

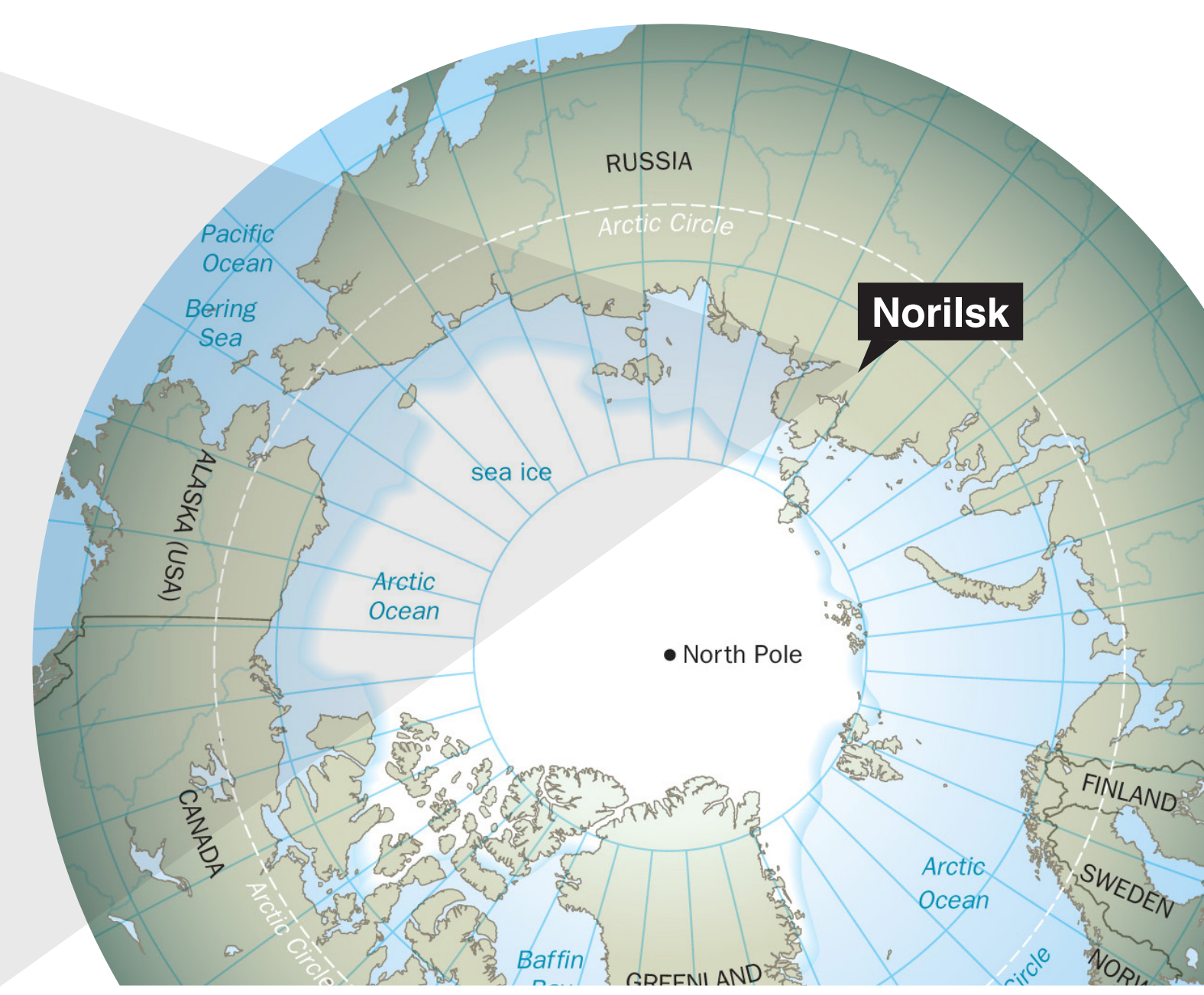
Norilsk Nickel Factory Transforming the City of Horror

Location: Norilsk, Krasnoyarsk Krai, Russia **Population affected:** 177,506

Macaulay Honors College Students: Alasdair McLean, Ellianna Schwab, Kevin Call, Revital Schechter
Instructor: Dr. Angelo Lampousis, *Department of Earth and Atmospheric Sciences, City College of New York, CUNY*

Introduction

A former Soviet Gulag camp, Norilsk is now a long forgotten, poverty-stricken town in the Arctic Circle. The one hundred seventy-seven thousand residents live in a nearly uninhabitable climate, but it is something else that truly endangers them. The city, located in the Krasnoyarsk Krai region of Russia, is home to one of the world's largest suppliers of heavy metals, Norilsk Nickel. This massive company does little to temper its environmental impact, blighting the surrounding wildlife despite numerous calls of action from federal agencies and local support. Currently the company is estimated to produce 1% (2x10⁸ tons) of global sulfur dioxide emissions, a gas that is known to cause acid rain and respiratory problems to those exposed. The health of Norilsk's residents is directly impacted, indicated by a life expectancy of only 46 years. Although citizens of Norilsk recognize the hazards of where they live, the greater majority of the population is incapable of leaving due to extreme poverty. Norilsk Nickel is the largest employer in the region and does not provide the citizens of Norilsk with living wages. Not only is it close to impossible to leave Norilsk, but it is also impossible to enter, as local authorities closed off the city without any cause. **It seems that Norilsk remains the same today as it was when it was first established as a gulag. The city simply cannot escape its history with its own efforts and will require international intervention to prevent further loss of life and to restore the ecological stability.**



Norilsk is located in Siberia, inside the Arctic Circle.
Photo credit: gelio.livejournal.com/17/. Global Map source: swmaps.com/16/.

What's so bad about Norilsk Nickel Factory?

Pollution is Destroying Norilsk:

- Norilsk Nickel releases 11,140 tons of metal contaminants into the air annually (mainly Cu, Ni).¹
- Responsible for 1% of global SO₂ emissions.¹
- All vegetation is completely dead in an 8 km radius from the factory. Beyond the visible damage zone, the 200 surrounding kilometers have clearly affected vegetation, including damaged and reduced growth.¹
- 99,000 tons of pollutants were released into the surrounding water in the Polar Division.¹

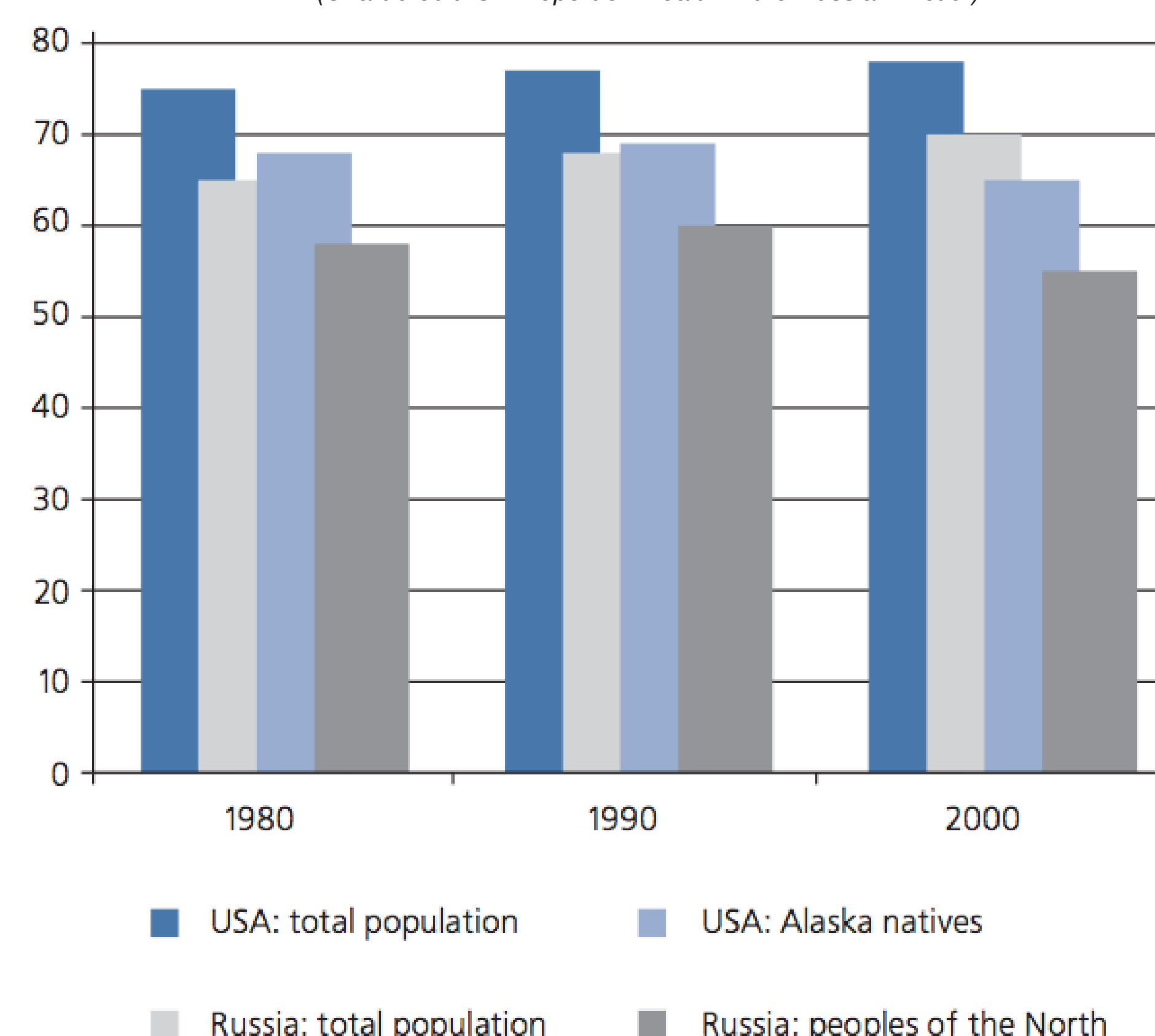
Health Effects of the Discharged Pollutants:

- Respiratory, ear, nose and throat diseases⁸
- Children living near the Norilsk plants were 1.5-2 times more likely to become ill than those living further away⁸
- 15.8% of child mortality and 21.6% adult mortality was caused by respiratory disease in Norilsk, which are much higher rates than the rest of Russia.¹
- Frequent premature births, late-term pregnancy complications, low birth weight babies.¹
- Air pollution accounts for 21.6% of newly identified illnesses among adults and 37% among children.⁸
- The life expectancy is 46 years, 24 years below the Russian average (~70 years), and 33 years below the U.S. average (~79 years)¹

Extreme Poverty in the Region:

- The average annual salary in the region is \$10,800.¹⁶
- Most people cannot afford to move even if they want to.

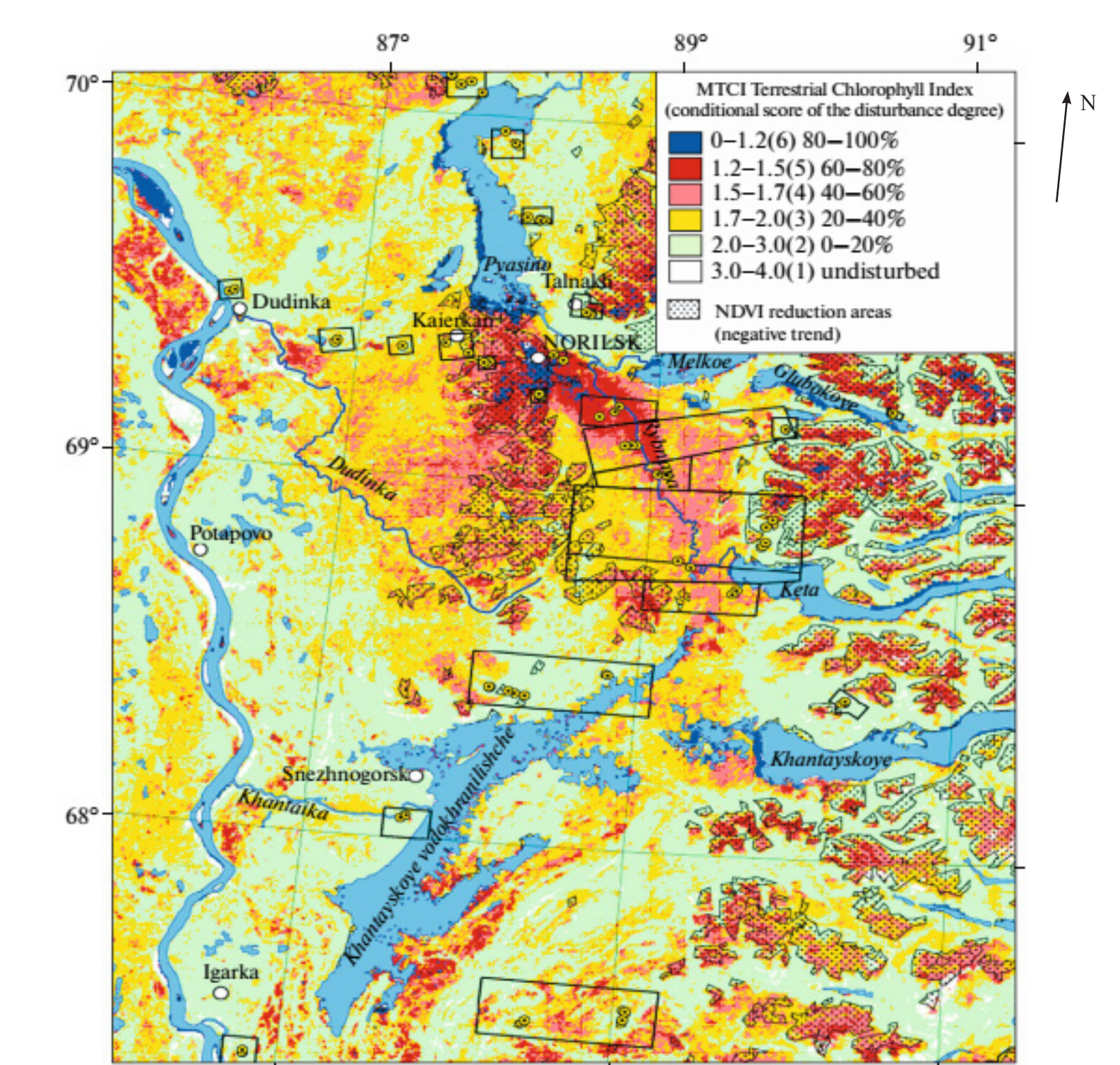
Life expectancy in Russia and the United States:
(Chart credit: UN Report on Health in the Russian Arctic²)



Challenges to Fixing the Situation

- Norilsk Nickel is a prime employer in the city, so a majority of residents rely on the factory as a source of income, even though they are not paid fair wages.⁹
- The city itself is remote and hard to reach, located 200 km north of the Arctic Circle, causing it to be naturally isolated.⁵
- In 2001, Norilsk was declared a closed city once again. The government does not allow tourists to come in, and the only visitors must be invited by the government or have appropriate clearance/paperwork.¹¹
- Rosprirodnadzo- The Federal Service for Supervision of Natural Resources, (the Russian environment protection agency), has tried to fight against the Norilsk Nickel company but they are not powerful enough to make a change. Their support and strength through partnership is critical to making a long term change.⁹

“In the 1960s a lot of people came here and they were all healthy. But now there are very, very few healthy children being born here and that is all because of the environment.”¹¹
Doctor Svetlana Golubkova, Norilsk resident



MTCI map (according to ENVISAT MERIS satellite data, 2004) and reduction areas (negative trend) of the NDVI (according to SPOT Vegetation satellite data for 1998-2004). M. A. Korets, V. A. Ryzhkova, and I. V. Danilova

Cleaning Up and Staying Clean within Budget

Desulfobolbus propionicus (order desulfobacteriales):

- Found to reduce sulfate emissions by up to 0.9kg*m⁻³yr⁻¹.⁴
- Use biofilms in order to provide protection and survive in the Siberian colds.¹³
- Costs \$84 for an initial culture.²

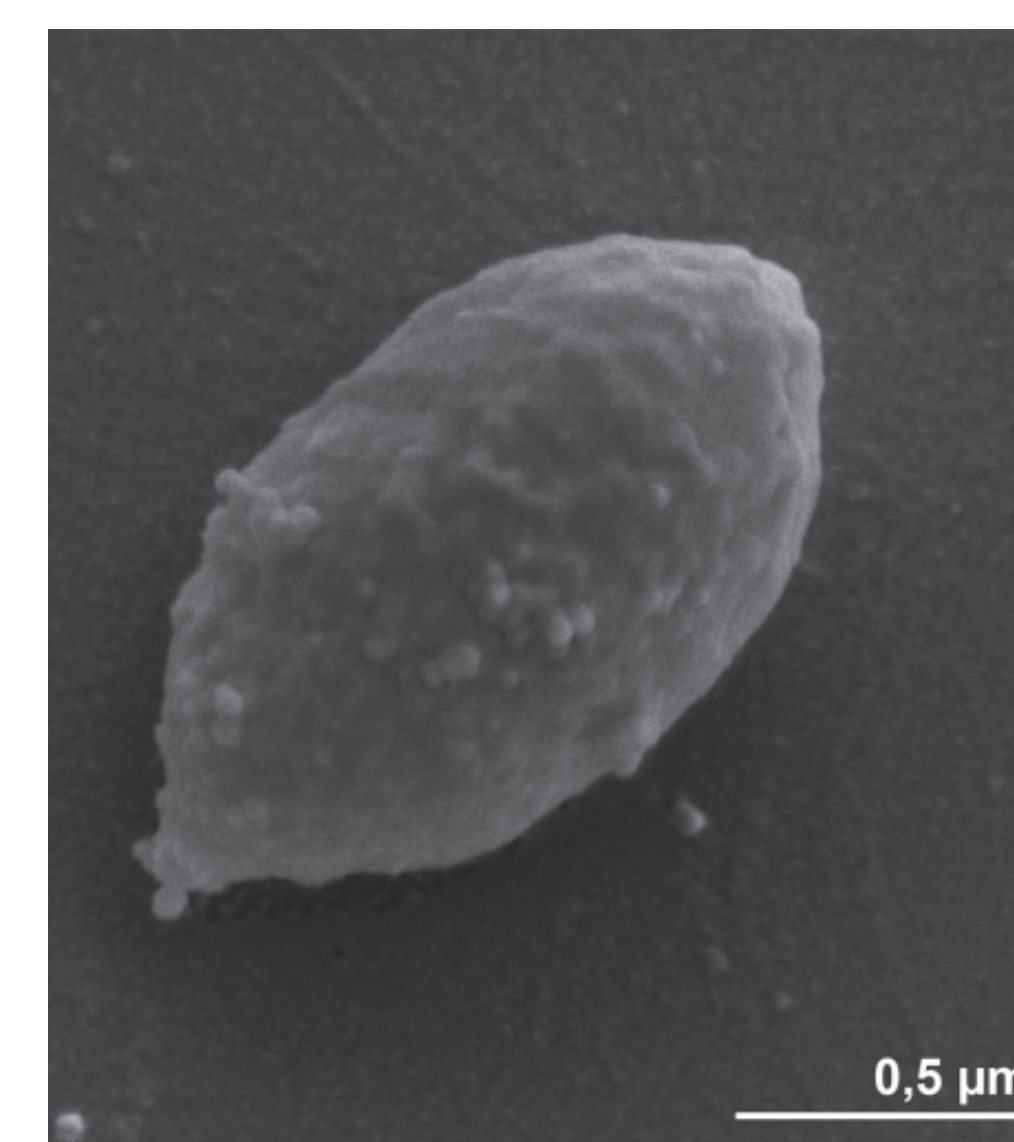


Photo credit: [Bacmap Genome Atlas](http://bacmap.genome-atlas.com/).¹⁴

Increasing Efficiency:

- Process entails converting high sulfur content to sulfuric acid.¹⁵
- The process of extracting Nickel requires high sulfur content for proper function of equipment:
 - If the sulfur content is not high enough, the sulfur is simply released straight into the atmosphere.¹⁵
 - If the sulfur content is high enough, it is simply re-absorbed and converted to sulfuric acid.¹⁵

Working with Consumers to Encourage Green Practice:

- Norilsk Nickel has raised over \$500 million from American investors¹⁰
- United States is key consumer market for Norilsk Nickel according to their own annual report⁷
- We propose to educate consumers as to Norilsk's unfriendly practices, asking for assistance in pressuring the company to maintain a greener production process and to finance the clean-up of the surrounding area.

Raise the Living Wage:

- Work with the factory to raise employees' wages. Since the city is closed off, cheaper migrants cannot replace current laborers.
- Encourage Norilsk Nickel to automate the most dangerous processes.
- Our team can educate the current population in skilled robotics management, justifying a raise in wage.
- This can lead to a higher quality of life for residents, in addition to supplying a discretionary income. People can move or start local business.

Instrumentation Inventory:

- Initial Site Screening Protocol, GASPer Air Quality Monitor, ICP Mass Spectrometer for Soil Testing, Beckman Coulter Laser diffraction, Macro-Core Soil Sample, Public Drinking Water Testing, Lead Poison Tests, Local and International Experts Consultation, MRE package, Bacterium Desulfobolbus propionicus cultures, 20 DuPont Hazmat Level B suits
- Total: \$50,000+

References and Acknowledgements

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