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Sergej Kirpotin: Permafrost thaw aggravates climate change

Sergej Kirpotin is a biologist at the University of Tomsk. After numerous expeditions to northwest Siberia he is now certain that the country's once-frozen tundra is not only melting but is also actively contributing to climate change due to carbon and methane molecules released by permafrost thaw.

Windblatt: *What are some of the signs of global warming in Western Siberia?*

Sergej Kirpotin: Western Siberia is covered with vast uniquely beautiful marshy areas. There is no other place as well suited for monitoring climate change. Global warming is advancing at a faster pace here than in any other subarctic and arctic regions. The upper atmospheric layers over Siberia are heating up much faster than over Scandinavia for example. According to calculations from various scientists, the temperature in Western Siberia has increased between two and six degrees in the past four decades.

Windblatt: *Why is global warming more pronounced in Western Siberia than elsewhere?*

Kirpotin: This is due to an extremely continental climate and the counter-effects of the melting permafrost soil. Nearly 60 % of the region between the Ural Mountains and the Yenisei River is subarctic wetlands, moors or swamps. The northern part is the permafrost zone, where the ground is frozen all year round – in some places up to many hundred metres in depth: A huge block of frozen peat which in summer only thaws out a bit – anywhere from a couple of centimetres to several metres deep.

Today, global warming is prolonging the summer thawing period, the seasonal thaw depth is increasing and there are more and more larger dark patches of water. These and the melting snow mantle are speeding up the warming process as less sunlight is

being reflected. In winter, the ground is not freezing as fast because the thick layer of water acts as insulation. Thus, thawing is fostering even more thawing.

Windblatt: *What effect do these processes have on the climate?*

Kirpotin: We're still missing data needed to make precise predictions. In summer, micro-organisms turn organic material in the thawed out soil into methane and CO₂. This is why warming is causing larger amounts of greenhouse gases to be released in the northern part of West Siberia. Swampy regions are expanding in the south. Increasing plant growth is promoting more CO₂ uptake. But we can't say exactly whether the atmospheric carbon dioxide concentration will rise or fall.

From my experience, the lakes in Siberia are growing and far more methane is escaping than before. In many places, so-called hot spots, there is so much gas bubbling up that these don't even freeze up during Siberia's severe winter. When it comes to heating up the atmosphere, methane is much more potent than CO₂ in trapping heat. That's why I assume that permafrost thaw is a huge contributing factor towards climate change. It can even be crucial as Siberia's frozen ground contains a quarter of the earth's carbon reserves.

Windblatt: *Are there any signs of reverse developments?*

Kirpotin: There is a threshold value for this type of process. Once it has been exceeded

the process is irreversible. We are already beyond the limit here. However, we should examine whether it



Sergej Kirpotin

is possible to neutralise the effects of permafrost thaw on the climate to at least slow down global warming.

Windblatt: *What do you think about using renewable energy to curb climate change?*

Kirpotin: It's interesting, but unfortunately Russia has chosen another technological approach. They've opted for nuclear energy for power production – and our oil and gas is exported all over the world for fuel. The economic aspect is the only thing that counts. One of the major factors, however, could be the savings: We could save half of our energy just by decentralising and overhauling our heating systems.

Windblatt: *Are there any pioneers for climate protection in Russia?*

Kirpotin: Not in mainstream politics. That's why I was so surprised when our government signed the Kyoto Protocol. This only happened because they probably didn't understand the amplitude of the processes involved. Our politicians only discuss sustainability and environmental issues when they're abroad. At home they never mention this. Fortunately, this is not the case at the regional level: There are some governors who are quite open. And here in Tomsk we at least have the opportunity to research these topics. 