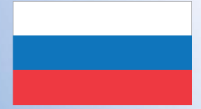


Climate Box

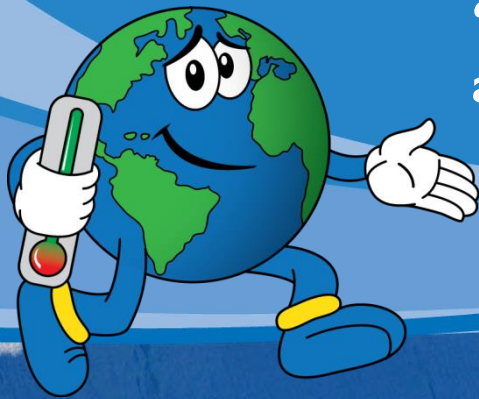


With financial support from
the Russian Federation



Empowered lives.
Resilient nations.

Module 2 Topic 2.1.1.1 Recommendations on the use of the “Climate box” interactive learning toolkit at primary, secondary and high schools



CONTENT OF SECTIONS



PART 1. The problem of climate change

- 1.1. Climate and weather
- 1.2. Climate types and climatic zones
- 1.3. How and why the climate has changed in the past
 - 1.3.1. Climate change causes: millions of years
 - 1.3.2. Climate change causes: tens and hundreds of thousands of years
 - 1.3.3. Climate change causes: centuries
- 1.4. Modern climate change

PART 2. How climate change affects nature and humans.

Can you adapt to the mandatory consequences?

- 2.1. How climate change affects the weather
- 2.2. How climate change affects plants and animals
- 2.3. How climate change affects forests
- 2.4. How climate change affects water resources
- 2.5. How climate change affects agriculture
- 2.6. How climate change affects coastal regions
- 2.7. How climate change affects mountain regions
- 2.8. How climate change affects the Arctic regions
- 2.9. How climate change affects cities
- 2.10. How climate change affects social problems

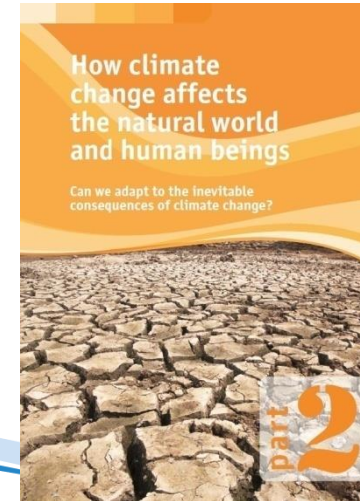
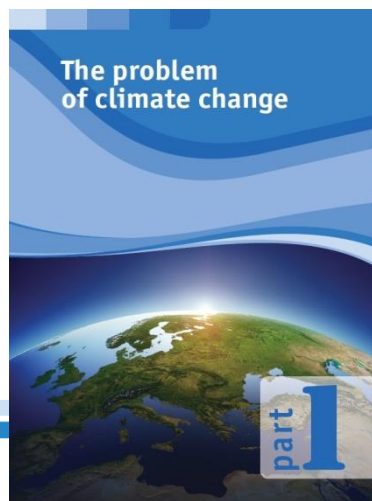
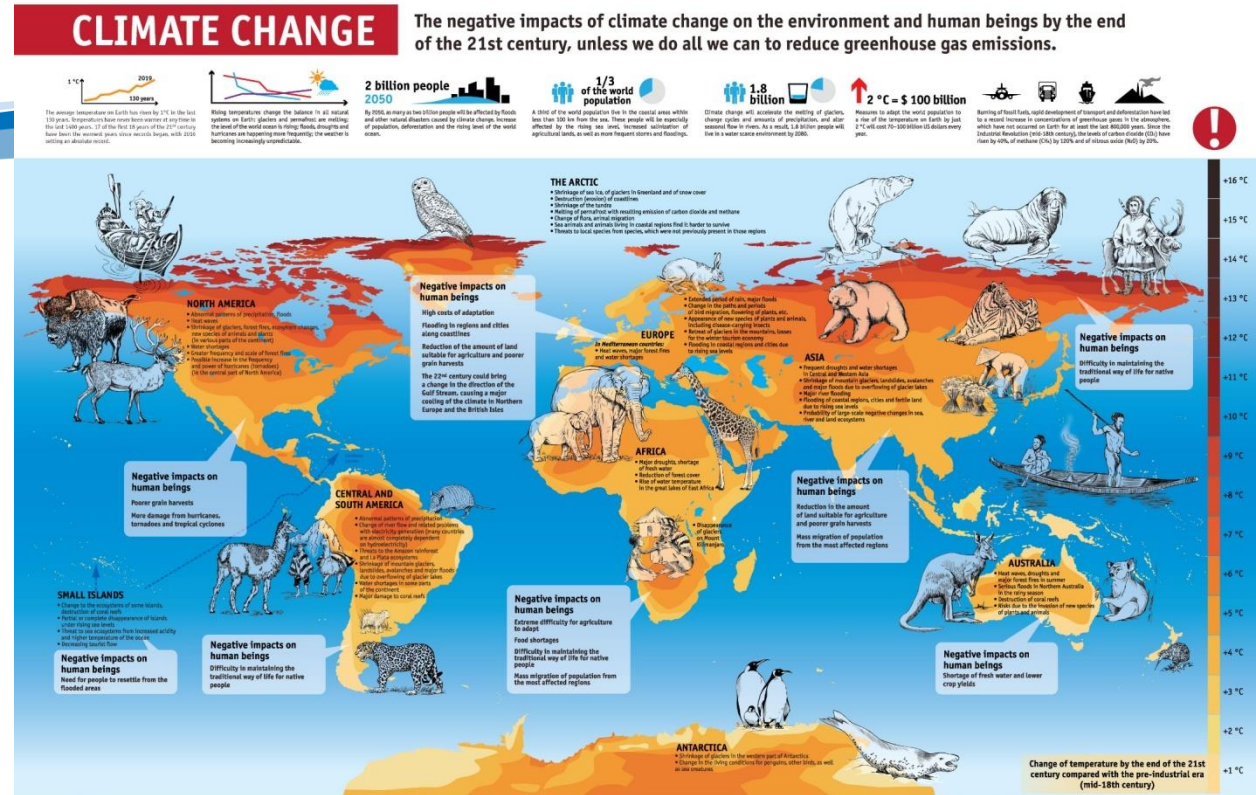
PART 3. How to prevent dangerous climate change?

- 3.1. "Green" energy sources
 - 3.1.1. What is energy?
 - 3.1.2. Main energy sources
 - 3.1.3. Hydrocarbon energy sources
 - 3.1.4. Nuclear power
 - 3.1.5. Renewable energy sources
 - 3.1.6. Advantages and disadvantages of different energy sources
- 3.2. Energy efficiency and energy saving
 - 3.2.1. Eco-friendly types of transport
 - 3.2.2. Household appliances and electrical appliances
 - 3.2.3. Green building. Passive and active houses
 - 3.2.4. Green cities
- 3.3. Carbon footprint
- 3.4. How can I help the planet? Reducing our carbon footprint
- 3.5. Global cooperation in climate change and sustainable development

Section 4. Methodological recommendations for teachers on the use of the "Climate Box" interactive learning toolkit at school

CONTENT OF SECTIONS

The material of the main sections will help students to identify types of climate and natural areas, show the relation between geographical components of natural systems, identify, describe and explain the essential features of geographical objects and phenomena, conduct weather observations, individual geographic objects, processes and phenomena, their changes in the result of natural and anthropogenic impacts, use alternative forms of energy, observe the rules of conduct in dangerous situations, prudent use of resources at home and school, and in nature.



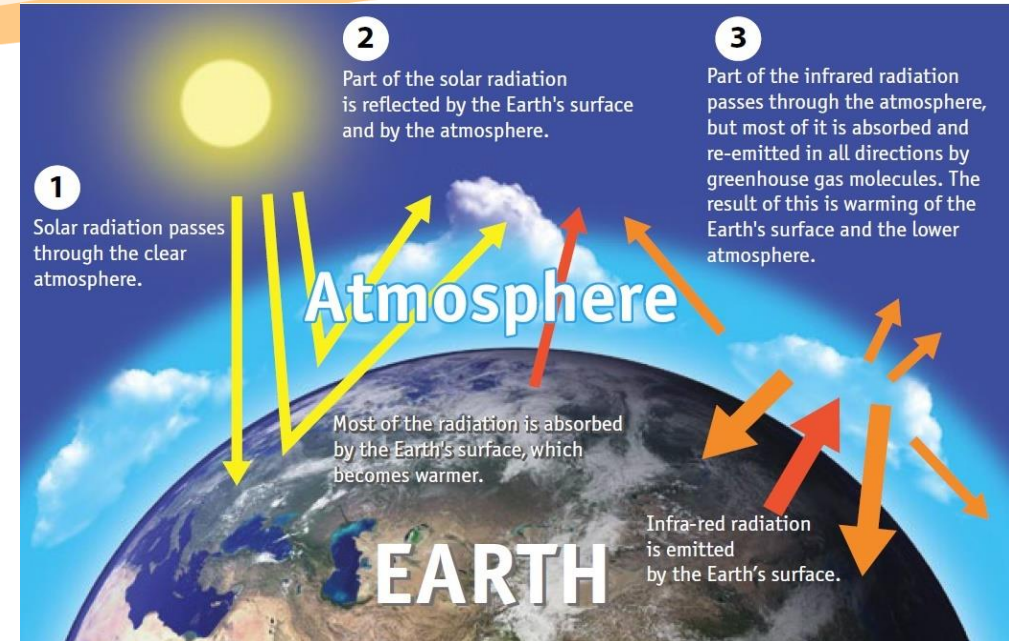
INFORMATIVENESS. FACTS. EXPLANATIONS

A large number of facts of natural anomalies, examples of the effects of climate change on coastal, mountain, Arctic regions, forests, cities and countries will allow students to analyze information independently, build hypotheses and forecasts for natural processes and phenomena in relation to their regions. It will contribute to the formation of a correct, responsible attitude to the problem of climate change and their own influence on this process.

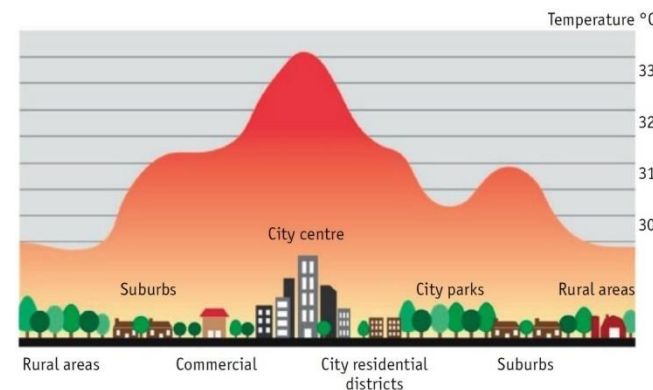
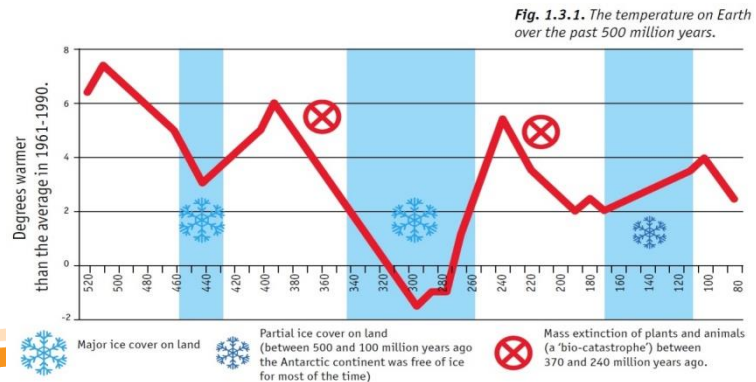


ILLUSTRATIONS. SCHEMES. GRAPHS. EXAMPLES

The colorful illustrations, diagrams, and graphs by the example of the causes of climate change in the past will help to solidify knowledge about evolution, the modern form of the mother Earth; the spatial difference in climate formation processes, geographical features of natural complexes of different continents and oceans, environmental management practices, natural and anthropogenic causes of environmental problems, measures to preserve nature and protect people from natural and anthropogenic, the greenhouse effect and biodiversity of life, and the human carbon footprint on Earth.



- Carbon footprint**
- E-mail message - 4 g
 - the same message, if it contains a sufficiently large attachment - 50 g
 - plastic bag in the store - 10 g
 - 0.5 liter bottle of local water - 110 g
 - a bottle - 160 g
 - ice cream - 500 g
 - a pair of jeans - 6 kg



CONSOLIDATION OF KNOWLEDGE

The questions and tasks offered in the textbook will allow you to use your knowledge in practice.

The textbook will help the teacher to lay the groundwork of a scientific worldview, develop intellectual abilities and cognitive interests of students.



Poplar



Task 2.

Game

Imagine that you are taking part in the United Nations Conference on Climate Change and you are going to discuss the problems of different countries related to climate change.

Prepare a brief welcome speech that the head of your state will read to all the Conference participants. The speech should mention:

- the climate and main natural resources of your country;
- how people in your country live;
- the chief sectors of your country's economy;
- the impact of climate change on nature, people and the economy;
- what your country expects the Conference to achieve.

After the welcome speech the Conference participants express their views on how to prevent the negative impacts of climate change on the environment and on people in the countries taking part in the Conference.

At the end of the game, the participants select a winner – the student who made the most contribution to the discussion, and who said the most relevant, well-argued and interesting things.

Task 3.

You are a governmental officer of a small island state in the Pacific region. Currently, you are preparing a proposal to apply for international financial support to help your country cope with the negative impacts of climate change. Reflect the following issues in your funding proposal:

Questions

1. It's cold outside, and the heating isn't working indoors. Which pieces of advice will be most useful for keeping warm at home and why?

- 1) wear a warm sweater and socks;
- 2) put a carpet under your feet;
- 3) have something to eat;
- 4) drink hot tea;
- 5) turn on an electric heater;
- 6) dance, jump or run;
- 7) light a fire in the stove or fireplace;
- 8) take a hot bath;
- 9) sit in the sun.

2. What is more economical and when is it more economical – taking a bath or taking a shower?

3. Can installation of water meters help to save energy? Why?

4. Do we use energy when we use water in an apartment building? What sort of energy do we use?

5. What do you already do in your home to save energy?

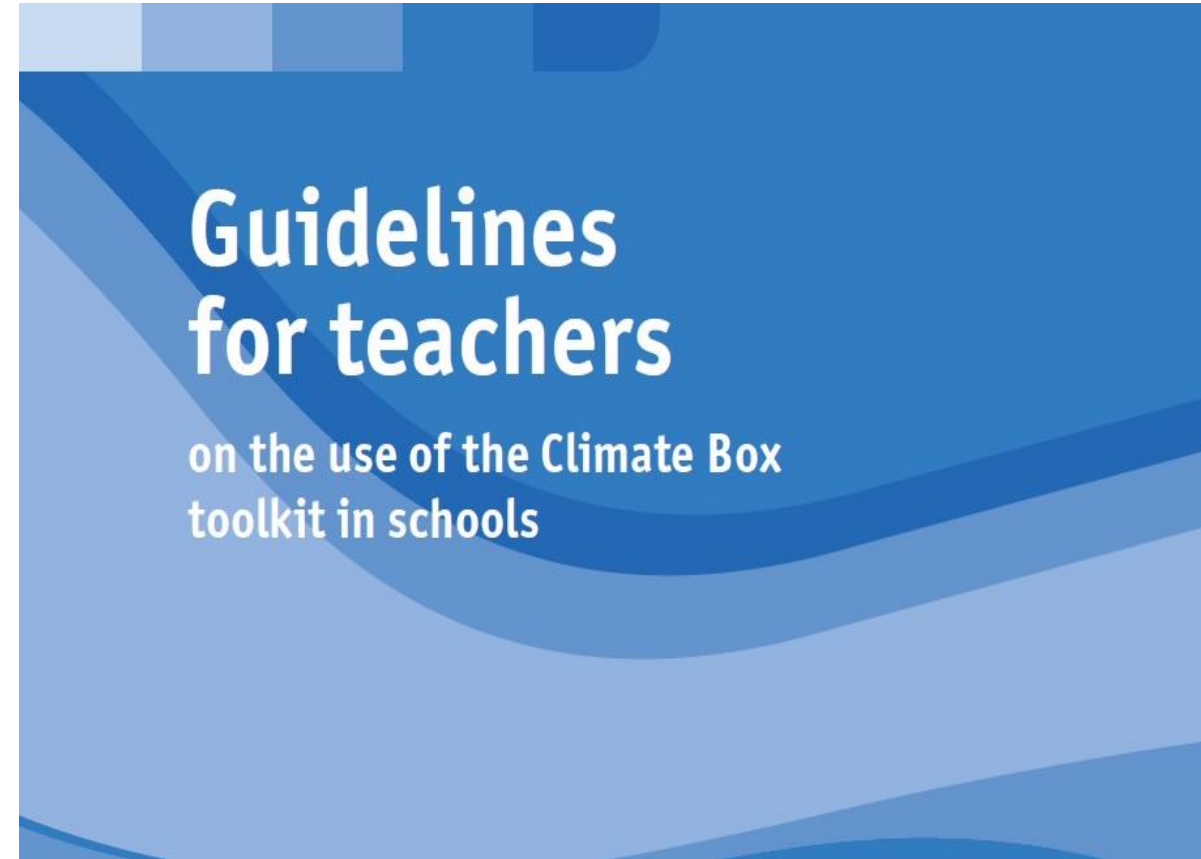
6. What important things do you need to remember when using a fridge?



USE OF METHODOLOGICAL RECOMMENDATIONS ON THE LESSONS

Section 4 provides "Guidelines for teachers on the use of the toolkit", where the topics of all parts are projected on the educational programs of secondary schools and give the possibility of using them as a supplement for individual topics of subject educational programs from the point of view of climate change issues.

This correspondence of topics is presented in the table separately for primary and secondary schools.



PRIMARY GENERAL EDUCATION

The world around us

SECONDARY GENERAL EDUCATION

Title of the section of the manual "Climate Box"	Natural Science	Geography	Biology	Chemistry	Physics	Life safety fundamentals
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PRIMARY GENERAL EDUCATION

Part 1. The problem of climate change

Title of the section of the textbook "Climate Box"	General education program
I.1. Climate and weather	Topics related to the study of the surrounding world and the nature of their region. Studying temperature, weather, weather phenomena, seasonal changes, natural areas, continents and other similar topics.
I.2. Climate types and climatic zones	
I.3. How and why the climate has changed in the past	Introducing the science of astronomy, the solar system, the past of the Earth and the modern problems of the planet.
I.4. Modern climate change	

PRIMARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to their inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics
2.1. How climate change affects the weather	<p>The material in the section "How climate change affects the weather" will be relevant as for lessons on the study of the world and nature as for lessons on life safety.</p> <p>Sections "How climate change affects plants and animals" and "How climate change affects forests" are for studying the diversity of the animal and plant world, getting acquainted with the red List, and studying the country's forest wealth.</p> <p>Themes of the general education program.</p>
2.2. How climate change affects plants and animals	<ul style="list-style-type: none"> • "Storm. Safe behavior during a thunderstorm", "Unusual natural phenomena. Rules of safe behavior during extreme weather events". • "Natural body and phenomena" • "Water on Earth. Oceans and seas. Ways to be safe in the water". • "Natural zoning" • "Red List, measures for the protection of flora and fauna". "Human influence on flora and fauna",
2.3. How climate change affects forests	<ul style="list-style-type: none"> • "Flora", "The role of plants in nature and human life". • "Fauna". "The role of animals in nature and human life", • "Forests of the country" • "The nature of the native land" • "Nature connections"

PRIMARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to their inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics
2.4. How climate change affects water resources	<ul style="list-style-type: none">• "Water, its properties. Three states of water. Water cycle in nature" "Water on Earth. Oceans and seas"• "Fresh water. Rivers", "The importance of rivers for nature and human".• "The value of water for nature and human"
2.6. How climate change affects coastal regions	<ul style="list-style-type: none">• "Land surface. Continents and oceans"
2.7. How climate change affects mountain regions	<ul style="list-style-type: none">• "Rocks and minerals"• "Mountains and their diversity", "Nature of mountains"• "Safe behavior in the mountains"
2.8. How climate change affects the Arctic regions	<ul style="list-style-type: none">• "Natural areas. The Arctic"

PRIMARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to their inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics
2.9. How climate change affects cities	The content of subject topics related to the emergence of cities, the peculiarities of life in cities, acquaintance with the largest cities of their country and the world.
2.10. How climate change affects social problems	

PRIMARY GENERAL EDUCATION

Part 3. How to prevent dangerous climate change

Title of the section of the textbook "Climate Box"	General education topics
3.1. "Green" energy sources 3.1.1. What is energy 3.1.2. Main energy sources	Educational programs in primary schools contain topics that can be supplemented with materials from part 3 of the "Climate Box": "How to prevent dangerous climate change?", which will help to raise awareness of climate change issues and develop the lifestyle and behavior that help reduce the burden on the climate. The section "Green energy sources" can be used for studying topics related to energy production, use of natural resources, solar energy and water:
3.1.3. Hydrocarbon energy sources	<ul style="list-style-type: none">• Energy is the source of motion;• Variety of energy manifestations;
3.1.5. Renewable energy sources	<ul style="list-style-type: none">• Energy action: electricity, sunlight, falling water;• Fossil fuels, their origin: peat, coal, oil, natural gas;
3.1.6. Advantages and disadvantages of different energy sources	<ul style="list-style-type: none">• The sun. Energy of sun;• Minerals. Exploration and production of minerals.

PRIMARY GENERAL EDUCATION

Part 3. How to prevent dangerous climate change

Title of the section of the textbook "Climate Box"	General education topics
3.2. Energy efficiency and energy saving 3.2.1. Eco-friendly modes of transport 3.2.2. Household appliances and electrical appliances	The materials in this section can be used for studying various types of transport and the fuel they use , materials used in the construction of houses, and the study of various electrical appliances and their properties.
3.2.3. Green building. Passive and active houses	
3.2.4. Green cities	

Themes of educational programs may vary depending on the country or specific region. The topics from the section "How climate change affects agriculture" will be relevant for studying the nature of the country in the agricultural region, in others, it is necessary to focus in more detail on the impact of climate change on mountain or marine systems.

PRIMARY GENERAL EDUCATION

| Mathematics

Problems book in mathematics for primary school using materials from the "Climate Box" on the "Climate Change" topic

➤ **Tasks for finding the sum, increasing and decreasing, difference comparison.**

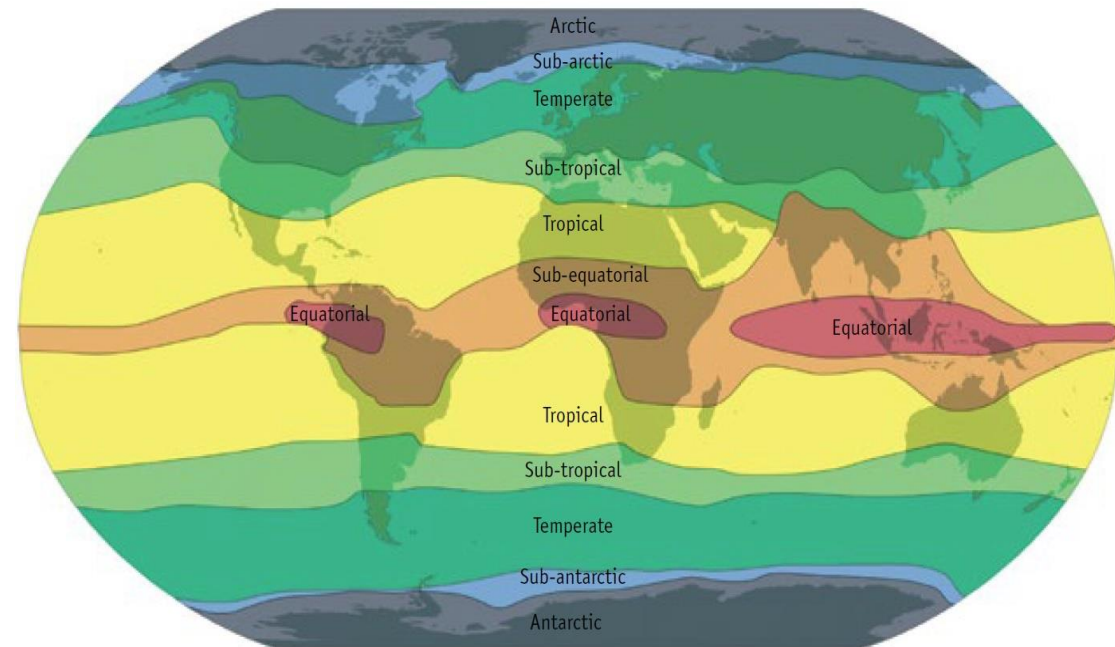
If we save 1 kg of paper, then we also save 13 kg of oil and 32 kg of water. How much water is saved more than oil?

➤ **Tasks for increasing, several times decrease in and multiple comparison.**

The Gangotri glacier is melting by 30 m per year. It's the fastest. How many meters will the glacier decrease in 5 years? In 10 years? In 15 years?

➤ **Logical tasks.**

Which of the climatic zones occupies the smallest territory, if the tropical climatic zone occupies more territory than temperate, and temperate does more than equatorial?



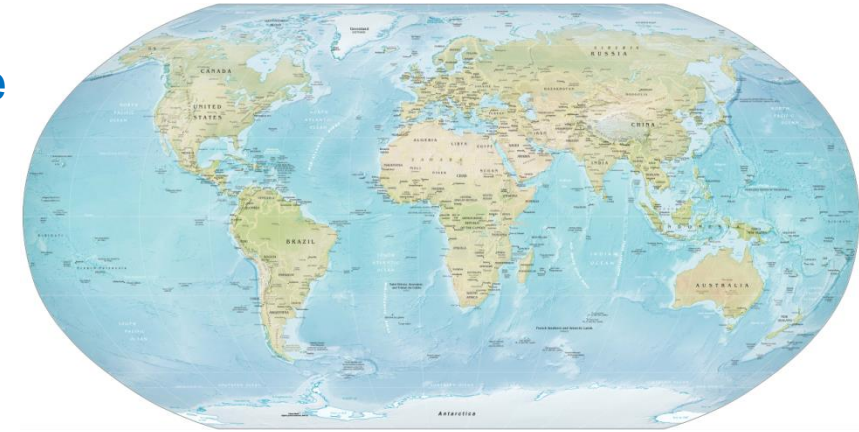
PRIMARY GENERAL EDUCATION

| Mathematics

Problems book in mathematics for primary school using materials from the "Climate Box" on the "Climate Change" topic

➤ **Theme: from left to right, from right to left.**

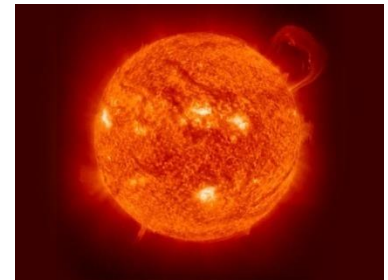
There is an image of the world map on the slide. Today we are going on a journey across our planet. We are at the point X. In which direction will we go to visit the polar bear; panda, etc.



➤ **Theme: Ray.**

There are two images of the sun on the slide. Are these images different? What does ray mean? Does it have the beginning and the end? What geometric shape does the ray that reached the Earth resemble?

The sun is a renewable source of light and heat. Sunlight, wind, flowing water, rain, ebb and tide, the heat of the Earth can provide a large amount of energy, moreover, these resources are practically inexhaustible.



➤ **Theme: Numeric Line.**

- Where else can we use the numeric line in life?
- Why do we need a thermometer?
- Why do we measure air temperature?
- According to these thermometers, determine which season the temperature corresponds to. Explain;





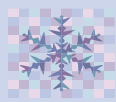
OBSERVATIONS DIARY OF THE WEATHER

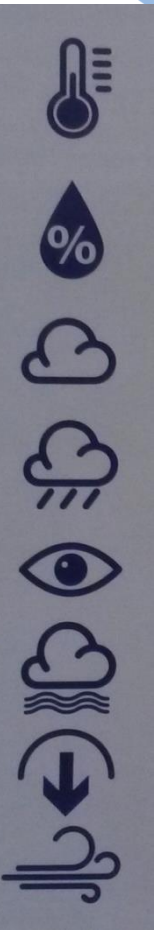
The study of natural phenomena such as rain, wind, snow, flooding, as well as natural anomalies will be interesting to study in all climate zones as part of the issue of climate change. There is the weather observations diary in aid of. Observations allow children to understand the essence of changes occurring in nature, phenological processes, and patterns.

The "Climate Box" offers symbols that you can use. You can also create your own calendar.

You can add phenological observations that will help develop observation skills and link seasonal processes in nature such as bud swelling, leaf opening and falling, flowering and fruiting, arrival and departure of birds, and other weather factors.



Date	Air temperature	Wind direction		Cloudiness	Precipitation type
31.12.2015	-3 °C	4 mps 		Cloudiness 	Precipitation type 



CONSOLIDATION OF KNOWLEDGE

To consolidate knowledge :

Answers to questions at the end of the studied section;

- Performing practical tasks, offered at the end of each section, and explanation;
- Answers to the "Climate Quiz" cards questions or the creation of an interactive quiz on the basis, where children gain points by the face value of the question;
- Solving crosswords;
- Different tests: choose the correct answer, put a word, find a match and others;
- Solving situational problems that are directly related to the climatic characteristics of the country, region, area of residence;
- Conducting extracurricular activities;
- Other methods.

Test questions.

Insert the missing word (s):

1. CO₂ is absorbed from the atmosphere by the ocean, and
2. Others



Test questions.

1. 2. What mathematical sign can be placed between the concepts of "climate" and "weather"?
 - A - climate = weather;
 - B - climate > weather;
 - C - climate < weather;
 - D - there is no right answer

<u>100</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>
<u>100</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>
<u>100</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>

An interactive quiz with a choice of a question at par. Color corresponds to the section of the Manual.



Quest from the "Climate Box". Count the number of warm and cold years over the past 20 years.

SECONDARY GENERAL EDUCATION

In secondary general education programs, the "Climate Box" can be used in various subjects, but most fully in the courses of geography, biology, chemistry and physics.

Part 1. The problem of climate change

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
I.1. Climate and weather	Themes to study: atmosphere, Earth's climate, weather and weather elements, moisture in the atmosphere, climatic zones, continents and other related topics.	-	-	"Atmosphere pressure"
I.2. Climate types and climatic zones				

SECONDARY GENERAL EDUCATION

Part 1. The problem of climate change

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
1.3. How and why the climate has changed in the past 1.4. Modern climate change	Studying topics related to the geological structure of the Earth, sea currents and the movement of lithospheric plates, the atmosphere and the influence of human.	Studying topics related to the origin of life, the role of human in the biosphere and global environmental problems.	-	• "The first principles of Astronomy"

SECONDARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
2.1. How climate change affects the weather	In the course of geography and biology, in the study of the diversity of natural components, the diversity of flora and fauna and their role for nature and humans, the preservation of species diversity as the basis for the sustainability of the biosphere.		-	-
2.2. How climate change affects plants and animals			-	-

SECONDARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
2.3. How climate change affects forests	In the course of geography and biology, in the study of forest ecosystems, natural communities, the cycle of substances in nature.		-	-
2.4. How climate change affects water resources	Studying topics related to the internal and external waters of the country, economic activities using water resources.	-	Studying the role of water in chemical reactions.	Studying water pipes, locks, navigation of ships.

SECONDARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
2.5. How climate change affects agriculture	Studying the relevant topics of the geography course: <ul style="list-style-type: none"> • "Agriculture and Fishery" • "Hydrosphere" • "World Ocean" • "The ocean and land interaction" • "Lithosphere of the Earth" • "Formation of land relief" • "The mountains. Altitude zonation" 	-	-	-
2.6. How climate change affects coastal regions		-	-	-
2.7. How climate change affects mountain regions				

SECONDARY GENERAL EDUCATION

Part 2. How climate change affects nature and humans. Is it possible to adapt to inevitable consequences?

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
2.8. How climate change affects the Arctic regions	<ul style="list-style-type: none"> • "Glaciers" • "Permafrost" • "the Arctic deserts, tundra" 	-	-	-
2.9. How climate change affects cities	<ul style="list-style-type: none"> • "Urbanization as a worldwide process" 	-	-	-
2.10. How climate change affects social problems	<ul style="list-style-type: none"> • "Geographical aspects of the global mankind problems" 	-	-	-

SECONDARY GENERAL EDUCATION

The material in this section is more for studying of applied, practical topics.

Part 3. How to prevent dangerous climate change

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
3.1. "Green" energy sources 3.1.1. What is energy 3.1.2. Main energy sources 3.1.3. Hydrocarbon energy sources 3.1.4. Nuclear power 3.1.5. Renewable energy sources 3.1.6. Advantages and disadvantages of different energy sources	<ul style="list-style-type: none"> Main types of ecosystem exploitation 	-	Studying carbon and its properties, hydrocarbons and their natural sources such as oil, gas, coal	Studying topics: <ul style="list-style-type: none"> Internal energy Fuel energy Low heating value Atomic and nuclear power engineering Alternative types of power station

SECONDARY GENERAL EDUCATION

Part 3. How to prevent dangerous climate change

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
3.2. Energy efficiency and energy saving 3.2.1. Eco-friendly modes of transport 3.2.2. Household appliances and electrical appliances 3.2.3. Green building. Passive and active houses 3.2.4. Green cities	In the course of social geography: "social sphere, housing and recreational economy"	Studying environmental problems and ways to solve them	Studying the properties of alcohols	Studying heat engines and alternative energy sources, efficiency, laws of thermodynamics, energy

SECONDARY GENERAL EDUCATION

Part 3. How to prevent dangerous climate change

Title of the section of the textbook "Climate Box"	General education topics			
	Geography	Biology	Chemistry	Physics
3.3. Carbon footprint 3.4. How can I help the planet? Reducing our carbon footprint	-	Topics related to nature protection, biodiversity conservation, rational use of natural resources.	Studying physical and chemical phenomena, states of matter, factors of climate influence on changes in the environment.	
3.5. Global cooperation on climate change and sustainable development	• "Geographic aspects of global mankind problems in the past and present. Ways to solve problems"			

THE THEME OF CLIMATE CHANGE ON OTHER SUBJECTS

Life safety :

- Dangerous and natural emergencies and population protection from their consequences.
- Natural disasters and population protection from their consequences: forest fires, floods.
- Dangerous situations of a nature: earthquakes, mudflows and landslides.
- Safety measures in hot weather.
- Rules of conduct in in case of a hurricane, storm, tornado.
- The rule of conduct in case of flooding, avalanches.



History

Many historically significant events are related to climate change, for example:

- Drought early 1st millennium BC in the Eastern Mediterranean coincided with the decline of Late Bronze Age cultures in Atlantic Europe.
- In the 1st century BC the temperature was two degrees higher than in previous centuries. The snows of the Alps melted, the mountains became passable for the legions, and Rome conquered the Germans, Franks, and then Britain without serious resistance.
- Russian troops against Napoleon in 1812 and Hitler in 1941 took advantage of the climate (they lived in, and thus were adapted) and successfully waged wars.



Pryanishnikov I.M. Episode from 1812.
Museum-panorama "Battle of Borodino"

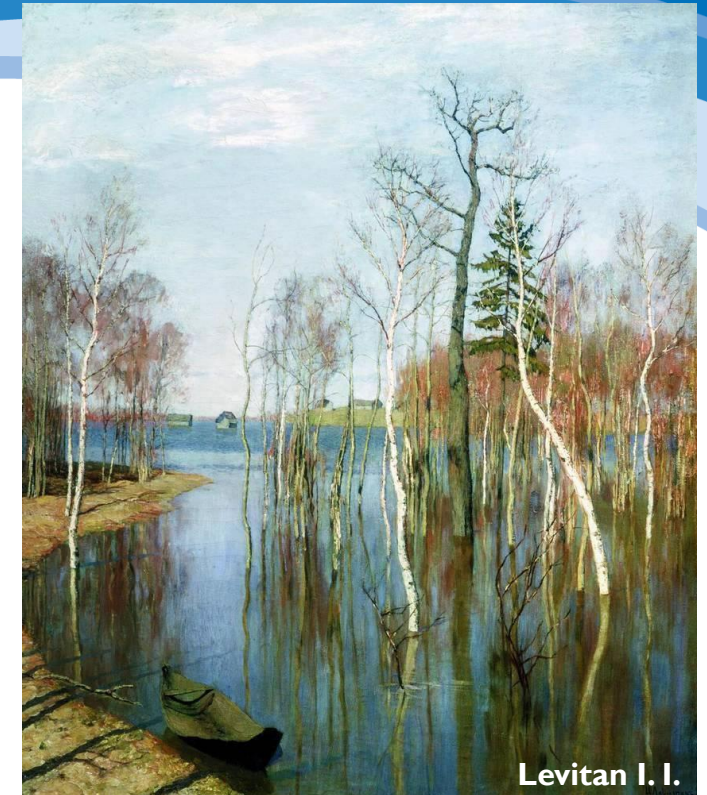
THE THEME OF CLIMATE CHANGE ON OTHER SUBJECTS

Learning foreign languages :

- Activation of vocabulary on the topics "Nature", "Weather and Weather Phenomena", "Animals and Plants", "Environmental Protection", "Separate Waste Collection", "Urban Transport", "Energy" and others.
- Examples of "green cities", environmentally friendly solutions.

Art/drawing:

To solidify the material from the "Climate Box" and climate change topic, you can instruct to depict animals or plants listed in the Red List, for example. You can also organize a photography competition or devote one of the lessons to the study of paintings that depict nature and various natural phenomena or disasters.

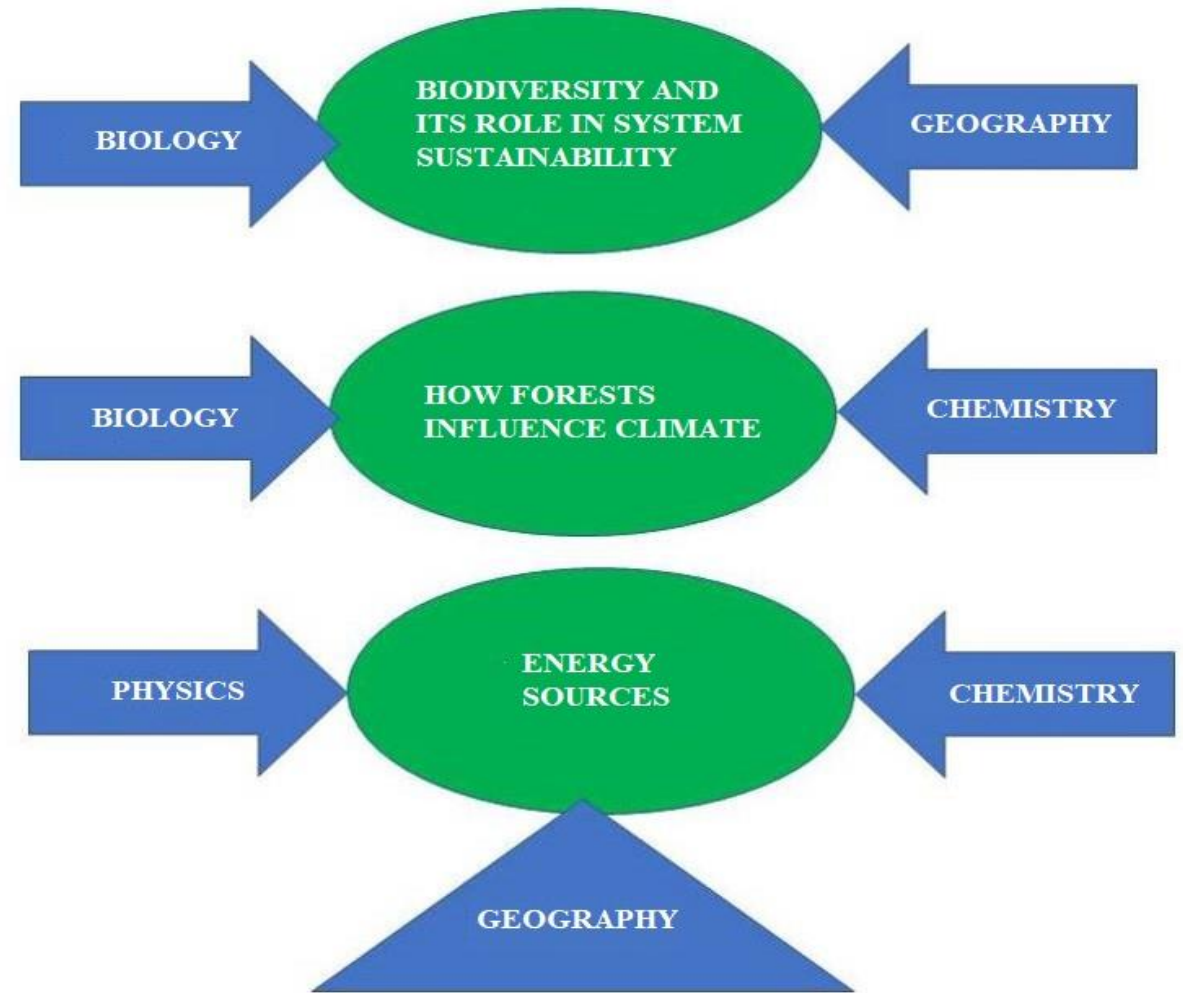


INTERDISCIPLINARY APPROACH

In middle and high school, there is a more flexible approach to use the "Climate Box" and conduct lessons and awareness-raising activities on climate change. Children of this age are able to independently make decisions about their actions, lifestyle and evaluate it in relation to the processes that affect the climate.

Interdisciplinary lessons can be conducted both within the framework of the subject topics being studied at the moment, or not be related to them. The main goal of the interdisciplinary lessons is to show the connection between climate issues and all areas of human life, the development of science and technology, the ability of a person to influence the process of climate change, and show the ways of adaptation and its importance for reducing the effects of climate change, using a versatile approach.

Participation in project activities, the development of social activity and civic responsibility are of great importance for consolidating the acquired knowledge and forming responsible behavior at this age. This is formed through participation in activities, actions aimed at reducing the impact on the climate: planting trees, separate collection of waste, reuse and others. Many of these initiatives can be developed through student project activities.



CONSOLIDATION OF KNOWLEDGE

To consolidate knowledge :

Answers to questions at the end of the studied section;

- Performing practical tasks, offered at the end of each section, and explanation;
- Answers to the "Climate Quiz" cards questions or the creation of an interactive quiz on the basis, where children gain points by the face value of the question;
- Solving crosswords;
- Different tests: choose the correct answer, put a word, find a match and others;
- Solving situational problems that are directly related to the climatic characteristics of the country, region, area of residence;
- Conducting extracurricular activities;
- Other methods.



The organization of project activities of students is important in middle and high school. After learning about climate change and measures to reduce the impact on the climate, students can explore the school grounds and buildings and suggest ways to reduce the carbon footprint in their school, home, or develop a project of more global significance for the city or country.

LIST OF ILLUSTRATIONS

The photos and illustrations used in the module, where sources are not specified, are either taken from the Climate Box toolkit (see the List of illustrations at the end of the textbook) or provided by the program participants.

Sources of additional illustrations:

Slide 4

Photo above: Shutterstock.com (Peera_stockfoto)

Photo below (from left to right):

1 - Shutterstock.com (Dan Ross)

2 - Shutterstock.com (Greshnov Kirill)

3 - Commons.wikimedia.org (Quinn Norton)

Slide 15

Photo (top to bottom):

1 - Wikipedia.org (Physical map of Earth)

2 - Wikipedia.org (our_sun)

3 - Wikipedia.org (our_sun)

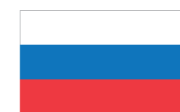
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Photo (top to bottom):

1 - Shutterstock.com (yelantsev)

2 - Wikipedia.org

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