The Glacier Flea:
A Tiny Witness to Alpine Climate Change

Discovering the Story of the Pasterze Glacier in Hohe Tauern National Park

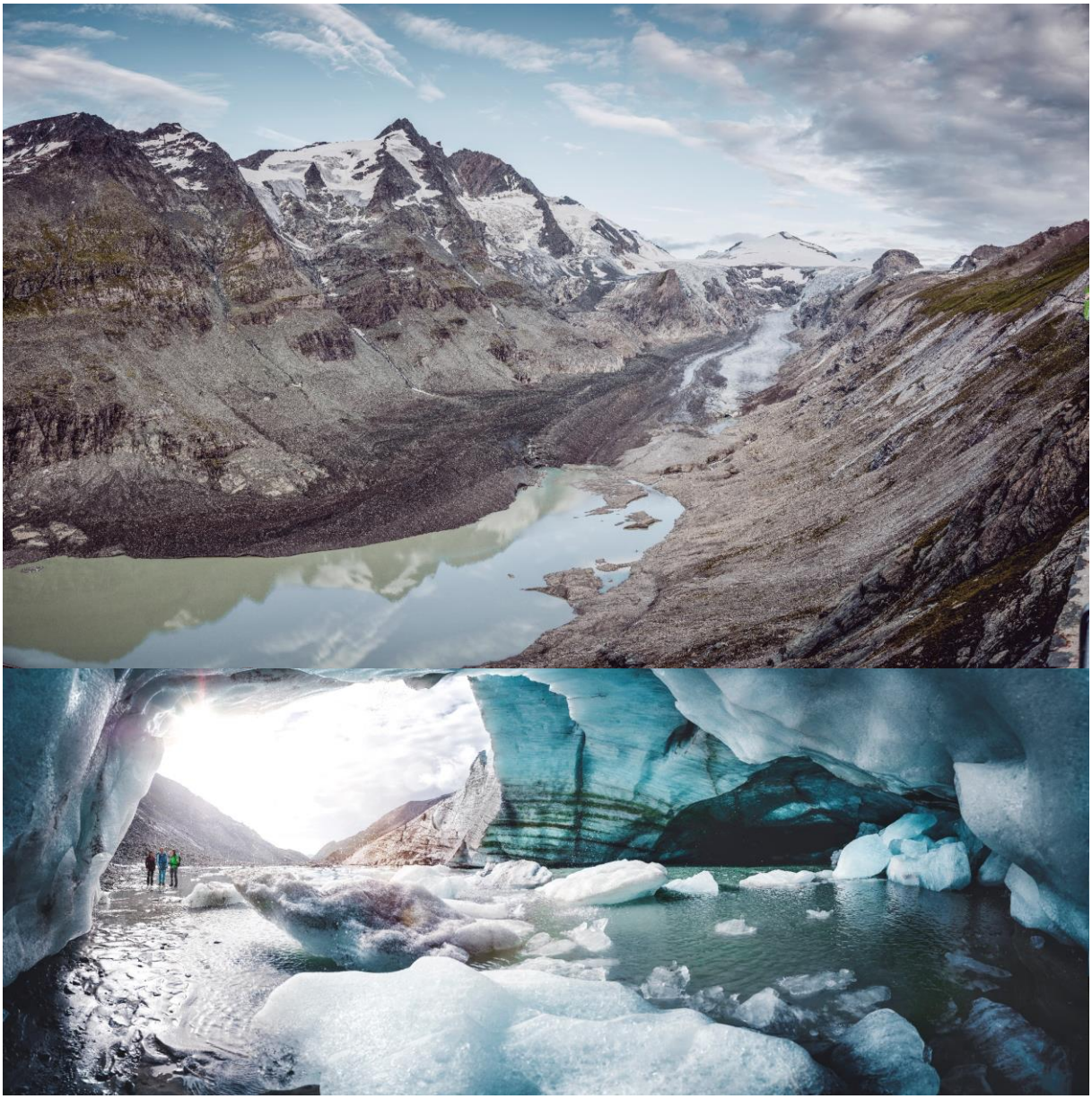

Figure 1: Pasterze Glacier_Nationalpark Hohe Tauern, NPHT_Stefan.Leitner

1. Content

The following teaching materials are designed for educators and anyone interested in exploring the impacts of climate change. They provide playful learning scenarios to illustrate the retreat of glaciers, using the Pasterze Glacier in Hohe Tauern National Park as a key example.

1. Introduction

The Hohe Tauern National Park is one of the most spectacular high mountain landscapes on planet Earth. With the Grossglockner, the Grossvenediger and the Hoher Sonnblick the highest and best known Austrian peaks are located here. The national park is home to the largest glacial areas of the Eastern Alps, breath-taking waterfalls, secluded mountain lakes and roaring glacial streams and rivers. Untouched nature in its core zone and the landscape of pastures and meadows cultivated by humans are a good basis for the almost unbelievable biodiversity present in the heart of the Alps.

2. The Glacier Flea: Teaching Climate Change through Local Stories

The Glacier Flea Game is an effective tool for making climate change relatable to children. This interactive activity introduces the glacier flea, a local insect that thrives on glacial ice, to demonstrate how glacier retreat threatens its habitat. Unlike distant symbols such as the polar bear, the glacier flea helps children connect climate change to their immediate surroundings, fostering awareness of both local and global environmental impacts.

Set against the dramatic backdrop of the Pasterze Glacier—the largest glacier in Austria—this learning scenario combines storytelling, play, and hands-on activities. It highlights how rising temperatures lead to ice melt, endangering habitats for various species, with the glacier flea serving as a symbol of the broader ecological challenges.

2.1. Location Options and Target Audience

This activity is primarily designed for children aged 9 to 12 (grades 4–6), making it an excellent fit for younger audiences. It can be conducted in a classroom, gym, or schoolyard, providing flexibility for various learning environments. For a more immersive experience, the activity can be enhanced through guided excursions with National Park rangers or workshops such as “Klima konkret” at the BIOS Nationalparkzentrum in Mallnitz.

Visiting the Pasterze Glacier or the Kaiser-Franz-Josefs-Höhe offers a unique opportunity for hands-on learning, allowing participants to observe the local impacts of climate change up close. While tailored for younger children, the activity has also been successfully adapted for older students and adults by incorporating deeper insights and more detailed information. This versatility ensures that participants of all ages gain a meaningful understanding of the interconnectedness between climate change, local ecosystems, and conservation efforts.

By engaging participants with their immediate environment, the activity fosters ecological awareness and inspires actionable steps to protect nature and combat climate change.

2.2. The Glacier Flea Game: Step-by-Step Guide

Step 1: Preparation
Begin by laying out newspapers on the floor to simulate a continuous glacier surface ("ice floes"). The teacher introduces the topic of climate change and the glacier flea, showing a picture of the insect and describing its glacier habitat. Students are asked if they have ever seen a glacier and where, creating a personal connection. If possible, show a time-lapse video of the Pasterze Glacier's retreat to illustrate the scope of the issue.

Step 2: Roleplay and Activity
Students take on the roles of glacier fleas and stand on the simulated glacier. The teacher narrates a story where the climate warms, causing the glacier to melt. As the story progresses, newspapers are gradually removed to represent melting ice, shrinking the habitat.

Step 3: Movement and Adaptation Strategies
Students must move to the remaining "ice floes," adapting to the loss of habitat. This activity fosters teamwork and problem-solving skills as they collaborate to stay on the shrinking glacier.

Step 4: Reflection
After the activity, hold a discussion where students share their experiences and emotions. Discuss the real-life impacts of climate change on animals and humans and explore examples like the Alpine snow grouse, snow hare, or ibex, which also face habitat challenges.

Step 5: Creating a New Habitat – A Positive Conclusion
5.1. Introduction: The teacher asks, "What happens when glaciers retreat?" This leads to the realization that while habitat is lost, new ones—glacial forefields—emerge. Images of the Pasterze's glacial forefield can be shown to support the discussion.

5.2. Creating a New Habitat: Each child receives coloured paper (blue for water, green for grass, brown for soil, gray for rocks). They replace the removed newspapers with these coloured papers, symbolizing the formation of a new ecosystem. The activity ends with students populating the new habitat by roleplaying as pioneer species (e.g., lichens, mosses, bacteria, or alpine plants like willows and larches).

5.3. Conclusion: The session concludes with a discussion about succession, the process by which ecosystems develop in new environments. Emphasis is placed on protecting these emerging habitats as untouched wilderness. The importance of protected areas like Hohe Tauern National

Park is highlighted, not only for preserving glaciers but also for safeguarding the biodiversity of glacial forefields.

This step reinforces the idea that while climate change presents challenges, it also offers opportunities for the creation of new ecosystems, fostering a deeper understanding of nature's dynamic processes.

2.3. Materials Needed

- Newspapers for simulating the glacier surface
- Coloured paper (blue, green, brown, gray) to represent new habitat elements
- Time-lapse videos of the Pasterze Glacier's retreat (e.g., *Gletscherbewegung Pasterze / Zeitraffer II (Neu)* https://www.youtube.com/watch?v=jN6HtfmsHCA)
- Data and images from the Alpine Club's glacier reports (e.g., https://www.alpenverein.at/portal/museum-archiv/gletschermessdienst/index.php)
- Supporting Visuals for the Glacier Flea Activity you find under Section 2.5.

2.4. The Story of the Glacier Fleas on the Pasterze

Set in the heart of Hohe Tauern National Park, surrounded by towering mountain peaks, lies the Pasterze Glacier. Stretching approximately 7 km in length and covering 15 km², it remains Austria's largest glacier. This majestic icefield represents both the breathtaking beauty and the fragile vulnerability of our environment.

Start by giving the children sheets of newspaper to create a glacier surface on the floor.

In this icy world, tiny black glacier fleas make their home. These wingless ancient insects thrive in the boundary layer between the ice and snow, where dark glacial dust gathers. This dust is a mix of wind-blown particles, including dust, pollen, and plant debris—a perfect habitat for the glacier fleas.

The children become glacier fleas and stand on the paper glacier.

However, both the glacier fleas and the people of the Alpine region notice a change: temperatures are rising. The ice on the Pasterze begins to melt earlier in the year, and the protective winter snow becomes less abundant. Since the mid-19th century, temperatures in the Alps have already risen by 2°C.

Remove one sheet of newspaper and say, "Look, the ice is melting."

Year after year, the warming continues, and the Pasterze's frosty environment slowly turns into a warmer one. The glacier fleas struggle to adapt as their icy home melts away.

Remove more "ice sheets" to simulate the shrinking glacier.

Glacier fleas cannot tolerate temperatures above 12°C for long. They anxiously await winter, but even the colder season no longer brings the frost they need. The glacier continues to thin, retreating at an alarming rate. Over the last decade, the average annual retreat of the Pasterze has been 69.2 meters.

Remove additional sheets of paper from the lower section of the glacier.

The situation worsens. Space becomes scarce for the glacier fleas, who must huddle closer together. In the most recent measurements *(2022/23)*, the Pasterze retreated an unprecedented 203.5 meters—a record-breaking loss.

Remove more "ice sheets." The children, acting as glacier fleas, feel the space shrinking and must strategize to stay on the remaining sheets.

As temperatures rise above the critical threshold of 12°C, the survival of the glacier fleas is at risk. They attempt to move to higher, cooler areas of the glacier, but not all can adapt to the rapidly warming conditions. Some fleas cannot survive the changes.

Remove even more "ice sheets," leaving too little space for all the children to stand on. Some children will inevitably "lose" their habitat.

Glacier Data and Statistics: Autumn 2024

2.5. Supporting Visuals for the Glacier Flea Activity

The selected photos are designed to complement the Glacier Flea activity by serving as visual aids and discussion starters.

Figure 2: Pasterze Glacier 2023, NPHT_M.Steinthaler

Figure 3: Group of Glacier Fleas, Tiefenbachferner, Tyrol, Austria ©CC BY-SA 3.0 de

Figure 4: New Habitat_Glacier Trail Pasterze 2023, NPHT_V.Rupitsch

Figure 5: New Habitat_Glacial Forefield Pasterze, NPHT_J.Mösslacher

Figure 6: New Habitat_Pasterze Lake, NPHT_G.Granig

Figure 7: New Habitat_Currant Bush, NPHT_G.Granig

Figure 8: Pasterze Glacier_Glacier Status in 1875, Slupetzky

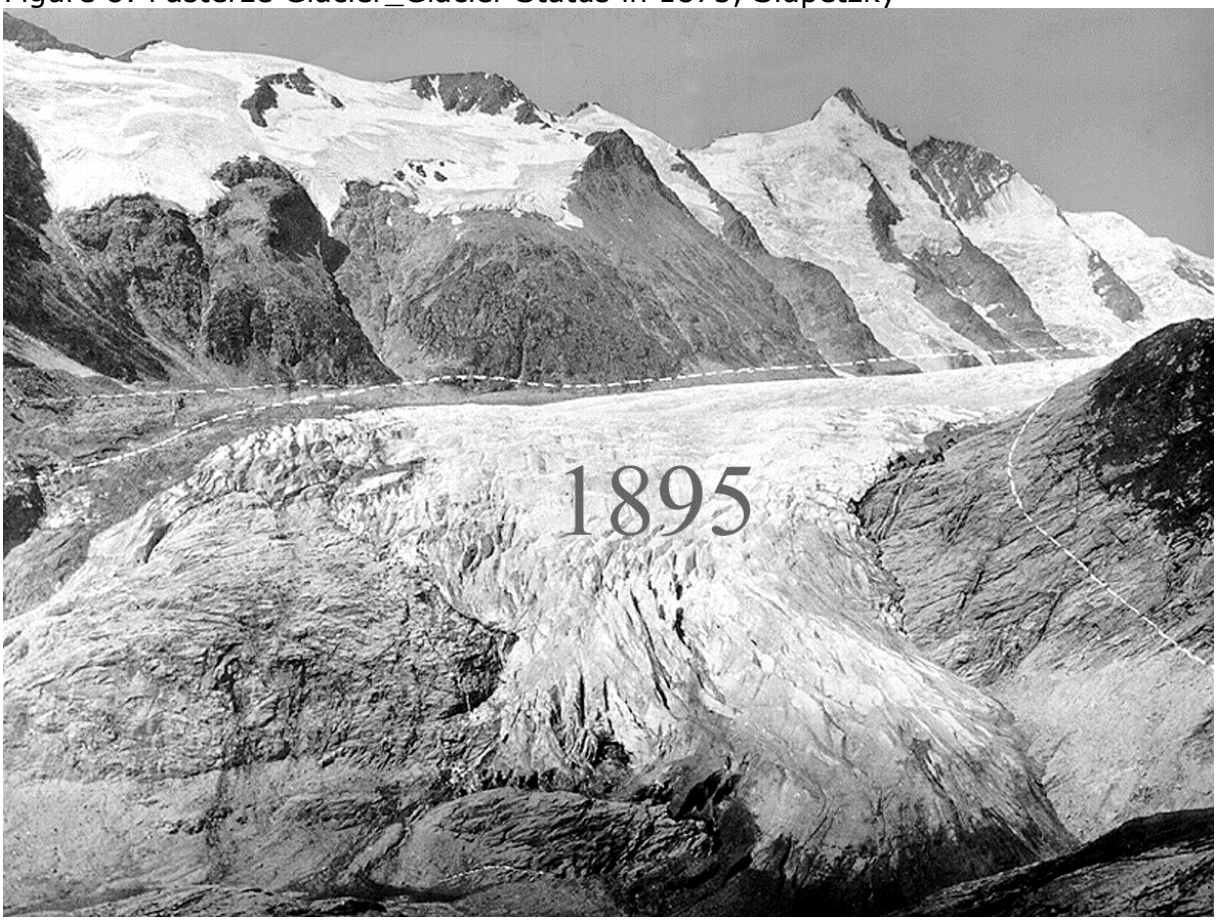

Figure 9: Pasterze Glacier_Glacier Status in 1895, Slupetzky

Figure 10: Pasterze Glacier_Glacier Status in 1921, Slupetzky

Figure 11: Pasterze Glacier_Glacier Status in 1974, Slupetzky

3. Conclusion

The Glacier Flea activity provides an engaging way to connect participants with the realities of climate change. By combining storytelling, hands-on learning, and reflection, it fosters a deeper understanding of environmental impacts and inspires actionable steps to protect our planet's fragile ecosystems. The activity aligns with SDG 4 (Quality Education) and SDG 13 (Climate Action), promoting sustainability awareness and empowering participants to contribute to climate solutions.

4. Sources

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The present document is based on a learning scenario from the following source, which has been translated into English and expanded with additional general data for broader application:

Karan, Magdalena (2024): Gletscherfloh als Botschafter. Der Klimawandel in den Alpen: Eine spürbare Realität. In: *CultureNature Literacy für den Unterricht. Next-Practice-Beispiele für Schule und Hochschule*. https://cnl.ph-noe.ac.at/projektvorhaben/lernszenarien

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