



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard Physics, Earth and Space Science Level 1

This exemplar supports assessment against:

Achievement Standard 92044

**Demonstrate understanding of human-induced change within the Earth
system**

An annotated exemplar is a sample of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers with planning.

New Zealand Qualifications Authority

To support internal assessment planning

Grade: Achieved

For Achieved, the student needs to demonstrate understanding of human-induced change within the Earth system.

This involves describing change within the Earth system that has resulted from human activity, and using science ideas to describe effects of the human-induced change.

This student has described what deforestation is. They also use the science idea of habitat to describe how deforestation affects the biosphere.

The student has described how deforestation decreases water quality and harbour depth through sedimentation, affecting both the hydrosphere and biosphere.

For Merit, the student could explain how the removal of forest habitat affected a species, for example with either a food chain or supported by data. They could use science ideas to explain water quality changes, either biologically, chemically, or physically.

Achieved

NZQA Intended for teacher use only

Deforestation is the removal of trees in a selected area to make use of the land for humanity to use.

██████ has had a fair amount of native trees and plants removed for the development of infrastructure and roads, the Biosphere and atmosphere has been affected because this has resulted in less carbon dioxide being absorbed by trees and more of it going into the atmosphere.

Another area of the biosphere that is being affected is the removal of the habitats that the birds and insects live in.

This has happened because the trees and plants provide food and housing for the animals and when they are taken away, they have no place to go.

In addition to areas being affected by the trees being taken down is the Māori community because they have lots of connections to the trees and plants throughout their history and have preserved them for generations.

Plants and trees have been responsible for sheltering and supplying their ancestors for many years and losing it all would be disrespectful and be detrimental to their morals and lifestyle.

Another area that is being affected is the sea life in the ██████ harbor because when there's no trees covering the sediment, it can easily be blown away into the waterways.

This has affected the hydrosphere by lowering the quality of the water for the fish to live in, and it has led to the water becoming more shallow over time due to the build of sediment.

Another big area that is being affected by this are the Māori community because a large amount of their culture and ancestry has ties to the land, ocean and creatures that live in it, and every day they start to lose it because of the sediment.

Grade: Merit

For Merit, the student needs to explain human-induced change within the Earth system.

This involves using science ideas to explain how the change affects the Earth system.

This student has explained how soil without trees and their roots can lead to both flooding and droughts. Effects on the geosphere and hydrosphere are explained. The student has also included several pieces of data to indicate how significant the human induced change is across Aotearoa.

For Excellence, the student could discuss the scientific implications of a human induced change by analysing how effects in a sphere may link to affects in other sphere(s).




Deforestation

PESS 1.1 Demonstrate understanding of human-induced change within the Earth system.



How deforestation leads to floods



Tree roots soak up excess water in the soil. If there are fewer trees, the roots won't be soaking up water, so once the soil has absorbed all the water it can, the extra water will have nowhere to go and will sit above ground, causing a flood. The tree roots also funnel the water deeper underground, where the water won't get to otherwise. Without roots holding the soil together, the dirt and debris can easily get pulled along with flowing water and cause a blockage which water can build up behind and flood even higher. After trees get cleared, the roots will dry out and shrivel up, which creates blockages underground in the soil, so it takes longer for water to soak down, meaning more sitting water.

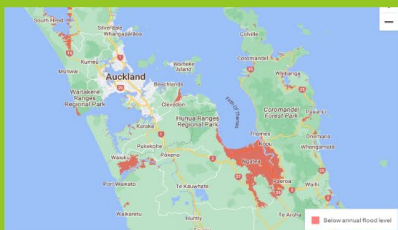


How deforestation leads to droughts

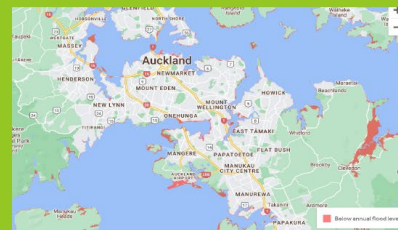
Trees funnel water underground and that water supplies lakes, rivers, and other plants. Without trees funnelling the water, this process can't happen, causing water shortages. A fully grown tree releases 1,000 litres of water vapor per day into the atmosphere, and the entire Amazon rain forest sends up 20 billion tons a day. ([NY Times](#)) The water vapor creates clouds that turn into rain, so without the trees, there is less rain, and water sources dry out, so droughts happen. Cutting down trees releases carbon dioxide, held in the trees, into the atmosphere. The carbon dioxide then traps heat and leads to global warming, so water dries up faster, and droughts become more frequent.



What will happen to Auckland if deforestation continues



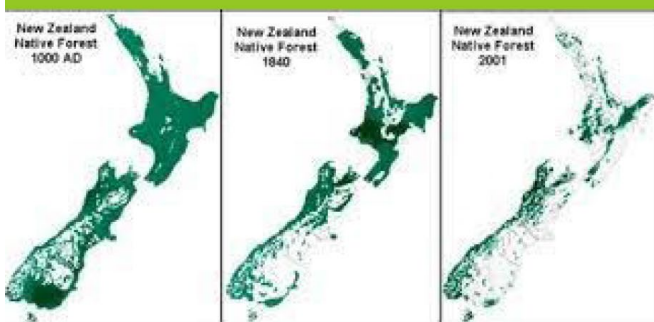
[Climate central](#)



Deforestation leading to climate change and flooding means the sea level will rise. The red zones on these two images, of Auckland and surrounding areas, show the areas that are expected to be submerged by 2050 ([Climate central](#)). If deforestation continues at the rate it currently is, climate change rates will also keep climbing, and these red zones won't be the only parts underwater.



What NZ previously looked like vs what it looks like now



([Enviro History](#))

This image shows that between 1000 AD and 1840, there was a lot of deforestation, especially along the east coast of the south island, the centre of the north island and the top of the north island. Between 1840 and 2001, there was even more deforestation spreading over the entirety of every island. As a result, there is minimal forest left in many places that used to have dense forest covering it.

Grade: Excellence

For Excellence, the student needs to analyse human-induced change within the Earth system.

This involves discussing scientific implications of the change within the Earth system.

This student began their analysis by defining relevant concepts such as fossil fuels, the atmosphere, and the hydrosphere.

They have explained the role of CO₂ in the greenhouse effect, and they have explained how warming the ocean causes the sea level to rise. Finally, the student has discussed how the change in the atmosphere affects the hydrosphere.

Fossil fuels are fuels that are made from decomposing plants and animals which come from a long time ago. We use fossil fuels to burn them and to produce steam and to produce electricity, we also use fossil fuels to power most modes of transport. When fossil fuels are burnt it is turned into a gas called carbon dioxide (CO₂) and CO₂ is the gas that is harming the earth so much and is warming our planet by a process in which I will explain.

The atmosphere is made of different gases that surround the earth, it has oxygen which we need and protects us UV radiation. The hydrosphere is all the water on earth, from ice to the ocean and under ground reservoirs. The hydrosphere moves in a cycle called the water cycle, which involves six main stages the evaporation stage, the condensation stage, the precipitation stage, the infiltration stage, the runoff stage, the transpiration stage. the ocean is one of the largest parts of the hydrosphere at 97% and one of the most important parts of the hydrosphere.

What happens in the atmosphere when CO₂ is released? When fossil fuels are burnt, they release CO₂ in the atmosphere, CO₂ is a greenhouse gas. How the greenhouse effect works. When the sun is out, the energy from the sun heats up the earth's surface and then the earth's surface will release the energy back into the atmosphere as infrared light, but the catch is, that greenhouse gases absorb infrared light and traps the heat in the atmosphere. CO₂ then releases the heat back into the atmosphere, therefore making the atmosphere warm up. Greenhouse gases are good as long as it is kept at an optimum level because it keeps us comfortably warm and keeps the temperature warmer at night when the sun isn't out, without greenhouse effect the earth will be too cold for life to exist. Burning too much fossil fuel releases too much carbon dioxide leading to too much greenhouse effect causing global warming. Global warming means the temperature in the atmosphere continues to go up and cause lots of unthinkable consequences.

The atmosphere releases heat into the ocean by a process called heat transfer, greenhouse gases heat the particles in the atmosphere, then the particles in the atmosphere come in contact with the cool ocean particles and makes the ocean particles warmer, and therefore the sea warmer.

The hydrosphere is affected by global warming by the sea level rising, the sea level rises by the earth and the atmosphere heats up and the sea gets warmer, when the sea heats up the particles in the water start to move faster and hit into each other, so they move further apart so they don't hit each other and need more room to move so that the volume expansion occurs leading to sea level rise, sea level rising can cause coastal erosion and more flooding which can put houses near the coast and low lying houses in danger. Low level islands in the Pacific islands will become flooded and underwater causing plants and animals will become extinct. The United Nations also says that "nearly 10 percent of the global population is living in a low-lying zone" that shows how big the consequences are of global warming are and what a massive task it will be to move them all if sea level rise continues to rise.

With the green house gas's releasing so much heat into the atmosphere, the atmosphere can release some heat into the ocean, this is called a carbon sink. A carbon sink is when the ocean or anything that absorbs CO_2 and heat takes in more CO_2 than it releases. The ocean (hydrosphere) is the world's largest carbon sink absorbing around "90 percent of the excess heat generated by these emissions" says the UN, this shows how the atmosphere and the hydrosphere are connected in the way that the hydrosphere absorbs a large amount of the heat and carbon dioxide from the atmosphere, but the ocean isn't able to absorb enough heat and the atmosphere is having to take more heat and CO_2 . The ocean's currents and waves move the warm water into the cooler areas and start to warm the cooler water, and with warmer waters the polar ice melts contributing to the sea level rise, not by much, but is still a contributor to sea level rise.

In conclusion, if we continue to burn fossil fuels and produce carbon dioxide then the sea will become too high for people to live in low lying areas by the process of global warming. The ocean is a critical carbon sink and if this starts to give off more carbon dioxide than it takes in, then it will be a big problem. Global warming and sea level rising are connected by fossil fuels and too much greenhouse gases.