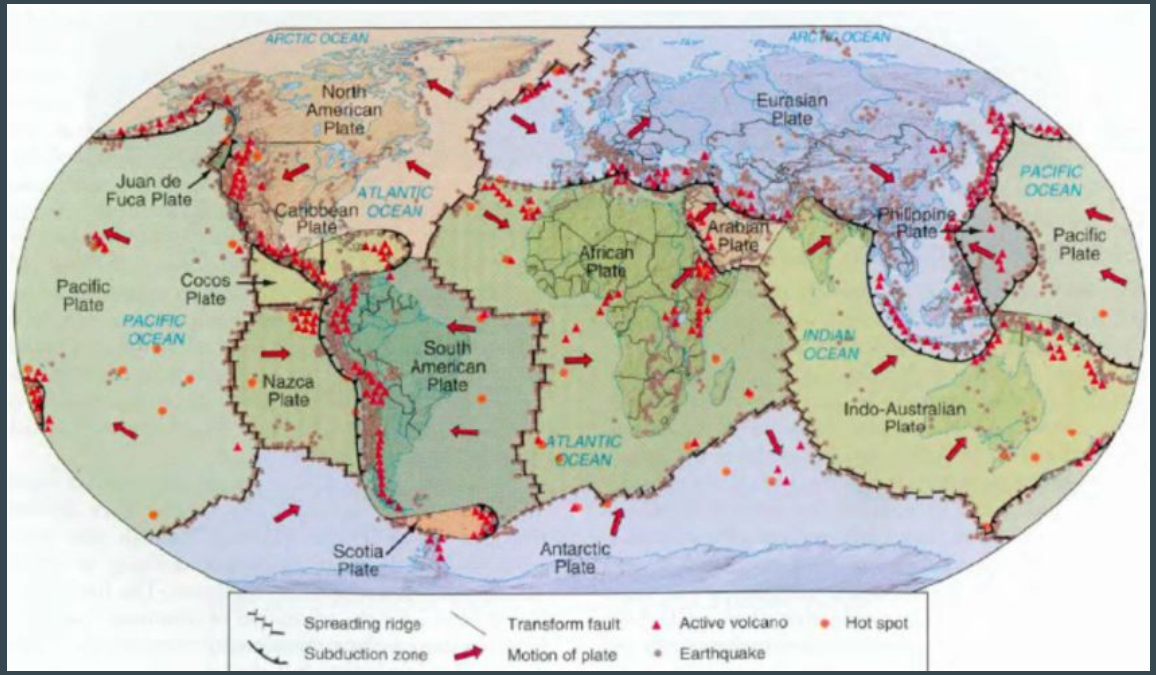
# World Patterns of Physical Elements

Student Exemplar

# Table of Contents

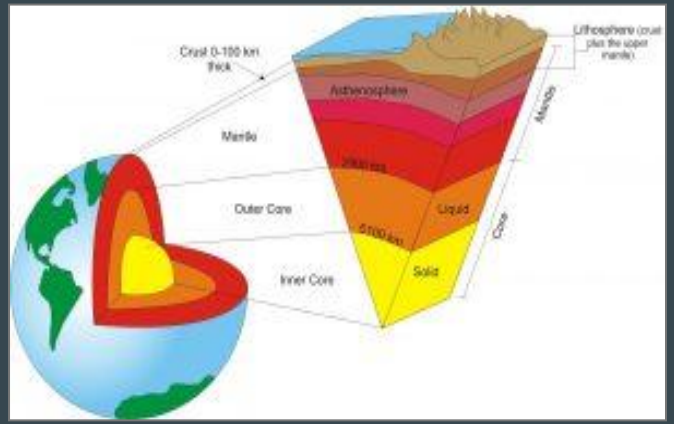
# The Lithosphere

The term lithosphere refers to the cool, rigid, outermost shell of a rocky planet. Most, including Earth's, are comprised of the crust and upper mantle. Earth's lithosphere consists of two main types: Oceanic and Continental; both with distinct qualities.. Oceanic plates are more dense than their continental counterparts, and new mantel is constantly being made at Mid Ocean Ridges. Here, magma from Earth’s core cools to eventually become Earth's crust. As more is made, the older mantle is pushed away, to be recycled in subduction zones later. Continental crust is much thicker, and makes up 70% of Earth's crust volume, while only covering 40% of the surface. Lastly, both oceanic and continental plates are broken up into smaller pieces, known as tectonic plates. There are 15 of these plates, and they all the have ability to impact the shape of the Earth's surface. These plates are constantly shifting, rubbing, and tearing with one another. This action is what creates Earthquakes, Volcanoes, Mountains, Ocean Ridges, and more.




This is a graphic of the major tectonic plates including North American, Caribbean, South American, Scotia, Antarctic, Eurasian, Arabian, African, Indian, Philippine, Australian, Pacific, Juan de Fuca, Cocos, and Nazca.

Image of the components of Earth's Lithosphere



# How Does the Lithosphere Affect Human Activity?

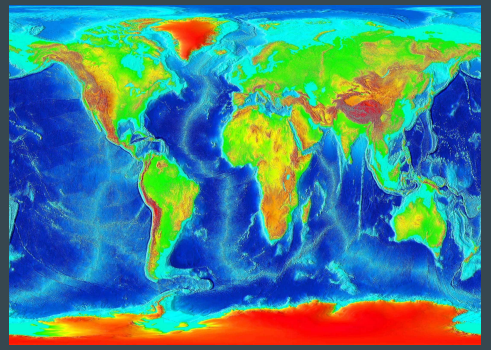
The lithosphere affects humans simply because of its existence. All things on Earth, animate or inanimate, lay upon the lithosphere. Its tectonic movements can create natural disasters for humans, such as volcanic eruptions, earthquakes, and tsunamis. Likewise, based on where your tectonic plate is located, humans may be of higher risk for these disasters, and may require additional tools in case of emergency; ultimately affecting their way of life. To add, because the lithosphere is where our resources are gathered from, different areas may bring about unique characteristics not found in other areas. This affects resource availability, climate, and culture as people use what they have in front of them. Lastly, operations such as open pit mining, deforestation, mass agriculture, and hazardous pollution can affect the quality and longevity of some areas of the lithosphere, specifically the resources found within.

# LandForms

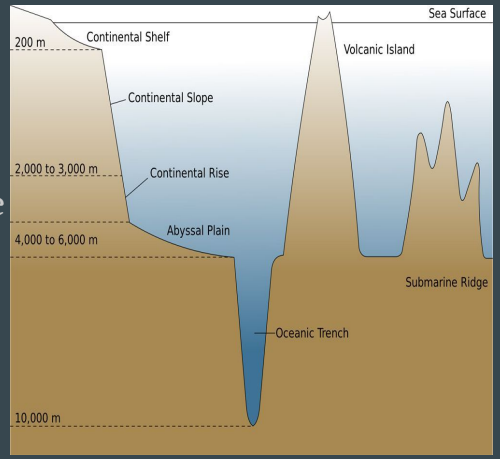
A landform is simply any geographic feature that can be found on earth's lithosphere, including under the ocean. There are many different physical landforms including mountains, hills, plateaus, and plains (considered the main four), as well as canyons, ridges, and basins etc. Landforms are present all over the world, with different types being more frequent in specific places. For example, The Rocky Mountain Range, which is located in Western North America, is more likely to have hills and mountains than the Sahara Desert, which is more of a flat plain. To add, landforms are always changing; growing and shifting based on its region. There are many reasons for this, including volcanic activity, plate tectonics, and erosion. When volcanoes erupt, magma spews out, solidifies, and becomes a landform. Similarly, when tectonic plates push up or down against each other, mountains and ridges are formed. Likewise, water and wind can break down landforms to create new ones, including canyons.

# Map

- Canyons can be formed by wind and water erosion



- Mountains and ocean trenches can be formed by volcanoes and plate tectonics




- Map showing different elevations of the world. Red is high, dark blue low

# How Landforms Affect Human Activity

Landforms affect human activity in many ways. One way is how humans interact with the environment. Different landforms create unique landscapes that can serve different purposes. For example, people living in a mountain range would require very different needs than somebody living on a plain. Likewise, they can provide different advantages, such as a canyon blocking wind. To add, landforms are constantly shifting and moving, and sometimes they are affected by external elements. This can cause disasters. For example, an earthquake may cause a mountain to collapse, turning into a rockslide. This is very dangerous and can destroy infrastructure. A famous example is Franks Slide in 1903. Lastly, landforms affect tourism. People may want to see Earth's natural phenomenons, such as the Grand Canyon, or Mount Everest. Or, they may want to ski down a mountain at a resort. Both of these add to the economy.

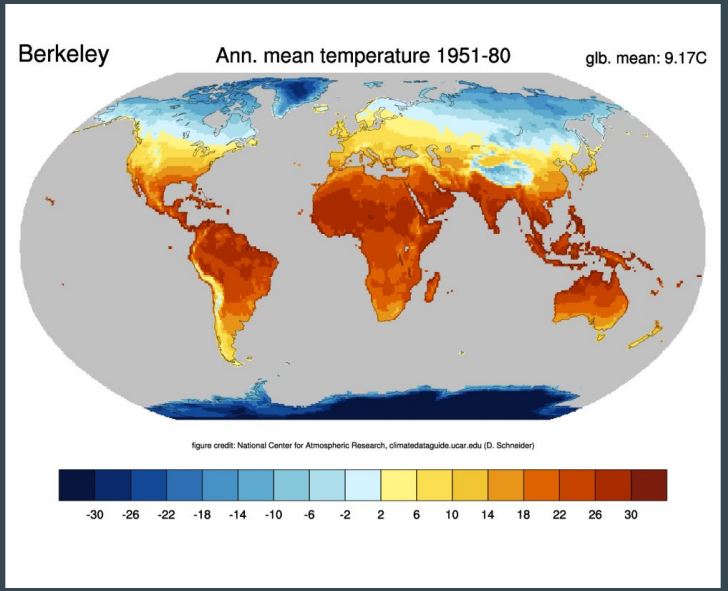
# Climate

Climate is considered the long term weather patterns of a specific region. It is the average temperature and precipitation over time. This can take many years to change, including decades and centuries. This differs from weather, which is the immediate change day to day. For example the weather of a specific region could be -5 and windy, but have a warm, calm climate. Generally, it takes 30 years of research into the weather patterns of a region to scientifically determine its climate. Climate relies on many different factors. These include altitude, region, albedo, bodies of water, the equator, sun exposure, wind, and precipitation among others. Although varying from region to region, it follows a consistent pattern around the world. Climate can affect the vegetation, animal species, and human migration patterns in a region.

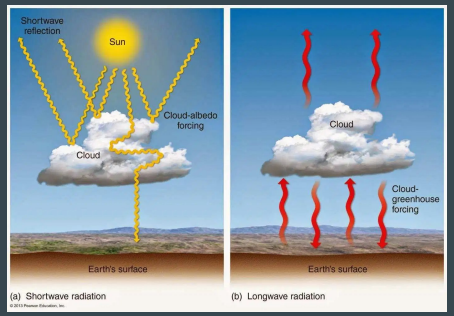
# a). Elements of Climate

Many different factors, both man made and natural, affect the climate of a region. The natural elements that affect a region's climate are as follows: temperature, precipitation, humidity, atmospheric pressure, cloudiness, wind, and solar radiation. Temperature is the amount of heat energy in the air radiated to Earth by the sun in the form of light. A regions albedo can impact this. Precipitation is the amount of water that falls to earth as a solid or liquid. It can impact vegetation and surrounding bodies of water. Humidity is the water vapour in the air, and is impacted by rainfall and solar radiation. Atmospheric pressure is the force exerted due to the weight of the atmosphere on a given surface. It is impacted by altitude and the density of the air. Cloudiness is the amount of clouds in the atmosphere. It can block sunlight and distribute water. Wind is moving air. It can dry humidity and cause storms. Lastly, solar radiation is the source of heat from the sun and affects all the elements.

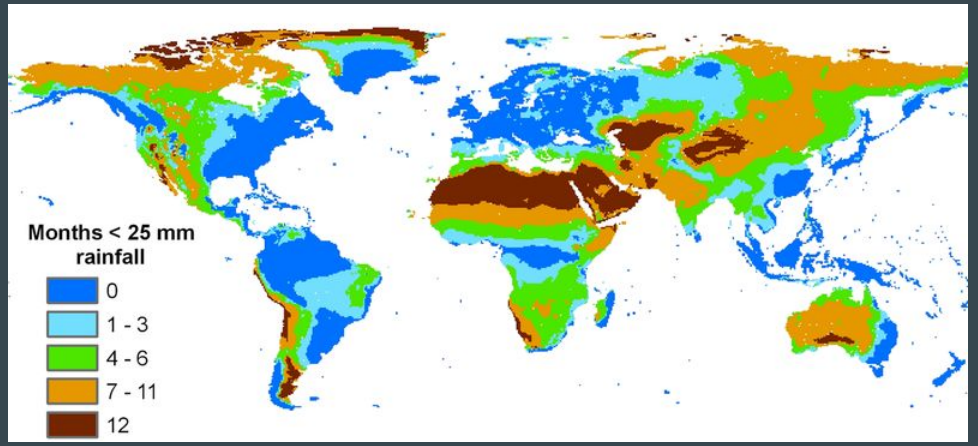
# Map: Elements




- Map showing mean earth temperatures, an element of climate




- Image showing clouds impact on Earth's albedo which impacts climate

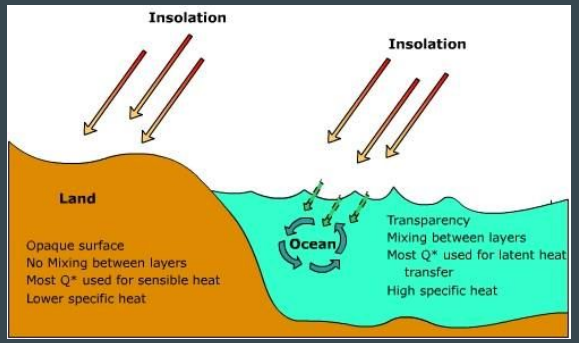



- Image showing Earth's average precipitation levels: another element of climate

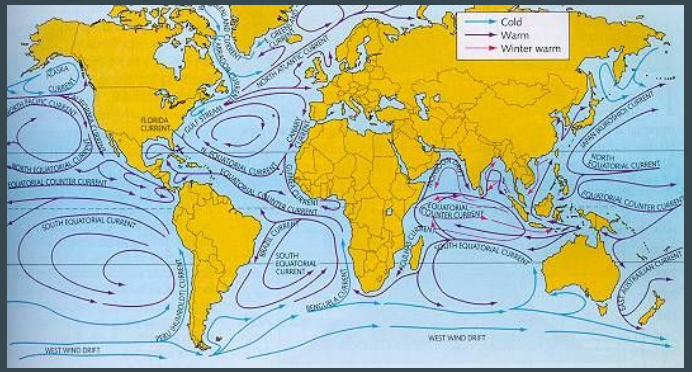
# b). Controls of Climate

There are many different factors that work together to influence climate. Controls are considered factors that are not related to Earth elements. There are considered to be four main controls, with others impacting them as well. They are latitude, elevation, large bodies of water (Continentally), and landforms. Also affecting is wind, and ocean currents. Latitude determines the distance from the equator and ultimately the amount of solar radiation a region receives. This is the biggest effect on climate. Elevation is important because the higher you go, air cools making the climate colder. Large bodies of water impact climate because they can store and release heat (energy) slower. It takes great energy change to impact the temperature of a large body of water, helping regulate the climate around it. Landforms impact climate because changes in the earth's surface can cause moving air to heat and cool accordingly. Likewise, ocean currents can move hot or cold water in a region, and wind patterns can impact moisture and air temperature.

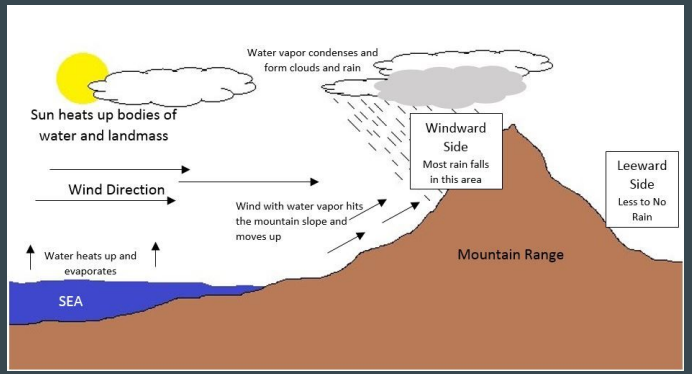
# Map: Controls




- Image showing how water can store heat effectively




- Image representing ocean currents. This impacts climate by moving warm/cool water into a region

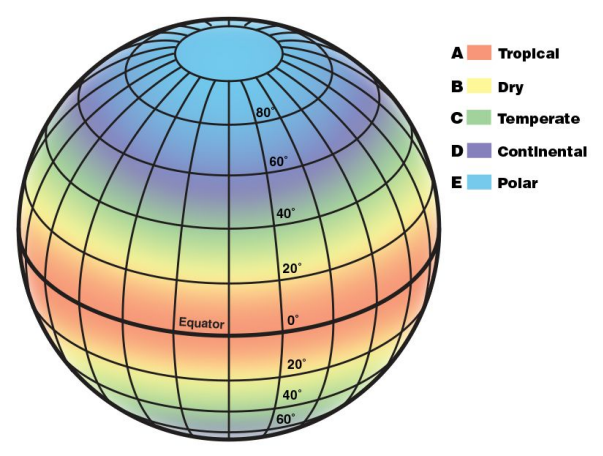



- Image showing hoe landforms affect climate due to wind movement

# c). Regions of Climate

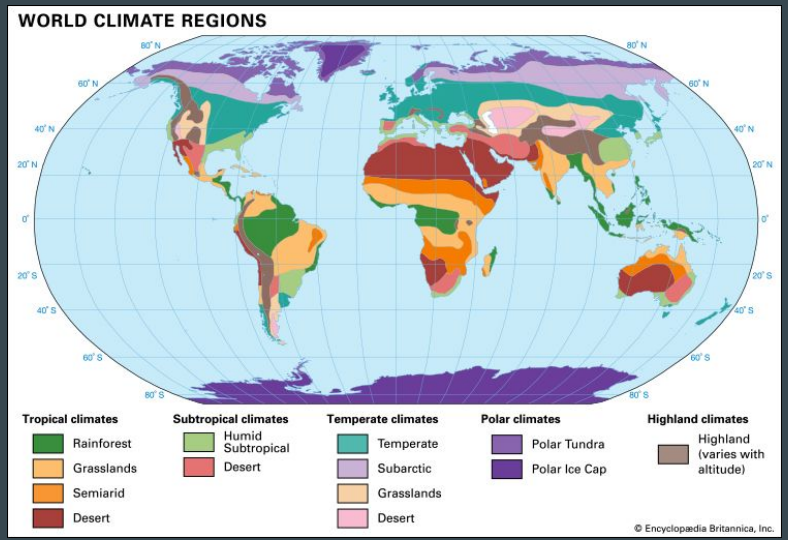
Naturally, the climate of a region has a direct correlation to its geographical position on Earth, and its distance from the sun. This is how scientist Wladimir Koppen created 5 major climate zones: Tropical, Dry, Temperate, Continental, and Polar. Tropical climate zones are hot and humid; temperatures are above 18 degrees celsius year round. They receive plenty of precipitation, averaging 59 inches per year. Dry regions receive very little rainfall, and rarely have permanent sources of water. Temperatures are hot, but vary day to night. Upwards of 50 degrees celsius during the day, and colder than 30 degrees at night. Temperate climates are the middle of the extremes. Summers are warm with light amounts of precipitation (the odd storm). Winters are mild, varying from -2 to 20 degrees celsius. Continental, or cold climates, are characterized by cool summers, cold winters, and a fair amount of precipitation (snow). Summers can be 20-30 degrees celsius, while winters being anywhere from 0 to -30 degrees. Lastly, Polar climates are very harsh. They lack a summer season. Ice, tundra, and little sunlight is common. Even the warmest temperatures rarely exceed 10 degrees, and not for long.

# Map: Regions




- Colour coated image showing earth's general climate zones

- Image representing Earth specific climate zones based on geographical location



# How Does Climate Affect Human Activity

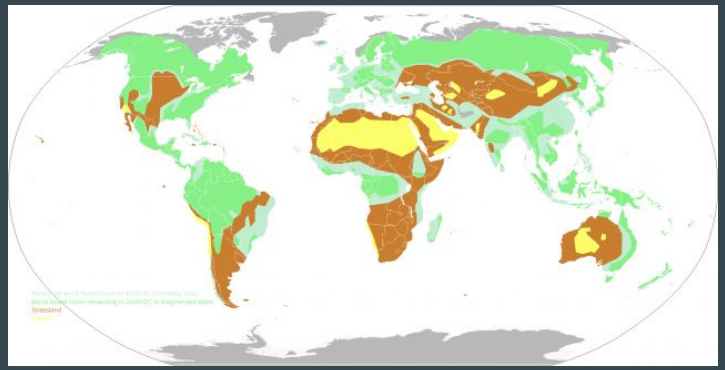
Climate arguably has one of the most prominent impacts on human activity. It impacts human migration patterns due to people wanting to live where they are comfortable. Likewise, it can impact tourism adding the economy. It also impacts vegetation levels (which can impact soil quality), plant and animal species, sunlight exposure, and therefore terrain. These all impact humans. Agriculture is a huge portion of the economy, and different climates are responsible for housing specific needs for goods required around the world. This adds to the global economy. Ultimelty, humans have to adapt their lifestyle around the resources they have. This includes, but is not limited too, the food they have, plants they can grow, and the sun/precipitation they can receive. This is all affected by the climate of the region. A climate unsustainable to your needs will not allow for the success and growth of a society, and therefore it is important you find a climate that fits your perceived sustainable lifestyle.

# Vegetation

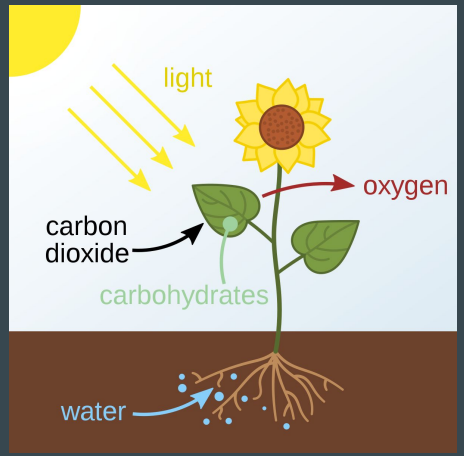
The term “Vegetation” refers to the organic plant life in a specific region. There are five main vegetation regions across the lithosphere, including forest, grassland, tundra, desert, and ice sheet. Each have distinct characteristics, including requiring different needs to survive, having a different role in their ecosystem, and differing in how they are used among animal and human life. Likewise, the species and niches of specific vegetation varies from region to region. However, in all of these regions vegetation does serve similar roles. It is crucially important in Earth's natural cycles, including that of Carbon, Nitrogen, and Water. It plays a major role by interacting with the sun to sustain life in various ecosystems. Furthermore, it  can affect the soil and the nutrients within, all while acting as shelter and food for humans and animals.

# Map

- Comparison of two different vegetation regions from across the world



- Different vegetation regions of Earth. Green is higher density, yellow is low.




- The process of photosynthesis. Vegetation plays a major role

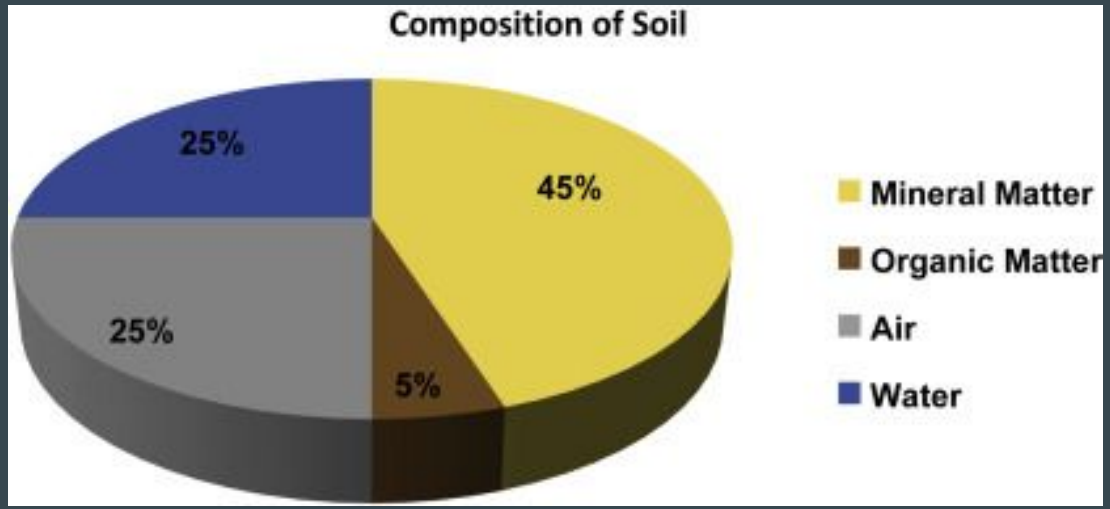
# How Does Vegetation Affect Human Activity

Humans are gravely impacted, and reliant, on vegetation. First, life as we know it would not exist. Vegetation accepts the sole responsibility of the carbon cycle, which is how humans, and other life forms, receive breathable oxygen. With the oil and gas industry booming, as well as pollution levels at an all time high, this is crucially important. Likewise, its photosynthetic characteristics make it vital to providing energy amongst the biosphere, allowing life to grow and develop. In turn, this provides food to both humans and other organisms, which may also be used later on in the food chain. Its ability to affect soil nutrients also plays a part in the agriculture of an area, which is an essential stimulant to the economy. Too add, vegetation across the world provides shelter to both humans and animals from the elements. Lastly, it can have a major impact on climate, which can affect human migration patterns, and other aspects: such as tourism.

# Soils

Soil is considered loose surface material that covers most of earth's land surface. It is comprised of organic and inorganic material, and it provides the structural base, as well as the nutrients and water for plant life to survive. Soil types vary greatly from region to region, with factors such as climate, composition, vegetation, and weathering affecting its condition. The four main soil types are clay, sand, silt, and loam; each having different characteristics. All soil types consist of inorganic components including sand, gravel, and silt. They also have organic components such as leaves, animal waste, and decomposing organisms (fungi, algae, bacteria, etc.). As a result, the composition and quality of soil directly impacts what vegetation can thrive in a particular area.

# Map




- Image showcasing soil composition.


- Representation of the 4 main soil types. Each have different characteristics that impact agriculture.

# How Does Soil Affect Human Activity

Soil affects human activity primarily because of its agricultural value. Different soil types allow for different variations of farming, impacting what we can sustain. As a result, it can impact our economy and where we choose to live in order to grow our crops. Low soil quality can deter us from a location in fear of a low yield, and would force other aspects to drive economy. Likewise, since most infrastructure is built on ground, the rigidness of the soil can also impact construction. Loose or split soil might not support a building as good as solid, tight ground components. However, the main way soil affects us is by what vegetation we can grow, which has a direct correlation to agriculture and economy.

# Conclusion

In conclusion, patterns of the different physical elements of the Earth impact humans each and everyday. Homosapions are always trying to meet there basic needs in order to survive. How the earth is shaped, the landforms present, the climate of a region, and its vegetation / soil composition all affect these basic needs, and ultimately, human quality of life. Where we live, what job we are able to fulfill, what resources we are subjected too all depend on these physical elements. Likewise, it can impact our economy greatly. Different climates, vegetation, landforms and soil types impact agriculture, and well as other jobs specific to your region.  In all, without these elements it would be impossible to live. We are impacted every day by them, and therefore need to help make sure they are not only sustainable for us, but for future generations to come.

# Bibliography


- Jerry Coffey. “What is Lithosphere.” N.p: Universe Today, 14 Sept. 2010
https://www.universetoday.com/73597/what-is-lithosphere/

- Ivan Osorio. “Prediction.” N.p: Research Gate, July 2010
https://www.researchgate.net/figure/Standard-model-of-12-major-tectonic-plates-showing-their-relative-motions-thick-red_fig3_45929238

- “Lithosphere.” N.p: Polarpedia, n.d https://polarpedia.eu/en/lithosphere/

- National Geographic Society. “Landform.” N.p: National Geographic, N.d.
https://www.nationalgeographic.org/encyclopedia/landform/

- Mountain Image: https://en.wikipedia.org/wiki/Trapper_Mountain#/media/File:Trapper_Mountain_7530'.jpg

- Canyon Image: https://www.insider.com/grand-canyon-tourists-rims-edge-2019-4

# Bibliography


- Ocean Trench Image: https://www.nationalgeographic.org/encyclopedia/ocean-trench/

- Earth's Elevation Image: https://www.sciencephoto.com/media/158970/view/earth-topographical-map

- "Vegetation". N.p: Science Daily, N.d https://www.sciencedaily.com/terms/vegetation.htm

- National Geographic Society. "Vegetation Region." N.p: National Geographic, N.d https://www.nationalgeographic.org/encyclopedia/vegetation-region/

- Rainforest Image: https://rangerrick.org/ranger_rick/visit-a-rainforest/

- Mountain Plain Image: https://dissolve.com/stock-photo/Autumn-colored-dwarf-birch-tundra-vegetation-covers-tundra-rights-managed-image/102-D1233-20-434

- Photosynthesis Image: https://en.wikipedia.org/wiki/Photosynthesis

- Vegetation Regions Image: https://geography.name/vegetation-zones/

# Bibliography


- “What is Soil?” Melbourne, Victoria: Department of Environment and Primary Industries, May 1998 http://agriculture.vic.gov.au/agriculture/farm-management/soil-and-water/soils/what-is-soil

- Soil Components Image: https://www.sciencedirect.com/science/article/pii/B9780128092705000145

- Different Soil Types Image: https://www.wilsonbrosgardens.com/different-soil-types.html

- “What is Climate?” N.p: Exploring Earth, N.d https://www.classzone.com/books/earth_science/terc/content/investigations/es2101/es2101page01.cfm?chapter_no=investigation

- “Climate Elements.” N.p: BasicPlanet, N.d https://www.basicplanet.com/climate-elements/

- “Climate Controls.” N.p: Penn State University, N.d https://www.e-education.psu.edu/emsc100tsb/node/330

- Nicole Crawford. “Types of Climate Regions.” N.p: Sciencing, March 18, 2018 https://sciencing.com/types-climate-regions-6863446.html

- “What are the Different Climate Types?” N.p: SciJinks, N.d https://scijinks.gov/climate-zones/

# Bibliography


- Mean Temperature Image: https://climatedataguide.ucar.edu/climate-data/global-surface-temperatures-best-berkeley-earth-surface-temperatures

- Mean precipitation Image: https://www.pinterest.com/pin/18014467246787565/

- Cloud Albedo Image: https://www.innovationtoronto.com/2014/12/cost-of-cloud-brightening-for-cooler-planet-revealed/

- Water Insolation Image: https://www.slideshare.net/hennaqam/factors-that-affect-climate

- Ocean Currents Image: https://www.acer-acre.ca/resources/climate-change-in-context/general-concepts/proximity-to-water-bodies

- Landforms Affect on Climate Image: http://worldlandforms.com/landforms/how-landforms-affect-global-temperature-and-weather/

- General Climate Zones Image: https://scijinks.gov/climate-zones/

- Specific Climate Zones Image: https://kids.britannica.com/students/assembly/view/120523