

# Preserving Glacial Microbes for Future Research and Industrial Innovation

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## Call to Action

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Urgent action is needed to preserve the unique microbial ecosystems found in glaciers and ice sheets, as they are melting at an accelerating rate. Involvement of the private sector could provide essential funding, while offering corporations the opportunity to capitalize on these untapped resources, such as new antibiotics, cold-adaptive enzymes, and solutions for wastewater treatment. These microorganisms hold immense potential for scientific and industrial applications, including medical innovation and biotechnology. Preserving these resources, both physically and digitally, is crucial to ensure their availability for future research and innovation.



## Urgency of Action

The loss of microbial biodiversity in glaciers and ice sheets represents an irreversible depletion of Earth's genetic and biological heritage.

As glaciers melt, the ecosystems within them face extinction, many of them potentially within the next century.

These microorganisms are not just scientifically fascinating but also critical for practical applications, such as in the discovery of cold-adapted enzymes for industrial use, new

antibiotics to combat drug resistance, and pollutant degraders suited for microbial wastewater treatment plants in colder climate zones.

Furthermore, their study offers insights into extraterrestrial analogs, such as the icy moons of Jupiter, where similar cold environments could harbor life and inform the development of self-sustaining microbial ecosystems for space exploration.

The establishment of cryopreserved collections and genomic databases for these microorganisms is

imperative to ensure their survival and accessibility for future scientific research, applications, and innovation.

With the involvement of the private sector, there is also an opportunity to drive investment, accelerating these preservation efforts while offering corporations valuable access to untapped resources.

This policy brief emphasizes the urgent need for investment in these preservation efforts to safeguard the treasure trove of genetic and microbial resources of the cryosphere.

## Challenges

- Limited funding and resources for large-scale cryopreservation initiatives.
- Accessing glacial ecosystems is costly and logistically challenging, requiring significant funding and transport for remote regions and equipment.
- Creating a global genomic database faces challenges, including data storage and deciding who will manage and fund it.
- Lack of international coordination and a policy framework for preserving microbial biodiversity.

## Recommendations

*Any action resulting from this call should respect the Nagoya Protocol's Access and Benefit-Sharing framework.*

### Recommendation 1: Cryopreserved collection

Establish an international initiative to create and maintain cryopreserved collections of microorganisms from glaciers and ice sheets. An international body should take the lead in this effort, coordinating contributions from multiple nations and organizations.

### Recommendation 2: Genomic database

Develop a free-access genomic database to digitally preserve the genetic information of these microorganisms. Global collaboration is needed to establish and manage it.

### Recommendation 3: Private sector involvement

Encourage private sector involvement, particularly from biotechnology companies, to help fund preservation efforts and capitalize on the potential applications of glacial microorganisms. Raising awareness about the opportunities for new antibiotics, cold-adaptive enzymes, and wastewater treatment solutions could drive corporate investment and innovation, helping to overcome funding challenges.

Opinion: "Private sector involvement in preserving glacial microorganisms could significantly accelerate preservation efforts, providing the necessary funding and innovation to unlock their vast potential for both scientific and industrial applications."

**"The loss of microbial diversity in glaciers and ice sheets threatens future breakthroughs."**