Introduction to Senior Geography

"Geography is the science which seeks to explain the character of places and distribution of people, features and events as they occur and develop over the surface of the Earth”.

_The International Charter on Geographical Education (1996)_

In Senior Geography we focus on the two broad fields of geography: **Physical Geography** and **Human Geography**. The units are organised into these two categories but we must appreciate that they overlap (Ecological Dimension)

![Diagram showing the relationship between physical and human environments, including atmospheres, lithosphere, hydrosphere, biosphere, population, social and cultural, urban, and economic geographies.](image-url)
Differentiating between the Ecological and Spatial dimensions in the study of Geography

The very first outcome in geography states that you need to be able to differentiate between the ecological dimension of geography and the spatial dimension.

**SPATIAL DIMENSION:**
- Simply, what is there? where is it? and why is it there?
- So, whenever you learn about location and processes such as weathering, erosion, nutrient cycles, soil formation etc. you are focusing on the spatial dimensions

**ECOLOGICAL DIMENSION:**
- Simply, how do humans affect the environment and how does the environment affect humans.
- Whenever you learn about how humans are impacting on the environment such as land clearing and environmental management or how the environment affects people such as natural disasters, climate determining what we wear, you are focusing on the ecological dimension.
Ecological and Spatial dimensions are not distinctively separate but overlapping.

**Ecological**
- How do people interact with the environment?
- What are the impacts of humans?
- Which biophysical processes have humans disturbed?
- What ways are people responding to the issue?

**Spatial**
- Where does the issue exist?
- Why is it in that particular location?
- How big or small is the issue (scale)?
- How does it vary in different locations and places?
- What is the location of groups affected by the issue?

*Source: Baker et al (2000, p 128)*
The key geographical questions are a combination of spatial and ecological dimensions of geography.

- What is it? (Spatial)
- Where is it? (Spatial)
- Why is it there? (Spatial and Ecological)
- Should it be like this? (Spatial and Ecological)
- Has it changed over time? (Spatial and Ecological)
- What might it be like in the future? (Spatial and Ecological)
- How do people affect it? (Ecological)
- What action is appropriate? (Ecological)

- The first Unit of work we will work on is called the BIOPHYSICAL INTERACTIONS
- We will look at the spatial dimensions of the four spheres in the biophysical environment and then focus on the ecological dimensions by looking at human impacts and management
The focus of this study is a geographical investigation of biophysical processes and how an understanding of these processes contributes to sustainable management.

The nature and functioning of the four components: the atmosphere, hydrosphere, lithosphere and biosphere in a specific biophysical environment

The first thing we need to be able to do is to describe the interactions between the four components which define the biophysical environment

The biophysical environment

- The biophysical environment includes living things (bio) such as plants and animals, and non-living things (physical) such as rocks, soil, and water.
- The biophysical environment consists of FOUR main components or spheres:
  - **THE ATMOSPHERE**: the gaseous envelope surrounding the earth. It is a complex system that deals with weather, climate, energy and air.
  - **THE HYDROSPHERE**: The best way to understand the hydrosphere is that it is about the flow of water and the storage of water on the earth.
  - **THE LITHOSPHERE**: Focuses on the earth’s crust. How it is formed and how it is shaped.
  - **THE BIOSPHERE**: Focuses on all the living things on the earth’s surface. Such as flora (plants) and fauna (animals, insects etc).
• It is difficult to separate the four spheres of the biophysical environment into clearly defined zones as each of the four components interacts with others in various ways.
• These interactions influence the nature of the total biophysical environment
• For example Water (hydrosphere) and temperature (atmosphere) affects the types of vegetation (biosphere) that develop.
• In turn high landforms (lithosphere) can influence climate patterns (atmosphere) and vegetation types (biosphere).
• Changes in one sphere will result in changes in all other spheres as well.
• For example, If native vegetation is removed from the biosphere it will also affect the soils (lithosphere), evaporation and run-off (hydrosphere) and the amount of oxygen generated (atmosphere).
The Biophysical Environment – Worksheet

Name ___________________________ Due Date _________________________

1. Find the terms associated with the definitions below.

   a) The total of all things that surround us. ________________________________
   b) Includes living and non-living things. ________________________________
   c) Any form of moisture that reaches the earth’s surface. __________________
   d) Occurs when the ground absorbs water into the soil. ______________________
   e) The process where tectonic plates collide to form mountain ranges. __________
   f) Where almost all weather and related processes take place. _____________________
   g) Commonly called simply ‘the air’. ________________________________________
   h) The water on or under the earth’s surface. ________________________________
   i) The breakdown, but not removal of rocks. _________________________________
   j) The changes in a plant community over time until it reaches a state of balance. 
      __________________________________________________________
   k) A system involving the interactions between a community and the non-living environment 
      __________________________________________________________
   l) The numbers of different plant and animal species present. __________________________
   m) The earth’s surface to about 100 kilometres depth _____________________________
   n) Consists of people and their economic, social, cultural and political systems. 
      __________________________________________________________
   o) The natural environment of a species in an ecosystem. ____________________________
   p) The condition of the atmosphere at a particular time and place. ______________________
   q) The part of the earth’s surface and atmosphere in which organisms
      live. ______________________________________
   r) The transportation and removal of particles of soil. _________________________________
   s) Animals that feed on plants ________________________________________________
   t) Animals that feed on other animals ____________________________________________
2. **The Water Cycle**

*Complete the paragraph by filling in the most appropriate word to explain the functioning of the water cycle.*

Energy from the sun changes liquid water to a gaseous state (____________________) and enables plants to lose water from their leaves (____________________). The combined moisture loss from both these processes is called _______________. The process of water vapour in the atmosphere turning back into a liquid (______) or solid (______) is called ________________, and when it returns to the earth it is falls as _______________. Most precipitation occurs near the ________________ especially along coastal regions and in the ______________-latitudes. The precipitation either runs back to the oceans through either ______________ or ______________. If the ground is soft enough the water can be absorbed by the ground (______________). Water that moves through the ground and into rivers is called ______________ while water that stays in the ground forms the ______________ table. Eventually most water finds its way through a combination of water flows (____________________ flow) back into the ocean for the cycle to begin again.

3. **Draw a diagram below that shows the internal structure of the earth. Devise a key to show the crust, mantle and core.**

4. **Using the example of a rainforest ecosystem, explain the interactions between the atmosphere, hydrosphere, lithosphere and biosphere.**

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Background Information on The Kosciuszko Alpine Area

- Kosciuszko National Park is nationally and internationally recognised as a UNESCO Biosphere Reserve.
- It is one of the world's great national parks, and the largest in New South Wales.
- Covering almost 675,000 hectares, the park contains the highest mountains in Australia, the famous Snowy River and all NSW ski fields. It is NSW’s largest national park.
- Its many and varied attractions include walks through alpine herbfields; spectacular caves and limestone gorges; scenic drives; and historic huts and homesteads.
- It contains six wilderness areas, and its alpine and sub-alpine areas contain plant species found nowhere else in the world.
- The park is also home to the rare mountain pygmy possum and corroboree frog.
- The alpine area has quite distinct features, with glacial lakes such as Blue Lake, Lake Albina and Hedley Tarn, and large granite boulders dominating the area.
- The vegetation varies from herbfields of snow grass and snow daisies, heaths, feldmarks (consisting of bare, stony ground between plants), and alpine bogs.
- Mt Kosciusko (located in the national park) at 2228 metres, is Australia’s highest peak.
- It was first climbed by Polish explorer Paul Strzelecki in 1840, and was named after a Polish national hero.
• The population of the Snowy Mountains region is approximately 34,500
• The northernmost extremity of the Snowy Mountains lies only 30kms west of the ACT
• The southern end of the region is marked by a 1,951 metre high peak called South Rams Head, and is only 10kms from the Victorian border.
• More than half of the 250 square kilometres of alpine habitat in Australia falls inside the Snowy region's boundaries
• Around 3 million people visit Kosciusko National Park each year and some 30,000 make the trek to the top of Mount Kosciusko
• During the most recent ice age, the area around Mount Kosciusko was the only part of mainland Australia to be covered by glaciers.
• The glaciers left their mark on the mountains, most notably by gouging 13 enormous cirques, four of which are deep enough to be permanently filled with water; these are known as glacial lakes.
1. **Location of the Kosciusko Alpine Area**

1. **Using the tracing paper provided, copy the map on page 122 of the textbook**
   - Ensure you have the 5 elements of a map: Border, Orientation, Legend, Title, Scale (BOLTS)
   - Include water storage areas and the Alpine area, Melbourne, Canberra, and Mt Kosciuszko.
   - Label key towns, rivers, water storage, and mountains.
   - Paste the map in the space below and then answer the questions

2. Over what two Australian states do the Australian Alps extend?
   ____________________________________________
   ____________________________________________

3. What is the approximate latitude (lat lines are the flat lines) and longitude of the Australian Alps?
   - Latitude: _______________
   - Longitude: ______________

4. What does the latitude tell you about the type of climate the Australian Alps might experience?
   __________________________________________________________________________
   __________________________________________________________________________
5. Calculate the approximate area of the Australian Alps.

______________________________________ _____________________

6. What are the three main rivers of the Australian Alps?

_________________      __________________      ________________

7. Name SIX (6) mountains of the Australian Alps in order of size (highest to lowest)

_____________________

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8. Name THREE (3) water storages in the Alps.

_____________________

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_____________________

9. What is the source of the Snowy River?

____________________________________________________________________

____________________________________________________________________

10. Write one paragraph that describes the location of the Australian Alps. Include the information collected above.

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1.2 The Atmosphere

When talking about the atmosphere, geographers often refer to:

- **Climate**: long term temperature and precipitation patterns
- **Weather**: conditions in the atmosphere at a particular time
- **Atmospheric processes**: the factors that affect precipitation and temperature?

1.2.1 The Climate of Kosciuszko Alpine Area

*Complete the climatic graph for Charlotte Pass and paste into your work books*

From the Climatic graph you should notice a pattern in the temperature and precipitation.

- **Low Temperature**: The average mid summer temperature is often less than 10º Celsius and the average midwinter temperature is far below 0º Celsius.

- **High Precipitation**: An average annual rainfall of 2800-3600mm (mainly as snow)

As geographers we ask ourselves WHY is the climate like this in the Kosciuszko Alpine Area?
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Latitude (deg S): -36.4337; Longitude (deg E): 148.3327; Alt: 1735m

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### Graphical Representation

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14
1.2.2 Why the Low Temperature?

There are two explanations:

1. Less sunlight (known as INSOLATION) reaches the area
2. Altitude (height above sea level) makes an area cooler.

**Less Sunlight**

- Latitude has a big influence on temperature. Remember lat lines are the flat lines around the Earth.
- The further away (north or south) you travel away from the equator, the cooler it gets.
- Also you need to remember that the Equator is $0^\circ$ and the North and South poles are $90^\circ$.
- Why does it get cooler away from the equator?
- Well, it all has to do with the amount of sunlight (INSOLATION) that hits the earth’s surface.
- The concept of **ANGLE OF INCIDENCE** explains this
- Because the Earth is shaped like a sphere the middle of it sticks out more and closer to the sun. Whereas, the ends are tucked in and further away from the sun.
- Then add to this the tilt in the Earth’s axis.
- What is the Latitude of Kosciuszko Alpine Area? It is $36^\circ$ south of the equator.
- Since it is further away from the equator less insolation reaches this particular spot thus contributing to the low temperature.
The angle of incidence

The same amount of solar radiation has to heat a greater surface area at high latitudes and pass through a greater thickness of atmosphere (B) than that at low latitudes (A).
### Altitude

Plot the following on the graph paper provided. Do not join the lines.

<table>
<thead>
<tr>
<th>Location</th>
<th>Altitude (m)</th>
<th>Average Annual Min. Temp. ºC</th>
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<tbody>
<tr>
<td>Thredbo</td>
<td>1380</td>
<td>2.1</td>
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<td>Crankenback</td>
<td>1957</td>
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<td>Cooma</td>
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<td>Nimmitabel</td>
<td>1075</td>
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<td>Nalbaugh</td>
<td>675</td>
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<td>Tumut</td>
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<td>Charlottes Pass</td>
<td>1735</td>
<td>-0.6</td>
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<td>Carabout S/F</td>
<td>420</td>
<td>6.1</td>
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• The graph clearly shows a pattern. As there is an increase in altitude the lower the temperature gets. Thus, there is a relation between altitude and temperature.

• This is due to a phenomenon called the **ENVIRONMENTAL LAPSE RATE**. (ELR)

• According to ELR, temperature drops an average 6º Celsius for every 1000m you go up.

• This figure changes based on how moist or dry the air is.

• The Environmental lapse Rate occurs because of a process called adiabatic heating and cooling. The term adiabatic implies a change in temperature of the parcel of air without gain or loss of heat from outside the air parcel. Rising air experiences a drop in temperature, because of the decrease in atmospheric pressure at higher altitudes. If the pressure of the surrounding air is reduced, then the rising air parcel will expand which affects the parcel’s temperature. One of the results of the Laws of Thermodynamics is that there is an inverse relationship between the volume of an air parcel and its temperature. During either expansion or compression, the total amount of energy in the parcel remains the same (none is added or lost). The energy can either be used to do the work of expansion, or to maintain the temperature of the parcel, but it can’t
be used for both. If the total amount of heat in a parcel of air is held constant (no heat is added or released), then when the parcel expands, its temperature drops. When the parcel is compressed, its temperature rises. In the atmosphere, if the parcel of air were forced to descend, it would warm up again without taking heat from the outside. This is and adiabatic cooling of rising air is the dominant cause of cloud formation.

- The Kosciuszko area is the highest in Australia. Therefore, it experiences cool temperatures because of its height and the influence of ELR.
1.2.3 Why the High Precipitation?

There are TWO explanations for the high precipitation in Kosciuszko:

1. Rain bearing winds (air cells)
2. Orographic Uplift

Rain Bearing Winds (air cells)

• There are a number of types of air masses (big cells of air in the atmosphere)

• Some cells of air are cool and are full of moisture, some are dry and hot, and some are moist and hot.

• Air cells that originate from the ocean are often moist whereas air cells that originate over continents (large land masses) are often dry.

• The Air cell that impacts the Kosciuszko Alpine Area is known as the Southern Maritime Air Mass.

• It originates from the Southern Ocean near Antarctica, which makes it cool and moist. (It is full of rain) It travels mainly from the West.

• Most of the rain and snow that falls on Kosciuszko is from this air mass
**Orographic Uplift**

- Clouds are evaporated water that has been heated. They get to a certain height and cool down and form as clouds (Condensation). When it gets really cool they turn back into water (precipitation).
- With Orographic Rain the air is lifted to higher altitudes because of rising ground.
- As the air cannot pass through the Earth it is forced up and over the higher ground (remember temperature drops the higher you go)
- It is so cool that the condensation turns to rain and falls on the mountain. That is why most mountains are very moist.

Since the Kosciuszko Alpine Area has a high altitude, the moist air from the Southern Maritime air mass from the west is forced up over the region. The air is cooled quickly because of the ELR and the moisture is dumped onto the region.
1.3 The Lithosphere
The lithosphere is all to do with the surface of the Earth.

Geographers:

- Describe the shape of the surface and identify its features (TOPOGRAPHY)
- Explain how it was shaped (built up and worn down)
- Identify the materials that make it up.

1.3.1 The TOPOGRAPHY of the Kosciuszko Alpine Area
The Kosciuszko Alpine area’s topography consists of extensive undulating plateaus and ridges that are surrounded by steep slopes and escarpments. The plateaus are characterised by broad shallow valleys and gentle slopes rising to rounded or flattened hill tops.

The following key terms help describe Kosciuszko’s topography:
- Undulating
- Plateau
- Ridges
- Steep slopes
- Gentle slopes
- Shallow valleys
- Escarpments
- Rounded

Some landform features in the Kosciuszko Alpine Area
- Peaks and knolls
- Basins
- Escarpments
- Slopes and Ridges
- Gorges and Water falls
- River Valleys
- Cirque
- Moraine
Horizontal Scale is the Map Scale
A walk in the Snowies

We met in the township of ............. at GR 193668, and walked out along the ............. Road towards Mount Kosciuszko, heading in a ............. direction. We stopped at the ............. at GR 189672. Below us, in fact ............. metres below us, we could see the Snowy River bubbling along in a ............. direction. We consulted the map. It was ............. kilometres to Mount Kosciuszko as the crow flies, but unfortunately it was ............. along the road.

We crossed the bridge over the Snowy River at GR ............. and then climbed the ............. metres up to Seaman’s Hut, and then on to the top, passing a foot-track heading south at GR ............. from the peak of Mount Kosciuszko. We could see Mount Townsend ............. kilometres away in a ............. direction, and Mount Clarke, at least ............. in height in a ............. direction. We took the foot-track heading ............. towards Meullers Pass. We were hoping to reach the junction of the four-wheel drive track and the foot-track, at GR 163699, but it was ............. from Mount Kosciuszko to the junction! After four kilometres we could see ............. below us to the ............. . When we hit the four-wheel drive track we started to head due ............. before turning abruptly to the ............. . Due ............. was the foot-track to Blue Lake, located in AR ............. according to the map.

From the turn to the south-east at ............. it was another ............. kilometres to the ............. River, and then the last slog up ............. metres back to the ............. Road.

From Charlottes Pass and back we had walked ............. kilometres.