The project answers the growing need for better understanding and monitoring of the reaction of marine-terminating glaciers to climate shifts. The rise of sea level caused by melting ice may soon force the displacement of roughly 200 million people living in coastal areas. The rapid release of glacier meltwater also impacts the global heat transfer and the circulation of critical nutrients in the ocean. That is why it is so important to study the retreat of glaciers in two ways: through short-term experiments and long-term monitoring.

Making any measurements in remote glacial bays is difficult and dangerous. Building-size ice blocks that break off from glacier termini in a process known as 'calving' pose a significant threat to researchers. Therefore, it is necessary to keep a safe distance when making measurements. Unfortunately, satellite remote sensing is usually insufficient for monitoring glacier mass loss. Glaciers move towards the sea like rivers of ice – the speed of the glacier movement must be taken into account when monitoring changes in the position of the ice cliff. Satellite images are usually taken every few days or less frequently and therefore do not allow for observing individual calving events and providing accurate estimates of the glacier surface velocity. Moreover, taking high-quality images of glacier termini during the polar night or overcast skies is usually impossible. **Consequently, the development and application of new techniques for both studying and monitoring marine-terminating glaciers are critical.**

The project will use innovative methods of recording and analyzing glacier sounds. Recent studies have demonstrated that the glacier mass loss due to calving can be measured using the underwater noise generated as icebergs impact the sea surface. Using this knowledge and supporting acoustic methods with modern optical techniques and oceanographic measurements, the project aims to answer two major questions:

1. What is the impact of distinct calving mechanisms on the glacier mass loss under different environmental conditions?

2. Can we use passive acoustics combined with optical remote sensing as a key for efficient monitoring of glacier mass loss due to calving?

Three marine-terminating glaciers located close to the Polish Polar Station in Hornsund fjord, Spitsbergen will be studied continuously for almost two years. A set of multiple microphones mounted at the bottom of the glacier bay will be used for the first time. This innovative approach will allow for the precise localization of sound sources; this includes the inaccessible, underwater part of a glacier terminus.

The project results will be important not only in a purely scientific and technical context. Fascinating and spectacular sounds of calving glaciers can help bring people's attention to the climate change issue.