



# CLIMATE BOX

Educational Programme

**Collection of Worksheets  
for Integrating Climate Change  
into School Subjects**



**2026**



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Collection of Worksheets for Integrating Climate Change into School Subjects was developed for middle and high school subject lessons as a supplementary instructional resource to accompany the educational and game-based materials for students on the topic of climate change "Climate Box".

**The purpose of this collection** is to provide educators with a practical tool for integrating the topic of climate change into both classroom and extracurricular activities through the lens of specific academic subjects. We believe that understanding a global issue must be built upon clear, subject-specific knowledge: how the greenhouse effect is explained by the laws of physics, what biological consequences climate change has for ecosystems, and how geographical factors determine regional vulnerability.

**The innovative approach** of this collection lies in the fact that each worksheet is embedded within a specific topic in geography, biology, physics, chemistry, social studies, or other subjects. This eliminates the need to treat climate change as a separate or "special" topic; instead, it is presented as the real-world context in which the phenomena and processes under study exist.

These worksheets are designed as a flexible resource that can be adapted to various instructional formats and levels of student preparedness. Each worksheet corresponds to a specific section of Climate Box. The subject focus of each worksheet includes several clearly defined topics within one or more academic disciplines in which it can be effectively applied. For ease of reference, each academic subject is assigned by a corresponding symbol.

## Placement within the Educational Process

### ■ As part of a traditional lesson:

The collection as a whole, or individual worksheets, may be used during the introduction of new material (as a problem-based task), for reinforcement (as a practical exercise), or for assessment (as a diagnostic task or homework assignment).

### ■ Interdisciplinary projects:

The collection supports project-based learning that integrates multiple subjects. For example, a group of students may explore the topic "Anthropogenic Impact on Climate" using worksheets from chemistry (combustion processes), physics (alternative energy sources), and social studies (climate policy).

### ■ Extracurricular activities:

The worksheets are well suited for clubs, elective courses, and preparation for academic conferences and competitions.

## Differentiation and Adaptation:

### ■ For advanced students:

Tasks may be made more challenging by asking students to independently research additional information, prepare a short presentation, or analyze real statistical data.

### ■ For students who require additional support:

Instructions may be simplified, complex tasks divided into sequential steps, and supporting materials such as reference diagrams or a glossary of terms provided.

- Working in pairs or small groups of students with similar skill levels can further support effective learning.

### Possible uses of the "Worksheets":

- Print the worksheets according to the number of students for use in specific lessons.
- Complete assignments electronically and submit the finished worksheets to the teacher.
- Display assignments on a screen for independent work; in this case, students may record their answers in their notebooks.

### Common terms of academic subjects:



Geography



Biology



Chemistry
















Social Studies















Physics






### Contents of the worksheet collection "Climate Box: Interdisciplinary Workshop"








Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
1.		<b>Atmosphere. Weather and climate.</b> <i>Middle School Level</i> The Earth's atmosphere and climate. Geographical methods for studying objects and phenomena. Weather and its indicators. Atmospheric natural hazards. Causes of weather changes. Climate and climate-forming factors.	1.1
2.		<b>Weather. Weather forecast.</b> <i>Middle School Level</i> The Earth's atmosphere and climate. Geographical methods for studying objects and phenomena. Weather and its indicators. Atmospheric natural hazards. Causes of weather change. Climate and climate-forming factors.	1.1
3.		<b>Composition and structure of the atmosphere.</b> <i>Middle School Level</i> The composition of atmospheric air. Water in the atmosphere. Types of precipitation.	1.1
		<b>Composition and structure of the atmosphere.</b> <i>Middle School Level</i> The Earth's atmosphere and atmospheric pressure. Reasons for the existence of the Earth's air envelope. Measuring atmospheric pressure.	
4.		<b>Climate. Climate-forming factors.</b> <i>Middle School Level</i> Climate-forming factors. Dependence of climate on latitude and altitude above sea level. Local climate.	1.2








Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
5.		<b>Climate and climate-forming factors. Climatic zones.</b> <i>Middle School Level</i> Natural systems and climate diversity on Earth. Climate-forming factors. Dependence of climate on latitude and altitude above sea level. Climatic zones. Characteristics of the main and transitional climate zones of the Earth.	1.2
6.		<b>Air temperature. Thermal zones 1.</b> <i>Middle School Level</i> Air temperature: average daily, monthly, and annual values. Annual variations in air temperature. Uneven distribution of sunlight and heat across the Earth's surface.	1.1.-1.4.
7.		<b>Air temperature. Thermal zones 2.</b> <i>Middle School Level</i> Air temperature: average daily, monthly, and annual values. Annual variations in air temperature. Uneven distribution of sunlight and heat across the Earth's surface.	1.1.-1.4.
8.		<b>Atmospheric pressure.</b> <i>Middle School Level</i> Weather and its indicators. Causes of weather changes.	1.1.-1.4.
		<b>Atmospheric pressure.</b> <i>Middle School Level</i> The Earth's atmosphere and atmospheric pressure. Measuring atmospheric pressure. Dependence of atmospheric pressure on altitude above sea level.	
9.		<b>Wind. Atmospheric circulation.</b> <i>Middle School Level</i> The atmosphere as the Earth's air envelope. Atmospheric pressure. Causes of wind. Wind rose, breezes, and monsoons.	1.1-1.4.
10.		<b>Air humidity. Atmospheric precipitation.</b> <i>Middle School Level</i> Water in the atmosphere. Air humidity. Cloud formation and types of clouds. Fog. Formation and occurrence of atmospheric precipitation. Types of precipitation.	1.1-1.4.
11.		<b>Natural laws of the Earth. Ancient periods of glaciation.</b> <i>Middle School Level</i> The Earth as a planet in the solar system. Fundamental natural laws of the Earth. Uneven distribution of sunlight and heat across the Earth's surface. Lithospheric plates and their movement. <i>High School Level</i> Ancient and modern glaciations. The World Ocean, ocean currents, and their role in climate formation.	1.3.







Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
12.		<p><b>Global climate change. The impact of modern human economic activity on the Earth's climate.</b></p> <p><i>Middle and High School Level</i></p> <p>Methods for studying and observing the global climate. The impact of modern human economic activity on the Earth's climate. Climate change under the influence of natural and anthropogenic factors. Human adaptation to diverse climatic conditions within a country. Projected national-level consequences of climate change.</p>	1.3.
13.		<p><b>Dangerous and adverse meteorological phenomena.</b></p> <p><i>Middle and High School Level</i></p> <p>Natural phenomena in the atmosphere, methods of observation, and protective measures. Dangerous and adverse meteorological phenomena. Natural hazards and their relation to climate change.</p>	2.1.
14.		<p><b>How climate change affects plants and animals.</b></p> <p><i>Middle School Level</i></p> <p>Diversity of flora and fauna. Adaptation of living organisms to habitats in different natural zones. Specially protected natural areas within the country. UNESCO World Natural Heritage Sites.</p>	2.2
		<p><i>High School Level</i></p> <p>Specially protected natural areas as one of the targets of the Sustainable Development Goals (SDGs).</p>	
15.		<p><b>How climate change affects forests.</b></p> <p><i>Middle School Level</i></p> <p>Natural environment. Specially protected natural areas.</p> <p><i>High School Level</i></p> <p>Types of natural resources. Forestry and the environment. Global forest resources. Natural and economic systems.</p>	2.3.
16.		<p><b>How climate change affects water resources.</b></p> <p><i>Middle School Level</i></p> <p>The hydrosphere and methods for studying it. Components of the hydrosphere. Inland waters and national water resources: rivers and lakes. Natural phenomena in the hydrosphere and methods of observation and protection.</p> <p><i>High School Level</i></p> <p>Uneven distribution of water resources. Increased water consumption and pollution. Conservation of water resources. Availability of fresh water for humanity. Global hydropower resources. The role of World Ocean resources (energy, biological, mineral) in human life and prospects for their sustainable use.</p>	2.4.

Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
17.		<p><b>How climate change affects agriculture.</b>  <i>Middle School Level</i>            Soil formation and fertility. Soil conservation. Human economic activity, with a focus on agriculture. The agro-industrial sector of the country.</p> <p><i>High School Level</i>            Agroclimatic resources. National soil resources. Measures to preserve soil fertility, including land reclamation, combating soil erosion, and preventing pollution. Global agriculture. Environmental impacts of agriculture and its sectors. Geographic differences in land availability. Organic farming. Crop production and livestock management.</p>	2.5.
18.		<p><b>The impact of climate change on coastal regions.</b>  <i>Middle School Level</i>            The World Ocean and its components. Natural phenomena in the ocean. Changes in ice cover and sea level, their causes and consequences.</p> <p><i>High School Level</i>            Rising sea levels. Fisheries and aquaculture.</p>	2.6
19.		<p><b>How climate change affects mountainous regions.</b>  <i>Middle School Level</i>            Altitudinal zonation. Landforms. Features of natural geographical relief. Conservation of critical biotopes.</p> <p><i>High School Level</i>            Natural geological hazards and their distribution within the country. Regional relief features. Glaciers. Altitudinal zonation in mountains.</p>	2.7
20.		<p><b>How climate change affects the Arctic regions.</b>  <i>Middle and High School Level</i>            Glaciers. Permafrost. Antarctica as a unique continent on Earth. Human exploration and modern research in Antarctica.</p>	2.7–2.8.
21.	 	<p><b>How climate change affects desert regions.</b>  <i>Middle and High School Level</i>            Deserts and their flora and fauna. Characteristics of desert ecosystems. Threats to these regions and measures for their preservation. Impacts of climate change on deserts. Desertification.</p>	2.2

Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
22. 23.		<p><b>How Climate Change Affects Cities 1. How Climate Change Affects Cities 2.</b></p> <p><i>Middle School Level</i></p> <p>Current world population. Factors affecting population growth. Population distribution and density. Geographic patterns of population distribution. Urban and rural populations. Urbanization.</p> <p><i>High School Level</i></p> <p>Major cities and urban agglomerations. Urbanization and its characteristics in countries with different socio-economic structures. Megacities and global metropolitan regions.</p>	2.9.
24.		<p><b>The impact of climate change on social issues.</b></p> <p><i>Middle School Level</i></p> <p>The impact of climate on people's lives. Geographic patterns of population distribution and the factors that influence them.</p> <p><i>High School Level</i></p> <p>The impact of climate on the lives and economic activities of populations. Climate refugees. Geographic patterns of population distribution and influencing factors. Population migration: causes, main types, and directions.</p>	2.10.
25.		<p><b>Electric power industry. Natural resources of the country and the world.</b></p> <p><i>High School Level</i></p> <p>Classification of natural resources. Mineral resources of the country and challenges in their rational use. Electric power industry. Natural resource capital of regions and major countries. Endowment of countries with oil, gas, uranium, ores, and other minerals.</p>	3.1.1.
		<p><b>Electric power. Natural resources of the country and the world.</b></p> <p><i>Middle School Level</i></p> <p>Fuel energy. Heat engines and environmental protection.</p>	
26.		<p><b>Mineral resources. Primary energy sources.</b></p> <p><i>Middle School Level</i></p> <p>Classification of natural resources. Mineral resources of the country and challenges in their rational use. Electric power. Fuel and Energy Complex (FEC).</p> <p><i>High School Level</i></p> <p>Natural resource capital of the regions and major countries. Endowment of countries with oil, gas, uranium, ores, and other minerals.</p>	3.1.2.

Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
27.		<p><b>The fuel and energy complex and climate change.</b>  <b>High School Level</b>            Classification of natural resources. Fuel and Energy Complex (FEC). National mineral resources and challenges in their rational use. Electric power industry. Natural resource capital of global regions and major countries. Fossil fuels. National endowments of oil, gas, uranium, ores, and other minerals.</p>	3.1.3.
28.		<p><b>Nuclear energy. Problems of and prospects for its use.</b>  <b>High School Level</b>            Natural resource capital of the global regions and major countries. Uranium supply of countries.</p>	3.1.4.
		<p><b>Nuclear energy. Problems of and prospects for its use.</b>  <b>High School Level</b>            Nuclear energy. Issues and prospects of nuclear energy.</p>	
29.		<p><b>Renewable energy sources.</b>  <b>Middle School Level</b>            The use of water energy by humans.  <b>High School Level</b>            Power plants utilizing renewable energy sources. The global Fuel and Energy Complex (FEC) and the energy transition. Leading countries in renewable energy development.</p>	3.1.5.
		<p><b>Renewable energy sources.</b>  <b>High School Level</b>            Renewable energy power plants.</p>	
30.		<p><b>The impact of various energy sources on humans and the environment.</b>  <b>High School Level</b>            Main types of power plants. The global electric power industry. Current industry trends and their geographic implications. Environmental impacts of the fuel industry and various types of power plants, including those using renewable energy sources.</p>	3.1.5.
		<p><b>The impact of various energy sources on humans and the environment.</b>  <b>High School Level</b>            Effects of radioactive radiation on living organisms. Environmental issues in thermal power engineering. Environmental aspects of the nuclear energy industry.</p>	

Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
31.		<p><b>Transport and environmental protection.</b>  <i>High School Level</i>            National economy: infrastructure sector.</p> <p><i>High School Level</i>            Sea, inland waterway, rail, road, and air transport. Transport and environmental protection. Global economy: service sector and transport. Major international highways and transport hubs.</p>	3.2.1.
		<p><b>Transport and environmental protection.</b>  <i>High School Level</i>            Topics: Effects of radioactive radiation on living organisms. Environmental issues in thermal power engineering. Environmental aspects of nuclear energy.</p>	
32.		<p><b>Electric heating and electric lighting devices.</b>  <i>High School Level</i>            Technical design and practical applications of electric heating and lighting devices. Technical devices and practical applications, including internal combustion engines, household refrigerators, and air conditioners. Responsible use of electricity in everyday life. Principles of rational economic behaviour.</p>	3.2.2.
33.		<p><b>Urban Economy and the Environment.</b>  <i>High School Level</i>            Economic development and environmental conditions. Environmental safety and protection of the urban environment. Urban agglomerations and megacities of the world.</p>	3.2.3.
		<p><i>High School Level</i>            Key building materials: ceramics, glass, cement, concrete, reinforced concrete. Safe use of building materials in everyday life.</p>	
34.		<p><b>Green cities. Ecological construction.</b>  <i>High School Level</i>            Economic development and environmental conditions. Urban agglomerations and megacities of the world. Green cities and ecological construction.</p>	3.2.3 – 3.2.4
		<p><b>Green cities. Ecological construction.</b>  <i>High School Level</i>            Key building materials: ceramics, glass, cement, concrete, reinforced concrete. Safe use of building materials in everyday life.</p>	

Number of the worksheet	Learning subject	Worksheet Topic/Age Category/Subject Topics	Compliance with the section of the manual
35.		<b>Carbon footprint.</b> <b>Middle School Level</b> Environmental changes resulting from human economic activity.	3.3.
		<b>High School Level</b> Responsible use of electricity in everyday life.	
		<b>High School Level</b> Plastics and natural, artificial, and synthetic fibers. Humans in the world of substances and materials. Household chemical literacy.	
36.		<b>Global challenges facing the humanity and international efforts to address them.</b> <b>Middle School Level</b> The need for international cooperation in the use and conservation of nature. Global challenges and international efforts to address them. The United Nations Sustainable Development Goals (SDGs). UNESCO World Heritage Sites: natural and cultural. <b>High School Level</b> Global challenges facing humanity: climate change, natural disasters, water resource scarcity and quality deterioration, desertification and land degradation, and biodiversity conservation. Pollution of the World Ocean and exploitation of its resources. Possible solutions to global challenges.	3.4.
		<b>Global challenges facing the humanity and international efforts to address them.</b> <b>Middle School Level</b> The importance of environmental protection for the survival of humanity. Anthropogenic changes in the biosphere. Global environmental problems.	
		<b>Global challenges facing the humanity and international efforts to address them.</b> <b>Middle School Level</b> Current global problems and potential solutions through the efforts of the international community and international organizations.	

# 1

## Atmosphere. Weather and climate

### Exercise 1.

Identify which natural phenomena related to the climate change are shown in the illustrations. State the relationship.



1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_

Indicate the relationship with the climate change \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Exercise 2.

Complete the sentences:

- The science that studies climate is called \_\_\_\_\_ .  
Weather phenomena are studied by the science \_\_\_\_\_ .  
Past climate changes are studied by the science \_\_\_\_\_ .  
A weather specialist, observer, and researcher of atmospheric phenomena is - \_\_\_\_\_ .

### Exercise 3.

Fill in the blanks with the names of the meteorological elements:

1. It is a collection of tiny droplets or crystals of ice suspended in the atmosphere. \_\_\_\_\_  
2. It is an accumulation of condensed water vapor in the air near the Earth's surface. \_\_\_\_\_  
3. It is a horizontal movement of air caused by differences in atmospheric pressure. \_\_\_\_\_

### Exercise 4.

List the main characteristics of the climate:

1. \_\_\_\_\_ 4. \_\_\_\_\_  
2. \_\_\_\_\_ 5. \_\_\_\_\_  
3. \_\_\_\_\_ 6. \_\_\_\_\_

# 2

## Weather. Weather forecast

### Exercise 1.

Which of the following shown in the picture relates to the weather?

Answer:

\_\_\_\_\_

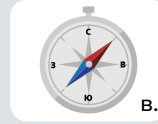
\_\_\_\_\_



a.



б.



в.



г.

### Exercise 2.

Give a definition.

Weather is \_\_\_\_\_

### Exercise 3.

Write down the main meteorological elements.

<i>Temperature</i>	

### Exercise 4.

Write down the main signs of weather change.

1. *Cloud cover change.*

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

### Exercise 5.

Imagine you're the presenter of a TV weather show. Your goal is to create and skillfully present tomorrow's weather forecast for your city using infographics (using symbolic images like the sun, clouds, wind arrows, etc.). Your forecast must include at least five elements:

1. Daytime and nighttime temperatures.
2. Expected cloud cover.
3. Probability and type of precipitation.
4. Wind direction and strength.
5. Atmospheric pressure.
6. Any interesting phenomenon (*morning fog, ice, thunderstorms*).

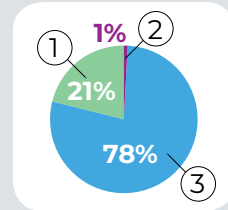
\_\_\_\_\_

# 3

## The composition and the structure of the atmosphere

### Exercise 1. Fill in the blanks.

The air in the atmosphere consists of gases. \_\_\_\_\_ is nitrogen, \_\_\_\_\_ is oxygen, and \_\_\_\_\_ is made up of other gases, which include carbon dioxide, water vapor, hydrogen, and others.



### Exercise 2. Fill in the blanks "The Importance of the Atmosphere".

The atmosphere is \_\_\_\_\_ shell that surrounds our planet. The main role of oxygen in the atmosphere is to provide \_\_\_\_\_ for living organisms. Carbon dioxide is used by green plants in the process of \_\_\_\_\_. The atmosphere protects the Earth from \_\_\_\_\_ preventing it from \_\_\_\_\_ during the day and \_\_\_\_\_ at night. \_\_\_\_\_ phenomena, including dangerous ones, form in the troposphere.

### Exercise 3. Match the names of the layers of the atmosphere with their location.

Thermosphere

Exosphere

Stratosphere

Mesosphere

Troposphere



1



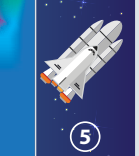
2



3



4



5

8-18 km

50-55 km

80-90 km

700 km

### Exercise 4. Fill in the blanks.

The \_\_\_\_\_ layer of the atmosphere is the troposphere. It contains approximately \_\_\_\_\_ of the total air mass. The thickness of the troposphere varies; over the poles it is about \_\_\_\_\_ km, and over the equator \_\_\_\_\_ km. Almost all water vapor is concentrated in the troposphere, which is why all \_\_\_\_\_ changes occur there, including rain and clouds. The temperature in the troposphere \_\_\_\_\_ with altitude.

Select the correct answers from the suggested options (50%, 16-18, 80%, 22-25, 8-10, 2-3, weather, decreasing, increasing, lower).

### Exercise 5. Select the correct statements about the ozone layer.

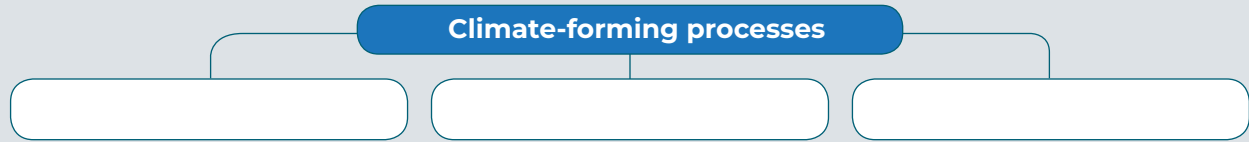
1. The ozone layer is located at the bottom of the stratosphere.
2. The ozone layer protects the Earth from radioactive radiation from the Moon.
3. The ozone layer is part of the troposphere.
4. The ozone layer absorbs ultraviolet radiation from the Sun.
5. The ozone layer is thinnest at the equator.

Answers: \_\_\_\_\_

# 4

## Climate. Climate factors

### Exercise 1. Fill in the cluster.



### Exercise 2. Select the correct statements.

- A. Climate is the long-term weather pattern characteristic of a given area.
- B. The climate is the same throughout the planet.
- C. In temperate latitudes, four climatic seasons are distinguished.
- D. The climate of the coastal areas is not different from the climate of continental interiors.
- E. Global warming has been observed over the last century.

Answers: \_\_\_\_\_

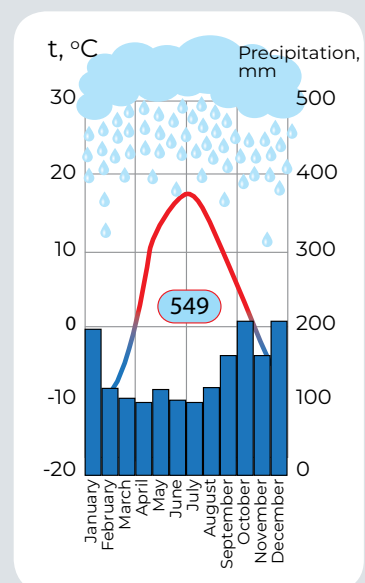
### Exercise 3. Analyze the word cloud and select the factors that affect the climate.

- |          |          |
|----------|----------|
| 1. _____ | 5. _____ |
| 2. _____ | 6. _____ |
| 3. _____ | 7. _____ |
| 4. _____ | 8. _____ |



### Exercise 4. Describe the climate of the area using a climate diagram.

- Average temperature in January \_\_\_\_\_
- Average temperature in July \_\_\_\_\_
- Average annual temperature \_\_\_\_\_
- Annual amplitude \_\_\_\_\_
- Annual precipitation \_\_\_\_\_
- The month with the most precipitation \_\_\_\_\_
- Month with the least amount of precipitation \_\_\_\_\_





# 5

## Climate and Factors Affecting the Climate. Climate zones

### Exercise 1.

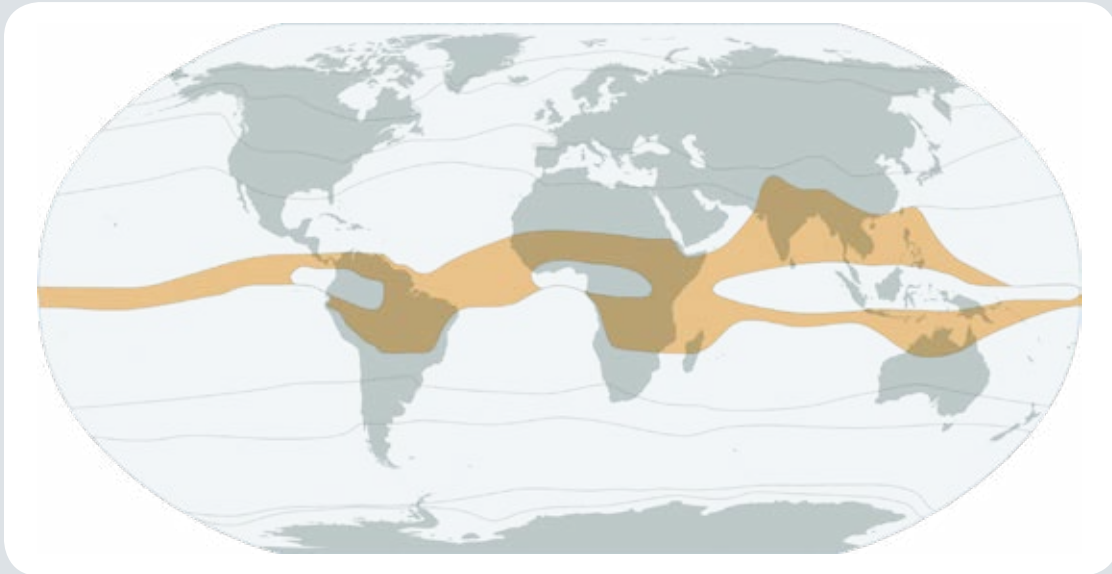
Fill in the blanks.

\_\_\_\_\_ – a region of the Earth's surface with relatively uniform climatic conditions.

\_\_\_\_\_ – a part of a climatic zone characterized by a specific temperature and precipitation regime, and prevailing seasonal weather patterns.

### Exercise 2.

Determine which climate zone according to B. Alisov's classification is shown in the picture.



Answer: \_\_\_\_\_

### Exercise 3.

Key words are missing from the text. Insert these words according to the meaning.

**Mountain climate** – the climatic conditions in mountainous areas. The main reason for the difference between mountain climates and lowland climates is the decrease in atmospheric \_\_\_\_\_ and \_\_\_\_\_ of air with increasing altitude.

**Arid climate** – the climate of deserts and semi-deserts. Here, large daily and annual air temperature ranges are observed; there is an almost complete absence or an insignificant amount of \_\_\_\_\_ (100–150 mm per year).

**Humid climate** – the climate with excessive humidity where the amount of atmospheric \_\_\_\_\_ is greater than can evaporate and seep into the soil.

**Nival climate** – the climate of high mountains (above 3,000 m), where more solid precipitation falls than can melt and evaporate. This leads to the formation of \_\_\_\_\_ and snowfields.

### Exercise 4.

Find the pair "climatic zone – climate characteristics".

Climate zone according to B. Alisov	Climate characteristics
<b>A.</b> Equatorial	<b>1.</b> This climate type develops over temperate latitudes (from 40–45° north and south to the Arctic Circle). The climate is characterized by frequent and strong weather changes due to cyclones. The climate's main characteristic is four seasons: two main ones—cold (winter) and warm (summer), and two intermediate ones—spring and autumn. Prevailing westerlies bring precipitation throughout the year, ranging from 1,000 mm in coastal areas to 100 mm inland.
<b>B.</b> Tropical	<b>2.</b> The air temperature here is constant (+24–28°C), and there is a significant amount of precipitation throughout the year (from 1,500 to 5,000 mm). Since precipitation exceeds soil evaporation, dense, tall rainforests grow there.
<b>C.</b> Temperate	<b>3.</b> The sun doesn't rise for several months and doesn't set below the horizon for several months. Snow and ice reflect more heat than they receive, so the air remains very cold, and the snow doesn't melt all year round. High atmospheric pressure throughout the year lead to light winds and virtually no clouds. Precipitation is very low; the air is saturated with fine ice crystals, and a prolonged drizzle is typical in summer.
<b>D.</b> Polar (Arctic, Antarctic)	<b>4.</b> High-pressure anticyclones dominate, and the weather remains clear almost all year. This climate zone is characterized by two seasons: warm and cold. Temperatures can range from +20°C on the coast to +50°C inland. Diurnal temperature fluctuations are significant: in summer, daytime temperatures reach +40–45°C, while at night they drop to +10–15°C.

Enter the numbers of the definitions corresponding to the climatic zones in the table.

A	B	C	D



Aristotle

### Interesting facts

The first hypothesis about the existence of geographic zones was proposed by an ancient Greek scholar Aristotle. He believed that the Earth was divided into three climatic zones based on their distance from the equator.

In the mid-20th century, the Russian scientist B. P. Alisov proposed identifying climatic zones and regions based on the conditions of general atmospheric circulation.

# 6

## Air temperature. Thermal zones 1

### Exercise 1.

Select two correct statements about changes in air temperature throughout the seasons.

- A) Air temperature depends on the angle of incidence of the Sun's rays.
- B) Air temperature changes throughout the year only at the equator.
- C) If the Sun's rays strike the Earth's surface at an acute angle, the Earth's surface heats up more.
- D) The more direct the angle of incidence of the Sun's rays, the more heat the Earth's surface receives.
- E) In the temperate zone, average annual air temperatures do not exceed +5°C.

Answer: \_\_\_\_\_

### Exercise 2.

Fill in the cluster.

#### Factors influencing climate change

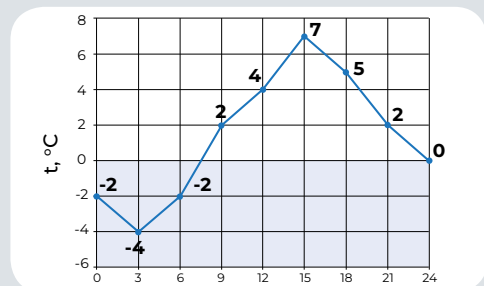
  
  


### Exercise 3.

Using the daily temperature chart, determine:

- A) minimum air temperature \_\_\_\_\_ °C;
- B) maximum air temperature \_\_\_\_\_ °C;
- C) average air temperature \_\_\_\_\_ °C;
- D) the daily temperature range \_\_\_\_\_ °C.



### Exercise 4.

Solve the problem.

On average, as altitude increases, air temperature decreases by about 6 °C for every 1,000 m. Determine the air temperature at the top of a mountain of 6,000 m high if at its foot it was +24 °C.

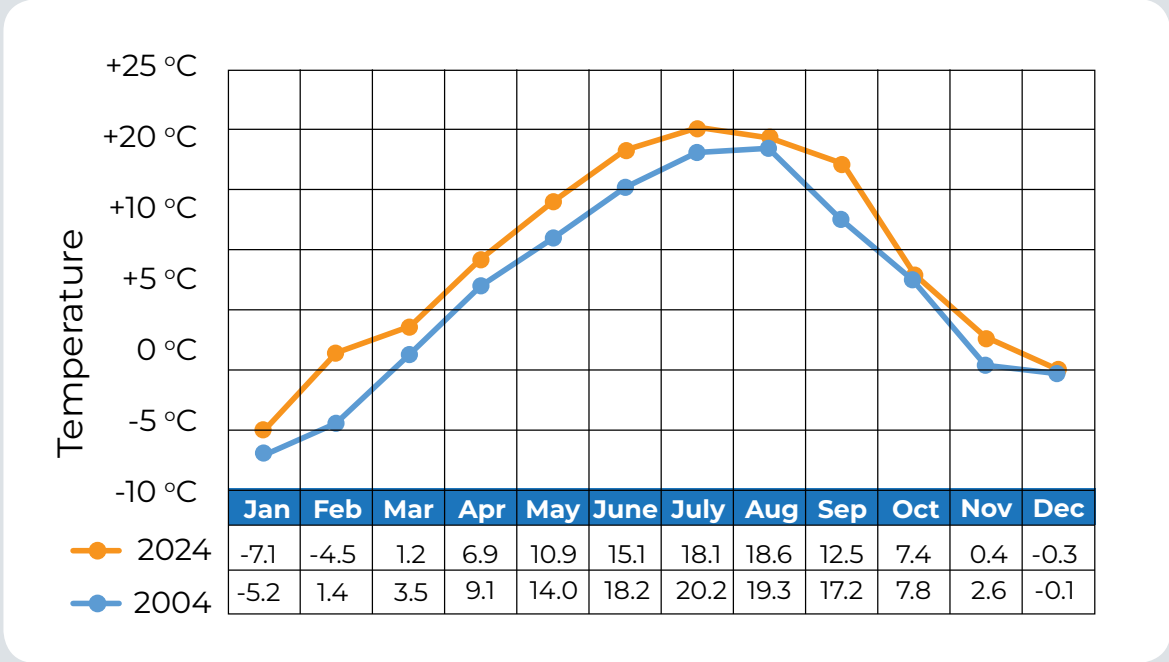
Solution \_\_\_\_\_

Answer \_\_\_\_\_

### Exercise 5.

#### Annual cycle of air temperature.

Consider the graphs of the annual temperature variations for city N for 2004 and 2024 and complete the tasks:



**A)** determine the average annual temperature for 2004 and 2024

2004  $T_{av}$  = \_\_\_\_\_ °C; 2024  $T_{av}$  = \_\_\_\_\_ °C;

**B)** the average annual temperature in 2024 is higher/lower than the average annual temperature in 2004 by \_\_\_\_\_ °C;

**C)** the warmest month in 2004 was \_\_\_\_\_, with an average monthly temperature of \_\_\_\_\_ °C, and the warmest month in 2024 was \_\_\_\_\_, with an average monthly temperature of \_\_\_\_\_ °C;

**D)** the average temperature of the coldest month in 2024 was \_\_\_\_\_ °C, which is higher/lower by \_\_\_\_\_ °C than the average temperature of the coldest month in 2004;

**E)** What factors (see exercise 2) influenced the increase/decrease in the average annual air temperature in 2024 compared to 2004?

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# 7 | Air temperature. Thermal zones 2

## The planet is warming up!

Since the beginning of the 20th century, the average temperature on Earth has risen by 1°C. Sixteen of the last seventeen years have ranked among the ten warmest years in recorded meteorological observations. In the Northern Hemisphere, there has not been a period as warm as 1989–2024 in the past 1,400 years.



### Exercise 1. Look at the picture.

Determine in which case the Earth's surface heats up more? Why?

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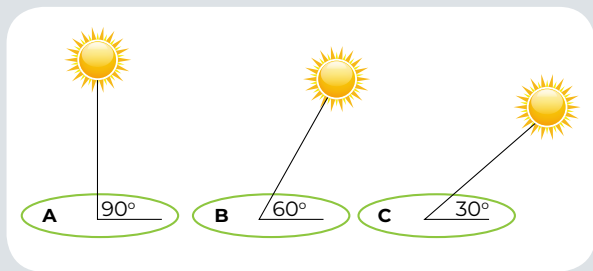
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### Exercise 2. Look at the picture.

Explain why the minimum daily temperature occurs before dawn, and the maximum temperature occurs not at midday, but at 2–3 p.m.

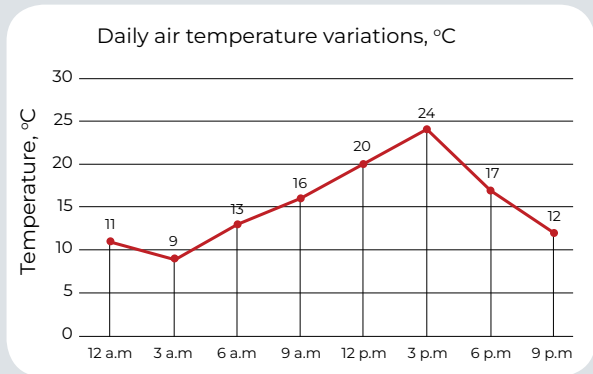
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### Exercise 3. Look at the picture.

As you know, the air temperature depends on the angle of incidence of sunlight. Using the drawing, explain why July or August is not the hottest month in the city of N (540 sq.w., 270 sq.d.)?

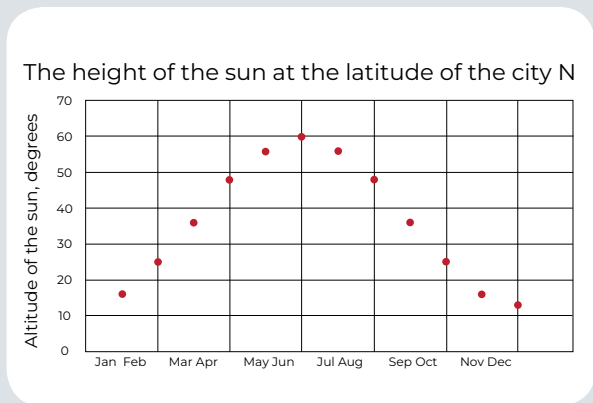
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**Exercise 4. Look at the graph.**

Look at the graph of average annual air temperature changes in city N over the past 20 years. Explain whether this graph can be used to assess global climate change.

Why?

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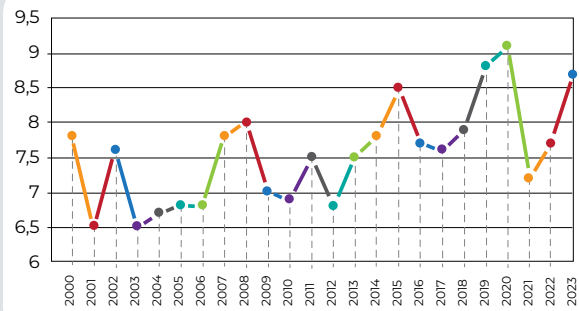
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**Exercise 5. Look at the picture.**

Which hemisphere of the Earth is warming more – the Northern or the Southern? Why?

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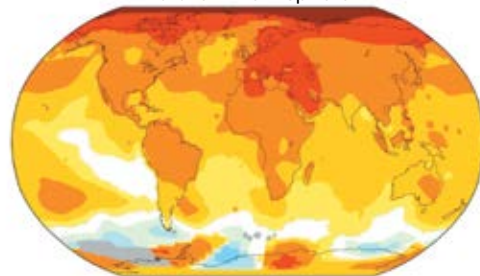
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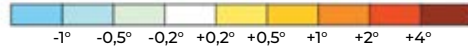
**Temperature change over the last 50 years**

Northern Hemisphere



Southern Hemisphere

Temperature change dynamics from 1973 to 2023 °C

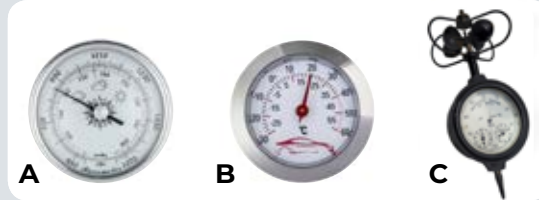


# 8

## Atmospheric pressure

### Exercise 1.

Which of these devices measures atmospheric pressure?  
What is the name of this device?



Answer: \_\_\_\_\_

### Exercise 2.

Insert the missing words.

Atmospheric pressure depends on \_\_\_\_\_.  
As the air temperature rises, atmospheric pressure \_\_\_\_\_, and as  
the air temperature falls, atmospheric pressure \_\_\_\_\_.  
Throughout the year, the maximum atmospheric pressure over land is observed  
\_\_\_\_\_, and over the oceans \_\_\_\_\_.

### Exercise 3.

Solve the problem.

At the foot of the mountain, the barometer shows a pressure of 760 mmHg, and at the top – 700 mmHg. Choose the option that correctly indicates the height of the mountain.

A) 350 m;    B) 580 m;    C) 720 m.

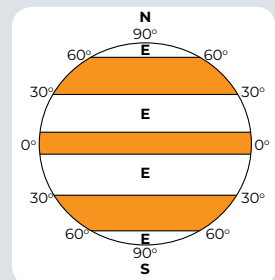
Answer: \_\_\_\_\_

### Exercise 4.

Look at the picture and think about it.

As we know, atmospheric pressure depends on air temperature. Why do you think areas of high atmospheric pressure form in tropical latitudes, while low pressure forms in temperate latitudes?

Answer: \_\_\_\_\_



### Exercise 5.

As global climate change progresses toward global warming, atmospheric pressure will also change. Explain how this will affect human well-being and health.

Answer: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# 9

## Wind. Atmospheric circulation

### Exercise 1.

Use arrows to indicate wind direction A.  
In which case (A or B) will the wind be stronger? Why?

Answer: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- A **752 mm Hg**  **757 mm Hg**  
 B **750 mm Hg**  **748 mm Hg**

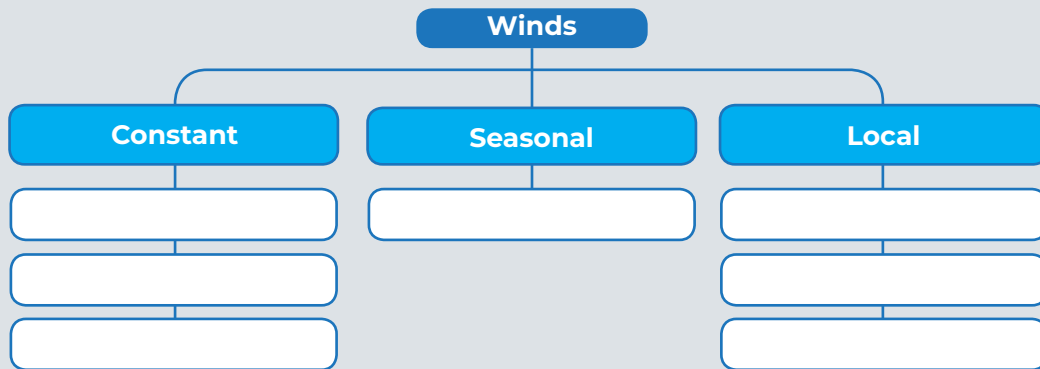
### Exercise 2.

Find the match between the picture and the name of the wind  
(*calm, weak, strong, hurricane*).



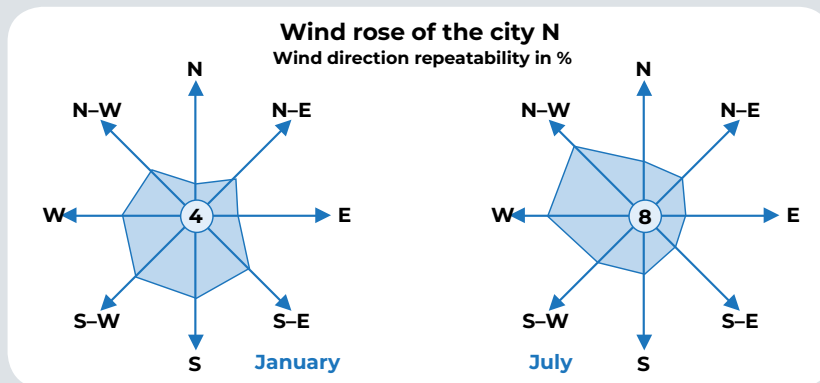
### Exercise 3.

Fill in the diagram "Types of winds".



### Exercise 4.

Look at the wind roses. What wind directions prevail in city N in January and July? What kind of weather do they produce?



Answer: \_\_\_\_\_

**Exercise 5.**

The Dutch invented a special type of headgear for sailors and fishermen. It's a canvas hat that reliably protects a sailor's neck and shoulders from rain and wind. They called it a sou'wester. Considering that strong winds with rain often come to the Netherlands from the Atlantic Ocean, what wind direction do you think most often troubled Dutch sailors?



*Sailor in a sou'wester*

Answer: \_\_\_\_\_  
\_\_\_\_\_

**Exercise 6.**

What impact does climate change have on atmospheric circulation? Support your answer with specific examples.

Answer: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# 10

## Air humidity. Atmospheric precipitation.

### Exercise 1. Select the correct statements.

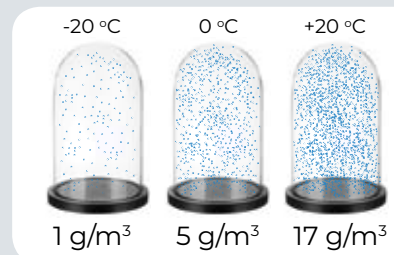
- A. Water vapor enters the air through evaporation from the surface of the oceans.
- B. The absolute air humidity is constant.
- C. Warm air contains more water vapor than cold air.
- D. When air saturated with water vapor cools, precipitation occurs.
- D. Dry air contains a large amount of water vapor.

Answer: \_\_\_\_\_

### Exercise 2. Solve the problem. Answer the question.

Determine the relative humidity of the air if  $1 \text{ m}^3$  contains  $11.9 \text{ g}$  of water vapor at a temperature of  $+20^\circ\text{C}$ . Is the air saturated or unsaturated?

Answer: \_\_\_\_\_

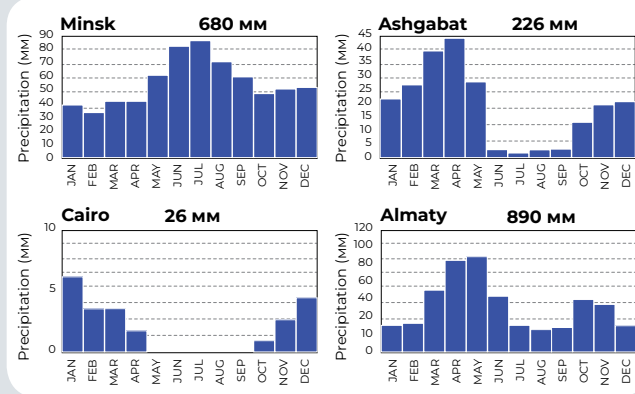


### Exercise 3. Complete the sentences.

The greatest amount of precipitation falls in areas with \_\_\_\_\_ pressure, the least in areas with \_\_\_\_\_ pressure. In equatorial latitudes, the average annual precipitation is \_\_\_\_\_ mm, while in polar regions, it is \_\_\_\_\_ mm. The maximum amount of precipitation falls in the \_\_\_\_\_ and subequatorial climate zones, while the minimum occurs in the \_\_\_\_\_ and \_\_\_\_\_ climate zones.

### Exercise 4. Using the diagrams, determine:

- Which city receives the most precipitation?  
\_\_\_\_\_
- Which city receives the least amount of precipitation?  
\_\_\_\_\_
- In which month does Minsk receive the most amount of precipitation?  
\_\_\_\_\_



### Exercise 5. How does climate change towards global warming affect air humidity and what consequences may arise in this regard?

Answer: \_\_\_\_\_

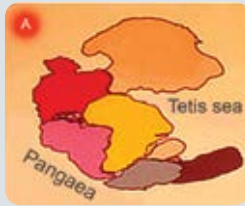
# 11

## Global climate change and the causes thereof

### Exercise 1.

One hundred million years ago, the Earth was much warmer than it is today. However, 50 million years ago, as a result of the breakup of the ancient continent Pangea and the polar movement of continents, temperatures dropped sharply, reaching levels similar to those we observe today.

1. Where were the coldest continents located?



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**Continental drift over the past 500 million years.**

- A** – the formation of Pangaea;
- B** – the division of Pangaea, formation of Laurasia and Gondwana;
- C** – the splitting of Gondwana, formation of Hindustan, Australia and Antarctica;
- D** – the formation of South America, beginning of the division of Laurasia.

2. On which continent is the surface cold, and on which is it warming?  
How can this be explained?

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### Exercise 2.

Approximately 60 million years ago, the last dinosaurs became extinct. Scientists still cannot determine exactly why this happened. One theory suggests that, for some reptiles, soil temperature determines whether males or females hatch from eggs buried in coastal sand.

Explain how climate change could have affected the survival of such species.

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### Exercise 3.

Along with the onset of ice ages, the level of the World Ocean also changed.

1. How did the level change during warm periods and how did it change during cold periods?

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2. Explain your answer.

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### Exercise 4.

Volcanic eruptions are one of the most spectacular and powerful natural phenomena on Earth.

Which has a stronger effect on the climate – spreading red-hot lava or ash ejected from the volcano's mouth? How does this influence affect the climate? Explain the answer.

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Hot lava of a volcano



Emission of ash from the crater of a volcano

### Exercise 5.

Climate is also influenced by fluctuations in ocean currents. How does this influence manifest itself? Bring an example.

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R. Hooke (1686).

### Interesting facts

The first ideas about ancient climate were outlined by the English physicist Robert Hooke (1686). He proposed that the Earth had been warmer in the past and that climate change was the result of oscillation of the Earth's axis. The French naturalist J. Buffon, author of the famous work «The Ages of Nature» (1778), believed that climate change was a consequence of the cooling of the Earth's interior.

He argued that this cooling was evidenced by the discovery of the remains of elephants and rhinoceroses, which in the past inhabited even polar regions, where temperatures were comparable to those of the modern tropics. A similar view was held by one of the greatest naturalists of the first half of the 18th century, A. Humboldt.

# 12

## Global Climate Change: The Impact of Modern Human Economic Activity on the Earth's Climate

### Exercise 1.

Answer the questions.

1. Does our planet have a natural greenhouse effect?

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2. What would the planet's climate be like if there were no natural greenhouse effect?

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### Exercise 2.

An increase in the concentration of greenhouse gases in the planet's atmosphere leads to a rise in the temperature of the lower layer of the atmosphere. The main greenhouse gases on Earth are water vapor, carbon dioxide, methane, ozone, and nitrous oxide. List the most significant sources of greenhouse gases:

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### Exercise 3.

Analytical task: "Chain of Effects." Select one industry (e.g., livestock farming, transportation, coal-fired power generation, cement production). Make a cause-and-effect chain consisting of at least four links, showing how this human activity affects climate.

**Example for the coal-fired power industry:**

1. Coal combustion in thermal power plants (TPPs)
2. Emission of large amounts of CO<sub>2</sub> and other greenhouse gases.
3. Enhancement of the greenhouse effect in the atmosphere.
4. Increase in average global air temperature.
5. Melting of glaciers and permafrost.

**Your chain (select your industry):**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. (as desired) \_\_\_\_\_

### Exercise 4.

Name the consequences of climate change shown in the photo.



1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

### Interesting facts

#### When the climate becomes dangerous.

In 2017, from September 19 to September 21, Hurricane Maria claimed 3,059 lives of residents of the Lesser Antilles. The economic damage from the hurricane was estimated at \$91.61 billion. The wind speed reached 282 km/h. In the period from May to October 2020, floods occurred in Afghanistan, India,

Bangladesh, Nepal, Pakistan, Sri Lanka. The damage from the disaster was estimated at \$105 billion. The number of victims is 6511 people.

From June 12 to September 12, 2022, an abnormal heat wave was observed in 20 European countries. An air temperature of 47°C was recorded in Portugal. People died in France about 11,000 people, in Spain – 4,655 people, in Germany – more than 4,500 people. The damage is estimated at 19 billion euros. The total number of victims is 24,501 people.

# 13

## Hazardous and unfavorable meteorological phenomena

### Exercise 1.

Analytical task "Meteorologist's dictionary".

#### 1. Give definitions to the following concepts

A. A hazardous meteorological phenomenon is

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B. An unfavourable meteorological phenomenon is

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2. Distribute the following phenomena into the appropriate column of the table:  
Strong wind, thunderstorm, hurricane, glaze, drought, tornado, snowstorm, hail, sudden warming, fog, squall, downpour.

#### Hazards

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

#### Unfavourable phenomena

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

### Exercise 2.

More frequent and intense weather anomalies are caused by increased evaporation of water from the ocean surface, driven by rising global temperatures due to increased greenhouse gas emissions from human activities. Label the natural anomalies in the photo.



1. \_\_\_\_\_



2. \_\_\_\_\_



3. \_\_\_\_\_



4. \_\_\_\_\_

**Exercise 3.****Enter the names of weather hazards in the table.**

Name of the hazard	Characteristics and criteria of the weather phenomenon
	Wind speeds of 33 m/s or more.
	Blowing dust or sand caused by strong winds, reducing meteorological visibility to 500 m or less and lasting at least 12 hours.
	A period during the summer months when maximum air temperatures for several consecutive days reach or exceed the normal values for that area.
	A decrease in air and/or soil surface temperature to values below 0°C against a background of positive average daily air temperatures during periods of active crop growth or harvesting in temperate climates.

**Exercise 4.****Select weather anomalies from the list provided:**

1. Frosts in August on the northern Mediterranean coast;
2. Heavy rains in Saudi Arabia in July;
3. Frosts in southern Argentina in August;
4. Sandstorms in Greece in February;
5. Wildfires in California in July;
6. Frosts in western China in November.

**Answer:** \_\_\_\_\_**Exercise 5.****Select and mark the indicators from the list provided that relate to meteorological elements by which the weather is determined.** Air Temperature Visibility Leaf fall Humidity Sunset Clouds Bud swelling Fog Dawn Precipitation Atmospheric pressure Wind

# 14

## How climate change affects plants and animals

**Exercise 1.** Fill in the blanks in the definitions.

**Types of biodiversity:**

\_\_\_\_\_ diversity (the diversity of genes and their variants);  
\_\_\_\_\_ diversity (the diversity of species in ecosystems);  
\_\_\_\_\_ diversity, that is, the diversity of the ecosystems themselves.

**Exercise 2.** What climate changes could have caused the extinction of tree ferns in the Mesozoic era and gymnosperms at the beginning of the Paleogene period?

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**Exercise 3.** Fill in the table by indicating the habitats of the listed vulnerable animal species.

Vulnerable animal species	Their habitats
Polar bear	
African elephant	
Bengal tiger	
Kangaroo	
Indonesian orangutan	
Sea turtle	
Emperor penguin	

Name the climate changes that pose a threat to the existence of these species.

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**Exercise 4.** Fill in the blanks in the definitions.

\_\_\_\_\_ – are animals that appeared in previous geological eras. These include, for example, the desman (1), bison (2), jellyfish (3), latimeria (4), and sharks (5).



What adaptive measures allowed these animals to survive the unfavourable climatic conditions of previous geological eras?

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**Exercise 5.** Research assignment: "Climate Passport of a Species." Choose **ONE** animal or plant from the list (or suggest your own) and conduct a mini-research. Use the internet or educational materials.

**Options:** Koala, African elephant, emperor penguin, sea turtle, red coral, English oak.

**Name of the species:** \_\_\_\_\_

**1. How does climate change threaten this species right now?**  
(For example: droughts, fires, ocean warming, melting ice, etc.)

**Answer:** \_\_\_\_\_

**2. What adaptive strategies does this species have?**  
(Can it migrate, change its diet, breeding time?)

**Answer:** \_\_\_\_\_

**3. Suggest one idea on how to help this species survive.**

**Answer:** \_\_\_\_\_

**Exercise 6.** Guess what will happen to plants if their usual habitat is changed?

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# 15

## How climate change affects forests

### Exercise 1.

List the main types of forests:



1



2



3



4

Determine and label the types of forests shown in the images: boreal forests (taiga), Mediterranean forests, tropical forests, and broadleaf forests.

### Exercise 2.

Establish a cause-and-effect relationship of the impact of climate change on forests using the given example (1). Draw a conclusion.

Nº	Causes	Effects
1	Rising temperatures and droughts	<i>Trees are weakening and dying at an increasing rate. Ecosystem changes: drought-tolerant species are displacing moisture-loving ones.</i>
2	Changes in precipitation and river patterns	
3	Increasing frequency and intensity of forest fires	
4	Spread of pests and diseases	
5	Shifting climate zones	

Вывод: \_\_\_\_\_

### Exercise 3.

Examine the map of modern forests. Mark how you think the forest zone boundaries will look like in 10 years. Describe the reasons for the boundary changes.

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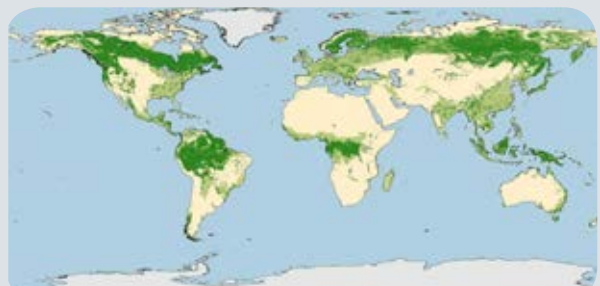
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# 16

## The impact of climate change on water resources

### Exercise 1.

How is climate change affecting your region?  
How does this change affect freshwater supplies in your region?  
What consequences might this lead to? Provide examples.

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### Exercise 2.

Find the pairs in the table "The impact of climate change on the hydrosphere".

Reasons	The consequences
A. Increase in average air temperature	1. Drying up of large bodies of water
B. Decreased precipitation	2. Changes in river runoff
C. Increased rainfall	3. Rapid spread of pathogenic microorganisms
D. Changes in precipitation	4. Melting of snow and ice and rising sea levels

Write your answer in the table:

A	B	C	D

### Exercise 3.

Imagine living in your hometown (or region) in 2050. Climate change has significantly impacted water resources. Describe the changes that have occurred to water resources and how human life and nature have changed under these conditions.

Helpful questions:

1. Where does your home's water come from? Is it the same source as it is now?
2. How do you use it? Are there any strict restrictions?
3. How much does water cost? Is it a luxury?
4. How has the surrounding landscape (rivers, lakes, vegetation) changed?
5. What new technologies or habits have people adopted to save water?

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### Exercise 4.

The virtual water footprint is the volume of water used to produce the goods and services we consume. The table provides approximate data on the virtual water footprint of some products.

Product	Water footprint
Beef	15 000 l/kg
Cheese	5 000 l/kg
Rice	3 500 l/kg
Egg	196 l/piece
Apples	700 l/kg
Wheat bread	1 600 l/kg
Coffee	1120 l/litre
Tea	120 l/litre
Milk	1300 l/litre



#### Helpful questions:

Remember what you had for breakfast today (or yesterday). Estimate the approximate "water footprint" of your breakfast. (For example: 1 cheese sandwich and tea: bread (100g) = 160 l + cheese (50g) = 250 l + tea (250g) = 60 l. Total = 470 l. \_\_\_\_\_  
\_\_\_\_\_

#### Think and answer:

a) How does food production (especially livestock and irrigated agriculture) contribute to climate change? (Hint: deforestation, greenhouse gas emissions, high water consumption).  
\_\_\_\_\_  
\_\_\_\_\_

b) What three steps can you take to reduce the water footprint of your diet without reducing your intake of essential vitamins, micro and macronutrients?  
\_\_\_\_\_  
\_\_\_\_\_

## Interesting facts

### Disappearing Lakes

**Lake Poopó in Bolivia.** The second-largest salt lake after Lake Titicaca that has evaporated due to global warming.

**Lake Urmia in Iran.** Previously over 140 kilometers long and 50 kilometers wide, its volume has now decreased by 95% to 32 cubic kilometers. This was caused by a severe drought that began in 1998.

**Lake Chad in Africa.** Since the 1960s, Lake Chad has lost 90% of its surface area. Its shrinkage is due to persistent drought, extensive water withdrawal for irrigation and other human activities, and natural variability in water availability.

# 17

## How climate change affects agriculture

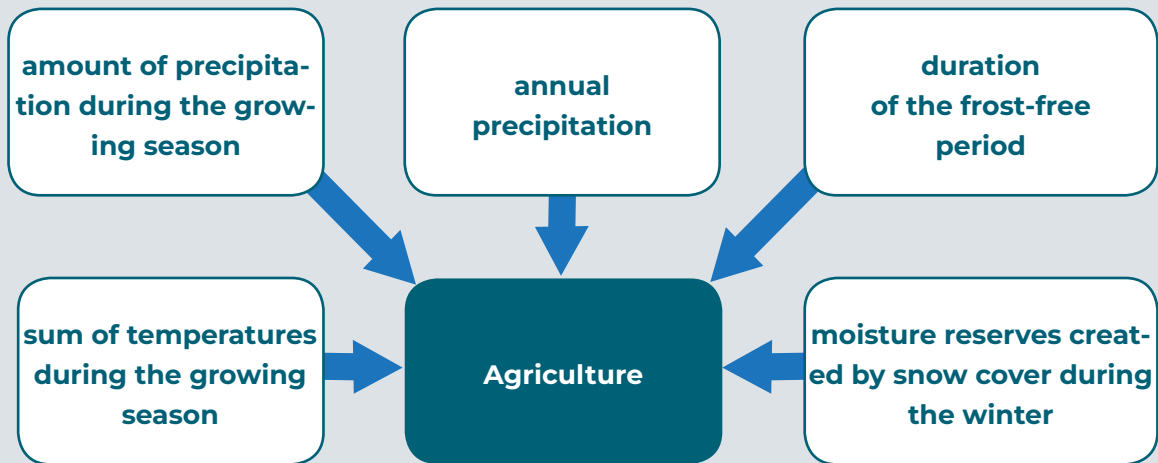
### Exercise 1.

List the sectors of agriculture that are highly dependent on climatic conditions. Explain why.

Sectors of agriculture	Reasons

### Exercise 2.

Look at the diagram "Climate Factors Affecting Agriculture" and circle the factors that are affected by climate change.



### Exercise 3.

Place the events in the correct order – from cause to effect:

1. hunger and poverty;
2. declining crop yields;
3. climate change;
4. increasing greenhouse gas emissions;
5. drought;
6. population migration;
7. increasing food prices;
8. rising temperatures.

Answer: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Exercise 4.****Can the listed adaptation methods be applied in your area?**

Methods	Yes/No
Using climate-resilient crop varieties.	
Improving soil health.	
Implementation of water-saving irrigation systems (for example, drip irrigation).	
Planting trees.	

**Explain your selection.**


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**Exercise 5.****Design a smart farm.**

Draw a diagram of a future agricultural enterprise (a farm, a nursery, a greenhouse, a berry and vegetable plantation, or something else) that is adapted to climate change through the use of various technological means. Label the means next to their intended purpose.

**Example:**

- "Drip Irrigation System" → "Saving water during drought";
- "Solar Panels" → "Clean energy for farm needs";
- "Rain Collectors" → "Water collection for irrigation".

# 18

## The impact of climate change on coastal regions

### Exercise 1.

Write three reasons why people have inhabited sea coasts since ancient times?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

### Exercise 2.

Give three examples of the impact of climate change on coastal fisheries.

- |    |  |
|----|--|
| 1. |  |
| 2. |  |
| 3. |  |



### Exercise 3.

Look at the table.

The effects of global warming on oceans and seas	
How climate change affects oceans and seas	Main consequences and risks
Increase in water temperature (ocean warming). Thermal expansion of water Melting of sea ice. Ocean acidification (decrease in pH).	Heat stress for marine organisms, coral bleaching and degradation of coral reefs, reduction of biodiversity, migration of marine species to cooler regions. Sea level rise, flooding and erosion of coastal areas, salinization of freshwater, risks to infrastructure. Reduction of sea ice cover, increased ocean warming, disruption of polar ecosystems. Difficulty in forming shells of mollusks and skeletons of corals, changes in marine ecosystems.

Analyze the consequences listed in the table. How might these changes affect people's lives and economic activities?

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### Exercise 4.

To protect coastal areas from rising sea levels, countries around the world are using a comprehensive approach, employing various types of solutions. Describe how the following adaptation measures fulfill their protective function.

Adaptation measures	Protection function
Restoration of mangroves	
Conservation and restoration of salt marshes and salt flats	
Creation and expansion of dunes	



### Interesting facts

#### Sea Level Rise

Since 1900, the level of the world's oceans has risen by about 20–24 cm. Today it is increasing at a rate of about 3–4 mm per year. By the end of the 21st century, sea level may rise by another 30–100 cm, creating a risk of flooding for low-lying coastal areas.

#### Population of Coastal Zones

More than 600 million people live in coastal areas located less than 10 meters above sea level. These territories are especially vulnerable to storms, coastal flooding, and sea-level rise.

#### Coral Reef Bleaching

Due to rising ocean temperatures, about 50% of the world's coral reefs have already been lost or severely degraded. If global temperatures increase by 1.5–2 °C, 70–90% of coral reefs could disappear.

#### Melting of Sea Ice

The extent of Arctic sea ice in summer has been decreasing by about 13% per decade since satellite observations began in 1979. The loss of sea ice accelerates ocean warming and disrupts polar ecosystems.

# 19

## How climate change affects mountain regions

### Exercise 1.

**Project task.** The famous mountain resort of N has relied on winter tourism for decades. However, due to climate change, snowfall has begun to fall later and melt earlier. Suggest three ideas on how the resort can adapt to these changes to regain its popularity among tourists.

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### Exercise 2.

Due to global warming, climate zones in the mountains are shifting upward. Which animals and plants from the list below will suffer more and why?



Marmot



Mountain goat



Edelweiss



Mountain thyme

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### Exercise 3.

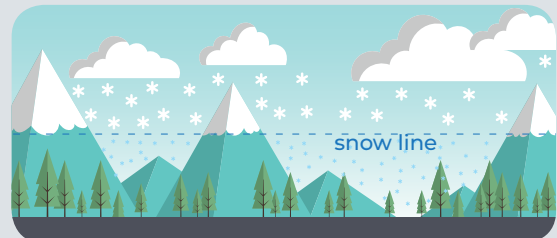
Determine the conditions necessary for the formation of glaciers:

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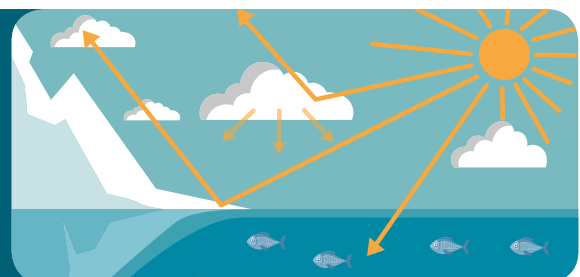
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**Albedo** is the proportion of light a surface reflects. The albedo of the Earth's surface determines how much incoming solar energy or sunlight is reflected back into space.



**Exercise 4.**

Write the main areas where glaciers are located on Earth.



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**Exercise 5.**

Give examples of the mutual influence of climate and ice cover.



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**Interesting facts**

According to a study published in 2023 in the scientific journal Science, if global temperatures rise by 1.5 °C, 50% of the world's glaciers could disappear, causing sea levels to rise by 9 cm. If warming reaches 4 °C, 80% of glaciers could melt, leading to a 15 cm rise in sea levels.

To raise awareness about glacier preservation, the United Nations General Assembly declared 2025 as the International Year of Glaciers' Preservation and proclaimed March 21 as the World Day for Glaciers. These initiatives emphasize the importance of protecting glaciers to help mitigate the impacts of global warming.

# 20

## How climate change affects mountainous regions

### Exercise 1.

The Arctic region is known for its extensive sea ice, which provides habitat for many species, including polar bears, seals, Arctic foxes, and walrus. However, climate change is causing rapid melting of the ice directly impacting their habitats.

What threat does the shrinking ice cover cause to polar bears?

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What are the challenges to the survival of harp seals?

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How climate change is affecting the decline of reindeer populations?

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### Exercise 2.

What are the main challenges and opportunities for Arctic indigenous peoples and their traditional ways of life related to the climate change?

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### Exercise 3.

An equally serious problem is the thawing of permafrost. In some places, permafrost reaches 1,500 meters, but typically, the frozen layer, with temperatures ranging from  $-2$  to  $-7^{\circ}\text{C}$ , is up to 100 meters thick.

Look at the photo and answer what the consequences of permafrost thawing are for:

- The natural environment?
- Infrastructure (roads, buildings, pipelines)?
- The global climate?

Name the consequences of permafrost thawing shown in the pictures.



### Exercise 4.

Look at the photo. Identify possible factors contributing to the ice sheet's thinning.



The upper part of the Fedchenko Glacier in 2005 and 2018.  
Decreasing glacier area in the Pamir Mountains

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# 21

## How climate change affects desert regions

### Exercise 1.

What impact do desert conditions have on human life and economic activity?



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### Exercise 2.

Complete the definitions.

\_\_\_\_\_ – an area of diverse natural zones characterized by an extremely arid climate, where evaporation is several times greater than precipitation.

\_\_\_\_\_ – the process of expansion of the area of deserts at the expense of adjacent territories, which can be facilitated by natural causes such as cyclical changes in climate and river flow, leading to periodic droughts.

### Exercise 3.

Ranking of the world's most unique deserts. Fill in the blanks.

- The largest desert on the planet, occupying approximately 25% of the African continent – \_\_\_\_\_.
- The largest desert in Eurasia – \_\_\_\_\_.
- The largest desert in Australia – \_\_\_\_\_.
- The driest desert in the world – \_\_\_\_\_.
- The largest desert in Central Asia – \_\_\_\_\_.

**Exercise 4.**

Fill in the blanks in the diagram «How Climate Change Causes Desert Expansion.»



**Exercise 5.**

What causes sand and dust storms? If you've ever been caught in a sand or dust storm, describe your experience.

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**Exercise 6.**

Desertification has negative consequences, which can be of environmental, economic and social nature. Provide examples.

Ecological consequences of desertification	
Economic consequences of desertification	
Social consequences of desertification	



### Exercise 7.

Choose one desert dweller (for example, a camel, fennec fox, meerkat, scorpion, saxaul, or other).

- What specific problems does climate change cause for it?

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- How can this species adapt to survive in new conditions?

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### Interesting facts

In some deserts, such as the Sahara, artifacts and fossils can be found that testify to past life. This includes fossilized dinosaur remains and stone tools from ancient civilizations.

In deserts, dry lakes or salt flats form as a result of the evaporation of temporary pools. They often contain high levels of minerals that can be used industrially.

The Sahara and Arabian deserts are known for their sandstorms, known as khamsin and shamal, respectively. These winds can reach speeds of up to 100 km/h and lift sand up to 1.5 km high.

The world's youngest desert is Aralkum, located in Uzbekistan and Kazakhstan. Having begun to form on the site of the dried-up Aral Sea about 50 years ago, it is still in the process of formation. The primary cause of Aralkum's formation is an ecological disaster caused by humanity.

# 22

## How climate change affects desert regions

### Exercise 1.

Answer the question "What is a city?".

Write a definition in your own words (2–3 sentences):

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### Exercise 2.

Complete the definitions.

\_\_\_\_\_ – is the growth of cities due to the migration of population from rural areas in search of better jobs and living conditions.

\_\_\_\_\_ – is a giant city formed as a result of merging several neighboring cities and urban agglomerations.



### Exercise 3.

Establish cause and effect relationships.

A) Indicate the main causes of climate change associated with urban activities:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

B) How is climate change already affecting the city and its residents?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Exercise 4.** Select the correct statements.

- A. Climate change is a serious threat that requires immediate action.
- B. We need to focus on technology and innovation to adapt.
- C. The key is to change human behaviour, and not technology alone.
- D. Climate change is not a serious problem.
- E. Cities are major sources of greenhouse gas emissions.

Answer: \_\_\_\_\_

**Exercise 5.** Please indicate which of the following you observe in your city.

- In summer, the city center is much hotter than parks or outskirts.
- Storm drains cannot cope with rainfall.
- Public transportation (such as buses) use hydrocarbon fuels.
- There are not enough trees and shade.
- Wind speeds are lower in the city than outside of it.

**Exercise 6.** Suggest measures that could improve the microclimate in your city.

Areas of activity	Necessary measures
Construction and Architecture	
Transportation	
Energy	
Healthcare and social Welfare	
Tourism	

**Exercise 7.** True or false.

1. Urban heat islands are exacerbated by large amounts of asphalt and concrete.		
2. Electric vehicles increase greenhouse gas emissions.		
3. Planting trees can reduce temperatures.		
4. The higher the temperature, the less likely flooding is.		
5. Tall buildings and narrow streets disrupt wind flows and make it difficult for the surface to cool.		

# 23

## How climate change affects cities

### Exercise 1.

List the main characteristics of urban and rural settlements.

Urban settlements	Rural settlements

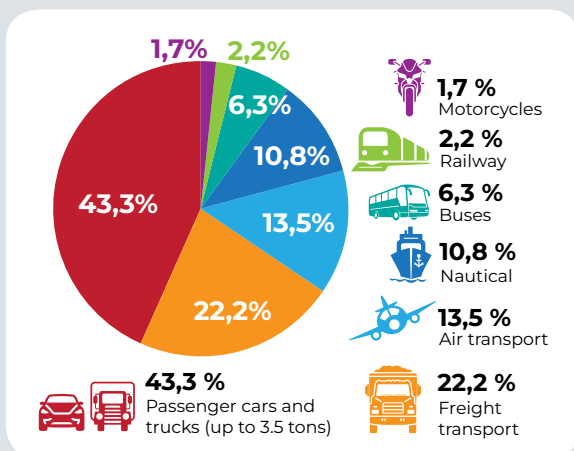
### Exercise 2.

Select and mark the correct statements about the climatic features of cities:

1. Large settlements have a unique climate;
2. Atmospheric transparency is higher in cities;
3. Cities are warmer at night than the surrounding countryside;
4. Urban surfaces, such as asphalt, have a high albedo;
5. Precipitation is more frequent in cities.

### Exercise 3.

Analyze the diagram «Impact of different modes of transport to CO<sub>2</sub> emissions in the city» and propose urban measures to help reduce these emissions.




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**Exercise 4.**

**Read the definition. Answer the question.**

**A sustainable city or eco-city** is a city designed with consideration for its environmental impact, where residents aim to minimize the consumption of energy, water, and food resources, reduce unnecessary heat emissions, decrease air pollution from carbon dioxide and methane, and prevent water pollution.

**What changes or transformations should be implemented in your city to make it more environmentally friendly?**

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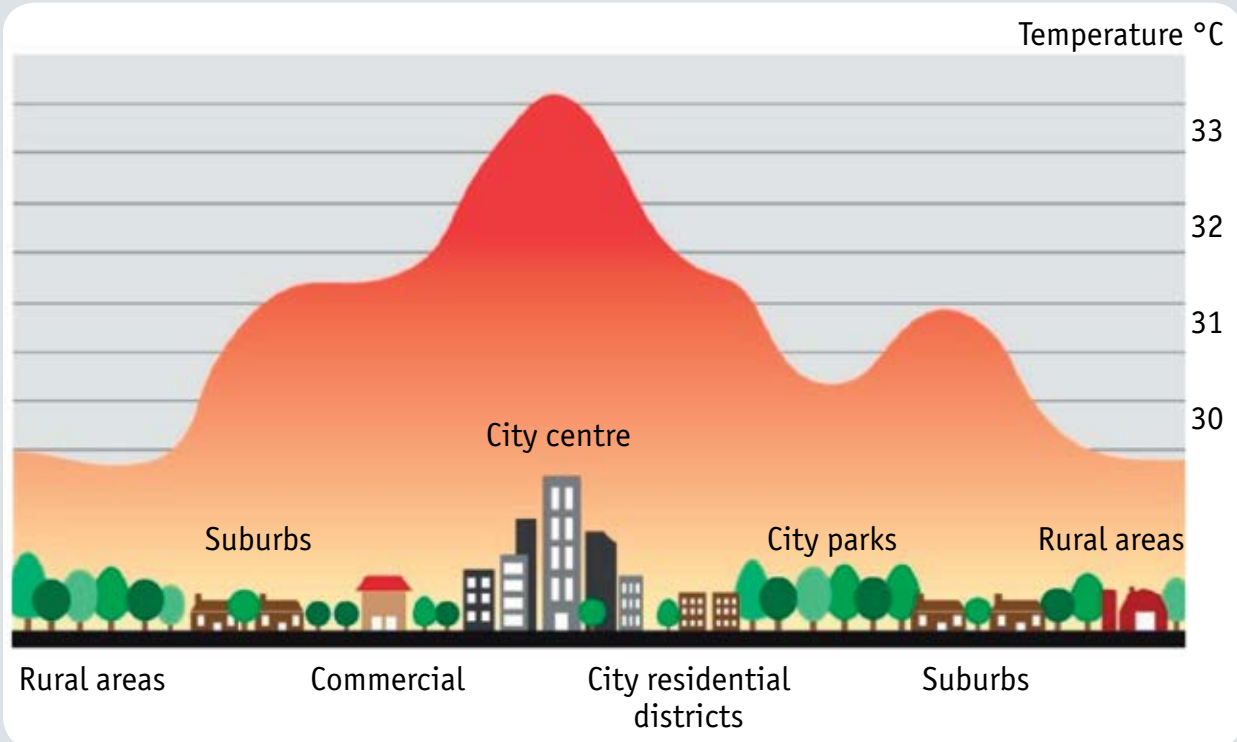
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**Exercise 5.**

**Analyse the temperature graph in the city centre, suburbs, and rural areas.**



**Why is it happening so?**

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**Suggest 3 ways to "cool down" the city:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

# 24

## The impact of climate change on social problems

### Exercise 1.

Climate change has a serious impact on human health. The most vulnerable groups include children, the elderly, people with pre-existing chronic conditions, and residents of low-income countries with limited capacity to adapt.

The causes of climate change impact on human health are presented in the table in the left. Fill in the right column with the consequences (using the example provided).

Causes	Consequences
1. Increased frequency and intensity of heat waves	1. Heat stroke, exacerbation of cardiovascular diseases
2. Deteriorating air quality	2.
3. Spread of mosquitos	3.
4. Floods and flooding	4.
5. Violation of food and water security	5.

### Exercise 2.

List 5 social problems that are exacerbated by climate change.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_





**Exercise 4.**

**Read the three short stories about people.**

1. Resident of an island state: "The sea is flooding our garden, and the water in the well has become salty."
2. Farmer from a drought-stricken region: "No harvest for the third year because of drought. We have nothing to feed our family."
3. Residents of coastal town: "Our house was destroyed by a hurricane of unprecedented strength."

**Identify the root cause of each person's problem and give them a common name. What advice could you give them to avoid catastrophic consequences?**

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**Exercise 5.**

**Two families with different incomes live in a city threatened by flooding. The higher-income family lives in a sturdy house on a hill and owns a car. The lower-income family lives in a flimsy house in a low-lying area and does not own a car.**

Which family will suffer more?

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Why?

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How can the society help more vulnerable groups?

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# 25

## Electric Power. Natural Resources of the Country and the World

### Exercise 1.

Select the correct answers.

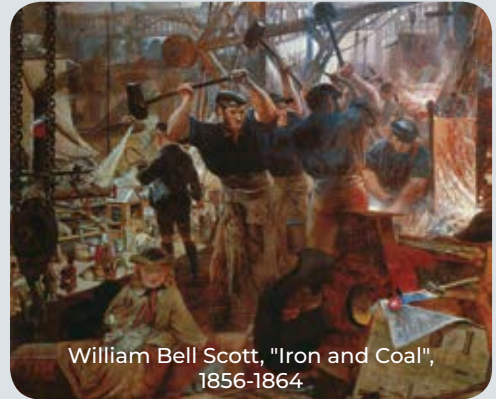
#### 1. Which energy source did humans begin to use first?

1. Coal;
2. Water power;
3. Wood;
4. Wind;
5. Oil;
6. Solar radiation;
7. Tides;
8. Natural gas.



#### 2. Why did coal become necessary during the Industrial Revolution?

1. Winters were cold during this period.
2. Coal was the fuel for the ferrous metallurgy.
3. Windmills stopped working.
4. Steam engines appeared.
5. Coal deposits were accessible for mining.



#### 3. Why did people begin to search for alternatives to the use of oil and coal in the second half of the 20th century?

1. Their reserves were depleted.
2. Their harmful impact on the environment became increasingly evident.
3. Their reserves were unevenly distributed, leading to serious international conflicts.
4. A method for efficiently generating energy from renewable sources was developed.
5. Alternative energy sources are cheaper than traditional ones.



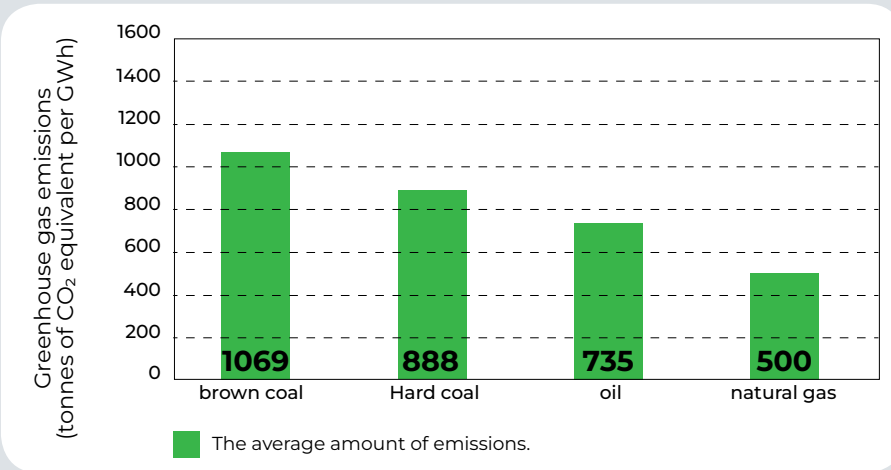
### Exercise 2.

Name the renewable energy sources shown in the pictures.



### Exercise 3.

Graph analysis. Look at the graph of CO<sub>2</sub> emissions from different energy sources. Which energy source, in your opinion, is associated with the highest emissions? Why is this a climate problem?



### Exercise 4.

#### Practical assignment.

Imagine you're an ecologist. Create a short list of three reasons why humanity should reduce its use of fossil fuels, other than climate change.

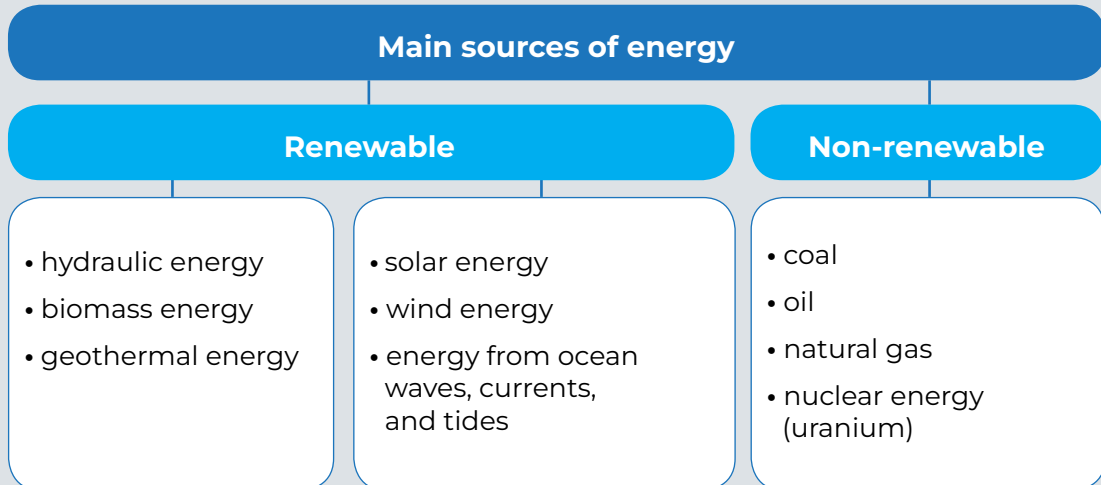
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

# 26

## Minerals. Main Sources of Energy

### Exercise 1.

Look at the diagram and fill in the missing terms in the definitions.



\_\_\_\_\_ energy sources are natural energy resources that are replenished naturally within a relatively short period of time and can be used without depletion if managed responsibly.

\_\_\_\_\_ energy sources are natural resources whose reserves are limited and which do not replenish within a human lifetime.

### Exercise 2.

Read the text and answer the question.

Water is one of the oldest energy sources harnessed by humans. For millennia, water has been used not only for irrigation but also to power various mechanical devices, such as watermills, sawmills, dock cranes, and elevators. Today, hydroelectric power is the most widely used form of renewable energy. The main obstacle to the wider development of hydropower is its environmental impact.

**What components of nature does hydropower have the greatest negative impact on?**

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**Exercise 3.** Analytical task "Energy map".

Carefully study the diagram showing the structure of global energy consumption (hypothetical data). Answer the questions.

1. What are the three most widely used energy sources in the world? Why do you think that is so?

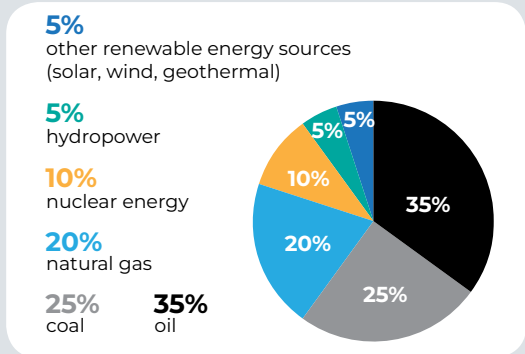
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2. What is the share of the renewable energy sources (hydropower + other renewable energy sources) in the overall energy source? Do you think it is sufficient?

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3. Which of the following energy sources emit greenhouse gases (mainly CO<sub>2</sub>) during energy production? List them.

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**Exercise 4.** Read the text and answer the question.

Biomass is considered a renewable energy source because the energy it contains is produced through photosynthesis, when plants convert the sun's radiant energy into hydrocarbons. Biogas is a type of biofuel formed through the anaerobic (oxygen-free) decomposition of organic waste. In the absence of oxygen, microorganisms break down organic matter and release a mixture of gases. When captured, this gas — consisting primarily of methane and carbon dioxide — can be used as fuel. Biogas provides a natural way to convert waste into energy.

**Why is the use of biogas considered more environmentally friendly compared to the use of oil and natural gas?**

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**Exercise 5.****Read the text and answer the question.**

Geothermal energy is derived from heat generated deep within the Earth. Beneath the Earth's crust lie hotter layers that contain molten rock called magma. Magma heats the surrounding rocks and groundwater. The heated water and steam can rise to the surface in the form of geysers, hot springs, and steam vents. Geothermal energy is considered a cleaner source of energy.

**Why, despite all the advantages of geothermal energy, has it not become more widespread?**

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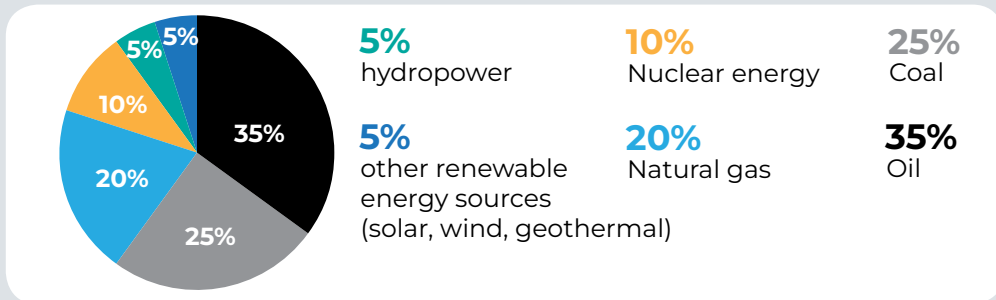
# 27

## Fuel and Energy Complex and Climate Change

### Exercise 1.

Look at the diagram "World Energy", name the main sources of energy.

What share is from fossil (non-renewable) energy sources? What share is from renewable energy sources?



Non-renewable –  %      Renewable –  %

### Exercise 2.

Compare three fuels by their CO<sub>2</sub> emissions when burned, and determine their impact on climate change: coal, oil, and natural gas. Draw a conclusion.



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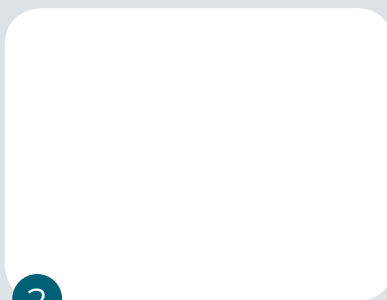
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### Exercise 3.

Creative task: draw a three-panel comic strip: "The Life of a Piece of Coal," showing its journey from mining to combustion and its impact on the atmosphere.



1



2



3



# 28

## Nuclear Energy: Problems and Prospects for Its Use

### Exercise 1.

Look at the pictures. Where is nuclear energy used? Label it.



1



2



3

### Exercise 2.

Which countries and regions of the world use nuclear energy most actively? Why? Name at least three reasons.

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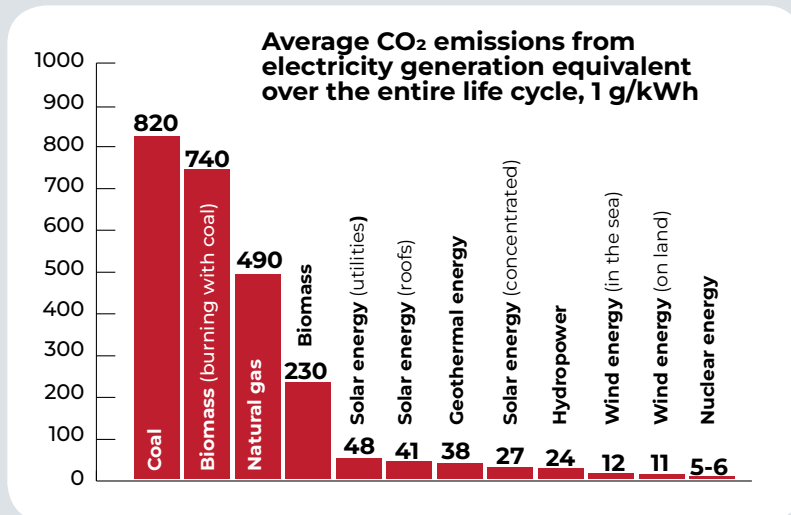
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### Exercise 3.

Compare the graph of CO<sub>2</sub> emissions from nuclear power plants and fossil fuel power plants. What is the key advantage of nuclear power in the context of climate change?



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# 29

## Renewable Energy Sources

### Exercise 1.

What is depicted in the pictures? What do these objects have in common?



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### Exercise 2.

In which regions of our planet is wind energy the most efficiently used of all renewable energy sources? Why?

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### Exercise 3.

In which regions of our planet would the use of solar panels be most rational? Why? Name these regions.

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### Exercise 4.

Project task.

If you needed to power a small, remote village, which renewable energy source would be your primary choice and why? Please specify the geographic location of the village (in the mountains, on the coast, in the sunny steppe) or other features of its location that influence the choice of renewable energy source.

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# 30

## Impact of Various Energy Sources on Humans and the Environment

### Exercise 1.

Fill in the missing cells in the table.

Sources of energy		Advantages	Disadvantages
Non-renewable	Coal		The process of burning coal pollutes the environment; large amounts of CO <sub>2</sub> are released that lead to an increase in atmospheric temperature.
	Oil	valuable products are obtained from oil; it is easily transported	
	Natural gas		
	Nuclear energy		Uranium resources are limited; high costs of extraction and transportation, risk of nuclear contamination.
Renewable	Solar energy		The high cost of solar cells; the service life of the cells is limited; the cells contain toxic substances.
	Wind energy		
	Tidal energy		
	Earth energy		
	Hydro-energy		Flooding of agricultural lands and settlements; disruption of the water balance of rivers.
	Biofuels		

### Exercise 2.

Fill out the table by marking the following in the appropriate cells: (-) indicates no criterion, (+) indicates a low criterion value, (++) indicates a high criterion value, and (+++) indicates a very high criterion value. Compare energy sources based on the following criteria:

Source	Criteria			
	CO <sub>2</sub> emissions	Stability of production	Cost	Safety
Coal				
Nuclear Power Plant				
Solar				
Wind Power Plant				

### Exercise 3.

Energy company slogans: "Expanding Horizons," "Energy in People," "Building a World that Works," "Open Energy for a Bright Future," "Energy Without Borders," "Energy and Warmth for Your Home." Choose one of the slogans and leave a comment on the message it conveys:




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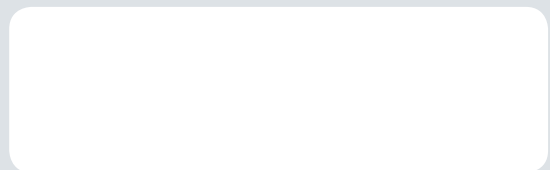
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### Exercise 4.

The images below symbolize renewable energy sources. Suggest your own design for a renewable energy logo.



## Interesting facts

**China has held the global lead in renewable energy development since 2013.**

China has the world's largest solar and wind power capacity, accounting for approximately 50% of the total increase in global renewable energy capacity. China is the "world's factory" for renewable energy technologies. It accounts for:

- 80% of global solar panel production.
- 60% of wind turbine production.
- Dominance in battery production.

# 31

## Transport and Protection of the Environment

### Exercise 1.

Write down the types of transport shown in the pictures.



1



2



3



4



5



6

Number them in order of decreasing impact on the climate, starting with the most "dangerous". **Answer:** \_\_\_\_\_

### Exercise 2.

Compare an electric car and a gasoline-powered car using the given criteria. Fill in the table. In the appropriate cells, indicate: (-) none, (+) low value, (++) high value, (+++) very high value.

Comparison plan	Gasoline car	Electric car
Greenhouse gas emissions during use		
Greenhouse gas emissions throughout the entire production chain		
Fuel cost		
Refueling time		
Range		
Refuelling capacity		
End-of-life disposal		

**Exercise 3.**

Electric vehicles are called "zero-emission vehicles." Is this always true? What determines an electric vehicle's actual carbon footprint?

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**Exercise 4.**

Read the text and answer the question.

Observing an airplane flying in a clear sky, you may notice a white condensation trail behind it. This trail forms as a result of the cooling and condensation of water vapor in the engine's exhaust gases. Under certain conditions, such trails can remain in the atmosphere for a long time, spread out, and contribute to the formation of cirrus-like clouds.

Emissions from aircraft engines (carbon dioxide, nitrogen oxides, and water vapor) affect the composition of the atmosphere and contribute to climate change.

**Why, despite the impact of aviation on the atmosphere, is road transport considered the main source of pollution in the transport sector?**

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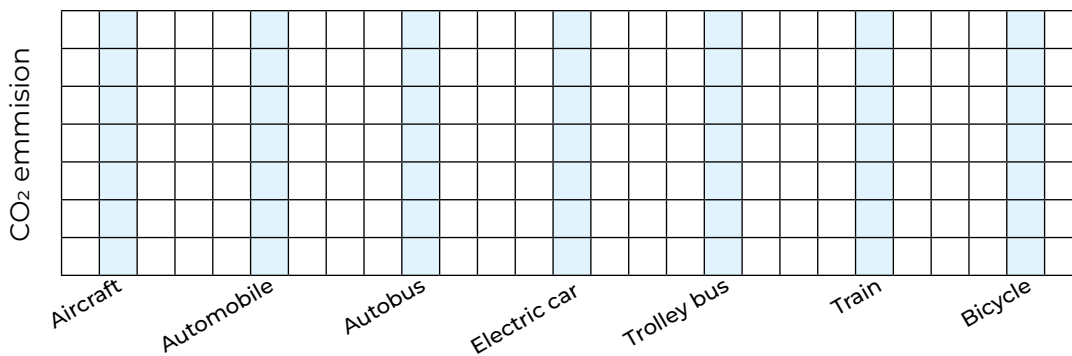
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**Exercise 5.**

Create a chart showing the average CO<sub>2</sub> emissions per passenger per 100 km traveled for different modes of transport. When calculating, focus not on the absolute emissions, but on the relative emissions between these modes.

**Average CO<sub>2</sub> emissions from operating transport per passenger.**



# 32

## Electric Heating and Lighting Devices

### Exercise 1.

Write down the electrical appliances your family uses in everyday life.

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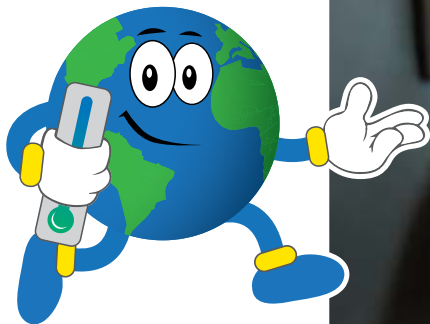


### Exercise 2.

Add keywords to the rules and methods for saving electricity.

#### Simple and effective ways to save electricity:

1. Replace regular incandescent light bulbs with \_\_\_\_\_.
2. Turn off the \_\_\_\_\_ when leaving the room.
3. Periodically clean the electric kettle from \_\_\_\_\_.
4. Do not place the refrigerator next to \_\_\_\_\_.
5. Hang \_\_\_\_\_ wallpaper and paint the ceiling in \_\_\_\_\_ tones. This will allow your room to reflect up to 80% of the sun rays.
6. Wipe light bulbs off \_\_\_\_\_.
7. Unplug \_\_\_\_\_ for your smartphone from the power outlet after use.
8. Dry clothes on \_\_\_\_\_.
9. Avoid ironing \_\_\_\_\_ clothes.
10. Don't place hot food in \_\_\_\_\_.



### Exercise 3.

Ask your parents the cost of 1 kilowatt-hour (kWh) of electricity. Using the "Electricity Consumption by Household Appliances" table, calculate your family's monthly electricity consumption and the cost of electricity bills.

Appliance	Power (Watt)	Operating time per day (hours)	Consumption per month (kWh) A	Cost of electricity per month A x 1 kWh
6 light bulbs, 60 watts each	360	10		
TV	100	10		
computer	200	10		
electric kettle	1,500	0.5		
refrigerator	225	15		
iron	1,500	0.5		
washing machine	300	1		
vacuum cleaner	700	0.3		
air conditioner	1,500	3		
mixer	450	0.3		
oven	1,000	0.5		
other	....	.....		
<b>Total:</b>				

Where and by how much could you reduce your electricity consumption?

How much money would you save in your family budget?

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### Interesting facts

A microwave oven uses 50% less energy than a conventional oven.

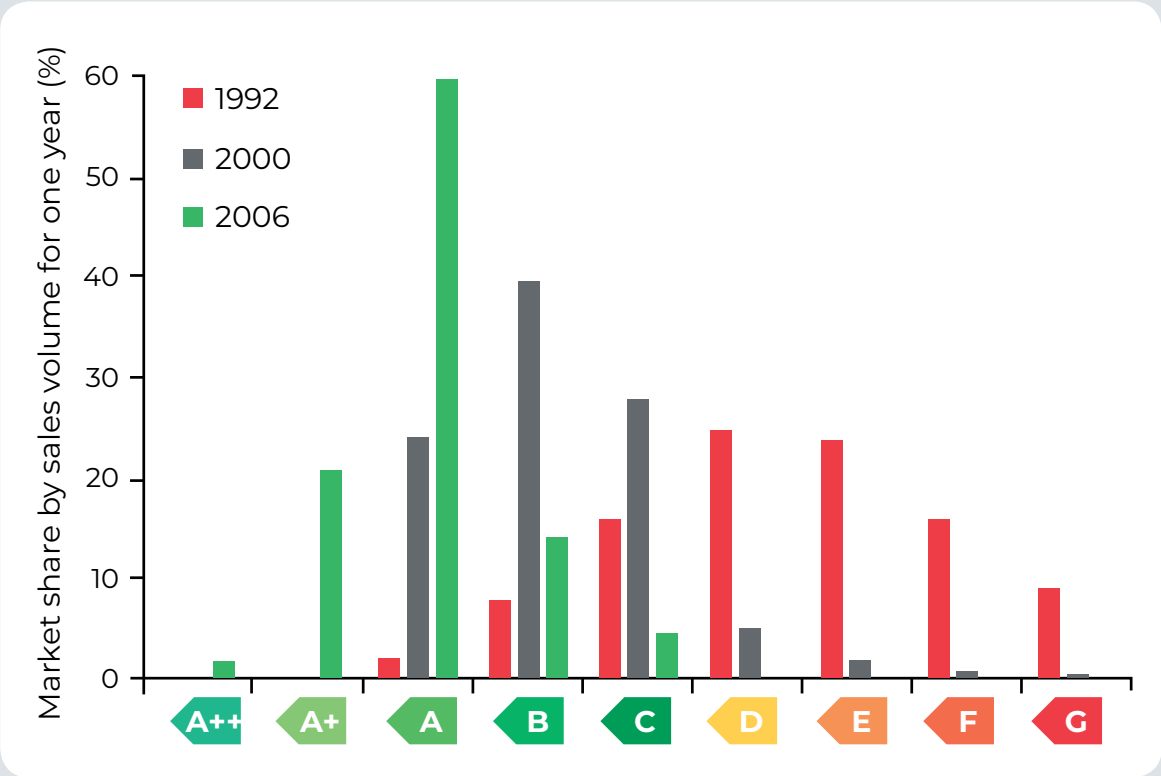
Some computers consume as much energy in standby mode as a small refrigerator.

If you cannot turn off your computer, turn off the monitor to save more than 50% of energy.

Wash with hot water only when necessary; otherwise, use cold water to achieve the same results while saving significant energy.

**Exercise 4.**

Which energy efficiency class (e.g. A, B, C, etc.) is most beneficial for the buyer and the planet? Why?




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**Exercise 5.**

Create a "5 simple rules" guide to saving energy when using household appliances:

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# 33

## Urban Management and Environment

### Exercise 1.

Look at the illustrations. What materials did people use to build structures in ancient times?



### Exercise 2.

Construction challenges include negative impacts on the climate, the use of materials with high greenhouse gas emissions (steel, cement) and energy inefficiency.

Suggest your own options for making the construction industry less harmful to the environment.

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### Exercise 3.

Key green construction methods:

- green roofs and walls;
- solar panels and rainwater collection systems;
- use of recycled and renewable materials.

Which of these methods might be applicable in your location?

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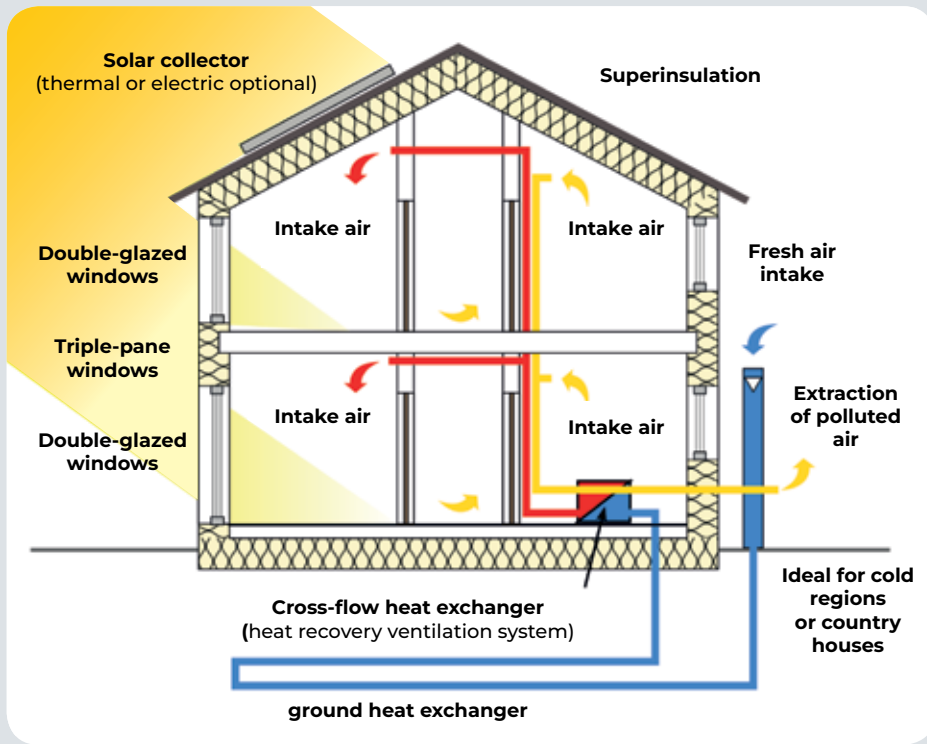
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**Exercise 4.**

Study the passive house diagram. Which components help save energy on heating and cooling? (Indicate 2-3 elements.)

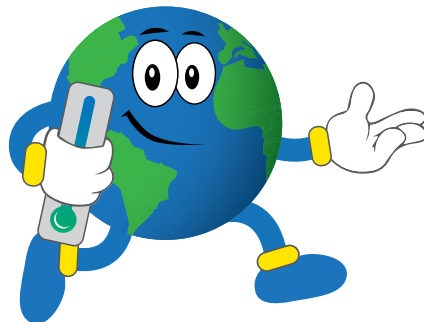


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# 34

## Green Cities. Ecological Construction

### Exercise 1.

These are some of the cleanest and greenest cities. What measures and features allow these cities to be considered among the most environmentally friendly?



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### Exercise 2.

Explain how developing public transport and cycling infrastructure makes the city not only more convenient, but also greener from an environmental and climate perspective.

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### Exercise 3.

Analyze to which extent the city you live in can be considered a "green city" using the following criteria: (-) means no criterion, (+) means low criterion value, (++) means high criterion value, and (+++) means very high criterion value.

A "green city" is more than just a city with plenty of parks. It is a complex, intelligent, and sustainable system where the environment, economy, and social spheres are balanced to ensure a high quality of life for current and future generations.

Nº	Criterion	Meaning of the criterion
1	<b>Biodiversity:</b> The presence and condition of parks, and the number of plant and animal species within the city limits.	
2	<b>Availability and accessibility of a separate waste collection system.</b>	
3	<b>Share of recycled waste:</b> A high percentage of waste is sent for recycling rather than to landfills or incineration.	
4	<b>Share of renewable energy sources (RES):</b> Use of solar, wind, and geothermal energy in the city's overall energy mix.	
5	<b>Climate change adaptation policy:</b> The city has strategies in place to combat floods, heat waves, and sea level rise.	
6	<b>Public transportation network development:</b> Availability of stops, frequency of service, and the share of electric vehicles (electric buses, trams, and metro).	
7	<b>Cycling and pedestrian infrastructure:</b> Extensive bike paths and safe pedestrian crossings.	
8	<b>Quality and availability of charging infrastructure for electric vehicles.</b>	
9	<b>Share of public green space:</b> The number of square meters of parks, squares, and lawns per resident is at least 9-12 m <sup>2</sup> .	
10	<b>Accessibility of green spaces:</b> The majority of the population lives within walking distance (5–10 minutes) of a park or square.	
11	<b>Availability of rainwater collection and utilisation systems.</b>	
12	<b>Permeability of surfaces:</b> A high proportion of areas not covered by asphalt or concrete allows water to drain into the soil.	
13	<b>Condition of the water supply network:</b> Water supply failures and water losses due to worn-out pipes are rare.	

**Exercise 4.**

By which criteria of task 3 does your city have the highest value, and by which the lowest?

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Make a list of 3 measures that the city mayor could take to reduce the impact that the city life support has on the climate (for example, replacing street lighting with LED, greening the roofs of bus stops, etc.).

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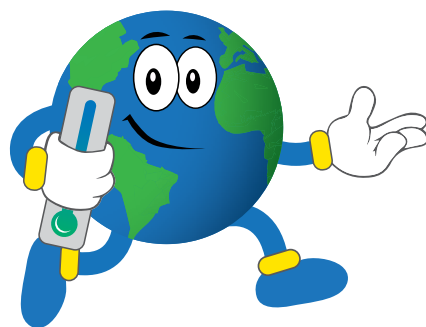
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# 35

## Carbon Footprint

### Exercise 1. Complete the definition.

\_\_\_\_\_ – the total amount of greenhouse gas emissions produced by a person, organization, event, product, city, or state, directly or indirectly.

### Exercise 2. Identify which carbon footprint source the following examples belong to:

Using a personal gasoline-powered car, buying clothes, packaging goods in plastic wrap, frequent air travel, natural gas production, transporting products, agriculture.

**Direct sources:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Indirect sources:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Exercise 3. Take a look at the diagram of the average person's carbon footprint. Which areas of life (food, transportation, housing) contribute the most? What components of these areas can be reduced and how?

#### Transportation 40%

personal car – 25%  
air travel – 10%  
public transport – 5%

#### Nutrition 30%

meat and animal products – 15%  
other products – 10%  
related processes – 5%

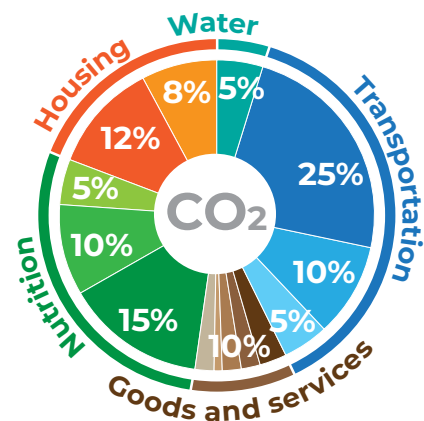
#### Housing 20%

Heating/cooling – 12%  
electricity – 8%

#### Goods and services 10%

clothes – 3%  
Electronics – 2%  
Leisure – 2%  
Furniture – 1%  
Services – 2%

#### Water supply 5%



\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Exercise 4.**

Analyze one typical day. Describe three actions that increase your carbon footprint and three actions you could take instead to reduce it (for example, ride a bike instead of driving).

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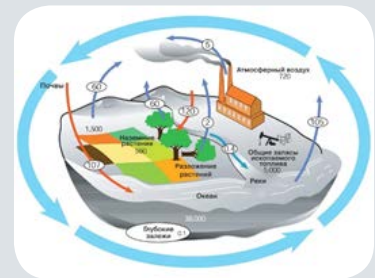
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**Exercise 5.**

Highlight the carbon footprint reduction tips that are relevant to you.

- Try to use public transportation and walk more often.
- Avoid frequent flights or, if possible, replace planes by trains.
- Buy local and seasonal products.
- Reduce meat consumption.
- Conserve energy in any form.
- Consume wisely. Avoid impulse purchases.
- Prevent food from spoiling.
- Separate waste and use reusable packaging.
- Conserve water when bathing, washing dishes, etc.



**Exercise 6.**

Read the text and answer the question:  
**What is a carbon polygon?**

Carbon polygons are areas where comprehensive research is conducted to monitor greenhouse gas levels in the atmosphere.

They are called carbon polygons because they primarily focus on the emission of carbon dioxide (from the Latin carboneum, meaning coal), along with other greenhouse gases such as methane and nitrous oxide.

Experiments with plant communities are conducted not only in forests, steppes, and mountainous areas; special attention is also paid to marine flora. Research shows that algae and other ocean plants are just as effective at absorbing carbon gases as ordinary trees and shrubs.

Where in your country could carbon polygons be built? Why in these areas?

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# 36

## Global Problems of Humanity and International Efforts to Overcome Them

### Exercise 1.

Look at the logos of international organizations:



Fill in the blanks with the abbreviations of the organizations.

- \_\_\_\_\_ – World Meteorological Organization.
- \_\_\_\_\_ – World Wildlife Fund.
- \_\_\_\_\_ – United Nations Environment Programme.
- \_\_\_\_\_ – Intergovernmental Panel on Climate Change.
- \_\_\_\_\_ – United Nations Development Programme.

### Exercise 2.

Answer the questions.

In which regions of the world are climate change issues most acute? Why?

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What actions is the international community taking to address these problems?

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### Exercise 3.

Imagine you are representing your country at an international climate conference. What proposal or initiative would you put forward to contribute to the common cause?

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**Exercise 4.**

**Working with information. What is the Paris Climate Agreement? What is its main goal?**

Find the information in the Climate Box. Present your answer as a cluster or diagram.

**Exercise 5.**

**Compare two approaches to the problem: "reduction of emissions" and "adaptation to the consequences." Provide one example of measures for each approach.**

**Reduction of emissions**

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**Adaptation to the consequences**

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**Exercise 6.**

Fill in the table by assigning the international agreements to the appropriate thematic categories.

	Thematic focus		
	A Climate change	B Environmental pollution	C Biodiversity
Agreement			

**Agreement:**

- 1) Paris Agreement (2015)
- 2) Montreal Protocol (1987)
- 3) Vienna Convention (1979)
- 4) Kyoto Protocol (1997)
- 5) Ramsar Convention (1972)
- 6) CITES Convention (1973)

**Exercise 7.**

A creative task.

Create a sketch of a poster or symbol for the international youth climate movement, which would reflect the idea of global cooperation and hope for a better future.

# Illustrations:

- **Page 2.** Globe logo: Anna Golovatyuk and Nathan Giuliano.
- **Page 6.** Anna Golovatyuk, Nathan Giuliano and the National Adaptation Plan of Armenia project of the UNDP and the Green Climate Fund
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- **Pages 9-10.** Nathan Giuliano.
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- **Page 14.** Fig.: <https://www.flickr.com/photos/usdagov/12308593123> , <https://www.flickr.com/photos/cifor-icraf/35187788493>, <https://hy.armradio.am/archives/569780>
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# **Collection of Worksheets for Integrating Climate Change into School Subjects**

E. Malts, A. Poghosyan, Y. Dobrolyubova, S. Kulieva, Y. Metelsky, A. Shamova, A. Klimova.

UN Development Programme  
2026

"Collection of Worksheets for Integrating Climate Change into School Subjects" complements the United Nations Development Programme (UNDP) Climate Box educational and game resource kit and is designed to support teachers as a supplementary resource for working with students. The collection aims to provide educators with a practical tool for integrating the topic of climate change into both classroom and extracurricular activities across multiple academic subjects.

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