by Dr Gary Busch (June 2020)

With its dependence on raw materials extraction and their export to fund its defence and international ambitions, as well as meet the needs of its people, the Russian economy has been hit by falling prices globally and the impact of global warming, particularly in the multi-time zone vastness that is Siberia

The first signs of the effects of global warming on the economy were the large numbers of explosions in Siberian mines due to the release of methane gas due to global warming after 2017. An explosion in the Severnaya coal mine, in Vorkuta, left four people dead and twenty-six stranded some eight hundred meters below the surface; another explosion, three days later, killed six rescue workers and condemned to death the miners in the inaccessible shaft. A Russian government commission investigating the disaster said that they would authorise the flooding of the mine to extinguish the methane-induced fire. They agreed to flooding it with water and figured that it would take sixty to eighty days to extinguish.

The explosion at Severnaya was not unique in mine disasters. There is a long history of mines exploding due to sudden increases in the amount of methane in the air underground. That is why miners have traditionally carried canaries into the mines in the knowledge that poisonous gases like methane, carbon dioxide and carbon monoxide would kill the canaries first; thus giving the miners' some chance of escape before they too were poisoned.

However, the volume of the methane released in the Severnaya mine was so intense that no canary would have given the miners sufficient warning to escape. Safety procedures in Russian mines have never been adequate or comprehensive. For seven decades at least most of the

miners were zeks; prisoners in forced-labour camps. They were expendable. The Russian mineworkers' unions which were allowed to form outside the closed circle of the 'official union' structure have campaigned hard for improvements in mine safety with little governmental or corporate support.

However, the increase in the amount of methane in Russian mines, especially in Western Siberia, is not entirely the result of the inadequacy of mine safety provisions, although these are desperately needed. The dangerous climactic phenomenon is releasing subterranean gasses at a prodigious rate.

As a result of global warming vast swathes of marshland in Siberia are starting to emit greenhouse gases thirty times more potent than carbon dioxide into the atmosphere. The threat comes from permafrost bogs around the size of mainland France which absorbed carbon dioxide over thousands of years before freezing over during the last Ice Age. Now for the first time in 11,000 years, the thick permafrost under these bogs is beginning to thaw rapidly and form lakes. Temperatures are rising at twice the global rate in Russia's coldest region because of warming, and this is likely to continue in the future.

This continues to threaten the viability of the mining industry in Siberia as there is no way to control or redirect the melting of the vast frozen permafrost lakes. The important Russian mineral export business is threatened. The exploitation of minerals, oil and gas is a fundamental component of the Russian economy, and hence the stability of the Russian government.

The mines, especially those deep mines which operate at 700 to 900 metres underground are right near the point of conversion of methane from a solid to a gaseous state. Without an effective response to climate change this process will continue to accelerate. This is equally true for the oil and gas industries which operate in the same regions.

With the melting of the permafrost, oil rigs become unstable as the ground shifts. Oil and gas pipelines are distorted, torqued, and damaged by shifts in the ground. A massive stabilisation programme will have to be undertaken to maintain the oil and gas flows; an enormous burden whose costs come off the bottom line. The costs of stabilisation of existing wells and pipelines will require heavy investment.

The Russia climate crisis has been known to the authorities for several years. In 2017 the Russian state weather and environment service Roshydromet experts issued a comprehensive report on the effects of climate change and the risks such changes posed to the nation. Much of the infrastructure for extracting the resources that drive the country's economy sits atop the permafrost that covers two-thirds of the country. In that study, researchers found that the value of buildings and infrastructure located on Russian permafrost amounted to $300 billion. They also found that the heating of Siberia by climate change was drying up the ground and accelerating the degradation of the infrastructure across the region. The climatic warming led to innumerable fires which agglomerated into giant forest and peat fires.

Even when these fires were 'put out' they continued to burn underground in the peat and popped up again as 'zombie fires' which repeated the previous conflagrations. In April and May 2020, North-central Siberia experienced a record heat, after a record-setting warm winter. Several stations in north-central Siberia, including areas near or above the Arctic Circle, saw temperatures climb well into the 80s. On May 22, the Siberian town of Khatanga, located well north of the Arctic Circle, recorded a temperature of 78 degrees, about 46 degrees above normal. The typical maximum temperature for that day at that location is 32 degrees.

The temperature departures from average in Siberia this year are some of the highest of any area on Earth. Since January, the region has been running at least 5.4 degrees (3 Celsius) above the long-term average, according to a recent report from the U.S. National Oceanic and Atmospheric Administration. According to Robert Rohde of Berkeley Earth, which monitors global temperature trends, Russia averaged a temperature anomaly of nearly 11 degrees (6 Celsius) above average for the January-to-April period. Such warmth has dramatic repercussions for the landscape, primarily through evapotranspiration, the process by which plants and soils release moisture into the atmosphere. As temperatures increase, so too does the moisture exchanged between the soils and the air. When temperatures warm up, the air is much more efficient at sucking the moisture out of the fuel, and causes causing the drying of soils, including peatlands, that would have been more resistant to burning under wetter conditions. It becomes a tinder box.

The effects of this heating and burning are increasingly apparent. In mid-June 2019, the melting of the permafrost caused major flooding in Irkutsk. Twenty-five people died and almost three thousand people were affected. A few days later there was a second flood. TASS reported that the water level in the Iya river reached 14 metres in the town of Tulun. These floods also created ancillary ecological problems as the flood waters pushed untreated toxic waste from a pulp and paper mill in Baykalsk, into Lake Baikal.

In June 2020, the effects of the climate change weakened the support of a fuel storage tank in the northern city of Norilsk which released about 21,000 tons of petroleum. President Putin declared a state of emergency in Norilsk after a collapsing storage tank leaked 21,000 tons of diesel fuel into the Ambarnaya and Daldykan rivers and 6,000 tons into the surrounding soil. The size of the disaster has been compared to the Exxon Valdez oil spill in Alaska. The operator, Nornickel, said that it was caused by a sudden sinking of supporting posts in the basement of the storage tank as the permafrost below the tanks melted and collapsed. It turned the rivers bright red.

In early June 2020, in Murmansk, the foundations of the bridge across the River Kola were washed away by rapidly melting snow and strong flows of water. On 3 June, the bridge gave way. This crossing is the only one into the port city, so the shipping of coal from Murmansk has been halted, as has rail traffic from Murmansk to the rest of Russia. It will take months to repair the bridge.

These problems of flooding, collapse of buildings and infrastructure and giant forest fires have been occurring with great regularity as global warming continues. There is no ending of these environmental disasters in sight. Costs to the country could be crippling and other consequences inside and outside Russia's borders could be profound.