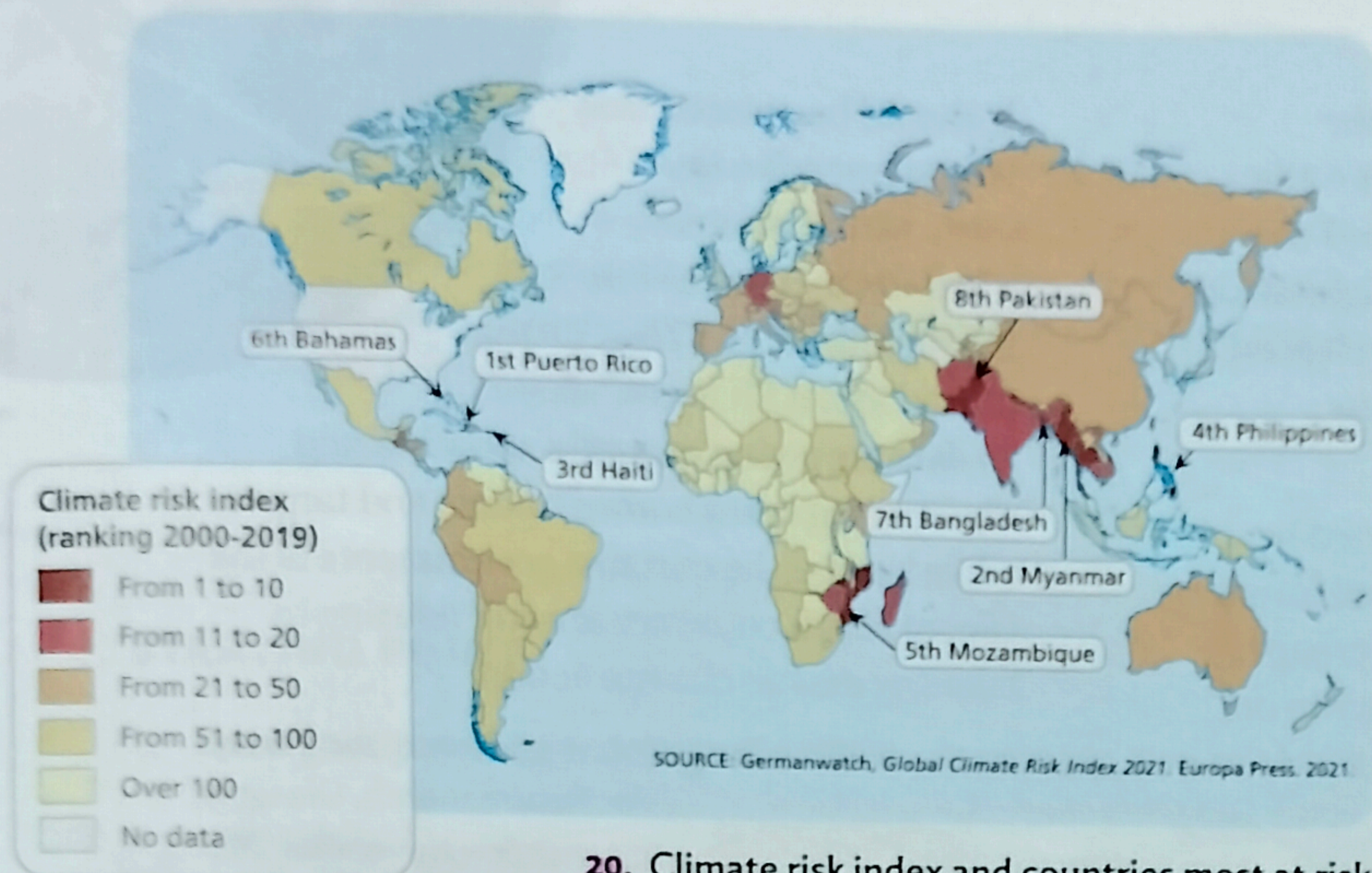
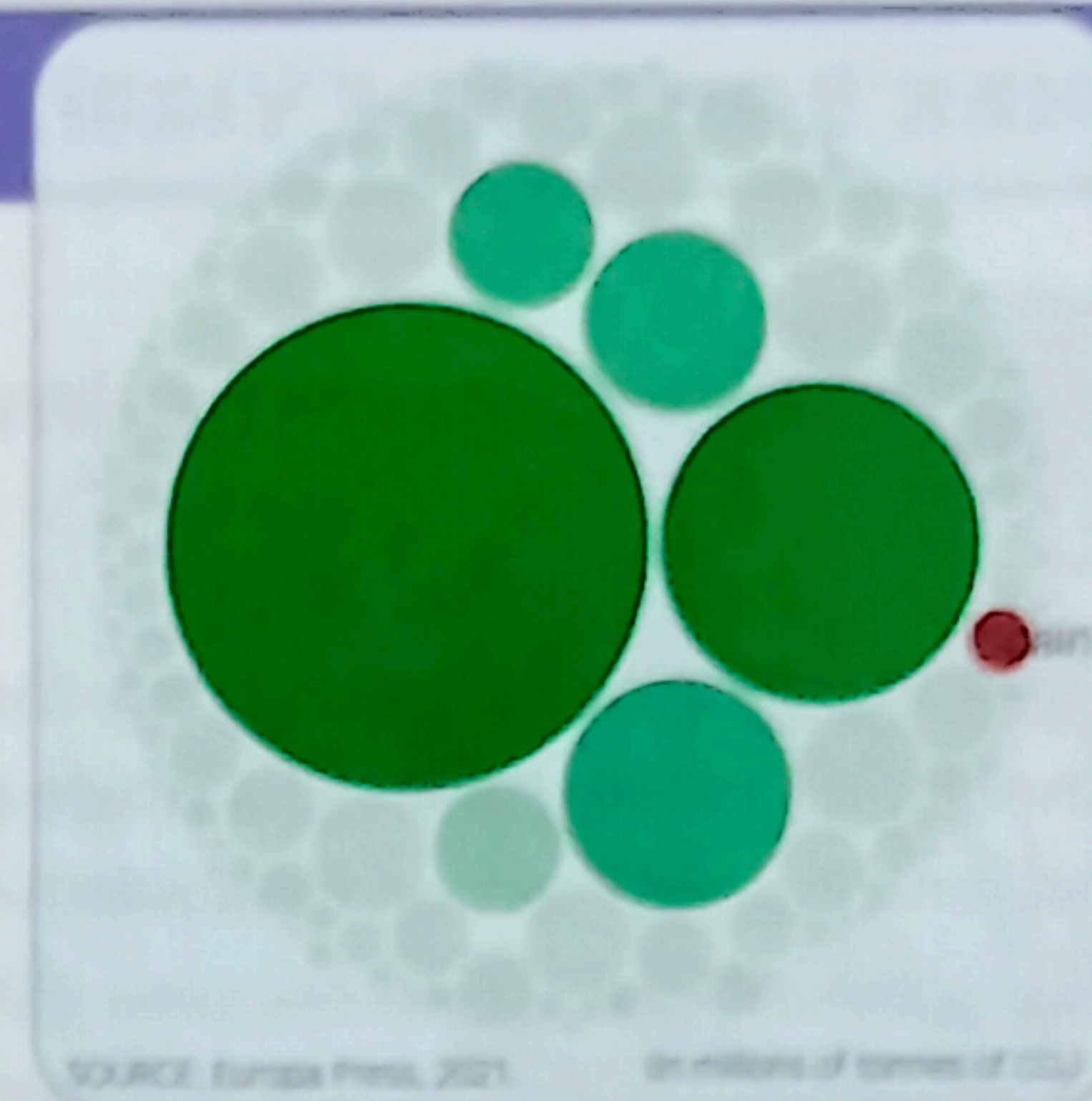




Write an article about climate change



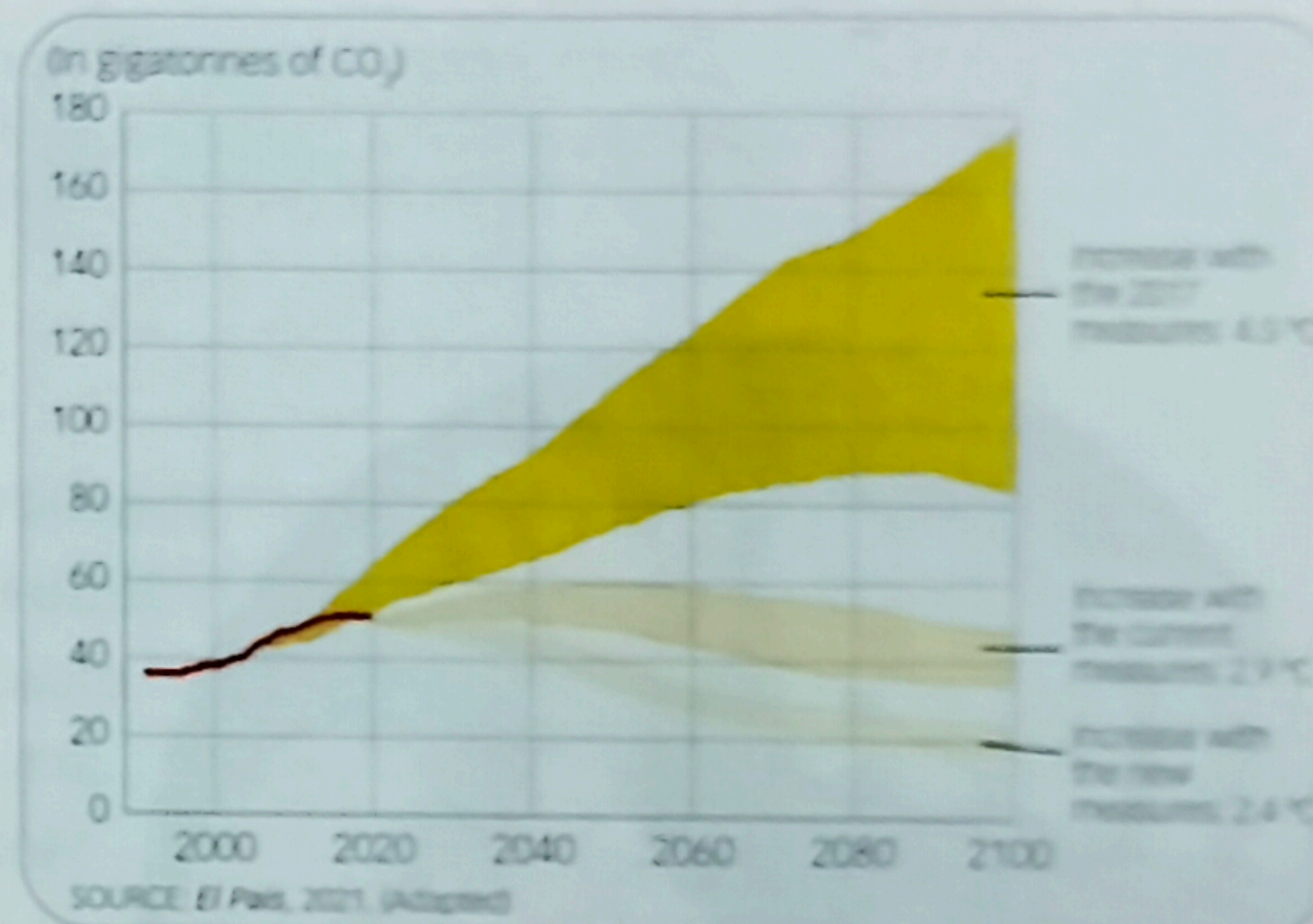
20. Climate risk index and countries most at risk



Millions of tonnes of CO₂

China: 10,668	Spain: 209
USA: 4,713	Afghanistan: 12.2
India: 2,442	Malawi: 1.4
Russia: 1,577	Burundi: 0.6

21. CO₂ emissions from fossil fuels in 2020



22. Predictions for the rise in land temperatures

19 Analyse and select data.

- Interpret the map and the graphs. Note the most interesting data.
- How are the data related?

20 Choose the content for your news article.

- What do you want to communicate? What is the main idea? What data will you use to support your article?
- Make a note of some secondary ideas you could also include.

21 Write the text for the news article. Include a catchy headline.

CRITICAL THINKING

Is climate change part of Earth's natural lifecycle?

22 INVESTIGATE

- Find out and explain the rate of global warming on Earth since the 1980s. Where did you find data? Does it seem reliable? Explain why or why not.

23 CONTRAST

- According to the scientific community, what is causing climate change? What measures must be taken to prevent climate change?
- Is it possible there are groups interested in casting doubt on climate change?

24 DECIDE

- Answer this section's headline question using scientific arguments.

The Earth's climate has changed continuously for millions of years. However, these changes in the climate usually take thousands of years.

4

The sustainable use of Earth's waters



LEARNING SITUATION

▲ Lake in Madagascar



We live on the "blue planet". We give it this name because three-quarters of the Earth's surface is covered by water. However, water stress is a serious problem in many parts of the world.

According to the United Nations (UN), three out of ten people in the world do not have access to safe drinking water. The UN estimates that in 2050 over half of the Earth's population will suffer from water shortages.

We all recognise the importance of water for life on Earth and everyone's right to have access to it. However, it is essential to manage water properly and protect its quality so that everyone has access to clean water.

LET'S GET STARTED

- What is water stress? What is the level of water stress in Europe? What about Sub-Saharan Africa?
- Do you think water stress and water scarcity are the same thing? Explain your opinion.
- What do you find most surprising from the data on these pages? Why?
- What percentage of the global population does not have access to safe water? How can this affect development?

Almost 70% of the surface is covered

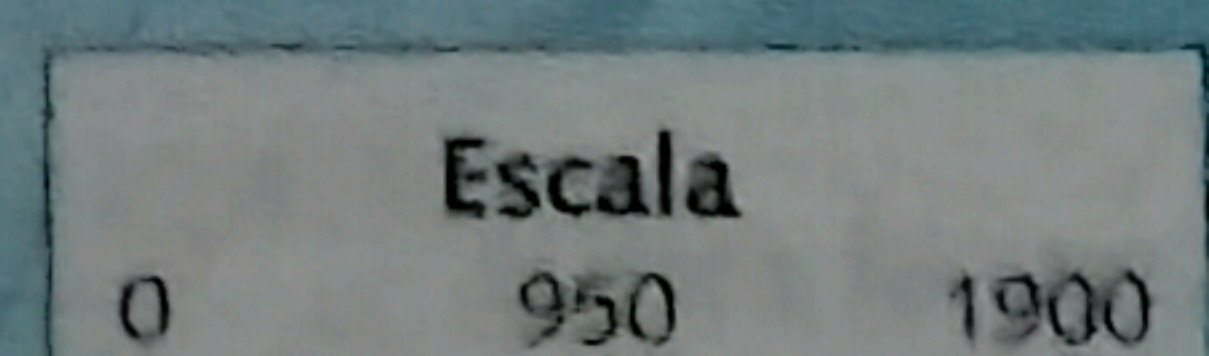
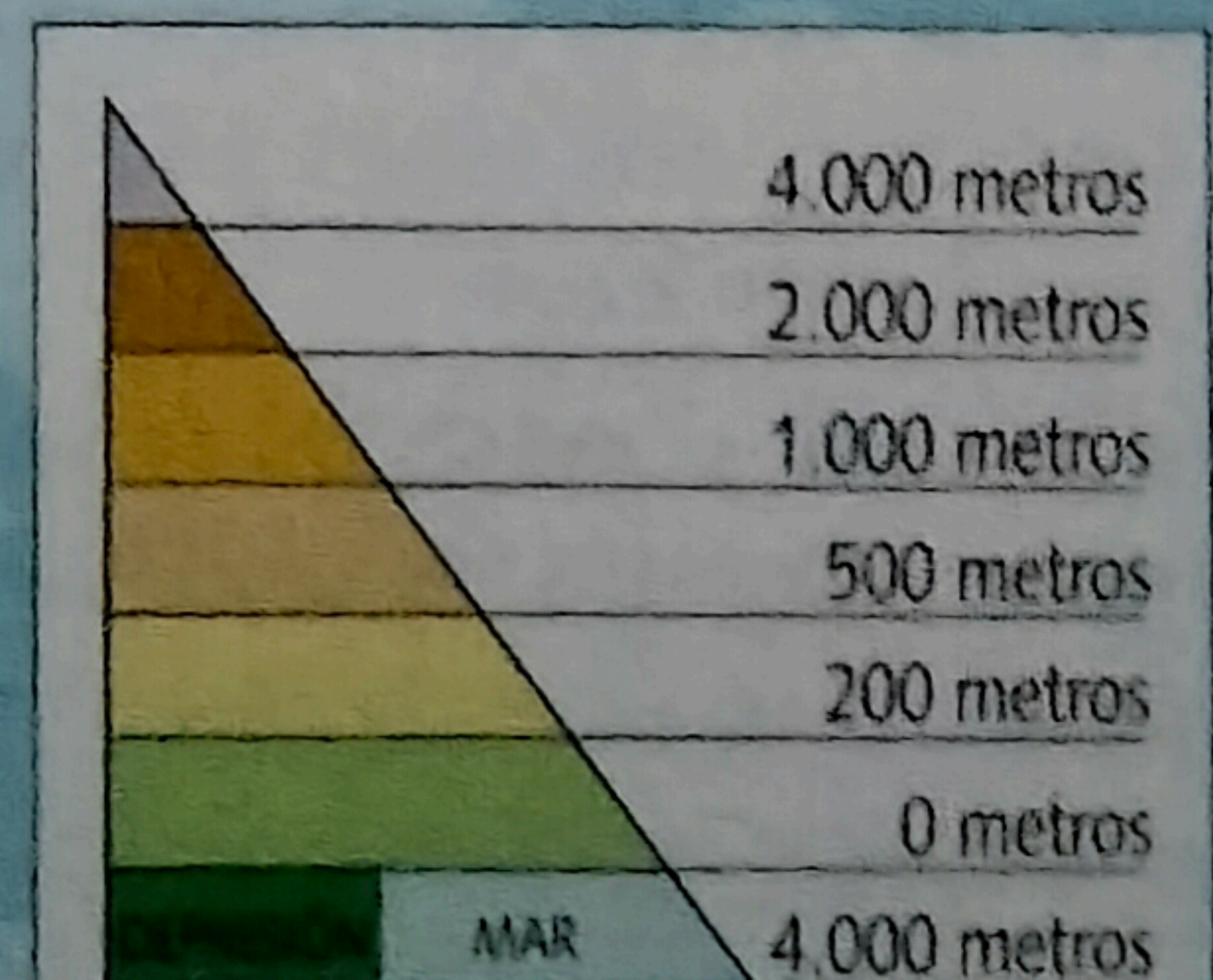
97.5%
is salt water

2.5%
is fresh water

71%

IN THIS U

- You will learn about the characteristics of water stress and water scarcity.
- You will analyse the problem of water scarcity today.
- You will take part in a role-play to evaluate the consequences of the construction of a dam and its surrounding area.



2

How the Earth's relief affects populations



LEARNING SITUATION

▲ Fault line along the Mid-Atlantic Ridge in Iceland



When we look at mountains, rocks or the ground, we might believe that they have always been that way and always will be. However, this is not the case. Relief is constantly changing. In general, these changes are so slow that they are undetectable in a person's lifetime. But some changes can be sudden, like when there is an earthquake or a volcanic eruption.

Earthquakes modify the landscape, but they also cause great damage to infrastructures, buildings and people. A country's level of development and its ability to prevent or reduce the effects of an earthquake are closely related. A seism causes more damage in a poor country than a rich country.

LET'S GET STARTED

- Look at the figures for the earthquakes in Haiti and Japan. Which earthquake was stronger? Which caused the most damage? What do you think the differences are due to? Explain your answer.
- What is the relationship between a country's level of prosperity and its ability to face a natural disaster like an earthquake? Think of examples of other recent disasters and form conclusions.

HAITI

Earthquake on 21st January 2010

MAGNITUDE 7.1

JAPAN

Earthquake on 11th March 2011

MAGNITUDE 9.0

Duration: **60 SECONDS**

316,000 people killed

350,000 people injured

1.5 MILLION people lost their homes

Figures for Haiti

Population: 11,402,533

Life expectancy: 63 years

GDP per capita: 1,728 dollars

% of the population living in extreme poverty: 54%

Unemployment rate: 70%

Illiteracy rate: 49%

Figures for Japan

Population: 125,836,021

Life expectancy: 84 years

GDP per capita: 41,419 dollars

% of the population living in extreme poverty: 16%

Unemployment rate: 2%

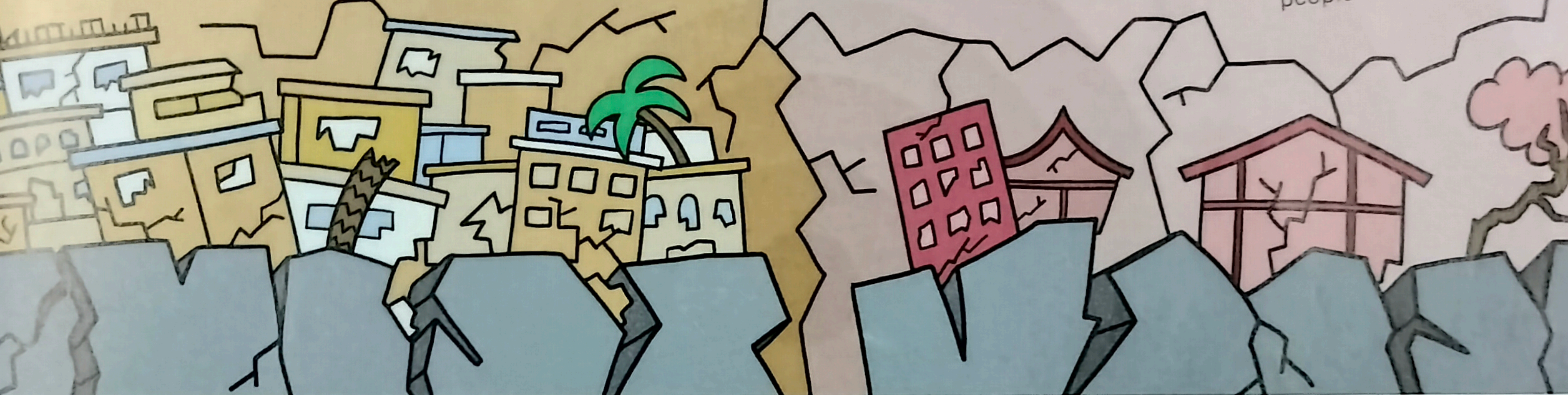
Illiteracy rate: 1%

Duration: **3 MINUTES**

15,893 people killed

6,152 people injured

12,664 people missing



IN THIS UNIT...

- You will learn about the main types of landforms on our planet.
- You will discover how the Earth's relief is formed.
- You will understand how the forces of nature and the actions of living things transform the Earth's relief.
- You will take action. You will propose a plan of action to follow if an earthquake happens.

CHALLENGE

10 REDUCED INEQUALITIES



Do natural disasters affect everyone in the same way?

The effects of natural disasters clearly demonstrate the close relationship between poverty and vulnerability. **Create an earthquake protocol** for your school that can help to reduce the damage caused by this type of natural disaster.

1. What is relief?

Landforms

Relief consists of all the features on the surface of the Earth's crust. These features can be grouped into the following categories: (1)

Continental landforms

- Mountains are high landforms with steep sides. These can be grouped into sierras, or mountain ranges. Valleys are areas of land between mountains. Rivers usually flow through valleys.
- Plains are low, flat areas of land. Plains are found both along the coast and in inland areas.
- Plateaus are flat areas of land at higher altitudes than plains.
- Depressions are areas of land at a lower altitude than the surrounding land. Some depressions are even below sea level.

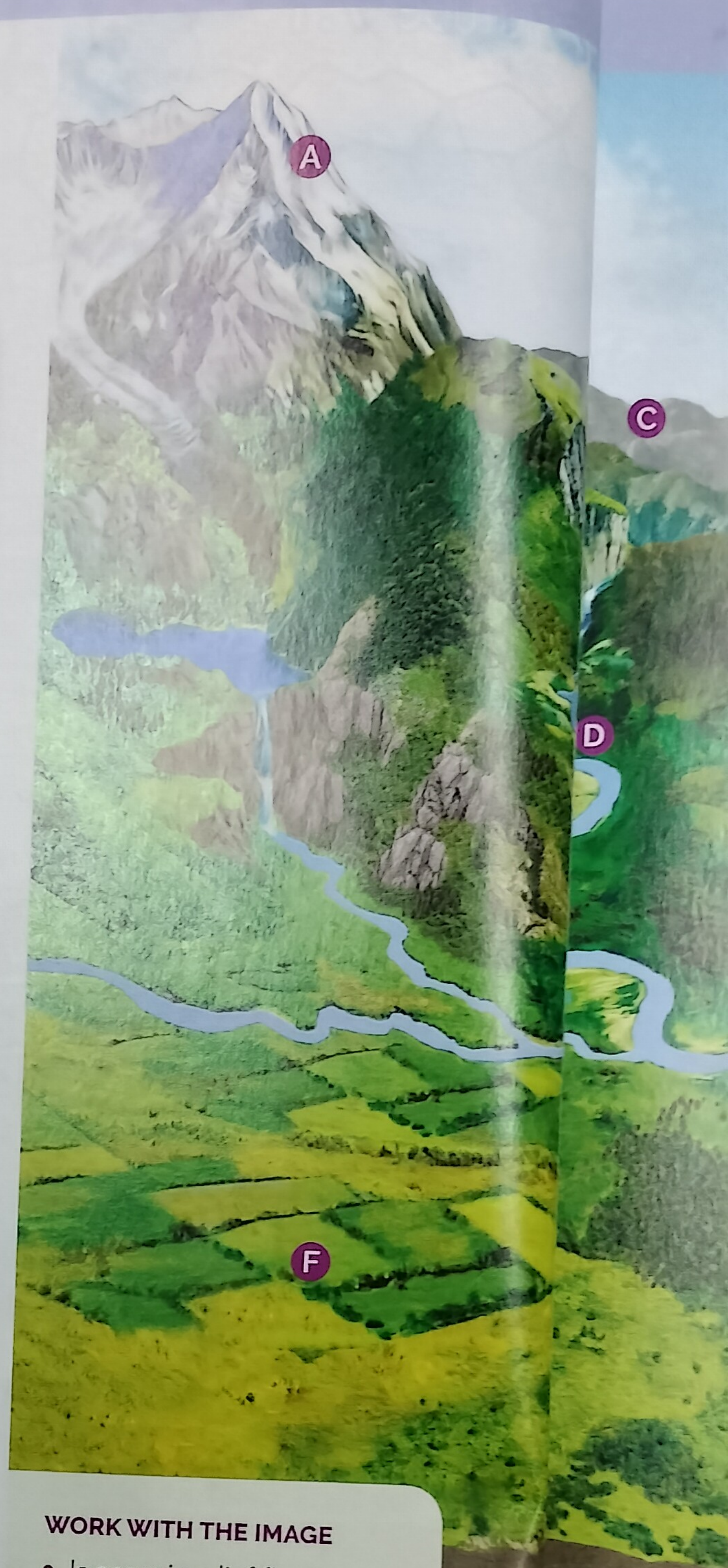
Coastal landforms

The coastline is the area where the land meets the sea. Different types of landforms are found here:

- A peninsula is an area of land surrounded by water on all sides except one. An isthmus connects a peninsula to the continent.
- An island is an area of land surrounded by water on all sides. A group of islands close together form an archipelago.
- A cape is a strip of land that extends into the sea.
- A gulf is a part of the sea that extends into the land. A small gulf is called a bay. Coves and inlets are even smaller than bays.

Oceanic landforms

- A continental shelf is the area that begins at the coast and descends to a depth of around 200 metres below the ocean. The continental shelf descends gently and ends at the continental slope. This is a steeply sloping area that leads to the deepest parts of the ocean.
- Abyssal plains are located at a depth of between 3,000 and 7,000 metres. Abyssal plains form the ocean floor, and mid-ocean ridges are usually found here. Mid-ocean ridges are long, submerged mountain ridges. The peaks of the highest ridges rise above the ocean's surface and can form islands.
- Ocean trenches are long, deep cracks in the abyssal plain. The deepest ocean trench is Challenger Deep, in the Pacific Ocean. It is more than 10,000 metres deep.



WORK WITH THE IMAGE

- Is oceanic relief flat or rugged? Describe it.
- Are continental landforms and oceanic landforms similar? Explain your answer.
- Compare. What is the difference between an island and a peninsula? What is the difference between a plateau, a plain and a depression?

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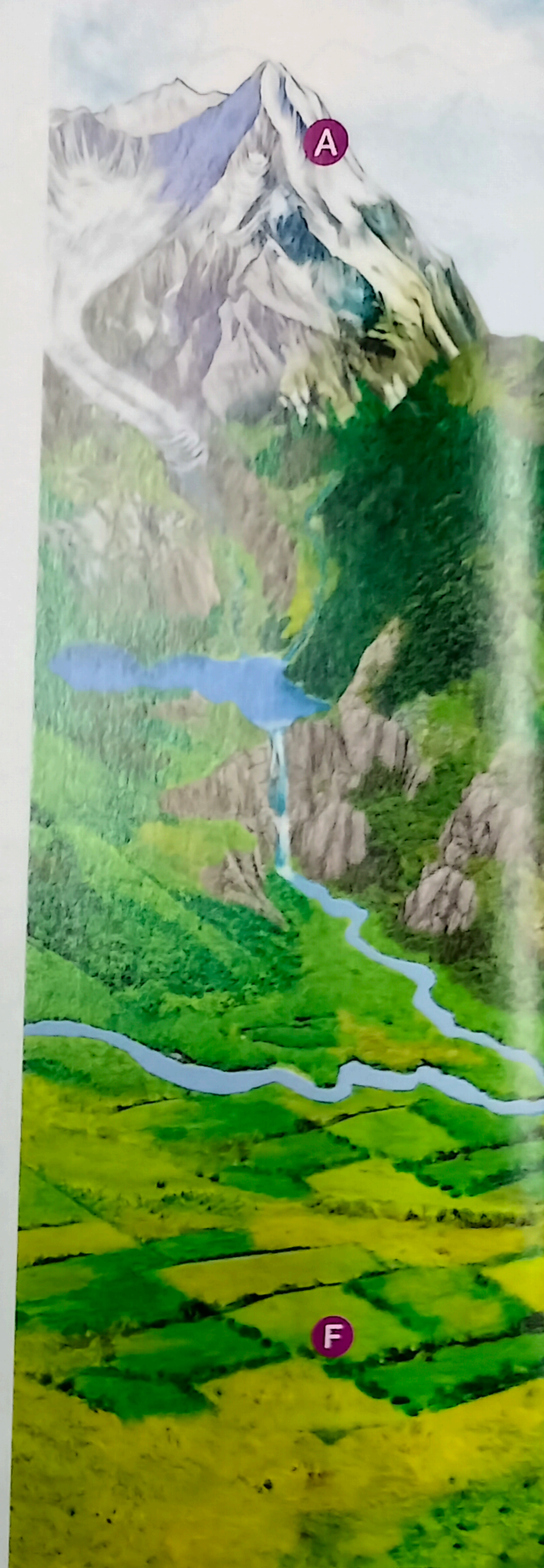
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1. Main types of landforms on Earth:

(A) Mountain. (B) Sierra. (C) Mountain range. (D) Valley. (E) Plateau. (F) Plain. (G) Beach. (H) Cliff. (I) Gulf. (J) Cape. (K) Isthmus. (L) Peninsula. (M) Island. (N) Continental shelf. (O) Continental slope. (P) Abyssal plain. (Q) Ocean trench. (R) Mid-ocean ridge.

Interpret a relief map of the world

A world relief map shows the main features of continental and coastal relief on the planet. (2)

How to do it

Consider the following aspects:

- **Altimetry.** This shows the elevation of the land. It is represented in different colours:
 - Purple tones show the highest land on the map.
 - Yellow, orange and brown tones represent the intermediate elevations.
 - Green tones indicate the lowest land.
- **Labels.** This is the text that is written on the map.

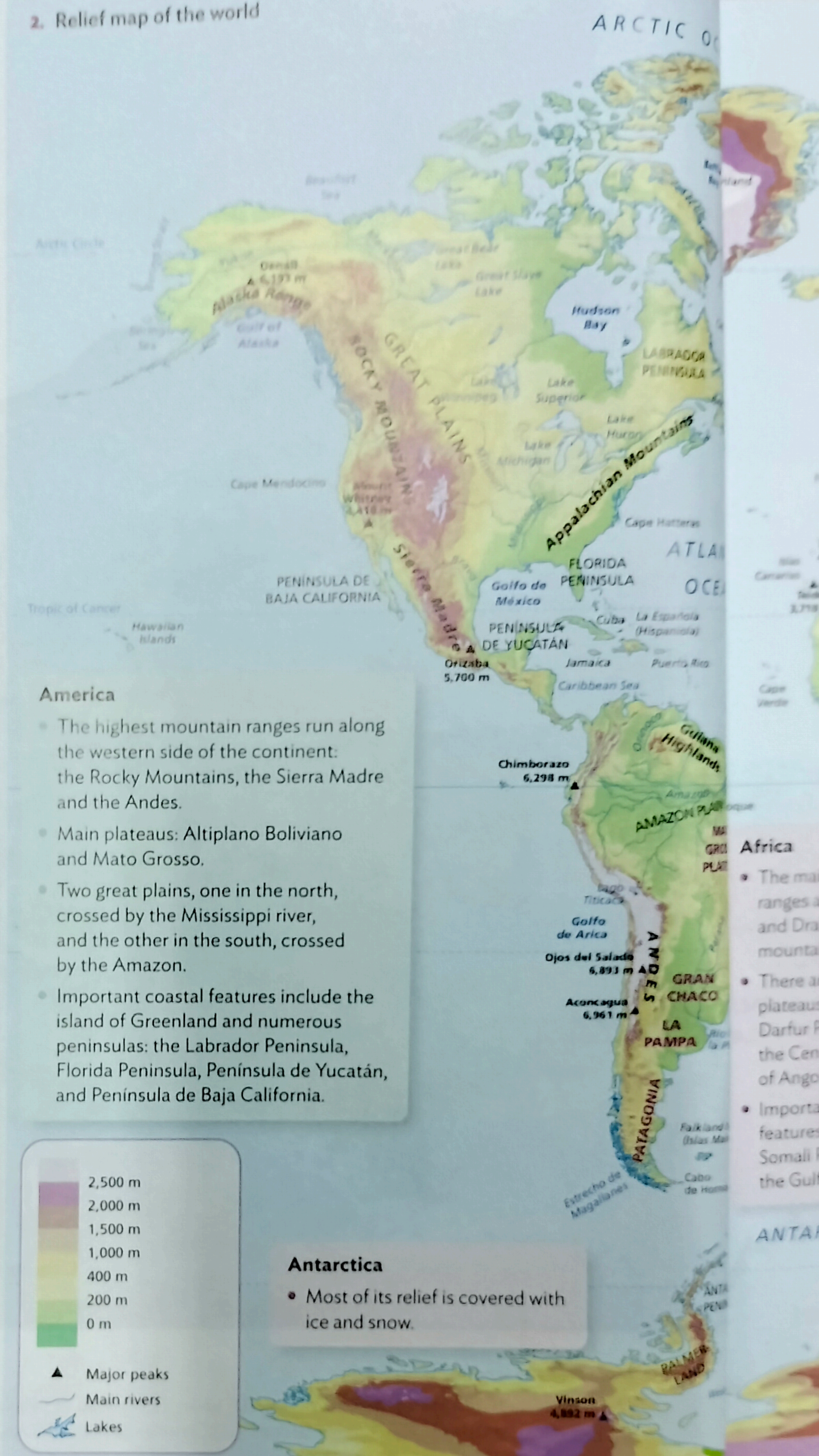
Your turn

- Name the highest mountain peak on each continent and the mountain range it belongs to.
- Look at America. On which part of the continent are the highest mountains?
- Copy and complete the table with examples.

	ISLANDS	PENINSULAS	CAPIES
Africa
America
Asia
Europe
Oceania

- If you travelled in a straight line from the North Cape to the Cape of Good Hope, which features of coastal and continental relief would you cross?

2. Relief map of the world



America

- The highest mountain ranges run along the western side of the continent: the Rocky Mountains, the Sierra Madre and the Andes.
- Main plateaus: Altiplano Boliviano and Mato Grosso.
- Two great plains, one in the north, crossed by the Mississippi river, and the other in the south, crossed by the Amazon.
- Important coastal features include the island of Greenland and numerous peninsulas: the Labrador Peninsula, Florida Peninsula, Península de Yucatán, and Península de Baja California.

Antarctica

- Most of its relief is covered with ice and snow.

Africa

- The main ranges are the Atlas and Drakensberg mountains.
- There are plateaus in Darfur and the Central Plateau of Angola.
- Important features include the Somali Plateau and the Gulf of Aden.

ANTARCTICA

Europe

- The main mountain ranges are in the south: the Pirineos, the Alps, the Carpathian Mountains and the Caucasus.
- The Great European Plain extends from the Atlantic Ocean to the Urals.
- There are many peninsulas on the coast: the Balkan, Italian and Scandinavian peninsulas and the Península Ibérica. There are also many islands: Sicily, Crete, Sardinia, etc.

Asia

- The Himalayas is the highest mountain range in the world, and Everest is the highest mountain peak.
- Tibet is the highest plateau in the world.
- There are large peninsulas on the coast, like the Anatolian, Arabian, Indian and Indochina peninsulas. There are also large gulfs, like the Persian Gulf and Bay of Bengal.



Africa

- The main mountain ranges are the Atlas and Drakensberg mountains.
- There are huge plateaus, like the Darfur Plateau and the Central Plateau of Angola.
- Important coastal features include the Somali Peninsula and the Gulf of Guinea.

Oceania

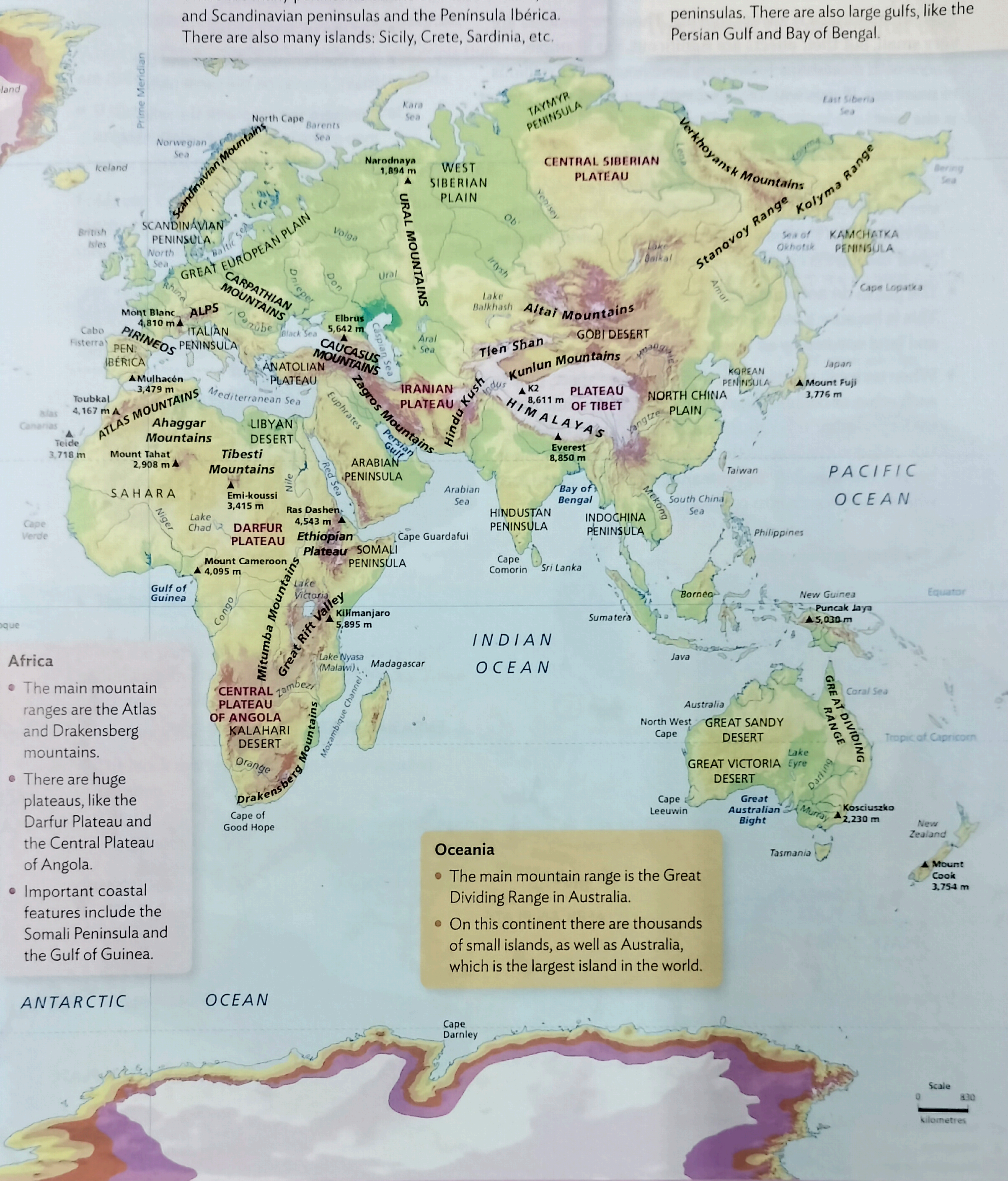
- The main mountain range is the Great Dividing Range in Australia.
- On this continent there are thousands of small islands, as well as Australia, which is the largest island in the world.

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Scale
0 830
kilometres

2. The formation of relief: folds and faults

What is the theory of plate tectonics?

The Earth's surface is always moving. These movements are very small, but their effects are significant. For example, places with mountains today may have been plains millions of years ago. Places with dry land may have been under water in the past.

According to the theory of plate tectonics:

- The Earth's crust is made up of tectonic plates whose size and thickness varies. These plates are continuously moving due to the Earth's internal forces. Tectonic plates cover the Earth's crust like pieces of a jigsaw puzzle. (3)
- The plates do not coincide exactly with the continents. This is because a plate can be made up of both dry land and land covered by an ocean.
- When tectonic plates move, they can move apart, slide over each other or collide. When two plates collide, one may slide under the other towards the Earth's interior. In other cases, this collision can lead to the formation of large mountain ranges. Earthquakes and volcanoes are common in areas where plates come into contact.

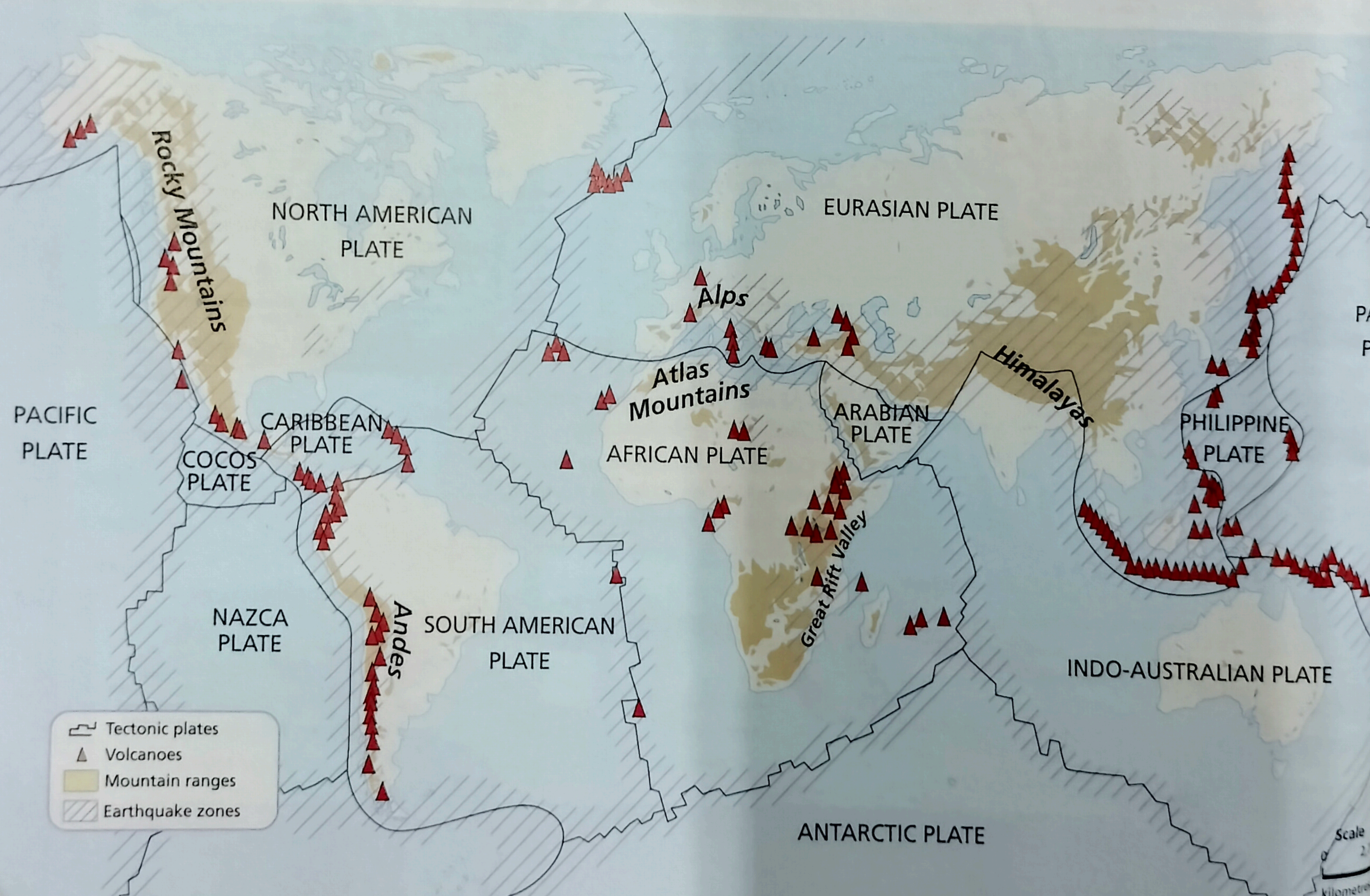
WORK WITH THE IMAGE

- List the tectonic plates.
- Are the Península Ibérica and the Islas Canarias on the same plate?
- Compare this map with the relief map of the world. What relationship can you see between the plate boundaries and large mountain ranges?

KEY QUESTIONS

- Explain the theory of plate tectonics. How is it related to the formation of relief?
- Compare and explain the formation of folds and faults.

3. The Earth's tectonic plates



Folds and faults

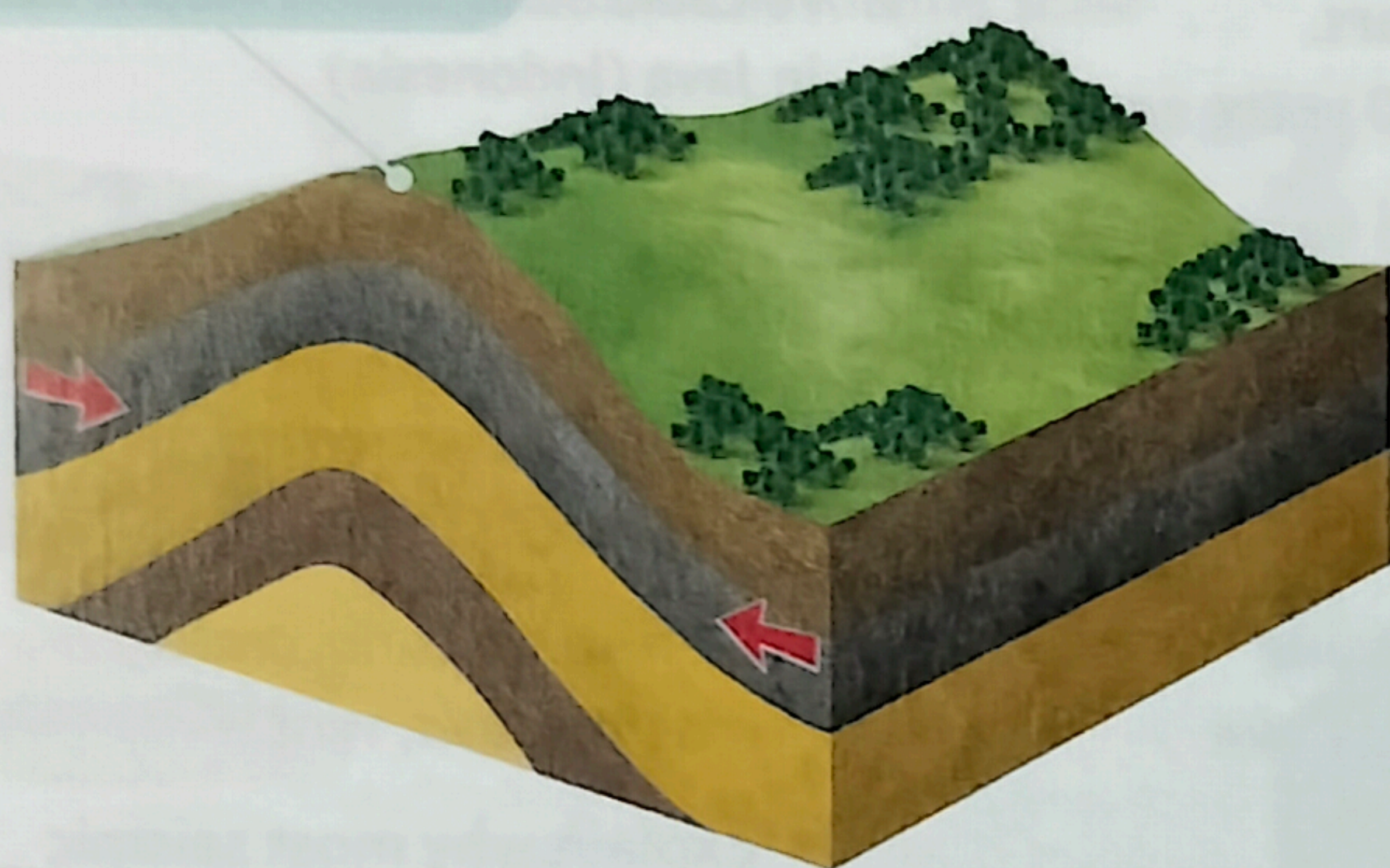
Plate collisions cause changes to the Earth's crust.

When the Earth's internal forces act on materials that are not very rigid, they undulate and form folds:

- If the fold is convex in shape, it is called an **anticline**. (4)
- If the fold is concave in shape, it is called a **syncline**.

Folds can lead to the formation of large mountain ranges, like the Himalayas. The Himalayas originated millions of years ago when two tectonic plates collided.

anticline or raised convex fold



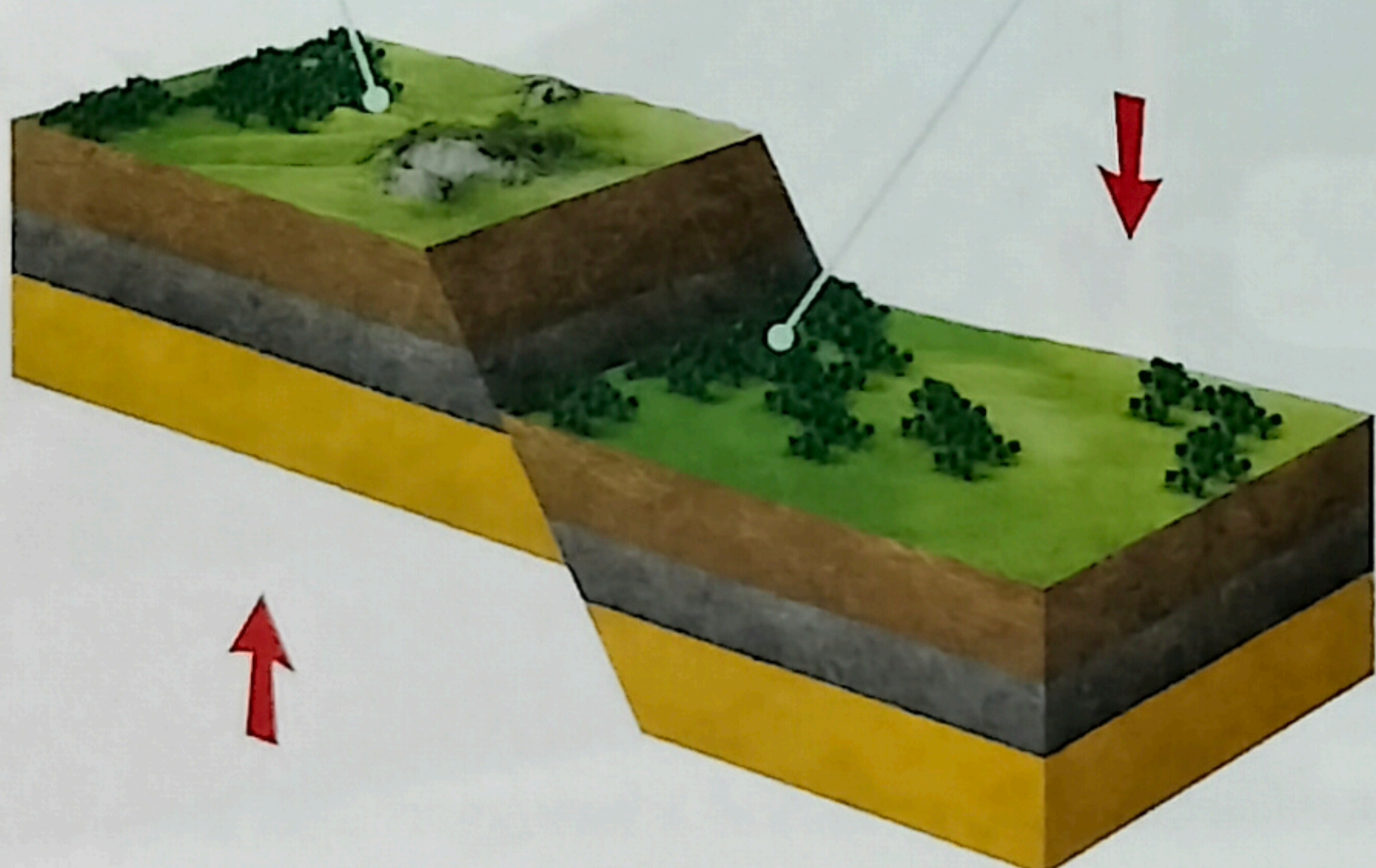
4. The formation of a fold

When the Earth's internal forces act on very rigid materials, they crack and fracture into blocks. These fractures are called **faults**. (5)

- The block that is pushed upwards is called a **horst**.
- The block that is pushed downwards is called a **graben**.

horst or raised block

graben or lowered block



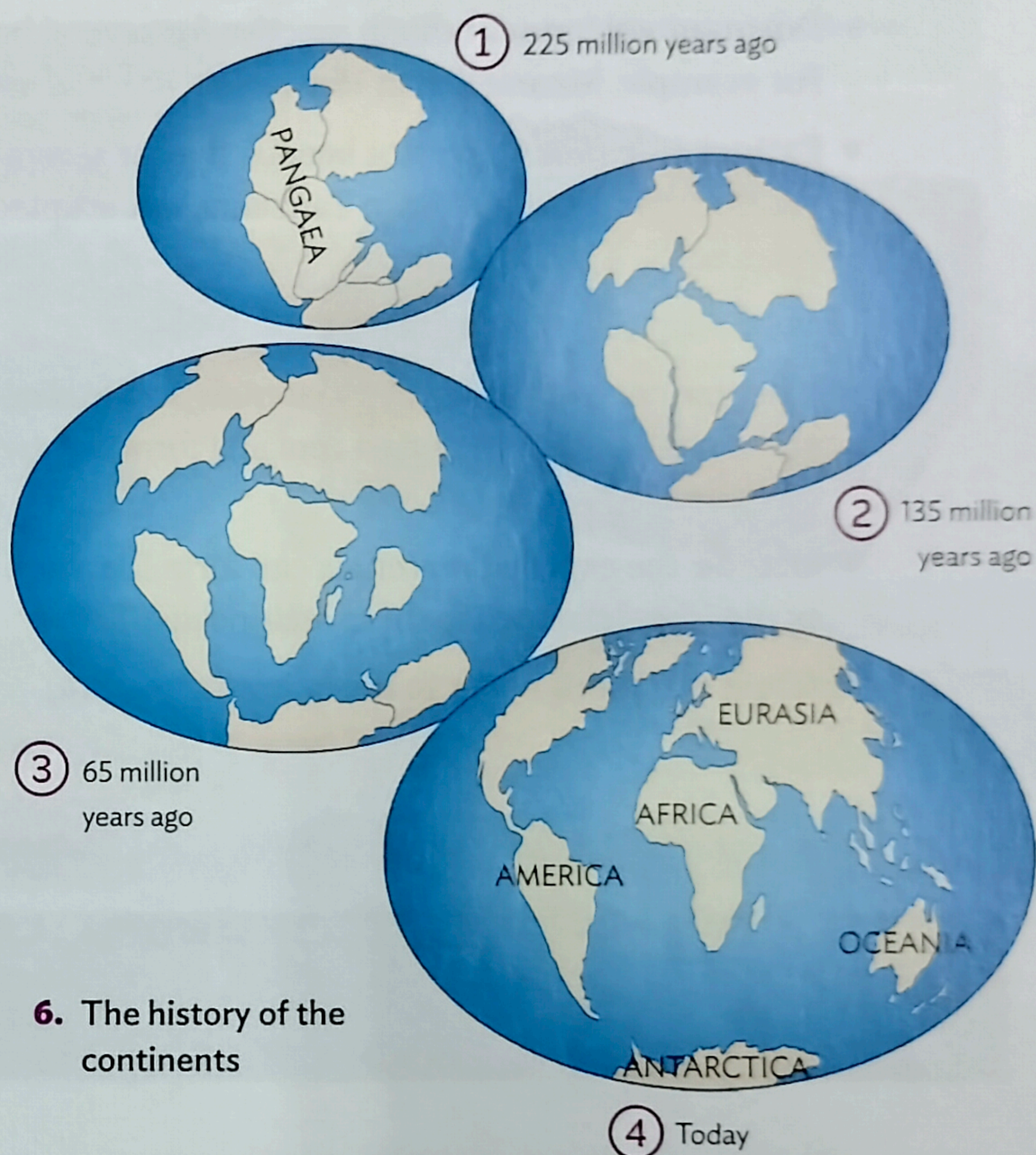
5. The formation of a fault

EXPLORE

The theory of continental drift

The theory of continental drift was developed in the early 20th century. According to this theory, 200 million years ago there was a single super-continent, which scientists called **Pangaea**.

Over millions of years, Pangaea fractured into large pieces, the **tectonic plates**. These tectonic plates moved very slowly over the Earth's mantle to form the current continents and oceans. (6)



6. The history of the continents

Investigate

- Look at the west coast of Africa and the east coast of America. Do they fit together? Do you think this is evidence of continental drift?
- Find out if there is a relationship between continental drift and plate tectonics.

Speaking out against climate change

It is easy to forget that ultimately the climate emergency comes down to a single number – the concentration of carbon in our atmosphere. The measure that greatly determines global temperatures and the changes in that one number is the clearest way to chart our own story. For it defines our relationship with our world. [...]

Perhaps the fact that the people most affected by climate change are no longer some imagined future generation, but young people alive today. Perhaps that will give us the impetus we need to rewrite our story, to turn this tragedy into a triumph.

DAVID ATTENBOROUGH'S speech at the opening ceremony of the climate summit in Glasgow, 2021

It should be obvious that we cannot solve the crisis with the same methods that got us into it in the first place. [...] The COP has turned into a PR event, where leaders are giving beautiful speeches and announcing fancy commitments and targets, while behind the curtains governments of the Global North countries are still refusing to take any drastic climate action.

GRETA THUNBERG'S speech at the Fridays for Future march, Glasgow, 5th November 2021



Time is fast running out for my islands, and we will accept no more excuses or failures from world leaders. We know they are not doing enough. [...] COP26 must deliver concrete solutions urgently, and we are here to force them to act. [...] For a decade now, the storms in the Pacific have been getting more violent, the droughts have been longer and the floods deeper. Fishers cannot feed their families. Family-owned shops that are flattened in a cyclone are rebuilt, only to be destroyed by rising water. [...] We know that if one part of a canoe is damaged, the whole thing sinks. What is happening now to the Pacific Islands is a warning to the rest of the world.

BRIANNA FRUEAN speaking about the climate summit in Glasgow, 2021

25 Investigate.

- Look for information about David Attenborough, Greta Thunberg and Brianna Fruean. Summarise with one word, one idea and one phrase each of their commitments to the fight against climate change.
- Find out about other climate activists.
- Find out what decisions were made at the climate summit that took place in Glasgow in 2021.

26 Read and analyse the excerpts.

- What is the main message of each person?
- What do they all agree on? How do they differ?
- Which do you like the most? Why?

27 UNDERSTAND OTHERS. Imagine you could speak with David Attenborough, Greta Thunberg and Brianna Fruean.

- What would you ask them?
- Do you think they are satisfied with the outcome of the Glasgow climate summit? Why or why not?

28 DEBATE. Think and comment.



- Is more activism needed to speed up the fight against climate change?
- The world's wealthiest countries are responsible for the highest emissions. Should they make a bigger effort than poor countries in the fight?



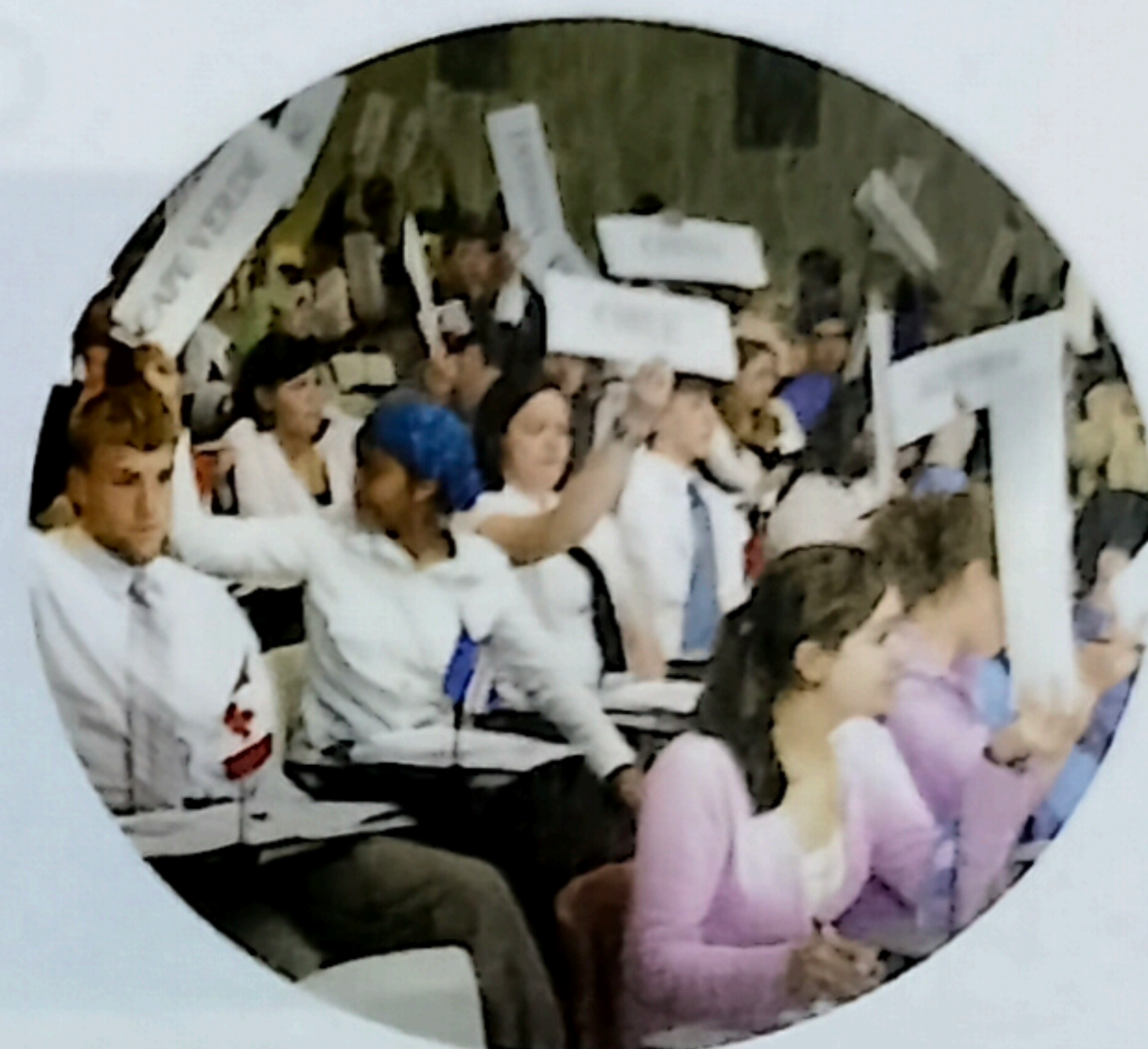
TAKE ACTION

Organise a climate summit

3



Climate change makes us think about the future of the Earth, and what planet we are going to leave for future generations. We are becoming more aware of the need to change our production methods and our lifestyles. The first step is to discuss possible solutions. Organise a climate summit in the classroom and speak out in favour of a more sustainable planet.



STARTING POINT

1. Each group will be a delegation that represents one of these countries:

China

USA

Spain

Tuvalu

Burundi

Peru

India

2. Before you begin, choose:

- A person to chair, or lead, the summit. This person will be in charge of introducing the different delegations, moderating the debates and opening the summit with an explanation of the climate emergency.
- Two climate activists. They will give the opening speeches.

3. The main topics of the summit will be:

Can CO₂ emissions in the atmosphere be reduced by 50 %?

Is it possible to limit global warming to 1.5 °C?

How can economic and environmental interests be balanced to preserve the planet's health?

PREPARE YOUR PROJECT

4. Gather information about the country you are representing.

- General information: location, capital, languages, type of government, currency, etc.
- Socioeconomic information: population, human development index, greenhouse gas emissions, etc.

5. Prepare your contribution to the summit.

- Your country's role and responsibility in climate change.
- How climate change affects your country.
- Your capacity to reduce emissions.

SHARE YOUR PROJECT

6. Debate and try to reach an agreement. Remember:

- You must represent your country's interests, not your own opinion.
- Justify your statements.
- Come to an agreement.

7. Prepare a document with your conclusions. Specify the commitments to which all the participating countries have agreed.

3. The formation of relief: volcanoes and earthquakes

The movement of tectonic plates can lead to the formation of two other phenomena: **volcanoes** and **earthquakes**. They also create and modify the Earth's relief.

Volcanoes

Volcanoes are cracks in the Earth's crust. Materials from inside the Earth are expelled through these openings at high temperatures.

Volcanoes are usually located on the boundaries of tectonic plates.

Most volcanic eruptions occur on the ocean floor.

Volcanoes can be found in different states:

- **Active volcanoes** are always active and sometimes erupt. For example, Popocatépetl, in Mexico, erupted on various occasions in 2020.
- **Dormant volcanoes** remain inactive for several hundred years. For example, Mauna Kea in Hawaii last erupted around 4,500 years ago.
- **Extinct volcanoes** have not been active for several thousand years. For example, Kilimanjaro, in Tanzania, last erupted around 360,000 years ago.

Volcanic eruptions change relief:

- **Volcanic cones:** the expelled materials accumulate on the outside of the volcano. The materials cool and form elevations that look like mountains. (7)
- **Islands:** the expelled materials can form islands, like the Islas Canarias or the islands in the Japanese archipelago.

Volcanic eruptions occur in the following way: (8)



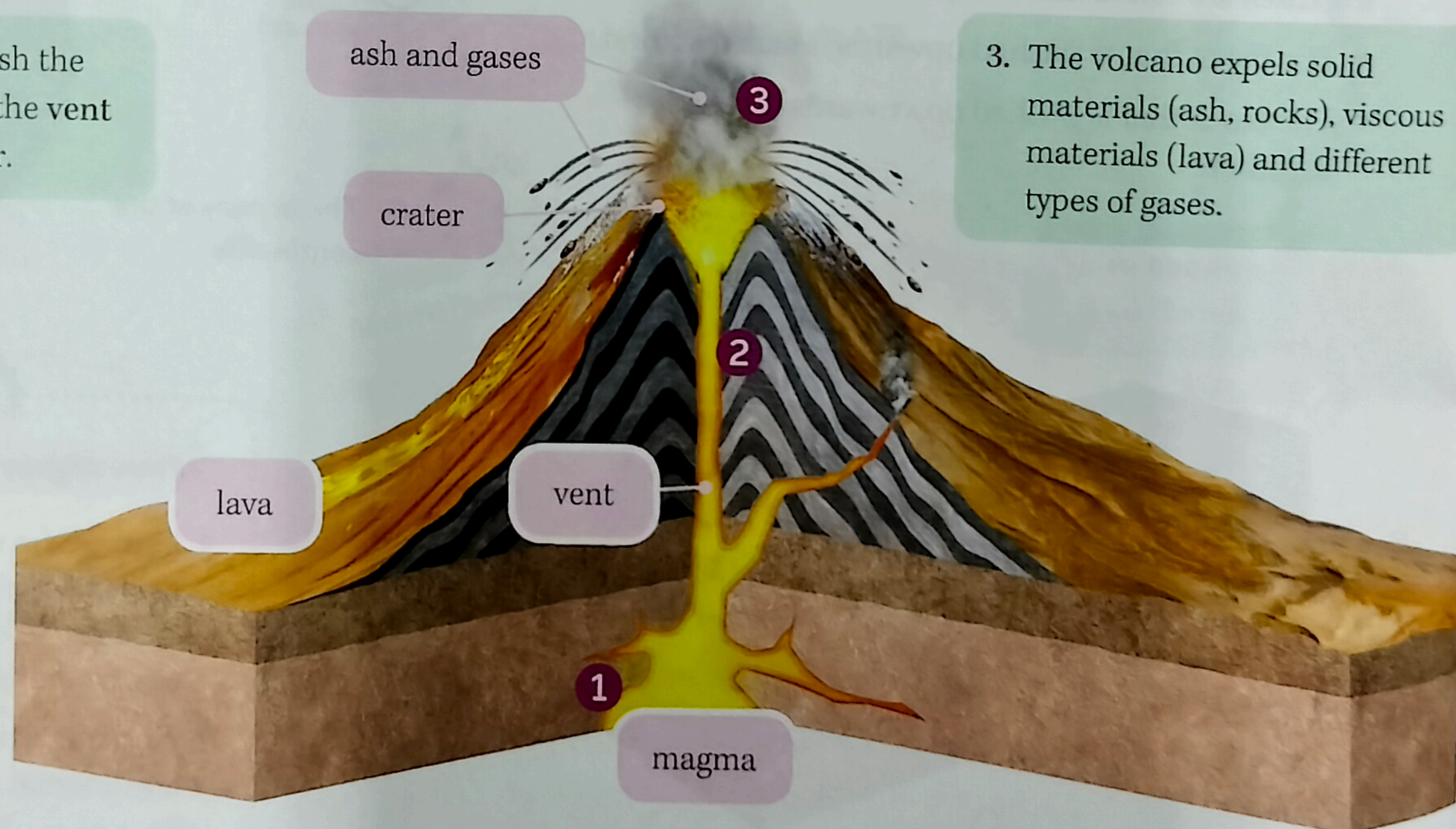
7. Volcanic cone, called Mount Batok, in Java (Indonesia)

KEY QUESTIONS

- **Define:** *volcano, crater, magma, lava, vent.*
- **Explain** why most seismic activity occurs in the region called the Ring of Fire.

2. The pressure can push the magma up through the vent and out of the crater.

1. Magma is subjected to intense pressure inside the Earth.



8. A volcanic eruption