

Geography Notes:

Environment: the term environment where unqualified, means the living and non-living elements of the earth's surface and atmosphere. It includes human changes to the earth's surface and atmosphere, for example, croplands, planted forests and buildings.

Anthropogenic Biome: a global ecosystem unit defined by global patterns of sustained direct human interaction with ecosystems, creating a description of the terrestrial biosphere in its contemporary, human-altered form. Known as anthromes or human biomes.

Natural Biome: is a formation of plants and animals that have common characteristics due to similar climates and can be found over a range of conditions.

Land Cover Change: can be defined as physical and biological cover such as water, vegetation, soil and artificial structures.

Ecosystem: an interacting community of elements.

Ecosystem Structure and Dynamics: The network of interactions within the ecosystem community, these include nutrient cycles and energy flows. The abiotic and biotic features of an ecosystem, their interactions and a source of energy, make up the structures of an ecosystem.

Biodiversity: the type, number and variety of living organisms within a given environment.

Biodiversity Loss: a decrease in species, genetic and/or ecosystem diversity.

Climate: the long term, average weather conditions for a location, calculated over long periods of time. It is measured from long-term precipitation and temperature patterns and often expressed as monthly or seasonal averages.

Climate Change:

Sustainability: meeting the needs of the current and future generations through simultaneous environmental, social and economic adaptation and improvement.

How the natural environment is changed as a consequence of the development of anthropogenic Biomes such as urban areas and agriculture:

Due to the creation of urban areas and agriculture, 80% of people who live in urban areas, live in densely populated urban and village areas. In the 1700's there were wild trees with wild woodlands in Australia, this has transformed to remote rangelands and populated croplands in the 2000's.

Explain how anthropogenic land cover changes can affect global forests

Describe three spatial techniques used to collect and record geographical data.

Forests cover 31% of the earth's surface. However forests are continually being deforested at a rapid rate. Deforestation is the removal or clearing of forests generally for other uses such as agriculture and urban development. The different types of deforestation include fires, clear cutting, unstable logging for timber and degradation from climate change. It is estimated that between 74 000 to 93 000 km squared are removed every year. **(Three spatial techniques used)**

- Carry out a survey
- Field observations and survey techniques'
- Cartography

Briefly explain how world population growth, economic development and advances in technology have had an impact on land cover change and loss of biodiversity over time.

From industrialization, accelerated population growth and the consequent urban expansion in developed or 'rich' countries, a pattern emerged where affluence and 'technology hungry' populations worsened environmental quality. World population growth, growing affluence and advances in technology will impact on the nature; rate and extent of land cover change and potential biodiversity loss. For example, the human demand for biologically productive land will increase with the growth in population. The demand for fossil energy nitrogen and phosphorous as well as fresh water will impact on the use of land. Arable land is lost through desertification and or the encroachment of human settlement due to poor land management and climate change.

Complete the table which outlines the processes that have caused land cover change.

Process	Reasons/factors	Examples
Deforestation	Largely due to exploitation of natural resources (e.g. wood in this case) to fuel economic growth and income.	Primarily south east Asia where lacking laws on environmental protection are the 'norm'.
Expansion and intensification of agriculture	Cheap land allows for farms to be expanded and by intensifying the agricultural production of that farm it allows for more land to be utilized.	Rice fields, wheat or other mechanized farming practices.
Rangeland modification	Government investment in rural areas due to mining boom, largely agricultural and mining based economy in these regions.	
Land and soil degradation	Often due to deforestation, extensive agriculture and rising water table as a result of deforestation.	
Irrigation	Cultural way of farming practice's from Europe involves extensive irrigation.	
Land drainage and reclamation	Government policy to maintain as much land as possible to help secure food security	
Urban Settlement	Urban sprawl, cheap land, centrifugal processes and need for housing in isolated areas for mining purposes.	Newman, <u>Kalgoorlie</u> . Rural California started as mining towns in the gold rushes.
Industry and Mining	Vast amounts of ore located in Northern W.A on cheap land along with the opening up of mining by the government.	Mining companies such as Rio Tinto opening up extensive and expansive mine sites.

Compare the factors that have influenced land cover change between Australia and China.

Australia's population density is 24 million and 88.9% of Australians live in urbanized areas.

China's population density is 1.4 billion, 57% of china's population live in urban areas.

Australia has the 12th largest economy, which relies on agricultural and mining exports for income.

China is the second wealthiest country, the Chinese property boom has increased individual wealth and has created land use change by the clearing of land for development.

Australia: the Enviro protection and biodiversity conservation act 1999 protects native areas and there are many legislative restrictions to land use change including the aboriginal and Torres Strait islander heritage protection act.

Chinas planned economy and fundamental communist ideology there was no housing market. Post 1978, China experienced reform and private housing ownership and a shift in ideology to recognize it as a personal consumable commodity. With china's rapid wealth there have been many ecological problems as it has largely gone unchecked by the ministry of environmental protection (MEP) until January 2015 when new laws allow for the prosecution of polluters and protection of natural areas.

Australia's economy is described as a mixed market economy, which means it, has a mixture of capitalism and socialism, It allows for economic freedom, the government can interfere in economic activities for social purposes. It is dominated by the services sector.

China is a socialist market economy, which means it is largely a state owned economy because of its communist ideology. China's economy is large manufacturing economy.

Using Examples identify past and present land indigenous land management practices and evaluate the impact these have had.

Fire:

Aboriginal people traditionally created a sophisticated system of patchwork burnt and regrowth areas. Fire was used to clear vegetation to make it easier to travel. It was also used to promote growth in some areas and flush possums out of their habitats for food and there were uncontrolled fires as we often witness in recent times.

Modern Times:

Land carers attempt to combine modern practices with traditional knowledge and techniques. Some of the areas in which this can occur are as follows:

- the protection of cultural sites of significance to aboriginal people.
- The creation of seasonal harvesting calendars from traditional knowledge
- The mapping and tracking of water sources
- The recognition and recording of new plants and the removal of seed back and weeds.
- The reducing of greenhouse gases by using traditional methods of land management
- The retention of traditional knowledge for future generations

- Knowledge to reduce the risk of bush fires
- And assistance with the conservation of water resources.

Caring for country:

This includes activities such as cultural practices and rituals, seasonal use of resources and use of fire to achieve optimal environmental conditions. In use of fire to achieve optimal environmental conditions. In a contemporary management context, traditional practices to control feral animals, weeds, conduct biodiversity surveys and tracking of native fauna.

- 20% of Australian land was used for nature conservation and other protected areas (indigenous use)

Complete the following table outlining the impacts of land covers change on the environment.

Type of Impact	Impact	Examples
Changes to the water cycle	<ul style="list-style-type: none"> » Damming increases the amount of evaporation and filtration in the area » Deforestation reduces transpiration and raises the water table » Any land cover change will ultimately change run off which increases erosion and sediment deposition. » Irrigation depletes rivers and water tables, as well as potentially increases the nutrient run off causing eutrophication » Any pollutants can change the nature of precipitation. » An overuse of ground water for drinking, irrigation and industrial use has an impact on the water table. 	Acid rain caused by high levels of sulphuric acid, this has occurred in china and New York.
Soil Erosion and degradation	<ul style="list-style-type: none"> » Grasslands and forests become crops. » The impact of this includes soil erosion, compaction of the soils, loss of soil structure, nutrient degradation and soil salinity. » There is less fertile land » Increased pollution from fertiliser » As a result of the mining process, clogged waterways from sediment and soils that are more prone to flooding because they have lost their water retention qualities. » The effects are the loss of arable land, clogged and or polluted waterways and increased flooding. 	» With greater demand for commodities such as palm oil, coffee, cotton, soybean and wheat comes land cover change for agriculture
Loss of habitat and biodiversity	<ul style="list-style-type: none"> » The impact of land cover change on loss of habitat at local and regional level refers mainly to deforestation and degradation of forests. » This has occurred due to the expansion of agricultural land, increase in demand for timber and other forest products and overgrazing. 	Tropical rainforests are most at risk of exploitation and they contain over 50% of the worlds biodiversity.
Degradation and aquatic marine environments	<ul style="list-style-type: none"> » The quality of the watershed areas and run off into oceans has an impact on aquatic and marine flora and fauna. » Pollution is a major issue with chemicals and effluent causing damage to habitats and 	Damming changes water temperature and level of nutrients, which can have far reaching effects such as the sediment, and nutrients from

	<p>therefore animals.</p> <ul style="list-style-type: none"> » Eutrophication can occur when excess nutrients enter the water courses and cause an algal bloom. This algal bloom can reduce oxygen in the water and fish and other marine life dies. » Ocean Acidification: can occur as a result of the dramatic rise in carbon dioxide levels in the atmosphere. The impact of this is that in order to absorb the CO₂ the pH levels lower and the water becomes acidic which, in turn affects the marine biology. » Damming stops the normal flow of sediment from flowing down rivers and streams which, in turn, affects physical processes and habitats. 	<p>the Congo River can provide a carbon sink for atmospheric gases in the Atlantic Ocean. They replace fast moving water with slow moving water so that mosquito borne diseases can proliferate and, in case of China's three dam project, they will require people to resettle which creates a whole new land cover change.</p>
Loss of ecosystem services	<ul style="list-style-type: none"> » Loss of invasion resistance, which means non-native species can invade native areas and reduce the biodiversity of the area. » Lack of pollination of plants » A loss of ecosystem services can have an impact on climate regulation that is influenced by forests by effecting carbon storage, albedo, evapotranspiration, rising temperatures and fire regimes. » A lack of marine diversity may impact on photosynthesis levels, the carbon and nitrogen cycles. » 	<p>This would be particularly catastrophic for biodiversity hot spots such as the Burren-Augusta area.</p> <ul style="list-style-type: none"> » An example of lack of pollination of plants would be reduction of bees, which are essential to the pollination process required for many fruits and vegetables. »
Changes to regional climates	<ul style="list-style-type: none"> » The urban heat island effect is warming the temps due to man made environment in an urban area. In urban areas the temperature during the day is more likely to be higher as a result of the materials used to build urban areas, whereas rural areas are likely to have a lower mean temp as there is less urban structures and more reflective surfaces for the sun to bounce off of. 	
Urban Heat Islands	<p>This is caused due to the removal of natural surfaces, which absorb and use a greater level of the heat, whereas the built environment uses materials that are non-reflective and water resistance and radiate more heat.</p>	<p>In the downtown areas, the average temperature during the day and night is around 32.8 degrees whilst the rural areas have an average temperature of 29.4 degrees.</p>

Explain how urban development has resulted in the loss of biodiversity and the urban heat island effect.

Urban development or urbanization will see more of the world's people living in cities or the metropolitan areas surrounding cities. Although urban areas only cover 0.47% of the world's land area they contain more than 50% of the world's population. According to scientists, urban areas can affect climate because they change the smoothness of a surface thus affecting the heat budget and the water cycle through changes in the transmission of heat, water, albedo and radiation as well as vegetation cover.

The clearing of land for urban and residential purposes has depleted the environment and the biodiversity through deforestation as both flora and

fauna are being depleted as their homes are being destroyed for other purposes such as agriculture or land reclamation.

Explain how deforestation has resulted in the loss of biodiversity and has influenced the climate.

Deforestation occurs primarily as a result of: agriculture, fuel use and production, timber harvesting, pasture clearing for livestock animals, and expanding settlements. The world's annual rate of deforestation is to be around 13.7 million hectares a year. It has been a cause of a truly massive number of species extinctions in modern times. The clearing of forests takes away the habitats in order for flora and fauna to survive in a specific area, this causes a massive decline in biodiversity as many species die due to this. With the trees gone the air warms up, creating large, rising masses of warm air. When these air masses hit the upper reaches of the atmosphere, they create ripples called teleconnections that flow towards the mid- and higher latitudes which in turn warms up the earth and causes for rainfall and weather events in different countries.

Global Climate Change:

1. Definitions:

Climate → The long term average weather conditions for a location that is calculated over long periods of time. Climate is measured from long term precipitation patterns, often being expressed as monthly or seasonal averages.

Climate Change → The long term trend in global, regional and/or local climatic conditions.

Heat Budget → The perfect balance between incoming heat absorbed by earth and outgoing heat escaping it in the form of radiation. If the balance is disturbed, then earth would get progressively warmer or cooler with each passing year.

Albedo → The amount of radiation reflected by a surface, ranging from 0-100% reflection rate.

Greenhouse Gases → A gas in the atmosphere that absorbs and emits radiation within the thermal infrared range. They include Water vapour, Carbon Dioxide, Methane, Nitrous Oxide and Ozone. Without the resulting "Greenhouse Effect", the global temperature would be approximately 15 degrees colder than it is currently.

Hydrological Cycle → The movement of water as a liquid, gas and solid throughout the land, oceans and atmosphere is an important part of the Earth's climate systems. This natural cycle removes some of the water's impurities and constantly recycles the Earth's fresh water supplies. The driving force behind the hydrological cycle is solar energy, which powers the process of evaporation:

Evaporation → is the process of water changing its physical state from liquid to gas, and requires an input of energy to occur.

As insolation from the sun heats water in rivers, lakes or oceans the rate of evaporation increases.

Condensation → is the process of changing water changing its physical state from gas to liquid

- » As water vapor rises, it becomes cooler and changes back its physical state back to tiny liquid droplets. During this process the latent heat of evaporation is released back into the atmosphere.

Precipitation → occurs when rain, snow, sleet or hail falls from the sky. When enough liquid water has condensed and the atmosphere cannot support its weight, gravity ensures that the water falls from the clouds back to Earth.

- » As water falls back to Earth, some of it soaks or infiltrates into the ground. It can then be collected underground in aquifers (layers of permeable rock, sand or gravel) and this is known as groundwater.
- » Groundwater will eventually seep into rivers, creeks, lakes or other water storage bodies, thereby providing a steady flow of water even after the rain has stopped.
- » Run-off occurs when water does not soak into the ground, but rather flows across the land instead.
- » Plant roots may also absorb water in the ground. This water is then available for the plant to use in the process of photosynthesis.
- » Carbon Sink → A forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.

Carbon Store →

- » Atmospheric Circulation → The large-scale movement of air, and the means (together with the smaller ocean circulation) by which thermal energy is distributed on the surface of the Earth

The Spatial distribution of high and low rainfall areas on a global scale:

- » Precipitation near the equator is high due in part to the influence of the Intertropical Convergence Zone. Here, convection and low pressure dominate and provide lift for the air throughout much of the year.
- » b. at about 30° north and south latitude precipitation decreases due to the presence of the subtropical high pressure systems.
- » c. Subsiding air from high pressure suppresses uplift, which inhibits the formation of precipitation.
- » D. Precipitation increases in the mid-latitudes where vastly contrasting air masses collide along weather fronts to cause precipitation.
- » E. As one approaches the poles, precipitation decreases on account of the cold temperature and its associated low saturation point.
- » Orientation of winds, mountain systems, and air mass dominance play important roles in the pattern of precipitation.
- » G. The temporal variation in global precipitation is directly linked to the seasonal changes in the heating of the Earth and its effect on the movement of global pressure systems and air masses.

The spatial distribution of high and low temperature areas on a global scale

- » Temperatures on the Earth are largely dependent upon how much energy is received from the Sun, which varies both with latitude on the

Earth and the [time of year](#).

- » B. At present, the global average surface temperature is about 15°C. Regions nearer the equator are much warmer than regions nearer the poles, with average surface temperature 25°C or higher.
- » C. In contrast, average temperature on Antarctica is way below freezing. This latitudinal temperature gradient however, generates a global transfer of heat from equator to poles via the [general circulation](#) of [winds](#), such that the equator is kept cooler and the poles warmer than they would be if the Earth had no atmosphere.
- » D. The equator however, does not experience the highest temperatures on Earth. Here, rising air generates daily thunderstorms that consume considerable amounts of heat energy, suppressing the air temperature by several degrees Celsius.
- » E. The greater cloud cover also helps to reduce the amount of sunlight. In fact, the hottest places on Earth lie in the subtropical climate zone of high [pressure](#) between latitudes 25 to 40°, where cloud cover is virtually non-existent and sunshine levels are very high throughout the year.
- » F. Parts of the Sahara Desert, Saudi Arabia, California and Australia can experience daytime temperatures of over 50°C, although during the winter months, severe radiation cooling under the clear skies at night can drop the air temperature close to or even below freezing.
- » G. The most pleasant climates occur in the [temperate](#) mid-latitude zone. Here summer temperatures rarely go above 40°C, and winters are usually fairly mild, on account of the influence of the warm westerly winds that originate from the subtropics.

Two factors that account for the spatial distribution of the world's rainfall patterns

- » Highest rainfall is found in the tropics near the equator. This is due to the sun's strong heat creating an uplift of moist air that eventually for frequent thunderstorms.
- » Rainfall patterns also shift with each hemisphere, meaning that there is differentiation between the northern and southern hemispheres' precipitation patterns.

Two factors that account for the spatial distribution of the world's temperature patterns

- » Seasonal changes, as the southern and northern hemisphere differ in seasons, and therefore temperature, as they tilt towards and away from the sun. The differences in temperature tend to be greater in higher latitudes. Areas closer to the equator tend to be warmer than areas located near the poles.

The earth's climate is influenced by natural systems such as Atmospheric circulation. The position of a region relative to the

circulation cells and wind belts has a great effect on its climate. In an area where the air is mostly rising or sinking, there is not much wind.

The Intertropical Convergence Zone (ITCZ) is the low pressure area near the Equator in the boundary between the two Hadley Cells. The air rises so that it cools and condenses to create clouds and rain. Climate along the ITCZ is therefore warm and wet. Early mariners called this region the doldrums because their ships were often unable to sail due to the lack of steady winds. The ITCZ migrates slightly with the season. Land areas heat more quickly than the oceans.

*Because there are more land areas in the Northern Hemisphere, the ITCZ is influenced by the heating effect of the land. In Northern Hemisphere summer, it is approximately 5° north of the **Equator**, while in the winter it shifts back and is approximately at the Equator. As the ITCZ shifts, the major wind belts also shift slightly north in summer and south in winter, which causes the wet and dry seasons in this area.*

The prevailing winds are the bases of the Hadley, Ferrell, and polar cells. These winds greatly influence the climate of a region because they bring the weather from the locations they come from. Local winds also influence local climate. For example, land breezes and sea breezes moderate coastal temperatures.

1. Two natural causes of climate change:

Plate tectonics impacts on the area where Climate exists and impacts on. The drift of the continents changes the land to ocean ratio, impacting on the amount of heat that the earth's surface reflects and absorbs.

Volcanic eruptions are a natural climate forcing factor. They affect the climate due to the large amounts of gases, dust and ash that are thrown up into the atmosphere. In the atmosphere, sulphur dioxide turns into aerosol, which are tiny droplets of sulphuric acid. These droplets reflect energy from the sun back into space, preventing some of the sun's rays from heating the earth.

Using two examples, explain two anthropogenic causes:

The increase of greenhouse gases due to anthropogenic forces is evident through many means. One example is the increase of Carbon dioxide due to fossil fuel burning, deforestation, biomass, gas flaring and cement production. Cement production in particular has the effect of increasing the heat and radiation from the earth's surface, accelerating the earth's warming. Another anthropogenic cause for climate change is the increase of Nitrous oxide due to biomass burning, combustion and fertilisers in the soil.

One evidence of climate change through geological time is through corals.

Corals are known for being sensitive to changes in climate conditions. Coral reefs have existed for millions of years and are affected by ocean warming. Coral bleaching occurs when the temperature rises or falls. They have recently been affected by change in the pH of seawater, known as ocean acidification. This is caused by more Carbon Dioxide dissolving in the ocean. Calcium Carbonate skeletons form by extracting Carbon from ocean waters. The density varies on the season. Corals can be used to determine past climate in tropical oceans. Scientists can also predict future trends in climate systems. Scientists gather data from using a diamond shaped tip to drill and gather small core samples from corals. They use X-ray imaging software to look at the patterns. Analysing the composition of trapped oxygen atoms gives an estimate of the seasonal temperature.

- 2. All three major global surface temperature reconstructions show that Earth has warmed since 1880. Most of this warming has occurred since the 1970s, with the 20 warmest years having occurred since 1981 and with all 10 of the warmest years occurring in the past 12 years. Even though the 2000s witnessed a solar output decline resulting in an unusually deep solar minimum in 2007-2009, surface temperatures continue to increase.*

The Greenland and Antarctic ice sheets have decreased in mass. Data from NASA's Gravity Recovery and Climate Experiment show Greenland lost 150 to 250 cubic kilometers (36 to 60 cubic miles) of ice per year between 2002 and 2006, while Antarctica lost about 152 cubic kilometers (36 cubic miles) of ice between 2002 and 2005.

Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. This increase is the result of humans emitting more carbon dioxide into the atmosphere and hence more being absorbed into the oceans. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.

12 : Land cover changes (e.g., forest to grassland) affect albedo, and changes in albedo can influence radiative forcing (warming, cooling). The concept of Albedo is used to represent the amount of radiation reflected by a surface. It can range from a value of 0 (no reflection) to a value of 1 (100% reflection). The albedo of the earth's surface can vary as there are different types of surfaces, such as forests, cities and oceans. When the flow of incoming solar energy is balanced by an equal flow of heat to space, the earth is in radiative equilibrium. Global temperature is relatively stable when the sum of the gains is approximately equal to the sum of the losses.

13. Land use change is widely recognized as a net source of greenhouse gas emissions at the global scale. Most of these emissions are attributed to losses from aboveground terrestrial pools such as deforestation. However, much less is known about the effects of land use change on soil carbon pools at regional

scales. On the basis of former and ongoing socio-economic changes causing extensive land use changes in alpine areas – more precisely the abandonment of increasingly unprofitable pastures and meadows – land cover is transforming at an accelerating rate. Moreover, land cover change is a major driving force of global change and land-use changes are affecting important ecosystem services. The effects of these changes on SOC sequestration are unknown. (I COULD NOT FIND MUCH ON THIS QUESTION).

3. Effects on climate change:

- *Global warming is melting glaciers in every part of the world, putting millions of people at risk from floods, droughts and shortages of drinking water*
- *Arctic sea ice reached its third lowest recorded level during the melt season of 2010. The lowest level since satellite measurements began in 1979 was in 2007*
- *Scotland's hottest year on record – in 2003 – killed hundreds of adult salmon as rivers became too warm for them to extract enough oxygen from the water*
- *Summer temperatures in European capitals have increased by up to 2°C over the past 30 years, a WWF report showed*
- *Rising sea levels threaten entire nations on low-lying islands in the Pacific and Indian oceans. Read Climate Witness stories about the impact of rising sea levels in the South Pacific and India*
- *The report Global Warming contributes to Australia's worst drought released by WWF and leading meteorologists shows that human-induced global warming was a key factor in the severity of the 2002 drought in Australia, generally regarded as the worst ever.*
- *More hot days*
- *More severe storms, floods, droughts and fire*
- *Higher sea levels*
- *This small temperature rise could threaten human health, lives, industries and jobs. Global warming threatens agricultural production, fresh water supplies and the survival of native species and ecosystems.*
- *More hurricanes and cyclones in the Caribbean, the United States and Burma*
- *More extensive droughts in eastern Africa, Australia, southern Europe and parts of China and India*

- *More devastating floods like those in Pakistan (in 2010), Brazil and Australia (in 2011), and other parts of the world*

4. Future projections of climate change:

Greenhouse gas concentrations in the atmosphere will continue to increase unless the billions of tons of our annual emissions decrease substantially. Increased concentrations are expected to:

- *Increase Earth's average temperature*
- *Influence the patterns and amounts of precipitation*
- *Reduce ice and snow cover, as well as permafrost*
- *Raise sea level*
- *Increase the acidity of the oceans*
- *Increase the frequency, intensity, and/or duration of extreme events*
- *Shift ecosystem characteristics*
- *Increase threats to human health*

These changes will impact food supply, water resources, infrastructure, ecosystems, and even health.

- *Global average annual precipitation through the end of the century is expected to increase, although changes in the amount and intensity of precipitation will vary significantly by region.*
- *The intensity of precipitation events will likely increase on average. This will be particularly pronounced in tropical and high-latitude regions, which are also expected to experience overall increases in precipitation.*
- *The strength of the winds associated with tropical storms is likely to increase. The amount of precipitation falling in tropical storms is also likely to increase.*
- *Annual average precipitation is projected to increase in some areas and decrease in others. The figure to the right shows projected regional differences in precipitation under two emission scenarios.*
- *Northern areas are projected to become wetter, especially in the winter and spring. Southern areas, especially the Southwest, are projected to become drier.*
- *Heavy precipitation events will likely be more frequent, even in areas where total precipitation is projected to decrease. Heavy downpours that currently occur about once every 20 years are projected to occur between twice and five times as frequently by 2100, depending on location.*
- *The proportion of precipitation falling as rain rather than snow is expected to increase, except in far northern areas.*
- *The intensity of Atlantic hurricanes is likely to increase as the ocean warms. Climate models project an increase in the number of the strongest (Category 4 and 5) hurricanes, as well as greater rainfall rates in hurricanes.*
- *There is less confidence in projections of the frequency of hurricanes.*

- Cold-season storm tracks are expected to continue to shift northward. The strongest cold-season storms are projected to become stronger and more frequent.

Global Climate Change Management:

Define the following terms:

- **Restoration:** is the action of returning something to a former place or condition.
- **Rehabilitation:** is the act of restoring something to its original state.
- **Mitigation:** is the act of reducing the severity of something.
- **Preservation:** Is the Maintenance of a resource in its present condition, with as little human impact as possible.
- **Adaptation:** ways of living and coping with certain changes such as climate change.
- **Sustainability:** development, which considers the impact upon the natural environment, society and economic activity, and ensuring that future generations are provided for. (Emphasis on minimizing environmental impact, reduce waste, reducing inequality on global basis)

The mitigation strategies that aim to reduce the effects of global climate change:

- **Greenhouse Gas Emissions.**
- Using less energy
- Consuming fewer products
- Replacing energy efficient items
- Driving less and travelling more frequently
- Using less hot water
- Switching off appliances
- Planting more trees.
- Carbon taxes for polluters
- Carbon credits for emission reduction projects
- Subsidies for biofuel production
- Solar and wind power infrastructure.
- Community awareness programs

- Example, In Australia: biomes are extremely fragile because the soils are generally low in nutrients, thin and easily eroded. It is the driest inhabited continent and weather shocks such as droughts and floods are increasing as climates change. Changing weather patterns affect the frequency and intensity of fires and their effectiveness in removing land cover.

Current:

- Firestick farming has been introduced in the early dry season to minimize damage from high intensity wildfires. Research revealed that a hectare burnt in May releases half the greenhouse emissions of a hectare burnt in hot November wildfire. **Examples such as deals with Conoco Phillips, a liquid Natural Gas refining company to pay one million dollars per annum for 17 years to support Arnhem fire management and Indigenous groups to manage controlled cool, mosaic burns at the beginning of the dry season.**
- Companies buying carbon credits, carbon tax to reduce the amount of carbon dioxide in the atmosphere

Proposed:

- The Carbon Farming Initiative was introduced in 2011 by the Labour Government to promote more sustainable fire management practices. The initiative involves a variety of emissions avoidance projects, In Northern Australia including carbon credits for reducing methane emissions and/ or nitrous oxide from livestock, increasing the efficiency or fertiliser use, enhancing carbon in agricultural soil and increasing the store of carbon by re-vegetation.
- Companies that produce carbon dioxide to buy trees like pine plantations that grow faster to cater for the carbon dioxide emissions

Two adaptation strategies designed to change/modify the effects of global climate change.

Intense weather shocks → stress on existing plants → lower the biomass, replaces plants with actively growing plants → increase the rate of photosynthesis, ^ Oxygen and decrease Carbon Dioxide. More native plants that require less water in order to survive. (Xerophytes)

Discuss two programs designed to address to impact of land cover change on local and regional environments.

Alcoa: Impact of land cover change, biodiversity loss, altered geobiochemistry and hydrology.

Alcoa Land Rehabilitation: comprehensive cataloguing of flora and fauna → seedbank
Stripping and storing of top soil

Exploration drilling – identify specific location of ore bodies.

Stripping and storing of overburden layer – caprock

- » Bauxite mine located in dwellingup WA
- » 51% owned by America, 49% owned by state government
- » Aluminum Company of America.
- » Alcoa Bauxite Mine is a MINING LAND COVER
- » Prior to this the land was NATURAL LAND COVER

Process undergone to change this land cover:

Clearing and deforestation, digging for extraction.

- POST MINING REHABILITATION
- LANDSCAPING: pit is filled and flattened
- PRE RIPING: Breaks up compaction of pit floor caused by heavy machinery, helps water and roots to penetrate through the soil.
- SOIL RETURN: Over burden and top soil layer returned.
- CONTOUR RIPPING AND SEEDING: undertaken to increase soils water capacity, seed mix is spread.
- FERTILISING
- ONGOING MONITORING AND MANAGEMENT OF REHABILITATING AREAS.

Economic Impacts:

- **POSITIVE:** Been investing in Australia for over 50 years, total investment is 12 billion
- 75% of revenue stays in Australia's economy – wages, local purchasing, taxes, capital investment, dividends to domestic shareholders.
- Leading EXPORTER → \$5 billion export revenue per year
- 4600 jobs, predominantly REGIONAL AUSTRALIA.
- **NEGATIVE:** CROWDS OUT other industries → expansion of bauxite mining causes a contraction in non mining industries → Business closures and job losses
- **More than half is foreign owned (51%)**

Environmental: POSITIVE:

- Recognized world leader in mine site rehabilitation and was the first in the world to achieve 100% plant species richness
- First mining company in the world to be recognized by the UN by its inclusion in Global 500 role of honor.
- Taken by global leadership position on addressing climate change and decreasing GHG's.

Social: POSITIVE:

- Played an important role in adding value to surrounding communities for more than 50 years
- Invests \$4 million into community partnerships/ year
- ALCOA FOUNDATION funds community partnerships → since 1952 it has contributed to more than \$550 million in local communities.

Q6. Evaluate the extent to which they reflect the environmental, economic and social principles of sustainability.

Planning Sustainable Places and their challenges:

Using examples, define the following terms:

Urban: well developed areas surrounding a city.

Rural: rural area is an open swath of land that has few homes or other buildings, and not very many people. A rural area's population density is very low.

Urbanization: Urbanisation is the increase in the proportion of people living in towns and cities. A population shift from rural to urban areas, and the ways in which each society adapts to change.

Urban Growth: Urban growth, also known as urban sprawl, refers to the expansion of a metropolitan or suburban area into the surrounding environment.

Wellbeing: the state of being comfortable and happy.

State the difference between an urban and rural settlement:

Urban populations tend to be significantly higher in more developed regions. (78 percent) and high-income regions, these tend to be regions that benefitted from industrialization that have commenced in the 1800's. A number of regions have levels of urbanization well above the world average; Europe and Latin America. Rural populations tend to dominate in regions such as Africa, and to less extent Asia.

Outline the differences between urbanization and urban growth:

Increase in percentage, increase in raw growth.

What impacts has urbanization had on world population growth and human wellbeing in urban and rural places?

Population Growth: Rural towns and villages that suffer from large scale depopulation face considerable challenges in terms of their overall survival, especially in terms of trying to finance the cost of providing and servicing local services ranging from local shops and the hotel, post office, schools, health services and infrastructure services such as roads, sewerage and energy supply. The world's population has increased significantly since 1800

when it was estimated to be 980 million people. It has increased to 1.65 billion people, a 68 percent increase.

Human Wellbeing: 54 percent of the worlds population lives in urban areas. “rapid and unplanned urban growth threatens sustainable development when the necessary infrastructure is not developed or when policies are not implemented to ensure that the benefits of city life are equitably shared. An estimated 863 million people representing nearly one third of urban residents in developing regions, lived in slums or informal settlements in 2012 characterized by housing.

With reference to economic and environmental factors, outline the ways urban and rural settlements interact with each other.

Describe the distribution of Australia’s rural and urban populations.

URBAN PROCESS	DEFINITION	LOCATION e.g Land Use Zone	INFLUENCE ON LAND USE	EXAMPLES/ RURAL/ URBAN
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NSW	1911: Urban: 63.8% Rural: 36.2%	2011: Urban: 90.4% Rural: 9.6%
Vic	Urban: 58.4% Rural: 41.6%	Urban: 90.8% Rural: 9.2%
QLD	Urban: 43.8% Rural: 56.2%	Urban: 87.3% Rural: 12.7%
SA	Urban: 55.4% Rural: 44.7%	Urban: 88.4% Rural: 11.6%
WA	Urban: 56.2% Rural: 43.8%	Urban: 89.9% Rural: 10.1%
Tas	Urban: 46.9% Rural: 53.1%	Urban: 73.9% Rural: 26.1%
NT	Urban: 28.5% Rural: 71.5%	Urban: 71.7% Rural: 28.3%
ACT	Urban: 0.0 Rural: 100%	Urban: 99.7% Rural: 0.3%

Explain the influence that economic, physical, cultural and historical factors have had on Australia’s rural and urban population distribution.

Historical factors: during the first 40 years population growth was fairly in both NSW and Tasmania, the first colonies to be settled. From about 1840 population begins to increase rapidly in NSW, more than doubling between 1840 and 1850. By 1890 the population had reached 1.11 million. But it was not the largest state between 1840 and 1890 when the population grew from 538,234 to 1.13 million. Since 1890 population growth has been considerably stronger in with decadal population growth greatest in absolute terms between 1960 and 1970 when it increased by 696,474 people. This was almost equaled during 2000-2010 when the SNW population grew by 694,810 people.

Economic:

Physical:

Cultural:

Urban Sprawl: refers to the outward spread of an urban area

Location: In Australian urban environments such as the capital cities.

Influence on Land use: resulted in new housing developments stretching further and further from the city centre. This process leads to a number of associated problems including the provision of infrastructure and services to these new developments, which is extremely expensive.

Urban: tends to occur in a low density fashion resulting in single story, detached homes built on the outer edges of the city.

Rural: encroachment into other land uses usually natural vegetation or rural land use and a heavy dependence on private vehicles as public transport is often not well established.

Invasion and Succession: Invasion occurs when one land use function enters another land use zone.

Location: occurs in transitional zones such as within the inner mixed one and rural urban fringe.

Influence on Land Use: has led to a number of issues within the Urban and rural places including urban blight as the uncertainty of future invasion prevents the necessary upkeep of properties. Often leading to buildings taking on a run down appearance and lowering the land value of the surrounding area.

Renewal: refers to larger scale redevelopment projects, which can take place within an urban or rural location.

Location: usually occurs in areas that are heavily blighted or rundown with the aim to rejuvenate the area.

Influence on land use: the renewal of previous industrial areas into mixed use complexes and or renewal of slums into new residential estates

Inertia: is a process that acts to limit change within an urban or rural area.

Location: It occurs when a land use function has retained its location despite the original benefits which attracted it to a location.

Influence on Land Use: this resistance to change and resistance to change location, is usually due to high relocation costs.

Urban and Rural: in urban and rural environments older buildings often those that had been heritage listed remain in their original end up being surrounded by other land use functions such as an older church now being surrounded by high rise buildings (CITY CENTRE)

Agglomeration: the process refers to the grouping together, or clustering of similar land use functions within an urban or rural place.

Location: land use functions group together due to the derived benefits of using shared infrastructure as well as sharing services.

Urban And rural: large industrial centers emerge comprising of industrial based companies in one location, often spate from main residential areas. The same occurs in rural locations, where service centers cater for the needs of the farming communities or where agricultural based businesses locate on the edge of small country towns.

Changing demographic trends of Australia's population. Refer to both urban and rural

It can be seen that Australia has been a predominantly urbanized nation over the last 100 years or so. After federation (1911) After WWII (1947) In 1911, the urban distribution of the population was at 43%, this then decreased to 25% in 1951 and in 1976 it was 14%, then to decrease to 11% in 2001. Urban population distribution in 1911 was at 58% then increased to 75% in 1951 and then steadily increased to 90% in 2011.

Provide examples of the changing economic and social characteristics of urban and rural.

Population Loss:

Nature: is a challenge facing a number of rural and remote locations in Australia.

Causes: the declining share of populations living in these places is the result of a combination of factors driving increased urbanization i) post war industrialization and economic growth, ii) mass international migration and, iii) rural/urban migration.

Impacts: rural areas have lost population because of young people moving to urban areas for tertiary education and employment opportunities, loss of employment in remote locations due to the increased global competition in agriculture, the appeal and development of larger regional centers due to the availability of

services and commerce , increased mechanization of farming practices and the amalgamation and corporatization and small farm holdings.

Examples: ABS noted that there has been rural population growth in coastal areas.

Resource Degradation:

Nature: occurs when land use deteriorates the quality of the biophysical environment on which it is located or which it surrounds. In rural and remote places in Australia this is evident through soil degradation.

Causes: overgrazing is a major cause of soil degradation

Impacts: leads to desertification and severe soil erosion. The extensive land clearing associated with farming activities has also led to dryland salinity which is a major concern for farmers and the government.

Examples: 60 percent of Australia's land use is agriculture, covering 461 million hectares . 88 percent of this activity is livestock grazing, which occurs in arid and semi arid locations.

Land Use Conflict:

Nature: the major source of land use conflict currently in rural and remote Australia involve that of mining companies with conservation groups and aboriginal land rights.

Causes: mining companies whom are seeking new mining leases often run into issues with conservation groups who consider an area important to protect

Impacts:

Examples: the Margaret river region

Fly in/Fly out work patterns:

Nature:

Causes:

Impacts:

Examples:

Isolation and Remoteness

Nature: isolated and remote centers experience limited access to goods and services and often pay higher costs due to cost of transport.

Causes: Residents often experience feelings of social exclusion contributing to mental health concerns.

Impacts:

Examples:

Housing:

Nature: land abandonment.

Causes: increased competition due to globalization and free trade can result in marginally productive lands becoming unprofitable.

Impacts: land abandonment occurs due to:

Crippling natural disasters

Land mismanagement/ over exploitation

Political, social unrest

Farmers seeking improved lifestyle in the urban areas. Rural-urban migration.

Examples:

Economic Restructuring and Employment.

Nature: shift from manufacturing industry base to service and information and technology sectors impacts upon employment patterns in Australia.

Causes: Primary is now highly mechanized requiring few workers.

Impacts: mining employment fluctuates which influences job security/future employment prospects- especially with FIFO the main trends, FIFO tends not to have a huge economic benefit for rural towns as the workforce lives predominantly in urban settlements.

Examples: less than 25% of employment in WA is outside of Perth. Some rural towns seek diversification or transition from primary industry such as grazing and undertake tourism, however tourism is only seasonal.

Service and Water Provision:

Nature: Low population results in limited political influence resulting in limited access to services e.g health and education and infrastructure such as reliable water provision, communication and transport. Lack of services and infrastructure acts as a centrifugal force pushing young people to centers in search of higher education, social inclusion and employment.

Causes: populated by the

Impacts:

Examples:

Socially vulnerable populations:

Nature: those unable to move characterize rural populations. i.e. poor, disabled, uneducated, elderly, the sick. Thus further isolating and excluding the socially vulnerable.

Quality of life is impacted by remote rural areas experiencing high rates of service and economic exclusion due to lack of medical, childcare, and financial services as well as high levels of unemployment.

Fluctuating mineral markets have meant some regional centers and rural towns have struggled to provide services e.g accommodation/transport/health care. For the influx of workers during the boom and then are left with declining asset values and underutilized services during the bus periods.

Causes:

Impacts:

Examples:

Describe the site and situation of perth:

- **Site (Physical)**
 - Sited on the swan coastal plain (20-30km in width)
 - Built on undulating sandy soils
 - Sited with the Indian ocean to the west
 - Sited with the Darling Scarp and State Forest to the east
 - On the confluence of two main rivers (swan and canning)
- **Situation (Physical)**
 - Situated on the south-west coast of Australia
 - Perth's nearest capital city is Adelaide at approximately 2700km to the east
 - Perth is one of the most isolated cities in the world
 - Closest regional centres include Bunbury, Geraldton, Kalgoorlie-Boulder and Albany
 - Mitchell and Kwinana freeways have influenced the north and south linear growth.
 - Eastern and Albany Highway have influenced the eastern and south-eastern development