

United Nations Environment Programme

MetMUNC XLVIII

Topic: Thawing of Permafrost

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Permafrost is land that remains frozen for an extended period of time. In order to be considered permafrost, the ground must be frozen for at least two consecutive years, and it can remain this way for thousands of years. Permafrost is mainly located at high latitudes and



Figure 1: This is an image of thawing permafrost located in Alaska (2004).

altitudes, and covers about 24% of ground land in the northern hemisphere. Global warming, which occurs due to the release of greenhouse gases such as carbon dioxide, methane, and water vapor, is increasing the likelihood that permafrost will thaw out. As world temperatures rise, ice melts; it's a simple process with potentially catastrophic consequences.

Hidden within the frozen ground are diseases that have been wiped out, such as the Spanish Flu and smallpox. The majority of Earth's carbon is hidden beneath the permafrost, and would be released into the atmosphere should the ice melt. Although this carbon has the possibility to nourish the plants that can grow on the soil which lies on top of the permafrost, only about 20% can be utilized by the plants to aid in photosynthesis, which would cause the other 80% to be

released into the atmosphere. This establishes a bitter cycle: global warming causes permafrost to melt, which only speeds up the process of global warming.

The upper layer of permafrost is called the permafrost table. The surface layer that tends to thaw in the summer is referred to as the active layer. The thickness depends on how moist it is. If it is wet, it can be very thin, but thicker it becomes, the less water content there is.

Peats are plants that grow in watery environments without water and decay over time. Peat keeps the underlying frozen ground from thawing out, therefore keeping the carbon from being released into the atmosphere. However, any type of fire can remove the peat. In addition, the burning releases carbon dioxide, and can cause the burned ground to absorb more solar radiation.¹ Peat can be found in Iceland, Indonesia, Argentina, Scandinavia, and the British Isles. Countries such as Finland, Ireland, and Scotland use peat as fuel.²

Permafrost is likely to be found at high altitudes in the Northern Hemisphere and in mountainous regions in the Southern Hemisphere. It is common in Alaska, Canada, China, Greenland, Russia and in places with a high altitude such as the Tibetan plateau, Rocky Mountains, and South American Andes. Because permafrost covers most of the land in places such as Alaska, Canada, and Siberia, it made the most sense to simply build



Figure 2: Damaged roads due to permafrost in Canada.

towns, roads and other structures on top of it because the permafrost was not expected to melt. However, when the ground melts, it causes everything on top of it to sink. The damages caused

¹ <https://blogs.ei.columbia.edu/2018/01/11/thawing-permafrost-matters/>

² <https://www.nationalgeographic.org/media/peat-forgotten-fuel/>

by the thawing can be dangerously expensive to repair, if that is even possible due to the unstable land. Permafrost traps carbon and methane and can also house threatening pathogens. This was seen in Siberia when the remains of a reindeer infected with anthrax were trapped in permafrost. It is likely to recur with other diseases such as smallpox and the Spanish flu.³

The world relies heavily on fossil fuels such as oil to power the planet and in places such as Alaska, Canada, and Russia that often produce oil in order to provide energy to its towns and cities as well as trading it with other countries. Drilling in oil wells and creating those wells can increase the likelihood that the ground nearby will begin to thaw. Permafrost covers 65% of Russia. This makes the increased heating even more threatening due to the fact that Russia's warming rate increases 2.5 times as fast as the international average. Russia's economy relies on the ability to access and transport minerals from the permafrost. The permafrost houses less than 4% of the Russian population however 17% of fixed assets can be found there. This further proves that the permafrost is vital to the economy of anywhere that houses permafrost.⁴

Alpine permafrost is when the permafrost stays frozen for a seemingly infinite amount of time. The largest amount of alpine permafrost can be found in China covering 1,500,000 square kilometers in comparison to the 100,000 square kilometers that can be found in the United States.⁵

In China, a train was built on top of the permafrost for means of transportation in order to keep the ground beneath it frozen, so the tracks would not be destroyed. The Chinese engineers used crushed rocks to insulate the ground. Another method of protecting the ground is to build the building on a steel frame above the ground to allow cool air to flow in order to prevent the

³ <https://www.nrdc.org/stories/permafrost-everything-you-need-know>

⁴ <https://www.climatechange.org/russia/permafrost/>

⁵ <https://www.britannica.com/science/permafrost>

heat of the building to impact the room. In cases where the permafrost is thin it is possible to dig it out in order to build on top of it. Thermosyphons are long metal tubes that can be used to draw out heat and keep the ground frozen. These come with the price of approximately 10,000 U.S. dollars each, thousands of them were installed across Alaskan ground to help keep the ground frozen.⁶

The 2015 UNFCCC Paris Climate Agreement recently outlined goals for controlling and monitoring climate change in comparison to what global temperatures were before the industrial period. During this period there was a drastic increase in greenhouse gases, which caused global temperatures to rise. If the Paris Agreement is successful then the climate will be at most 2°C (37°F) above what it was before the industrial period.⁷ The majority of the world's nations are involved in this agreement. However the US plans to officially withdraw its part in the agreement by November 2020.⁸ The agreement is meant to be a long term plan and has only been in action since April 2016. Unfortunately, for every single degree Celsius that the overall climate is raised, another piece of permafrost the size of India will thaw. This means that if the Paris Agreement isn't successful, approximately 2.5 million miles of permafrost will thaw, even further worsening its current state.⁹

One method being used to preserve permafrost in Serbia is to bring animals such as horses, oxen, reindeer and bison to areas where permafrost is beginning to melt. The thought behind this plan is that the animals would be able to stomp down the snow, making it thinner and denser which will allow the ground to stay frozen for longer. This would mostly work during the

⁶<https://www.npr.org/2018/06/11/617240387/oil-industry-copes-with-climate-impacts-as-permafrost-thaws>

⁷ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

⁸<https://www.scientificamerican.com/article/formal-u-s-withdrawal-from-paris-climate-agreement-looms/>

⁹ <https://psmag.com/news/new-research-on-how-to-save-a-huge-chunk-of-earths-permafrost>

nine months of winter when the snow can be compacted thoroughly, but when the warmer summer comes the animals will most likely expose the active layer to more heat by breaking down the moss and soil with their hooves.¹⁰ The animals that have the possibility of helping the permafrost stay frozen can be difficult to obtain and move to such remote locations in Russia. Adult bison can weigh up to 2,000 pounds, so if they are brought to the grounds when they are young they will be easier to transport and will also have more years to reproduce amongst themselves. If the animals do what they are intended it will help keep the permafrost from thawing but there is a risk the opposite will happen and will rather expedite the overall process of the permafrost melting.¹¹

As permafrost continues to thaw, it will cause billions of dollars in property damage to the infrastructure of affected cities. If left untreated, there will only be more greenhouse gasses released to speed up global warming. There are multiple ways to address the issue. Potential resolutions could focus on finding new ways to slow thawing of permafrost, or implementing systems to deal with consequences in the event that the ice continues to melt. Either way, UNEP must find a way to utilize its resources to slow the melting of our planet's foundation.

¹⁰<https://www.pri.org/stories/2017-04-30/bold-plan-slow-melt-arctic-permafrost-could-help-reverse-global-warming>

¹¹<https://www.fastcompany.com/40561843/baby-bison-are-being-flow-to-siberia-to-try-to-save-the-permafrost>

Questions to Consider:

1. How does your country contribute to global warming, and what efforts are they making in order to decrease to overall climate change?
2. How does your country try to prevent permafrost from thawing?
3. How much permafrost is located in your country and how has its state changed within the last 10 years?
4. How has the economy of your country been impacted by damage caused by building on permafrost?
5. What solutions did your country find to be effective in preventing permafrost from thawing?

Helpful Links:

- <https://www.climatechangepost.com/russia/permafrost/>
- <https://www.nrdc.org/stories/permafrost-everything-you-need-know>
- <https://www.britannica.com/science/permafrost/Climatic-change>
- <https://blogs.ei.columbia.edu/2018/01/11/thawing-permafrost-matters/>
- <https://www.npr.org/2018/06/11/617240387/oil-industry-copes-with-climate-impacts-as-permafrost-thaws>