

Geography Essays Revision - Summaries

Describe the characteristics of an administrative region you have studied and discuss the possible challenges facing this region.

- Ireland and its county system.
- Single tiered system e.g. Kerry County Council communicates directly with central government.
- System roots in Anglo-Norman invasion - setting up of counties such as Dublin, Cork, and Limerick.
- Local government act 1898 - local councils to be set up in each county to deal with local issues, such as housing and sewerage, and to liaise with government on issues e.g. inter-county roads.
- Urban - based administration units set up - City councils, Town councils, and Borough councils.
- City councils look after Dublin, Cork, Limerick, Galway and Waterford.
- City councils face the problem of their areas not increasing to deal with growing suburbanisation.
- Borough councils deal with Ireland's largest towns e.g. Kilkenny - 5 Borough councils in Ireland.
- 75 Town councils, responsible for any other densely populated areas. They are based on historic settlement patterns and functions and are relatively powerless bar some planning powers.
- Multi-tiered system in France. Local authorities must go through one of 26 regional authorities - not directly connected to central government.
- No multi-tiered system in Ireland however attempts have been made e.g. Southern Health Board.
- Single-tiered system efficient in Ireland due to small population, but would be very inefficient in France, which has a much larger population.
- Urbanisation is main challenge facing Ireland's administrative structure, in Dublin in particular.
- Celtic tiger resulted in rapid population growth around Dublin - will reach 1.5m by 2020.
- Massive population will lead to traffic problems and erosion of overall quality of life in Dublin & surrounding areas as the urban area sprawls out to encompass these areas.
- National Spatial Strategy, Transport 21 and Decentralisation policies main tactics to fight problem.
- NSS attempts to spread out populations by developing other areas. Transport 21 in place to increase accessibility to all areas and improving all transport networks in Ireland. Decentralisation policies attempt to relocate populations by distributing public service jobs.
- Councils have adapted to this issue also e.g. Dublin council has been split into 3 councils.

Explain how the physical landscape can define regions, with reference to examples you have studied.

- Relief, drainage and rock type play important role in defining physical regions. The regions I have studied are the Burren and the North European Plain.
- Burren defined by Karst landscape. Bare limestone covering 250km², appearing as an upland terraced region, with rock beds dipping slightly to the South.
- Limestone beds are separated by thinner layers of shale.
- Rocks formed 340m years ago in carboniferous period.
- Limestone made of skeletons of sea creatures living in warm shallow seas that covered the area.
- Their calcium-rich skeletons were compressed into rock. Shale formed from mud found in the seas.
- African and Eurasian plates collided & formed the Munster Mountains and the limestone and shale were uplifted to form the Burren region.

- Limestone's defining feature: it weathers easily by carbonation. Explanation of carbonation.
- Surface called a limestone pavement, with grikes separated by slabs called clints.
- The region is an eco-tourism destination. Alpine flowers e.g. Blue Gentian & butterflies e.g. Burren Blue Butterfly are found nowhere else in Ireland. Ailwee caves received 92,000 visitors in 2010.
- Tourism defines this region as an economically important region of Ireland.
- North European Plain stretches from Paris Basin to Russia.
- It was formed during the ice age when glaciers deposited sand and gravels as they retreated North.
- Ice age ending also resulted in sea levels rising which submerged parts of Europe, cutting off Britain and Ireland from the rest of Europe.
- Limon soils which were deposited are very fertile which has defined the region as a rich agricultural and commercial grain-growing region.
- The region's several rivers e.g. R. Seine and R. Rhine are important for trade and human movement.

Describe & explain the importance of culture in defining any regions you have studied.

- Language in the Gaeltacht and language in Belgium. Language is important as it is the main means of passing information and knowledge between people.
- In Gaeltachts, 80% of people speak Irish as their first language.
- Since independence the Irish government has committed itself to supporting Irish.
- Commission for Irish speaking districts was set up in 1925. Irish became Ireland's official language meaning all documents are written in Irish and English, and Irish in school became compulsory.
- Official Gaeltacht areas were designated in 1926 to protect the language as it is an integral part of Ireland's national identity.
- Pre 1850, Gaeltacht regions covered most of Munster & Connaught. Now they only exist on the west coast in pockets such as on the Achill Islands and in Dingle.
- Gaeltacht populations total 92,000 now, down by 544,000 on pre-1850 levels.
- Emigration, domination of English and the famine were the main causes of the decline.
- Gaeltachts are protected by the government which offers grants and incentives to stay.
- Clear to see how language & culture defines this region (a linking sentence to question).
- 3 official languages in Belgium. 60% of population live in the North and speak Flemish. The Southern region of Wallonia speaks French and the small region of East Cantons speaks German.
- Language is very important to the region & tensions have arisen since the 60s between languages.
- Northern Flanders feels under threat as French is a more dominant international language. This can be seen in bilingual Brussels where French speaking is increasing.
- Wallonia is in industrial decline e.g. in Sambre Meuse valley due to coalfields running out, while birth rates in Flanders are increasing, resulting in a change in population distribution.
- Changes have been enacted in Belgian constitution as a result of tensions.
- Wallonia and Flanders are now distinct regions based on language and deal with their own cultural and educational affairs. The regions are autonomous but both are represented in government.
- Cultural divisions have resulted in people from each culture not freely mixing and a far right political party known as Vlaams Blok was created in 1978 which defended Flemish culture.
- (Linking sentence) language in Belgium clearly divides and defines the regions.

Examine two factors that have influenced the development of primary economic activities in any Irish region that you have studied.

- BMW region (Border, Midlands & West).

- Factors such as climate and relief have influenced the development of farming and fishing.
- West coast has physical factors that benefit the development of successful fishing industries.
- Varied relief (indented coastline) and climatic influence of North Atlantic Drift.
- Sheltered bays provide safe harbours for vessels e.g. Killybegs and shallow, calm water needed for fish farms e.g. Killary Harbour Co. Galway.
- Bathymetrically suitable due to shallow waters as a result of the continental shelf, promoting plankton growth, an excellent food source for fish, and making trawling easier.
- North Atlantic Drift keeps coastal waters warm, attracting fish such as cod, mackerel and herring & encouraging breeding due to the warmer waters that those typical of the latitude.
- Fishing & aquaculture industries employ around 5,000 in the BMW.
- Relief & climate have hindered the development of agriculture in the BMW.
- The region is mostly upland thus it encounters much relief rainfall, creating a cool & wet climate.
- Relief rainfall occurs when moisture-laden clouds come in contact with mountains e.g. Derryveagh Mts, which cause the clouds to rise, condense, and burst, leading to high levels of precipitation.
- The BMW receives on average 2000mm of rain per year and summer temperatures are cool (14°C).
- Peat & gley soils have developed which are infertile with high acidity levels, preventing large-scale cereal farming in the region - only 1% of the national crop is produced here.
- Farms in the BMW are half the size of the national average.
- Much of the BMW is classified as disadvantaged for farming and so receives funding through the Common Agricultural Policy.
- 55% of farmland is used for pasture. Sheep are well suited to upland areas e.g. Bluestack Mts. Cattle are reared in the lowlands of the Border and Midland counties.
- Average age of farmers increasing which means agriculture will decline, hindering its development.

Examine the development of tertiary economic activities in an Irish region that you have studied.

- BMW has seen development in transport and tourism, as a result of physical & human factors.
- Transport system in the BMW has always been underdeveloped especially public transport.
- Physical factors such as an uneven landscape, with mountain ranges such as the Twelve Pin Mts, have prevented the development of an effective rail system with no rail network north of Sligo.
- The western rail corridor is now disused, however roads such as the M6 have been developed to connect the West of Ireland to Dublin.
- Ports in BMW cannot compete with ports such as Cork, as the bathymetry of ports such as Galway and Sligo means they cannot accommodate vessels of significant draught. Container ships and cruise liners cannot dock, limiting the investment these services would bring to these towns.
- Airports in the BMW are limited; however international passengers are accommodated at Knock.
- Knock has links with Dublin, Manchester and London however its existence promotes emigration.
- Government & EU funding promotes transport development within the BMW. Transport 21 provides money for transport upgrades and the Atlantic Corridor Scheme was also implemented.
- Areas of natural beauty e.g. River Shannon & Bluestack Mts attract tourists.
- Investments have been made to attract tourists such as the creation of Ard Na Gaoithe walking trail, complete with signage and clear routes to aide tourists.

- Coastline attracts surfing tourists - North Atlantic great source of waves in places such as Sligo.
- Human factors inhibit tourism growth - lack of accessibility to the region prevents development.
- 90% of air passengers go through Dublin on the East coast.
- Tourists do not leave Greater Dublin Area due to long travel times to the BMW.
- This has been addressed through the National Spatial Strategy, but the problem still remains.

Discuss the factors that influence the development of primary economic activities in an Irish region that you have studied

- South & East - highly developed primary sector.
- Relief & climate have had a large impact on agriculture in the region.
- Cool temperate oceanic climate. 800mm average rainfall value, 1000mm less than the BMW. 1500-1600 hours of sunshine per year, suiting crops & farmers.
- A long growing season (270 days) results, ideal for the production of cereal crops e.g. barley.
- Relief in the region is suitable for agriculture. Flat or gently sloping land except for Wicklow Mts. Most land is <250m also, meaning it is suitable for arable farming and machine use is efficient.
- Dublin is the largest market in the country, encouraging commercial agriculture.
- Large farm sizes also result in large turnovers e.g. cattle industry earns €140m annually.
- Bathymetry & pollution of Irish Sea & inland waterways is another physical factor affecting S&E.
- Shellfish farming in Howth Co. Dublin is a large industry, with exports all over the globe e.g. Asia.
- Some fishing ports are still very successful in Dublin & Cork.
- Boats must travel further to reach deepwater fishing areas of west coast, decreasing efficiency.
- Urbanisation & industrial development have depleted fish stocks in waterways in the S&E.
- Stringent EU & Government policies have failed to prevent pollution.
- Nitrate levels in the Irish Sea are many times higher than levels along the west coast, as a result of agricultural practices.
- Large waves cannot enter the Irish Sea so the mixing that they cause cannot occur on the East coast, meaning pollutants remain concentrated in the waters.

Examine the development of secondary economic activities in an Irish region that you have studied with reference to any two of the following factors: raw materials, transport, labour, markets.

- South & East - thriving secondary sector - 65% of manufacturing growth in this region during 90s.
- Contains Dublin city - high population density (3x BMW), young population (45% population under 25) - ideal labour force.
- Universities such as CIT, UCD provides knowledgeable workforce useful for industries such as computer manufacturing, software development. Wages 10% more than national average.
- Labour force also provides a market for the goods. Food processing - highly developed agriculture.
- Largo foods Co. Meath founded by local potato farmer, now successful - highly qualified employees.
- Largo owns Tayto, King etc. They source all potatoes from within 30km of the plant.
- Low-lying relief conducive to excellent transport system - rail and motorways connect the area.
- M50 construction - manufacturers now located in Dublin suburbs.
- National Spatial Strategy - development of gateway towns with well developed infrastructure.

- Main seaport and airport located in Dublin, providing a gateway to Europe for manufacturers.
- Silicon disks used by Intel in Leixlip are flown into Dublin, Largo foods ship in sunflower oil.
- Dublin port handles 1 million trucks every year - easy access abroad.
- Manufacturing industries dispersed due to excellent transport e.g. heavy industries in Ringaskiddy Co. Cork, computer chip manufacturing in Leixlip Co. Kildare.
- Public transport limited - more driving to work, limits scope for expansion out of urban areas.

Account for the development of agriculture in a European region that you have studied with reference to the factors listed: relief, markets and climate.

- Paris Basin - all factors have affected development.
- Paris Basin measures 320x480km, occupies 25% of France.
- It sits on a large syncline, with the rock layers beneath saucer shaped such that the rise to form scarps around the edge of the region.
- The agriculture of areas in the Paris Basin is affected by the rock type on which they lie (scarps).
- The distinct farming regions are called pays e.g. Champagne & Brie, which produce their namesake.
- Limon soils occur at centre of Paris Basin, which were deposited by wind at the end of the last ice age. They are very fine soils, suitable for machinery. This region has also low-lying relief (<200m).
- The region is known as the Ile De France, a prosperous region nicknamed the “granary of France”.
- Maritime region in west and continental climate in east. A transitional climate exists between.
- Maritime climate - suits pastoral agriculture (800mm rain/year).
- Cereal growing favoured further eastward due to long growing season (270 days).
- Viticulture also dominant in east due to the southerly aspect and the warm climate.
- 700mm annual rainfall which is distributed evenly also benefits cereal growing.
- A favourable climate means the Paris Basin is responsible for ¼ of Europe’s cereal production.
- Area close to markets. 21m people live here. Le Havre port provides access to international market.
- Ex French colonies e.g. Tunisia are a main market. Wheat export worth €3.4B annually.
- Airports such as Charles De Gaulle, as well as TGV high speed rail make transport easy.
- Road network also developed - low transport costs.

Discuss the factors that have led to the development of a well developed manufacturing/secondary sector in a non-Irish, European region you have studied.

- Paris Basin - several factors affect the secondary sector.
- Location & accessibility - in the west of continental Europe, so widely accessible.
- Airports e.g. Charles De Gaulle as well as sea ports e.g. Le Havre attract heavy industries, as raw materials and energy sources such as oil can be brought in readily.
- International market access also a benefit. Mainland Europe, Africa, Americas all accessible.
- Rail & road developed e.g. Channel Tunnel > efficient and fast means of transporting materials.
- Located in Ile de France - ¼ of Europe’s cereal harvest > raw materials for food processing industry.
- Population & economics - 21m people live in Paris Basin, 11m in Paris, providing ¼ France’s workers.
- 17 universities in Paris Basin e.g. University of Paris provide skilled workforce.
- Large population = large market, many shops & sellers e.g. at Avenue de Champs Elysees.
- Tertiary activities can buy straight from nearby manufacturers, encouraging them to set up nearby.

- Fashion industry in South City (e.g. Chanel) , spin-off industries e.g. Jewellery set up nearby.
- Governmental policy - Schema Directeur. Set up industrial zones e.g. Marne La Vallee - Star Airlines.

Discuss the factors that have led to the development of a tertiary industry in a European (non-Irish) region you have studied.

- Paris Basin in France. France receives 75m tourists every year, 45m+ to the Paris Basin. Tourism is a €35b industry, and is focused around Paris.
- Relief & climate - low-lying except in Champagne where limestone scarps exist.
- Continental climate in this region + southerly aspect mean it is suitable for viticulture.
- Hot summers (20°C) and long growing season (270 days) with 700mm rainfall evenly distributed.
- Reims is centre of wine production - well-developed wine tourism industry. Tours & tasting.
- River Seine accessible and many tourists go on river cruises.
- Historic & modern attractions. Medieval towns e.g. Caen attract those interested in history and many visit the beaches of Normandy every year to remember relatives lost in WWII.
- Disneyland Paris attracts 12m tourists per year.
- Art galleries e.g. The Louvre, as well as Notre Dame Cathedral and the Musée D'Orsay (5m annual visitors) attract older tourists.
- Shopping districts e.g. Champs Elysees, Boulevard Hausseman - Dior, Chanel, L'Oreal etc.
- Transport excellent. City Metro present. SNCF & TGV rail services outside city - connects to London, Marseilles and Lille.
- Three international airports, Charles de Gaulle, Paris Beauvais and Orly.

Compare how two physical factors have defined two contrasting European regions.

- Mezzogiorno & Paris Basin. Physical factors are relief and climate.
- Paris Basin highly developed 480x320km in NW France. Multiple climate types.
- Maritime climate west-800mm rain, mild temps. Pastoral agriculture - grass easily grown - Brittany.
- Continental climate east-700mm rain, 28°C summers. Viticulture - southern aspect - Champagne.
- Transitional climate in middle -750mm rain. Limon soils - Ile de France highest cereal yield in France. Paris Basin produces 24% of Europe's cereal yield.
- Relief - Paris Basin sits on downfold syncline formed 400m years ago - land under 200m mostly.
- Saucer-shaped scarps of differing rocks - varied, fertile soils. Contributes to the region's agriculture.
- Mezzogiorno is south of Italy up to Rome, and includes Sicily. It is a poor, peripheral region.
- Mediterranean climate-50mm rain in summer, 28-30°C. Mild winters (800mm rain). Uneven rainfall is not conducive to horticulture, contrasting greatly to climate in Paris Basin.
- Apennine mountains dominate relief - <15% land is flat. Olives & citrus fruits all that can be grown.
- Soil erosion occurs because of the slopes which also prevents machines working efficiently. As a result, pastoral farming is common as it is more feasible than horticulture. Defines region as such.

Describe and explain factors that have influenced the development of agriculture in a European region that you have studied.

- Mezzogiorno in Italy. The factors are climate, relief and human influence.
- Mediterranean climate, long hot summers (27-29°C). 50mm rainfall in summer. Winters usually have about 750mm rain with temps around 15°C.

- Crops fail in summer because water evaporates or seeps through permeable limestone; this only suits the growing of citrus fruits.
- Apennine Mts run along length of Italian peninsula, 85% land hilly or mountainous. This means tools & machinery cannot work efficiently. Soil erosion prevalent so pastoral agriculture is common.
- Unfair land ownership was in place till mid 20th century. 80% of land was owned by absentee landlords, their estates called latifundi, which were divided up into the tenant farmers' minifundi.
- There were 2 million tenant farmers, called braccianti, who took little care of the rented land.
- Braccianti grew cash crops year on year as it was all they could afford. Yields were low and the land was over cropped and overgrazed. This system ended in 50s but still effects agriculture today.
- Cassa per Il Mezzogiorno put in place. Latifundi broken up. Farmers given 5-50 hectares (was 1).
- Farmers received training & technology. Co-ops set up to buy produce. Irrigation schemes set up.
- EU categorised Mezzogiorno as a Category 1 region, thus allocating more funding.
- Improvements have been made but still a long way to go.

Account for the development of the manufacturing industry in a European region you have studied.

- Mezzogiorno region was traditionally underdeveloped but has improved somewhat since 1950s.
- Pre 1950, less than 20% of population was in manufacturing > unskilled workforce + poor market.
- Lack of energy for industry. HEP not utilised due to permeable limestone and drought conditions.
- Coal, oil and gas were not produced in the region.
- There was a high emigration rate, and an earthquake in 1980 badly affected the region.
- Cassa per il Mezzogiorno was implemented in 50s. €-B was pumped into region.
- Capital for small-medium businesses. Grants & tax incentives encouraged businesses to the area.
- Land was made cheaper & Greenfield sites were offered to manufacturers.
- Gas deposits developed on in Sicily, Naples & Calabria.
- By-laws enacted meant 60% of all public and semi-state investment had to be in Mezzogiorno.
- The Bari-Brindisi-Taranto triangle was developed for heavy industries & petrochemical industries.

- Deepwater ports at Taranto & Siracu
- sa attracted steel and oil-refining industries e.g. Finsider.
- Naples developed more diversified industries such as textiles, cars etc.
- The result was the creation of construction jobs for factory construction, and factory jobs then.
- Cassa not entirely successful. Factories were capital intensive and didn't provide many jobs due to the mechanisation of many tasks.
- Many manufacturing workers maintained family farms, and would often take time off for farm duties which decreased productivity.
- Communication failures between councils and industry resulted in towns and factories being built far apart, making commuting difficult.
- State-owned factories were privatised meaning they were no longer bound by restrictive by-laws.

Examine the factors that influence the development of one tertiary economic activity in a European region that you have studied.

- Mezzogiorno region has seen development in Tourism.
- Climate is attractive. Hot, dry summers (26-29°C) attract beach tourists. Apennines attract winter sport enthusiasts in winter. This means there is a year-round tourism industry.
- Areas of natural beauty e.g. Amalfi Coast, Mt Vesuvius & Pompeii attract cultural tourists.
- Greek & Roman architecture still existent e.g. Pompeii, architecture e.g. Monreale Cathedral in Sicily is impressive (younger than Roman & Greek though - Built 12th century).
- Mezzogiorno is generally cheaper than Northern Italy, suiting tourists on a budget.
- Cassa per il Mezzogiorno benefitted tourism. 15% of Cassa funding was for tourism.
- Large-scale development resulted. Autostrada del Sole built to connect North & South Italy, which reduced transport times and transport costs.
- Airports & ports were developed e.g. in Naples.
- Railways & ferries were improved, such as ferries to Sicily and Sardinia, making the areas accessible.
- Jobs have been created in hotels, tours etc, while spin-off jobs have been created in industries such as agriculture, manufacturing, banking etc.
- Infrastructure has been developed such as tourist centres, which further benefit tourist numbers.
- 12 million people visited the Mezzogiorno in 2003, up by 4 million from 2000, with figures still rising.
- Negative factors affecting tourism: development has only taken place in coastal regions. Inland areas do not have developed tourist industries.

- Tourism employment is often seasonal & low-paying.
- Tourists are spoiling the beauty of the area, creating pollution and straining the water supply.

Outline the development of human processes in a peripheral European region you have studied.

- Mezzogiorno region in Italy. The population of the region is 22 million. The distribution relates to the topography, as the Apennine Mts have a low pop density, and the coast has a high pop density.
- Traditional high birth rate, decreasing with development, reasons are: women more empowered, Catholic church influence decreasing, family planning education and also economic development.
- Life expectancy has increased due to increased quality in healthcare and nutrition.
- Less young people and more old people than before.
- 5 million have migrated to Northern Italy since 1951, in what is called out-migration.
- 10 million people have emigrated in the last century (USA/Aus pre 1945, Germany/France since).
- Decrease in outward migration since the 70s due to modernisation of the region.
- Push factors from the region were unemployment, overpopulation, isolation, poverty & poor soils.
- Pull factors to host regions were employment & education and better wages and environment.
- Communist regimes collapsing in East Europe in the 90s and poverty in North Africa brings many migrants to the region.
- A quota system was implemented due to the strain put on the region economically, which limits the number of refugees allowed access.

Account for the distribution of population throughout a European region that you have studied.

- Mezzogiorno in Italy. Low economic development and harsh environment factors driving changing population distribution. 65% live in rural areas of 21 million population.
- Pre-1950, the area depended on agriculture - little alternative.
- Lowland areas were swampy w/ marshes. Farmers lived upland in villages or towns.
- High population density upland - land was divided up into Latifundi owned by absentee landlords.
- Small plots called minifundia were rented out (<5ac) close together leading to a high pop density.
- Coastal cities e.g. Naples and Campania province had fertile volcanic soils (Vesuvius) which led to a thriving food processing industry and a growth in trade & commerce through Naples Port.
- Government stepped in to cut youth out-migration. Cassa Per Il Mezzogiorno set up in 1950.

- Land taken from absentee landlords and redistributed to peasants in more viable plots.
- Less people needed upland caused a move to the coast. Swamps were drained for farmland.
- Secondary Industries in growth poles were developed. Jobs in Naples and Bari-Brindisi-Taranto industrial triangle led to a change in the population distribution.
- Cassa began developing tourism in the 80s. Jobs were created on the coastline.
- The Mezzogiorno, especially coastal cities, became a destination for migrants and refugees from Balkan states and Africa. This again affected population distribution.

Describe and explain two factors that influence the development of agriculture in a continental/sub-continental region you have studied.

- Region is India. Two factors are climate and soils.
- Tropical latitude = tropical climate. Monsoon climate type dominant, hot all year round (20-32°C)
- Rice & sugar require these high temperatures to be grown.
- Monsoon climate has two seasons. Wet season June to September, and dry October to June.
- Monsoon rains control what crops are planted, as if rains are delayed crop yields are affected.
- Up to 10,000mm of rain can fall in some areas in wet season, resulting in leaching and infertile soils.
- Ganges Valley, Eastern Ghats and Western Ghats receive approx 2,500mm. Rice is dominant here.
- Wheat, maize and millet grown in dry season - not dependant on rain.
- Thar Desert in North East unsuitable for crop growing, cotton and millet grown in irrigated areas.
- Rice requires wet alluvial soils, found along Ganges Valley. Soils are renewed each year when the River Ganges bursts its banks and spreads nutrients over its floodplains.
- Himalayas in North have high relief resulting in shallow, infertile soils. Goat grazing and subsistence farming is dominant here.
- Black soils found on Deccan Plateau. Large clay content, retain moisture and are suitable to cotton growing.
- Climate extremes in India can lead to monoculture and infertile soils.
- Population growth results in deforestation, and the lack of roots increases soil erosion.

Discuss the development of secondary economic activities in a continental/sub-continental region you have studied.

- Pre 1950 only 2% of Indian workforce was involved in manufacturing e.g. Pharma, electronics etc.
- Only industry was in Chennai, Mumbai and Kolkata. Governmental policy, a large labour force and access to energy and raw materials have contributed to a development in the sector since then.
- After 1947 independence, government focussed on local craft industries and food processing.
- These rural industries could use local produce e.g. wheat, and the government invested in fertilisers and machinery to improve agricultural output. This was largely unsuccessful.
- India has advantages for labour; a well educated and cheap labour force. India has more graduates than Canada and the US combined, and 40% of graduates have engineering or science degrees.
- Multinationals in the high-tech software industry have been attracted to India. Employees cost less than a third of what they would in Europe or the States. Bangalore=Indian Silicon Valley (IBM here).

- Coal and iron ore deposits are close to Kolkata, making it the centre of the coal and steel industry in India.
- Textile industry located in the dry north-west e.g. Ahmadabad and Baroda- local cotton main input.
- Main port is Mumbai. Pharma industry located here to lower transport costs.
- 95% of foreign trade occurs through Chennai and Mumbai.
- Transport is generally poor > forces industry to main cities. 600k rural villages have no access to tarred roads, making secondary sector expansion difficult and causing it to remain urban based.

Discuss the factors that have influenced the development of one tertiary economic activity in a continental/sub-continental region you have studied.

- Tourism has developed in India.
- Tourism is the largest service industry in India and accounts for 10% of employment.
- Tourism is worth 6% of India's GDP. 5.2million people visit India on average each year but this has increased in recent years. The US and the UK provide the most tourists to India.
- Physical factors have influenced development. India lies between 9° and 36°N of the equator, and due to its topography is an extremely varied region.
- Himalayas in north(attract trekkers), beaches such as Goa (attract sun tourists), river valleys e.g. R. Ganges valley, rainforests and rare and unique wildlife such as the Bengal tiger all contribute.
- Many human/cultural attractions e.g. many people tour the golden triangle of cities in the north - Delhi, Agra and Jaipur. These cities are well connected with train services and luxury coach lines.
- Agra has Taj Mahal, a world famous mausoleum. Many tourists travel to experience yoga and meditation holidays e.g. in Goa in the south-west. Kerala (south) is known for festivals and beaches.
- Tourism industry has to overcome many problems e.g. poverty hinders internal tourism.
- Many people in India cannot afford to holiday. Foreign tourists find the poverty and over-population upsetting, and coupled with the long-haul nature of a flight to India, can be deterred.
- Terrorist issues e.g. 2008 Mumbai hotel bombing also discourage tourists from coming to India.
- Government policy and transport improvements are helping to alleviate these problems.
- Indian Tourism Plan is upgrading tourist facilities and marketing India abroad.
- The Plan has helped increase tourism numbers to 8.8million visitors in 2016.
- New air transport links and luxury hotels in Mumbai and Bangalore are improving tourist numbers.
- Internal tourism has improved slightly as wealthy IT workers from Bangalore and Chennai travel to the South-west for "monsoon holidays".

Describe and explain the development of one Irish urban region you have studied.

- Dublin City's boundaries have expanded from the 50s to the present day.
- Rural to Urban migration has caused urban sprawl: the city has spread into the surrounding countryside. Its zone of influence now covers much of east Ireland.
- Dublin is the capital city and centre of government. There are thousands of civil service jobs here.
- Wide variety of healthcare and universities make it an attractive place to live.
- Good comms networks make Dublin attractive for industries such as finance, light engineering etc.
- In 1971 Dublin had 35.7% of population. Will have 46% by 2020 and the city will have 1m people.
- Tallaght, Blanchardstown and Lucan/Clondalkin were 3 towns built on the edge of Dublin in the 70s, to accommodate the rising population. Adamstown, built in 2007, is expected to house 70k.
- In the 90s, demand for housing was so high that development spread to Maynooth and Leixlip.

- Traffic congestion occurred due to increased wealth (pre 2009), higher rates of car ownership and high city centre house prices. People began buying homes in surrounding counties like Meath and Kildare and began commuting long distances to work each day.
- Commuters now live up to 90km away in towns like Carlow or Mullingar.
- Dublin City's boundaries used to be Howth, Phoenix Park and Dun Laoghaire, but are now Swords, Calbridge and Bray.
- Local Government Act 1993 set up to control Dublin's growth.
- 3 new councils were formed to control services in and around the city. Dun Laoghaire/Rathdown, Fingal and South Dublin councils were set up., and provide more efficient management of services.

Describe and explain the growth of one European urban region you have studied.

- Paris has a population of over 10million and has grown for a number of reasons.
- Defence was an important factor in medieval times. Paris lies on the Ile-de-France, an island in the River Seine, meaning it was a safe location and acted as a bridging point for the river.
- Paris lies in the Paris Basin, an area of fertile limon soils. Cereals and other products such as dairy are produced here, and industry has developed as a result, leading to a centre of employment.
- Paris is the centre of government, providing thousands of civil service jobs > attractive feature.
- Paris has a migrant population of 1.4m, and total population is expected to reach 14m by 2050.
- Migrants live in suburbs, the construction of which has led to urban sprawl.
- Social & economic problems to do with growth: traffic, social deprivation and inner city decline.
- Schema Directeur developed to combat these. Aims = control growth, improving housing, provide more recreational space in the city and provide employment in towns outside Paris.
- 5 new towns built around city, e.g. St Quentin-en-Yvelines, which is 30km South West of Paris and houses 150,000 people and provides 40,000 jobs.
- Schema has been successful in slowing growth and improving living standards.
- Parisian riots of 2005 and 2007 highlighted the high unemployment and lack of opportunity in poor suburbs.

Describe and explain the growth of one continental/sub-continental region you have studied.

- Mumbai is an island mega-city in west India with a population of 23m (2nd largest after Tokyo).
- Originally 7 islands joined by reclaimed land.
- Trade was important in 1600s, leading to the city's growth. East India Trading Company controlled the city and built sea defences and developed the area as a trading port.
- Merchants moved to the city, and population also grew due to it being politically stable and the city allowing religious freedom. Population nearly 60,000 by late 17th century.
- In 19th century conflict between Hindus and Muslims caused people to flee to Mumbai > growth.
- Cotton spinning & weaving industries were established in late 1800s, supplying the British Empire.
- Building of the Suez canal meant Mumbai was closer to Europe, benefitting trade in Mumbai.
- Today Mumbai is the financial capital of India and the centre of Bollywood film industry.
- Mumbai's port is the largest in India and handles 25% of India's international trade.
- Many problems typical of mega cities such as air pollution and slum settlements.
- Almost 10 million people live in slum settlements, the largest of which is Dharavi.
- Dharavi was the first stop for landless migrants as they came to Mumbai.

- Dharavi used to be a peripheral swamp but now occupies prime development land in the city centre.
- The government plans to demolish Dharavi and move residents to apartments. An €800m development of business parks, hotels, restaurants and a university is planned for the site.
- Suburbs are being built to ease congestion and provide space for industrial parks elsewhere in Mumbai.

Describe and explain destructive plate boundaries.

- Destructive boundaries occur at convergent boundaries, where plates collide.
- Heat in mantle creates convection currents, which flow in asthenosphere (upper mantle).
- Molten rock rises, cools, moves laterally and falls, dragging the plates, sometimes together.
- Crust is destroyed at convergent boundaries.
- Some destructive boundaries occur where oceanic plates meet continental plates.
- Oceanic crust is heavier, made of dense basalt. It is destroyed when plates meet and it subducts.
- The melting oceanic rock is reabsorbed into the mantle.
- A deep trench is formed at the point of subduction, as well as volcanoes which are a result of the magma displaced by the melting rock rising through buckled rock, resulting in explosive eruptions.
- This lava type is usually acidic, aiding the explosive nature of the eruptions.
- Other destructive boundaries occur where two ocean plates collide, and one sinks into the mantle.
- The resultant magma rises through overlying rock to form explosive volcanoes in volcanic island arcs on the seabed e.g. Japan and Philippines Islands.
- Magma at these boundaries is very acidic forming steep sided volcanic cones e.g. Mount Pinatubo Islands.
- Destructive boundaries also occur between two continental crusts. Both plates are light and resist downward movement, so buckle upwards to form mountains.
- Collision between Eurasian and Indian plate formed the Himalayan mountains.

Explain, with reference to examples you have studied, how plate tectonics helps us to understand the forces at work along crustal plate boundaries.

- Explain convection currents.
- One force along boundaries is convergence. Two plates collide (oceanic-oceanic, oceanic-continental, continental-continental).
- At oceanic-oceanic, one subducts forming a trench e.g. Mariana trench at Pacific and Philippian plate boundaries (11km deep). Volcanoes can form and create islands e.g. Japanese Islands.
- At continental-oceanic, heavy basalt oceanic plate subducts. The light continental plate slides up to form fold mountains and volcanoes can also form e.g. Mt St Helen's, as well as earthquakes.
- Continental-continental results in fold mountains e.g. Himalayas (Eurasian and Indian plates).
- Can also cause devastating shallow earthquakes such as 2005 Pakistan earthquake which killed 85k.
- Other forces occur at other plate boundaries. Constructive (divergent) boundaries occur where plates separate, and form mid ocean ridges e.g. Mid Atlantic Ridge.
- Mid Atlantic Ridge stretches over 40,000km from North to South Pole.
- Eurasian and North American plates moving apart at 5cm per year, increasing size of the Atlantic.
- Crust splitting forms a rift valley, allowing magma to rise, cool and form new crust.
- Volcanoes occur at cracks or fissures, and minor earthquakes are also prevalent.
- 3rd type of force is a conservative boundary, also known as a passive, transverse or transformative boundary.

- Plates slide past each other and often appear as fault lines e.g. San Andreas Fault, where the Pacific and North American plates slide past one another.
- Both plates are moving in a NW direction, Pacific plate at 5cm/year, North American plate at 1cm/year. The difference results in an immense build up of pressure.
- In 1905 a devastating earthquake ruined San Francisco and other locations along the fault.

Explain with reference to examples you have studied how the theory of plate tectonics helps us to explain the distribution of earthquakes around the world.

- Many areas where earthquakes are frequent e.g. Southern Italy and Pacific Ring of Fire.
- Theory of continental drift proposed by Alfred Wegener in 1912.
- He said all land used to exist as one land mass called Pangaea and drifted apart.
- His ideas were the result of finding identical fossils on far apart continents, matching rock types on far apart continents, and the fact that South America and Africa appear to fit into one another.
- He realised convection currents must be driving movements. Explain convection currents.
- Sea floor spreading the 2nd theory on which plate tectonics is based, discovered by Henry Hess.
- He saw volcanoes and new land forming in his submarine.
- These theories show where earthquakes will occur - at plate boundaries, which may be constructive, destructive or transformative in nature.
- 2 plates are pushed together at convergent boundaries. Name 3 types. Result in subduction and pressure building up, which can cause releases of pressure in the form of earthquakes.
- Eurasian and African plates meet at Mediterranean and earthquakes occur here, such as 2016 South Italian earthquake.
- At transform boundaries plates slide along each other, in different directions or at different speeds.
- This causes a pressure build up and earthquakes can occur e.g. 1989 San Francisco earthquake.
- San Andreas Fault lies along a transform boundary between Pacific and North American plates, and many earthquakes happen here, backing up the theory.
- Constructive boundaries can also cause smaller, less violent earthquakes as rising magma causes vibrations in the crust.
- Can do 2 diagrams on this essay.

Explain with reference to examples you have studied how the theory of plate tectonics helps us to explain the distribution of volcanoes around the world.

- Areas of volcanic activity include the Hawaiian Islands, Pacific Ring of Fire and Sicily.
- Explain theories of sea floor spreading and continental drift outlined in previous essay.
- These theories explain the locations of volcanoes, at plate boundaries - which can be constructive, destructive or conservative boundaries.
- Volcanoes can also occur at hotspots, areas of weakness on the earth's crust.
- Dangerous and violent volcanoes occur at convergent boundaries, at the subduction zones.
- As one plate subducts, the crust melts to form magma which pushes up and cools to form granite, or forms volcanoes such as at the Rockies.
- The pressure build up is caused by gases expanding as they rise, and this occurs at subduction zones all over the world e.g. Mt Fuji in Japan, part of the Pacific Ring of Fire.
- Volcanoes at constructive boundaries are less explosive - gas pressure does not build up as gases can escape freely through the newly formed gap.
- As a gap is left, magma oozes out to form mid ocean ridges or volcanic islands e.g. Iceland. Pyroclasts can blow 100s of ft into the air but volcanoes at destructive boundaries are far larger.
- Other volcanoes are not located at plate boundaries e.g. Hawaii.

- These occur at hotspots where magma rises through the mantle at weak spots. These volcanoes have a wide base and gently-sloping sides - shield volcanoes.
- The lava at hotspots is often basic meaning the lava flows over long distances - not steep.
- Diagram of any one boundary.

Examine the processes that have led to the formation of any two volcanic landforms.

- Two volcanic landforms are volcanic cones and batholiths.
- All volcanic activity starts in earth. The superheated core melts the magma around it.
- Molten magma cools further from core, resulting in convection currents which move up from the core, cool, move sideways in the asthenosphere and fall again, dragging tectonic plates around.
- Volcanic cones are extrusive landforms, forming on the Earth's surface.
- Shield volcanoes occur in hotspots - regions of thin or weak crust - which allow the formation of plumes (narrow columns rising up through the crust), which allow magma to escape.
- The lava that flows on the surface of these is basic lava (<55% silica) and so is very runny in texture.
- The eruptions here are often not powerful, like fountains. Mauna Loa in Hawaii is a shield volcano.
- Another type of volcano is a dome volcano, common at destructive boundaries.
- One plate subducts, pushing magma upwards. The gases in magma expand as atmospheric pressure decreases, leading then to an increase in pressure which can cause powerful explosions.
- The magma has a high silica content (>70%), and is thick in consistency meaning it does not travel far before cooling, forming volcanoes with steep slopes in a convex shape. E.g. Mount Pelee.
- Magma can sometimes bulge out the side of the crater to form a parasitic cone.
- Other cones exist e.g. cinder cones and composite cones, formed by differing processes.
- Batholiths are intrusive landforms formed originally beneath the Earth's surface.
- Batholiths may now be visible due to erosion.
- They are huge masses of granite formed as magma intruded the crust and cooled slowly over thousands of years, forming large crystals. The magma is less dense than rock, causing it to rise.
- The hot magma can metamorphose overlying rock to form metamorphic aureole.
- The surrounding rock is then eroded over millions of years to leave low, rounded, granite mountains. Examples of batholiths can be seen in the Wicklow mountains or Mourne Mts in Down.
- Add diagram of one of mentioned features.

Discuss the positive effects of volcanic activity.

- Many negatives but some positives. New land is created, which can be of economic and physical benefit. Volcanoes can provide fertile volcanic soils suitable for agriculture.
- Two benefits to be discussed are tourism and geothermal energy.
- Volcanic activity is a source of tourism globally. 200k people climb Mt Fuji in Japan annually.
- Many people travel internationally to climb it, creating spin-off industries e.g. restaurants & hotels.
- Spring and mud baths can appeal to beauty tourists e.g. Blue Lagoon in Iceland , providing employment and financial stability for locals.
- Geysers e.g. Old Faithful in Yellowstone attract tourists to their many eruptions (2.6m/ year).
- Foreign tourism benefits include increased incomes and foreign currency exchange. For example, tourism is worth €700m annually to the Irish economy.
- Geothermal energy is energy created within the core of the earth and is harnessed by humans.
- Water is heated to provide home heating and steam is used to generate electricity.
- Iceland utilises geothermal energy efficiently. It lies on the Mid Atlantic ridge.

- Convection currents in the magma in the asthenosphere are pulling the Eurasian and North American plates apart, allowing magma to rise to the surface in Iceland.
- Rainwater which seeps in to the ground rises to over 200°C.
- Holes are drilled 2km into surface and pipes are laid. Water is pumped down, heated and returns.
- Geothermal energy heats 89% of Iceland's homes, and 26% of Iceland's power comes from geothermal power plants.
- Geothermal energy is cheap and good for the environment, using less fossil fuels and providing a source of tourism such as the aforementioned blue lagoon.

Explain how the occurrence of volcanoes and earthquakes can be monitored and predicted.

- Seismologists study earthquakes. It is difficult for them to predict earthquakes.
- They use modern technology to monitor along fault lines e.g. San Andreas fault, destructive plate boundaries and Japan. Japan is at major risk - lies where three plates meet.
- Laser beams can detect plate movement.
- Seismometers study vibrations and tremors- increases in such may indicate impending earthquake.
- Radon gas levels are measured - if these rise, rocks are likely fracturing underground.
- Well and oil levels are monitored. If the ground is squeezed or stretched these could change.
- Animal behaviour is monitored e.g. Italian toads left mating ground before earthquake in 2016.
- Earthquake drills and evacuation procedures are in place in high risk cities.
- New roads and buildings are designed to withstand shaking.
- Volcanoes occur at boundaries. Most destructive at destructive plate boundaries.
- Volcanoes are easier to predict as volcanoes are usually active in the days before eruption.
- Seismometers can also be used in predicting volcanoes - seismic activity increases in the run up, as magma and volcanic gases must force their way through shallow fractures.
- Seismometers are placed within 20km of volcano.
- The ground is observed for deformation. Sudden bulging or swelling indicates magma rising in vent.
- Tiltmeters or satellites' radar can measure ground deformation.
- Sulphur dioxide and carbon dioxide levels increase before eruption - these levels are monitored.
- Samples of these gases are taken from automatic chemical sensors and results radioed back to scientists. Mount Etna is monitored 24/7.
- Gas sampling is dangerous due to remote location, hazardous fumes and suddenness of eruptions.

Explain how folding influences the development of landforms.

- One landform formed by folding is fold mountains. Example Munster ridge and valley & Himalayas.
- Folding occurs when rocks are compressed and squeezed.
- Rocks fold when great heat or pressure make the rock flexible allowing it to bend.
- Compression occurs due to the collision of the earth's plates at destructive boundaries.
- When plates collide, rocks fold upwards and form fold mountains.
- Old red sandstone was formed 350m years ago and covered with limestone.
- These rocks were compressed 300m years ago in Armorican folding period to form mountains.
- The compression came from North and South and so the mountains have an East-West trend.
- The limestone was eroded from anticlines exposing sandstone e.g. Comeragh Mts.
- Limestone is preserved in synclines e.g. Blackwater Valley.

- 3 stages of folding have impacted global landscape. Caledonian Orogeny is oldest (400m y/o).
- Caledonian have a north-east/south-west trend e.g. Wicklow Mts.
- Youngest fold mountains are alpine formed 50m years ago, trending east-west. None in Ireland.
- Symmetric folds occur when pressure is applied equally and gently from both sides of rock layers.
- Overfold faults occur where more pressure is applied to one side. Rock is turned over on itself.
- Overthrust folds occur when pressure is great, fracturing the fold pushing one limb over the other.

Explain how faulting influences the development of landforms.

- Faulting forms many landforms; block mountains such as Ox Mts Co Mayo, doming e.g. Black mountains in South Dakota, and rift valleys such as the African rift valley.
- Rocks crack or fracture when pulled apart or compressed by moving tectonic plates. This is faulting.
- Normal faults occur when a sloping fault is created and land slips down along one side of it.
- These caused by land being pulled apart (tension) sometimes forming a valley.
- Rift valleys (graben) form when crust stretching results in the land between two normal faults sinking. The valley formed has steep sides and a flat floor.
- The slopes mark fault lines and are known as fault scarps.
- In African Rift Valley, faulting is occurring due to a hotspot rising up and pushing up and stretching the crust.
- ARV is 5000km long and is between 40-100km wide. The edges have scarps running from Ethiopia to Mozambique.
- Reverse faults are caused by compression of plates forcing land to move up along a sloping fault.
- Block Mountains (horsts) form from further compression of reverse faults, forcing land upwards between two faults.
- The edges of the block mountains are fault scarps e.g. Ox Mountains.
- Thrust faults are a type of reverse fault where the angle of the fault plane is very low.
- Overlying rock is thrust forward up to 40km e.g. in Munster Sandstone has been thrust over limestone.

Examine the influences of tectonic activity on the development of the Irish landscape.

- Lithosphere split into large plates which sit on molten asthenosphere. Plates move due to convection currents created by the earth's superheated core.
- Plates collide and separate to form destructive and constructive boundaries.
- Tectonic activity results in formation of landforms such as fold mountains and lava plateaux.
- Plate collision has influenced Irish landscape. Rock layers fold upwards under pressure.
- These form fold mountains. 2 orogenies (mountain formings) have affected Ireland.
- Caledonian orogeny 450m years ago formed mountains with south west north east trend.
- Granite and quartzite remnants of these mountains found in Wicklow Mts and Donegal.
- Armorican folding 350m years ago formed east-west trending mountains e.g. Macgillicuddy Reeks.
- Diagram of colliding plates.
- Plate separation has influenced Irish landscape.
- Earth's crust splits, forming faults and large rift valleys.
- Low pressure on mantle below and basic lava (<55% silica) makes its way to valley floor.
- Lava builds up and spreads over time to form high flat topped areas of basalt.
- Occurred 60m years ago in Ireland to form Giant's causeway when Eurasian and North American plates split.

Explain the formation of igneous rocks with reference to Irish examples.

- Granite and basalt. Igneous rocks form when magma cools and solidifies above or below surface.
- Intrusive/ plutonic igneous rocks form beneath the earth's surface deep inside crust.
- Magma forms at destructive plate boundaries when descending plates are subducted.
- Oceanic plate sinks under continental plate e.g. Nazca and South American plates.
- Plumes of magma rise and enter rocks above, cooling slowly surrounded by insulating rock.
- Large crystals e.g. glassy quartz form.
- Granite is an example of an intrusive rock. It is grey, white, pink or green depending on its mineral content and can include minerals such as feldspar and mica.
- Granite found in Wicklow and Donegal Mts, formed in Caledonian era 450m years ago.
- Magma intruded into Wicklow Mts and cooled slowly to form Leinster batholith (mass of granite).
- This rock appeared on surface when above rock was eroded.
- If magma cools closer to surface intermediate rocks are formed e.g. dolerite which is often found in sills, laccoliths and dykes e.g. in Fair Head Co Antrim.
- Extrusive rocks occur where lava pours on to surface and cools quickly e.g. basalt
- Basalt forms at divergent boundaries and is dark brown or black. Crystals have no time to form.
- Lava reaches surface through fissure.
- Basalt found on Antrim Plateau, formed 65m years ago when Eurasian and American plates separated. This basic lava formed hexagonal columns, and layers of basalt rock.
- Basalt is hard and resistant to erosion.
- Acidic lava does not flow across surface easily and forms basalt domes e.g. Mt St Helens.
- Examine, with references to examples from Ireland, the formation of sedimentary rocks.**
- Made from accumulation of organic and inorganic sediments, formed in layers called strata.
- As a new layer is deposited, water, minerals and air are squished out of lower strata.
- Horizontal joints called bedding planes separate the strata.
- Turning sediment to stone is known as lithification. Great weight of above layers cement particles together by removed silica or calcite to form solid sedimentary rock.
- Sedimentary rocks classified according to composition and formation.
- Organic rocks composed of animal and plant remnants, inorganic rocks are formed of small rock particles building up and evaporite rock formed from the evaporation of sea water.
- Limestone is an organically formed rock, and the most common rock in Ireland.
- Karst landscape in Burren a prime example.
- Limestone formed 350-300m years ago when Ireland lay 20-30° S of equator, under warm sea.
- Remains of fish, organisms and mud built up and compressed over time to form limestone. Calcium carbonate is responsible for gluing the organic particles together.
- The remains of animals can be seen in fossils in limestone.
- Limestone is a porous, permeable rock which is easily weathered.
- Limestone metamorphoses into marble under great heat or pressure.
- Sandstone is an inorganically formed rock found in the Galtees in Co. Cork. It is very common.
- It formed when small particles of eroded rock were carried by rivers into seas or lakes, and lithification occurs with silica binding the particles.
- Irish sandstone formed 350-400m years ago when Ireland was 30° S of equator with a dry desert climate.
- Red tint is as a result of iron oxide present.
- Sandstone is porous and permeable and metamorphoses into quartzite.
- Evaporite rocks form from the evaporation of sea water from enclosed lakes or seas in hot climates e.g. Rocksalt found in Carrickfergus.
- Diagram of evaporite

Explain one process of physical weathering and one process of chemical weathering.

- Weathering is the breaking down of rocks into smaller particles by mechanical or chemical means.
- Freeze-thaw action is a form of mechanical weathering. Carbonation is chemical weathering.
- Physical weathering is the breaking down of rocks into smaller particles by mechanical means.
- Freeze thaw action occurs where temps fluctuate about 0°C regularly with rainfall e.g. Galtees.
- Rainwater settles in cracks in rocks .
- Temps drop, water turns to ice and expands by 10%, placing pressure on the rock.
- When temps rise, the ice melts and pressure is released. This cycle is repeated often day and night.
- This causes cracks to widen and rock fragments can split off and fall down slope as scree or talus.
- Scree can stop water reaching rock down slope preventing weathering from occurring.
- Diagram of freeze thaw action.
- Chemical weathering results in chemical changes within the rock.
- Carbonation affects limestone due to its high calcium carbonate content.
- Explain how rainfall becomes acid, reacts with rock to form calcium bicarbonate which washes out.
- Carbonation effects can be seen in Karst landscapes where limestone is visible and on limestone buildings where weathering is often evident.
- Chalk also susceptible to carbonation and same chemical reaction takes place

Discuss the formation of one sedimentary rock and briefly explain how that rock can be converted to a metamorphic rock.

- Formation of sandstone and how it is converted in to quartzite.
- Sandstone is an inorganically formed rock found in the Galtees in Co. Cork. It is very common.
- It formed when small particles of eroded rock were carried by rivers into seas or lakes, and lithification occurs with silica binding the particles.
- Irish sandstone formed 350-400m years ago when Ireland was 30° S of equator with a dry desert climate. Huge rivers flowed in this area carrying sediment.
- Red tint is as a result of iron oxide present.
- Sandstone is porous and permeable, meaning it has gaps where oil and gas can be found. It is an important reservoir for groundwater (an aquifer).
- Permeability means oil, gas and water can be pumped from the rock.
- Sandstone converts to quartzite in thermal metamorphism caused by tectonic plate movement.
- In thermal metamorphism, heat over 200°C from magma in the mantle bakes the sandstone, causing grains to melt slightly and lose their sandy texture.
- Grains recrystallize when rock cools down and have a different texture and colour. It is harder now.
- Metamorphism removes pores from the rock and quartzite is not porous.
- Quartzite is white and resistant to weathering. Found in Mount Errigal Co. Donegal.

Examine with reference to examples from Ireland the formation of metamorphic rocks.

- Marble (formerly limestone) and quartzite (formerly sandstone). Found in Connemara and Mount Errigal, respectively.
- Metamorphism is the changing of rock by the action of great heat and/or pressure.
- Metamorphism occurs at temps over 200°C and pressures over 300 megaPascals.
- Thermal metamorphism occurs when rocks are affected by heat of magma in mantle or as lava.
- Quartzite is formed when sandstone is baked by the heat of the magma below e.g. Sugar Loaf Mt.

- Dynamic metamorphism occurs when there is great pressure along fault lines and due to pressure e.g. slate in Valentia is formed from shale under pressure.
- Regional metamorphism occurs when rocks are changed by both heat & pressure, due to gradual movement of the earth's plates, and affects a large area. Gneiss is an example.
- Metamorphism causes foliation (banding) and changes the colour and hardness of rocks. Crystals and grains are flattened and rearranged due to great pressure e.g. gneiss.
- During metamorphism grains are heated and melt slightly. Rock cools & they stick together = hard.
- Metamorphic rocks are usually a different colour to original, as the minerals metamorphose.
- Pure calcite marble is white, marble containing hematite is reddish, and Connemara marble is green due to its serpentine content.

Examine how different rock types produce distinctive landscape with reference to examples that you have studied.

- Limestone and basalt, both found in Ireland forming unique landscapes.
- Karst landscapes occur where limestone is exposed e.g. Burren Co. Clare.
- Limestone forms from the remains of plants and animals and such has a high calcium content.
- Chemical weathering of limestone is the basis behind such landscapes forming.
- Limestone is permeable - water passes through gaps, bedding planes and joints.
- Rainwater is acidic due to carbonation, where atmospheric CO₂ reacts with rain to form carbonic acid, which in turn reacts with calcium carbonate in limestone to form calcium bicarbonate.
- This is soluble and washes away. This process repeats, opening up fissures in rocks.
- The landscape formed is called a limestone pavement and contains deep grooves called grikes separated by blocks called clints.
- Features like swallow holes, dry valleys and gorges are formed, as well as underground features.
- Diagram of limestone landscape can include underground features. Focus on above ground ones.
- Basalt is an extrusive igneous rock formed on the earth's surface by volcanoes or separating plates.
- Basalt exists on Antrim plateau, and makes a unique landscape at Giant's causeway.
- In eruptions or at divergent boundaries lava cools quickly on surface due to cool atmosphere.
- Crystals do not have time to grow and so are invisible to the naked eye.
- Basalt is a hard rock resistant to weathering, dark brown or black in colour.
- Basalt is not affected by weathering and the exposed rock at Giant's causeway is unique.
- It is made of thousands of hexagonal pillars. The hexagonal shape is due to the way in which the rock cooled and fractured evenly.

Examine the role of the processes of erosion in the formation of any one landform that you have studied.

- Cliff is a coastal feature of erosion e.g. Cliffs of Moher in Clare.
- Cliff is steep slope where land meets sea.
- Associated features are wave-cut platforms and wave-built terraces.
- One process of erosion is hydraulic action. This is the power of moving water - specifically waves.
- Exposed areas can receive continual heavy waves and this causes erosion in intertidal zone.
- Weak rock on the coast can chip off and be washed away by the power of this water.
- Hydraulic action prevalent on west coast due to large Atlantic swells.
- Compressed air is another process of erosion.
- Waves crash into rock, trapping air within cracks and pushing in to create pressure.
- Pressure leads to rock cracking and crumbling away, eroding the rock.

- Solution is a third process of erosion. Chemicals and particulates in the sea can react with compounds in rock e.g. CaCl_2 in limestone, creating weaker soluble compounds which wash away.
- Undercutting takes place as a result, and a steep cliff face is formed.
- Abrasion is fourth process. It is the forceful impact of rocks, stones etc. off a rock face.
- Repeated violent impacts break up the rock at base of cliff, creating undercutting.
- Rock above falls off eventually, leaving behind a recessed face and a wave-cut platform beneath.
- The remains of the eroded rock is deposited out to sea in a wave-built terrace, carried by water.
- Areas of harder rock can be more resistant to erosion meaning erosion is unequal along a coastline.
- Diagram of cliff face eroded and features of erosion.

Explain with reference to examples how human activities have impacted on the operation of coastal processes.

- Humans impact on processes such as erosion, transportation and deposition for their benefit.
- Humans protect coast from damaging erosional processes e.g. abrasion, compressed air, H.A.
- Soft methods are those which use the sea's own power to build up the coastline to protect it.
- Soft methods encourage deposition, as deposited materials protect vs further erosion e.g. Sand dune protection - mats and fences are placed in front of dunes to trap airborne sand (Bull Island).
- Hard methods focus on resisting sea's power e.g. Boulders and sea wall in Lahinch Co. Clare.
- Transportation can be halted by groynes - structures built perpendicular to coastline which trap sand as it moves through longshore drift, promoting building up of beaches e.g. Youghal.
- Sea currents are diverted to prevent depositional build ups in shipping areas.
- North & South Bull walls in Dublin built to keep Dublin port clear of sand.
- The sand that should have been deposited here is deposited at Bull Island instead, creating 5km long sand spit known as Bull Island.

Describe and explain, using examples which you have studied, the difference between the terms population density and population distribution.

- Population density refers to the average number of people per square kilometre in a country or region. (Divide population by land area)
- Pop dens is an average figure and can hide large discrepancies in the pop dens in individual areas.
- In Brazil the pop dens is 20/km but large areas of rainforest have low pop dens (6/km) while cities such as Brasilia have a pop dens of 410/km.
- Population distribution describes where and how many people are found in a region.
- Availability of lowland, water, fertile farmland and resources affect pop dens and distribution.
- Lowlands have water and fertile farmland making food production easier.
- Areas with many services make transport easier.
- Most of world's population live between 23-60° N (Europe, North America etc. have high pop dens).
- People avoid extreme climates and steep slopes where living is difficult.
- Desert and Mountainous regions have low pop dens and few people because they are too dry or steep (Sahara and Himalayas).

Explain how Isostasy has impacted on the Irish landscape.

- Isostatic processes involve changes in sea level due to the uplift/sinking of the Earth's lithosphere.

- Cause is the removal or addition of huge ice sheets during the ice ages. The great weight of ice causes the lithosphere to sink slightly, and when ice leaves it returns to its original level slowly.
- The uplift of the land as it rises back up is called isostasy.
- The effect of isostatic processes in Ireland is to change the base level of rivers flowing over land.
- Uplifting of land causes the base level of rivers to reduce and it has a renewed ability to erode.
- This is termed river rejuvenation.
- Knickpoints are rapids and small waterfalls found in the mature or lower stage of a river's course.
- They were once where the river entered the sea, but due to isostatic uplift the sea level was lowered and the river had to travel a longer course to reach the sea.
- The river was made young again at this point and was able to vertically erode.
- The point where the new river profile meets the old one is the knickpoint.
- Many Irish examples in South and East at about 150m altitude e.g. River Barrow.
- This shows that Ireland has uplifted by approx 150m.
- Rejuvenated rivers cut down into existing floodplains cutting a narrow groove, and make new flood plain at a lower level.
- Original valley floor is left high above new flood plain and is seen as steps in the land either side.
- These steps are called river terraces and are seen in pairs on either side of a river.
- Rivers can be rejuvenated more than once and multiple steps can exist. Terraces also found on River Barrow in Co. Kilkenny.