# Geography
## Glaciers

### Learning objectives
- The students learn about glaciers: how they form and how they affect the planet.
- In the project stage, students write a report on a glacier.

### Warmer
Ask the students to look at the photos and find *a glacier*, *an iceberg* and *a fjord*. Next, ask them, in small groups, to write down things they know about glaciers, icebergs and fjords and things they would like to know about them.

Write the groups' ideas on the board in two columns. Note: the students will return to this activity in the cooler stage.

**1** If you haven't done this in the warmer stage, pre-teach *glacier*, *iceberg* and *fjord* by asking the students to find these things in the photos. Pre-teach *melt* and *freeze* by asking the students to read the key words box at the bottom of the fact-file and ask *What's the opposite of melt?* Also, ask the students to guess the meaning of *break up* and *build up* (question 4) by looking at the first word of these phrasal verbs.

Then, in pairs, ask the students to try to answer the quiz questions. They will find the answers in exercise 2.

**2** Ask the students to read the fact-file quickly and locate the answers to the quiz in the text. If they enjoy competition, award the students points for every answer they guessed correctly.

### Answers
**1** a 5% (*About 95% of this ice is in Antarctica and Greenland. The rest of our world's glacial ice is located in cold, mountainous regions*)
**2** b Antarctica (*In some areas of Antarctica, the ice is more than 2 kilometres thick*)
**3** c (*They keep local temperatures cooler*)
**4** a break up (*coastal glaciers also break up … When this happens, large pieces of ice … become icebergs*)
**5** c valley (*We call these underwater valleys fjords*)

**3** Ask the students to look at the words in the box first and try to think about how these words were used in the fact-file, e.g. *layers of snow*, *glacial ice*, etc. Next, ask them to complete the questions and then check they have completed them correctly.

Ask the students, in pairs, to read the questions and try to answer them from memory. Then ask them to read the text more carefully and find the answers. If appropriate, tell them to underline the answers in the text.

### Mixed ability
In groups of three, each student finds the answers to two of the questions and then shares their answers.

### Answers
**1** glacial: in Antarctica and Greenland (*About 95% of this ice is in Antarctica and Greenland*)
**2** layers: it becomes solid ice (*The newer snow presses down on the older snow and changes it into solid ice.*)
**3** local: they keep local temperatures cooler (*they keep local temperatures cooler*)
**4** melted: oceans would rise (*If all the ice in Antarctica melted, our oceans would rise about 60 metres*.)
**5** mountains: they break them down (*When it's warm, glaciers melt and move. When this happens, they can break down large rocks, hills and even mountains*.)
**6** fill up: fjords (*We call these underwater valleys* fjords.)

**4** Organise the students into small groups to discuss these questions. Point out that the students should use the information from the fact-file and also their own ideas to answer them.

### Suggested answers
**1** Without these glaciers, the world would be wetter and some areas would be covered in water.
**2** It could melt because the new snow needs to press on the old snow so that it becomes solid ice.
**3** They are dangerous for ships. They often look small above the water, but underneath they are huge.
**4** Apart from Antarctica and Greenland, there are large glaciers in Patagonia, Washington State USA, Kilimanjaro, Tanzania, the Himalayas, Iceland and Switzerland, amongst other places. There are smaller glaciers in many other parts of the world.
**5** Norway, Iceland, Greenland, Alaska, British Columbia and Chile.

**5** ▶ **1.12** Challenge the students to find the places on a map first. Ask them to try to guess which of the countries have glaciers and which ones do not. Then ask them to try to guess why the presentation is going to talk about Amsterdam and Mumbai, which don't have glaciers. Play the recording once and ask the students to number the places. With a stronger group, ask the students to also listen for the connection between Amsterdam and Mumbai and glaciers.

### Answers
**1** Mt Kenya **2** La Paz **3** Stubai **4** Churchill
**5** Amsterdam **6** Mumbai

**6** 1.12 Ask the students to look at the places again and say what they can remember about each one and their connection with glaciers. Then ask them to read through the notes and try to complete them before they listen again. Play the recording and ask them to check their ideas. If necessary, play the recording for a third time and stop it after each answer is given.

## Audioscript

**Interviewer:** Good afternoon, everyone, and thanks for coming today. As you know, we've invited Professor Harold Larkin here today to speak to us about glaciers and the effect they have on the lives of people who live near them. It's a pleasure to have you here today, Professor.

**Prof Larkin:** You're welcome.

**Interviewer:** And to start off, I'd like to ask you, 'What's the most important effect of glaciers on local populations?'

**Prof Larkin:** Well, there are many, but perhaps the most important factor is glacial run-off. That is, the water that comes from glaciers when they melt, during warm weather.

**Interviewer:** And why is that?

**Prof Larkin:** Well, first of all, it provides fresh water for people to drink. The water collects in lakes and rivers, and also underground. Without the water from melting glaciers, our drinking water would dry up. And that would also cause problems for farmers, because they need water for their plants and farm animals. That's definitely the case in Kenya, in East Africa. Millions of farmers and other people depend on water from glaciers on Mount Kenya.

**Interviewer:** Of course! And without that water, farming isn't possible.

**Prof Larkin:** Exactly, and water from mountain ice and glaciers is very important for cities too, like in the Andes Mountains of South America. For example, La Paz is the capital city of Bolivia, and it gets a lot of its water from glaciers.

**Interviewer:** And what other activities depend on glaciers and ice? I mean, if local temperatures go up and there isn't any new snow, how would that change people's lives?

**Prof Larkin:** Well, in many areas, tourism depends on cold temperatures. For example, there are many winter resorts for skiing and other snow sports in the European Alps, like Stubai, in Austria. They would have to close if the weather gets too warm, and that would have an important effect on local businesses.

**Interviewer:** That's an interesting point. If we lose our glaciers, what other effects could that have on people's lives?

**Prof Larkin:** Well, it would have an effect on local ecosystems as well. For example, near Churchill, in northern Canada, large areas of ice are melting, and polar bears are losing their natural habitat. Polar bears travel and hunt on the Arctic ice, and if it melts, they'll have nowhere to go. That will damage tourism in Churchill, which is famous for its polar bears. But there will be problems in other areas of the world too.

**Interviewer:** For instance?

**Prof Larkin:** Well, there are many low-lying, tropical islands that will disappear if too much of our world's ice melts. If the level of our oceans rises, many islands like the Maldives, the Seychelles or the Solomon Islands will be under water. And not just islands would be in danger. Other low areas around the world will also be under water.

**Interviewer:** Such as the Netherlands, in Europe?

**Prof Larkin:** Yes, definitely. The Netherlands are lowlands, so some areas, like the city of Amsterdam, would be covered by rising water. The same thing would happen in other coastal cities, like Mumbai in India, Ho Chi Minh City in Vietnam, or Miami in the United States. Those cities would be completely flooded. It's difficult to imagine, but …

## Answers

**Benefits**

*for people:* fresh water for drinking and for farms; tourism, e.g. skiing in Austria or watching polar bears in Churchill
*for plants:* water
*for animals:* drinking water; polar bears travel and hunt on ice

**Problems**

*tourism:* fewer ski resorts and no polar bears, businesses close
*islands:* will be under water
*coastal cities:* would be completely flooded

## Cooler

If you did the Warmer activity above, use the questions in the *Things we'd like to know* column for a class quiz. Organise the students into teams. Ask the questions and award points for every correct answer. If necessary, allow the students time to find the answers on these two pages first. If the answer is not given, accept any sensible answer, but encourage the students to check their ideas on the internet at home.

If you don't have a list of questions, ask the students to write some questions first and then set up the class quiz.

## Project

Ask the students to work in pairs and tell them they are going to write a short report on a famous glacier. They can either choose one from the list on page 29 or choose another.

Ask them to find the answers to the questions on the internet. Encourage them to present their information in a report with headings and photos or pictures. They can either use the questions as headings or use the words *Location*, *Extension*, *Size*, *Changes* and *Effect on local people*.

For the class presentation stage, ask the students to write some quiz questions about their chosen glacier. Display the reports around the classroom and encourage the students to answer each other's quiz questions.