administrative Regions of Hong Kong and Macau and the foreigners living in China are completely exempted. This policy was introduced in 1978 and initially to first born children from 1979.

Background:
During the period of Mao Zedong's leadership in China, infant mortality declined from 227/1000 births in 1949 to 53/1000 in 1981, and life expectancy dramatically increased from around 35 years in 1949 to 65 years in 1976. Until the 1960s, the Government encouraged families to have as many children as possible. So the population grew from around 540 million in 1949 to 940 million in 1976. Beginning in 1970, citizens were encouraged to marry late and have only two children.

The policy:

- To address overpopulation, the policy had been planned in 1977, although it was not mandated until 1979.
- The policy was introduced to promote one child families and forbids couples having more children in urban areas.
- Parents with multiple children are not given the same benefits as parents of one child
- In most cases, wealthy families pay a fee to the government in order to have a second child or more children.
- The limit has been strongly enforced in urban areas, but the actual implementation varies in locations
- In most rural areas, families are allowed to apply to have a second child if their first-born is a daughter or suffers from physically disability, mental illness, or mental retardation
- Families violating the policy are required to pay penalties and may possibly be denied bonuses at their workplace.
- Children born in overseas countries are not counted under the policy if they do not obtain Chinese citizenship
- Chinese citizens returning from abroad are allowed to have a second child.

Positive Impacts:

- The authorities claim that the policy has prevented more than 400 million births from about 1979 to 2011.
- The individuals saving rate has increased since the one-child policy was introduced
- The fertility rate in China fell from 2.63 birth per woman in 1980 to 1.61 in 2009
- The focus on population control provided better health service for women and reduction in risks associated with pregnancy.
- At family planning offices, women received free contraception and pre-natal classes

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Negative Impacts:

- The policy has been implicated in an increase in forced abortions, infanticide, and underreporting of female births
- The sex-ratio at birth in China reached 1170:1000 in the year 2000, substantially higher than the natural baseline, which ranges between 1030:1000 and 107:100 due to the preference for a boy child
- Little Emperor syndrome – as some parents over-indulge their only child he may become unadjusted to the society
- Resulted into Gender-selected abortion, abandonment, and infanticide
- Since there are no penalties for multiples births, couples turned to fertility medicine to have twins. According to a 2006 China Daily report, the number of twins born per year in China had doubled.
- Government officials and especially wealthy persons have often been able to violate the policy in spite of fines.

According to a 1968 proclamation of the International Conference on Human Rights, "Parents have a basic human rights to determine freely and responsibly the number and the spacing of their children. Nonetheless, a 2008 survey undertaken by the Pew Research Center reported that 76% of the Chinese population supports the policy.

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REVISION QUESTIONS

1. What is meant by *birth rate*?
The average number of births per 1000 of the population in a year

2. Explain why there are high birth rates in many LEDCs.
Ideas such as: little availability of/lack of/can't afford contraception/birth control/family planning/or examples; • not educated re: contraception/family planning;
• likely to want children to work on the land/on farms/free labour for the family;
• likely to want children to send out to earn money/work;
• likely to want children to help around the house/look after younger children/collect water; likely to want children to look after parents in old age;
• not likely to be affected by government policy to reduce family size;
• likely to have large families due to tradition/wealth/to get a son;
• likely to have large families due to religious influences/ religion does not allow contraception; no access to abortion; high infant mortality rates/people have more children in the hope that some will survive; women stay in the home/don't work; early marriage; lack of emancipation for women; etc.

3. Describe the problems caused by high natural population growth in LEDCs.
Ideas such as:
• poverty; people do not have enough resources/pressure on resources;
• pressure on energy supplies (or example); lack of work/high unemployment;
• inadequate food supplies/food shortages/malnutrition/starvation; poor access to education/government spend more on education/not enough schools;
• poor access to health care/government spend more on healthcare/not enough hospitals; overcrowded housing/homeless/growth of shanty towns/lack of living space;
• inadequate water supply/sanitation; overuse of agricultural land/overgrazing/lack of land to farm; deforestation/loss of natural vegetation; impact on economy/GDP falls, slows; specified pollution problems; increased traffic congestion; etc.

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4. Describe policies which governments can use to reduce birth rates.
Ideas such as;
• introduce anti-natalist policies; one child policy/limit number of babies/restrict number of children; advertise the benefits of small families; educate people about contraception;
• legalise abortion; make (free) contraceptives available; examples of specific incentives (e.g. free education, free health care); introduce pensions for elderly;
• examples of disincentives if have a 2nd child e.g. fines, lose jobs;
• reduce benefits for people having children e.g. reduced maternity leave/child benefit/child tax credits; forced sterilization; free goods e.g. radios in India; educate women to encourage them to take jobs or careers; marriage regulations e.g. late marriage/seek permission; gender equality acts; etc.

5. Explain why there are low death rates in MEDCs
Ideas such as: good health care/enough hospitals/doctors/nurses/clinics; good sanitation/more hygienic; good access to safe/clean water sufficient food supplies innoculation against many disease/drugs/medicines/cures for diseases; education re healthcare/life style issues availability of pensions; specific provision for elderly (or examples)

Case study: Niger: A country with high growth rate of population

The Republic of Niger is a land-locked country in West Africa named after the Niger River. Its climate is mainly very hot and dry with many desert areas. It is an LEDC, and is one of the poorest countries in the world.

The population of Niger has grown from 1.7 millions in 1960 to over 13 millions in 2008. With a high population growth rate of 2.9% it is expected to reach 56 millions by 2050. Niger has the highest fertility rate in the world with 7.1 births per woman.

Literacy rate is only 28.7% and the population below the poverty line is 63%. About 90% of the total workforce is engaged in agriculture; industry 6% and services 4%. The birth rate is 49.6 and the death rate is 20.3.

If the people of Niger remain uninformed about the family planning, by 2050, it will be impossible for the government to provide adequate health, education, jobs and water. For poor families, children are a s source of wealth.

Consequences of high rate of population growth

- **Overcrowding** – high rate of population growth may cause overcrowding. In some cities, people live in a congested shanty towns or squatters due to inadequate housing. When people live in such a condition, diseases can spread easily due to lack of infrastructures.
- **Shortage of food** – despite technological advancements in agricultural production, local food supply cannot meet the increasing demand. Due to high pressure on farmland, many fields become over cultivated.
- **Pressure on social services** – in most of the LEDCs there is a great pressure in providing medical services and education to meet the growing population.

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- **Unemployment and other social problems** – the farmers earn a low income in the LEDCs due to lack of land availability and infrastructures. As the population grows, the farmland will be over cultivated resulting to decline in production. There is also no enough job opportunities in the cities. When some people cannot support themselves with proper jobs, some may turn to crime.

Topic 1.2 Over-population and under-population

1. **Over population:** when the total number of people living in a country is more than the available resources in a country is considered as over population. Eg: Nigeria

2. **Under population:** when the total number of people living in a country is less than the available resources in a country is considered as under population. Eg: Australia.

3. **Optimum population:** the size of population that permits the full utilization of the natural resources of an area, giving maximum per capita output and standard of living. (the availability of resources are enough for the total population living in a country)

Case study 1:

Niger: Over-populated country

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The population of Niger has grown from 1.7 millions in 1960 to over 13 millions in 2008. With a high population growth rate of 2.9% it is expected to reach 56 millions by 2050. Niger has the highest fertility rate in the world with 7.1 births per woman. About 90% of the total workforce is engaged in agriculture; industry 6% and services 4%. The birth rate is 49.6 and the death rate is 20.3.

The problems faced by people in the country. (Or the problems faced by people in countries which are overpopulated)

- ✓ People do not have enough natural resources or raw materials
- ✓ There will be lack of fuel/power (or example such as electricity)
- ✓ Lack of work and poverty prevails
- ✓ There is not enough food supplies and people suffer from starvation and famine
- ✓ There is poor access to education
- ✓ There is poor access to health care; only a few hospitals
- ✓ High levels of disease and high death rates prevails
- ✓ Housing are overcrowded and not enough space for housing

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- ✓ Many squatter settlements are found
- ✓ There is traffic congestion
- ✓ There is atmospheric and water pollution causing health problems
- ✓ There is inadequate water supply; lack of sanitation
- ✓ The agricultural land are overused
- ✓ There is overgrazing and disputes over agricultural land or places to live.

Case study 2:
Australia: The consequences of under-population

Australia has only 20 million people with an area of 7.7 million sq.km. The population density of Australia is only 0.4% per sq.km. Many areas of Australia are empty and the resources are not being used fully. The successive Australian governments have tried to increase its population, to develop the country economically and to protect it from foreign influences.

The consequences of under-population

- ✓ There will be less working people in the country.
- ✓ The economic growth will be stagnant due to lack of working people.
- ✓ The available resources will be unexploited fully.
- ✓ There will be lack of people in the defence.
- ✓ There will be huge expenses on old age people for old age home and other maintenances.
- ✓ One of the positive aspects of under-population could be no unemployment like in those over-population countries.
- ✓ There will be no pressure on social services and everyone will get proper infrastructures and other facilities.
- ✓ There will be no overcrowding and the environment of the country will be more peaceful and cleaner.

Indonesia: Rapid growth of population

Indonesia is the 4th largest population in the world, and the Government of Indonesia is worried and concern about its rapid population growth. The government of Indonesia had introduced family planning and taken up other measures to reduce its rapid population growth. However, due to many other reasons, the population is alarmingly growing its population.

Some of the reasons that caused problems due to rapid growth of population may be mentioned as:

i) **Lack of job opportunities -** Indonesia is not a well-developed country and the majority of the population is depending on primary sector. The total number of workforce in secondary sector and tertiary sectors are comparatively less. Indonesia has a large

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population but the job opportunities is quite less, and may people do not have sustainable job for their daily life. The lack of availability of work leads to poverty.

ii) **Inadequate food supplies** – Many people are very poor due to lack of job opportunities in the industries and other sectors. Many people lived in shanty houses where there is not any proper drainage and safe drinking water. Due to lack of job opportunities, people do not get enough food supplies which cause death by malnutrition.

iii) **Poor access to education** – poor access to education is making people remain unqualified and finding to find job in MNC and TNC. Due to lack of proper education, there is less skill and expert workforce and the resources are also unexploited.

iv) **Poor access to health care** – there is no enough Doctors and hospital to meet the high annual population and its rapid growth of population. The poor access o health care leads to high death rates.

v) **Traffic congestion** – the traffic congestion is becoming one of the serious problems especially in Jakarta. Every the number of population added due to the natural growth of population and due to lots of migration from rural areas to Jakarta city. The number of vehicles are increasing every, which is leading to traffic congestion.

vi) **Inadequate water** – as the city Jakarta is located on the Island, the drinking water is difficult to tap from the ground due to high present of salt. People have to buy drinking water and the poor people cannot afford to buy drinking water. Drinking water is another rare commodity for the people living in the Island.

vii) **Overcrowded housing** – there is no enough housing for the immigrants from the other Island to Jakarta and thus squatter settlements are found in many parts of the city. There is no enough basic amenities due to overcrowded housing in the city.

In addition to above mentioned problems, there are also some other problems like air pollution, drainage problem etc. Whenever there is heavy rainfall in the city like Jakarta, floods occur in many parts of the city.

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REVISION QUESTIONS

1. The population has grown so much in some countries that they are now overpopulated. Describe four problems caused by overpopulation. (2015)
Ideas such as: Poverty; people do not have enough resources; pressure on energy supplies (or example)/strain on utilities e.g. gas or electricity; lack of work; inadequate food supplies/ malnourished/ starvation; poor access to education/government spend more on education; poor access to health care/government spend more on healthcare; overcrowded housing/ homeless/ shanty towns develop; inadequate water supply/ sanitation/government spend more on water supply or sanitation; overuse of agricultural land/ overgrazing; deforestation/loss of natural vegetation /habitats; increase in specified pollution type.

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Topic 1. 5: Migration

Key Terms:
Migration – the movement of people across a specify boundary – national or international and live there for a year or more.

Voluntary migration is the movement of people usually voluntary and often involves looking, and hoping for, a better quality of life and standard of living at the new destination.
Involuntary migration is the forced migration of the people or individuals usually do not know where their destination will be what their quality and standard of living will be like.

Internal migration – the movement of people within a country which may be from rural to urban or from urban to rural.

International migration – the movement of the people from a country to another country to live and work for a year or more.

Immigration – moving in to a country from another country

Emigration – leaving (moving out) one's own country

Net migration – the difference between the immigration and emigration is known as net migration

Asylum seeker – a person who has left their country of origin for fear of persecution. They have asked for permission to stay in another country and are waiting for a decision on this. Example: people leaving conflict in South-East Asia arriving by boat from Indonesia to seek asylum in Australia.

Refugee – a person who has been forced to leave their country of origin in fear of their lives. They run away often with no idea where they will end up and with no permission to stay in another country. Example: Palestine- Israel, Sri Lankan LTTE, Iraq civil war, Afghanistan terrorism.

International migrant – a person who moves to live and work in a different country for at least a year. If they move for better work they are called economic migrants.

National migrant – a person who move to live and work in another place within the same country

Illegal migrant – a person who enters a country to live and work there without permission

Push and Pull factors:
Push factors are negative conditions at the point of origin which encourage or force people to move.

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Pull factors are positive condition at the point of destination which encourage people to migrate. The nature of pull and push factors varies from country to country (and from person to person) and changes over time.

Forced migration and voluntary migration – In voluntary migration the individual has a free choice about whether to migrate or not. In forced migrations, people are made to move against their will. The abduction and transport of Africans to the Americas as slaves was the largest force migration in history.

Push factors:

- Adverse climatic conditions
- Natural disasters (drought, famines)
- Social upheaval
- Poor employment
- Low income
- Intolerance
- Housing shortages
- Poor educational opportunities
- War with another country
- Civil war

Pull factors:

- Amenities
- Attractive environment
- High standard of living
- Job prospects
- High wages
- Improved housing
- Tolerance
- Better medical facilities
- Chance of better education
- Family or friend may have already moved
- Safety

Barriers or problems in international migration

- Cost of travel can be high
- High cost of Visa
- There are legal restrictions
- Cultural differences – language, way of life

Most people prefer their own country:

- Existing job and work contacts
- Family and friends are near
- Familiar surrounding and culture
- Living costs may be lower

Migrants may return home:

- With capital to starts a business
- With new skills and qualifications
- If they have difficulty in setting overseas

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- When they retire
- If they are forced to return for legal reasons

Advantage of emigration – the source (origin) country

- Reduced unemployment
- Benefits from the remittance (payments) sent back
- Returning migrants bring new skills to the country
- Returning migrants increase the social expectations
- Returning migrants are with high purchasing power
- Increased investments in projects like buildings

Disadvantages of emigration (move out from a country)

- There are disproportionate number of females left behind
- The non-return migrants cause imbalance on population pyramid
- Departure of youth cause a loss of cultural leadership
- The loss of people with businesses and political skills

Advantages of immigration (destination) (moving in to a country)

- Economic migrants tend to take up less desirable jobs
- Gain skilled people at low cost
- Can pay low wages
- Will work long hours
- Cost of retirement transferred back to the home country
- Creation of multi-cultured society (life style, dress, tradition, food)
- Fresh ideas and intelligent people in research and development institutions
- Young talents in the field of sports, culture etc

Disadvantages:

- The cost of education to migrants children
- Fewer jobs for unskilled workers
- May move back once earned money
- Amenities problems – hospitals, schools etc with extra number of people
- There is an overdependence of some industries on migrant labour
- Discrimination against ethnic groups may lead to civil war (Indonesia – 1997-98)
- The loss of aspects of cultural identity particularly among the second generation migrants
- Segregated areas of similar ethnic groups are created (Singapore – little India)
- Problems of illegal migration

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Case study:

International Migration from Mexico to California, USA

California was, until the mid-nineteenth century, sparsely populated mainly by Native Americans. The first migrants did not arrive in any large numbers until the mid-nineteenth century.

The first settlers came from Spain by sea in 16th and 17th centuries. The European settlers came to California in mid-19th century. In early 20th century, the people from eastern and southern Europe and Eastern Asia came to California. They are the voluntary migrants.

Since 1950s, many people have immigrated to California from north and east of USA. The Mexicans (Hispanics) who were the voluntary migrants were initially seasonal migrated and increasingly permanent migrants.

There is a 2000 km border between USA and Mexico. Estimates suggest that 1-2 million Mexicans try each year to cross into the USA, mainly illegally. Illegal migration is a problem for the US border patrol guard, 850000 illegal migrants were caught in 1995 and deported.

Push factors in Mexico:
Due to poor medical facilities (1800/doctor), low paid jobs, adult literacy rate (55%), life expectancy (72 years) and unemployed (40%).

Pull factors:
Excellent medical facilities (400/doctor), well paid jobs, adult literacy rate (99%), life expectancy (76yrs) and availability of many low paid jobs.

Negative impact on the USA:

- Illegal migration costs the US millions of dollars for border patrol and prisons
- Migrants workers keep wages low which affects American workers
- May move back once earned money
- Problems in cities due to cultural and racial issues
- Services such as hospitals and schools cannot cope with extra numbers
- Mexican culture has enriched the US border states with food, language and music
- Mexicans are considered as a drain of wealthy by the US
- The incidents of TB has been increasing greatly due to migration

Positive impacts

- The migrants take the harder, dirtier, seasonal, more monotonous, more dangerous, less skilled and less well-paid jobs.
- The migrants can accept low wages
- They are willing to work for long hours
- Increased population will spend more in local economy.

Negative impact on Mexico:

- The Mexican country side affects a shortage of economically active people

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- Woman are in trouble for finding partners
- Young people migrate leaving the old and kids
- Immigrants send 6 Billions dollar a year to Mexico
- Certain villages like Santa Ines have lots 2/3 of its inhabitants

Positive impacts:

- Chance of a job
- Better pay than in Mexico
- Can save money and return to improve life in Mexico
- The remittance send by the migrants will improve their family and standard of living.

……..

Revisions Questions

1. What are the main reasons for rapid growth of population in Niger – an LEDC in West Africa?

2. What are the main reasons for population decline in Russia?

3. What are the main causes and problems of overpopulation in Nigeria?

4. What are the main causes and problems of under-population in Australia?

5. What are the main consequences of the 'One Child' policy of China?

6. What are the main reasons for increasing population in Singapore?

7. Explain why it will be difficult to persuade people in Niger to have smaller families?

8. Describe how birth rates and death rates changed in Russia between 1980 and 2008?

***9.* Suggest the possible impacts on LEDC of a large amount of emigration.**
Ideas such as: loss of working population/loss of young population/jobs not filled/loss of economically active/less pressure of jobs; under-population; increase in wages; shortage of skills or example/lack of innovation; decline in economy/production is lower/GNP reduced; hard to produce enough food; families split up; declining birth rate; loss of traditional culture; money /remittances sent home by migrants; less pressure on services/housing; resources wasted/less demand for resources; less taxes paid/taxes increases/less government money e.g. for pensions; ageing population/increased dependency ratio; gender imbalance; closure of businesses/businesses make less profit/less spending power; closure of amenities or services or example such as schools or hospitals; less traffic congestion; less specified pollution.

10. Explain the reasons for internal migration of a counry.
Content Guide: employment, health care, education, drought, food supplies, political issues,war, wages, standard of living etc.

11. Suggest reasons why there are many high rise buildings in the city in CBD.
Ideas such as: lack of space/to save space/there is not much room/little land; high demand for land/lots of government buildings /shops /businesses locate here/many people work in the CBD; expensive land/to reduce costs/it is cheaper;

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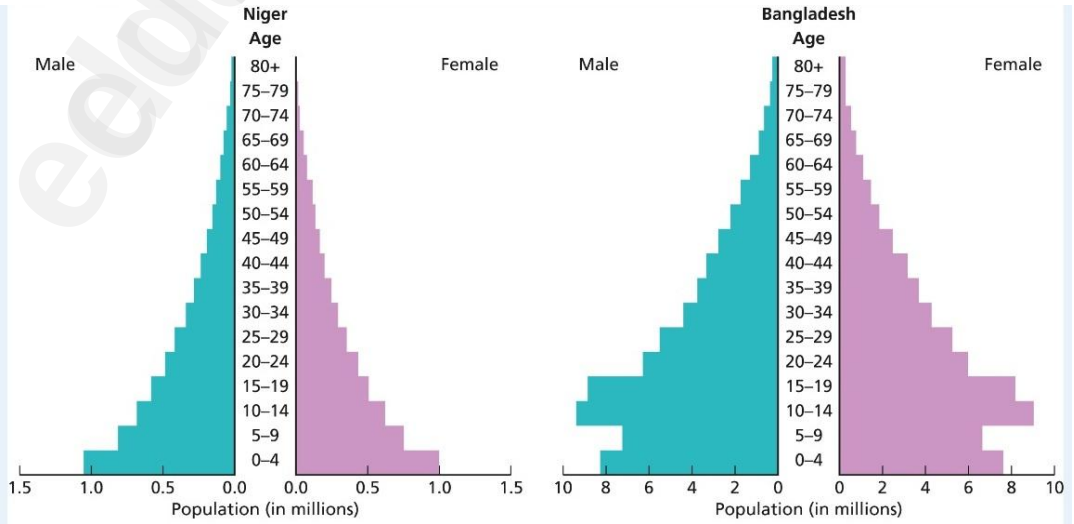
12. Compare the pattern of urban land use in cities in LEDCs and MEDCs.
Ideas such as: Centrally located CBD in both MEDC and LEDC; In both MEDC and LEDC there are distinct zones of housing of different cost/quality; higher cost/class/quality housing tends to be close to CBD in LEDC/further away in MEDC; lower cost/class/quality housing tends to be close to CBD in MEDC/further away in LEDC; industry is close to transport links in both LEDC and MEDC/near edge of city in both/near centre in both; areas of shanty town/squatter settlement in LEDC but not in MEDC; housing near CBD in LEDC but industry near CBD in MEDC;

13. Describe the problems caused by traffic congestion in urban areas.
Ideas such as; delays/wastes time/have to allow more time/longer journeys; lateness for school/work; loss of productivity/companies lose profit; increased risk of accidents/more deaths and injuries from accidents; noise pollution; which makes concentration difficult; atmospheric pollution/exhaust fumes/smog/appropriate named gas; acid rain or named effect; global warming or named effect; reduced visibility; causes difficulty breathing/ problems for asthmatics/eye irritations; road rage/frustration; difficult for emergency services to access; difficult for firms to get deliveries; increased use of fuel/higher fuel costs.

14. Describe and explain the attempts which have been made to solve traffic problems.
Content Guide: ring roads, build /improve/repair roads by pass, pedestrianisation, public transport, cycle lanes/bike hire schemes, park and ride; congestion charges; traffic lights; speed bumps etc.

Topic 1.3: Population structure and control

Population pyramids change significantly in shape as a country progress through demographic transition –



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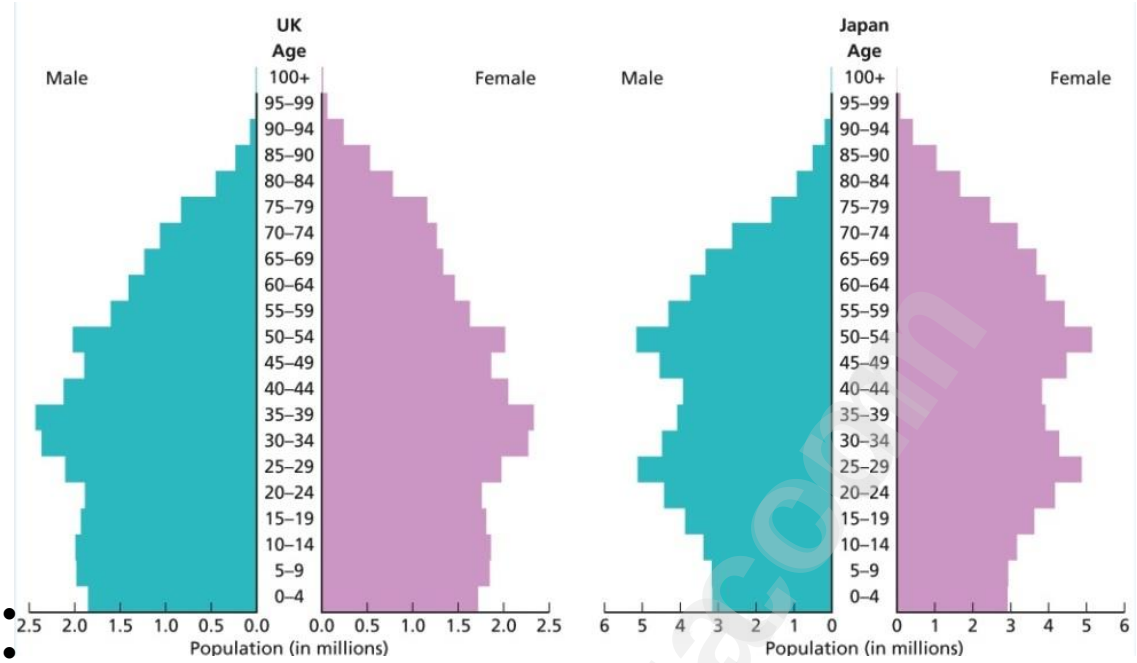

- The wide base of Niger's pyramid reflects extremely high fertility. The birth rate in Niger is 48/1000, one of the highest in the world.
- The base of the pyramid for Bangladesh is narrower, reflecting a considerable fall in fertility after decades of government promoted birth control programmes.
- The fact that the 0-4 and 5-9 bars are narrower than the two bars immediately above is evidence of recent falls in fertility.
- In the pyramid of UK much lower fertility still is illustrated by narrowing of the base. The birth rate in the UK is only 12/1000.
- In the case of Japan has a distinctly inverted base reflecting the lowest fertility of four countries. The birth rate is only 9/1000.

Divisions of population pyramid:

1. The young dependent population : 0-14 years
2. The economically active population: 15-64 years
3. The elderly dependent population: 65 years upwards.

The dependency ratio:

$$\text{The dependency ratio} = \frac{\%\text{pop aged 0-14} + \%\text{pop aged 65+}}{\%\text{pop 15-64}}$$ or dependents/working pop.

The youth dependency ratio is the ratio of the number of people under 15 to those 15-64 years of age. The elderly dependency ratio is the ratio of the number of people over 64 years to those 15-64 years of age.

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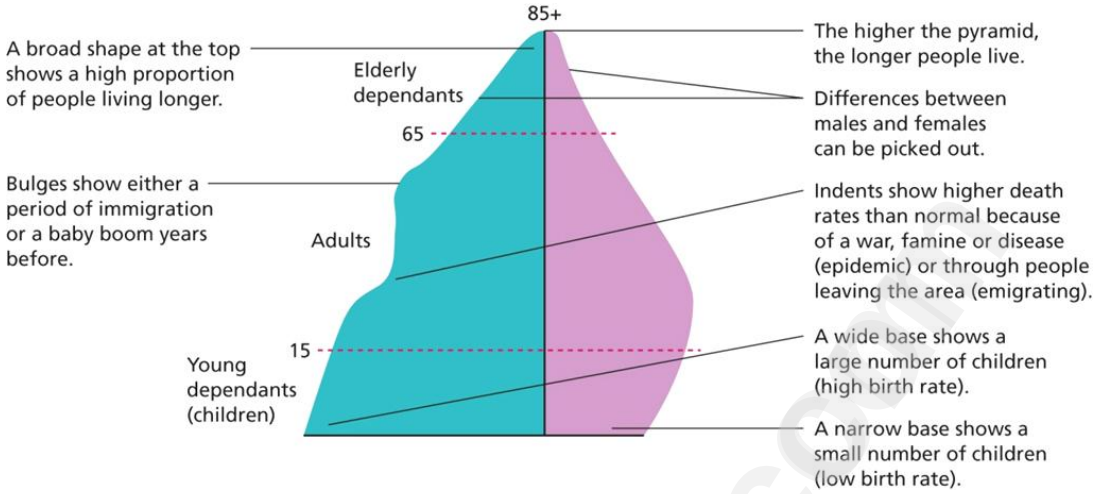
The shape of the population pyramid:



The shape of the population pyramid:

1. Broad base: broad base shows a large number of children – high birth rate
2. Broad shape at the top: shows a high proportion of people living longer (higher life expectancy)
3.

REVISION QUESTIONS

For a named country you have studied, describe and explain changes in the population structure. Name of country… (2015)

Content Guide: Answers will depend on country chosen but most are likely to refer to;
• ageing population,
• reducing proportion of young dependents;
• increasing proportion of elderly
• male/female imbalance
• migration ideas; etc. Place specific reference is likely to consist of: named parts of the chosen country/locational detail, population data etc.

Case study:

Niger: A country with a high dependent population

The Republic of Niger is a land-locked country in West Africa named after the Niger River. Its climate is mainly very hot and dry with many desert areas. It is an LEDC, and is one of the poorest countries in the world.

Niger has the highest fertility rate in the world with 7.1 births per woman. Literacy rate is only 28.7% and the population below the poverty line is 63%. About 90% of the total workforce is engaged in agriculture; industry 6% and services 4%. The birth rate is 49.6 and the death rate is 20.3.

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The Niger population under 15 years is 48 percent with 3 percent of 65 years or more, which shows that 51% of the total population is dependents. Bangladesh has 37% dependents; Japan 37% and UK has 34% dependents.

Problem of high young population in Niger:

- ✓ Niger has a large young population of 48%, which needs to allocate a substantial proportion of resources to look after them.
- ✓ The young people require resources for health; need proper education, food, safe drinking water and housing.
- ✓ The money required to cover such needs may mean there is little left to invest in agriculture, industry and other aspects of the economy.
- ✓ It is difficult to meet the large demand of country's resources, and may need to introduce family planning to reduce the birth rate. However, the parents have different views and consider their children as wealth.
- ✓ They also have to rely on their children in old age because of the lack of state welfare benefits.

Problem of ageing population in Niger:

- ✓ An increasing amount of money is needed for residential homes for the elderly people.
- ✓ More money is required for pensions to the retired people.
- ✓ Need more hospital and health care for the elderly people
- ✓ Increasing amount of the family doctor's financial budget and time is taken up by the elderly.
- ✓ Less money is available for younger age group for their education and other necessities

Topic 1. 4: **Population Distribution and Density**

Population density is the average number of people living in a square kilometre of land. The population density varies in different places. When the number of people living in a square kilometre of land exceeds 200, the area is **densely populated**. When the number of people living in a square kilometre of land is between 10 to 200, the area is described as **moderately populated**. When there are fewer than 10 people living in a square kilometre, it is described as **sparsely populated**.

$$\text{Population density} = \frac{\text{Total population}}{\text{Area /Sq.Km}}$$

Population distribution – is refers to the spread of people in an area. The world population is unevenly distributed. The majority of the people in the world are living in Asia, which accounts for 60% of the total world population. Africa ranks second and Europe ranks third in world population distribution. The South America and North America rank fourth and fifth respectively. The Oceania including the Australia and New Zealand has the fewest people, while Antarctica has only scientists and explorers only.

In ancient time, the main activities of the people was hunting, fishing and gathering fruits. However, with the dawn of domestication and agricultural practices, people commenced to settle down in a particular place. Some of the attributes that generally consider for human settlements in a particular area are – Relief - low-land where the

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people can practice agriculture; Climate – in those places where there is no extreme climate; Availability of water for drinking and farming; Fertile soil – for agriculture etc.

Factors affecting population density and distribution

1. **Physical factors**
   i) Relief (Flat land)
   ii) Climate (temperature)
   iii) Soil (soil fertility)
   iv) Natural vegetation (forest)
   v) Mineral resources (gold, iron)

2. **Human and Economic factors**
   i) Agriculture (farming)
   ii) Mining and industry (oil, steel)
   iii) Commerce (banking)
   iv) Transport and accessibility (rail, road)
   v) Politics and religion (stable government)

Reasons (factors) of people attracted to live in some areas

i) Flat land
ii) Employment (job opportunities)
iii) Fertile soil
iv) Reliable water supplies
v) Natural resources
vi) Good Transportation and communications
vii) Suitable climate
viii) Stable Government

Reasons of people not living (not attracted) in some areas

i) Steep relief (mountainous regions)
ii) Arid climate (deserts)
iii) Infertile soils
iv) Marshy land
v) Extremely cold climate (polar regions)
vi) Dense forest

Reasons for low-density in rural areas

- Not enough flat land for agriculture (farming)
- Infertile soil (acidic or thin)
- Isolation and Inaccessibility (poor road transportation)
- Little work except forestry
- Relief (mountainous)

Reasons for high-density in rural areas

- Fertile soil (gently sloping land)

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- Suitable climate
- Accessible (road transportation)
- Farming (machinery on flat land)

Reasons for high-density in the urban areas

- Transportation and communication
- Medical facilities
- Safe drinking water
- Educational institutions
- Job opportunities
- Industries
- Offices (administration and others)
- Commerce (banking, import and exports)
- Entertainment and Recreational facilities

Case study: Java and North Indonesia

Java is an Island of Indonesia and the site of its capital city. The population density of Java is 1040 per Km^2, and it covers 6.9% of total land in Indonesia.

Causes of High Density

- **Physiography –** Java is a volcanic Island. Merapi is its most important active volcano. The mountains help to split the interior into a series of relatively flat and suitable land for rice cultivation and agriculture.

- **Fertile soil –** the volcanic soil of Java is considered as the most fertile soil. The volcanic ashes of the active Merapi make the soil fertile. Certain regions are covered by alluvial soil

- **Early agriculture development** – ideal agricultural conditions and wet field rice cultivation started in the 8th century. This allowed villages and kingdoms to flourish in this regions.

- **Tropical climate** – the natural climate of Java Island is not extreme like in deserts or Polar regions. Its moderate climate is one of the most important reasons for its high population density. The demands maded on clothing and housing by the population are not much. The average temperature of Java is 28^0C and the annual rainfall is 200 cm. The rainfall is distributed throughout the year.

Consequences of High population density:

- **Overcrowding –** Java covers only 6.9% of land in Indonesia when 60% of the total population resides here. The population density of Jakarta is 4383 per KM^2
- **Low living standards –** Jakarta is a city of 10 million people. There are many fishing villages like the one in Muara Angke. Less than 50% of Jakarta's residents have access by water.

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- **Pollution –** the cities are polluted with industrial and residential waste. Jakarta produces

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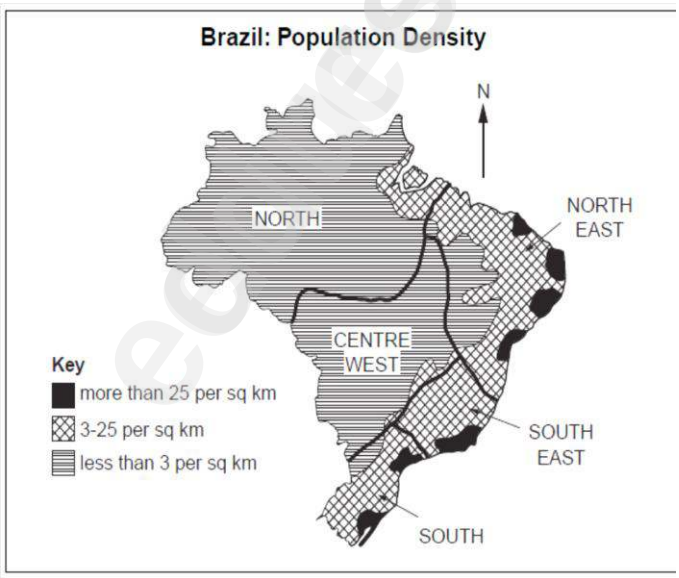
Revision Questions

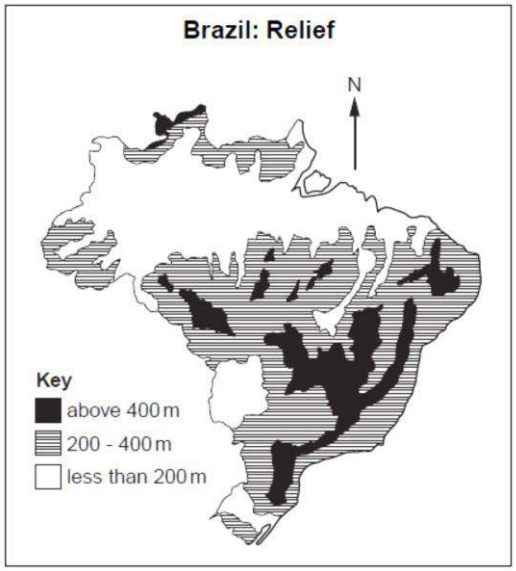
1. Explain how physical factors can influence population distribution. (2015)
Ideas such as: more likely to live on flat land; people are more likely to live in lowland areas/avoid living in mountains/live in a valley; people live in areas of temperate climates/where it is wet/warm; people avoid areas which are too hot/too dry/too cold/areas with extreme climate conditions; flood plains are avoided; swampy areas are not built on; in tropical areas higher land is attractive to live in as temperatures are lower; large areas of rainforest are sparsely populated; people live near a water source/rivers/nodal points for rivers/where rivers meet; people live near fertile soil; defensive sites e.g. surrounded by mountains/meander/on a hill; dry desert areas are avoided/have few people; near to natural resources/fossil fuels/minerals;

2. For a named country you have studied, describe and explain changes in the population structure.
Content Guide: ageing population, reducing proportion of young dependents; increasing proportion of elderly; male/female imbalance; migration ideas; etc.

3. For a named area you have studied, explain why it has a low population density.
Content Guide:relief; accessibility / isolation; climate / low or high temperatures depending upon location / rainfall / desert; water supply / desert / drought;employment / lack of jobs; natural resources / resource availability; inability to grow food / soil fertility / inadequate food supply; areas of dense vegetation/type of natural vegetation;etc.

4. For a country which you have studied, show the relief of the country and suggest the reasons unevenly distribution of population.





Reasons such as: explain using the reasons given below: differences in relief; high lands are not densely populated; difficult to build (dev);for communications (dev); less than 200 metres sparsely populated; possible flood risks (dev); differences in precipitation; areas above 2000 mm rain sparsely populated; as this creates rainforest

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(dev); difficult to penetrate (dev); coastal location encourages trade; thus development of industry/settlement/tourism (dev) etc

5. Referring to physical factors, explain why some highland regions are sparsely populated.
Ideas such as: communications are difficult/roads hard to build; difficult to build on (steeply sloping land); isolation/far away from CBD/cities/towns; agriculture is poor in mountains/food hard to produce/shortage of food; climate often cold/snow/icy/or implications; poor soils/infertile; wet/windy;

6. Referring to economic and human factors, explain why many coastal regions are densely populated.
Ideas such as: Settlements developed around ports/harbours/easier to travel abroad; trade opportunities/imports/exports; much industrial development/factories; employment/job opportunities; coastal areas have good communications/roads/rail links/transportation; growth of tourism/examples of jobs in tourism; fishing industry/food from sea; first regions to be settled idea;

Topic 1.6: Rural Settlements

Any form of human dwelling from a single house to largest city is a settlement. In other word, a settlement is a place in which people live and where they carry out a variety of activities, such as residence, trade, agriculture, manufacturing etc.

1.Types of settlements: There are types of settlements such as: Rural and Urban settlement. Most of the rural settlements are hamlets and villages, although not all are.

2. Pattern or shape of settlement: **i). Dispersed settlement:** Is a dispersed settlement pattern is one in which individual houses and farms are widely scattered throughout the countryside. They are common in sparsely populated areas. This happen because it became more convenient to build farmhouse out in the fields of the newly established farms.

ii). Nucleated settlement: Nucleated settlements are those in which houses and buildings are tightly clustered around a central feature such as a church, village green or crossroad.

iii) Linear settlement: In linear settlement houses are spread out along a road, railway track, or a river. Linear settlement is also found where poor drainage prohibits growth in a certain direction.

iv) Cruciform settlement: is found at intersections of roads and usually consist of lines of building radiating out from the crossroad.

Some of the factors that favours nucleation are:

i) Joint and co-operative working of the land
ii) Defence, for example hilltop locations to protect from other people
iii) Shortage of water causing people to locate in areas lose to springs
iv) Near important junctions and crossroad as these favour trade and communications

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4. Site and situation: The site of a settlement is the *actual land* on which a settlement is built, whereas the situation is the location of the settlement in relation to the area around it. Example of site: on flat land, on fertile soil, on a hilltop etc. example of situation: close to a reliable water supply, close to a main route etc. Some of the favourable sites for settlement includes:

i) Availability of water
ii) Free from flooding
iii) Availability of resources
iv) Availability of good soil for agriculture
v) A potential for trade and commerce
vi) Climatic condition

A **dry point** is an elevated site in an area of otherwise poor natural drainage. It includes small hill or islands. Water supply and fertile alluvial soils and the use of a valley as line of communication are all positive advantages.

A **wet point** site is a site with a reliable supply of water from springs or wells in an otherwise dry area. Spring line villages at the foot of chalk and limestone ridges are good example. Spring line settlement occurs when there is a line of sites where water is available.

5. Functions: The function of a settlement relates to its economic and social development, and refers to its main activities. Generally the larger settlement will have more functions than smaller settlements. Larger settlement tends to be multifunction.

Functions: Agriculture, Mining town, Fishing, Lumbering (logging), Cattle rearing, Quarrrying, Ports, Weaving, Pottery, commercial, administrative, residential etc.

6. Amenities: Market, Post office, unmetalled road, Primary school, Primary health center, electricity, drinking water etc.

……..

REVISION QUESTIONS:

1. Suggest three possible reasons for the growth of large settlements
Ideas such as: • flat land/room for expansion; • industry/factories/businesses; • markets for surrounding area/trade from surrounding area; • migration (from surrounding rural area); • commercial/retail development; • mining/raw materials/extraction of resources; • meeting of roads/route centre/transport links meet together; • central location; etc.

2. Explain why some people in MEDCs (More Economically Developed Countries) are choosing to live in rural areas rather than living in towns and cities.

Ideas such as: • some people like tranquility/quiet/more peaceful/lack of noise;
• lack of specified pollution air/water; retirement; less stressful living environment/too crowded in cities; lower crime rates/less vandalism/graffiti/safer to raise a family or examples; people working from home; improvement in ommunications/transport/people have greater personal mobility; work in tourist industry; work in farming/they are farmers; scenic beauty/no visual pollution; more land available/larger houses with gardens (or vice versa for cities); less traffic congestion/less traffic; etc.

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3. Explain why different rural settlement patterns develop in different areas.

Ideas such as: • influenced by relief/large area of flat land;
• land use influences pattern;
• influenced by communications/along roads;
• ideas linked to specific settlement patterns:
• linear settlements develop in valleys /next to rivers (dev);
• nucleated settlements grow up at junctions/where roads meet/rivers meet (dev);
• nucleated along bridging points;
• nucleated wet points/dry points;
• in farming areas population will be dispersed/spread across the farmland;
• on coalfields population will be nucleated/grow up close to mines;
• where settlements have developed at/as defensive sites would be nucleated; etc.

Case study: Service provision in a city or an area
Osaka- Kobe, Japan

The twin cities of Osaka –Kobe are located in the Kansai region of the Japanese Island of Honshu. Kansai with a population of over 9 Million, has become a world leader in education, science, business, technology, industry etc.

- Osaka and Kobe provide lots of services to the people in the city which lead to attract many people to migrate here. There is a good port and around 1400 ships a day enter the dock at Osaka. It is also known well-known for imports and exports raw materials and manufactured goods.

- Kansai is a major industrial region. The port area has large oil refineries, steelworks and other industries processing imported raw materials.

- Osaka and Kobe has a very good transportation link with bullet train, which provides the most reliable rail service in the world. One of the three bullet train lines passes through Osaka and Kobe. The trains carry 275 million people per year, run at 7 minutes interval, are computer controlled, arrive prompt to the second and

- In addition to the present road transportation, a new road has been built linking Osaka and Kobe with the Islands of Awaji and Shikoku.

- Kansai International Airport, built on an artificial Island in Osaka Bay, opened in 1994. The terminal, the world's largest, can handle over 30 million passengers a year.

- The cities also provide good educational institutions and many people from different parts of Japan and abroad come to these cities for education and research purposes.

- Science and technology become another important center in these cities. Many people are involved in science and technology and research projects.

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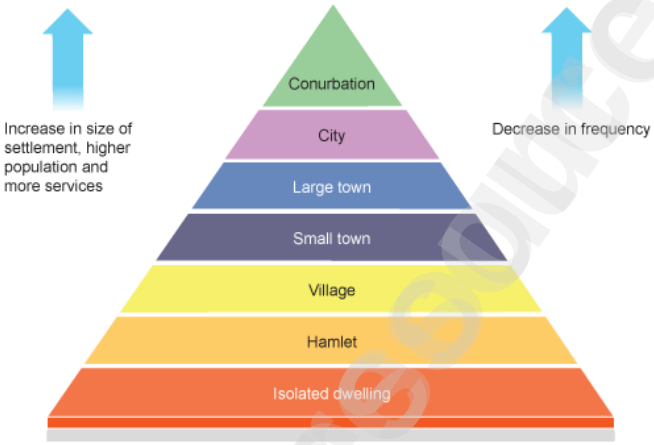
- Osaka-Kobe became the business center. Many business people across the globe come to visit here.

- In addition to some of the mentioned above services, there are also many other services like hospitals, housing facilities, safe drinking water, communications, power station and many other services.

Topic 1.7: Urban Settlements

Settlement hierarchy
The term hierarchy refers to the arrangement of settlements within a given area in an 'order of importance'.
The 'order of importance' in the hierarchy is determined based on:

i) the population size of a settlement
ii) the range and number of services provided by a settlement
iii) the sphere of influence, or market area, of a settlement.



Isolated home/farmstead (1family) → Hamlet (5-6 buildings) → Village (upto several hundred people) → small town (10,000-20,000 people) → large town (upto 100,000 people) city (upto a million people) → Conurbation (1-2 million people) → Primate city or capital (several million people)

Sphere of influence: The sphere of influence or market area is the area served by a particular settlement. The area of sphere of influence depends upon the size and services of a settlement. Hamlets and villages generally have low spheres influence.

Range of a good: The maximum distance that a person is prepared to travel to buy an item (good) is known as the range of a good. Low order goods have a small range whereas high order goods have a large range.

Threshold population: The number of people needed to support a good or service is known as the threshold population. Low order goods may only need a small number of people to support a small shop, whereas a large department store might require larger number of people in order for it to survive and make a profit.

Factors affecting the size, growth and function of settlements
A number of factors affect settlement size, growth and function. In extreme environments settlement are generally small.

1. In those low land where farming can be practiced are more suitable for human settlement

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2. Climatic condition also affect the growth and function of the settlement
3. Easy transportation and communication attract more settlement.
4. Settlement in the more favoured areas had greater potential growth, and a greater range of services and functions

Functions of urban settlement

- ✓ Market town where the famers buy and sell goods. There are many services e.g. shops and offices, have good transport links, a market place.

- ✓ Port where goods loaded and unloaded by ship. There are sheltered harbours, building or storage

- ✓ Industrial town where many people work in factories, processing raw materials or assembling products. It is found near coalfields.

- ✓ Resort a place where tourists visit to enjoy themselves. It is located on the coast with beaches or scenic inland areas, may be large historical cities.

Urban land use models:

Urbanization means an increase in the proportion of people living in towns and cities. Although towns were important even in the early civilization of Mesopotamia and the valley of the Nile, Indus and Huang-He (China), most people tend to live in rural areas. However, due to rapid of industry in nineteenth century that large-scale urbanization began in Europe and US.

Urban land use models:

A model is a theoretical framework which may not actually exist, but which helps to explain the reality.

Burgess's concentric model (1925)

Assumptions:

- ❖ Burgess assumed that new migrants to a city moved into inner city areas where housing was cheapest and it was closes to the source of employment.
- ❖ Over time residents move out of the inner city area as they become wealthier

Features / characteristics:

- Model based on Chicago in the 1920s
- The city is growing spatially due to immigration and natural increase
- The areas around the CBD has the lowest status and highest density housing
- Residents move outwards with increasing social class and their homes are taken by new migrants
- Heart of the city
- Commercial and shopping facilities, intensive land development, sky scrappers
- Concentration of main offices, shop, financial institutes, entertainment centres
- Chief focus of traffic such as road junctions, bus stations
- Large number of pedestrians

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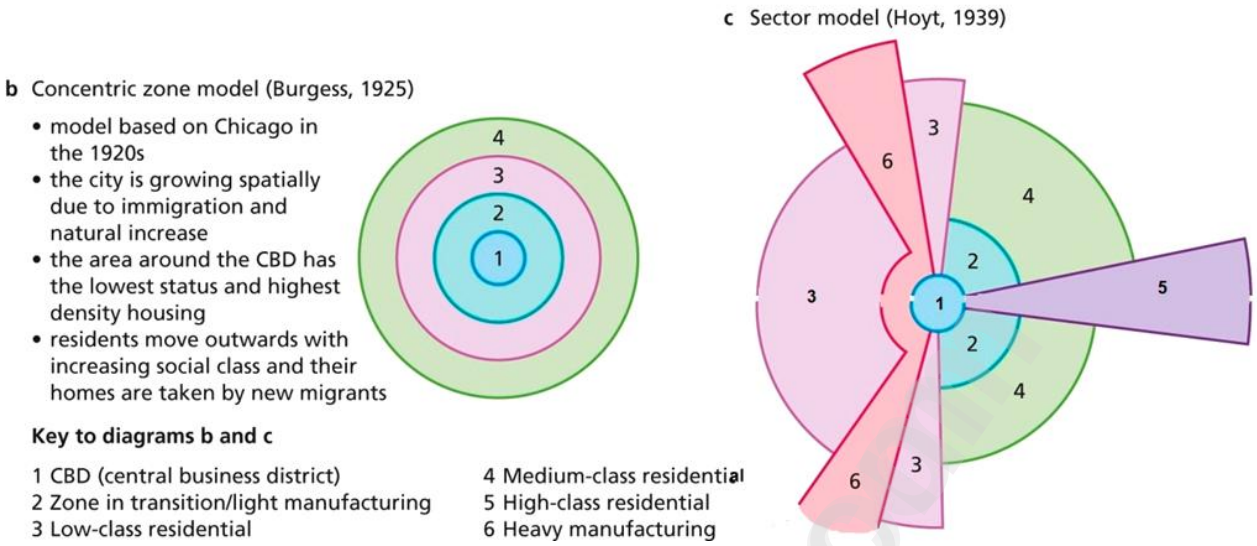

b. Burgess's concentric model and c. Hoyt's Sector model

1. Central Business District (CBD)
2. Factories/Industries
3. Working Class housing
4. Middle Class housing
5. a) A commuter zone
   b) high class housing

In his model, housing quality and social class increase with distance from the city centre.

Land in the centre is dominated by commerce as it is best able to afford the high land prices, and requires highly accessible sites. In the early twentieth century, public transport made the central city the most accessible part of town.
Beyond the CBD is a manufacturing zone that also includes high density, low quality housing to accommodate the workers.

As the city grows and the CBD expands, the concentric rings of land use are pushed further out.
The area of immediate change adjacent to the expanding CDD is known as the zone in transition.

Hoyt's sector model (1939)

Homer Hoyt emphasized the importance of transport routes and the incompatibility of certain land uses. Sectors develop along important routeways, while certain land uses, such s high-class residential and manufacturing industry deter each other and are separated by buffer zones or physical features.

REVISION QUESTIONS

1. What do you understand by typical of a settlement hierarchy?

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In a typical settlement of hierarchy –
• there are more small settlements/low order than large ones/high order;
• larger settlements are further away from each other than small ones/smaller ones are closer together;

2. Explain why people are prepared to travel further for some shops and services than others.
Ideas such as;
• travel further for high order goods; it depends on the availability of the services; e.g. there are lots of shops selling bread (dev); so people will be able to buy it locally (dev);
• main leisure facilities may only be found in large urban areas;
• so have to travel to a nearby city to go to cinema (dev);
• for some goods people go further so they have a better choice/a wider variety of goods in some shops; travel further for a better quality product;
• General frequency of use idea e.g. don't go there very often so will travel further;
• travel further for a specialized shop not found near where they live;
• travel further for cheaper prices; travel further for expensive goods e.g. car; etc

3. For a shop or service in a named settlement you have studied, describe its location and sphere of influence. Name of settlement…Shop or service…

Content Guide:
Answers will depend on example chosen, however reference may refer to location:
• within CBD,
• on specific street,
• road network,
• proximity other services etc.

4. Describe and explain the main functions of an urban settlement

Content Guide:
• industry,
• commercial development,
• market town,
• education,
• administration/government,
• tourism
• port; etc.

5. Describe the types of land use which occur at the edges of cities.
Ideas such as: housing estates/new housing/detached housing/high quality housing; retail parks/shopping centres/supermarkets/hypermarkets; large areas for parking; ring roads/motorways/by passes; leisure centres/specific type of leisure provision; industrial estates/new factories/science parks/footloose industries; parks/state parks/theme parks/country parks; farmland/plantation/fields/crops/pasture/grazing land/forestry; squatter settlements; power stations; airports; sewage works; refuse tips/landfill sites; quarries; game reserves; botanical gardens; commuter/suburbanised villages; reservoirs.

6. For a shop or service in a named settlement you have studied, describe its location and sphere of influence.
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• within CBD,
• on specific street,
• road network,
• proximity other services etc.

7. Explain why shops and services in the CBD of a capital city may have a large sphere of influence.
Ideas such as: they are high order services/goods;
they are specialist/they sell comparison goods;
people travel a long way to use them/large range;
as there are none available where they live/villages do not have these services;
they may use them infrequently/goods are high cost;
they are easily accessible/centrally located;
other high order services or tourist sites or work places are available nearby;
they use advertising; wide variety of goods/large in size;services are more advanced/sophisticated/high quality goods, etc.

8. Explain why any attempts to reduce traffic congestion in urban areas are likely to create conflicts.
Conflicts/problems such as: Disruption during construction phase; e.g. noise from machinery (dev), dust (dev), traffic congestion (dev); Use of land for building of transport facilities; loss of cultivable land in suburbs; may need to demolish properties to build new transport facilities; shanty towns cleared/people become homeless(dev); potential loss of business for petrol stations/CBD car parks/shops; because people not using cars as much (dev)/ therefore loss of passing trade (dev). Prefer tax money to be used for something else/leads to tax increases; etc.

9. Describe the impacts of rapidly growing city on the natural environment.
Ideas such as:
Deforestation/loss of woodland/forest/greenery/open spaces;
loss of farmland/hedgerows; habitats destroyed/animals killed/scared away;
species under threat/extinction/examples of species (dev);
filling in of water courses; reclamation of wetlands/swamps/flooding (dev);
air pollution; water pollution etc.

10. 4. Explain why high order services have a large threshold population.
Ideas such as:
High order services need more customers to make a profit/use or operate the service;
They are often expensive;
High order services are likely to be used less frequently than others;
High order services may be only used by a small proportion of the population;
They are often specialist;

Topic 1.8: Urbanisation

Urbanisation is the increase in the population of people living in towns and cities. Urbanization occurs because people move from rural areas to urban areas. This usually happens when a country is still developing.

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In 1950s, urbanisation has slowed down in MEDCs, and now some of the biggest cities are losing population as people move away from the city to rural environments. This is known as counter-urbanisation.

The main causes of urbanisation in LEDCs;

- Rural to urban migration is happening on a massive scale due to population pressure and a lack of resources in rural areas. (this is known as push factors)
- People living in rural areas believe that the standard of living in urban areas will be much better than in rural areas. They for well-paid jobs, greater opportunities to find 'informal' work, and better health care and education.

Main features/characteristics of Central Business District (CBD)

- Commercial and shopping facilities, Intensive land development – skycrappers
- Concentration of main offices – shops – financial institutions – entertainment centres
- Chief focus of traffic (junctions, bust stations)
- Large number of pedestrians
- Vertical zoning – shops occupy ground floors because of accessibility while offices occupy upper floors
- Functional grouping – similar shops and similar functions tend to locate together – increasing their threshold
- Traffic restrictions are greatest in the CBD – pedestrianisation has reduced access for cars.
- Concentration of retailing – high levels of accessibility attract shops with high range and threshold characteristics
- Low residential population – high bed rents can only be met by luxury apartments

Benefits – basic facilities are available (road, water, electricity), city centre location, cheaper goods are available.

Migration from Rural Peru to Lima

Factors influencing migration from villages in Andes to Lima

- Not enough agricultural land because it is shared between sons
- Drought and other natural hazards
- Low prices for agricultural products
- Cannot afford clothes and food for children
- Not much opportunity for children to go to school
- No running water, electricity or sewage disposal in many villages.

What migrants experience when they get to Lima

- Racial discrimination
- Separation from family
- Better quality services, e.g. water, electricity
- Better schools for migrants children
- Low pay and long working hours
- Forced to live in self-built houses or on the streets

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A case study on squatter settlement in Dharavi, Mumbai

Dharavi is a slum and administrative ward, suburbs of Mumbai, India. Dharavi is one of the largest slums in the world. It used to be the largest slum in Mumbai at one time, but as of 2011, there are four slums in Mumbai larger than Dharavi. In 1986 the population was 530,225, but modern Dharavi has a population near 1 million.

The facts:

1. Dharavi covers an area of 535 acres (217 ha), it is situated near to the Mithi River,
2. Migrants from Gujarat established a potters' colony.
3. Migrant tanners from Tamil Nadu and Maharashtra set up the leather tanning industry.
4. The embroidery workers from Uttar Pradesh, started the ready-made garments trade.
5. Dharavi's first school was constructed in 1924.
6. There is an increasingly large recycling industry, processing recyclable waste from other parts of Mumbai.
7. The district has an estimated 5000 businesses and 15,000 single-room factories

Positive Conditions:

1. Dharavi provides a cheap housing where rents are as low as US$4 per month.
2. Dharavi exports goods around the world. The total turnover is estimated to be over US$650 million/year.
3. **Informal shopping areas exist where it is possible to buy anything needed.**
4. **85% of people have a job in the slum and work LOCALLY, and some have even managed to become millionaires.**
5. Everything is recycled (23% of plastic waste recycled in the UK, in Mumbai it is 80%)
6. These areas have strong safe neighbourhoods that have low crime and communal riots.

Negative Conditions:

1. Poor drainage systems make Dharavi particularly vulnerable to floods during the wet season.
2. Dharavi has severe problems with public health, due to the scarcity of toilet facilities. As of November 2006 there was only one toilet per 1,440 residents.
3. The area also suffers from problems with inadequate drinking water supply.
4. The doctors deal with 4,000 cases a day of diphtheria and typhoid.
5. People live in very small dwellings (12X12ft), often with many members of their extended families (5 people per room).
6. The houses often have no windows and safe doors.
7. They have to work under the hot sun in dangerous conditions with toxic substances without protective clothing to earn around a £1 a day, this could affect life expectancy.

Redevelopment;

1. There have been many plans since 1997 to redevelop Dharavi. In 2004, the cost of redevelopment was estimated to be US$770 million.

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2. The Dharavi co-operative housing society, by the initiative of Shri. M.V. Duraiswamy, promoted 338 flats and 97 shops and was named "Dr. Baliga Nagar."

The latest urban redevelopment plan proposed by architect Mukesh Mehta, involves the construction of 30,000,000 square feet of housing, schools, parks and roads to serve the 57,000 families residing.

The slum dwellers face 14 story apartments as accommodation as proposed by the cities Slum Rehabilitation Authority.

Redevelopment problems;

1. There has been significant local opposition to the plans, largely because existing residents are due to receive only 269 square feet of land each.
2. Furthermore, only those families who lived in the area before 2000 are slated for resettlement.
3. Concerns have also been raised that some of their small businesses in the "informal" sector may not be relocated under the redevelopment plan as the government will only legalize industries that are not "polluting."
4. The locals would prefer small improvements to the existing slum such as improvements in drainage.
5. The value of land is so high that redevelopment is now a real threat. The alternative accommodation is very small.
6. This will separate communities and make people work away from where they live.

……..

REVISION QUESTIONS

1. Explain why many new shopping and entertainment centres are being built in suburban areas rather than in the centre of cities.

Ideas such as:

Low land costs; More space to built large mall ; and for parking (dev); Away from congestion in CBD ; makes deliveries/access for customers easier (dev); easy access from motorway (dev); Away from noise/atmospheric pollution ; more pleasant shopping environment (dev); large market/lots of customers etc

2. Describe the problems in its rural-urban fringe which are being caused by its growth.

Traffic congestion as many people who live in new developments commute to work in CBD, loss of farmland due to new housing developments/road construction, atmospheric pollution from increased traffic etc

Topic 1.9: Urban Problems

Urban decay – urban decay occurs when parts of the city become run-down and undersirable to live in. Examples of urban decays are:

- ✓ slum housing, with outside toilets, overcrowding, no hot water or central heating
- ✓ buildings in disrepair with leaking roofs, draughty windows and crumbling brickwork
- ✓ empty buildings boarded up or vandalized
- ✓ areas where buildings have been knocked down and which turn into derelict land.

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Comprehensive redevelopment: There have been a number of schemes to reduce the problems of urban decay. Comprehensive redevelopment occurs when all the building are knocked down and the area is completely rebuilt, for example old housing and factories demolished and replaced by new flats and multi-storey high-rise building. This approach has been criticized as people have to move from their established communities and workplaces – they no longer know their neighbours and they have moved away from their friends and relations.

Urban regeneration: urban regeneration is the renovation of existing housing and improvement of the environment and economy including:

- ✓ rewiring the houses and fitting central heating
- ✓ fitting double glazing
- ✓ cleaning the outsides of old buildings by sand-blasting
- ✓ improving the environment by landscaping
- ✓ building or improving the social facilities such as clubs and medical centres
- ✓ encouraging new businesses and industry to set up in the areas with grants and loans

This has proved more popular as people have been able to stay in their own area.

Factors influencing CBD decline/ decay

- Investment in city centres often lack a co-ordinated plan
- Congestion reduces accessibility of CBDs
- Investors and businesses are attracted to peripheral sites that have better environments
- Cost of development is high – business rates, rents and land costs
- Rise in care ownership leads to increased personal mobility
- Planning policies can encourage urban expansion and provide 'out of town' developments
- Companies find peripheral locations cheaper, and nearer to customers and staff who live in the suburbs.
- City centres are perceived as dirty, unsafe, with an ageing environment and poor infrastructures
- Progressive suburbanization leads to urban sprawl

Problems associated with urban growth:

- Lack of housing; Very high land values and rent in the city centre
- Congestion in the CBD; Traffic congestion – time delay, accidents
- Unemployment; Crime – robbery, theft; Racial conflict ; Pollution – air, noise, water etc; Lack of open space- parks, brown field sites; Urban decay and dereliction; Overcrowding – congestion, pickpockets

Solutions to urban problems

- Government support for low-income self-built housing
- Provision of enough quality housing; Subsidies for home building; Flexible loans to help shanty-town dwellers; Construction of health and educational services
- Improve sanitary facilities; Increase access to electricity and potable water
- Slum upgrading in central areas; Improved private and public rental housing
- Site and service schemes; Encouragement of community schemes

Case study: Urban problems and solutions – Cairo in Egypt

Cairo is located around the banks and Island of the river Nile in the north of Egypt. There has been rapid growth of population since 1950s. The growth has been too rapid

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for the city to cope, with increasing demands for services such as piped water, schools, paved roads and electricity. Traffic congestion, along with noise, air and water pollution, adds to the problems.

Problems in Cairo city:

1. **Lack of housing:** Self built brick houses are built illegally on farmland by the river Nile. These informal houses cover 80% of Cairo. Half a million people live in homemade of huts on roof spaces of office blocks and flats in the city centre.
2. **Traffic congestion**: Between 1970 and 2000, the number of cars has increased from 100000 to over a million. Many drivers are aggressive and do not keep to the rules of the road, causing danger for road users and pedestrians.
3. **Lack of jobs:** Jobs for unskilled workers are hard to find. Many poor people are forced to work in the informal sector, selling things on the streets to earn a meager living.
4. **Pollution:** The air is heavily polluted by a cocktail of vehicle exhausts and fumes from fuels used in homes and workplaces. Ground water is polluted by waste illegally dumped by factories and workshops.

Solutions to Cairo city problems:

1. New satellite and dormitory towns built around the city
2. Ring road built, encircling the city
3. People with donkey carts were lincensed to collect and recycle garbage
4. Homes and public services were upgraded in the most run-down part of the city.
5. A modern metro system was built
6. There greater Cairo waste water project, extended and repaired the sewage system.

REVISION QUESTIONS

1. For a named urban area you have studied, describe the attempts taken to reduce the problems caused by traffic.

Content Guide:pedestrianisation; road improvement / widening; ring roads; by-passes; public transport systems / trams / tube / guided bus routes; congestion charging; park & ride; number plate usage; lanes for car sharing; bus lanes; catalytic convertors / reduce air pollution; etc.

Topic 1.10: Urban Sprawl

The expansion of the city into its surrounding rural areas is the urban sprawl. As population increases in towns and cities, urban sprawl takes places. This happens in both MEDCs and LEDCs, but the causes are different. *Urban sprawl tends to be unplanned in LEDC cities and planned in MEDC cities* – but the outcome is similar. In both cases the urban area expands into the countryside, affecting people and changing the environment at the rural-urban fringe.

Rural –Urban Fringe (zone of transition / green field) features
It is the transition zone where urban and rural mixture of land uses. The **Rural-Urban fringe** is the name given to the land at the edge of an urban area, where there is often a

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huge mixture of land uses. Often science parks, business parks and industrial estates locate in the rural-urban fringe as the land is cheaper, there is room for expansion and they are closer to transport links to allow export and import of goods.

Recreational land-uses such as golf courses and leisure parks have been established in the rural-urban fringe. Out-of-town shopping centres also find that the space available, good transport connections and cheap land encourage them to establish in the rural-urban fringe. Farming still occurs in the rural-urban fringe, although the farmers often come under great pressure to sell their land for development. A farmer will make far more money from a sale if there is already planning permission for building to occur on the land.

Greenbelts

Greenbelts were established to prevent the continued growth of cities. They are rings of heavily protected open land circling an urban area. They aim to protect the surrounding countryside from development, and in some cases stop two large cities from merging. Planning permission is not usually granted for schemes on green belt land, although there is often great pressure to allow some proposals through.

Main features of rural-urban fringe

- Constantly changing pattern of land occupancy and or ownership.
- Small farms in which intensive forms of agriculture,including market gardening are carried out.
- Rapid residential expansion and predominance of speculative buildings.
- Incomplete provision of public utilities and services.
- Out of town shopping centers.
- Socially, the residents tend to be segregated into distinctive groups;the older rural groups,the new tenants and owner occupier of new private housing.
- Roads – National highways, by-pass, low street density
- There is also garden, gym, swimming pool, lifts, helipads, low housing density, outer city council estate-large buildings for the poor.
- Developments of high tech industries
- Development of shopping complex, hyper markets, out of town shopping centres (occupy large space and variety of goods, parking, high demand for goods)
- Recreational areas – amusement parks, playground, sports stadium, country parks,
- Science parks, hotels and conference centres (large area)
- Sewage works and landfill sites for urban waste.

Advantages in the rural-urban fringe:

- Availability of cheap land
- Enough space for expansion
- Good quality environment
- Fresh land area
- Good road transportation
- Better security.

Disadvantages in the rural-urban fringe

- Loss of farming land and jobs;
- Increase in population results in suburbanisation of villages;
- Increasing competition for land between industrial and agricultural purpose;

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- Loss of natural reserves for wild life;
- Increase in traffic leads to accidents,
- Sewage works and disposal causes land, water pollution.

The growth of out-of-town shopping centres

Shopping in MEDCs (more economically developed country) and NICs (newly industrialised country) has changed from an industry dominated by small firms to one being led by large companies. The retailing revolution has focussed on superstores, hypermarkets and out-of-town shopping centres. These are located on Greenfield suburban sites with good accessibility and plenty of space for parking and future expansion. The initial out-of-town developments came in the late 1960s and early 1970s. Now more than 20% of shopping expenditure in MEDCs takes place in out-of-town stores.

Advantages:

- Plenty of free parking
- Lots of space so shops are not cramped
- New developments so usually quite attractive
- Easily accessible by car
- The shops can sell large volumes of goods and often at slightly lower prices
- Having a large shop means that individual shops can offer a greater range of goods than smaller shops
- Developments on the edge of the town reduce the environmental pressures and problems in city centres
- Many new jobs can be created both in the short term and in the long term.

Disadvantages

- They destroy large amount of undeveloped Greenfield sites
- They destroy valuable habitats
- They lead to pollution and environmental problems at the edge of town
- And increase in impermeable surfaces (shops, car parks, roads etc) may lead to an increase in flooding and a decrease in water quality
- They only help those with cars – people who do not benefit might include the elderly, those without a car, those who cannot drive.
- Successful out-of-town developments may take trade away from city centres and lead to a decline in sales in the CBD
- Small businesses and family firms may not be able to compete with the vast multinational companies that dominate out-of-town developments – there may be a loss of the personal touch
- They cause congestion in out-of-town areas
- Many of the jobs created are unskilled.

A case study: Urban sprawl in Atlanta

Atlanta is the capital of Georgia state. Its population has grown from 1.4 million in 1970 to 5.1 million in 2006. Between 2000 to 2006 it has added 1 million population which is becoming the fastest-growing metropolitan city in the USA.

Growth creates problems

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- Population growth – Atlanta is the largest metropolitan area in south-east USA. With 5.1 million populations in 2006, urban sprawl was inevitable.
- Traffic congestion – plus air and noise pollution is the fourth worst in the USA. 90% of residents drive to work experiencing 68 hours of delays year year.
- Air quality – traffic congestion causes increases in respiratory illnesses such bronchitis, asthma etc. air stagnates here so fumes from vehicles are rarely blown away.
- Water quality and quantity – sanitation systems cannot cope. Increased water demand for industry and irrigation uses up supplies, affecting fishing habitats.
- Agricultural land – expansion has meant that farmland has been bought and covered with shopping malls and other developments.
- Loss of green space – the city losses an average of 125 hectares of trees per day by deforestation. Ecosystems suffer a wildlife dies or migrate away.
- Cultural loss – civil war battlefields surrounding Atlanta, such as the Kennesaw mountain national battlefields to the north, are under threat from suburban homes.
- Socio-economic division – most sprawl is to the north where white middle- class suburbs have developed. The inner city has less investments; this is where the poorer black population has stayed.

REVISION QUESTIONS

1. Describe the advantages and disadvantages of creating areas of green belt land around cities.

Ideas such as:
Advantages:
Retains rural/peaceful environment/stops excessive urban growth/prevents sprawl/ prevents unsightly buildings being built; people can easily access land for walking dog/cycling/amenity; lead to increased property prices; Provides clean air for city/stops/reduces air pollution; May contain water sources for city/no water pollution e.g. reservoir/river; Can be used for producing food/farming; etc.

Disadvantages:
Makes expansion of urban area more difficult; less land to build services e.g. schools; Therefore building of new housing is difficult/not enough homes for people; encourages upward growth/high rise; Have to live further away from city/development has to be at other side of green belt; leads to more traffic movement/congestion/more fumes/air pollution from traffic; makes construction of ring roads/by passes difficult/rail/airport; increased property prices;

2. Describe the hierarchy of settlements
More small villages than large cities, one big city which is the capital, several large cities within each part of the country etc.

3. Describe the effects of rapid urban growth on the natural environment.

Ideas such as:
loss of vegetation/deforestation;
loss of habitats;

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impacts on food chains;
pollution of rivers;
death of fish/other species;
pollution of ground water/seepage of toxins from dumps;
air/atmospheric pollution;
rivers dry up due to water extraction/water table lowered etc.

4. Many settlements have grown over the years into large urban areas. Explain the reasons for its growth.

good roads, flat land, water available/close to a river; focus of routes/route centre; good roads enabled growth of industry; flat land which was above flood plain; bridging point of river

Global Issues HIV / AIDS

Q. Describe the impacts of HIV/AIDS

Content Guide: Answers are likely to refer to;
• impact on death rates,
• impact on production,
• economic loss,
• social impacts etc.

Theme 2: The Natural Environment

Topic 2.1: Plate tectonic movement

Interior Structure of the Earth
From the evidence of earth quake waves the Austrian Geologist Suess has divided the earth into **Crust, Mantle and Core.** To know the plate tectonic movement, earthquakes, volcanic eruptions and some landforms such as Fold Mountain, rift valley, ridge etc, it is important to know the interior structure and its characteristics.

Characteristics:
Crust (Lithosphere, 8-33km) – the topmost layer of the earth is the crust.
Types of crust: The continental and oceanic crust. **Temperature:** 1200^0 C. **Composition:** Oceanic crust is made up of magnesium and basalt, while continental crust is made of less dense mineral such as aluminium and granite lighter rock. The oceanic crust is heavier and denser than the continental crust.

Mantle (Asthenosphere 2900km) – The temperature here is 3000^0 C. **Composition:** consists of lower mantle is solid rock and the upper mantle of molten rock called magma.

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Core (Barysphere 6400 km) – the core is very dense and there is convectional current. The temperature here is 5000^0 C. The layers are composed mostly of Iron and nickel.

Plate Tectonics:
The earth's crust is broken up into pieces called plate. Heat rising and falling inside the mantle creates convection current. The convection current moves the plates. The movement of the plates and the activity inside the earth is called plate tectonics. The model builds on the concepts of continental drift theory, and was accepted by the geoscientific community after the concepts of seafloor spreading were developed in the state in 1950s.

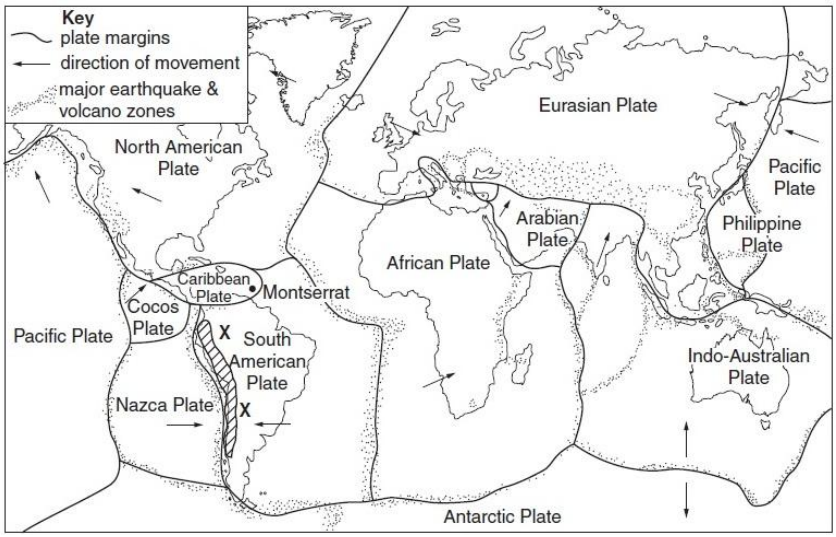
Why do tectonic plates move? Plate Tectonics Theory:
According to the Plate tectonics Theory, the crustal plate which are resting on the soft, plastic-like mantle areas constantly in motion. The force that brings about the motion of the crustal plates comes from the tremendous heat found in the earth's interior. This heat cause, the rock in the mantle to melt and become molten rock called magma. When magma is heated, it expands, rises and generates convectional current which push the plates away from each other. When it cools, the magma sinks and brings the plate towards each other. This constant rising and sinking of the magma results in the movement of the plates over the earth's surface.

The convectional currents move these plates away from or towards or alongside each other. These movements along plate boundaries give rise to earthquakes, volcanoes and fold mountains. Where convection currents diverge near the earth's crust, plates move apart. Where the convection currents converge, plates move towards each other.

The major plates are:
1. North American plate
2. South American plate
3. Eurasian plate
4. Indo-Australian plate
5. African plate
6. Pacific plate
7. Antarctic plate

There are seven smaller secondary plates namely:
1. Nazca 2. Cocos 3. Caribean 4. Scotia 5. Arabian 6. Phillipine and 7. Juan de Fuca.

   Because the plates are so big, they have faults and cracks in them sometimes divided into small tertiary plate as well.



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Types of plate boundaries:

1. **Divergent boundaries (constructive)** occur where two plates move apart from each other causing sea-floor spreading; new oceanic crust is formed, creating mid-ocean ridges. (eg: Europe is moving away from North America). Gentle volcanic and earthquake occur under these boundaries.

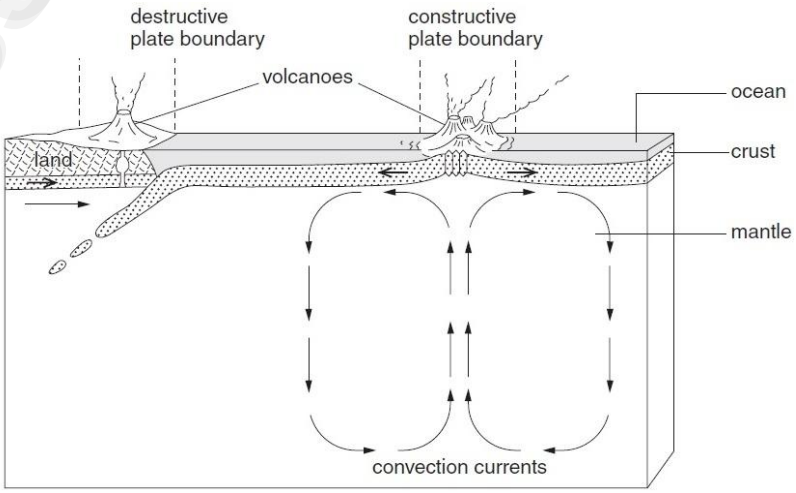
   i. **Oceanic – oceanic plate divergence:** When two Oceanic plates meet, new sea floors are formed in a process of sea floor spreading. When the plates move apart from each other, magma rises and solidifies to form a ridge on the sea floor. The resultant features are – mid –oceanic ridge.

   ii. **Continental – continental plate divergence:** the divergence of two continental crusts may result in the formation of steep-sided lowlands known as rift vallys. E.g: East African rift valley. When the continental crusts move apart, fractures are form at the boundary and the continental crusts sinks. The linear depression formed at the boundary is known as rift valley.

2. **Convergent boundaries (destructive/subduction zones)** occur where two plates moving towards each other there is formation of a subduction zone (sink beneath) or folding of the crust takes place.

   i. **Oceanic – continental plate convergence:** when the oceanic crust collides into a continental crust, the denser oceanic is forced to sink under the less dense continental crust forming an oceanic trench. The sinking crust melts to become magma, which rises to the earth's surface through the fractures to form volcanoes. The compression of the continental crust also forms a range of Fold Mountains. Nazca plate sinks under the South American plate. Violent volcanic and earthquake occur under these boundaries.

   ii. **Oceanic – oceanic plate convergence:** when two oceanic plate collide, the denser oceanic crust will be forced under the less dense crust. Some of the oceanic plates are more denser than the other due to the age of the sea floor. The sinking crust melts under pressure of heat and become magma. This magma rises up through the fractures forming undersea volcanoes. Sometime, this volcano builds up and forms volcanic Islands.



   iii. **Continental – continental plate convergence:** when the two continental collide each other, massive bending and folding of the crusts takes place.

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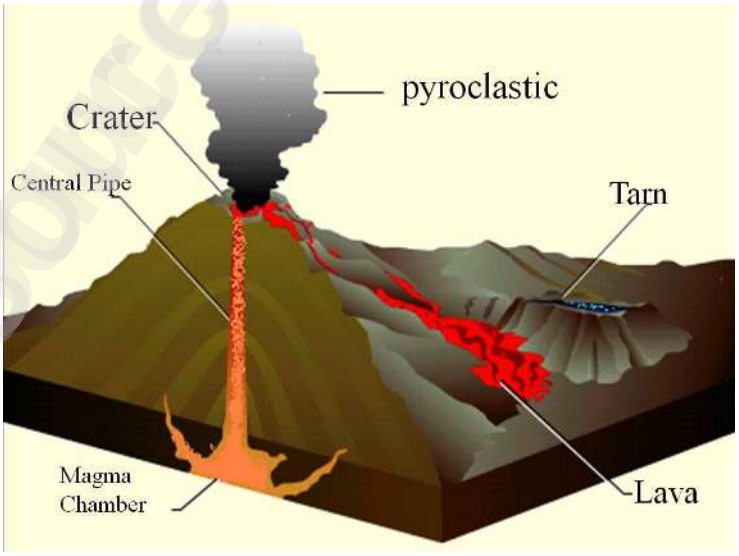
With this kind of collision, the Fold Mountains are formed like the Himalayas. Earthquakes are also occurred at the plate boundaries.

3. **Transform boundaries (conservative)** occurs where two plates slip sideways each other but land is neither destroyed nor created. This movement result in the formation of transform fault. Violent earthquake can be occurred but no volcanic eruption occurs. Eg: The San Andreas fault in California. Earthquake are common along such boundaries, there are few or no volcanoes.

Topic 2.2. Volcanoes

A Volcano is a conical or dome-shaped landform formed from the accumulation of lava that has been emitted onto earth's surface. These materials include lava and pyroclastic materials, which consists of ash, dust, gas and rock fragments. All fragments thrown into the air by a volcanic eruption are called pyroclastic material. Volcanoes that consist predominantly of pyroclastic materials are called cinder cones.

Formation of Volcanoes:
The formation of volcanoes begins when the magma chamber below the earth's surface experiences pressure from movements at plate boundaries. The pressure may result from the collision of two plates at convergent plate boundaries or the moving apart of two plates at divergent plate boundaries. Such movements cause the magma to force its ways upwards through vents in the earth's crust. Eventually, the magma pours onto the earth's surface as lava.



EFFECTS OF VOLCANOES:

LAVA: Lava is magma that reaches the surface. This liquefied rock is many times hotter than boiling water and glows bright yellow, orange, and red. Some lava cools quickly, on or near the volcano, but more fluid lava may travel for kilometres before slowly harden into rock.

PYROCLASTIC MATERIAL: All fragments thrown into the air by a volcanic eruption are called pyroclastic material. During a violent eruption, the force of the blast sends super hot gas and millions of pieces of lava into the air. It travels at a speed of 500km/hr with the tem.700^{0}C

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GASES: The gaseous substances are mainly composed of steam, hydrochloric acid, ammonium chloride, sulphur dioxide, hydrogen sulphide, hydrogen and carbon dioxide.

Ash clouds – the weight of the falling ash can collapse building and destroy crops. It reduces sunlight by blocking out the sun and even causes problems for air travel

Tsunami and acid rain – tsunami also occur when there is volcanic eruption in the ocean and acid rain due to large amount of elements emission in the air.

Types of Volcanoes

- ✓ **Composite volcano:** A large cone-shaped with a steep slopes. The beautifully symmetrical cones of Fuji in Japan and Mayon in the Philippines are the examples. The Strato or composite volcanoes are the highest and steepest volcanoes in the world.

- ✓ **Shield volcanoes:** A cone-shaped with gentle slopes and wide bases, because they release fluid lava slowly. These volcanoes can create huge landforms. Mauna Loa and Mauna Kea on the island of Hawaii are classic examples.
- ✓ **Acid Lava Dome Volcano:** Dome-shaped with steep convex slopes. The lava flows from a central vent, cool and solidifies quickly

- ✓ **Fissure eruption:** Under certain circumstances, instead of issuing from a central vent, lava pours out along cracks, or fissures, that may extend for several kilometres across the land surface. Flows of this sort have created thick sheets of basalt covering thousands of square kilometres. The Deccan Plateau in India and the Columbia Plateau in the northwest United States are the example.

DISTRIBUTION OF VOLCANOES

1. **CIRCUM PACIFIC BELT:** The majority of the world's active volcanoes occur along the plate boundaries. The most important belt of volcanoes is the so called the **Ring of Fire.** This belt is more or less surrounds the Pacific Ocean. Nearly 66% of the active volcanoes lie in this belt. It is co-incidental with the belt of earthquakes. It runs through the young fold mountains of the Rockies, and the Andes in North and South Americas and along the eastern coastal areas and islands of East Asia. Mayon, Fuji are some examples. The Ring of Fire extends through the Andes of South America, Central America, Mexico, the Cascade Mountain of Western USA. Volcano like Cotopaxi, Katmai, Fujiyama etc are located in this belt.

2. **Atlantic Belt:** Another belt runs north-south through the Atlantic and accordingly is known as Atlantic belt. It extends from Jan Mayen Island in the north to the Cape Verde Island in the south. Volcano like Mt. Pelee, St. Helena, Mt. Hekla etc are located.
3. **Mediterranean Himalayan belt:** Another volcanic belt is the Mediterranean Himalayan belt extending east-west from the Alps via the Apennines to the Caucasus and the mountain of Asia minor. Volcanoes like Vesuvius, Etna, Mount Ararat are located in this belt.

Usefulness of Volcanoes:

1. Fertile volcanic soils such as those found in Java, Indonesia, are excellent for growing crops.

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2. Valuable minerals and precious stones such as gold, diamonds, copper and silver are found in volcanic rocks. E.g: diamond and copper mining are found in Kimberley in South Africa and Bougainville in Papua New Guinea.
3. Interesting volcanic landforms can lead to the development of the tourism industry which is an important source of revenue. Mount Fuji in Japan, hot springs in Rotorua, New Zeland.
4. Geothermal energy is an important source of clean energy for generating electricity like in New Zealand, Japan, Italy, USA etc.

Case study: Mount Merapi volcanic eruption, Indonesia

The volcanic eruption in October 2010 in Mount Merapi in Central Java was said by authorities to be the largest since the 1870s. On 25 Oct. the Indonesian government raised alert for Mount Merapi to its highest level (4) and warned villagers to move to safer ground. Official said about 500 volcanic earthquakes had been recorded on the mountain over the weekend of October, and that the magma has risen to about a kilometer below the surface due to the seismic activity.

Monday, 25 October: Merapi erupted three times on Monday afternoon spewing lava down its southern and south-eastern slopes.

Tuesday, 26 October: the pyroclastic activity had begun to subside. The eruptive events were classified as explosive events with volcanic burts of ejected material, visible flame and pyroclastic hot air flows.

Friday, 29 October, an eruptive activity included lava ejection with hot ash clouds reported to be flowing 3 kms down. Ash falls reached as far as the central Java town of Magelang.

Impacts of Mount Merapi volcanic eruption

Effects – social:

- ✓ The International Red cross reported on 29 October, pyroclastic flow from Merapi struck Lamat river, Senowo river and Krasak river.
- ✓ The evacuation orders affected over 350,000 people were evacuated from the affected 10 kms area.
- ✓ The price of many vegetables, such as potatoes and water spinach were reported as increasing. Schools were reported closed up to 120 kms west of Yoyakarta.

Health problems:

- ✓ It was cautioned that volcanic ash could cause breathing difficultires, particularly for people with chronic respiratory ailments such as asthma, emphysema or bronchitis
- ✓ The survivors of the Merapi eruption suffered from acute respiratory infection, hypertension, headache etc.
- ✓ The President and Prime Minister of the UAE Red Crescent Authority responded to appeals by Indonesian officials to assisted field hospital to the affeceted people.

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Air travel disruption

- ✓ The eruptions and subsequent volcanic ash plumes caused extensive disruption to aviation movements across central and western Java Island.
- ✓ At Jakarta Soekarno-Hatta Airport (CGK) airlines cancelled 50 flights on 7 November in addition to 36 flights cancelled on 6 November due to volcanic ash.

Effect on Borobudhur temple

- ✓ Borodubhur – a Budhist temple, one the world's largest Buddhist temple was affected.
- ✓ Volcanic ash from Mount Merapi fell on the temple, which is 28 kms west-southwest of the crater.
- ✓ A 2.5 cm layer of ash on temple statues during the eruption and was temporarily closed for tourists.

Foreign aids

- ✓ The European Commission announced that it was offering 1.5 million Euros to help the victims of the Mount Merapi and the tsunami.
- ✓ The Australian government donated 1 million Australian dollar
- ✓ Malaysian made a contribution worth Rp 1 billion
- ✓ Taiwan donated US dollar 3000,000 to finance reconstruction efforts in disaster hit regions in Indonesia
- ✓ US ambassador announced to grant 2 million US dollar.

2.3 Earthquake

An earthquake is a sudden shaking or vibration in the Earth's crust. The vibrations in the form of seismic waves occur when tectonic energy that has built up over time by plate movement is released rapidly.

The crust is divided into sections, called plates, which continually move in relation to each other and are bordered by faults. When plates suddenly move past each other, the built-up strain is released along the fault, and the rock fractures. An earthquake also can be triggered by molten rock moving up into the chamber of a volcano before eruption.

Cause of Earthquake

The tectonic variety is by far the most devastating. According to the theory of plate tectonics, tectonic quakes occur at the boundaries of the plates, where one plate slides past or beneath another. Tectonic earthquakes occur in a variety of geological settings.

- Majority of the earth quakes occur along the fracture line, where slipping and settling down of rock masses takes place.

- When rocks can bear no more stress, breaking with sudden displacement of the rocks on two sides of the fault takes place. It produces a blow to the upper rocks on one side of the fault-plane and to the lower rocks on the other side.

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- Humans activities may contribute to the cause of earthquakes through a variety of activities such as filling new reservoirs, detonating underground atomic explosives, or pumping fluids deep into the ground through wells. For example, in 1962 Denver, Colorado, in the United States began to experience earthquakes.

An epicentre is the point on the Earth's surface directly above the underground source, or focus, of an earthquake. The impact of the earthquake is usually strongest near the epicentre.

EFFECTS OF EARTH QUAKES.

Apart from the immediate destruction of life and property, EQ bring about several changes in the earth's crust.

1. Cracks and fissures develop in the surface of the rock strata due to which new springs may appear on the surface or old may disappear.
2. If these cracks develop in hilly areas they result in landslides.
3. The rivers may change their courses, if fissures develop in their beds.
4. When an EQ affects the ocean floor, great sea waves which are known as TSUNAMIES spread outwards
5. Contraction of the rock strata takes place.
6. It may form depressions forming lakes.
7. Due to uplift and subsidence some wells may become dry while others get more water.

DISTRIBUTION OF EARTHQUAKES

No place on the earth's surface is totally free from earthquakes. But the earthquakes occur more frequently in certain areas. These areas are the weak and unstable parts of the crust.

The Circum Pacific belt: This belt encircles the pacific Ocean and follows the western coast of North and South America, the Aleutian islands and Islands of the eastern coast of Asia like Japan and Philippines. Nearly 68% of the earth quakes of the world originate in this belt.

Mid World Mountain belt: This belt is associated with the young fold mountain ranges of the Alps, The Himalayas and their continuation in the south-east Asian islands. Nearly 21% of the earthquakes of the world originate in this belt.

Mid-ocean ridges are the sites of numerous such events of moderate intensity: Tectonic earthquakes also occur in a zone stretching from the Mediterranean and Caspian seas to the Himalayas, and ending in the Bay of Bengal.

Fold-Mountains distribution: Generally, Fold Mountains are found near destructive plate boundaries on coastlines and they are a liner formation. When two plates collide, the compressional force put the rock layers pressure. Eventually, they bend and fold. They are created by the uplift and folding of tectonic plates as they move towards each and collide. Eg: the Himalayas and the Alps. Eg: Himalaya. 'Young fold mountains' and the 'old fold mountains' over 200 million years old. The Ural Mountains are over 250 million years old.

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Richter Scale	Mercalli Scale
2.5 Generally not felt, but recorded on seismometers	I. Felt by almost no one II. Felt by very few people
3.5 Felt by many people	III. Tremor notice by many, but they often do not realize it is earthquake IV. Felt indoor by many. Feels like a truck has struck the building V. Felt by nearly everyone; many people awakened. Swaying trees and poles may be observed.
4.5 Some local damage may occur	VI. Felt by all; many people run outdoors. Furniture moved, slight damage occurs. VII. Everyone runs outdoors. Poorly built structures considerably damaged; slight damage elsewhere.
6.0 A destructive earthquake	VIII. Specially designed structures damaged slightly, others collapse. IX. All buildings considerably damaged, many shift off foundations. Noticeable cracks in ground
7.0 A major earthquake	X. Many structures destroyed. Ground is badly cracked
8.0 and above Great earthquake	XI. Almost all structures fall. Bridges wrecked. Very wide cracks in ground. XII. Total destruction. Waves seen on ground.

Revision Question

1. Explain why some volcanoes erupt on **constructive** (divergent) plate boundaries.
Ideas such as: plates move apart; so a line of weakness/gap is created; where magma or lava can reach the surface/forms islands/bubbles up/bursts through crust; etc.

2. Describe the opportunities offered by volcanoes for people who live close to them.
Ideas such as: fertile soils/high crop yields/good for farming; geothermal power; attract tourists/ tour guides/souvenirs or other examples; resource extraction/or examples e.g. sulphur; volcanologists can study volcanoes; etc.

3. Explain how the Himalayas were formed as a result of plate movement.
Ideas such as: plates move towards each other; collision zone/convergent boundary (dev); both are continental plates; pressure/compression; no subduction occurs; as rocks are of same density; rocks squeezed; uplift occurs/land rises etc.;

4. Explain why earthquakes occur close to plate boundaries.
Ideas such as: plates move or slide towards/past/away from each other or plates collide; friction/plates get locked together/plates stick; build up of pressure or tension or energy; pressure or tension released/sudden jolt; shockwaves/seismic waves/vibrations on surface, etc.

5. Explain why people live in areas where earthquakes occur.
Ideas such as: they can't afford to move; they have lived there all their lives/sentimental attachment; lack of space elsewhere/they have nowhere else to go; there is work/ education/ source of income available; relatives/friends in area; confidence in precaution/buildings; they are unaware of the risk/people don't think it will happen; willing to take the risk/benefits outweigh the risk (or example); they do not happen very often, etc.;

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6. Explain why earthquakes of the same magnitude (strength) are likely to cause more deaths and injuries in an LEDC than an MEDC.

Ideas such as: poor quality or weak buildings; buildings easily collapsed; building regulations are not enforced; poor medical services; people cannot be properly treated for their injuries; less disaster planning/emergency procedures rescue equipment/disaster relief; poor education re: earthquake precautions; less investment in emergency services; LEDCs have to wait longer for rescue teams or relief/poor transport infrastructure; buildings/structures are not earthquake proof, etc.

7. Explain why volcanoes erupt on destructive plate boundaries.
Ideas such as: plates move together/towards each other/converges; subduction occurs; friction/ heat builds up; destruction/melting of crust/magma is created; pressure build up/magma builds up/high pressure;

8. Explain how a volcanic eruption can damage the economy of a country.
Ideas such as: disruption of flights; so people are stranded (dev); airlines lose money (dev); ash covers crops; reducing yields (dev); closure/damage to workplaces (or examples);

9. Name the fold mountains which have been formed close to the boundaries between:
   A. the South American and the Nazca plates;
   B. the Eurasian and the Indo-Australian plates.

26. Name **two** plates which share a boundary along which it is happening.
    A sea floor spreading
    B subduction
    C plates sliding past each other
27. Explain why fold mountains are formed close to some plate boundaries. You may use labelled diagrams in your answer.
28. Describe ways in which both high fold mountains and active volcanoes may cause problems for people who live in areas where they are located.
29. What is an *active volcano*?
30. Describe **three** likely problems which the volcanic eruption may have caused for people living in the area.
31. Describe what can be done to protect people from volcanic eruptions.
32. Explain why most earthquakes occur at plate boundaries.
33. To what extent do you think earthquakes can be predicted?
34. Describe and explain the distribution of fold mountains. You should refer to named examples. Content guide to answer: plate movement, plates meet/collision margins, subduction/ continental and oceanic plates meet/destructive margins, plate density, uneven distribution, narrow belts, uplift etc.

35. Explain why people live in areas where earthquakes occur.

Ideas such as: they can't afford to move; they have lived there all their lives/ sentimental attachment; lack of space elsewhere/they have nowhere else to go; there is work/education/source of income available; relatives/friends in area; confidence in precaution/ buildings; they are unaware of the risk/people don't think it will happen; willing to take the risk/benefits outweigh the risk (or example); they do not happen very often, etc.;

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Topic 2.4 River system

Key term to understand about the river system:

- Hydrologic cycle- the continuous recycling of water between atmosphere and land surface.
- Evaporation- water is heated by sun and rises up the sky as water vapour.
- Transpiration- the loss of moisture from plants and leaves to the atmosphere.
- Condensation- the cooling down of water vapour into water droplets to form clouds.
- Precipitation- all form of water released from clouds/atmosphere such as rain, snow, hail.
- Surface runoff- the flow of water across the surface of the land.
- Interception- natural or manmade objects get into the way(fall) of rain.(trees, buildings)
- Percolation/Infiltration- the soaring down of water into the soil.
- Ground water flow- the movement of water through the rocks and soil.
- Through flow- the flow of water towards sea or lake through the soil.
- Water table- the level of saturated ground/ground water in the soil.
- River source- the starting point of a river.
- Tributaries- the streams which contribute water to the main channel.
- Distributaries- the streams which distribute water from the main channel
- River mouth/Estuary- the end point of a river.
- Delta- the triangular shaped deposition at the mouth of a river.
- Confluence- the point at which two rivers merge.
- Load- the materials carried by the river.
- Drainage basin- the area coming under the influence of a particular river.
- Water shed- the boundary between two drainage basins.
- Catchment area- the area from which the river collects its water.
- Estuary- the partially submerged delta at the mouth.
- **Flood Hydrograph -** the graph which shows how a storm affects a stream or river over a short period of time.

Stream of water that flows along a channel from the highlands to the lowlands is known as river. The great majority of rivers eventually discharge into either the sea or a lake, although some rivers disappear due to water loss through seepage into the ground and evaporation into the air. The development of a river valley is the combined effect of river erosion, transportation and deposition.

Parts of the River systems:

- **River systems** – the main river, its tributaries and distributaries is known as river system
- **Tributaries** – small streams which flow into a larger stream or river
- **Distributaries** - newly created stream channels that are separated from the larger main stream channel in a delta

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- Drainage basin – the area drained by a river system is called a drainage basin or catchment area.
- Watershed – the stretch of land that forms the boundary around a drainage basin and separates it from another is called watershed.

Importance of River

1. River is an important an important agents that shape the landscapes of the earth, river also have a great impact on human activities.
2. Rivers are important transportation routes that facilitate trade and communication.
3. River is also linking the regions with indigenous population, enabling cultural exchanges of social and historical significance.
4. Some rivers also function as important political boundaries between boundaries. For example, the Danube forms most of the borders of Bulgaria and Romania.
5. Rivers are important source of fresh water. In countries such as China, India and Indonesia, many rural areas have no access to treated and safe drinking water and depend on water from rivers and wells.
6. Rivers are important for irrigation and industrial purposes.

Hydrological Cycle

1. **Evaporation -** water is stored in the seas as a liquid. High temperature and warm winds change the liquid water into gas (water vapour) which rises into the atmosphere.

2. **Evapotranspiration** - vegetation not only intercepts rainfall but also take it up through roots from the soil. This water is eventually returned to the atmosphere by transpiration from leaves. Surface water is also evaporated from leaves.

3. **Condensation –** as water vapour is blown towards mountain by the prevailing wind it is forced to rise, cools and condensed back into water droplets. These form clouds and relief (orographic) rainfall or snow.

4. **Interceptions –** some rainfall is intercepted by plants and trees before reaching the ground. Some falls on the land and infiltrates the ground or flows on the surface as small fast- flowing streams.
5. **Overland flow** – upland streams flow downhill and join at confluences to form slower – moving wider, deeper rivers which eventually discharge the water into lakes or the sea.

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Course of the River

The course of the river can be divided into three parts:

1. Upper course
2. Middle course
3. Lower course.

Upper course	This is where the river begins. Many smaller streams and channels join up to form larger streams. Several streams join up to form a river. The river in this course flows along the steep gradient but the volume of water is small. The velocity of the river is great due to which it has a corrosive power and starts excavating its own bed.
Middle course	River starts to meander. Many tributaries join the river. Middle-course river processes are dominated by lateral rather than vertical erosion and by sediment transport. The majority of sediment is transported as suspended load, and the sediment becomes finer. Coarser cobbles and pebbles derived from upland erosion are largely deposited. The valley is wider than in the upper course, the sides are less steep, and the channel is bordered by a floodplain.
Lower course	Meanders are common. Many distributaries. River flows towards its mouth and enters the sea Delta may form at the river mouth. Lower-course river processes are dominated by sediment deposition, or storage, and floodplain building. Sediment is deposited during lateral shifting by the channel (or channels, in the case of braided rivers), and during flood flows.

Speed of Flow

Gradient of river	Steeper slope – faster speed of flow Gentler slope – slower speed of flow
Texture of river bed and bank	Rougher river bed and river banks – more friction – slower speed of flow. Smoother river bed and river banks – Less friction – faster speed of flow
Depth of Channel	Greater depth of channel – less friction from the channel boundaries – faster speed of flow Shallower depth of channel – more friction from the channel boundaries – slower speed of flow
Wetted Perimeter	Greater wetted perimeter – more friction – slower speed of flow Smaller wetted perimeter – less friction – faster speed of flow

River Processes

1. **River Erosion** (river erosion is the wearing down of the banks and bed of river and removal of the eroded materials by the action of gravity and flowing water)

A river can erode materials in four main ways **– Hydraulic action, abrasion (corrasion), attrition and solution (corrosion)**

- **Hydraulic action –** hydraulic action refers to the action of the flowing water that hits against the river banks and river bed**.**

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- **Abrasion/Corrasion –** Abrasion is an Erosional process whereby the river uses its load, e.g. rock fragments, to constantly scrap and grind against the channels' wall and bed.

- **Attrition –** this is the process whereby rock fragments carried by the water knock against each other. (sediments in the river rub against one another and become smaller, smoother and more rounded)

- **Corrosion/Solution –** this process occurs when water in the river reacts chemically with the minerals in the rocks and dissolves them to form a solution. It is most common in limestone areas.

2. **River Transportation** – eroded materials are carried by the moving water down the river course through the process of transportation. This materials transported are known as the river load.

    - **Traction –** this process occurs when there are large boulders that are too heavy to be lifted up by the water in the river, so they roll and slide along the river bed.

    - **Saltation** – this process occurs when larger particles such as gravel are part of the river load. These particles are too heavy to be suspended in water all the time and they bounce or hop along the river bed.

    - **Suspension** – Suspended materials are fine particles that are kept from settling down on the river bed by the turbulent flow of water.

    - **Solution** – this takes place when readily soluble rocks such as those found in limestone areas are dissolved in water to form solution which is transported downstream.

3. **River deposition** – a river may deposit its load anywhere along its course when the volume of flow is reduced or the speed of flow is decreased. The coarser and heavier load will be transported throughout the river systems to the sea or lake into which the river empties.

Land forms and features

1. **Erosional Landforms**
    a) **Gorge:** A gorge is a narrow valley with steep sides. Usually smaller than a canyon, it commonly forms when a river cuts downwards into its channel more quickly than it erodes the valley walls.

    b) **Canyon:** A canyon is a deep narrow valley with steep sides, usually wider and longer than a gorge. Canyons usually form in arid mountainous regions and are the result of erosion caused by rivers and heavy rains.

    c) **Rapids:** Rapids are a stretch of a river where the water flows fast and usually over or around rocks. The swift current results from a slight steepening of the stream bed or a narrowing of the channel.

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d) **Water fall**: A waterfall is a place in a river where the water descends abruptly. It forms where the river flows from a resistant rock layer into a less resistant layer. The softer rock is eroded by the water, creating a drop in the riverbed. The highest waterfall in the world, Angel Falls which is 979 m.

e) **'V' shaped valley:** These valleys come into existence in the upper course of the river due to its downward cutting. The river valley becomes deep. Along with the river, different agents of weathering also play an important role in its formation. Due to these agents the sides of valleys are weathered and the resultant rock materials are carried to the river, with the action of gravity. Thus these river valleys are wide at the top while their floors remain narrow. Eg. Western Ghats (India).

f) **Pot Holes**: These features develop in the areas of the beds of the rivers have a number of joints and cracks. The larger fragments carried by the river erode joints more easily and rapidly forming small depressions. The rock fragments get caught in it and with the swift flow of river a grinding circular action is set up due to which the floor becomes deeper and wider while the neck remains smaller Ex. River Mutha.

2. Depositional Landforms

a) Flood plain: An area of low relief that is inundated by water when the river floods, and which is covered in alluvium. When the river floods, the flood water spreads over a large low-lying area. It carries a large load and deposit when the flood water recedes very slowly without disturbing the deposited material. This process is continues during each flood time and thus vast depositional plains come into existence along both banks of the river.

b) Levees: During the flood, the finer particles are carried over long distances but the larger fragments are deposited along the banks of the river. Thus, natural embankments come into existence along the banks of the river due to their deposition. They are known as **Levees.** They are mainly made up of coarse material brought down by the river and thus are not very firm.

c) Meanders: meanders occur when a river twists and turns, and form hoop-like bends. The river usually bends and turns to avoid obstacles and find the easiest route down the slope. At this stage, usually no depostional landform is formed because the river carries little, if any load and the flow is too swift for deposition to take place. Each meander consists of an outer concave band and an inner convex bank. As the river flows around the bend, the current is faster and stronger on the concave bank. Hence, erosion by undercutting takes place on the that bank. On the convex bank, the flow is slower and weaker and this results in deposition. The meanders is named after the Büyük Meanderes, a river in South-western Turkey. Occasionally, a meander bend is destroyed when a particularly large flood or a change in upstream alignment causes the river to cut through the point bar. This leaves a reach of abandoned channel with a meander scar at the site of the former river cliff.

d) OX-BOW lake: Lowland meandering rivers are more twisting than their middle-course counterparts and channels may become so twisted and bends. Deposition at convex banks and erosion at the concave banks become narrower

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in meander's neck over time. During the flood, the river cuts through the narrow neck of land separating the ends of the bend. This is known as a neck cut-off. Abandoned bends are characteristically horseshoe-shaped and form the oxbow lakes.

e) **Alluvial fan**: Where a river is heavily loaded with sediment from a steep upper course on the mountains, abundant of sediments are deposited, which blocks and diverts the channel to form an alluvial fan. The Kosi River in India has one of the largest alluvial fans in the world, which is situated where the river leaves the Himalaya to enter the wide floodplain of the Ganges.

f) **Delta:** A delta is a triangular or fan-shaped deposit of sediment that forms at a river's mouth where that river flows into an ocean, lake, or slower river. As a river enters another body of water, its current slows and the sediment carried by the current is deposited. If ocean currents are strong enough, the sediment may be swept away, preventing a large delta from forming. The triangular shape resembles the Greek letter **delta;** the term was first used by the Greek historian Herodotus in the 5th century BC to describe the Nile delta. The triangular shape and the great width at the base are due to blocking of the river mouth by silt, with resulting continual formation of distributaries at angles to the original course. Deltas are usually characterized by highly fertile soil. The combined delta of the Ganges and Brahmaputra rivers in India, and the deltas of the Nile in Egypt and the Mississippi in the United States are the world's largest.

Natural Hazards

There are opportunities and hazards for the human activities in the natural environments. Some of the natural environments are hazardous for the human activities, while some of the natural environments provide opportunities for the human activities. The natural hazards include the hydrological, atmospheric and geological aspects. Some of the people are more vulnerable to natural hazards due to its location and economic aspects.

Floods: Flooding on the Rhine, Europe 1995

The Rhine is the longest river in Europe. It flows for 1320km. Not only is the river an important physical feature, the drainage basin also contains 40 million people, and a large amount of industry. As a result of its importance, the Rhine has been heavily protected and engineered, but some of this work may have contributed to the floods of January 1995.

The causes of Rhine floods:

- ✓ Heavy rain – Switzerland had over three times its average rainfall in January
- ✓ Saturated soils – there was nowhere for the rain to soak away
- ✓ Mild temperature – this melted snow in the Alps.

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- ✓ Much of the Rhine's floodplain has been built upon – the impermeable surface increases the amount of rain now reaching the river, and the speed with which it does so.
- ✓ Intensive farming compacts the soil and increases overland runoff
- ✓ Vegetation clearance reduces interception
- ✓ Channel straightening speeds up the flow of water downstream
- ✓ Dykes create faster and deeper flows.

Effects of flood in Rhine, Europe

- 27 people were killed
- Over 250,000 people were evacuated from their homes in the Netherlands
- Flood damage in Germany alone was valued at over 640 pound million.

Solutions to the flood problem

- ✓ Evacuation of people and livestock
- ✓ Sandbags placed across doors
- ✓ Removal of furniture upstairs
- ✓ Clearance of underground car parks and subways
- ✓ The development of an early warning system
- ✓ Dykes to increase the volume of water the river can hold – the Dutch flood protection scheme has cost over 1billion pound to build 600km of dykes since 1995
- ✓ Relief channels and basins to divert some of the water during the peak of the flood, but his requires co-operation between a number of countries in the upper course to prevent flooding in the lower course of the river
- ✓ Artificial floodplains – called forelands in the Netherlands, located within the winter dykes; these areas are allowed to flood and can be used for grazing and recreation.
- ✓ Limited residential and industrial development in floodplain areas.

REVISION QUESTIONS

1. Explain the formation of a flood plain.
Ideas such as: lateral erosion / or description; deposition in channel / on bed of river; displacement of water; flooding of river / overflows bank; carrying large amount of sediment; slow moving / stationary water / friction; deposition of sediment on flood plain / deposition of alluvium; build up of layers; etc.

2. Describe the likely impacts of floods for people who live in an urban area.
Ideas such as: people trapped / forced to stay in houses; loss of life / drowning; damage to housing; need to evacuate (dev); people are homeless; closure / flooding of workplaces; so people cannot earn money (dev); disruption to road transport / railways / bridges; sewage flows onto land / road / water; water borne disease; such as cholera / typhoid (dev); cost of repairs to damage; leads to increase in insurance premiums (dev); damage to possessions or examples e.g. car; cuts off electricity / gas; etc.

3. For a named river you have studied, explain why people live on its flood plain **or** delta. Or Describe the advantages for people of living on a flood plain.
Content Guide: fertile soils / high yields of crops; good grazing land; water from river for drinking / washing / in homes; irrigation; flat building land; transport along river; easy communications / roads / railways can be built along valley; power available from river /

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water mills / HEP; scenic beauty / make money from tourists; source of food / fishing; clay for building / making pots; etc.

4. Explain how a meander might become an oxbow lake. You may use a diagram or series of diagrams.
Ideas such as: faster flow of water on outside of bend; erosion on outer bank; neck narrows; cuts through neck during flooding/cutting through/meander cut off; ends/former meander sealed by deposition;

Topic 2.5 Coastal system

Coast: A coast is the zone where the sea or ocean meets the land.

Wave: the movement of water rising and falling in the oceans or seas.

Wave energy: the three main factors which determine the size and energy of wave are wind energy, duration of wind and fetch. Duration of wind refers to the length of time which the wind blows continuously while fetch refers to the distance of the sea over which wind blows to generate waves.

Wave movements:
Swash: the forward movement of waves up the shore is called swash.
Backwash: the flow back to the sea (due to gravity) backwash carries the materials back towards the sea.

The responsible agents that shape the coast are:
i) Types of waves
ii) Tides and
iii) Currents

1. Types of waves:
(i) **Constructive waves:** Constructive waves are waves that occur in calm weather on gently sloping coasts. They have a strong swash but a weak backwash. The gentle gradient allows waves to bring materials and deposited on the coast than are removed. Over time, the coast is built by the deposited sediment.
(ii) **Destructive waves:** Destructive waves occur on steeply sloping coasts. These waves break violently with high energy. They have a weak swash but a strong backwash. Instead of depositing materials on the coast, destructive waves erode the coast and transport coastal rocks and beach materials away from it.

2. Tides: Besides waves, another agent responsible for shaping coast is tides. Tides refer to the daily alternate rising and falling of the sea level along the coast. They are caused primarily by the gravitational pull of the Moon and to a lesser extent, the Sun. The pull produces two tidal bulges or high tides on opposite sides of the earth. The tidal action, like wave action, has a significant impact on the coast. The rise and fall of the

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sea level affects coastal processes of erosion and transportation. At high tides, wave attack, erode and transport away.

3. Currents: Coasts are also shaped by currents. Currents are large-scale and persistent movements of water in the ocean, driven largely by prevailing winds. Longshore drift is the example of ocean current that flow parallel to a coast. They can transport an entire section of a sandy beach several kilometres down the coast within a short period of time.

Coastal Processes are:

i) Erosion
ii) Transportation and
iii) Deposition

Coastal Erosion: Coastal erosion is affected by the types of waves, the structure and the composition of the coastal rocks and the position of coast.

i) Types of waves: destructive waves have more energy than constructive waves. More materials are eroded than deposited when destructive waves are present.

ii) Structure of coastal rocks: coastal rocks with numerous lines of weakness such as cracks and joints will be eroded and broken down more quickly when attacked by waves.

iii) Composition of the coastal rocks: coastal rocks with minerals composition that can be easily dissolved in water, or that can chemically react with water to form new chemicals may gradually weakened and broken down under the constant attack of sea waves.

iv) Position of the coast: coasts that are protected or sheltered from prevailing winds and wave action by natural or man-made structures will experience less erosion than coast that are open and unprotected.

1. Processes of Coastal Erosion

i) Hydraulic action: Hydraulic action is the direct impact of the waves against the coast.
ii) Abrasion: refers to the impact of materials carried by the waves scraping against the coast.
iii) Solution: When waves react chemically with soluble minerals contained in the rock and dissolved them, a chemical solution is formed. Eg: a coast made up of limestone is susceptible to this process.
iv) Attrition: when rocks carried by the wave rub or hit against each other, they break down into smaller pieces.

2. Processes of Coastal Transportation

One of the most important ways in which waves transport sediment along the coast is by longshore drift. When waves approach the coast at an angle, the swash carries the materials in the water up the beach at an oblique angle, while the backwash carries materials perpendicularly down the beach because of the pull of gravity. It is a powerful process that is capable of moving very large amounts of beach materials along the direction of movement.

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3. Processes of Coastal Deposition:
Deposition of sediments along the coast depends on the following factors:
i) Supply of sediment: Most sediment is transported down to the coast by rivers. Some sediment come from coastal erosion. When the wave energy is weak and the weak and the waves cannot carry their load of sediment, deposition takes place.
ii) Gradient of slope: On gentle slopes, constructive wave is prominent and the swash is stronger than backwash and it deposits materials rather than erode the materials from the shore.
iii) Position of the coast: along the coast that are sheltered or protected from strong winds such as indented coastlines and riverine inlets, destructive waves are not common. The calm coastal conditions allow deposition to take place and a beach may develop.

1. Erosional features

- **i) Notch**
- **ii) Cave**
- **iii) Cliff**
- **iv) Wave –cut platform**
- **v) Bays**
- **vi) Headland**
- **vii) Arch**
- **viii) Stack**

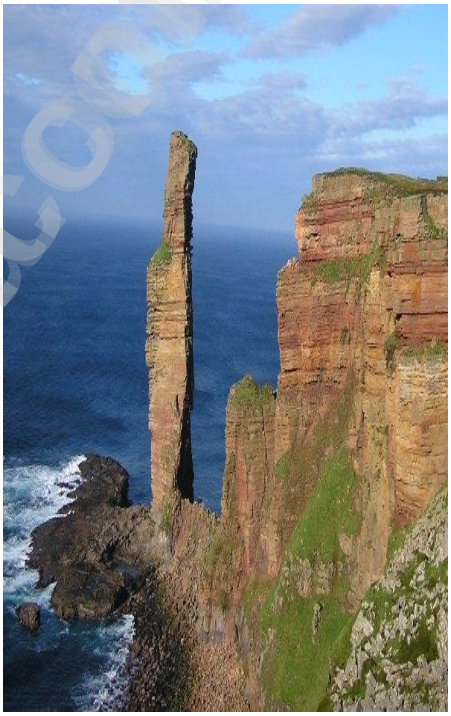

Fig.1 Stack

i) Notch: due to hydraulic and abrasion action of wave a crack is created, which is known as notch. It is also known as wave-cut notch. Or Notch is a deep indentation at the base of a cliff due to intense wave erosion. It is also known as wave-cut notch.

ii) Cave: a notch is further deepened inwards and increased in size to form a cave.

iii) Cliff: due to continuous undercutting by the wave the roof of the cave is collapsed and formed a cliff.

iv) Wave-cut platform: as the erosional process continues, the cliff may retreat further and gently-sloping platform appears at the base of the cliff. This platform is called a wave-cut platform. A **wave-cut platform** or **marine terrace** is the narrow flat area often seen at the base of a sea cliff caused by the action of the waves.

v) Bay: some of the coastlines are made of resistant rocks and less resistant rocks. The less resistant soft rocks are eroded faster than the more resistant hard rocks. When the softer rocks are eroded away, bays are formed.

vi) Headland: on a coastline when the softer rocks are eroded away and formed the bays, the remaining hard rocks extending into the sea is known as headlands.

vii) Arch: when the waves continue to erode the back of the cave and cut through the rocks, a new feature is formed which is known as arch.

viii) Stack: when the arch roof falls into the sea, a stack is formed.

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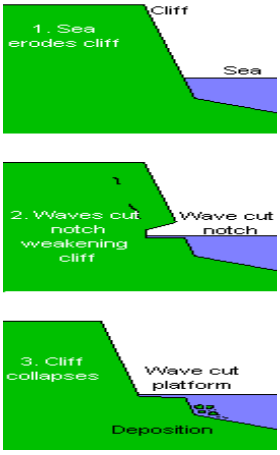
ix) Stump: after more erosion it is reduced in size to form a stump – a small remaining part of the stack due to wave erosion is known as stump.

Formation of Headland and Bay

Some coastlines are fairly straight because they are similar hardness and resistance to erosion. However, some have alternative strips of resistant hard rock and less resistant soft rock. The less resistant soft rocks will be eroded faster than the more resistant hard rocks. The result is the formation of indented coasts with headlands and bays. When the softer rocks are eroded away, bays are formed. The remaining hard rocks extending into the sea is known as headland. **Y** is the bay and **X** is the land in the given photograph.

Formation of Cliff and Wave-cut platforms:

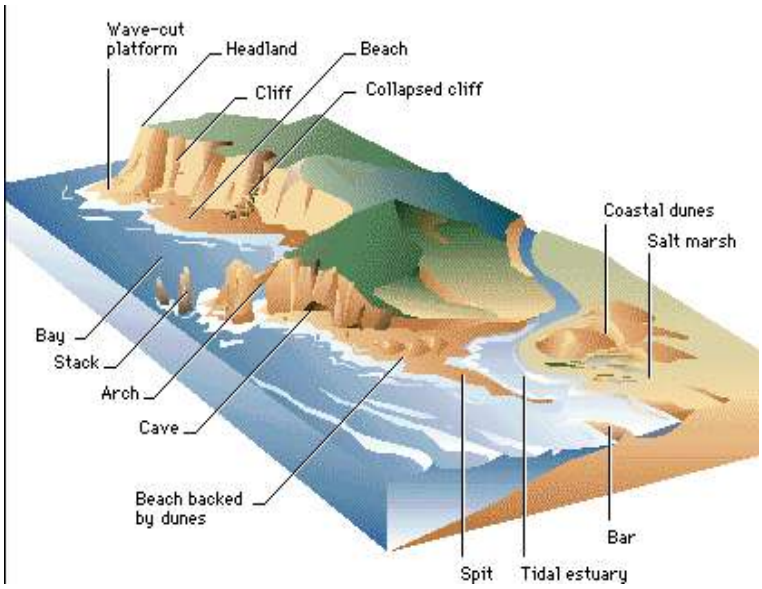
Cliffs are produced by the action of waves undercutting a steep rocky coast. Hydraulic action and abrasion erode a crack on the rock and eventually the crack is enlarged to produce a notch. This notch is further deepened inwards to produce a cave. Further undercutting by the waves cause the roof of the cave to collapse.



As the process continues, an overhanging cliff is formed. As the erosional process continues, the cliff may retreat further inland. Over time, a gently- sloping platform appears at the base where the cliff used to be. This platform is called as wave-cut platform. Another term for a wave-cut platform is a shore platform. In the given photograph, X is the Cliff and Y is the wave cut platform.

2. Depositonal Features

i) Beach
ii) Spit
iii) Tombolo
iv) Sand bar
v) Sand dunes
vi) Saltmarsh



i) Beaches: A zone of deposition, usually consisting of loose sediments such as sand and gravel along the sheltered part of a coast. Although beaches usually consist of sandy materials, they can also be formed from broken coral pieces, broken shells, small stones and black volcanic sand. The size and

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composition of the materials on the beach vary greatly and may change over time according to change in weather conditions. Generally the finer materials are deposited nearer the sea and the coarser materials further inland. During calm conditions, fine materials are deposited further up the coast and the coarser materials are deposited nearer to sea.

ii) Spit: A **spit** is a long narrow ridges of sand or shingle running out from the coast with one end attached to the land. They are formed by longshore drift. When there are abrupt changes in the direction of the coastline, the longshore drift continues to transport the materials in the original direction into the sea. The materials are deposited in the sea where they accumulate over time. Eventually, the accumulated materials will appear above the surface of the water forming a spit.

Photograph: Tombolo

iii) Tombolo: A spit that connects A spit has one end connected to a mainland while the other end projects out into the sea. If an Island lies near the mainland where the split is formed, the spit may continue to expand until it joins the island to the mainland. In this case, a new landform is formed known as Tombolo.

iv) Sand Bar: Bars are ridges of sand and other materials that run roughly parallel to the coast.

v) Sand dunes: Sand dunes are a distinctive coast features but they are caused by the wind, not the sea. Sand blown up from the beach develops into small hills, which is known as sand dunes.

Figure: Salt Marsh

vi) Saltmarsh: A **salt marsh** is a type of marsh found in the intertidal transition between land and ocean. They are also called **tidal marshes** or **saltings**.

Coastal Management or planning

There are two types of approaches to protect coasts are:

1. Hard Engineering and 2) Soft engineering. The hard engineering approach refers to the construction of physical structures to defend against the erosive power of waves. This is also known as structural approach.

The soft engineering approach, on the other hand, does not involve the building of any physical structures. It focuses on planning and management so that both coastal areas and property will not be damaged by erosion. It also aims at changing individual behavior or attitudes towards coastal protection by encouraging minimal human interference and allowing nature to take its course.

Hard engineering measures:

1) Seawalls: sea walls can be built along the coast. These structures absorb the energy of waves before they can erode away loose materials. Sea walls are effective in protecting cliffs from erosion.

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2) Breakwater: break waters help to protect the coast and harbor by reducing the force of the high energy waves before they reach the shore. They can built with one end attached to the coast or build away from the coast.

3) Groynes: Groynes are built at right angles to the shore to prevent longshore drift. These structures absorb or reduce the energy of the waves and cause materials to be deposited on the side of the groyne facing the longshore drift.

4) Gabions: Gabions are wire cages usually filled with crushed rocks. These cage are then pilled up along the shore to prevent or reduce coastal erosion by weakening the wave energy.

Soft Engineering measures:

1) Beach nourishment: This soft engineering measure refers to the constant replenishment of large quantities of sand to the beach system. The beach is therefore extended seawards, which lead to the improvement of both beach quality and storm protection.

2) Relocation of property: Instead of constructing seawalls and groynes, coastal planners are trying to protect man-made structures such as buildings by relocating them and letting the nature reclaim the beach in its own time. No building of new properties or structures would be allowed in coastal areas that are vulnerable to coastal erosion.

3) Planting of mangroves: mangroves, with their long, curved roots that prop up from the soil help to trap sediments

4) Stabilising dunes: coastal dunes can be found along the shore where there is a large supply of and strong winds. The winds carry and deposit the sand on the coast further inland. The piled up sand forming coastal dunes help to defend the coastal from the sea. These dunes are so fragile that delicate shrubs struggle to hold in place. To prevent the dunes from being disturbed by human traffic, access points to the beach should be controlled and designated. Shrubs and trees can be planted to stabilize the dunes as the roots can reach downwards to tap the ground water and thereby anchor the sand in the process.

5) Growth of coral reefs: Coral reefs can weaken wave energy. When coral reefs are destroyed, the waves may move towards the shore at full force and wash away beaches. The natural reefs can be conserved and protected while damaged reefs can be restored. Artificial reefs can be created along the coast by placing environmentally friendly and durable materials such as steel or concrete on the sea floor. Such man-made reefs can be just as protective of the coast as naturally formed reefs.

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Tropical Storms: Hurricane Katrina, USA

Hurricane Katrina was the USA's worst natural disaster in living memory. The storm hit land near New Orleans on 29th August 2005 at a speed of some 225km/h. The battering winds were not the only danger. The low pressure at the centre of the hurricane and the high winds made the ocean rise up by a much as 9m in places.

The hurricane was a particular threat to New Orleans, which is built on land below sea level, putting it at risk of serious flooding. Over 1830 people were killed in the USA. Economists suggest Hurricane Katrina cost the US economy $80 billion. The rescue operation was criticized for not doing enough to help the poorest members of this population. Many of the poor neighbourhoods were the worst hit by the hurricane.
When Katrina made landfall, it flooded the streets, wrecked the power grid, tore roofs and wall off historic buildings and brought down many trees. The floods brought with them poisonous snakes, water-borne disease, carcasses of livestock and abandoned pets and swollen human corpses. This was shocking sight of an MEDC society like the USA. There were also health dangers arising from fallen power lines and sewage-tainted water.

Many homes in New Orleans were submerged by the surge of floodwater brought on by the storm. Over 70% of the city is below sea level and 80% of it went under water, with some sections as deep as 6m. The floodwaters in New Orleans were ten times more toxic than is considered safe.

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REVISION QUESTIONS

1. Name **two** processes of coastal erosion.
Hydraulic action;
Corrasion/abrasion;
Corrosion/solution;
Attrition;

2. Explain how a wave cut platform is formed.
Ideas such as:
• erosion of cliffs/hydraulic action/corrasion;
• wave cut notch formed;
• undercutting;
• collapse;
• retreat of cliffs/leaves base at cliffs;
• smoothing by waves; etc.

3. Describe the impacts of a tropical storm.
Content Guide:
Impacts are likely to include;
• death and injury,
• flooding, • impact on agriculture,
• impact on tourism,
• water borne disease;
• economic impact,
• impact on transport/communications etc.

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2.6 Coral Reef

Coral reefs are underwater structure made from calcium carbonate secreted by corals. (A structure built up from remains of living organisms/coral polyps/offshore rocks formed of limestone skeletons, etc.). They are colonies of tiny animals found in marine waters that contain few nutrients. Often called "rainforests of the sea", coral reefs from some of the most divers ecosystems on earth. They occupy less than 0.1% of the world's ocean surface, yet they provided a home for 25% of all marine species.

Location and distribution: Coral reefs are largely between Tropics of Cancer and Capricorn/between 30^0N and 30^0S. In those areas where warm ocean currents are found more coral reefs are found.

Distribution or location of coral reef: Name of the countries: South East Asia, Caribbean, east African coast). Mexico, United States, Peru, Cuba, Haiti, South Africa, Kenya, Tanzania, Mozambique, Madagascar, India, Saudi Arabia, Indonesia, Thailand, etc.

Ideal conditions for formation:

i. Plenty of sunlight to aid photosynthesis
ii. Warm sea water; temperatures between 23^0 and 25^0 C)
iii. Shallow water; not more than 50 metres deep
iv. Water free from sediment or clear water
v. Plentiful supply of oxygen in water or unpolluted
vi. Plentiful supply of plankton, etc.

(Coral cannot grow in freshwater, and cannot tolerate silt nor water in high nutrients that allow plants to use the oxygen that the coral needs.

Types of reef

1. **Fringing reef** – coral platforms grow out to sea attached to the mainland. A shallow lagoon lies above them. (or directly attached to a shore, or borders it with a shallow channel lagoon)
2. **Barrier reef** – coral grows in a shallower area away from the mainland. The barrier reefs to be much farther away from shore than fringing reef.
3. **Atoll reef** – fringing reefs grow in a circle attached to the land. Sea level rises and subsidence of the land causes the coral to grow at the height of the rising sea level to reach the light. This eventually forms a ring of coral reefs with a lagoon replacing the island in the centre.

Threats to the Coral reef

1. Deforestation causes erosion, which releases a large amount of carbon stored in the soil, which then flows into the ocean, contributing to ocean acidification.
2. Coral reefs are dying around the world due to coral mining
3. Coral reefs are also destroyed due to agricultural and urban runoff pollution
4. Over fishing, blast fishing, disease
5. Digging of canals and access into Islands and bays
6. Broader threats are sea temperature rise, sea level rise and pH changes from ocean acidification, all associated with greenhouse gas emissions.

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7. A study released in April 2013 has shown that air pollution can also stunt the growth of coral reefs – it shows the threat of factors such as coal- burning and volcanic eruptions.

Protection of coral reefs:

1. Marine protected areas (MPAs) have become increasingly prominent for reef management
2. MPAs promote responsible fishery management and habitat protections
3. MPAs encompass both social and biological objectives, including reef restorations, aesthetics, biodiversity, and economic benefits. Conflicts surrounding MPAs involves lack of participation, clashing views, effectiveness and funding
4. In some situations, as in the Phoenix Islands, Protected Areas, MPAs can also provide revenue.
5. Many land use laws aims to reduce CO_2 emissions by limiting deforestation
6. Biosphere reserve, marine park, national monument and world heritage status can protect reefs. For example, the Galapagos Islands, Great Barrier Reef etc are world heritage sites.
7. In Australia, the Great Barrier Reef is protected by the Great Barrier Reef Marine Park Authority, and is the subject of much legislation, including a biodiversity action plan.

Human activities that damage the natural environment in coastal areas

1. Tourists walking through shallow reef waters damage coral structures;
2. The noise from ships could scare fish;
3. Litter from tourism pollute the environment;
4. Sewage outflows pollutes seas;
5. Oil spill to the sea from cruise and ships pollute the sea water
6. Overfishing has left stocks of fish seriously depleted;
7. Food chains – the fish consumes the contaminated oil in the sea
8. Visual impacts of developments, etc

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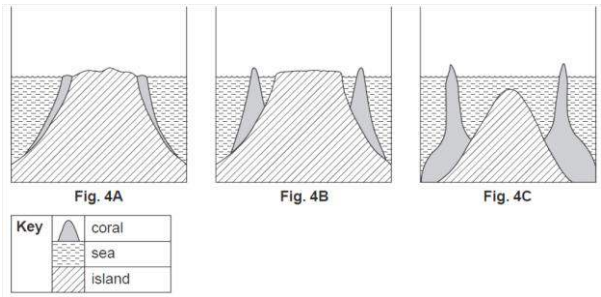
Revision Question on Coral Reef:

1. What is a *coral reef*?
2. For a coral reef at a named location you have studied, describe its main features and explain its formation. Content Guide: composition of coral, biodiversity, locational features, deposition of calcium carbonate, colonization etc.
3. Describe the global distribution of coral reefs.
4. Identify the type of coral reef



5. Name any two countries where the coral reefs are found.
6. Describe the conditions required for the development of coral reefs.
7. Name a country or an area you have studied about the coral reef. Describe about the threat to coral reef and solution to threat.

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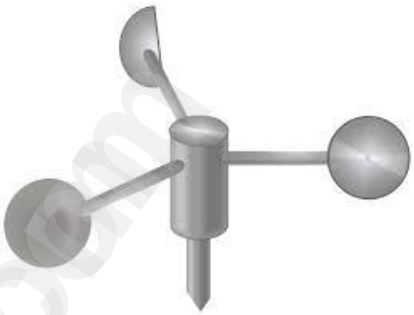
2.7 Weather Instruments and measurements

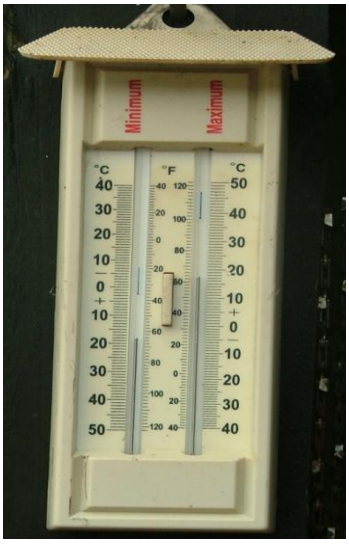
Weather Instrument for measuring the weather

1. **Anemometer:** (to measure wind speed in km) The wind forces the cups to rotate. They are connected to a meter. The meter converts the rotations into wind speed. This is measured in kilometers per hour (km/hr)



2. **Barometer:** This measure air pressure in milibars (mb). The pressure of air move a pointer around a dial. If pressure is high on the glass it moves the dial around to HIGH. If pressure is low on the glass the dial move towards LOW.

3. **Maximum – Minimum Thermometer (Six's thermometer)**: (to measure Max.and min. temperature in degrees centigrade) This instrument records, the highest and lowest temperature cover a period of time in degrees Centigrade (^{0}C). There are two steel markers inside the tube. One marker stays at the maximum temperature; the other stays at the minimum temperature until they are reset. They are pushed into place by mercury which is affected by alcohol in the tube expanding or contracting as temperature changes. This instrument is known as the Six's thermometer after James Six who invented it.



A **Stevenson screen** or **instrument shelter** is an enclosure to shield meteorological instruments against precipitation and direct heat radiation from outside sources, while still allowing air to circulate freely around them. It forms part of a standard weather station.

1. It consists of square wooden box on a stand
2. The box has louvred (slanting) sides to allow the entry of air.
3. The roof is made of double boarding to prevent the sun's heat from reaching inside the screen.
4. Insulation is further improved by passing the outside white to reflect the sun's rays.

Sitting: The sitting of the screen is very important to avoid data degradation by the effects of ground cover, buildings and trees:

1. It is also place on a stand 110 cm above ground level to avoid any effects of concrete or grass at the surface.

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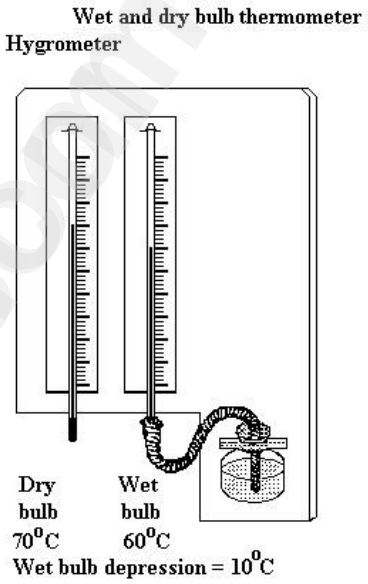
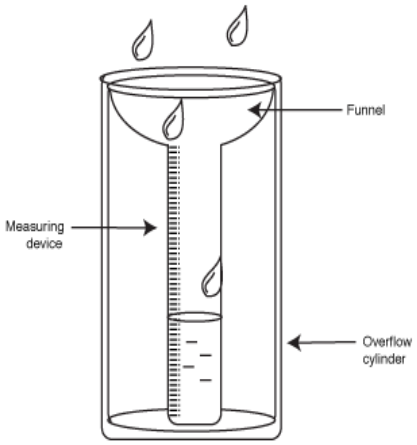
2. It is sited in an open space.
3. Away from the trees and buildings to avoid any obstacles affecting the readings.
4. In the northern hemisphere, the door of the screen always faces to north so as to prevent direct sunlight on the thermometers.
5. In Polar regions with twenty-four hour sunlight, the observer must take care to shield the thermometers from the sun and at the same time avoiding a rise in temperature being caused by the observer's body heat.

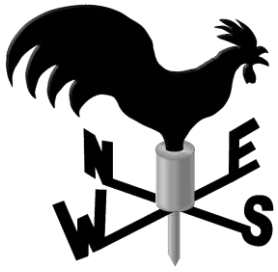
Instruments inside the Stevenson screen:
The Stevenson screen holds instruments that may include thermometers (ordinary, maximum/ minimum), a hygrometer, a psychrometer, a dewcell, a barometer and a thermograph. Stevenson screens may also be known as a cotton region shelter, an instrument shelter, a thermometer shelter, a thermoscreen or a thermometer screen. Its purpose is to provide a standardised environment in which to measure temperature, humidity, dewpoint and atmospheric pressure. A special type of Stevenson screen with an eye bolt on the roof is used on a ship. The unit is hung from above and remains vertical despite the movement of the vessel.



4. Wet and dry bulb thermometer (hygrometer): (to measure relative humidity- percentage moisture in air (%). This consists of two thermometer. One records the air temperature; the other is kept damp so it records the temperature as if the air was 100% saturated. The difference between the temperature determines the relative humidity of the air which is read off a table which gives relative humidity as a percentage of 100%.



4. **Rain Guage:** (to measure daily rainfall in millimeters (mm). Precipitation (rain, hail, sleet and snow) fall into the metal funnel and enter a glass container. At regular intervals the contents are tipped into a standard guage and measured. Snow or hail must be melted first. This is measured in millimeter (mm).



5. Wind Vane: (to measure direction of wind). This shows the wind direction. If the wind is from the west is from the west it is called a 'westerly wind' and the arrow is pointing from west to east.

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REVISION QUESTIONS

1. ***Explain how the weather instrument Wet and dry bulb thermometer/hygrometer is used to work out relative humidity. (2015)***

Ideas such as: read off wet and dry bulb temperatures/read both temperatures;
• use relative humidity table/chart; work out depression of wet bulb(2)/subtract wet bulb from dry bulb (8–6)/work out difference between the two; read off figure at intersection of dry bulb and wet bulb depression figures (where 8 and 2 intersect)/must convey how they would use the table; etc.

2. Explain why the weather instrument Wet and dry bulb thermometer/hygrometer is kept in a Stevenson Screen? (2015)

Ideas such as: reflect sun`s rays/so they are not heated by the sun/to avoid direct sunlight; so that air flows gently around them/they are not affected by the wind;
• so they measure condition of air not ground; so they are a standard height above ground; so they are not affected by concrete; to avoid tampering; etc.

3. Explain how wind speed and direction measurements are obtained at a weather station.
wind direction is recorded with a wind/weather vane;
• labelled diagram of wind vane/description (MAX 2);
• direction noted is where the wind is blowing from/arrow points to where the wind is blowing from;
• wind speed is recorded with an anemometer;
• labelled diagram of anemometer/description (MAX 2);
• both connected to computer/digital weather station;
• check instruments every X hours to get reading;
• locational idea of both instruments placed high up/on a roof/away from trees

2.5 Climate and natural vegetation

Weather and Climate

1. What is meant by weather?

- Weather refers to the conditions of the atmosphere at a specific place over a relatively short period of time.

2. What is meant by climate?

- Climate refers to the atmospheric conditions of a specific place over a considerable period of time. usually 30 to 35 years.

3. What are the differences between weather and climate?

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- Weather refers to the conditions of the atmosphere at a specific place over relatively short period of time while climate refers to the atmospheric condition at a specific place over a considerable period of time usually 30 to 35 years

4. What are the elements of weather?
a) Temperature
b) Relative Humidity
c) Precipitation
d) Wind

5. Describe in brief the elements of weather.
a) Temperature: is the degree of hotness or coldness of a place. It is measure temperature in degrees Celsius or degree Fahrenheit.

b) Relative Humidity: the proportion of water vapour present in the air in relation to the maximum amount of the air can hold at a particular temperature, usually expressed as a percentage.

c) Precipitation: It refers to all forms of water such as rain, frost, hail and snow that fall from the atmosphere onto the earth's surface. Rain is usually express in mm or cm.

d) Wind: the horizontal movement of air from a region of high pressure to a region of low pressure. It is measure terms of its speed, in km/h.

6. What is atmosphere?
Atmosphere is a layer of air which surrounds the earth.

7. What are the compositions or components of atmosphere?
The components of atmosphere are – mixture of gases, water vapour and dust particle.

8. What are the layers or structure of atmosphere?
The different layers of atmosphere are: Troposphere is the lowest layer of the atmosphere and the other layers are the Stratosphere, Mesosphere and Thermosphere.

9. Describe the factors that influence the temperature.
The factors that influence the temperature are – latitude, altitude, distance from the sea and cloud cover.

a) **Latitude –** Temperature decreases as the latitude increases. At the equator, the sun's rays strike the earth's surface perpendicularly and the solar radiation is concentrated over a smaller areas compared to the Poles, the heat is more intense at the equator. Thus experiences a higher temperature. As the sun's rays strike at an angle and the solar radiation is spread over a larger area, Poles experiences a lower temperature than in the equatorial belt. The sun rays travel longer distance to reach Poles and in the process it loses its heat, and lower the temperature at Poles.

b) **Altitude –** temperature decreases with increasing altitude at the rate of 6.5^0 C per 1000 metres in the troposphere. This rate of decrease is known as the Normal Lapse of Rate. The earth surface has more dense air which absorbs more heat from the sun but the higher altitude has thin air and unable to absorb

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heat effectively as the dense air. The higher altitude heats up the air through the process of conduction.

c) **Distance from the sea –** the land heats up and cools down more quickly than the sea water. This difference in the rate of heating and cooling of land and sea has an effect on the temperature of coastal areas. During the summer, the land is heated up quickly and experiences a higher temperature on the land. During the winter, the land cool down quickly and experiences a lower temperature than the sea. However, the temperature in the coastal areas almost remains constant due to effect of land and sea breeze.

d) Cloud cover – cloud cover affects the temperature of a place by influencing the amount of solar radiation entering and leaving the atmosphere. During the day, when the cloud cover is less or having a clear sky, the ground is heats up quickly and rises the temperature. During the night, when the sky is clear, the heats from the ground allow to escape into the space easily causing low temperature.

10. What is meant by relative humidity?
Relative Humidity is a proportion of water vapour present in the air, in relation to the maximum amount the air can hold in at a particular temperature. It is measured in percentage.

11. What is meant by condensation?
Condensation is a process in which cooled water vapor changes into water droplets. When there is more water vapor in the air, more condensation the occur.

12. What is meant by saturation?
Saturation occurs when the air is carrying the maximum amount of water vapor it can hold at that temperature.

13. What is meant by precipitation?
It refers to all forms of water such as rain, frost, hail and snow that fall from the atmosphere onto the earth's surface. Rain is usually express in mm or cm.

14. What are the forms of Precipitation?
Precipitation in places with cold climates may be in the forms of snow, frost or hail and precipitation in places with warm climates is usually in the form of rain.

15. What are the types of rain?
i. Convectional Rain – it occurs when there is intense heating of the Earth's surface, which usually takes place in the morning and early afternoon and give rainfall in the late afternoon around 3-4 pm.

ii. Relief Rain – It occurs mainly in places where moist air from the sea is forced to rise above a highland such as a mountain range and condensation take place and give rainfall.

16. What is meant by Air pressure?
Air pressure, or atmospheric pressure, is the downward force exerted by the weight of air per unit area on the Earth's surface.

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17. What is wind?
Wind is the horizontal movement of air from a region of high pressure to a region of low pressure.

18. What is a land breeze?
The wind that blows from the land to the sea is called as a land breeze. It occurs at night.

19. What is a sea breeze?
The wind that blows from the sea to land is called as a sea breeze. It occurs during the day.

2.9 Tropical Rainforest

Distribution (location):

- The tropical rainforest is located within the latitudes of 20^0 N and S of the Equator.
- These places include – Amazon Basin of South America, Congo Basin of Africa and countries in Southeast Asia like Singapore, Indonesia and Malaysia.

Characteristics:

- The tropical rainforest is characterized by high mean annual temperatures; averaging 27^0 C. Annual temperatures range is 2^0 C.
- The relative humidity is high above 80% and convectional rainfall occurs frequently.
- The rainfall is between 1500 mm upto 3000 mm, and generally rainfall throughout the year

Natural vegetation: the plants and trees that grow and develop themselves without human help.

Ecosystem: a biological community where the plants, animals and humans interact with one another and with their physical environment.

Biome: is a large geographical area where the vegetation and animal adapted to its distinctive climatic and physical conditions.

Divisions of natural vegetation:
The natural vegetation are divided into Forest, Grassland and Desert vegetation

Deforestation: is the clearance of forest by cutting or burning; it lead to barren land or soil erosion.

Reforestation: planting of new plants and trees in those deforested land

Afforestation: is the planting of trees in areas which were previously bare or were used for other land uses.

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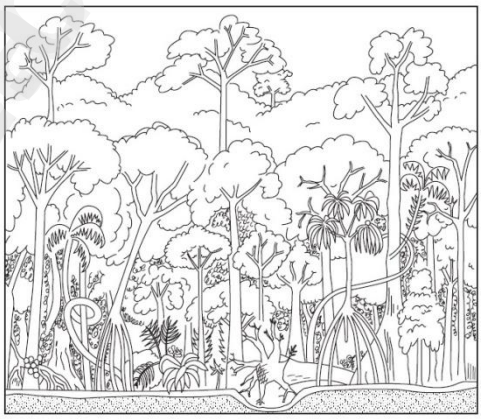
Features/characteristics of tropical rainforest

- The tropical rainforests have broadleaved and evergreen.
- The trees are very tall, the stems are straight and smooth
- The forests are very dense having diverse species within an area
- In tropical rainforest, there is emergent which emerge above the rest
- The canopy shades the ground from incoming sunlight almost completely.
- There is sparse undergrowth in tropical rainforest
- Lianas are long vines that twine around the tree trunks as support to reach upwards for sun light.
- Epiphytes with aerial roots to ensure rapid water intake when it rains.
- High temperature a high temperature enables continuous growing for plants and trees.

Diversity: relative diversity among the organisms present in different ecosystems. Around 400 species of trees are found in a hectare of land.
Climate: heavy rainfall about 200 cm per year, high temperature between 25- 35^0 C with high humidity



Structure or layer of the tropical rainforest:

1. **Emergent layer** – grow up to 40m height to get direct sunlight, tall trees with straight and thick trunks. The tallest trees are found in this layer.
2. **Canopy layer** – the trees grow upto 25-35 m height. Trees grow so close together that their crowns interlock like an umbrella. Common woody vines called lianas twine around the tree trunks. Epiphytes – a parasite plants are commonly found.
3. **Understorey layer** : the shorter trees grow up to 6-10m height with discontinuous canopy, the shade tolerant trees like palms and tree ferns are common. The leaves are much larger at this layer compared to other layers.
4. **Shrub layer** – shrubs, ferns and young trees are adapted to less sun light, this include wild ginger, pandan and tapioca.
5. **Ground layer** – moist and dark with little undergrowth, consisting of small fungi, mosses and ferns.

Adaptation of vegetation in the tropical rainforest climate

1. **Leaves:** the leaves are waxy and hairy with drip tips to remove the excess water easily. Broad leaves absorb more sunlight
2. **Fruits and flowers:** the fruits and flowers are colourful with good fragrance to attracts insects, birds etc for pollination as the wind is still in the tropical forest and it cannot move out from the forest for pollination through wind.
3. **Bark and branches**: the trees have thin and smooth barks because there is no need for protection against cold and dry conditions. The trees are adapted to less sunlight by having branches only on the top.
4. **Roots:** the roots are shallow as the nutrients are found on the topsoil, it has a buttres roots and grow up to 5m high to support the tall trees from falling.

Importance of forest (uses of forests) or benefits of forests

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Natural vegetation is one of the important aspects for animals and humans. Humans depend on vegetation for food, fuel, shelter, medicine, clothing and many other essentials in life.

1. **Green lung of the earth** – carbon dioxide which is a major green house gas is absorbed during the photosynthesis and oxygen is released. Hence, forest acts as large natural air purifier by absorbing carbon dioxide.

2. **Habitats –** forest is a natural home for the animals and for humans. Forests have long been the source of food for human since their early days as hunters and gatherers.

3. **Raw materials** – both hard and softwood are found and used for different purposes. Hardwood are use to make furniture, musical instrument, building ships etc. The softwoods are used for housing, construction, flooring, paper etc. Medicinal and cosmetic products also found from the forest. In less developed countries, woods are used as fuel for keeping warm and for cooking.

4. **Recreational purpose** – forest are popular for outdoor activities such as camping, fishing, sight-seeing, hiking etc. Example: Jungleland in Bogor, Jakarta.

5. **Water catchment area** – it enables water to be collected and stored within a water catchment and increseases the quantity and quality of water. Forests main the quantity of water suppy by playing a significant role of water cycle. Forests can maintain the quality of water as they support natural processes that filter water.

6. **Preventing floods** – forest are important for controlling floods in the lowlands. For example, the leaves of trees in the forest intercept rainfall, slow down its speed and allow it to seep into the soil. The mangrove forests also protect coastal areas from storms and strong waves.

7. **Research and education** – forests are also used for conducting scientific research. Scientists study forest plants to develop new medicines and other varieties of wild crops. They also study the interaction between the plants and animals with the environment.

A case study on deforestation in Amazon, Brazil or the cause of deforestation

1. **Population increase** – people clear and burn the rainforest to acquire land for building houses and for agriculture. The Government also cleared forests to develop transport and industrial infrastructures.
   - **i)** **Settlements** – the Government has been trying to resettle the people from densely populated cities and as part of resettlement effort, the government cleared part of the Amazon rainforest.
   - **ii)** **Rapid urbanization** – forested land is cleared for the building of new housing estates, town centres, hospitals, schools, transportation and other facilities.
   - **iii)** **Land transportation** – the Transamazonian highway in Brazil cut across the Amazon rainforest which runs 5100 km, and the railway which links the port of Sao Luis to Carajas in the interior ultimately leads to the clearance of more natural vegetation.

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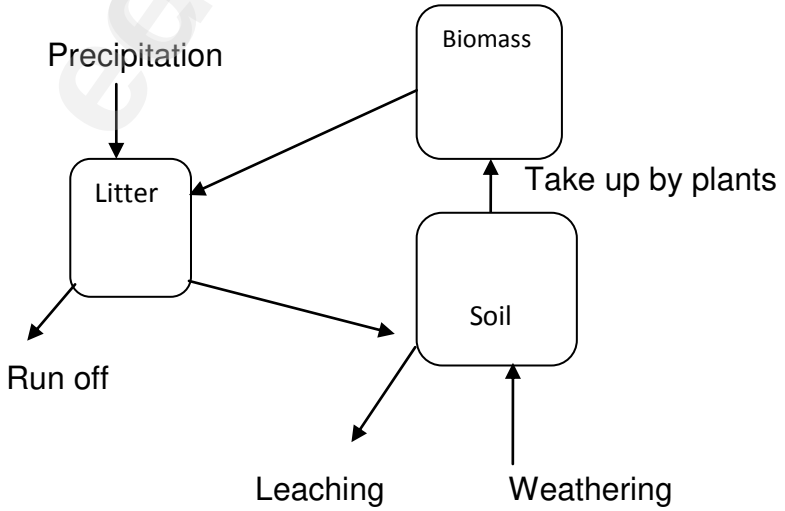
2. **Agriculture** – Shifting cultivation, practiced on a small scale by the tribal farmers does not pose a major threat to the forest. Subsistence and commercial farming incur more severe consequences. Commercial farming like rearing cattle and growing crops such as sugar cane, coffee etc have cleared the forest on a large scale.
3. **Forest fire** – forest fires burn up thousands of square kilometers of the Amazon rainforest every year. This situation is worsened when forested land is also burnt to create agricultural land.
4. **Economy development and payment of debt** – Brazil is one of the world's largest debtors, owing more than US $100 billion to foreign banks. As a result, the country's natural resources have been exploited to pay for development and to reduce the national debt.
5. **Commercial logging** – extensive deforestation take place as logging companies are eager to sell the timber to the more developed countries where there is a high demand for it. Actions against illegal logging but difficult to enforce as the extent of rainforest is so large.
6. **Mining** – the Amazon rainforest is rich in many minerals like iron ore, gold and fossil fuels. Over the years, large areas of the forest have been cleared by multinational corporations to extract the mineral and fossil fuels.
7. **Hydroelectricity** – the construction of large dams and reservoirs have caused huge areas of the Amazon forest to be flooded and destroyed. Example- Itaipu dam on the Parana River at the border of Paraguay.

Consequences of deforestation:

1. **Global warming** – as the forest helps to absorb carbon dioxide and release oxygen into the atmosphere, the deforestation could increase carbon dioxide in the atmosphere. Hence, more heat may be trapped in the atmosphere which will lead to global warming.

2. **Nurtient cycle and soil leaching** – Nutrients are plant food consisting of minerals and chemicals derived from the decomposition of organic matter. The cycle consists of three major stores like biomass (all the living organic matters such as vegetation), soil and litter (leaves and branches that are fallen on the ground). When the trees die, they decompose quickly under hot and humid conditions and the nutrients they have absorbed are released back into the soil. The soils in tropical regions are not fertile due to soil leaching. Trees help to improve soil fertility by absorbing nutrients in to the roots before these nutrients are washed or leached away. Due to deforestation, soil erosion also increased.



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3. **Flood and water quality** - when the trees are cleared, surface runoff water increased when it rains and caused flood in low-lying areas. The decomposition of organic debris the pH level and increase the acidity of the water and change the living environment for aquatic life.
4. **Air pollution –** in 1997 the smoke of forest fires from Sumatra and Kalimantan affected Malaysia, Singapore, Philippines and Indonesia. In the same year, Brazil was also affected by forest fires. The smoke produced by the fires caused airport closures and affected the health of the people.
5. **Loss of biodiversity –**Amazon rainforest contains the largest collection of plants and animals. It is estimated that one hectare of forested land contains more than 2000 species of plants and deforestation leads to extinction of flora and fauna.
6. **Impact on inhabitants of the forest –** the deforestation disrupts the culture and traditional way of the native people living in the forest. Many of them like the Kayapo (Brazil) can no longer survive by living in the forest.

Towards sustainable management of the forest or solution to deforestation
Sustainable management ensures the use of the forest and its resources in a way and at a rate that maintains its biodiversity. Some of the measures are highlighted below:

1. **Selective logging:** Instead of removing all the trees in area, selective cutting can be enforced. This allows cutting of only selected trees that have met certain criteria, and only a certain number of trees per hectare of forest.

2. **Establishment of laws and policies** – in order to further limit the number of trees being cut down, the government withdrew financial support and tax incentive for the new cattle ranchers. Enforcement agents are trained to patrol the forest and heavy fines are imposed on illegal loggers.

3. **Afforestation** – afforestation is another solution to deforestation. Trees are grown and nurtured on farmland. These trees eventually provide not only wood for charcoal, but also shade and food for the farmers.

4. **Conservation** – setting aside portions of the rainforest as conservation areas will ensure that many plants and animals will be left undisturbed and protected.

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REVISION QUESTIONS
1. Describe the processes which lead to a high annual rainfall in the tropical rainforest. Ideas such as: heating by sun/high temperatures/direct sunlight; evaporation; transpiration/evapotranspiration; ascending air/convection; cooling; condensation/ cumulus or cumulonimbus clouds form; saturation.

2. Explain why the tropical rainforest has a wide variety of plants, insects and animals. Ideas such as: high rainfall/humid/use of rainfall statistics; high temperatures/use of temperature statistics; optimum/ideal/perfect growing conditions/(frequent) photosynthesis; no seasons/continuous growing season/hot and wet all year round; many layers of vegetation; rapid nutrient cycling; habitats for organisms/or example/provides shelter or shady areas; large supplies of food for insects/animals/birds/decomposers; many areas are still not exploited by people/little human disturbance.

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3. Explain why the tropical rainforest is important globally.
Ideas such as; creation of oxygen; reduction of carbon dioxide; 'lungs of the earth'; reduces global warming/reduces greenhouse effect; reduces coastal or global flooding risk; impact on transpiration/water cycling/rainfall patterns; source of medicines; some undiscovered are potential cures for eg cancer; source of raw materials/ fuels/resources or example; diversity of species/biodiversity/there are millions of species; preservation of cultures etc.

4. Describe the impact of deforestation on the **local** natural environment.
Content Guide: species, habitats, food chains, soils, rivers etc.

5. Explain how the amount of rainfall in a tropical desert is influenced by wind direction and atmospheric pressure.
Ideas such as: trade winds / wind blows from SE / NE; across large areas of land; offshore winds / blows from a desert; so it does not pick up any moisture / or it has lost its moisture; atmospheric pressure is high; as air is descending; so no cooling / condensation; no condensation

6. Explain the relationship between world population and the number of extinct species of plants and animals.
Ideas such as: more land needed for homes/farms/industry; there are more people so more vegetation is cleared/deforestation occurs; habitats are lost; breeding patterns disrupted by human activity; more species (or example) are hunted/wiped out for food/medicine; more species are destroyed by water/air pollution or named type such as global warming or acid rain; impact on food chains

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2.10 Tropical Hot Desert

A desert is an area that receives less than 250mm precipitation in a year. Arid (dry) deserts can be hot, for example the Sahara desert in Africa. They have very high day time temperature, often over 50^0 C, and low night time temperature below 20^0 C with clear skies and sometime with ground frost.

Distribution: The deserts are found 0^0 to 23^0 latitudes north and south of the equator. The major deserts are located on the Western coasts of the continents between 15^0-30^0 north and south latitudes.

Important deserts: Sahara, Kalahari, Arabian, Iranian, Thar, California, Mexican, Atacama, Peruvian, Great Australian etc.

1. Sahara (North Africa): Algeria, Chad, Egypt, Eritrea, Libya, Mali, Mauritania, Morocco, Niger, Sudan, Tunisia and Western Sahara)
2. Arabian Desert: Western Asia (Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen)
3. Gobi Desert: East Asia (China and Mongolia)
4. Kalahari Desert: Southern Africa (Angola, Botswana, Namibia and South Africa)
5. Great Victoria Desert: Australia
6. Syrian Desert: Western Asia (Iraq, Jordan and Syria)
7. Thar Desert: South Asia (India and Pakistan)
8. Atacama Desert: South America (Chile and Peru)

Climate: Average temperature is 35^0 C having high range of diurnal and annual temperature around 30^0 C

Reasons: clear and cloudless sky, receiving maximum insolation, rapid evaporation
Humidity: dry air

Rainfall: low annual rainfall 25 cm, torrential rain with flash flood

Reasons for formation of deserts in the tropical region:

i) Mostly rain bearing trade winds blow off-shore (land to sea)
ii) Located in sub-tropical high pressure belts, this is the least favourable for rainfall
iii) Presence of cold currents may decrease evaporation (Peruvian current)
iv) Lack of moisture in the North-East winds (wind from land area)
v) Located away from coast – interior or continental like Australian
vi) Located in the leeward side of the mountains (Thar, California)

Vegetation: Xerophytic, low growing, small, round shaped or sharp to the sun
Main features of hot desert vegetation / adaptation of hot desert vegetation

- **Leaves:** Plants have small and narrow leaves to reduce loss of water through transpiration and it can survive without the need for daily supplies.
- **Roots:** Plants have long and deep roots so they can collect water from underground and retain water in their bodies
- Plants have roots that travel horizontally so they can avoid intense daytime heat
- **Stems:** Plants store water in thick or succulent stems to use in dry periods
- **Seeds:** short sprouting seeds, have thick and tough skin to protect them while dormant

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- **Flowers:** have a bad smell to be protected from animals
- **Foliage (skin)**: waxy, leathery and hairy to reduce transpiration
- Plants are low- growing to avoid water loss by strong winds

Animals

- Some animals store food and water for days to prevent water loss by evaporation
- Animals are often small to reach underground water supplies
- Small animals can hide burrows or stones to reach the maximum area for water and to find surface moisture
- Insects and reptiles have waterproof skins so they can hunt in cooler nights.
- Some rodents are nocturnal so there is less water loss from a small surface area

Main characteristics of hot desert

- Average temperature is around 35^0 C having high range of diurnal
- In tropical hot desert the day time temperature rises very high over 50^0 C.
- The night time temperature decreases to below 20^0 C
- The sky is clear and cloudless in the desert
- During the winter, sometime the grounds are found with frost
- The annual rainfall in the desert is around 250 mm
- Generally torrential rain with flash flood occurred

A Case study: Desertification – Sahel region in Africa

Desertification is a process of expansion of desert through land degradation. The Sahel is a narrow belt of land located at the Southern part of Sahara desert.

Causes of desertification

- Unreliable rainfall – the amount of rainfall is less and is confined to only a few months. The annual rainfall is less than 10 cm for the last 30 years
- Overgrazing – the basic economic activity of Sahel region is animal rearing like cattle, camel, goat, sheep etc., which has been increased upto 40% after 1950. The overgrazing causes loss of vegetation.
- Population – the population growth of this region is very high (30%), which leads to over cultivation and soil erosion.
- Lengthy drought – the region has been experiencing several droughts since 1960 (Ethiopia 1983 and Sudan in 1991). In this area most of the people are at the neck of drought.
- Climatic change – the global warming is considered as a main reason for desertification.
- Torrential rainfall – it causes gully erosion and the soil loses its vegetation and humus.

Suggestions / Solutions

- Planting trees and shrubs to create green belts
- Planting shelter belt to reduce wind erosion
- Construction of stone lines to capture the available moisture
- Research and development of international forums like Convention to Combat desertification (CCD)

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Theme 3: Economic development

3.1 Development

Different people have different notions of what development means. An economist is likely to define development purely in terms of economic growth or the accumulation of material wealth. A sociologist may equate development with social progress in a society, such as the increasing literacy rate of the population. For a geographer, the focus may be on how development as a process has spread from one region to another and how it has both positively and negatively affected the physical environment in particular.

Development – the progressive process, which aims to achieve economic growth and create an environment for individuals to enjoy a decent standard of living and quality of life.

Economic growth – refers to the change in a country's wealth over time and such changes are usually measured in percentages.

Standard of living – refers to the goods and services available to people in the environment they live in.

Quality of life – refers to the well-being of the people. It is dependent on factors such as political and religious freedom, environmental health, and happiness, which are difficult to measure.

Indicators of development

1. **Economic indicators –** Income per capita – the common economic measure of development is Gross National Product (GNP). It is the total values of goods and services produced by the citizens, and the income earned by citizens working and investing overseas, excluding the earning by non-citizens who worked or invested in the country.

GNP = A+ (B-C)
A = Gross Domestic Product (GDP) = total value of goods and services produced by the citizens and non-citizens in the country.
B = Income earned by citizens working and investing overseas
C= Income earned by non-citizens who worked or invested in the country.

GNP per capita refers to the average amount of income earned by each citizen in the country in a given year. Currently, GNP per capita is used by the United Nations (World Bank classification, 2005) to classify all the countries in the world into:

- ✓ High-income economies (US $10726 or more)
- ✓ Middle-income economies (US $ 876 - $10725)
- ✓ Low-income economies (US $ 875 or less)

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Generally, a MEDCs would have a higher GNP per capita than LEDC. This is because a MEDC usually has a higher proportion of secondary and tertiary industries that bring in a higher amount of income compared to a LEDC that has a larger primary industry.

2. **Demographic indicators** – the population characteristics like size, structure, growth, distribution and movement of population are often taken as reflection of a country's level of development.

Life expectancy – refers to the average number of years that a person can expect to live in a particular country. The life expectancy of people living in the MEDCs is often much longer than those living in the LEDCs. High fertility rates and life expectancy imply that health care and its accessibility are better in the MEDCs than the LEDCs.

Infant mortality rate – refers to the number of deaths of children under the age of one per 1000 live births in a year. In the MEDCs, the availability of good sanitation facilities and healthcare systems, and the easy accessibility of hospitals and doctors have contributed to lower infant mortality rates compared to those of the LEDCs.

3. **Social indicators** – the other indicators of economic development and the standard of living are accessibility to safe drinking water and the availability of proper sanitation.

Adult literacy rate – refers to the percentage of the population aged 15 and above who are able to read, write and understand simple statement. The populations of MEDCs have a higher literacy rate compared to those in the LEDCs. This is because the governments in the MEDCs have the financial resources to meet the educational needs of the people.

4. **Human development Index** (HDI) – the HDI combines three important development indicators – an economic indicator (GDP per capital), a social indicator (adult literacy rate) and a demographic indicator (life expectancy).

Employment structures

The divisions of employment sector into primary, secondary, tertiary and quaternary industry is known as employment structure. Industry can be classified using a four-way division. Over time, the percentage of the population of a country working in these different sectors of industry will change as the country develops. This is covered in the 'Employment structures' section.

- Primary industries are classified as those which produce the raw materials for industry. Examples include mining, quarrying, farming, fishing and forestry, all of which produce raw materials that can be processed in to a finished product. People working in these industries are described as being in the primary sector.

- Secondary industries are the manufacturing and assembly industries. They take raw materials and manufacture finished products from them. Examples include steel manufacture, bread making and food processing. People working in these industries are described as being in the secondary sector.

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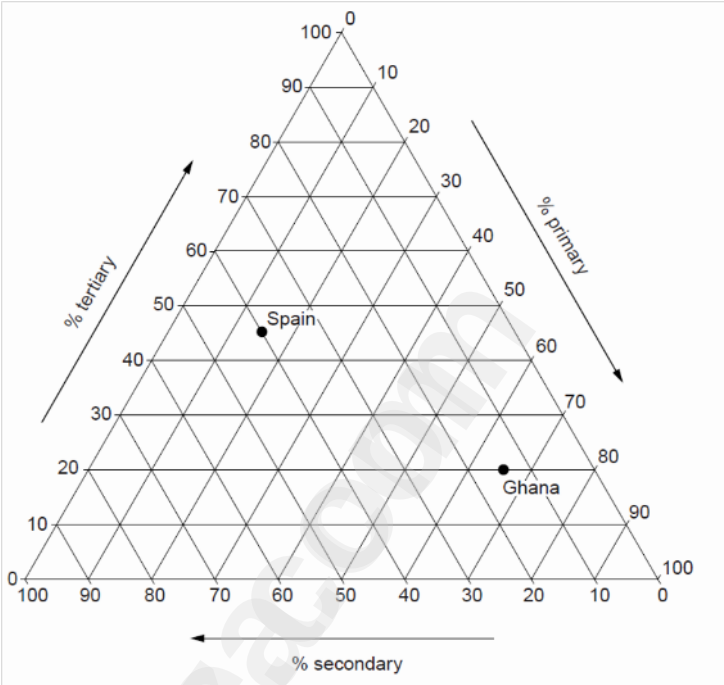
- Tertiary industries are service industries, and are the area of most growth in the United Kingdom. Examples include doctors, teachers, lawyers, estate agents, travel agents, accountants and policemen. People working in these industries are described as being in the tertiary sector.



- Quaternary industries are the newest, most hi-tech sector of industry. They are the research and development industries. Examples include the development of new computer components and research into GM crops. People working in these industries are described as being in the quaternary sector.

Employment structures

You can use the percentage of people working in each sector to help describe how developed a country is. This is called the employment structure. By looking back through history you can also see how one single country has developed by looking at the changes in their employment structure. The more developed a country becomes the more it will rely on secondary and, in particular, tertiary industries. A less developed country will be characterised by a greater percentage of the population in primary industries, usually farming.

Example: Ethiopia

Primary: 88%; Secondary: 2%; Tertiary: 10%; Quaternary:0%. Ethiopia is a typical example of a developing country, in terms of its employment structure. The majority of the population work in the primary sector. The United Kingdom shows, Primary: 3%; Secondary: 25%; Tertiary: 70%; Quaternary: 2%. The United Kingdom exhibits the employment structure of a well-developed country. The number of people working in the primary sector has steadily decreased and the number of people working in the secondary sector is still reasonably high, but has also been falling steadily. The massive growth has been in the tertiary sector, where huge numbers of jobs have been created. This is not just in the traditional tertiary industries like teaching and health care, but also in the tourist industry, the computer industry and the financial industry. There has also been the introduction of the quaternary sector, although this still takes up a very small percentage of the overall employment structure of the country.

What is globalisation?

Globalisation is the process of international integration arising from the interchange of world views, products, ideas, and other aspects of culture. Advances in transportation, information technology etc have been major factors in globalization, generating further interdependence of economic and cultural activities.

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Process of globalization / Reasons for globalisation

There are several key factors which have influenced the process of globalisation:

- Improvements in transportation - larger cargo ships mean that the cost of transporting goods between countries has decreased. Economies of scale mean the cost per item can reduce when operating on a larger scale. Transport improvements also mean that goods and people can travel more quickly.

- Freedom of trade - organisations like the World Trade Organisation (WTO) promote free trade between countries, which help to remove barriers between countries.

- Improvements of communications - the internet and mobile technology has allowed greater communication between people in different countries.

- Labour availability and skills - countries such as India have lower labour costs (about a third of that of the UK) and also high skill levels. Labour intensive industries such as clothing can take advantage of cheaper labour costs and reduced legal restrictions in LEDCs.

Role of technology in globalization

Developments in information and communication technology have changed our way of life, whether it is at home, at work, at school or at leisure. The internet and the development of digital technology (computer-based technology) in particular, have made the most significant impact in the field of information and communication technology in the past decade.

- **Information technology**: Internet enables people from almost anywhere in the world to access information on almost any topic from shopping to weather forecasts; and from research to downloading music and movies. In addition to the internet, global media networks also bring news and information about current events to people all over the globe.

- **Communication technology:** The communication of 'snail mail' which takes several weeks for mail to arrive from overseas has replaced with internet connection. It allows people in countries around the world to instantly contact each another. Satellites and Global Positioning Systems (GPS) have outgrown their original use in government activities and research and are now used by people in a variety of ways.

- **Transport technology:** Developments in transport technology have played a major role in globalisation. Technological development in the transportation industry has affected transformation in road, rail, sea and air travel. Airline transport has also enabled the expansion of tourism and trade across continents. Transport has also changed the way we do business.

<u>The impact of globalisation: individuals, local, national and global</u>

Individuals: Globalisation affects every aspect of an individual's life including, religion, food, transport, language, music and clothing. It affects each individual differently however, depending on a diverse number of factors such as location, education and income. While globalisation is said to unite the world, it has often been criticised for

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widening the gap between the rich and poor. It also has been said to favour the wealthy and educated, particularly those citizens belonging to the wealthier countries such as the United States. People from developing nations are exploited as cheap labour, many are also without access to technology like internet due to their inability to read and write English which is a dominant language in the new global world.

Local: Many smaller, local companies have been pushed out of business by their TNC competitors. It is often a result of consumers turning to the cheaper retail prices which TNCs can offer, owing to many having manufactured products using cheap foreign labour. Local cultures have also been affected by globalisation. Traditional customs and rituals are being replaced with the popular culture of the United States and the United Kingdom. The languages of local communities are being lost.

National: Globalisation, which is often dominated by finance, economics and business, has naturally had a significant effect on a national level. The developed countries have prospered from the wealth created by globalisation but the circumstances of poor nations may have actually become worse. The educated people are given visas to move to developed and wealthier nations but their country is being left without the skilled workers that are needed to improve its economy.

Global: Globalisation has resulted in almost every aspect of life existing on an increasingly international scale. A global economy is emerging owing to companies and countries expanding their international trade through improvements in technology. People are travelling to foreign countries more and cultures are being exchanged to form a shared global identity. **In** response to the way the world is operating on more of a global level, global organisations such as the United Nations (UN) and World Trade Organisation (WTO) have been established. These organisations with global power are able to help resolve conflicts between nations, in much the same way that conflict within a nation can be resolved at a national level. The effects of globalisation on the environment have come under heavy criticism in the past. It is thought that globalisation is a major contributor to global warming, due to its emphasis on international travel and trade, as well as industry.

Positive impacts of globalisation

- Inward investment by TNCs helps countries by providing new jobs and skills for local people.
- TNCs bring wealth and foreign currency to local economies when they buy local resources, products and services. The extra money created by this investment can be spent on education, health and infrastructure.
- The sharing of ideas, experiences and lifestyles of people and cultures. People can experience foods and other products not previously available in their countries.
- Globalisation may help to make people more aware of global issues such as deforestation and global warming - and alert them to the need forsustainable development.

Negative impacts of globalisation:

- Globalisation operates mostly in the interests of the richest countries, which continue to dominate world trade at the expense of developing countries.
- There are no guarantees that the wealth from inward investment will benefit the LEDCs. Often, profits are sent back to the MEDC where the TNC is based.

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- Transnational companies, with their massive economies of scale, may drive local companies out of business. If it becomes cheaper to operate in another country, the TNC might close down the factory and make local people redundant.
- They may pollute the environment, run risks with safety or impose poor working conditions and low wages on local workers.

What is a Transnational Corporation?
The definition of a transnational corporation is a corporation that has a home base, but is registered, operates and has assets or other facilities in at least one other country at one time. These corporations have a headquarters in one country, but have offices or factories in various other countries.

Characteristics of Transnational Corporations

- ✓ Transnational corporations may not be loyal to all of the countries they operate in, and look to maintain their own interests. In other words, they're mainly concerned about what's best for them even if it's at the expense of the other country's values or standards.
- ✓ Transnational corporations avoid high tariffs involved in importing when they set up in foreign countries. This allows a corporation to cut costs, but it's not always in the most honest way.
- ✓ They reduce costs by using foreign labor at a cheaper price than they would in their home country.
- ✓ They block competition by acquiring businesses. If they purchase foreign companies, they will not have as much competition.
- ✓ They may have political influence over some governments. This means that they may use their power to convince some governments to support their practices.
- ✓ Can create a loss of jobs in their home country.
- ✓ They can minimize taxes. The IRS has to study transnational companies very thoroughly to make sure they are paying taxes correctly.

Factors attracting TNCs to a country may include:

- ✓ cheap raw materials
- ✓ cheap labour supply
- ✓ good transport
- ✓ access to markets where the goods are sold
- ✓ friendly government policies

Case study on AppleTransnational Corporation (TNC)

Apple is a US Transnational Corporation. The Apple products are designed in Silicon Valley, California, made in China, by Foxconn, a Taiwan based company and sold all over the world, particularly to the developed countries. A market has been made in many different countries due to a distinct advertising campaign which has generated many customers devoted to buying apple products. All of this has only been made possible by improved communications, transport, knowledge diffusion and the movement of people and capital.

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The products are made in China due to the workers there being cheaper than American workers would be. This is a good thing in many ways to China as it provides some investment into the country and generates jobs. However, in 2006 it was reported that 200,000 workers who lived and worked in Shenzen factory were regularly working more than 60 hours a week for only around $100 a month, half of which was taken up by living expenses.

TNCs Positives and Negatives for Host and Origin Country

Host Country:
• Positive

• Investment
The companies bring much needed money into the country. Although most of their profits do return to the company's country of origin, the local economy does benefit.

• Employment:
Local employment by cumulative causation bringing wealth to the local economy through jobs that supply components, distribute new goods and supply services to the new plant. The jobs were financed with foreign money not government grants so have a big impact on local communities

• Environmental concerns
Companies bring with them the technology and expertise to reduce harmful pollution and create a safe working environment.

• New Methods of Working
Quality management systems monitoring the standard of output and technology transfer creating a more skilled workforce. The companies help the development of the country by bringing in technology and knowledge that the host country does not possess.

• Transportation: The new companies often help to improve transport links around the area.

• Inject Capital
More disposable income creates demands for housing, transport and services

Negative:
• Competition
- TNCs may be in direct competition with local firms. Most of the local companies cannot compete with the transnational corporation in many aspects, which leads to close down the local companies.

• Environmental Concerns
Cause damage to the atmosphere, water and land. Many developing countries have less strict pollution laws. Agricultural land may be lost, along with wildlife habitats

• Transportation
The transport links that do receive financial help from the transnational corporation often only serve the direct routes and needs of that company, not the wider area as well.

• Labour Exploitation
The wages paid to local workers are often low and some companies have been accused of exploiting the local workforce rather than benefiting it. Some TNCs exploit cheap, flexible, non-unionised labour forces in developing countries

• Urbanisation
Young workers migrate to the city to work for the TNCs affecting rural communities resulting in an ageing population

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• Outside decision making
Decisions about which plants stay open happens at the headquarters and its not in the interest of the host country

• Technologies
Unless the company actively participates in a program to educate local companies in the new technologies, the country's industry will not really benefit. The transnational corporation companies might be worried by sharing too much information, as they could find themselves with increased competition from local companies.

• Removal of Capital
The capital generated does not all stay in the host country. The TNCs take most of their profits out of the country, means that the actual economic benefit to the country could be minimal.

Origin Country:
Positive:
• Higher salaried jobs stay in the country of origin. The jobs like administration and Research and Development and other important job profiles are generally located in the country of origin.

• Profits returned to country of origin
- Shareholders benefit
- Government revenues from company taxation increase
- The total revenue earned by UK companies overseas in 2004 was £63.8 billion

Negative:
• Unemployment to the host country.
- In both the company and the component suppliers

• Multiplier effect
- Less disposable income
- Traditional industrial regions that rely on 1 or 2 industries are hard hit
……

Note: Introduction should be only 2-3 lines only in all the case studies.

……..
REVISION QUESTIONS

1. Explain why many people in cities in LEDCs work in the informal sector.
Ideas such as: lack of alternative employment / can't get another job / lack of jobs; lack of skills / education; cheap / quick to set up in business / quick way to earn cash; large number of customers; no taxes to be paid / no paperwork to be done; no need for premises; can work for themselves; can work from a very young age;

2. Explain why employment structure changes as a country develops.
Ideas such as: mechanization of jobs in primary / secondary sector; reduces need for workers (dev); some primary industries may close due to exhaustion of resources; growth of secondary sector as technology improves; countries want to manufacture their own goods rather than import; eventual decline of secondary due to automation / competition from abroad; where labour is cheaper (dev); rise in tertiary as education / skills levels increase; growth of secondary due to globalization/MNC's or TNC's locate there; growth of tourism; because a country has become more industrialized; closure of primary or secondary industries due to import of items (primary resources or secondary products); demand for services e.g. medical;

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3.2 Food production – Agricultural system

Individual farms and general types of farming can be seen to operate as a system. A farm requires a range of **inputs** such as labour and energy so that the **processes** that take place on the farm can be carried out. The aim is to produce the best possible **outputs** such as milk, eggs, meat and crops.

1. Arable farming – growing of crops like wheat, rice etc is known as arable farming.

2. Pastoral farming – rearing animals or livestock such as cattle, sheep etc is known as pastoral farming.

3. Mixed farming – cultivating crops and keep livestock together on a farm is known as mixed farming.

4. Shifting cultivation – changing place of cultivation from one place to another after losing the fertility of the soil is called shifting cultivation. Slash and burn cultivation is known as shifting cultivation.

5. Truck-farming – the growing of fruits and vegetables

6. Intensive farming – characterized by high inputs of capital, fertilizers, labour or machinery relative to the area of land.

7. Extensive farming – involves a low input of materials and labour, with the crop yield depending largely on the naturally available.

8. Market gardening – The small scale production of fruits, vegetables, and flowers as cash crops sold directly to local consumers. Distinguishable by the large diversity of crops grown on a small area of land, during a single growing season. Labor is done manually.

9. Plantation – a farming where cash crops are grown on a large scale (especially in tropical areas) Example growing of rubber and tea plants etc

10. Dairying – An agricultural activity involving the raising of livestock, most commonly cows and goats, for dairy products such as milk, cheese, and butter.

11. Factory farming – a system of rearing livestock using intensive methods, by which poultry, pigs, or cattle are confined indoors under strictly controlled conditions. (a large industrialized ***farm***; especially : a ***farm*** on which large numbers of livestock are raised indoors in conditions intended to maximize production at minimal cost.)

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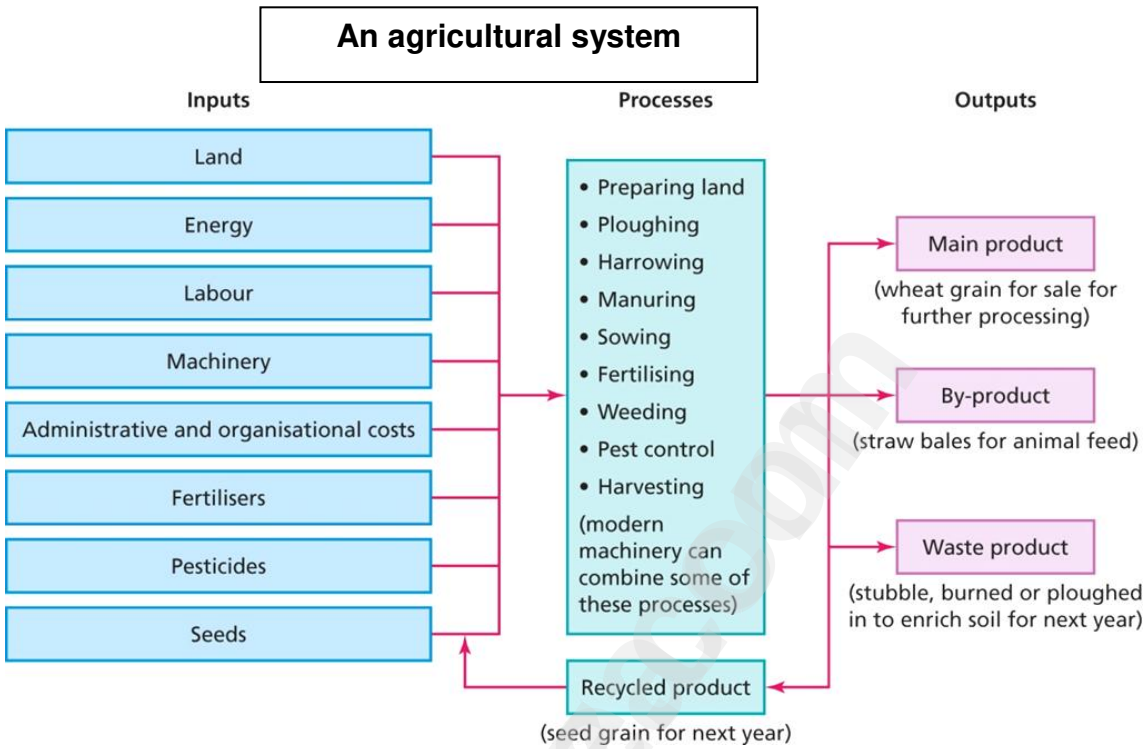

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Inputs	**Processes**	**Outputs**

Physical	Arable farm	**Main product**
Relief	Ploughing	Cereal, Wheat, barley, rice
Temperature	Planting	vegetables, Flowers
Precipitation	Fertilising	**By-product**
Soils	Pest control	Straw, fodder
Land	Weeding	**Waste product**
	Harvesting	burned or ploughed to enrich soil for next year
Human		
Farm building	**Pastoral farm**	**Animals**
Transport	Grazing /feeding	Calves, lambs, piglets
Labour	Cutting grass for silage/hay	Milk, wool
Subsidies	Milking/shearing/lambing/calving	Manure
Capital		
Machinery		
Seeds		
Animal feeds		
Pesticides		
Fertilisers		

Case study: Changes in subsistence farming to commercial farming (solution to food shortages)
Green Revolution, India 1960's

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The introduction of high yield verities of seeds and the increased use of fertilizers and irrigation are known as Green Revolution, which made India self sufficient in food grains. (The package of agricultural improvements generally known as green revolution). Green Revolution was seen as the solution to food problem in many parts of the developing world in the post 1960. Dr. Bolang who introduced hybrid wheat in 1963 is known as the father of green revolution. The farmers were mobilized with idea of agricultural revolution by M.S. Swaminathan and his team. India was one of the first countries to benefit when a high yielding variety seed programme (HVP) commenced in 1966-67.

In terms of production it was a turning point for Indian agriculture which had virtually reached stagnation. The HVP introduced new hybrid varieties of five cereals – wheat, rice, maize, sorghum and millet. All were drought resistant with the exception of rice, were very responsive to the application of fertilizers, and had a shorter growing season than the traditional varieties they replaced. Although the benefits of the Green Revolution are clear, serious criticisms have also been made.

The need of Green Revolution

1. Low irrigation facility – irrigated areas was only 17% in 1995.
2. Conventional and traditional approach – lack of modern method in farming
3. Frequent occurrence of farming (1940-1970)
4. Lack of finance (there was no Government or bank loan facilities available)
5. Marketing facilities

Strategies in Green Revolution

1. Use of high yielding varieties of seeds
2. Use of irrigation method
3. Use of pesticides, insecticides etc
4. Rural electrification
5. Introduction of new machinery eg. Tractor and harvesting machine
6. Use of chemical fertilizers
7. Improvement in marketing and storage facilities
8. Financial support – bank loans and subsidies
9. Research and development
10. Land reform

Advantages: (any 7 points**)**

1. Productions have increased two to four times greater than traditional varieties.
2. Farmers' incomes have increased, allowing the purchase of machinery, better seeds, fertilizers and pesticides
3. Agricultural productivity has increased and India become a self reliance in food production
4. Increased in food led to fall in food prices
5. Fast growing variety seeds allowed the cultivation of other crops in some farm. Eg. Vegetables
6. Farming changing traditional into commercial farming
7. The diet of the rural communities have improved and more varied.
8. Local infrastructures have been upgraded to modern techniques.

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Disadvantages: (any 7 points**)**

1. High yielding seed required more fertilizers and pesticides to optimize production, which is costly and it also led to contamination of soil and water.
2. High yielding variety seeds required more weed control
3. HYVs (high yielding varieties) are more vulnerable to pests and diseases.
4. Middle and higher-income farmers are more benefitted than the majority of the low income farmers, thus widening the income gap in rural communities.
5. Mechanisation has increased rural unemployment.
6. Some HYVs have an inferior taste
7. Overuse of synthetic fertilizers causes water pollution and dehydration
8. The problem of salinisation has increased in those irrigated areas.
9. Pesticides poisoning – chemical fertilizers has also brought infertility and digestion problems.

Case study: Shifting cultivation – Amerindians of American Basin (small scale subsistence farming)

Amerindians are the indigenous people living in America who started cultivation in the highlands which were known as the center of early agriculture. Even today, they live in the forest, wearing traditional clothes but partially developed. Togeri group is an example who still live in Amazon basin.

Physical inputs:

1. Land – river basin of Amazon basin, flat land and fertile soil
2. Climate – high temperature throughout the year (more than 25^0C)
3. Rainfall – high rainfall throughout the year (more than 200cm)
4. Natural vegetation – tropical – dense rainforest (difficult to clear)

Human inputs:

1. Traditional seeds
2. Traditional techniques
3. Traditional tools for digging, ploughing and harvesting
4. Labourers – the members in the family
5. Manures – natural fertilizers from decayed leaves, cow dung etc

Process

1. Cutting and burning of trees to clear the area
2. Removal of stems
3. Preparing the land and digging holes with a wooden sticks
4. Sowing seeds
5. Use of manures
6. Hand weeding
7. Irrigation (water) from rainfall
8. Mixed farming

Outputs

1. Food crops / food
2. Deforestation
3. Pollution due to burning plants and trees

Commercial farming (Large scale farming) – Case study on Malaysian Rubber plantation

Malaysia is known for its high quality and well priced rubber production with the export of 1/3 of world's rubber. The cultivation started in 1876 and in 2008, the production value has reached 11.24 billion dollars. Malaysia exports rubber products such as

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gloves, belt etc. to different countries like US, Japan and Europe etc. In Malaysia the rubber plants grow best on the gentle slope of the mountains.

Physical inputs

1. Land – undulating plain with slopes
2. Climate – equatorial climate – high temperature throughout the year – average temperature is about 25^0C per year.
3. Rainfall – high convectional rainfall about 200 cm
4. Soil – eroded soil
5. Natural vegetation – tropical rainforest

Human inputs:

1. High yield variety seeds (genetically modified seeds)
2. Use of machines like tapping machines, sprayers, rollers etc
3. Fertilisers like phosphorous, potassium etc
4. Irrigation system like water pumps
5. Pesticides
6. Research and development
7. Government policies like loans, subsidies etc

Process

1. Preparing land
2. Sowing of seed
3. Raising plants in a nursery
4. Transplantation
5. Planting the sapling plants in an equidistant manner
6. Mono cropping
7. Tapping (collection of latex) starts after 5-7 years of plantation and continue for 25-30 years.
8. Coagulation – adding acetic acid to make the rubber band
9. Making of rubber sheet from raw materials
10. Smoking and drying
11. Estate system
12. Seasoning – harvesting in special season

Output:

1. High export quality rubber
2. Standard Malaysian rubber (SMR)
3. Foreign money

……

REVISION QUESTIONS

1. Explain how the relief of the land can influence agricultural land use.

Ideas such as:
• Crops or valid examples are likely to be grown on flatter/lower land;
• tea is grown on higher ground/vines are grown on gently sloping land;
• Higher/steeper areas may be used for grazing/pasture;
• (Rice crops needing irrigation) can be grown on flood plains/low areas close to rivers;
• Vines may be grown on south facing slopes; etc.

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2. Explain how commercial farmers have been able to increase their output.
Ideas such as:
• more mechanisation;
• use of fertilizers/manure;
• use of pesticides/herbicides/insecticides;
• greater use of irrigation;
• battery farming of poultry/pigs;
• reclamation of marshland/wetland;
• terracing;
• HYV seeds;
• GM crops/GMO – genetically modified organisms;
• Aeroponics;
• Hydroponics;
• Crop rotation/leave fields fallow;
• Greenhouses/plastic sheeting; etc.

3. Suggest reasons why coffee production varies from year to year.
Ideas such as: variation in precipitation/water availability; amount of sunshine; temperature differences; incidence of frost; pests/disease/floods/natural hazards; fluctuation in world price of coffee/fluctuation in demand; amount of land used for coffee; amount of fertilizer used/soil fertility declines/soil has been exhausted; government subsidies/grants offered by government; quality of seeds, etc.

4. Describe different methods of soil conservation which can be used by commercial farmers.
Ideas such as: farmers can add manure/fertilizer; use of crop rotation/land left fallow; avoidance of monoculture/overcultivation avoiding overgrazing; contour ploughing; terracing; building small walls to trap soil; planting windbreaks or hedges; cover-cropping/inter-cropping/strip farming; dry farming; mulching, etc.

5. Explain why agricultural land use varies from place to place.
Reference to factors such as: temperatures; rainfall/water supply; length of growing season; fertility of soil; relief; market; availability of government subsidies; quotas; availability of finance/capital; sunlight;

3.3 Food Shortages

About 15% of the world's population suffer from hunger i.e. 815 million people in the world. The problem is concentrated in Africa but it also has an impact on a number of Asians and Latin America countries. Food shortages can occur because of both natural and human factors.

The 10 hungry countries

1. Somalia
2. Burundi
3. Congo
4. Afghanistan
5. Eritrea

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6. Haiti
7. Mozambique
8. Angola
9. Ethopia
10. Tajikistan

Causes and effect of food shortages:

1. Soil erosion
2. Drought
3. Locusts
4. Tropical cyclones
5. Severe winter weather
6. Economic and political factors
7. Transport / access issues

1. **Soil erosion:** Bolivia, which is located in the heart of southern America, farming, deforestation and grazing of livestocks have all increased soil loss and erosion. With increasing population over 7 million and living on the marginal farming land, using wood for cooking and clearing land for food lead to more deforestation and soil erosion.

2. **Drought**: Rapidly rising food prices and drought have contributed to the worst hunger crisis seen in Ethiopia and Somalia. Drought in Afghanistan is also led to food problem as the high price has affected the import.

3. **Locusts:** In West Africa, locusts settled and began to eat even bit of greenery in sight. As they finished eating up all the green leaves and plants, they look for greener pastures. The worst plague for 15 years affected much in West Africa.

4. **Tropical cyclone:** The tropical cyclone and flood destroy crops in some countries in the tropical region. In Bangladesh, every year thousand are killed in flood and storms in this low-lying region of the Ganges delta. These also cause a lack of clean water, food and shelter.

5. **Severe winter:** In Tajikistan, due to severe long winter, many rivers are frozen, roads are blocked with snow and electricity is limited to two hours per day. The severe weather destroyed potato harvest and over half a million local people are unable to afford minimum food needs

6. **Economic and political factor:** In addition to physical factor, political unrest and conflict lead to food shortage. In Sudan, the Arab live in the north and the African in the south. Tension between these two groups led to civil war in 2003. In 2009, periodic drought and civil war to food shortage. Since 2003, the region has seen one of the world's largest concentration of human suffering.

7. **Transport /access issues:** Afghanistan faces a deficit of 2 million of wheat flour and rice to feed 6 million people during the drought. But the biggest problem is the transportation. They need the food convoy to reach mountain areas before the road are block by heavy snow.

Food problem: A case study on Sudan

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In recent years there have been severe food shortages in the Sudan, Africa's largest country. The long civil war and drought have been the main reasons for famine in the Sudan, but there are many associated factors as well.

The civil war, which has lasted for over 20 years, is between government in Khartoum and rebel forces in the western region of Darfur and in the South. One of the biggest issues between the two sides in the civil war is the sharing of oil wealth between the government –controlled north and the south of the country where much of the oil is found. The UN has estimated that up to 2 million people have been displaced by the civil war and more than 70,000 people have died from hunger and associated diseases.

Some of the important factors that led to food shortages in Sudan are:

1. **Physical factors:**
   i) Drought in the southern Sudan
   ii) Increased rainfall variability
   iii) Increased use of marginal land leading to degradation
   iv) Flooding
   v) Limited access to famine areas

2. **Social factors**
   i) High population growth (3%) linked to use of marginal land (overgrazing, erosion)
   ii) High female illiteracy rates (65%)
   iii) Poor infant health
   iv) Increased threat of AIDS

3. **Economic / political factors**
   i) High dependency on farming (70%) of labour force
   ii) Dependency on food imports and exporting non-food goods like cotton
   iii) Limited access to markets to buy food or infrastructures to distributed it
   iv) Debt repayment limit social and economic spending
   v) High military spending
   vi) Lack of food surplus for use in crisis
   vii) Conflict in Darfur reduces food production and distribution
   viii) Lack of political will
   ix) Slow donor response
   x) Regional food shortages

Farming and its problems/disadvantages/impact on natural environment:

- Soil erosion – due to farming there is soil erosion and soil deterioration
- Eutrophication – the presence of fertilizers promote rapid grow of plants in water bodies and create deficiency of O_2 for aquatic organisms.
- Bioaccumulation – accumulation of pesticides in plants tissues.
- Biomagnification – the amount of pesticides is increased with increased in level of food chain
- Global warming – increased in temperature of the earth due to deforestation for farming
- Deforestation - loss of vegetation/cutting down trees
- Impact on habitat
- Loss of species/endangered/extinction
- Impact on food chains/ecosystems

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- High levels of atmospheric pollution
- Acid rain
- Noise scares animals/disturbs wildlife

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REVISION QUESTIONS

1. Explain why there are food shortages in some parts of the world.
Ideas such as; • poverty/can't afford to buy food/imports/fertilisers;
• drought/no precipitation; • crops have low yields (dev);
• war; • food in storage is destroyed (dev);
• infertile soils; • soil erosion;
• desertification/ground too dry;
• production of cash crops for export;
• poor distribution;
• poor storage;
• food is eaten by insects/mice (dev);
• natural disasters or examples/flooding (Max 2);
• corrupt government doesn't distribute food equally; uneven distribution of food; etc.

2. Describe the impacts of a drought on an area or country you have studied.
Content Guide:
• death,
• starvation,
• malnutrition,
• reduction of yields/loss of crops and livestock,
• forced migration,
• drying up of water courses,
• death of natural vegetation,
• impact on food chains/ecosystems etc

3.4 Industry

Industry refers to the production of goods for sale or the production of materials that can be used in the manufacturing of good. Industries can be classified as –

1. **Primary sector**
2. **Secondary industry**
3. **Tertiary industry**

(Some of the authors add Quatenary (knowledge and research) or even Quinary (culture, top executives) sector)

Primary sector: involved in extraction of resources directly from the earth; which include farming, mining logging. They do not process the products at all. They send it off to the factories to process or make profit.

Secondary sector: refer to work that involves in processing of raw materials or the manufacturing of good from raw materials. Secondary industry has two types:

a) Light industry (textile industry, electronic industries)

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b) Heavy industries include Iron and Steel industry, ship building etc.

Tertiary sector: Tertiary industries provide services to people and serve the primary and secondary industries. Example, teaching, managing, retailing, tourism etc

Quatenary sector: this involved in the research of science and technology. This includes – scientist, researchers etc.

Quinary sector: some consider this to be a branch of quaternary industries. This includes the highest level of decision making bodies. This include top executives or official like Government official, culture, media etc.

Employment structure: Employment structure means how the workforce is divided up between employment Sectors

Manufacturing industry: It is refers to work that involves in processing of raw materials to finishing goods. Example: Textile industry, Iron and Steel industry

High technology industry: High technology industries are science-based or computerized method industries such as aerospace, pharmaceuticals, computers, and manufacture of communication equipment and scientific instruments.

2. **What are the locational factors that affect the setting up of a manufacturing industry?**
Every decision is about where to locate industrial premises, ranging from small shops to huge industrial complex. For each possible location a wide range of factors can have an impact on total cost and thus influence the decision making process.

The location factors that affect the location of manufacturing industry are briefly described below:

Physical factors:

i. **Land (site for the industry)**: the availability and cost of the land is important. Large industries in particular need flat, well drained land on solid bed rock.
ii. **Raw materials:** industries requiring heavy and bulky raw materials, which are expensive to transport will generally locate as close to these raw materials as possible.
iii. **Water supply:** availability of sufficient water supply is important. A huge quantity of water is used in manufacturing in some industries like cooling purpose.
iv. **Power supply:** for an industry to operate efficiently there need to power to drive the machinery. Some of the industries that need lots of power such a metal smelting may be require to locate in those countries having relatively cheap hydroelectricity.

Human factors

v. **Capital :** early industry depends on wealthy of the entrepreneurs. However, today bank government may give loan and subsidies. Availability of capital that can be in the form of machinery and buildings may be consider for setting up and industry.

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vi. **Labour:** the availability of cheap labour is also another important factor influencing the location of industry. Some industries need many workers who need not be highly skilled.

vii. **Transportation and communication:** transportation cost plays a very important part in the location of an industry. An area which is well connected to other places by transport is usually more attractive to an industry than one which is poorly linked.

viii. **Market** : the present of a ready market that is demand for goods influences the location of some industries. Perishable goods like dairy products are generally located near the market**.**

ix. **Government policies** : government policies may encourage or restrict the location of industries. Economic and social consideration such as peace and stability are important since it is the duty of the government to ensure that a country's resources are used to the best advantage.

x. **Quality of life:** highly skilled personnel who have a choice about where they work will favour areas, where quality of life is high like availability of infrastructures.

1. Case study: Manufacturing industries

Location: Pipri Iron and steel industry in Pakistan

After independence from India in 1947, it did not take long for Pakistan to realize that in order to develop the industrial sector of its economy. After much debate, the first Steel factory for Pakistan steel were built in 1973, completed and formally opened on 15th Jan. 1985.

Factors for setting up manufacturing steel industry in Pipri, Pakistan are:

Physical factors:

i) **Land:** Flat, cheap unused land was available at Pipri near Gharo creek, which is about 40km east of Karachi.

ii) **Harbour:** Port Qasim has a natural habour that can deal with imports of materials and exports of steel to the countries neighbouring the Arabian sea and east and west of the Indian ocean. The 2.5km sea water channel is kept navigable for ships.

Human factors:

iii) **Capital:** the former USSR (now Russia) provided economic assistance in the form of technical expertise, finance and capital.

iv) **Raw materials:** iron ore, manganese and most of the coking coal can be imported through Port Qasim. Limestone needed as a flux can be brought by road from the nearby Makir Hills near Thatta. Large quantities of water required for making steel can be brought from Lake Halejr.

v) **Transportation**: Pipri was connected to the main Karachi – Kotri railway. Metalled road also connected this area to the main road system.

vi) **Labour:** plenty of skilled and unskilled cheap labour was available locally from Karachi.

vii) **Market**: many steel – using industries were located in Karachi such as too making. It supplies rolled sheets, galvanized sheets, pig iron and coal to the rest of the country. Over half the steel is used in the Punjab at Taxila where a heavy mechanical complex was established with Chinese finance in 1979.

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REVISION QUESTIONS

Q1. Explain why, in many countries, industrial waste is released into rivers, lakes and seas.

Many countries especially in the LEDCs used to release the industrial waste into river, lakes and seas due to some of the reasons given below:

i. It is easy and quick to dispose the industrial waste
ii. It is also cheap to dispose the waste
iii. The environmental protection regulations in LEDCs are weak or no laws
iv. No proper regulations are not enforced
v. Economic growth given preference over environment

Q2. Describe the advantages and disadvantages for people of living in industrial zones.

The advantages of people living in industrial zones are:

i. The people get the job opportunities
ii. They are close to the working place
iii. Money is circulating in the area
iv. There is improvements of standard of living
v. There is development of infrastructures like road networks, electricity, water supply;
vi. Provision of housing by company to the employees

Disadvantages such as:

i. The atmospheric pollution like smoke is causing health problem
ii. The smell causes breathing difficulties and unpleasant conditions for the people
iii. Pollution of drinking water supplies
iv. Noise pollution to the local people living there
v. Traffic congestion become another problem to the people
vi. It is also causing visual impact to the people

Q3. For a named area where manufacturing industry is important, describe its impacts on the natural environment. Name of area.

Location: Pipri, Pakistan: Introduction: After independence from India in 1947, the Pakistan built the first Steel factory in 1973, completed and formally opened on 15th Jan. 1985.

Some of the impacts on natural environment of manufacturing industry are:

i) It is causing air pollution and killing species of insects
ii) It causes deforestation to the area and thus increasing carbon dioxide
iii) It pollutes rivers therefore reducing biodiversity
iv) It gives off carbon dioxide therefore causing global warming etc
v) It is also affected the animal habitat in the area
vi) It produced about 473 tons a day of carbon monoxide; 182 tons a day of sulphur;
vii) It also produced about 148 tons of polluted dust and particles; 41 tons of nitrogen oxide

Q4. Explain why many large companies have located high technology industries in NICs?

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Today many high-tech industries are located in the NICs as the people are more educated and improved in the infrastructures. Some of the reasons for the location of high-tech industries in NICs are:

i) Increasing market in LEDCs
ii) Availability of large workforce in the NICs
iii) Relatively cheaper labours are more available in LEDCs
iv) It is also observed that more skilled, literate and educated workforce are found in LEDCs
v) The cost of land is also cheaper and more available in LEDCs
vi) There is more lenient labour restrictions
vii) There is also limited trades union activity
viii) Ease of global transport of components and products by air and sea
ix) The government also give subsidies and support
x) The government also take low taxes

Q5. Suggest reasons for the changes in employment structure from Primary and Secondary to Tertiary Industry in LEDCs.

i) Import of food supplies
ii) Loss of agricultural land to urban expansion
iii) Industry
iv) greater use of technology in farming
v) movement to the cities
vi) automation/mechanization of manufacturing
vii) industry/ factories;
viii) increase in service provision/schools/hospitals; tourist development; increase schools/ education/ increases literacy/more skilled;
ix) more money to spend on services; running out of raw materials e.g. coal/iron ore (DEV); agricultural produce
x) manufactured goods now imported; etc.

Q6. Give an example of a manufacturing or processing industry and name an area where this type of industry is located. Explain the factors which have attracted this type of industry to the area.

Industry chosen .....Answer: Pakistan: large workforce; good transport links; cheap land; raw materials; energy supply; water supply etc.)

Q7. Name an area where either manufacturing or processing industry is important and give an example of a type of industry (or factory) which you have studied in that area. Explain the reasons for its growth at that location.

Answer: Pipri in Pakistan (or any place) : large workforce; good transport links; cheap land; raw materials; energy supply; water supply etc. (e.g. large workforce with engineering skills, good rail links to raw material supplies, located on coalfield for energy supply, water supply to use in processing etc.) (e.g. good motorway links to markets in large cities such as Lahore, Karachi, government grants for investment, large areas of flat land available, large workforce in urban area etc.) **Explain in details.**

Q8. Describe the likely benefits to the people of the development of manufacturing industry in the area. [4]

When there is development of manufacturing industry, the people in the areas will be benefited. Some of the benefits are mention below:

i) The people get the job opportunities

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ii) They are close to the working place
iii) Money is circulating in the area
iv) There is improvements of standard of living
v) There is development of infrastructures like road networks, electricity, water supply;
vi) Provision of housing by company to the employees

Q9. Describe the problems which manufacturing industries, such as the meat processing factory, might cause for the natural environment in and around Lobatse.

i) There will be atmospheric pollution like smoke from factory; exhaust fumes from lorries.
ii) Pollution of rivers and groundwater
iii) It will also have visual impact
iv) There will be deforestation leading to less natural vegetation
v) Impact on fauna and loss of their habitats
vi) Impact on ecosystems and food chains

Q10. High technology industries are science-based industries such as aerospace, pharmaceuticals, computers, and manufacture of communication equipment and scientific instruments. For a named country or area which you have studied, explain why high technology industries were located there.
Points to mention: (Read the given notes) example: skilled, highly qualified workforce, good motorway links to transport finished products, proximity to international airport to import component parts, large areas of attractive, government investment into planned high tech; government 'technology action plan' put emphasis on technology etc. industrial areas greenfield sites for employees to live, near universities to obtain skilled workforce etc.)

Q11. For either high-technology industries or manufacturing industries, explain how:
• transport, • labour, • markets, • *at least* one other factor influenced its growth at a named location you have studied.
Answer: Explain how transport, labour, markets and other factors you have mentioned are helping to grow the industries.
Q12. What are the types of industry sector? (Primary, Secondary and Tertiary sector)
Q13. Give an example of light and heavy industry. (Textile and ship building)
Q14. Describe the inputs, process and outputs of a textile industry. (Answer from the textbook)
Q15. Give an example of Manufacturing and Hi-tech industry. (Textile industry and Aerospace industry)
Q16. Name an area you have studies where manufacturing industry is carried out. Describe the impact of this industry on the natural environment. (Read about the Pakistan Steel industry)

Q17. Why the LEDC needs industry? What are the inputs that need for a manufacturing industry? (In order to develop the industrial sector of its economy; to avoid paying huge import bill; no to relying on other countries. Second part: Inputs: Capital, enterprise, land, raw material, power, labour)
Q18. Give an example of an output that is a final product sold directly to the general public and an output that becomes a raw material for another industry. (drugs, fans,

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garments, tractors etc) (bottles, cotton cloth, nuts and bolts, steel sheets, axles, electric motors, fan guards etc)

Q19. There is an iron and steel industry in your city. Write the negative and positive impacts to the local people.

Positive impacts:

i) The people get the job opportunities
ii) Money is circulating in the area
iii) There is improvements of standard of living
iv) There is development of infrastructures like road networks, electricity, water supply;

Negatives impacts:

i. The atmospheric pollution like smoke is causing health problem
ii. The smell causes breathing difficulties and unpleasant conditions for the people
iii. Pollution of drinking water supplies to the people
iv. Noise pollution to the local people living there

3.5 Hi- Tech Industry

Hi- tech industries involve making and using Silicon chips, computers, semi-conductor devices and micro-electronics to make computers, pharmaceuticals communications equipment for the aerospace industries. One of the earliest – concentration of hi-tech industry was in 'Silicon Valley' near San Francisco, in the US in 1960s and this is still one of the most important locations.

Attraction for hi-tech industries location:

i) Easy access to airports
ii) Government incentives
iii) Attractive landscaped working environment
iv) Good road link
v) Highly qualified and skilled work force
vi) Close to research facilities and universities
vii) Attractive location to live – shopping, cultural and entertainment facilities.

2. Case study: High –tech Industries

Location: Silicon Valley North: Ottawa Region of Canada

High-technology is the fastest growing industry in Canada today. Ottawa has the greatest number of electronics and computer companies in Canada. The area is known as 'Silicon valley north' after the world renowned Silicon Valley (south) in California.

Some of the reasons for location of hi-tech industries in Ottawa are:

i) It is the capital city. Decision makers and experts of all kinds work there.
ii) The region has benefited from the growth of public scientific research laboratories such as the Atomic Energy of Canada Laboratory.
iii) Ottawa's two Universities are famous for science and engineering, these are strong formal and informal links between high-tech firms and the universities

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iv) Many high-tech companies begin with the help of government grants and many now rely on government contracts for work.
v) High-tech firms benefits from the 'agglomeration economies' being close together
vi) The region has had good access to venture capital which has been vital in providing the start up costs of many new companies.
vii) It is close to major Canadian and US markets where many of the products are sold
viii) Ottawa is a very pleasant place to live. This helps firms to highly skilled workers.

High-tech companies in Ottawa include:3M, Dell Hewlett Packard (HP), IBM, Intel, Mitel, Nortel etc. There are 1841 high-tech companies and 78000 people working there.

Impact of industrial development:

- Location of New industry
- Creates jobs and attracts people
- Growth of service industries
- Development of industry to supply inputs
- Increase of local government fund through taxes
- Investment in infrastructures, road, public utilities, health and education

3.6 Tourism

Leisure activities and tourism

The World Tourism Organization (WTO) defines **tourists** as people *"traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes".* Tourism involves the temporary movement of people to places away from home, the activities they engage in and the facilities and services that are created to meet their needs. According to the WTO reports in 2012, France (83.0 million), United States (6.0 million) and China (57.7million) are the three countries most visited international tourist.

Reasons for the growth of tourism / Factors affecting tourism:

There are many hidden costs to tourism, which can have unfavorable economic effects on the host community. Often rich countries are better able to profit from tourism than poor ones. Many countries both in the LEDCs and MEDCs invest capital for tourism like in hotel, airports, road and other infrastructures and amenities that facilitates the tourists.

1. Economic Factors

- Economic improvement and rising of real income enable people to travel
- Widening range of destinations within the middle-income range
- Cost of certain vacations act as a travel barrier
- Globalisation has increased business travel considerably

2. Availability of Infrastructures

- Improvement in transportation enable people to reach faster and cheaper
- Some of the amenities like hotels, recreational, amusement parks etc
- The modern information technologies have a great impact in tourism

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3. **Political Factors**
   - Government investment in tourism industry encourages tourism
   - Government making easy visa and immigration regulations, use of foreign currencies and credit card in the country
   - Tourists avoid areas of political unrest
   - Reports of terrorism, virus or high crime rates can keep people away

4. **Natural and cultural attractions**
   - The natural attractions are like beaches, hilly stations, mountains, waterfalls, snowfalls, flora and fauna etc
   - The cultural attractions includes: arts, music, dances, festival, sports events, monuments, ancient historical sites etc.

The benefits tourism to receiving areas

1. **The economic impact**
   - **Foreign currency:** The tourists spend money for the goods and services provided to them. This inflow of foreign money helps the country to grow economically.
   - **Job opportunity:** Tourism has some direct and indirect effects. People are directly employed in the tourism industry as driver, office staff, travel agency, entertainer, tourist guide etc. The indirect effect include: aircraft manufacturing, computer, financial services and other services.
   - **Employment in rural:** By providing employment in rural areas help to reduce rural-urban migration. Such migration is a major problem in many developing countries.
   - **Small business:** It can create openings for small businesses such as taxi firms, beach café etc. it can support many jobs in the informal sector, which plays a major role in the economy of many developing countries.

2. **Environmental impact**
   - Tourism helps to improve the environment as the government help to keep clean and maintain the environment.
   - The historical buildings, monuments, museum are conserved for tourists attraction

3. **Socio-cultural impact**
   - Through tourism people come to contact and learn each other culture.
   - Learning other culture promote international good will and understandings
   - Tourism encourages the preservation of traditional customs, handicrafts and festivals

Problems of tourism in receiving areas:

#Economic leakage: Economic leakages are that part of the money a tourist pays for a foreign holiday that does not benefit the destination country because it goes elsewhere. The cost of goods and services imported for tourism industry. In most all-inclusive package tours, about 80% of travelers' expenditures go to the airlines, hotels and other international companies (who often have their headquarters in the travelers' home countries), and not to local businesses or workers.

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1. Economic problem:

- Job opportunities are provided but it is a low paid, seasonal and temporary, which affect the income of the employees.
- Economic leakage is another problem as it does not benefit much to the destination country.
- At some destinations tourist spend most of their money in their hotels with minimum benefit to the wider community.
- Increasing demand for basic services and goods from tourists will often cause price hikes that negatively affect local residents whose income does not increase proportionately.

2. Environment

- Tourism also contributes to the degradation of the environment.
- In many developing countries, a large amount of waste are found littering which pollute the air, streams and deface of the tourists sites.

3. Socio-cultural

- Interaction with the tourists can influence drugs abuse, alcoholism and spread of Aids.
- Interaction with tourists can also lead to abandon the traditional cultures and values.
- Crime and prostitution sometime involving children
- Desecration of religious places and hurting the sentiment of the host country

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REVISION QUESTIONS

Q1. Explain why the tourist industry has developed at a named location which you have studied.

Q2. Give three reasons why international tourism has increased.

Ideas such as: Increasing affluence; developments in travel/larger planes; tourists are being more adventurous; more knowledge about distant locations/internet; increased holiday time/time off work/paid holidays; more advertising; etc.

Q3. Suggest four negative impacts of the hotel on the natural environment.

Ideas such as: natural vegetation/forest/grassland removed for construction; estructions of habitats; vegetation/plant life trampled/killed by people; swimming in sea/boats anchoring could damage corals/rocks; increase disposal of sewage in sea/rubbish in sea; fumes from traffic/air pollution from traffic; lowering of water reserves/water table; noise scares animals; death of fish/sea creatures; specific impact of litter/rubbish left on natural environment; break down of ecosystems/destroys ecosystems; cliff has been cut away to make a road; etc.

Q3. Explain how the tourist industry might cause problems to the local people living in the area?

Problems such as: increase in local traffic/traffic congestion/atmospheric pollution; from traffic; hotel could cause visual impact; loss of local culture/traditional way of life; impact of behaviour of tourists/drunkeness etc.; noise disturbs people; exploitation/low paid jobs/long hours; seasonal work; shortage of water supplies; litter from tourists; lack of privacy; loss of farmland for building; visual impact; increases prices in local shops; Government invests more money in tourist areas rather than local housing; etc.

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Q5. For a named area which you have studied, explain how physical and human factors have encouraged the growth of the tourist industry.
Name of area: (e.g. hot weather, sunny, low rainfall, nice scenery, beaches, local culture, easy to get to, waterfront restaurants/bars etc.) low rainfall so tourists can go on the beach, clean blue seas so can do water sports, waterfront restaurants/bars for evening entertainment, attractive headlands with cliffs so people can enjoy a picturesque environment, sheltered sandy bays ideal for sunbathing, ease of access via good roads and airport etc.)

6. Explain how its negative impacts of tourism are managed.
national Parks;
• nature reserves;
• restricted access;
• litter control etc.
Place specific detail may in

3.7 Energy

The demand of energy in the world is increasing as the world population continues to grow. In those LEDCs, the main source of energy tends to be fuel-wood used for heating, cooking and even scaring away the wild animals. However, as the countries developed further, their source of energy changes. They probably continue to depend on fossil fuels, but will begin to use more renewable energy.

Reasons of increasing use of renewable energy resources or reasons for the change in using fossil fuels to renewable energy resources.

- Greater concerns for the environment
- Rising prices of fossil fuels
- The knowledge that fossil fuels are finite
- Aim to reduce reliance on fossil fuel exporting countries
- The hope of developing and selling renewable technology
- Better technology and increased stability allowing nuclear development
- Fossils fuels are exhaustible and need alternative means

Fossil fuels: combustible organic matter that is made from the remains of former flora and fauna. Eg. Petroleum

World energy use, 2007

- Oil provides 37% of the world's energy
- Coal provides 25% of the world's energy
- Natural gas provides 23% of the world's energy
- Nuclear power provides 6% of the world's energy
- Fuel wood provides 4% of the world's energy
- HEP provides 3% of the world's energy
- Others provides 2% of the world's energy

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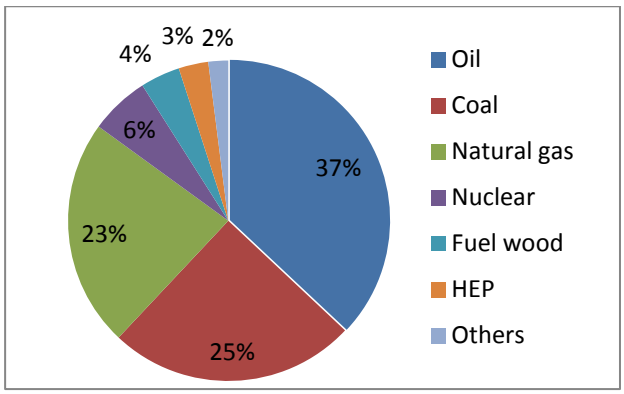

World fossil fuel energy producers, 2007
Top 5 Oil producers in the world are: 1. Russia 2. Saudi Arabia 3. USA 4. Iran and 5. China

Top 5 Coal producers countries are: 1. China 2. USA 3. India 4. Australia 5. South Africa

Top 5 Gas producers countries are: 1. Russia 2. USA 3. Canada 4. Iran and 5. Norway

Renewable energy: Renewable energy is energy which comes from natural resources which are renewable (naturally replenished). Some examples of renewable energy are: Sunlight, wind, rain, tides (Hydro-electric energy), and geothermal energy (Both rain & tides are hydro energy); energy that is naturally occurring and potentially infinite e.g: wind

Types of Renewable Energy
Solar energy: Solar energy is the energy derived from the sun through the form of solar radiation. Solar powered electrical generation relies on photovoltaic and heat engines. A partial list of other solar applications includes space heating and cooling through solar architecture, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes.

Wind energy: Wind power is the conversion of wind energy into a useful form of energy, such as using wind turbines to make electricity, wind mills for mechanical power, wind pumps for pumping water or drainage, or sails to propel ships. The environmental effects of installing one electricity-generating wind-mills are relatively low. Wind power consumes no fuel, and emits no air pollution, unlike fossil fuel power sources. The energy consumed to manufacture and transport the materials used to build a wind power plant is equal to the new energy produced by the plant within a few months of operation.
Hydro energy: Hydro energy is the power that is derived from the force or energy of moving water, which may be harnessed for useful purposes. Prior to the widespread availability of commercial electric power, hydropower was used for irrigation, and operation of various machines, such as watermills, textile machines, sawmills, dock cranes, and domestic lifts.
Geothermal energy: Geothermal energy is energy obtained by tapping the heat of the earth itself, both from kilometers deep into the Earth's crust in some places of the globe or from some meters in geothermal heat pump in all the places of the planet. It is expensive to build a power station but operating costs are low resulting in low energy costs for suitable sites. Ultimately, this energy derives from heat in the Earth's core.

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Geothermal power is cost effective, reliable, sustainable, and environmentally friendly, but has historically been limited to areas near tectonic plate boundaries.

Biomass: Biomass is a renewable energy source, which is biological material from living, or recently living organisms, such as wood, waste, (hydrogen) gas, and alcohol fuels. Biomass is commonly plant matter grown to generate electricity or produce heat. In this sense, living biomass can also be included, as plants can also generate electricity while still alive. The most conventional way on how biomass is used however, still relies on direct incineration. Forest residues for example (such as dead trees, branches and tree stumps), yard clippings, wood chips and garbage are often used for this. However, biomass also includes plant or animal matter used for production of fibers or chemicals. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic materials such as fossil fuels which have been transformed by geological processes into substances such as coal or petroleum.

Advantages:

- Renewable energy is renewable, therefore sustainable and so will never run out
- Generally required less maintenance than the traditional generators
- Its fuel being derived from natural and available resources reduces the cost of operation
- Even more importantly, renewable energy produces little or no waste products such as carbon dioxide or other chemical pollutants.
- Renewable energy projects can also bring economic benefits to many regional areas. These economic benefits may be from the increased use of local services as well as tourism

Disadvantages:

- Renewable energy is difficult to generate the quantities of electricity that are as large as those produced by traditional fossil fuel generators.
- This may mean that we need to reduce the amount of energy we use or simply build more energy facilities
- Renewable energy often relies on the weather for its source of power. Hydro generators need rain to fill dams to supply flowing water. Wind turbines need win to turn the blades, and solar collectors need clear skies.
- This can be unpredictable and inconsistent
- The current cost of renewable energy technology is also far in excess of traditional fossil fuel generation (new technology and large capital cost)

Non- renewable energy: energy that be reproduced in the time that it takes to consume it eg. Coal

Advantages:

- Energy production using coal can be increased or decreased according to demand
- The technology to burn coal to generate electricity already exists
- Technology is improving to extract deeper reserves as well oil in tar sands (Canada)
- It is now possible to compress gas and transport it more easily

Disadvantages

- Source is finite so will eventually run out

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- Many existing reserves are becoming harder to extract or are in environmentally sensitive areas
- It releases large amounts of green house gases when burnt causing pollution (coal, oil)
- Mining deep underground is very dangerous
- Very bulky and expensive to transport around the world (coal)
- It is located in politically unstable countries or environmentally sensitive areas (eg. Oil – Libya and Iraq)
- Oil is vulnerable to large scale changes in its price
- Gas is vulnerable to leaks and explosions

Locational factors for Thermal Power

- Proximity to coal mine
- Availability of water –river or lake
- Nearness to rail-road transportation
- Nearness to coastal/port – to import coal
- Large area of land
- Locally available skilled and unskilled workforce

Advantages of Thermal Power

- Large amount of electricity can be produced in one place
- Transporting oil and gas to power station is easy and cheap
- Gas-fired power stations are very efficient and can generate electricity at low cost
- A thermal power station can be built almost anywhere, so long as you can get large quantities of fuel to it.
- They are less expensive to build than nuclear power station
- They do not produce dangerous waste

Disadvantages:

- Burning any fossil produces carbon dioxide and sulphur dioxide, which contribute to the greenhouse effect and acid rain
- Mining, and the use of large areas of land for power station, destroys natural vegetation and landscape
- Pollution of rivers may occur as a result of using large amount of water for cooling.
- Oil and gas stocks are running low. Their 'ownership' often leads to argument by the leading countries of the world
- Fossil fuels are non-renewable and increasing in cost
- Transporting coal by lorry and train from the mine to the power station causes atmospheric pollution.

Locational factors for Hydro electricity Power (HEP)

- Good topographical location along the path of river – high altitude
- Right geological structure – narrow, steep sided valley cut into hard impermeable rocks
- Availability of sufficient water
- Major fast flowing rivers
- Uniform and continuous supply of water
- Away from earthquake prone ozone

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Locational factors for Nuclear Power

- Accessibility to water resources for cooling process
- Close to the coastal area – import and export
- Away from major populated areas
- Flat and vast land for expansion
- Hard rock area for stable foundation
- Transportation facilities
- Away from earthquake prone ozone

Advantages of Nuclear Power

- Very little fuel used
- No green house gases produced
- Produce electricity cheaply
- Does not cause acid rain
- It reduces the dependency on oil, gas, coal producing countries
- The technology to make nuclear power already exist

Disadvantages of Nuclear power

- High cost of building the power station
- Possibilities of release of radioactivity
- Difficulty in disposing of radioactive waste
- Cos of de-commissioning and length of time to de-commission plant at end of useful life
- There is risk that nuclear power station may become terrorists targets
- Countries may misuse nuclear technology to make weapons
- There is a belief that living near to nuclear stations increases the risk of cancer
- Nuclear waste remains radioactive for thousands of years

Uses of renewable and non-renewable energy resources:

- ✓ Level of development of a country and availability of technology – in those less developed countries, due to non-availability of knowledge and skills on technology, they depend on the available resources like non-renewable energy.
- ✓ Availability of finance – the LEDCs do not have enough to install Nuclear or Wind mill due to financial reasons.
- ✓ Government policy – some of the governments are less concern for the environmental problem, while some other government choose to reduce environmental problem and adopt to green energy.
- ✓ Attitude towards the environment
- ✓ Availability of alternatives/reserves of fossil fuels/coal/oil/ natural gas etc.

Energy conservation

It refers to efforts made to reduce energy consumption, energy conservation can be achieved through increased efficient energy use, in conjunction with decreased energy consumption or reduced consumption from conventional energy sources. Energy conservation can result in increased financial capital, environmental quality, national security, personal security and human comfort.

Energy conservation in the United Kingdom has been receiving increased attention over recent years. Key factors behind this are the Government's commitment to reducing

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carbon emission. Domestic housing and road transport are currently the two biggest problem areas.

Energy conservation issues:
Consumer are often poorly informed of the saving of energy efficient products. People need practical and tailored advice how to reduce consumption in order to make change easy.

- The use of telecommunication by major corporation is a significant opportunity to conserve energy, as many Americans now work in jobs that enable them to work from home instead of commuting each day
- Electric motors consume more than 60% of all electrical energy generated and are responsible for the loss of 10 to 20% of all electricity converted into mechanical energy.
- The research one must put into conserving energy often is too time consuming and costly when there are cheaper products and technology available using today's fossil fuels.
- It is frequently argued that effective energy conservation requires more informing consumers about energy consumption, for example through smart meters at home or while shopping
- Some retailers argue that bright lighting stimulates purchasing. However, health studies have demonstrated that headache, stress, blood pressure etc.

Case study on HEP in Indonesia

The Cirata dam is located on the Citarum river in West Java, Indonesia, 100 km southeast of Jakarta. It was constructed between 1984 and 1988 for the primary purpose of hydroelectric power generation. Other purposes include flood control, aquaculture, water supply and irrigation. The power station was completed in two phases in 1998.

Features:

- The dam is 125m tall and 453 m long
- The concrete-face rock-fill dam withholds a reservoir with a gross storage capacity of 2,165,000,000m^3
- Its catchment area is 4119km^2
- The reservoir has a which surface area of 62 sqkm which caused relocation of 6335 families
- The dam's power station is located underground about 4.5 km downstream and contains eight generators (126MW)
- It has a total capacity of 1,008 MW and an annual generation of 1,426 Wh
- It serves mostly as a peaking power plant and is the largest hydroelectricity power station in Indonesia.
- The dam is operated by PT Pembamgkitan, Java Bali

Advantages:

- Main object is to protect millions of people living in down river area (Jakarta) from frequent floods
- It generates more than 100Kw which is the main source of energy for Western Java
- Industries like textiles are using the water from the dam

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- The reservoir, surrounded by hills provide a perfect site for boating and other leisure activities (tourism)
- It provides water supply to the settlements like Depok and Sentul for domestic needs
- It controls soil erosion and protect the most fertile volcanic soil
- It helps in aquaculture

Disadvantages

- The development of this project caused submergence of equatorial forest
- There is a concern that this dam could break due to its sheer weight, earthquake and volcanic activity
- It endangered the animal species and affected their movements
- Reduced sediments in the lower course of river may harm agriculture as farmers depend on fertile volcanic soil
- The reservoir caused relocation of 6335 families
- Tourism may be affected because of concerns on scenic beauty or environment.

.....

REVISION QUESTIONS

1. Describe **one** way in which energy is produced.

Uses named example (e.g. UK). Comprehensive and accurate statements describing one way in which energy is produced including some place specific reference. (Place specific information could include named locations or statistical details)

2. Explain the advantages and disadvantages of generating wind power, rather than using fossil fuels.

Advantages such as: clean/green energy/does not damage the environment; it is renewable; does not pollute atmosphere; or produce solid waste; low production/running costs; will preserve supplies of fossil fuels; does not contribute to global warming (dev)/acid rain(dev); Disadvantages such as: Visual impact; Noise from turbines; Amounts of energy may be limited; Wind doesn`t always blow/unreliable; May negatively affect wildlife/birds; High development cost/set up cost; Shadow flicker; Limited number of sites; which restricts development(dev); etc

3. Explain how hydro-electric power is generated.

Ideas such as: water held in reservoir/water stored behind dam; flows down slope/into water inlet/through control gate; turns turbine; turbine linked to generator/creates electricity.

4. Name an area where large amounts of fuel wood are used for energy, describe the problems this causes for local people.

Time consuming; risk of fires; lung cancer; impacts of erosion of unprotected soil (on people); breathing difficulties toxic fumes/ health problems/ breathing difficulties; e.g. cancer/asthma/heart disease; lost production due to sickness; people have to walk long distances for fuelwood; time consuming collecting wood; back problems causes by carrying heavy loads; food cannot be grown as desertification occurs; less wood supply for building; houses can easily catch fire etc. etc.

5. Give the reasons for variation of uses and the degree of importance of nuclear power, Thermal, wind, solar, HEP etc in different countries.
6. What are the uses of fuelwood, coal, gas, oil etc.?

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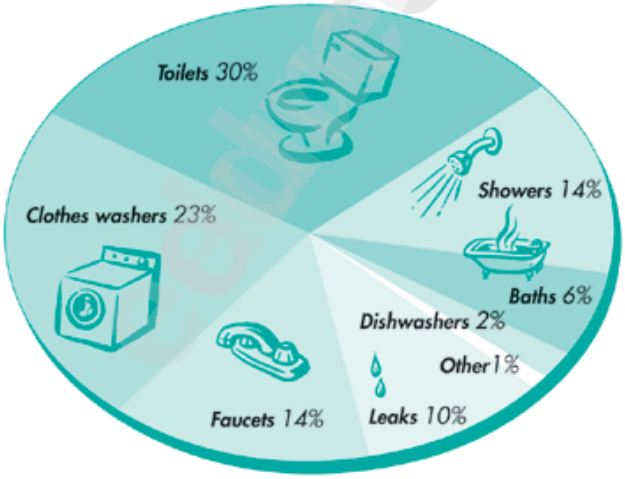
7. Give the reasons for different uses of fuelwood, Coal, Gas, Oil etc.
8. What are the effects of using renewable energy resources?
9. What are the effects of using non-renewable energy resources?
10. Give the reasons for variation in the using of renewable and non-renewable resources in LEDCs and MEDCs or in different countries.

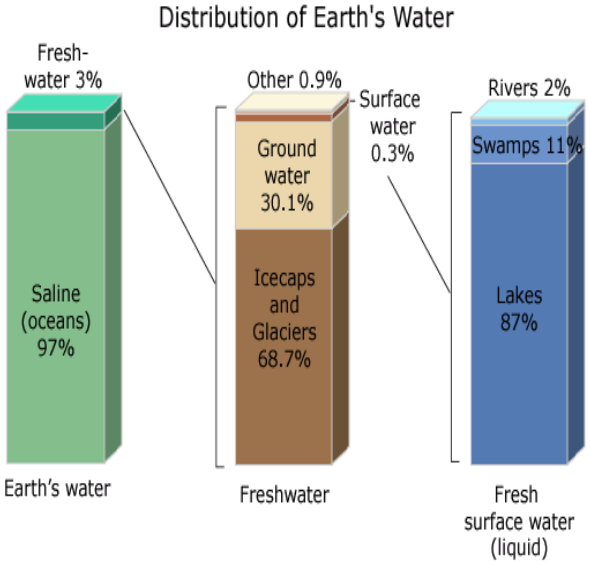
3.8 Water Resources

Where is the Earth's Water?
About 70% of the earth surface is covered by water. The majority of the world's water is seawater (about 97%). This leaves only 3% that is potentially useful for humans. However, out of this freshwater the majority is frozen (about 69%) or under the ground (about 30%). This means that only about 1% of the earth's water is useful and easily accessible.

In terms of surface water, the large continents of North America, Asia and Africa have the most. Every continent has a large supply of groundwater. Even though the world has a lot of frozen water (glaciers and ice caps) the water is not useful because you would have to melt it, releasing large amounts of greenhouse gases and altering local ecosystems and then you would have to transport it large distances to where it is needed.

How is Water Used?
Agriculture is by far the World's biggest user of water. Water is used for animals, but the majority is used for irrigation. The amount being used by agriculture is also increasing as the World's population increases and the demand for food increases. Household or domestic use in the next biggest user. Industry and energy production also uses large percentages in manufacturing and cooling processes. The fourth biggest user is actually water lost through evaporation and leaks in reservoirs.





Groundwater: Groundwater is water stored under the ground. Water can be held in porous rocks called aquifers.

Aquifer: Rocks that can hold water. Aquifers are called "confined" if they are surrounded and contained by aquitards and aquicludes. Unconfined are not contained by aquitards and aquicludes, instead their upper limit is the water table.

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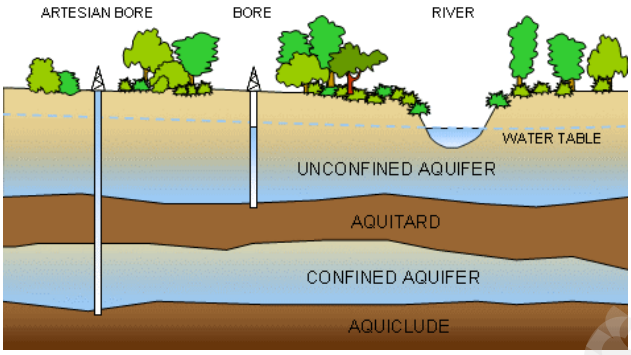
Aquiclude: Rock that will not hold water or allow its movement i.e. they are non-porous and impermeable.
Aquitard: A layer of rock that limits the movement of groundwater. It may be non-porous and has low hydraulic conductivity e.g. clay, that water finds it hard to pass through.

Water table: The boundary between saturated and unsaturated ground.

Salinisation: An increase in the salinity (salt content) of water.
Saltwater intrusion: When aquifers near the coast are depleted and saltwater leaks into the aquifer changing its salinity.

Subsidence: This is the collapsing of ground. Ground may collapse if water has been abstracted (removed) from an aquifer underground. Eg; Parts of Mexico City.



Economic water scarcity: This is when water is available, but for some reason it is inaccessible or unusable. Because groundwater is expensive to extract and transport.

Physical water scarcity: This is when there is not enough water available. The most common reason for this is low precipitation rates.

Water stress: This is when the demand for water exceeds the supply of water causing water shortages. Water shortages are known as **droughts**.

The main reasons for demanding of water

- **Population Growth:** As with many of the world's resources, they are coming under increasing pressure as the world's population grows.
- **Domestic Demand:** The demand from households is not only increasing because there are more households in the world. For example as peoples income increases and they move into permanent residences, they demand flush toilets, washing machines, dishwashers and green gardens, all of which use large amounts of water.
- **Agricultural Demand:** As can be seen below, agricultural places by far the biggest demand on water. With a growing population, global warming and the movement in to less favourable agricultural regions, the demand from agriculture is only likely to increase in the future.
- **Industrial Demand:** As the world's population grows and becomes richer our demand for industrial products grows. Many industrial products, like metal making use huge quantities of water and place increasing demand on resources.
- **Energy Production:** Although HEP is the most obvious form of energy that uses water, there are types of energy that uses large amount of water for cooling e.g. coal and nuclear power, may pollute or evaporated water removing it from local use.
- **Mismanagement:** If water is not used sustainably or used inappropriately then water shortages can occur. One of the most famous examples is the Aral Sea near Kazakhstan. Water was taken from the two rivers that fed the Aral Sea to irrigate the desert and grow cotton. Unfortunately so much water was needed to grow cotton in the desert that no water reached the Aral Sea and it began to dry up.

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Impacts of Water Shortages

- **Drought:** If there is water scarcity and water stress exists then drought can occur. Because drought is below average supply of water, even relatively wet country's like the UK can suffer from drought.
- **Crop Failure:** If there is a shortage of water and farmers cannot irrigate their crops then they will die.
- **Livestock Deaths:** If livestock don't have enough water to drink they will begin to die.
- **Famine:** If cops are failing and livestock are dying then people will become undernourished and suffer from famine.
- **Groundwater Depletion (subsidence and saltwater intrusion):** If aquifers begin to dry up or are used unsustainably, then the ground above can subside (collapse) or the aquifer can suffer from salinisation.
- **Conflict:** If there is a limited supply of water and water resources are shared conflict can arise. The ongoing border dispute between Israel and Palestine is often blamed on water shortages.
- **Refugees:** If there is drought and famine then people are forced to relocate as refugees or face death.

Impacts of Water Pollution

- **Disease:** Dirty water can attract mosquitoes which can increase diseases like dengue and malaria. Dirty water can also cause the spread of diseases like hepatitis A and typhoid as well as diarrhoea.
- **Eutrophication:** Run-off from farms containing fertiliser can lead to the excess growth of algae causing water to not oxygenate properly or receive enough light. This can cause plants and animals to suffocate and die.
- **Sewage Treatment:** This is the removal of contaminants from waste water and household sewage. It requires physical, chemical and biological processes to remove all the contaminants and make safe.
- **Biodiversity Loss:** Dirty water and eutrophication can cause loss of biodiversity in wetland environments, but also just like humans can die of thirst and starvation, so can animals. Big animals like elephants which require large amounts of water often die in African droughts.

Possible Solutions to Water Shortages

- **Irrigation Projects:** Countries that have regional shortages of water or variable rainfall can use irrigation systems to redistribute water and water the land. More efficient forms of irrigation, like drip irrigation can also be used.
- **Reduced Leakage:** Leakage is a huge problem, especially in countries with old pipe networks. In the UK it is estimated that 460 million litres of water is lost everyday through leaks. (Enough water for 22m people leak from pipes EVERY DAY - Daily Mail Article)
- **Dam Construction:** If Dams are built sustainable they can create artificial stores that can collect water in rainy seasons and distribute during drier periods.
- **Water Metering:** Charging people per unit of water used, rather than charging a flat fee can drastically reduce wastage and make people consider how and when they use water.
- **Construction of Wells:** Many countries cannot afford to have piped water to every residence so wells become important in accessing groundwater supplies. As long as

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wells are used sustainably they can be a vital source of water in many LEDCs and arid countries.

- **International Cooperation:** When water is shared, it is necessary to have sustainable policies to reduce the tragedy of the commons. The countries along the Nile are trying to create such agreements, but Egypt is hostile to any plans to redistribute.
- **Virtual Water:** Many products use large amounts of water to produce. For example it is estimated that 4500 litres are needed to produce just one beef steak. It has therefore been suggested that arid countries should specialise in producing products that need less water to produce. The products cold then be traded between each other, so **instead of water being traded, products with large amount of water used in their production are being traded - this is virtual water.**
- **Desalination:** With the growing shortage of freshwater, attempts have been made to desalinate seawater more efficiently. Traditionally the processes has involved evaporation water off to remove salt (thermal desalination), but increasingly reverse osmosis is being used to forces water through semi-permeable membrane to remove salts. Although the second process uses less energy, both are energy intensive and require high levels of technology.

The UK is trying to save water by using the following methods:

- Reducing leakages
- Metering water
- Educating people about water conservation
- Building reservoirs
- Improving sewage treatment
- Introducing hosepipe bans (only temporary)

Conservation and Education: Residents and water users can be educated about basic conservation methods which can reduce water wastage. (half flush toilets, showering instead of bathing, watering the garden after sunset and recycling grey water (shower water, etc)

Case Study: Lake Biwa, Japan

Lake Biwa is the largest freshwater lake in Japan, covering an area of 670km2. It is located on the island of Honshu, north east of the cities of Kyoto and Osaka. After the end of World War II, Japan demilitarised and concentrated on rebuilding its economy and population. Between 1945 and 2010 Japan's population grew from 72 million to 128 million. Japan's economy was regarded as an economic miracle, growing at 10% a year in the 1960's. Japanese companies like Toyota, Nissan, Mitsubishi, Sony and Toshiba started to grow rapidly. The area around Lake Biwa became one of the most densely populated and most industrialised in the country. Osaka on its own contains about 2.7 million people. As well as population and industrial growth, agriculture was also to grow rapidly to meet growing demand.

The rapid growth meant that a lot of land reclamation took place around Lake Biwa in order to accommodate new factories, growing cities and to create new farmland. During this period of economic growth, the economy was more important than environment so household, industrial and agricultural waste was allowed to run-off into the lake.

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These pollutants caused a series of problems including:
In the 1960's agricultural chemical poisoned and killed aquatic life
In the 1970's heavy metals poisoned and killed aquatic life
Also in the 1970's agricultural fertilisers caused eutrophication to take place.

There have been a number of responses to the pollution including:

1960's - "Direction for Safe Use of Agricultural Chemicals" - this meant that chemicals could not be used within 6km of the lake.
1969-"Pollution Control Ordinance" - introduction of strict effluent controls
1970's - Japanese housewives started an organisation to eliminate synthetic detergents.
1979 - "Ordinance Relating to the Prevention of Eutrophication in Lake Biwa"
In reality for much of the time that Lake Biwa was being polluted, economic growth was much more important and it was not until the economy started to grow, people had secure jobs, growing incomes and increased leisure time, did people start thinking about the environment.

Revision Questions

1. **Suggest two reasons why conflicts may occur when a river flows through more than one country.**

Ideas such as: fights/disputes/arguments over the use of its water; people in one country using more than their fair share of water; country upstream may pollute it and make it useless for country downstream; damming of river upstream reduces downstream supply; using water for irrigation in one country reduces availability of it in another; building a dam in one country reduces deposition of sediment downstream; access along the river is reduced.

2. **Explain how improving the water supply in LEDCs, is likely to improve the quality of life.**

Ideas such as: there is more clean/drinking water/the body needs water/cannot function without water/prevent dehydration; reduction of diseases/cholera, typhoid/hygiene is improved etc.; people more able to work/able to produce food/earn money; more water for irrigation for use in agriculture/increases yields of crops; people do not have to spend so much time collecting water/do not have to walk as far

3. **Describe other methods which can be used to supply more water to areas which need it.** (What are the methods to supply more water to an area which need water?)

Ideas such as: desalination/taking salt from sea water; using the underground water/aquifer/wells; building reservoirs; cloud seeding; importing water supplies; use of tankers etc.

4. **Explain how water can be used in a sustainable way.**

Ideas such as: treatment of waste water; regulations on/prevention of pollution of rivers; and strict enforcement; use water more carefully/people should not waste water; hosepipe bans;

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use of water meters; as paying for water makes people more careful; use showers not baths;
put brick in toilet cistern; turn off taps when not in use; roof top tanks/water butts etc.; mend leaking pipes; more careful use of irrigation or example; educate/make people aware of water conservation

5. **Suggest methods which could be used to reduce water shortages.**

Methods such as: dam/reservoir building; desalination plants; more boreholes/wells/underground; cloud seeding; water treatment/purification; water supply infrastructure/pipelines; transfer water from wet areas to areas where there is a shortage; conserve water/or examples of methods to max 2/rationing; teach skills/educate people about how to purify water/how to conserve; tanks on roof of houses (to collect water)/water butts; import water from other countries; etc.

6. **Explain the benefits to local people of the water treatment works.**

Positive effects such as: income from sale of treated water; employment/ in construction/operating plant(DEV in terms of type of job or in terms of improving quality of life); clean/safe water available/more water available/water more accessible/so it can be used for drinking/domestic purposes(DEV) ; reduction in diseases (or examples); (DEV if state water borne diseases)/ death rates lowered (DEV); hence less money spent on hospital care; etc.

7. **Human activities may cause water and air pollution. Choose an example which you have** studied of **either** water pollution **or** air pollution. Describe the causes of this pollution and its effects on people and the environment.

More developed statements describing causes and effects of air or water pollution.
(e.g. increased rates of lung cancer, asthmatics have difficulty breathing, factories producing smoke by burning fossil fuels etc

8. **The total amount of water used for agriculture in the world is increasing. Suggest reasons for this.**

Ideas such as: rowing population (to feed); more use of irrigation/need for irrigation; more droughts occurring; more agriculture taking place in marginal areas; higher temperatures in many areas;
development of hydroponics; use of HYV seeds; etc.

9. **Describe the likely impacts of a water shortage on the people and development of an area.**

Ideas such as: Loss of lives/higher death rates; due to dehydration (dev). Less food production/crops die; so people die of starvation (dev)/malnutrition (dev). Migration to urban areas; as crops fail in rural areas (dev). Slows down economic development; Puts off tourists; Lowers production of manufacturing industries; as water not available for cooling or processing goods (dev). Reduction in levels of hygiene/sanitation; so diseases like cholera spread easily (dev). Rationing/water restrictions etc;

10. **Describe how people can be provided with a reliable supply of safe drinking water.**

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e.g. dam/reservoir building so water is retained after rainy periods; desalination plants in order to remove salt from sea water; boreholes/wells to obtain water from aquifer; cloud seeding by spraying silver iodide into atmosphere etc)

11.The total amount of water used for household purposes in the world is increasing. Suggest reasons for this.
Ideas such as: growing population to supply; more use of pipes/taps to supply; more use of domestic appliances (or examples); greater need of water to promote good hygiene/sanitation; more water used to wash cars/water gardens/fill swimming pools; development of LEDCs leads to greater domestic water use etc.

12. Describe the likely impacts of a water shortage
on the people and development of a named area which you have studied. e.g. Loss of lives/higher death rates due to malnutrition/starvation; less food is produced as crops die due to insufficient water; As they cannot make a living from farming people migrate to urban areas; rise in diseases
such as typhoid as people use same water for drinking, bathing and waste disposal etc.)

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3.7 Environmental risks of economic development

The global economic activity has increased and brought considerable benefits for many people but has brought strain on the natural environment. Every aspect of human activity has an impact on the environment. **Resource management** is the control of the exploitation and use of resources in relation to environmental and economic costs. **Sustainable development** is a carefully system of resource management which ensures that the current level of exploitation doesn't compromise the ability of future generation to meet their own needs. The industry has spent increasing amounts on research and development to reduce pollution – the so called 'greening of industry'.

1. Case Study: Argentina's Pampas

The Pampas is one of the world's great grasslands. It is a flat prairie with deep, fertile topsoil. Traditionally pastoral farming is the main occupation in the Pampas of Argentina. However, there was a rapid changed in Pampas replacing from pastoral farming to arable farming. According to the Argentina Rural Society, 10 million hectares of the Pampas have been ploughed up in last 15 years.

Benefits:

1. Argentina has become the world's third largest soybean exporter after USA and Brazil.
2. More profitable soybeans and corns farming replaced the cattle rearing and making them a stronger economically.
3. The Argentina's oilseed and grain industry has increased about 50% between 2003-2006.
4. Rising global demand for soybean, particularly from China has pushed up world prices considerably, which help them to make more profit or revenue.
5. In 2006, Argentina exported $9 billion of soybeans and soybeans products, which is 1/5 of the country's total exports

Problems:

1. Changing from cattle rearing to soybean farming has increased chemical input to the land and food chain.
2. Pampas being over farmed and had a significant impact to the ecosystem.
3. The world-famous cattle of Pampas are driven to the harsher swamps and scrubland in the north of Argentina.
4. The cattle in the northern part of Argentina encounter problems like drought, flooding, poisonous snakes, vampire bats and piranhas.
5. In 2007, it is estimated that 40,000 cattle died due to starvation and infected wounds from piranha bites.
6. The temperature in the north is hot; reaches 40^0C, which is difficult for the cattle to live as they are used to be in low temperature in the Pampas.
7. The Cattle owners are now cross-breeding these cattle with Brahman strains from Brazil and India so that the new herds can cope better with heat and poorer pastures in the north.
8. The high reputation of Argentina's beef has been based on Aberdeen Angus and Hereford cattle, which is once considered as 'the best beef in the world' is going to change after cross-breeding and the flesh will become less tender.

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9. Endangering wildlife including South American ostriches, pumas and wildcats.
10. Increasing amount of crop production used as biofuel is also going to increase the pollution in the area.

2. Manufacturing Industry: Pearl River Delta

Chinese economy has attained such a size and is continuing to grow so rapidly that it is now being called 'the new workshop of the world'. One of the China's main industrial regions is the Pearl River Delta. It is located in southeast China. It is a focal point of a massive wave of foreign investments into China. The river drains to the South China Sea.

Factors for location of many industries in Pearl River Delta, China

1. Cantonese work ethic was so important in the rapid development of Hongkong
2. Low cost of labour
3. Lack of unions
4. Improving level of hard and soft infrastructure
5. Proximity of suppliers - efficiency of the supply chain now rivals the low cost of labour as the major location factor for some companies.
6. A welcoming regulatory environment

Benefits:

1. Shunde – a largest centre for the production of microwave ovens in the world. Galanz exported 70% of the 15 million microwave ovens.
2. Shenzhen – a special economic zone estimates that it produces 70% of the world's photocopiers and 80% of its artificial Christmas trees. It is a global purchasing center for Kingfisher and Wal-Mart, which together sourced $10 billion of goods from China in 2002.
3. Dongguan- specializes in running shoes with 80,000 people employed in single factory.
4. Zhongsan- major world centre of the electric lightning industry.
5. Zhuhai- major manufacturer computer games, consoles and golf clubs.
6. Guangzhou- site of large export-only Honda car plant.
7. Employ 30 million people

Problems:

1. In 2007, eight out of every ten rainfalls in Guangzhou were classified as acid rain.
2. Factories, power stations and growing number of cars are the cause s of air pollution.
3. Worst acid rain Guangdong
4. Two-thirds of Guangdong's 21 cities were affected by acid rain in 2007
5. Wastewater is not treated before dumping to water bodies.
6. Average of 40% Chemical Oxygen Demand(COD)- water pollution
7. Over exploited neighbouring uplands, considerable reduction in vegetation cover resulted in soil erosion.

Solution taken up by the Government

1. Government has pledged to reduce Chemical Oxygen demand (COD) by 15% by 2010
2. It also aims to cut Sulphur dioxide (SO_2) emissions by 15%
3. Higher sewage treatment charges
4. Stricter pollution regulations on factories and
5. Tougher national regulations on vehicle emissions

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6. To reduce further exploitation of uplands for industries
7. To plant more trees to reduce soil erosion and deforestation

3. Energy: Risks and benefits

Case study: Niger Delta

The Niger delta is located in West Africa, by the Atlantic ocean. Niger delta is one of the world's largest wetlands and Africa's largest remaining mangrove forest. Many problems have risen due to oil production in the delta. Even with so much oil, Nigeria is still one of the poorest countries among the oil exporting countries.

Benefits:

1. Oil was first extracted here in 1956 and helping the people to boost their income
2. Low sulfur oil gained important export markets around the world leading to earn more revenue
3. By the mid 1970s, it joined OPEC and became the world's largest sixth largest oil exporter
4. They operate in 159 oilfields, 275 flow stations and 7250 km of pipelines
5. Oil makes up 90% of export earnings and 80% of its revenue
6. It nationalized its oil industry in 1971.

Disadvantages:

1. The African people has gone from being self-sufficient in food to importing more than produce it
2. Both the government and many communities have neglected agriculture in pursuit of oil wealth.
3. Refineries are old and poorly run, resulting in frequent breakdowns
4. Nigeria also imports bulk of its fuel
5. It has been estimated that corruption siphons off as much as 70% of annual oil revenues.
6. Quality of life in Nigeria is below all other major oil producing countries.

Risks / affects to the natural environments

1. Oil spills, acid rain from gas flares and the stripping away of mangroves for pipeline routes have killed off fish
2. Between 1986 and 2003, more than 20000 ha of mangroves were cleared for gas exploration
3. Natural gas has been burnt off as flares causing acid rain and releases greenhouse gases.
4. There have been over 6817 oil spills since 1956.
5. Construction and increased ship traffic changed local wave patterns causing shore erosion and the migration of fish into deeper water.
6. Various types of construction taken place without adequate environmental impact studies.
7. Loss of vegetation due to oil spilled on the ground.
8. Habitats life was affected due to deforestation there was problem in food chains
9. Pollution of lakes, seas and rivers
10. Atmospheric pollution

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4. Tourism- Ecuador's Galapagos Island

The Galapagos Islands are a very popular tourist destination. 100,000 tourists visit the Galapagos Island a year. 3% of islands are a National Park. Five of the 13 islands are inhabited.

Benefits:

1. The tourism industry brings in much- needed foreign currency, which is good for the economy.
2. Provide valuable employment opportunities in communities where employment is limited
3. Visitor numbers are currently 100,000 a year and rising improved the revenue of the country
4. Volcanic islands can be visited all year round
5. Entrance fee is 65 pounds to National Park, which also added revenue to the country.
6. Many attractions : giant tortoises, marine iguanas and blue footed bobbies

Risks:

1. Growing population- 18000 islanders and 15000 people who lives illegally
2. Illegal fishing shark and sea cucumber which is believed to be of all-time high
3. The number of cruise ships continues to rise leading to water pollution.
4. The increasing number of cruise ships also affected the marine life.
5. Internal arguments within the management structure of the National Park
6. The opening of a hotel in 2006 has become controversial.

Solutions:

1. Ensure tourism is truly sustainable while maintaining clear economic benefits
2. Monitor environmental threat

5. Transport: Risks and benefits

Case study: Heathrow airport, UK

Heathrow is located 21 km west of central London is the world's busiest international airport. More than 90 airlines fly to over 170 international destinations. In 2007 almost 68 million passengers passed through the airport's terminal on 476000 flights. Big issue came up when they proposed third runway to expand number of flights.

Risks:

1. Increased in number of people who will be affected by aircraft noise
2. Increased noise levels for many people already affected by aircraft noise
3. Rising air pollution levels due to considerable increase in flights
4. Increase in road traffic generated by the extra flights
5. The wildlife is affected to noise pollution and deforestation.
6. The expansion will cause noise level 55 or over
7. Exposure to noise causes ill health like heart attack and strokes

Benefits:

1. Heathrow is a huge direct employer with 72000 people working at the airport

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2. It also supports another 100,000 jobs in the UK.
3. It is located at the biggest site of employer
4. Large number of independent firms depends on this airport for their business. Ex. In-flight catering, security services, etc
5. Heathrow provide access to virtually every major city in the world
6. Strong relationship between Heathrow and the financial services industry operating in the city of London.
7. If the third runway is built, it is going be benefitted and add more advantages to their business in competing airports such as Paris and Amsterdam.

Tourism- The great barrier reef in Australia

Great Barrier Reef is one of the great tourist attractions in Australia. It includes over 2900 reefs, around 940 islands and cays and stretches 2300 km along the coast of Queensland. Moreover, it covers an area of 345000 km^2

Benefits:

1. 1500 species of fish
2. 359 types of hard coral
3. One third of the world's soft coral
4. Six of the word's seven species of threatened marine turtle
5. More than 30 species of mammal animals
6. 215 bird species
7. Significant economic impact on the state of Queensland
8. Contributed $5.8 billion to the Australian economy in 2004 and employed over 60000 people

Risks:

1. Impact of land-based pollution from agriculture, industry, residential areas and tourism causing a significant damage to the reef ecosystem
2. Overfishing- the use of dragnets in particular can damage the coral
3. Coral bleaching is in bad condition by increased sea temperature due to global warming. This causes coral polyps to die. As a result, the range of colours is lost
4. Tourist visiting the reef are causing damage

Solution:

1. 4.6% of the reef was fully protected
2. Australian government produced a plan to protect 33% of the reef
3. Great Barrier Marine Park zoning plan was implemented in 2004
4. It includes a network of a marine sanctuaries, protecting over 11 million ha along the length of the reef
5. It established new guidelines for tour companies using the reef

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The topics covered in Paper 2 (IGCSE):

May / June 2009

1. Population pyramid
2. Photograph: a small- scale subsistence agriculture in Asia
3. Photograph: tropical rainforest
4. Photograph: soil erosion
5. Bar graph on renewable energy
6. Plate movement – earthquake
7. Steel manufacturing industry

May/June 2010

1. Photograph: type of housing in a city
2. Climograph (rainfall and temperature graph)
3. Tourism
4. Coral reef

May / June 2011

1. Employment structure – the triangular graph showing the employment divisions
2. Graph on the trend of population growth – description and explanation
3. Life expectancy and growth rate of population
4. Photograph: River channel
5. Climograph

May/ June 2012

1. Plate tectonic movement – earthquake
2. Population pyramid
3. Demographic transitional model
4. Photograph: a coastal areas
5. Agricultural system
6. Photograph: tourism

May / June 2013

1. Settlement hierarchy
2. Photograph: Erosion and weathering (weathering not included in 2016 syllabus)
3. Plate tectonic movement – Volcanoes
4. Manufacturing industry – a steel industry in India
5. Soil erosion – soil damage with pie diagram

May / June 2014

1. Earthquake
2. Photograph 1: hot desert
3. Photograph 2: coastal area
4. Energy on coal

May / June 2015

1. River (5 marks from Q1)
2. Settlement hierarchy
3. Photograph: river
4. Tropical storms
5. Air pollution
6. Volcanoes

May / June 2016

1. Plate tectonic movement – earthquake
2. Photography: Tropical rainforest

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3. Photograph: Coastal areas
4. Photograph: Settlement patterns
5. Population pyramid
6. Population density : photograph or graph
7. Migration: photograph or graph or pie diagram
8. Rural settlements: Photograph / amenities
9. Urban settlements: photograph / amenities / redevelopment problems
10. Land use model : Burgess and Hoyt model
11. Urban sprawl : photograph – problems and advantages

Geography 0460 Case study

Theme 1

1. A country which is over-populated (Niger) (problems caused due to over-population 2011)
2. A country which is under-populated (Australia)
3. A country with a high rate of natural population growth (Niger) (reasons of high birth rate 2012, policies to reduce high population growth rate 2010)
4. A country with a low rate of population growth (or population decline) (Russia)
5. An international migration (International migration 2013) (Migration to California Pg30 Wiber World)
6. A country with a high dependent population
7. A densely populated country or area (at any scale from local to regional) (Japan) (2014 uneven population distribution)
8. A sparsely populated country or area (at any scale from local to regional) (Brazil Pg16 Wiber World)
9. Settlement and service provision in an area (2011)
10. An urban area (including changing land use and urban sprawl) Out of town shopping centers – UK, MetroCenter in Gateshead Pg 63 Wiber World (features of CBD 2010, solution to problems in living urban areas 2013, urban sprawl the changing the surrounding areas 2012 (2014- out of town shopping)
11. A rapidly growing urban area in a developing country and migration to it. (Kolkata – India, problem in a developing country, Wiber World Pg 84-85) (Rio de Janeiro, Brazil – problem and the solution, Pg 86-88)

Theme 2:

1. An earthquake (impacts of earthquake 2011, causes of earthquake 2010)
2. A volcano (Mount Merapi) (2014)
3. The opportunities presented by a river, the hazards associated with it and their management (causes of flooding 2014, advantages and difficulties living on a river delta 2010)
4. The opportunities presented by an area of coastline, the hazards associated with it and their management (tropical storm 2013)
5. An area of tropical rainforest (characteristics of its climate 2011, Benefits of rainforest 2012, deforestation 2013, impacts of deforestation 2015)
6. An area of hot desert

Theme 3

1. A transnational corporation and its global links A farm or agricultural system
2. A country or region suffering from food shortages (reasons for food shortages 2011)
3. An industrial zone or factory (reasons for its growth of industry2010, 2013, manufacturing industry and its impacts to natural environment 2012, Hi-tech industry 2015)

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4. An area where tourism is important (benefits and problems 2011, damage to natural environment 2014)
5. Energy supply in a country or area (2013, ways to produce energy 2012, problem of using fuel-wood 2015)
6. Water supply in a country or area (impacts of water shortage 2010, cause of water pollution 2013, Impacts of water shortage 2014)
7. An area where economic development is taking place causing the environment to be at risk

Preparing Geography (0460) IGCSE

Paper 1: 45% (75 Marks) (Answer 1 question only from each Section A, B and C)

1. **Case study**
   - ✓ Check that you have all the Case studies
   - ✓ Choose any relevant country/area/city
   - ✓ Need to mention 2-3 fact and figures in case study
   - ✓ Describe and explain – you need to describe and explain, how or why
   - ✓ For a named country or an area, describe and explain the causes of high density population. (you can choose any country or any area. Eg: Indonesia/Jakarta)

2. **Answers in the Questions**
   - ✓ Compare the city of A and B (it should give comparism to this question)
   - ✓ Support your answer with statistical figure (write the figure from the question)
   - ✓ Show the evidences in your answer (copy the evidence from the question)
   - ✓ Describe the location of Jakarta. (write the locational direction of Jakarta, scale is always given and refer to the scale and find the distance, near to which city/place)
   - ✓ Learn how to identify the diagram of various landforms and weather instruments.

Paper 2: (27.5 % 60 marks. All the questions are compulsory)

- ✓ 20 Marks from Map reading
  - Six grids reference
  - Compass bearing
  - Distance
  - Features
  - Description/Interpretation of Drainage (River), Relief (mountain, valley etc), Human economic activities
  - Cross profile and marking them
- ✓ Learn all the basic concept, graphs, table of all the topics (plate movement, population pyramid, population density, river and coastal landforms, weather instruments from paper 1)

Paper 4: (60 marks, 2 Questions only) 27.5 %

- ✓ River (river and CBD frequently asked in the exam)
- ✓ CBD
- ✓ Tourism
- ✓ Weather

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Need to know:

- ✓ Pilot survey and its importance
- ✓ Type of sampling
- ✓ Route to geographical enquiry / methods of survey
- ✓ Enquiry questions/ research questions
- ✓ Hypothesis (how to make hypothesis)
- ✓ Reasons for repetitive taking reading or doing survey
- ✓ Suggestion to improve the survey methods.

Paper 2: Skills to describe the Relief and Drainage

1. **Relief:**

1. **General pattern (shape)**: first refer to the main relief eg: coastal plain, hilly and mountainous etc. Name any such feature and describe it eg: this map area forms part of a coastal plain with gentle slopes.
2. **Direction/refer to four grids reference**: ref to features using the four grids or direction like north western parts, south eastern parts etc and describe them.
3. **Slope on the map**: describe the slopes on the map eg: widely spaced contours show gently sloping, closely contours show steeply sloping.
4. **General slope and height of the area**: describe the general slope and give the height of that area.

Syllabus IGCSE

Relationship between assessment objectives and components

Assessment Objective	**Paper 1 Geographical Themes**	**Paper 2 Geographical Skills**	**Paper 3 Coursework or Paper 4 Alternative to Coursework**	**Totals**
AO1 knowledge with understanding	21.5%	3%	5.5%	30%
AO2 skills and analysis	13.5%	22%	16.5%	52%
AO3 Judgement and decisionmaking	10%	2.5%	5.5%	18%
Totals	45%	27.5%	27.5%	100%

The table indicates how the percentage marks for the whole assessment are planned to be allocated.

Theme 1: Population and settlement

Topic:	**Candidates should be able to:**	**Further guidance:**
1.1 Population dynamics	Describe and give reasons for the rapid increase in the world's population	
	Show an understanding of over-population and underpopulation	Causes and consequences of over-population and under-population

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	Understand the main causes of a change in population size	How birth rate, death rate and migration contribute to the population of a country increasing or declining
	Give reasons for contrasting rates of natural population change	Impacts of social, economic and other factors (including government policies, HIV/AIDS) on birth and death rates
	Describe and evaluate population policies	
Case studies	A country which is over-populated • A country which is under-populated • A country with a high rate of natural population growth • A country with a low rate of population growth (or population decline)	
1.2 Migration	Explain and give reasons for population migration	Internal movements such as rural-urban migration, as well as international migrations, both voluntary and involuntary
	Demonstrate an understanding of the impacts of migration	Positive and negative impacts should be considered, on the destination and origin of the migrants, and the migrants themselves
Case study required in 1.2	An international migration	
1.3 Population structure	Identify and give reasons for and implications of different types of population structure	Age/sex pyramids of countries at different levels of economic development
Case study required in 1.3	A country with a high dependent population	
1.4 Population density and distribution	Describe the factors influencing the density and distribution of population	Physical, economic, social and political factors
Case studies required in 1.4	A densely populated country or area (at any scale from local to regional) • A sparsely populated country or area (at any scale from local to regional)	
1.5 Settlements and service provision	Explain the patterns of settlement	Dispersed, linear, and nucleated settlement patterns
	Describe and explain the factors which may influence the sites, growth and functions of settlements	Influence of physical factors (including relief, soil, water supply) and other factors (including accessibility, resources)
	Give reasons for the hierarchy of settlements and services	High-, middle- and low-order settlements and services. Sphere of influence and threshold population
Case study required in 1.5	• Settlement and service provision in an area	
1.6 Urban settlements	Describe and give reasons for the characteristics of, and changes in, land use in urban	Land use zones including the Central Business District (CBD), residential areas, industrial areas and

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	areas	the rural-urban fringe of urban areas in countries at different levels of economic development. The effect of change in land use and rapid urban growth in an urban area including the effects of urban sprawl
	Explain the problems of urban areas, their causes and possible solutions	Different types of pollution (air, noise, water, visual), inequality, housing issues, traffic congestion and conflicts over land use change
Case study required in 1.6	• An urban area (including changing land use and urban sprawl)	
1.7 Urbanisation	Identify and suggest reasons for rapid urban growth • Describe the impacts of urban growth on both rural and urban areas, along with possible solutions to reduce the negative impacts	Reference should be made to physical, economic and social factors which result in rural depopulation and the movement of people to major cities The effects of urbanisation on the people and natural environment. The characteristics of squatter settlements Strategies to reduce the negative impacts of urbanisation
Case study required in 1.7	• A rapidly growing urban area in a developing country and migration to it	

Theme 2: The natural environment

Topic:	**Candidates should be able to:**	**Further details:**
2.1 Earthquakes and volcanoes	Describe the main types and features of volcanoes and earthquakes	Types of volcanoes (including strato-volcanoes [composite cone] and shield volcano) Features of volcanoes (including crater, vent, magma chamber) Features of earthquakes (including epicentre, focus, intensity)
	Describe and explain the distribution of earthquakes and volcanoes	The global pattern of plates, their structure, and an awareness of plate movements and their effects – constructive/divergent, destructive/convergent and conservative plate boundaries
	Describe the causes of earthquakes and volcanic eruptions and their effects on people and the environment	
	Demonstrate an understanding that volcanoes present hazards and offer opportunities for people	
	Explain what can be done to reduce the impacts of earthquakes and volcanoes	

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Case studies required in 2.1	• An earthquake • A volcano	
2.2 Rivers	Explain the main hydrological characteristics and processes which operate within rivers and drainage basins	Characteristics of rivers (including width, depth, speed of flow) and drainage basins (including watershed, tributary, confluence) Processes which operate in a drainage basin (including interception, infiltration, throughflow, groundwater flow, evaporation, overland flow)
	Demonstrate an understanding of the work of a river in eroding, transporting and depositing	
	Describe and explain the formation of the landforms associated with these processes-	Forms of river valleys – long profile and shape in cross section, waterfalls, potholes, meanders, oxbow lakes, deltas, levées and flood plains
	Demonstrate an understanding that rivers present hazards and offer opportunities for people	Causes of hazards including flooding and river erosion Opportunities of living on a flood plain, a delta or near a river
	Explain what can be done to manage the impacts of river flooding	
Case study required in 2.2	• The opportunities presented by a river, the hazards associated with it and their management	
2.3 Coasts •	Demonstrate an understanding of the work of the sea and wind in eroding, transporting and depositing	
	Describe and explain the formation -of the landforms associated with these processes	Cliffs, wave-cut platforms, caves, arches, stacks, bay and headland coastlines, beaches, spits, and coastal sand dunes
	Describe coral reefs and mangrove swamps and the conditions required for their development	
	Demonstrate an understanding that coasts present hazards and offer opportunities for people	Hazards including coastal erosion and tropical storms
	Explain what can be done to manage the impacts of coastal erosion	
Case study required in 2.3	• The opportunities presented by an area of coastline, the hazards associated with it and their management	
2.4 Weather	Describe how weather data is collected	Describe and explain the characteristics, siting and use made of a Stevenson screen Rain gauge, maximum-minimum thermometer, wet-and-dry bulb

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		thermometer (hygrometer), sunshine recorder, barometer, anemometer and wind vane, along with simple digital instruments which can be used for weather observations; observations of types and amounts of cloud
	Make calculations using information from weather instruments	Use and interpret graphs and other diagrams showing weather and climate data
2.5 Climate and natural vegetation	Describe and explain the characteristics of two climates: ○ equatorial ○ hot desert	Climate characteristics (including temperature [mean temperature of the hottest month, mean temperature of the coolestmonth, annual range]; and precipitation [the amount and seasonal distribution]) Factors influencing thecharacteristics of these climates (including latitude, pressure systems, winds, distance from the sea, altitude and ocean currents) Climatic graphs showing the main characteristics of temperature and rainfall of the two climates
	Describe and explain the characteristics of tropical rainforest and hot desert ecosystems	The relationship in each ecosystem of natural vegetation, soil, wildlife and climate
	Describe the causes and effects of deforestation of tropical rainforest	Effects on the natural environment (both locally and globally) along with effects on people
Case studies required in 2.5	• An area of tropical rainforest • An area of hot desert	

Theme 3: Economic development

3.1 Development	Use a variety of indicators to assess the level of development of a country	Indicators of development (including GNP per capita, literacy, life expectancy and composite indices, e.g. Human Development Index (HDI))
	Identify and explain inequalities between and within countries	
	Classify production into different sectors and give illustrations of each	Primary, secondary, tertiary and quaternary sectors
	Describe and explain how the proportions employed in each sector vary according to the level of development	Use of indicators of development and employment structure to compare countries at different levels of economic development and over time
	Describe and explain the process of globalisation, and consider its impacts	The role of technology and transnational corporations in globalisation along with economic factors which give rise

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		to globalisation Impacts at a local, national and global scale
Case study required in 3.1	A transnational corporation and its global links	
3.2 Food production	Describe and explain the main features of an agricultural system: inputs, processes and outputs	Farming types: commercial and subsistence; arable, pastoral and mixed; intensive and extensive The influence of natural and human inputs on agricultural land use. Inputs including natural inputs (relief, climate and soil) and human inputs (economic and social). Their combined influences on the scale of production, methods of organisation and the products of agricultural systems
	Recognise the causes and effects of food shortages and describe possible solutions to this problem	Natural problems which cause food shortages (including drought, floods, tropical storms, pests) along with economic and political factors (including low capital investment, poor distribution/transport difficulties, wars) The negative effects of food shortages, but also the effects of food shortages in encouraging food aid and measures to increase output
Case studies required in 3.2	• A farm or agricultural system • A country or region suffering from food shortages	
3.3 Industry	Demonstrate an understanding of an industrial system: inputs, processes and outputs (products and waste)	Industry types: manufacturing, processing, assembly and high technology industry
	Describe and explain the factors influencing the distribution and location of factories and industrial zones	The influence of factors including land, labour, raw materials and fuel and power, transport, markets and political factors Their combined influences on the location, scale of production, methods of organisation and the products of the system Industrial zones and/or factories with respect to locational and siting factors
Case study required in 3.3	• An industrial zone or factory	
3.4 Tourism	Describe and explain the growth of tourism in relation to the main attractions of the physical and human landscape	
	Evaluate the benefits and	

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	disadvantages of tourism to receiving areas	
	Demonstrate an understanding that careful management of tourism is required in order for it to be sustainable	
Case study required in 3.4	An area where tourism is important	
3.5 Energy	Describe the importance of non-renewable fossil fuels, renewable energy supplies, nuclear power and fuelwood; globally and in different countries at different levels of development	Non-renewable fossil fuels including coal, oil and natural gas. Renewable energy supplies including geothermal, wind, HEP, wave and tidal power, solar power and biofuels
	Evaluate the benefits and disadvantages of nuclear power and renewable energy sources	
Case study required in 3.5	Energy supply in a country or area	
3.6 Water	Describe methods of water supply and the proportions of water used for agriculture, domestic and industrial purposes in countries at different levels of economic development	Methods of water supply (including reservoirs/dams, wells and bore holes, desalination)
	Explain why there are water shortages in some areas and demonstrate that careful management is required to ensure future supplies	The impact of lack of access to clean water on local people and the potential for economic development
Case study required in 3.6	• Water supply in a country or area	
3.7 Environmental risks of economic development	Describe how economic activities may pose threats to the natural environment, locally and globally	Threats to the natural environment including soil erosion, desertification, enhanced global warming and pollution (water, air, noise, visual)
	Demonstrate the need for sustainable development and management	
	Understand the importance of resource conservation	
Case study required in 3.7	• An area where economic development is taking place causing the environment to be at risk	

Important Note:
There are 3 Themes, and you have to attempt (answer) only ONE QUESTION from each Theme. There are 6 (six) Questions in total, 2 questions from each Theme. The total mark of Paper 1 is 75. Each Question carries 25 Marks. Paper 1 carries 45% weightage out of 100%. Paper 2 and Paper 4 carry 27.5% weightage each.

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