



What is permafrost?

KS2

KS3

Ages 7-14 ⌚ 4 min read

About a quarter of all land in the Northern Hemisphere sits on permanently frozen ground called permafrost. In some parts of Siberia, it's frozen to a depth of over a kilometre. It's been frozen for tens of thousands of years — since the last ice age. And it's now thawing.

What exactly is permafrost?

Permafrost is ground — soil, rock, and sediment — that has remained at or below 0°C for at least two consecutive years. In practice, most permafrost has been frozen for far longer. It underlies vast areas of Russia, Canada, Alaska, Greenland, and the Tibetan Plateau. Above it sits a thin "active layer" that thaws each summer and refreezes each winter. Below that, the permafrost can extend hundreds of metres down.

Permafrost is full of organic material — the remains of plants and animals that died and were frozen before they could fully decompose. It's essentially a massive freezer containing thousands of years of biological material.

🍖 Imagine putting meat in a freezer. It stays preserved indefinitely. Take it out and leave it at room temperature, and bacteria get to work — the meat decomposes and releases gases. Permafrost works the same way. While it stays frozen, the ancient organic matter inside it is locked away. Once it thaws, microbes wake up and start decomposing that material — releasing carbon dioxide and methane into the atmosphere.

Why does thawing permafrost matter?

Methane. Permafrost contains an estimated 1.5 trillion tonnes of carbon — nearly double the amount currently in the atmosphere. As it thaws, microbial decomposition releases some of that carbon as methane, a greenhouse gas roughly 80 times more potent than CO₂ over a 20-year period. This creates a feedback loop: warming causes thawing, which releases methane, which causes more warming, which causes more thawing. Scientists call this a climate tipping point — a self-reinforcing process that, once started, becomes very difficult to stop.

What's already happening?

Parts of Siberia are developing "thermokarst" — a landscape of slumps, sinkholes, and lakes formed as permafrost melts and the ground collapses. Buildings, roads, and pipelines built on permafrost are sinking and cracking. Rivers in Alaska have turned orange as thawing permafrost releases stored minerals. And scientists are finding that permafrost is thawing faster than models predicted. It's one of the most alarming but least discussed aspects of climate change.