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# Guidelines for teachers on the use of the Climate Box toolkit in schools

# 4 Guidelines for teachers on the use of the Climate Box toolkit in schools

The Climate Box toolkit, an interactive set of educational materials and games on climate change, is addressed to teachers of natural sciences, social studies, and the environment in Grades 1-11.

The materials have been prepared by UNDP with the support of the Global Environment Facility, the Ministry of Natural Resources and Environment of the Government of the Russian Federation, and the Coca-Cola Company. Climate Box is the third of a series of toolkits for school students prepared and presented by UNDP and its partners, following Black Sea Box and Baikal's Little Treasure Chest.

The objectives of the Climate Box toolkit are to:

- Inform students about the world around them and the relationships between human beings and the environment
- Promote ideas of conservation and respect for nature
- Instil an environmental culture of responsible consumption by young people and develop energy- and resources-saving skills among them
- Help teachers prepare and conduct lessons on subjects directly or indirectly related to climate change

The interactive toolkit contains:

- An illustrated textbook for students with educational materials and a variety of questions and tasks for individuals and groups, along with guidelines for teachers on the use of the toolkit in lessons for students in different age groups (as a chapter in the textbook and a standalone supplement)
- The Climate Quiz, a set of game cards
- A wall map illustrating the possible effects of climate change on nature and humanity in various parts of the world by the end of the 21st century
- A poster with tips on how to reduce your carbon footprint
- A poster with recommendations on how to resist and adapt to climate change impacts that are hard to mitigate
- climate-box.com – a website with all toolkit materials

## The Climate Box textbook

The textbook consists of three sections: 'The problem of climate change'; 'How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?'; and 'How to prevent dangerous climate change'.

It helps students to distinguish between different types of climate and natural zones; explains the relationship of the geographical components of natural systems; teaches them how to understand essential geographical features and weather phenomena and how they can change as a result of natural and manmade impacts; explains the use of alternative energy sources; teaches rules of conduct in case of extreme weather; and tells them how to make sparing use of resources at home and school and outdoors. Each section contains information that can usefully supplement many aspects of educational programmes.

The textbook contains interesting and informative facts about natural anomalies, examples of the consequences of climate change impacts on coastal, mountain and Arctic regions, forests, cities, and countries. It gives students an opportunity to independently analyze the information and build hypotheses and forecasts about natural processes and phenomena relevant to the region where they live.

The textbook helps students to view the world from the point of view of an astronomer, geographer, or ecologist. Colourful and attractive illustrations, charts and graphs help to consolidate their understanding of evolution (by reference to climate change events in the past and the shape of our planet today), spatial differences in the processes of climate formation, geographical features of the natural complexes of different continents and oceans, conservation practices, natural and manmade causes of environmental problems, measures to preserve the natural world and protect people from natural and man-made disasters, the greenhouse effect and biodiversity, and the carbon footprint of human beings on Earth.

Questions and tasks offer students an opportunity to use all this knowledge in practice The textbook can be used in work with students eight years and older and is particularly suitable for students aged 10–13 years, both as part of the main curriculum and in extracurricular activities.

Teachers are advised to use the textbook materials taking account of what their students are currently focused on, and their needs, interests, and abilities. Some children will find the entire textbook interesting, while others may be attracted by specific facts and illustrations, or ideas for experiments.

The tables below indicate how to link the Climate Box to national curricula. Although focused on the Russian educational programme, these suggestions could be relevant to similar curricula in other countries.

We are optimistic that every student will find something new and interesting in the textbook. We suggest that teachers take a creative approach to the toolkit, using the materials in activities outside the classroom and in extracurricular activities: these may be outdoor activities, environmental actions, subject weeks, competitions and quizzes, and study circles. The team of authors sincerely hopes that the Climate Box toolkit will encourage students, teachers, and parents to alter their lifestyles towards greater environmental awareness.

## Educational programmes

### Primary education

National programme for primary education “The World Around Us” (for grades 1–4)

### Secondary education

National programmes for basic secondary education in subjects:

- Geography (for grades 5-11)
- Biology (for grades 5-11)
- Chemistry (for grades 8-11)
- Physics (for grades 7-11)
- Social studies (for grades 6-11)
- Safety basics (for grades 8-11)

| PRIMARY EDUCATION | | | | |
|---|---|---|---|---|
| Section in the Climate Box textbook | The World Around Us<br>Programmatic and thematic content | | | |
| | 1st grade | 2nd grade | 3rd grade | 4th grade |
| **PART 1. The problem of climate change** | | | | |
| **1.1. Climate and weather** | · Monitoring the weather in your region. Weather and thermometer. Determination of air (water) temperature using a thermometer. Observing seasonal changes in nature. | · How does the Earth differ from other planets? Living conditions on the Earth. | · Properties of air. The importance of air for plants, animals, and humans. | · The Sun is the closest star to us, a source of light and heat for all life on Earth.<br>· The rotation of the Earth around the Sun and the change of seasons. |
| **1.2 Climate types and climate zones** | – | – | – | · Climate zones of your country: general idea, main climate zones (climate, flora and fauna, peculiarities of work and life of people, human influence on the nature of the studied zones, nature conservation). Connections in climate zones. |
| **1.3. How and why the climate changed in the past** | – | – | – | · Methods to understand nature: observations, comparisons, measurements, experiments to study natural objects and phenomena. |
| **1.4. Climate change today** | – | – | – | · Ecological issues of interaction between human beings and nature. |

| PRIMARY EDUCATION | | | | |
|---|---|---|---|---|
| Section in the Climate Box textbook | The World Around Us<br>Programmatic and thematic content | | | |
| | 1st grade | 2nd grade | 3rd grade | 4th grade |
| **PART 2. How climate change affects the natural world and human beings<br>Can we adapt to the inevitable consequences of climate change?** | | | | |
| **2.1. How climate change affects the weather** | – | – | – | – |
| **2.2. How climate change affects plants and animals** | · Plants. Plants in the immediate environment. Deciduous and coniferous plants. Wild and cultivated plants. Houseplants, rules of maintenance and care.<br>· Animals. Domestic and wild animals (differences in living conditions).<br>· Inanimate and living nature. Relationships between human beings and nature. Rules of ethical and safe behaviour in nature. | · Diversity of plants (flora).<br>· Diversity of animals (fauna).<br>· Connections in nature. The annual course of changes in the life of plants and animals<br>· The Red List, its meaning, individual representatives of plants and animals of the Red List. Reserves, natural parks. Protection of nature. Rules of ethical behaviour in nature. | · Dependence of the life cycle of organisms on environmental conditions.<br>· Conditions necessary for plant life (light, heat, air, water).<br>· Conditions necessary for animal life (air, water, heat, food).<br>· Plants and animals of our region.<br>· Human influence on natural communities. | · Protection of natural resources: water, air, minerals, flora, and fauna. International Red List (selected examples). |
| **2.3. How climate change affects forests** | · Plants. Plants in the immediate environment. Deciduous and coniferous plants. Wild and cultivated plants. Houseplants, rules of maintenance and care.<br>· Animals. Domestic and wild animals (differences in living conditions).<br>· Inanimate and living nature. Relationships between human beings and nature. Rules of ethical and safe behaviours in nature. | · Diversity of plants (flora).<br>· Diversity of animals (fauna).<br>· Connections in nature. The annual course of changes in the life of plants and animals<br>· The Red List, its meaning, individual representatives of plants and animals of the Red List. Reserves, natural parks. Protection of nature. Rules of ethical behaviour in nature. | · Dependence of the life cycle of organisms on environmental conditions.<br>· Conditions necessary for plant life (light, heat, air, water).<br>· Conditions necessary for animal life (air, water, heat, food).<br>· Plants and animals of our region.<br>· Human influence on natural communities. | · Protection of natural resources: water, air, minerals, flora, and fauna. International Red List (selected examples). |

| PRIMARY EDUCATION | | | | |
|---|---|---|---|---|
| Section in the Climate Box textbook | The World Around Us Programmatic and thematic content | | | |
| | 1st grade | 2nd grade | 3rd grade | 4th grade |
| **PART 2. How climate change affects the natural world and human beings Can we adapt to the inevitable consequences of climate change?** | | | | |
| **2.4. How climate change affects water resources** | · Plants. Plants in the immediate environment. Deciduous and coniferous plants. Wild and cultivated plants. Houseplants, rules of maintenance and care.<br>· Animals. Domestic and wild animals (differences in living conditions).<br>· Inanimate and living nature. Relationships between human beings and nature. Rules of ethical and safe behaviour in nature | – | · Water. Distribution of water in nature, significance for living organisms and human life. The water cycle in nature. Water protection. | · Reservoirs, their diversity (ocean, sea, lake, pond, swamp); river as a stream of water; human use of rivers and reservoirs. Reservoirs and rivers of our region (names, brief description based on observations). |
| **2.5. How climate change affects agriculture** | – | – | · Soil, its composition, significance for wildlife and human economic life. | – |
| **2.6. How climate change affects coastal regions** | – | · Continents and oceans. | – | – |
| **2.7. How climate change affects mountain regions** | – | – | – | – |
| **2.8. How climate change affects Arctic regions** | – | – | – | – |
| **2.9. How climate change affects cities and human health** | – | – | – | – |
| **2.10. How climate change affects social problems** | – | – | · Countries and nations of the world. | – |

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|---|---|---|---|---|
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| | 1st grade | 2nd grade | 3rd grade | 4th grade |
| **PART 3. How to prevent dangerous climate change** | | | | |
| **3.1. 'Green' energy sources**<br>**3.1.1. What is energy?**<br>**3.1.2. The main sources of energy** | – | – | – | – |
| **3.1.3. Fossil fuels** | – | – | · Rocks and minerals. Their importance in the human economic activities and use of minerals in a sustainable way. Minerals of our region (2–3 examples). | – |
| **3.1.4. Nuclear energy** | – | – | – | – |
| **3.1.5. Renewable energy sources** | – | – | – | – |
| **3.1.6. Advantages and disadvantages of different energy sources** | – | – | – | – |
| **3.2. Energy efficiency and energy saving**<br>**3.2.1. Environmentally friendly transport**<br>**3.2.2. Household appliances and electrical devices** | – | – | – | – |
| **3.2.3. Green construction. Passive and active buildings**<br>**3.2.4. Green cities** | – | – | – | – |
| **3.3. Carbon footprint and how I can help the planet by reducing my carbon footprint** | · Careful attitude towards things and taking good care of them. | – | – | · Rules of ethical behaviour in nature. |
| **3.4. Global cooperation on climate change and sustainable development** | – | – | – | · Rules of ethical behaviour in society, attitude towards people regardless of their nationality, social status, religious beliefs. |

| SECONDARY EDUCATION | | | | | | |
|---|---|---|---|---|---|---|
| Section in the Climate Box textbook | Geography<br>Programmatic and thematic content | | | | | |
| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 1. The problem of climate change** | | | | | | |
| **1.1. Climate and weather** | · Geographical methods of studying objects and phenomena.<br>· Phenological observations in nature. | · Air temperature. Average daily, average monthly, average annual temperature. Annual variation of air temperature.<br>· Water in the atmosphere. Types of precipitation.<br>· Weather and its indicators. Causes of weather changes.<br>· Climate and climate-forming factors.<br>· Dependence of climate on geographical location and altitude of the area above sea level.<br>· Human adaptation to climate conditions.<br>· Meteorologist as a profession.<br>· Basic meteorological data.<br>· Natural phenomena in the atmosphere. | – | · Factors determining the climate of our country.<br>· The influence of geographical location on the climate of a country. | – | – |
| **1.2 Climate types and climate zones** | – | · Global, Regional, and Local Natural Complexes. Natural complexes of the local area. | · Diversity of climate on Earth. Climate forming factors.<br>· Characteristics of the main and transitional climate zones of the Earth. | · Climatic zones and types of climates in our country, their characteristics. | – | – |

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| Section in the Climate Box textbook | Geography<br>Programmatic and thematic content | | | | | |
| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 1. The problem of climate change** | | | | | | |
| **1.3. How and why the climate changed in the past** | · The Earth in the solar system.<br>· The movement of the Earth around the Sun.<br>· Change of seasons on the Earth. Uneven distribution of sunlight and heat on the Earth's surface.<br>· Tropics and polar circles.<br>· The rotation of the Earth around its axis. | – | – | · Ancient and modern glaciations. | – | – |
| **1.4. Climate change today** | – | · Ways to study and monitor global climate.<br>· Climatology as a profession.<br>· Remote methods in the study of human influence on the Earth's atmosphere. | · The influence of modern human economic activities on the Earth's climate.<br>· Global climate change and different points of view on its causes. | · Ancient and modern glaciations.<br>· Climate change caused by natural and anthropogenic factors.<br>· Observed climate changes on the territory of our country and their consequences. Ways of adaptation to climate change.<br>· Features of the climate of our region.<br>· Predicted impacts of climate change on different natural and economic systems in our country. | – | · Modern directions of geographical research.<br>· Human adaptation to various natural conditions and their changes over time. |

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| Section in the Climate Box textbook | Geography<br>Programmatic and thematic content | | | | | |
| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | | |
| **2.1. How climate change affects the weather** | – | · Natural phenomena in the atmosphere, methods of observation and protection. | – | · Dangerous and adverse meteorological phenomena. | – | · Natural hazards, climate change. |
| **2.2. How climate change affects plants and animals** | – | · Biosphere.<br>· Diversity of flora and fauna. Adaptation of living organisms to their habitat in different climate zones.<br>· Research and environmental issues. | – | · The wealth of flora and fauna in our country: species diversity, factors that determine it.<br>· Features of the flora and fauna of various natural and economic systems of our country.<br>· Specially protected natural areas of our country and our region. UNESCO World Natural Heritage Sites; plants and animals listed in the Red List of your country. | – | · Specially protected natural areas as one of the objects of sustainable development goals. |
| **2.3. How climate change affects forests** | – | · Natural environment.<br>· Protection of nature.<br>· Specially protected nature areas. | – | · Forest industry and the environment. Problems and prospects for development. | – | · Forest reserves of the World.<br>· Deforestation - its causes and affected areas. |
| **2.4. How climate change affects water resources** | – | · Hydrosphere and methods of its study. Parts of the hydrosphere.<br>· Rivers. Nutrition and re-gime of the river.<br>· Lakes. Origin of lakes. Nu-trition of lakes.<br>· Natural phenomena in the hydrosphere, methods of observation and protection. | · Salinity of surface waters of the World Ocean, its dependence on the ratio of precipitation and evaporation, the desalinating influence of river waters and glacier waters.<br>· Ecological problems of the World Ocean. | · Aquatic natural systems of the: rivers in your country, seas, lakes.<br>· Dangerous hydrological natural phenomena and their distribution across the territory.<br>· Uneven distribution of water resources. Increase in their consumption and pollution. Ways to preserve the quality of water resources. | – | · Supply of fresh water.<br>· Hydropower resources of the world.<br>· The role of the natural resources of the World Ocean (energy, biological, mineral) in our life and the prospects for their use. |

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| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | | |
| **2.5. How climate change affects agriculture** | – | · Soil formation and soil fertility. Soil protection. | · Types of economic activities: agriculture. | · Agroclimatic resources.<br>· Soil resources in your country. Measures to preserve soil fertility: land reclamation, combating soil erosion and soil pollution. | · Agriculture.<br>· Land, soil and agroclimatic resources.<br>· Agriculture and environment.<br>· Features of the agro-industrial sector of your region. | · Agroclimatic resources of the world.<br>· The impact of agriculture and its individual activities on the environment.<br>· Geographical differences in land availability.<br>· Organic farming. Crop farming. Animal husbandry. |
| **2.6. How climate change affects coastal regions** | – | · The World Ocean.<br>· Movements of the waters of the World Ocean: waves; currents, ebbs, and flows.<br>· Natural phenomena in the World Ocean. | · Changes in ice cover and sea level, their causes, and consequences.<br>· Patterns of changes in ocean salinity.<br>· Main fishing areas. | · The wealth of flora and fauna in our country: species diversity, factors that determine it.<br>· Features of the flora and fauna of various natural and economic systems of our country.<br>· Specially protected natural areas of our country and our region. UNESCO World Natural Heritage Sites; plants and animals listed in the Red List of your country. | – | · Rising sea levels.<br>· Fisheries and aquaculture: geographical features. |
| **2.7 How climate change affects mountain regions** | – | · Altitudinal zone.<br>· Preservation of the most important biotopes of the Earth. | · Glaciers.<br>· Altitudinal zones in the mountains in your country. | – | – | – |

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| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | | |
| **2.8. How climate change affects Arctic regions** | – | • Permafrost. | • Antarctica is a unique continent on the Earth.<br>• Human exploration of Antarctica. Modern research in Antarctica. | • Glaciers.<br>• Permafrost. | • Arctic zone.<br>• State programme for the socio-economic development of the Arctic zone. | – |
| **2.9. How climate change affects cities and human health** | – | – | • Current world population. Factors influencing population growth.<br>• Location and density of population. | • Geographical features of population distribution.<br>• Urban and rural population.<br>• Urbanization in your country. Largest cities and urban agglomerations. | – | • The concept of urbanization; its features in countries of various socio-economic types.<br>• Urban agglomerations and megalopolises of the world. |
| **2.10. How climate change affects social problems** | – | – | • The influence of climatic conditions on people's lives.<br>• Cities and rural settlements. | • The influence of climate on the life and economic activities of the population.<br>• External and internal migrations. Reasons for migration and main directions of it. | – | • Climate refugees.<br>• Geographical features of population distribution and factors that determine it. Population migrations: causes, main types, and migration routes. |

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| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 3. How to prevent dangerous climate change** | | | | | | |
| **3.1. 'Green' energy sources**<br><br>**3.1.1. What is energy**<br><br>**3.1.2. The main sources of energy** | – | – | – | · Classifications of natural resources. Natural resource capital and environmental potential of your country.<br>· Mineral resources of the country and their rational use. | · Energy sector. Oil, gas and coal industries.<br>· Electric power industry. | · Natural resource capital of world regions and large countries. Provision of countries with oil, gas, uranium, ore and other minerals. |
| **3.1.3. Fossil fuels** | | | | | | |
| **3.1.4. Nuclear energy** | | | | | | |
| **3.1.5. Renewable energy sources** | – | · Hydrosphere and people. Use of water energy by the humankind. | – | – | · Power plants using renewable energy sources, their features and share in electricity production. | · Global energy sector: main stages of development, energy transition.<br>· Leading countries in the development of renewable energy. |
| **3.1.6. Advantages and disadvantages of different energy sources** | – | – | – | · Principles and methods of rational environmental management. | · Main types of power plants (nuclear, thermal, hydroelectric, power plants using renewable energy sources).<br>· Impact of the energy sector on the environment. | · World power industry. Current trends and geographical features in the development of the industry.<br>· Environmental impact of the power industry and various types of power plants, including renewable energy power plants. |

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| | 5th grade | 6th grade | 7th grade | 8th grade | 9th grade | 10th grade |
| **PART 3. How to prevent dangerous climate change** | | | | | | |
| **3.2 Energy efficiency and energy saving**<br><br>**3.2.1. Environmentally friendly transport**<br><br>**3.2.2. Household appliances and electrical devices** | – | – | – | – | • Sea, inland waterway, rail, road, air transport.<br>• Transport and environmental protection. | • Main international highways and transport hubs. |
| **3.2.3. Green construction. Passive and active buildings**<br><br>**3.2.4. Green cities** | – | – | – | – | • Economic development and the state of the environment.<br>• State documents reflecting issues of environmental protection of your country and government measures supporting energy transition and sustainable development. | • The concept of urbanization; its features in countries of various socio-economic types.<br>• Urban agglomerations and megalopolises of the world. |
| **3.3. Carbon footprint and how I can help the planet by reducing my carbon footprint** | – | – | • Changes in nature caused by human economic activities. | – | – | – |

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| **PART 3. How to prevent dangerous climate change** | | | | | | |
| **3.4. Global cooperation on climate change and sustainable development** | – | – | • Interaction between human beings and nature on different continents.<br>• The need for international cooperation in the use of nature and its protection. Development of environmental protection activities at the present time.<br>• Global sustainability problems and international efforts to tackle them.<br>• United Nations and Sustainable Development Goals.<br>• UNESCO World Heritage: natural and cultural sites | – | – | • Global issues: global climate change, natural disasters, shortage of water resources and deterioration of it quality, desertification of land and soil degradation, biodiversity conservation.<br>• Contamination of the World Ocean and the use of its resources.<br>• Possible ways to address global issues. Your country`s contribution to solving global issues. |

| SECONDARY EDUCATION | | | | | |
|---|---|---|---|---|---|
| Section in the Climate Box textbook | Programmatic and thematic content | | | | |
| | Biology | Physics | Chemistry | Social Sciences | Safety basics |
| **PART 1. The problem of climate change** | | | | | |
| **1.1. Climate and weather** | **5th grade**<br>· Scientific methods for studying living nature: observation, experiment, description, measurement, classification.<br>· Seasonal changes in plant life.<br>**7th grade**<br>· Seasonal changes in the life of the plant community.<br>**11th grade**<br>· Abiotic factors: light, temperature, humidity. Adaptation of organisms to the abiotic factors. Biological rhythms. | **7tth grade**<br>· Physics. Natural phenomena.<br>· Physical quantities. Measurement of physical quantities.<br>· Aggregate states of things. Features of the aggregate states of water.<br>· Earth's atmosphere and atmospheric pressure. Reasons for existence of the atmosphere of the Earth. Measuring atmospheric pressure. Dependence of atmospheric pressure on altitude above sea level. Instruments for measuring atmospheric pressure.<br>**8th grade**<br>· Air humidity.<br>**9th grade**<br>· Reflection of light. Law of light reflection. | **8th grade**<br>· Physical properties of substances. Aggregate state of substances.<br>· Air is a mixture of gases. Air composition.<br>· Oxides.<br>· The water cycle in nature. | – | – |
| **1.2 Climate types and climate zones** | **5th grade**<br>· Natural zones of the Earth, their inhabitants. Flora and fauna of natural zones.<br>**7th grade**<br>· Plants of natural zones of the Earth. Flora.<br>**8th grade**<br>· Animals of natural zones of the Earth. Basic patterns of distribution of animals on the planet. Fauna. | – | **8th grade**<br>· The water cycle in nature. | – | – |

## SECONDARY EDUCATION

| Section in the Climate Box textbook | Programmatic and thematic content | | | | |
|---|---|---|---|---|---|
| | Biology | Physics | Chemistry | Social Sciences | Safety basics |
| **PART 1. The problem of climate change** | | | | | |
| **1.3. How and why the climate changed in the past** | **7th grade**<br>· "Living fossils" of the plant kingdom.<br>**8th grade**<br>· Paleontology. Fossil remains of animals, their study. "Living fossils" of the animal world.<br>**11th grade**<br>· The sequence of appearance of species in the fossil record.<br>· The main stages of the evolution of the organic world on Earth, the development of life by eras and periods. | **9th grade**<br>· Rectilinear propagation of light. Eclipses of the Sun and Moon.<br>· Reflection of light. Law of light reflection.<br>**11th grade**<br>· Solar system.<br>· Sun. Solar Activity. | **8th grade**<br>· Classification of chemical reactions (compounds, decomposition, substitution, exchange). | – | – |
| **1.4. Climate change today** | **6th grade**<br>· Photosynthesis.<br>· Plant respiration.<br>· Formation of growth rings in trees.<br>**9th grade**<br>· Civilization.<br>· Technogenic changes in the environment.<br>**11th grade**<br>· Cycles of substances (carbon, nitrogen). | – | **8th grade**<br>· Classification of chemical reactions (compounds, decomposition, substitution, exchange).<br>· Fuel: coal and methane. Air pollution, increased greenhouse effect, destruction of the ozone layer.<br>**9th grade**<br>· Carbon, distribution in nature, physical and chemical properties. Carbon cycle in nature.<br>· Environmental problems associated with carbon monoxide, global climate change, greenhouse effect. | **6th grade**<br>· The connection between humans and nature.<br>**10th grade**<br>· The contradictory nature of progress. | **8-11th grades**<br>· The influence of human activities on the natural environment.<br>· Environmental literacy and rational resources management. |

## SECONDARY EDUCATION

| Section in the Climate Box textbook | Programmatic and thematic content | | | | |
|---|---|---|---|---|---|
| | Biology | Physics | Chemistry | Social Sciences | Safety basics |
| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.1. How climate change affects the weather** | **7th grade**<br>• Seasonal changes in the life of the plants.<br>**9th grade**<br>• Dependence of human health on the state of the environment.<br>• Environmentally conscious behaviour and behaviour in dangerous and emergency situations. | **8th grade**<br>• Vapourization and condensation. Evaporation. | **8th grade**<br>• Physical and chemical phenomena.<br>• The water cycle in nature.<br>**9th grade**<br>• Carbon cycle in nature.<br>• Carbon oxides, their physical and chemical properties. Environmental problems associated with carbon monoxide, global climate change, greenhouse effect. | – | **8-11th grades**<br>• Meteorological emergencies: storms, hurricanes, tornadoes, torrential rains, hail, frost, heat.<br>• Possibilities of forecasting, warning, mitigation of consequences. Informing and alerting the population about emergency situations.<br>• Rules for safe behaviour. Consequences of meteorological emergencies.<br>• Evacuation of the population in emergency situations, the procedure for the population. |

## SECONDARY EDUCATION

| Section in the Climate Box textbook | Programmatic and thematic content | | | | |
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| | Biology | Physics | Chemistry | Social Sciences | Safety basics |
| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.2. How climate change affects plants and animals** | **5th grades**<br>• Adaptation of organisms to their environment. Seasonal changes in the life of organisms.<br>• The concept of natural systems.<br>• Human influence on wildlife throughout history.<br>• Ways to preserve biological diversity. Protected areas (reserves, sanctuaries, national parks, natural monuments). Red List of your country.<br>**7th grade**<br>• Evolutionary development of the plant world on Earth.<br>• Protection of flora. Restoring the number of rare plant species: specially protected natural areas. The Red List of your country. Measures for the conservation of flora.<br>**8th grade**<br>• Diversity of the animal world.<br>• Evolutionary development of the animal world on the Earth.<br>• Extinct animals.<br>• Restoring the number of rare animal species.<br>• Measures for the conservation of wildlife.<br>**11th grade**<br>• Evolution of species.<br>• Community of organisms – biocenosis. Connections in the biocenosis.<br>• The concept of ecosystem and biogeocenosis.<br>• Biodiversity as a factor in the sustainability of ecosystems. Preservation of biological diversity on Earth.<br>• Conservation of biodiversity as the basis for the sustainability of the biosphere. | – | **8th grade**<br>• Physical and chemical phenomena.<br>• The role of solutions in nature and in human life.<br>• The water cycle in nature.<br>**9th grade**<br>• Chemical pollution of the environment with nitrogen compounds (acid rain, air, soil and water pollution).<br>• Carbon cycle in nature.<br>• Carbon oxides, their physical and chemical properties, effects on living organisms. | **11th grade**<br>• Environmental legislation.<br>• Environmental violations. | **8-11th grades**<br>• Rules of conduct necessary to reduce the risk of encountering wild animals, the procedure for action when encountering them; what to do in case of bites from wild animals, snakes, spiders, ticks, and insects. |

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| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.3. How climate change affects forests** | **6th grade**<br>· Photosynthesis.<br>· Plant respiration.<br>**11th grade**<br>· Ecosystem of coniferous or deciduous forest.<br>· The basis of rational use of natural resources. | – | **8th grade**<br>· The water cycle in nature.<br>**9th grade**<br>· Carbon cycle in nature.<br>· Carbon oxides, their physical and chemical properties, effects on living organisms. | **11th grade**<br>· Environmental legislation.<br>· Environmental violations. | **8-11th grades**<br>· Wildfires. Forecasting and warning capabilities. Rules for safe behaviour. Consequences of wildfires for people and the environment. |
| **2.4. How climate change affects water resources** | **8th grade**<br>· Adaptation of fish to environmental conditions.<br>· The importance of fish in nature and human life. Economic importance of fish.<br>**11th grade**<br>· Ecosystems of rivers and lakes. | – | **8th grade**<br>· Physical and chemical phenomena.<br>· Acids and salts.<br>· Oxides. Properties of oxides.<br>· Physical properties of water.<br>· Water is a solvent. Chemical properties of water.<br>· The role of solutions in nature and in human life.<br>· The water cycle in nature.<br>· Water contamination. Protection and purification of fresh waters.<br>· Solubility of substances in water.<br>**9th grade**<br>· Chemical pollution of the environment with nitrogen compounds (acid rain, air, soil, and water pollution).<br>**11th grade**<br>· The medium of aqueous solutions of substances: acidic, neutral, alkaline. | – | – |

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| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.5. How climate change affects agriculture** | **5th grade**<br>· Changes in nature due to the development of agriculture.<br>**6th grade**<br>· Plant nutrition.<br>· Soil, its fertility.<br>**7th grade**<br>· Agriculture. Cultivated plants of agricultural land.<br>**8th grade**<br>Domestication of animals. Farmland animals.<br>**11th grade**<br>· Agroecosystems.<br>· Biological and economic importance of agroecosystems.<br>· The basis of rational use of natural resources. | – | **8th grade**<br>· Physical and chemical phenomena.<br>· Acids and salts.<br>· Water is a solvent.<br>· Chemical properties of water.<br>· The water cycle in nature.<br>· Waters contamination.<br>· Solubility of substances in water.<br>**9th grade**<br>· Chemical pollution of the environment by nitrogen compounds (acid rain, air, soil, and water pollution). | **6th grade**<br>· The connection between human beings and nature. | – |
| **2.6. How climate change affects coastal regions** | **8th grade**<br>· Game animals (fishing, hunting). | – | **8th grade**<br>· Water is a solvent. Chemical properties of water. | **6th grade**<br>· The connection between human beings and nature. | **8-11th grades**<br>· Hydrological emergencies: floods, tsunamis.<br>· Possibilities for forecasting, warning, mitigation.<br>· Rules for safe behaviour. Consequences of hydrological emergencies |

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| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.7. How climate change affects mountain regions** | – | – | – | **6th grade**<br>· The connection between human beings and nature. | **8-11th grades**<br>· Geological emergencies: earthquakes, volcanic eruptions, landslides, mudflows, rockfalls, avalanches.<br>· Possibilities for forecasting, warning, mitigation.<br>· Rules for safe behaviour.<br>· Consequences of geological emergencies. |
| **2.8. How climate change affects the Arctic region** | – | **7th grade**<br>· Aggregate states of matter: structure of gases, liquids and solid (crystalline) bodies. Features of the aggregative states of water. | **8th grade**<br>· Physical properties of substances. Aggregate state of substances.<br>· Physical and chemical phenomena.<br>· Chemical properties of water.<br>· Solubility of substances in water. | **6th grade**<br>· The connection between human beings and nature. | – |

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| **PART 2. How climate change affects the natural world and human beings. Can we adapt to the inevitable consequences of climate change?** | | | | | |
| **2.9. How climate change affects cities and human health** | **7th grade**<br>• Plants of the city, a feature of the urban flora. Parks, forest parks, botanical gardens.<br>**8th grade**<br>• The city as a special artificial environment created by man.<br>• Synanthropic species of animals. Their living conditions.<br>• Recreational pressure on wild animals in the city.<br>**9th grade**<br>• Urbanization.<br>**11th grade**<br>• Urban ecosystems. Biological and economic importance of urban ecosystems. | **10th grade**<br>• Technologies for producing modern materials, including nanomaterials, and nanotechnology. | **8th grade**<br>•The water cycle in nature.<br>• Water contamination.<br>• Solubility of substances in water.<br>**9th grade**<br>• Carbon oxides, their physical and chemical properties.<br>• Environmental problems associated with carbon monoxide, global climate change, greenhouse effect. | – | **8-11th grades**<br>• Methods of protection against overheating and hypothermia in different conditions. First aid for overheating, hypothermia, and frostbite. |
| **2.10. How climate change affects social problems** | – | – | **9th grade**<br>• Chemical pollution of the environment by nitrogen compounds (acid rain, air, soil and water pollution). | **6th grade**<br>• The connection between society and nature.<br>• Social communities and groups. The position of a person in society.<br>**11th grade**<br>• Social inequality.<br>• Migration processes in the modern world. | – |

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| **PART 3. How to prevent dangerous climate change** | | | | | |
| **3.1. 'Green' energy sources**<br><br>**3.1.1. What is energy?**<br><br>**3.1.2. The main sources of energy** | **7th grade**<br>• The role of ancient ferns in the formation of coal. | **8th grade**<br>• Fuels. Operating principles of heat engines. Heat engines and environmental protection.<br>**11th grade**<br>• Production, transmission, and consumption of electrical energy. | **11th grade**<br>• The role of chemistry in ensuring environmental and energy security. | **6th grade**<br>• Resources and economy of your country. | – |
| **3.1.3. Fossil fuels** | – | – | **8th grade**<br>• Fuel: coal and methane. Air pollution, increased greenhouse effect, destruction of the ozone layer.<br>**9th grade**<br>• Initial concepts of organic substances as carbon compounds (methane, ethane, etc.)<br>• Natural sources of hydrocarbons (coal, natural gas, oil), their processed products (gasoline), their role in everyday life and industry.<br>**10th grade**<br>• Natural sources of hydrocarbons and their processing.<br>• Natural gas. Associated petroleum gases. Oil and its origin. Oil refining methods: distillation, cracking (thermal, catalytic). Petroleum products, their use in industry and everyday life.<br>• Coal and products of its processing. | **6th grade**<br>• Resources and economy of your country. | – |

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| **PART 3. How to prevent dangerous climate change** | | | | | |
| **3.1.4. Nuclear energy** | – | **9th grade**<br>· Nuclear energy.<br>**11th grade**<br>· Problems and prospects of nuclear energy. | – | – | – |
| **3.1.5. Renewable energy sources** | – | **8th grade**<br>· Methods of electrical energy generation.<br>· Power plants using renewable energy sources. | – | – | – |
| **3.1.6. Advantages and disadvantages of different energy sources** | – | **9th grade**<br>· Effects of radiation on living organisms.<br>**10th grade**<br>· Environmental problems of the power industry.<br>**11th grade**<br>· Environmental risks during electricity generation.<br>· Environmental aspects of nuclear energy. | **9th grade**<br>· Natural sources of hydrocarbons (coal, natural gas, oil), their processed products (gasoline), their role in everyday life and industry. | **6th grade**<br>· Resources and economy of your country. | – |

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| **PART 3. How to prevent dangerous climate change** | | | | | |
| **3.2. Energy efficiency and energy saving**<br><br>**3.2.1. Environmentally friendly transport**<br><br>**3.2.2. Household appliances and electrical devices** | – | **8th grade**<br>· Electrical circuits and consumers of electrical energy in everyday life.<br>· Use of electric motors in technical devices and transport.<br>**10th grade**<br>· Electric heating and electric lighting devices – technical design and practical application.<br>· Technical devices and practical application: internal combustion engine, household refrigerator, air conditioner.<br>**11th grade**<br>· The culture of using electricity in everyday life. | **9th grade**<br>· Natural sources of hydrocarbons and products of their processing (gasoline), their role in everyday life and industries. | **10th grade**<br>· Worldview, its role in human life.<br>· Rational economic behaviour.<br>· Economic activities and sustainable development.<br>**11th grade**<br>· Environmental legislation.<br>· Environmental violations. | **8-11th grades**<br>· The influence of human activities on the natural environment.<br>· Environmental literacy and rational environmental management. |
| **3.2.3. Green construction. Passive and active buildings**<br><br>**3.2.4. Green cities** | **7th grade**<br>· Plants of the city, a feature of the urban flora. Parks, forest parks, botanical gardens. | – | **9th grade**<br>· The most important building materials: ceramics, glass, cement, concrete, reinforced concrete. Problems of safe use of building materials in everyday life.<br>· Alloys (steel, cast iron, duralumin, bronze) and their use in everyday life and industry.<br>**11th grade**<br>· General physical properties of metals. The use of metals in everyday life, nature, and technology. Metal alloys. | **6th grade**<br>· The connection between human beings and nature.<br>**11th grade**<br>· Environmental legislation. Environmental violations. | **8-11th grades**<br>· The influence of human activities on the natural environment.<br>· Environmental literacy and rational environmental management |

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| **PART 3. How to prevent dangerous climate change** | | | | | |
| **3.3. Carbon footprint and how I can help the planet by reducing my carbon footprint** | **11th grade**<br>· Methods of environmental research.<br>· Ecological worldview of modern people. | **11th grade**<br>· The culture of using electricity in everyday life. | **8th grade**<br>· Physical and chemical phenomena.<br>**10th grades**<br>· Plastics.<br>· Natural and synthetic rubbers.<br>· Fibre: natural (cotton, wool, silk), artificial (acetate fibre viscose), synthetic (nylon and lavsan).<br>**11th grade**<br>· Humans in the world of substances and materials.<br>· Household chemical literacy. | **6th grade**<br>· The connection between human beings and nature.<br>**7th grade**<br>· Moral assessment of people's behaviour and your own behaviour.<br>**10th grade**<br>· Worldview, its role in human life.<br>· Rational economic behaviour. | **8-11th grades**<br>· The influence of human activities on the natural environment.<br>· Environmental literacy and rational environmental management |
| **3.4. Global cooperation on climate change, sustainable development and all-of-society approach to deal with climate change** | **9th grade**<br>· The importance of environmental protection for the preservation of humanity.<br>**11th grade**<br>· Anthropogenic changes in the biosphere. Global ecological problems. | – | **8th grade**<br>· Protection and purification of fresh water.<br>**9th grade**<br>· Environmental problems associated with carbon monoxide, global climate change, greenhouse effect. | **6th grade**<br>· Strengthening the relationships between countries and people in modern society.<br>· Global problems of our time and the possibilities of solving them through the collaboration of the international community and international organizations<br>9th grade<br>Global problems and possibilities for their solution. The environmental situation and ways to improve it. | **8-11th grades**<br>· Environmental emergencies. Possibilities of forecasting, warning, mitigation of consequences. |