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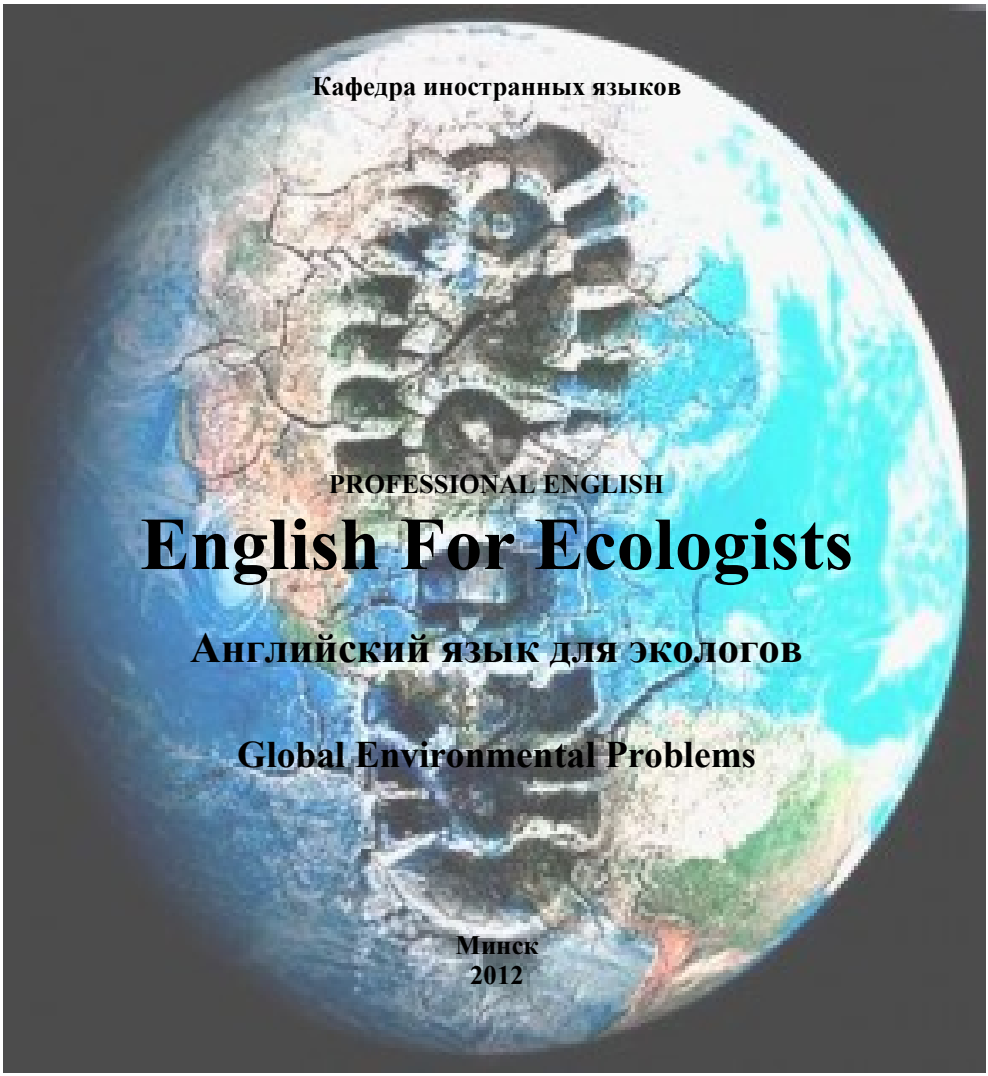

Кафедра иностранных языков

PROFESSIONAL ENGLISH

English For Ecologists

Английский язык для экологов

Global Environmental Problems

Минск
2012

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Учебное пособие по профессионально-ориентированному общению предназначено для развития лексических навыков в области специальной терминологии, совершенствования умений и навыков устной речи, чтения и перевода текстов, имеющих профессиональную значимость для экологов.

Данное пособие предназначено для студентов факультета мониторинга окружающей среды, а также для разных категорий учащихся, интересующихся проблемами охраны природы.

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UNIT 1

GLOBAL WARMING

Vocabulary

1. Match the words with their definitions:

1) distribution	[ˌdɪstrɪ'bju:ʃ(ə)n]	a) a sudden and powerful effect that smth. has on smth. or smb.
2) pattern (n.)	['pæt(ə)n]	b) produce and discharge (something, especially gas or radiation)
3) decade (n.)	['dekeɪd]	c) reduction of the amount of smth. or the number of things
4) average(adj.)	['æv(ə)rɪdʒ]	d) frequent changes in the amount, value, or level of smth.
5) fluctuation(n.)	[ˌflʌkʧu'eɪʃ(ə)n]	e) the normal or typical amount or quality for a particular group of things or people
6) impact (n.)	['ɪmpækt]	f) the action of sharing something out among a number of recipients
7) glaciation (n.)	[ˌgleɪsɪ'eɪʃ(ə)n]	g) not open to more than one interpretation
8) emit (v.)	[ɪ'mɪt]	h) the repeated or regular way in which something happens or is done
9) crust (n.)	[krʌst]	i) smth. that is formed from the decayed remains of plants or animals
10) unambiguous (adj.)	[ˌʌnæm'bɪgjuəs]	j) the process or state of being covered by glaciers or ice sheets
11) fossil fuel	['fɔs(ə)l 'fju(:)əl]	k) the tough outer part of something
12) depletion (n.)	[dɪ'pli:ʃ(ə)n]	l) a period of ten years

Listening

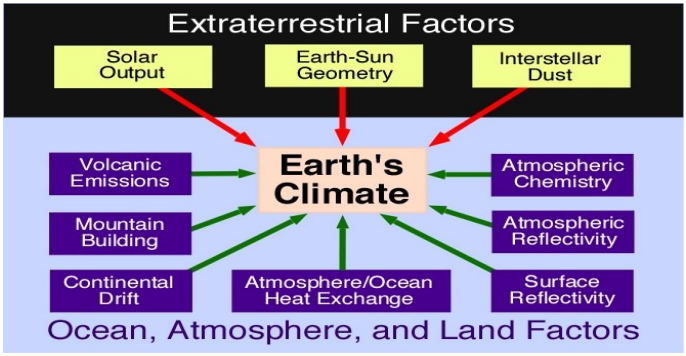
2. Before you listen, discuss with your partner if climate change can cause any problems.

3. Now listen to a radio talk about climate change. Read these notes that a student has taken while listening to the radio programme. Identify and correct three errors. Write true (T) or false (F).

1) Greenhouse Effect: The sun heats the Earth which sends energy into Space. Radiation stays in the atmosphere. It warms the atmosphere and the Earth.	
2) Methane and commercial oil and gas from landfills cause damage to the Earth's surface.	
3) Burning fossil fuels has made the problem bigger.	
4) The formation of new oceans could slow down global warming.	
5) Global warming will cause worldwide problems simultaneously.	

Before you read

1. You are going to read an article about Earth's climate. Look at the scheme. What does it tell you about it?



http://www.physicalgeography.net

2. Discuss with your partner the following questions.

- What do you know about the problem of climate change in the global aspect?
- What are the reasons for it?

3. Skim[1] the text to check your ideas.

Reading A

A PERIOD OF CLIMATE CHANGE

The Earth is going through a period of *climate change*. Climate change is generally regarded as the most important environmental problem of our time. The most general definition of climate change is a long-term change in the statistical *distribution* of weather *patterns* over periods of time that range

[1] *Skimming* means to get a general idea of what a text is about. Read the first paragraph (the introduction) and the last paragraph (the conclusion). Then read the first and last sentences of the other paragraphs.

from *decades* to millions of years. It may be a change in the *average* weather conditions or a change in the distribution of weather events with respect to an average, for example, greater or fewer extreme weather events. Accordingly, *fluctuations* on periods shorter than a few decades do not represent climate change. The term sometimes is used to refer specifically to climate change caused by human activity. In the latter sense climate change is synonymous with global warming.

Today we have the warmest climate since the 14th century. Is it natural or caused by environmental *impact* by man? But there are many other factors that influence the global climate. Natural variations have caused, as we know, both *glaciations* and warmer periods. This tells us that the temperature on the Earth is a finely tuned system and even small changes might have dramatic consequences.

Volcanic eruptions are examples of volcanic processes which release gases and particulates into the atmosphere. Volcanism is a process of conveying material from the *crust* and mantle of the Earth to its surface. Eruptions large enough to affect climate occur on average several times per century. Volcanoes are also part of the extended carbon cycle.

Glaciers are considered among the most sensitive indicators of climate change. Their size is determined by a mass balance between snow input and melt output. The growth and shrinkage of glaciers happen due both to natural variability and external force. Variability in temperature, can strongly determine the evolution of a glacier in a particular season.

Various hypotheses for human-induced climate change have been argued for many years. In some cases the chain of causality of human influence on the climate is direct and *unambiguous*. Of most concern in these factors is the increase in CO_2 levels due to emissions from *fossil fuel* combustion. Other factors, including land use, ozone *depletion*, animal agriculture and deforestation, are also of concern in the roles they play.

Evidence for climatic change is taken from a variety of sources that can be used to reconstruct past climates. But one thing is obvious that climate change is one of the most significant challenges facing the world today.

Reading Comprehension

Read the article carefully and answer these questions according to the information in the text.

1) Do you agree that climate change is synonymous with global warming? Why? Why not?

2) What is climate change?

3) What causes climate change?

4) What explains the recent (last 140 years) rise in earth's surface temperature?

5) Is climate change natural, or do human activities account for some or most of the change?

6) Does climate change happen gradually (so that humanity and ecosystems can evolve without too much stress), or does climate jerk quickly from one distinct "stable" state to another, too rapidly for social and biological systems to adapt?

7) If human impact on climate is significant, is the overall effect of present activity negative or positive?

8) What could happen if the climate changes?

9) What is being done around the world? How can society regulate environmentally hazardous activity?

10) How has the climate changed in your region over the last decade?

11) What can we do about climate change?

Language Development

!To talk about repeated actions or habits, permanent situations, general truths, give instructions, fixed future events, make suggestions and commentaries, observations and declarations, we use **the Present Simple Tense (subject + verb).** When the subject is 3rd person singular, we use the -s form of the verb.

The Present Simple is also used with certain verbs not normally used in the progressive forms and refer to states rather than actions.

These are the groups of verbs:

- verbs of the mind and thinking: *believe, think, consider, understand, suppose, expect, agree, know, remember, forget, doubt, mean, mind;*

- verbs of emotion and feeling: *like, dislike, hate, love, want, wish, prefer, care*;

- verbs of the senses: *see, smell, taste, hear;*

- verbs of possession: *have, possess, belong to, own;*

- certain other verbs: *concern, depend on, include*, *need, owe, seem* and others.

Some of these verbs can be used in the continuous tenses when the verb expresses an activity, not a state. However the meaning changes slightly.

Compare:

I think it's a great idea. *(think* as opinion, i.e. a state)

He's thinking of emigrating. *(think* as mental process, i.e. an activity)

Look at this sentence from the article and underline the Present Simple Tense: *Today we have the warmest climate since the 14th century.*

1. Find and underline other examples in the text. Explain the usage.

! **There** is an adverb meaning 'in that place'. When you want to say that something exists, begin the sentence with **there + be+** noun phrase. **There** is also used as an introductory subject in sentences beginning *there is/are, there seems to be, there might be* etc. *There* can be used with all tenses of *be* and in tags. In the **there + be** pattern, **there** is an 'empty' grammatical word (not an adverb of place).

2. Find the following pattern in the article and highlight it.

! We don't usually translate this pattern, e.g. ***There*** *are many winds in this area. – В этом районе преобладает много ветров.* ***There*** *remain several important issues to be discussed. – Осталось обсудить несколько вопросов*. Sometimes it is translated as *на этом месте, здесь, тут*, *там,* e.g. **There** he stopped – на этом он застрял.

! To compare two things we use the **comparative degree** of the adjective:

- add the ending **-er** to one syllable words and to two syllable words ending in **-y**, e.g. *fast-fast**er**; easy-eas**ier**;*
- put **more** (adverb of degree) in front of longer words, e.g. *difficult-more difficult;*
- use **than** before the second part of the comparison ***(subject + adjective+ than + object)***, e.g. *Mars is bigger than Earth;*
- use **more** with 'long' adjectives (***subject + more + adjective+ than + object)***, *e.g. Gold is **more** valuable **than** silver.*

To form **the superlative degree** of the adjective:

- add the ending **-est** to the short adjectives. Do not forget that **the** generally goes before a superlative adjective or adverb ending in **-est**, e.g. *the lat**est**;*
- use **most** with long' adjectives, e.g. ***the most*** *careful.* NB! There are some exceptions: *bad-worse-worst; little-less-least; good-better-the best.*

3. Find and underline other examples in the text. Name the patterns.

4. Fill in the proper forms of adjectives.

When we throw our garbage away, the garbage goes to landfills. Landfills are those big hills that you go by on an expressway that stink. They are full of garbage. The garbage is then sometimes burned. This sends an enormous amount of greenhouse gasses into the air and makes global warming _____ (**bad**).

Another thing that makes global warming _____ (**bad**) is when people cut down trees. Trees and other plants collect carbon dioxide (CO_2), which is a greenhouse gas.

Carbon dioxide is the air that our body lets out when we breathe. With _____ (**few**) trees, it is _____ (**hard**) for people to breathe because there is (**much**) CO_2 in the air, and we don't breathe CO_2, we breathe oxygen. Plants collect the CO_2 that we breathe out, and they give back oxygen that we breathe in. With _____ (**little**) trees and other plants, such as algae, there is _____ (**little**) air for us, and _____ (**many**) greenhouse gases are sent into the air. This means that it is very important to protect our trees to stop the greenhouse effect, and also so we can breathe and live.

This gas, CO_2, collects light and heat (radiant energy), produced by the sun, and this makes the earth _____ (**warm**). _____ (**little**) greenhouse gasses will rise into the air, and global warming will slow down.

5. Find and learn English equivalents for the following words and expressions:

1) период изменения климата	a)
2) выделяться в атмосферу	b)
3) серьезные последствия	c)
4) рост и уменьшение ледников	d)
5) истощение озонового слоя	e)
6) значимая проблема	f)
7) вызванный влиянием человека	g)
8) однозначное влияние	h)
9) продолжительный углеродный цикл	i)
10) небольшие колебания	j)

6. Find and learn Russian equivalents for the following words and expressions:

1) generally regarded	a)
2) long-term change	b)
3) finely tuned system	c)
4) predominant source	d)
5) seasonal distribution	e)
6) external force	f)
7) be of most (much) concern	g)
8) fossil fuel combustion	h)
9) sensitive indicators	i)
10) with respect to	j)

7. Translate the following article from English into Russian.

Fortunately, in the last few decades we have developed our scientific understanding of how climate change occurs, and the links between different elements in climate. We have also developed many techniques to determine past climate conditions over even longer periods. These help us to understand whether the measured rate of recent climate change is unusual, or has happened before. However, the problem is very complex, and there are still many. We start by considering some different ways in which climate might change. These include natural cycles, sudden changes from one stable state to another ("regime shifts"), and human ("anthropogenic") impacts. The most easily understood cycles are the shorter changes such as daily and seasonal cycles. These depend on well-known variations in the distribution of solar input that are a function of the earth's rotation and orbit. These processes are difficult to model because they depend on highly complex feedback mechanisms between solar input, the ocean, the atmosphere, the cryosphere (sea ice, ice sheets, and glaciers), and possibly also the role of the earth's terrestrial and aquatic flora and fauna (including humans).

Over to you

1. What are the most hazardous side effects of improvements of the environment?
2. Describe the main threats facing the global ecosystem?
3. What legal instruments for environmental protection can you name?
4. Do you agree that environmental problems have their roots in the use of natural resources?
5.  Prepare a presentation on the topic being discussed.

Writing

Glaciers everywhere in the world (with a very few exceptions) have been shrinking throughout the 20th century, a prime signal of rapid global warming.

Loss of tropical glaciers is particularly rapid. One glacier, previously photographed by the Austrian Hans Kinzl, receded about one kilometer in 67 years. Other glaciers are retreating as well. Mt. Kilamanjaro in Africa was reported to be losing its snow cap quite rapidly, with only one or two decades until total loss. Write an essay and explain your opinion on the topic being discussed.

To see more pictures of glaciers and changing ice conditions for your essay, take a look at Gary Braasch's Glacier webpage from his

www.worldviewofglobalwarming.org

THE GREENHOUSE EFFECT

Vocabulary

Match the words with their definitions:

1) hellish (adj.)	['helɪʃ]	a) allowing light to pass through so that objects behind can be distinctly seen
2) penetrate into	['penɪtreɪt]	b) a colourless, odorless flammable gas that has no smell and is the main constituent of natural gas
3) transparent (adj.)	[træn(t)' spær(ə)nt]	c) the process of smth. being soaked up or taken in
4) insulate (v.)	['ɪnsjəleɪt]	d) go into or through (something), especially with force or effort
5) methane (n.)	['mi:θeɪn]	e) intensified, increased, or further improved the quality, value, or extent of smth.
6) nitrous oxide	['naɪtrəs ɔksaɪd]	f) protect (something) by interposing material that prevents the loss of heat or the intrusion of sound
7) absorption (n.)	[əb'zɔ:pʃ(ə)n]	g) the proportion of the incident light or radiation that is reflected by a surface, typically that of a planet or moon
8) enhanced (adj.)	[ɪn'hɑ:n(t)st]	h) a colourless gas with a sweetish odour, prepared by heating ammonium nitrate
9) albedo (n.)	[æl'bi:dəu]	i) not able to be seen through; not transparent
10) opaque (adj.)	[ə'peɪk]	j) cloud forming a towering mass with a flat base at fairly low altitude and often a flat top, as in thunderstorms
11) cumulonimbus (n.)	[ˌkju:mjələu 'nɪmbəs]	k) extremely unpleasant

Listening &Watching

Watch the clip "Greenhouse effect" and then discuss with your partner what can cause greenhouse effect.

Before you read

1. This section provides an overview of the earth's atmospheric "greenhouse effect" by briefly exploring the atmospheres of nearby planets and discussing our atmosphere's greenhouse gases. Discuss with your partner the following questions.

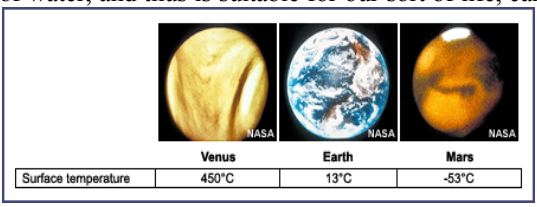
- What do you know about the greenhouse effect in the global aspect?
- What are the reasons for it?

2. Skim the text to check your ideas.

Reading B

THE EARTH'S ATMOSPHERIC OVERVIEW

The Goldilocks Principle can be summed up neatly as "Venus is too hot, Mars is too cold, and Earth is just right". The fact that Earth has an average surface temperature comfortably between the boiling point and freezing point of water, and thus is suitable for our sort of life, cannot be explained by simply suggesting that our planet orbits at just the right distance from the sun to absorb just the right amount of solar radiation.



	Venus	Earth	Mars
Surface temperature	450°C	13°C	-53°C

Our moderate temperatures are also the result of having just the right kind of atmosphere.

A Venus-type atmosphere would produce *hellish*, Venus-like conditions on our planet; a Mars atmosphere would leave us shivering in a Martian-type deep freeze.

Instead, parts of our atmosphere act as an *insulating* blanket of just the right thickness, trapping sufficient solar energy to keep the global average temperature in a pleasant range. The Martian blanket is too thin, and the Venusian blanket is way too thick! The 'blanket' here is a collection of atmospheric gases called 'greenhouse gases' based on the idea that the gases also 'trap' heat like the glass walls of a greenhouse do.

These gases, mainly water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), all act as effective global insulators. To understand why, it's important to understand a few basic facts about solar radiation and the structure of atmospheric gases. The sun radiates vast quantities of energy into space, across a wide spectrum of wavelengths. Most of the radiant energy from the sun is concentrated in the visible and near-visible parts of the spectrum. The narrow band of visible light, between 400 and 700 nm, represents 43 % of the total radiant energy emitted. Wavelengths shorter than the visible account for 7 to 8 % of the total, but are extremely important because of their high energy per photon. The shorter the wavelength of light, the more energy it contains. Thus, ultraviolet light is very energetic (capable of breaking apart stable biological molecules and causing sunburn and skin cancers). The remaining 49–50 % of the radiant energy is spread over the wavelengths longer than those of visible light. These lie in the near infrared range from 700 to 1000 nm; the thermal infrared, between 5 and 20 microns; and the far infrared regions. Various components of earth's atmosphere absorb ultraviolet and infrared solar radiation before it *penetrates into* the surface, but the atmosphere is quite *transparent* to visible light.

Absorbed by land, oceans, and vegetation at the surface, the visible light is transformed into heat and re-radiates in the form of invisible infrared radiation.

During the day earth would heat up, but at night, all the accumulated energy would radiate back into space and the planet's surface temperature would fall far below zero very rapidly. The reason this doesn't happen is that earth's atmosphere contains molecules that absorb the heat and re-radiate the heat in all directions. This reduces the heat radiated out to space. Called 'greenhouse gases' because they serve to hold heat in like the glass walls of a greenhouse, these molecules are responsible for the fact that the earth enjoys temperatures suitable for our active and complex biosphere.

Carbon dioxide (CO_2) is one of the greenhouse gases. It consists of one carbon atom with an oxygen atom bonded to each side. When its atoms are bonded tightly together, the carbon dioxide molecule can absorb infrared radiation and the molecule starts to vibrate. Eventually, the vibrating molecule will emit the radiation again, and it will likely be absorbed by yet another greenhouse gas molecule. This *absorption*-emission-absorption cycle serves to keep the heat near the surface, effectively insulating the surface from the cold of space.

Carbon dioxide, water vapor (H_2O), *methane* (CH_4), *nitrous oxide* (N_2O), and a few other gases are greenhouse gases. They all are molecules composed of more than two component atoms, bound loosely enough together to be able to vibrate with the absorption of heat. The major components of the atmosphere (N_2 and O_2) are two-atom molecules too tightly bound together to vibrate and thus they do not absorb heat and contribute to the greenhouse effect.

Atmospheric scientists first used the term 'greenhouse effect' in the early 1800s. At that time, it was used to describe the naturally occurring functions of trace gases in the atmosphere and did not have any negative connotations. It was not until the mid-1950s that the term greenhouse effect was coupled with concern over climate change. And in recent decades, we often hear about the greenhouse effect in somewhat negative terms. The negative concerns are related to the possible impacts of an *enhanced* greenhouse effect. It is important to remember that without the greenhouse effect, life on earth as we know it would not be possible.

In the atmospheric greenhouse effect, the type of surface that sunlight first encounters is the most important factor. Forests, grasslands, ocean surfaces, ice caps, deserts, and cities all absorb, reflect, and radiate radiation differently. Cloud cover also affects greenhouse warming by both reducing the amount of solar radiation reaching the earth's surface and by reducing the amount of radiation energy emitted into space.

Scientists use the term *albedo* to define the percentage of solar energy reflected back by a surface. Understanding local, regional, and global albedo effects is critical to predicting global climate change. The following are some of the factors that influence the earth's albedo.

Clouds: On a hot, sunny day, we usually welcome a big fluffy cumulus cloud passing overhead because we feel cooler immediately. That's because the top of the cloud reflects sunlight back into space before it ever reaches earth. Depending on their altitude and optical properties, clouds either cool or warm the

earth. Large, thick, relatively low-altitude clouds, such as cumulus and *cumulonimbus*, reflect incoming solar radiation and thereby reduce warming of the surface. The whitewash on plant greenhouses has the same effect on a smaller scale.

Surface albedo: Just as some clouds reflect solar energy into space, so do light-colored land surfaces. This surface albedo effect strongly influences the absorption of sunlight. Snow and ice cover are highly reflective, as are light-colored deserts. Large expanses of reflective surfaces can significantly reduce solar warming. Dark-colored land surfaces, in contrast, are strongly absorptive and contribute to warming. If global temperatures increase, snow and ice cover may shrink, the exposed darker surfaces underneath may absorb more solar radiation, causing further warming.

Oceans: Unlike dry land, water absorbs energy in a dynamic fashion. Some of the solar energy contacting the surface may be carried away by currents, some may go into producing water vapor, and some may penetrate the surface and be mixed meters deep into the water column. Water also has the capacity to store heat and transport large amounts of heat energy. Because of their enormous size and depth, oceans are extremely important in determining global climate and the future rate of global temperature change.

Forested areas: Like the oceans, the interaction of forests and sunlight is complex. The amount of solar radiation absorbed by forest vegetation depends upon the type and color of vegetation, the time of year, and how well watered and healthy the plants are. In general, plants provide a dark surface, so you might expect high solar absorption.

As we see, the ability of certain trace gases to be relatively transparent to incoming visible light from the sun, yet opaque to the energy radiated from the earth is one of the best understood processes in the atmospheric sciences. This phenomenon, the greenhouse effect, is what makes the earth habitable for life.

http://www.ucar.edu

Reading Comprehension

Read the article carefully and answer these questions according to the information in the text.

1) What is a greenhouse and how does it work?
2) What is the Greenhouse Effect?
3) How is the earth's atmosphere similar to a greenhouse?
4) What factors influence the function of a greenhouse?
5) What are the greenhouse gases?
6) What is albedo and how is it related to understanding global climate change?
7) What are the limitations in comparing the earth's atmosphere to a greenhouse?

Language Development

! We use **here** for the place where the speaker/ writer is, and **there** for other places. Note that **here** and **there** cannot normally be used as nouns, e.g. ***This place*** *is terrible.* ***It*** *is terrible here.* We CANNOT say ***Here is terrible.***

1. Find the example with here in the text and underline it.

! We can use comparatives with **the…the…** to say that things change or vary together, or that two variable quantities are systematically related **(the + comparative + subject + verb)**, e. g. ***The harder*** *you work,* ***the more*** *successful you will be.*

Sometimes we omit all words except **the + comparative**, e.g. ***the sooner, the better.***

More can be used with a noun in this structure, e. g. **the more** carbon dioxide, **the more** greenhouse gases we have.

2. Find the other example in the text and underline it.

! Also, as well and **too** have similar meanings, but they do not go in the same position in clauses. **Also** usually goes with the verb, in 'mid-position'; **as well** and **too** usually go at the end of a clause. **Also** can be used at the beginning of a clause to refer to the whole clause.

Look at the following sentence from the article. *"Venus is too hot, Mars is too cold, and Earth is just right".* Before adjectives without nouns and before adverbs we use **too. Too** is not normally used before **adj + noun.** It is different from **very. Too** means 'more than enough'.

3. Look through the article and find and underline the examples to the given rules. Explain the usage.

! Look at the following sentence from the article. ***If*** *global temperatures* ***increase,*** *snow and ice cover* ***may shrink****, the exposed darker surfaces underneath* ***may absorb*** *more solar radiation, causing further warming.*

This is the example of a conditional clause **(if + subject + present simple, future/modal + bare infinitive),** the 1st type of adverbial clause (real present). The event described in the main clause (may shrink/absorb) depends on the condition described in the conditional clause (if … increase). You can either use other conjunctions: unless (if not), provided/ing that, so long as, as long as, on condition that.

4. Use the prompts to make sentences with the 1st conditional.

1) the Earth atmosphere (be similar) to Mars, we (not breath).

_____

2) people (not burn) fossil fuel, we (not have) significant amount of greenhouse gases.

_____

3) we (not have) garbage dumps, there (be) less methane.

_____

4) we (not have) greenhouse effect, nothing can (regulate) temperature on Earth.

_____

5) the energy (not escape) from the atmosphere to space, we (have) a lot of problems.

_____

! Look at the sentence from the article. *A Venus-type atmosphere would produce hellish, Venus-like conditions on our planet; a Mars atmosphere would leave us shivering in a Martian-type deep freeze.*

The modal verb **would** is used here to say that the situation is probable. If it has a negative form it means weak probability.

5. Look through the article, find and underline the examples to the given rule. Explain the meaning and translate the sentences.

! It is not always easy to know which preposition to use after a particular noun, verb or adjective. Here are some of the common combinations. Learn them.

base on/upon; familiar with; be concentrated in; concentrate on/upon; penetrate through/into; transform/convert to/into; be responsible for; be suitable for; consist of/in/with; deal with; contribute to smth/-ing; couple with; depend on/upon.

6. Fill in the gaps with the proper prepositions.

1) Carbon dioxide is responsible _____ causing the greenhouse effect.

2) Sunspots are concentrated _____ two belts, one north and one south of the solar equator.

3) Interstate pipelines consist a number of components that ensure the efficiency and reliability of a system that delivers an important energy source year-round, 24 hours a day.

4) UVA rays from the sun can penetrate deep _____ your skin and damage collagen, which is the protein that holds your skin together in a firm and smooth way.

5) We all are familiar _____ the effects of carbon dioxide on our environment.

6) The scientists base their conclusions the conclusive evidence.

7) Most plants depend _____ seasonal rainfall, although some can draw upon groundwater supplies.

8) This is coupled _____ uncertainty associated with new technologies.

9) If scientists can successfully convert carbon dioxide _____some useful compound commercially using little energy then we can effectively deal _____ the ill effects of greenhouse.

10) The Holdren-Ehrlich model is highly suitable _____ use.

11) Mankind has certainly contributed _____ the fact that the 'natural sweater' has become 'thucker' during the last 150 years.

7. Find and learn English equivalents for the following words and expressions:

1) парниковый эффект	a)
2) закись азота	b)
3) поглощать радиацию	c)
4) точка кипения	d)
5) точка замерзания	e)
6) изоляционное одеяло	f)
7) удерживать тепло	g)
8) инфракрасное излучение	h)
9) изоляционный материал	i)
10) кучево-дождевые облака	j)

8. Find and learn Russian equivalents for the following words and expressions:

1) near-visible parts of the spectrum.	a)
2) atmospheric scientists	b)
3) trace gases	c)
4) albedo effects	d)
5) water vapour	e)
6) radiant energy	f)
7) bound atom	g)
8) contribute to	h)
9) Cirrus clouds	i)
10) nimbus	j)

9. Translate the following article from English into Russian.

The greenhouse effect is one of several factors that affect the temperature of the Earth. It was discovered by Joseph Fourier in 1824, with the first reliable experiments conducted by John Tyndall in the year 1858 and reported for the first time, quantitatively by Svante Arrhenius in 1896. Greenhouse gases, which include water vapour, carbon dioxide and methane, warm the atmosphere by efficiently absorbing thermal infrared radiation emitted by the Earth surface, by the atmosphere itself, and by clouds. Methane is produced when vegetation is burned, digested or rotted with no oxygen present. Garbage dumps, rice paddies, and grazing cows and other livestock release lots of methane. Nitrous oxide can be found naturally in the environment but human activities are increasing the amounts. Nitrous oxide is released when chemical fertilizers and manure are used in agriculture. Halocarbons are a family of chemicals that include CFCs (which also damage the ozone layer), and other human-made chemicals that contain chlorine and fluorine. The most poisonous and the abundantly released gas is carbon dioxide. Billions of tones of carbon dioxide are burnt into the atmosphere every year. Carbon dioxide is the gas that is exhaled by everyone in this Earth and it has the properties to absorb infrared radiation, which is the heat ra-

diated away from a warm object. The Earth cools off at night by radiating the heat back into the space, which it gets from the sun during the day, in the form of infrared radiation. With carbon dioxide present in the air, it will absorb some of the radiation and limit its exit into space. The presence of increased carbon in the atmosphere has made the oceans more acidic, killing many sea creatures and endangering the general health of the oceans all over the world.

www.cambioclimaticoglobal.com

10. Translate the following article from Russian into English.

Антропогенное глобальное потепление, как полагают (is believed to be), является результатом "усиленного парникового эффекта", главным образом, из-за увеличения концентрации парниковых газов в атмосфере благодаря человеческому вмешательству и изменений в использовании земли. В нашей солнечной системе на Марсе, Венере и Титане также проявляются соответствующие их среде парниковые эффекты. Кроме того, у Титана есть анти-парниковый эффект, и Плутон демонстрирует поведение, подобное анти-парниковому эффекту.

Из-за блокирования опасных ультрафиолетовых лучей и поддержания поверхности Земли достаточно теплой для живых организмов, озон, как полагают (is considered to be), является очень важным остаточным газом. Теперь же обнаружено, что озоновый слой, защищающий землю, утончается и постоянно уменьшается.

Сегодня используются сложные компьютерные модели, для того чтобы получить доступ ко многим важным факторам, которые влияют на климат Земли.

Over to you

1. Here is a short list of environmental issues. Which do you think is the most important?
   - Explain your choice to the class.
   - Climate change – global warming, or 'the greenhouse effect'
   - Acid rain
   - Species in danger of extinction
   - Destruction of the rainforest/countryside
   - Pesticides and other pollution
2. Work in groups. Discuss the following questions and decide which environmental issue you think presents most danger to the human race.
   - What is the most important environmental problem in your country?
   - Does everyone in the class agree on it?
   - What is being done about the problem?
3.  Prepare a presentation on the topic being discussed.

Writing

Since greenhouse gases make up such a small percentage of the atmosphere, why do changes in their concentrations have such a big effect on climate? Write your ideas in the form of an essay.

GREEN ISSUES

Vocabulary

Match the words with their definitions:

1) terraformed (adj.)	['terəˌfɔ:md]	a) a deep gorge, typically one with a river flowing through it, as found in North America
2) mankind (n.)	[ˌmæn'kaɪnd]	b) to become active, popular, or successful again
3) extinct (adj.)	[ɪk'stɪŋkt]	c) Earth-shaping
4) landfill (n.)	['lændfɪl]	d) strengthen or support physically or mentally
5) sustain (v.)	[sə'steɪn]	e) a body of permeable rock which can contain or transmit groundwater
6) dwindle (v.)	['dwɪndl]	f) human beings considered collectively; the human race
7) revive (v.)	[rɪ'vaɪv]	g) disposal of waste material by burying it, especially as a method of filling in and reclaiming excavated pits
8) decimate (v.)	['desɪmeɪt]	h) (of a species, family, or other larger group) having no living members
9) aquifer (n.)	['ækwɪfə]	i) diminish gradually in size, amount, or strength
10) canyon	['kænjən]	j) to destroy a very large number of smth.

Listening & Watching

1. Before you listen to the song and watch the clip, discuss with your partner what can cause pollution.

2. Now listen to the song and watch the clip by Michael Jackson checking your ideas. Complete the missing words.

EARTH SONG by *Michael Jackson*

1) What about _____
What about _____
What about all the things
That you said we were to _____
What about _____ fields,
Is there a _____
What about all the things
That you said was _____and mine
Did you ever stop to _____

2) What have we done to the ___
Look what we've _____
What about all the _____
That you pledge your only _____.
What about flowering _____
Is _____ a time
What about all the _____
That you said was yours and _____.
Did you ever stop to _____

All the blood we've _____ before
Did you ever stop to notice
The crying _____, the weeping __?
Aaaaaaaaah Aaaaaaaaah
3) I used to dream,
I used to glance beyond the _____
Now I don't know where we are
Although I know we've drifted ___.
Aaaaaaaaah Aaaaaaaaah
Hey, what about__(what about us)
What about the ____(what about us)
The heavens are falling
_____ (what about us)
I can't even _____ (what about us)
What about apathy (what about us)
I need you (what about us)
What about ____s worth (ooh, ooh)
It's our ___'s womb (what about us)
What about _____ (what about it)
We've turned kingdoms to
_____(what about us)
What about _____ (what about us)
Have we lost their __(what about us)
What about crying ___ (what about us)
We're ravaging the ___ (what about us)
What about _____trails (ooh, ooh)
Burnt despite our pleas (what about us)

All the children dead from _____
Did you ever stop to notice
The crying ____, the weeping _____?
Aaaaaaaaah Aaaaaaaaah
4)What about the holy
_____**(**what about it)
Torn apart by _____ (what about us)
What about the common
_____ (what about us)
Can't we set him ____(what about us)
What about _____dying
(what about us)
Can't you hear them _____
(what about us)
Where did we go _____(ooh, ooh)
Someone tell me ____ (what about us)
What about babies __ (what about it)
What about the _____
(what about us)
What about all their __ (what about us)
What about the _____
(what about us)
What about the ___man (what about us)
What about _____**(**what was us)
What about _____again (ooh, ooh)
Do we give a _____
Aaaaaaaaah Aaaaaaaaah

Before you read

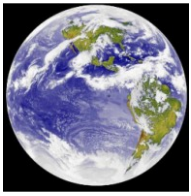
1. James Lovelock says that Global Warming is now at point of no return. Other top climate scientists are more hopeful but say we only have less than 10 years before it's irreversible and time is running out. This section provides an overview of the solutions for saving the Planet and Humanity. Discuss with your partner the following questions.

- What has to be done to save both the planet and humanity?
- What are the reasons for it?

2. Skim the text to check your ideas.

Reading C

HOW TO SAVE THE PLANET AND HUMANITY *by Phil B.*



Let's face reality. The Earth is going to be the first planet *terraformed*. The human race is killing our planet by flooding land, sea, and air with pollution and by over use. Plants and animals are unable to adapt quickly enough to the changes in the environment that *mankind* is causing. The Earth is becoming less capable of sustaining the world's population. Even humanity is at risk of becoming *extinct* because of the long term effects of global warming. Here are some recommendations of what has to be done to save both the planet and humanity.

Recycle everything! Instead of having our trash sent to *landfills*, everything that people consume and eventually throw out must be recycled. Therefore, we need recycling plants for batteries, electronics, organic (food and garden) wastes, medals, etc. in addition to recycling paper, plastic, glass, and aluminum.

Pollution Free Energy! Reducing energy utilization, such as energy efficient light bulbs, cars, and washing machines will not solve this problem; but only delay this problem from being solved as soon as possible.

Population Control. Right now, the Earth cannot *sustain* the existing human population indefinitely, and this is not including the current population growth. As a result, the world's resources are quickly *dwindling* without replacements. The only logical solution to this problem is population control. Since the world cannot indefinitely support the entire human population, then the world's population needs to decrease to a level so that the planet can sustain both humanity and wildlife indefinitely.

Renewable Resources. Humanity is currently consuming more resources than the planet can renew, and this does not include non-renewable resources such as oil. Therefore, business will eventually have to convert to strictly self sustainable and renewable resources in the near future.

Environmental Protection. The human race is destroying vast regions of the planet, so much so that the planet's ability of supporting life is decreasing. Throughout the world, forests and wild lands must no longer be allowed to be destroyed for human development, and this still may not be enough to support all wildlife. Land that has become infertile because of man's actions, such as strip mining and deforestation, must be *revived* by law. The world's oceans also need to be globally managed, since the world's fish population is suffering from overfishing. It is estimated that the world's oceans will no longer be commercially useful for fishing between 2030 and 2060. Even air pollution needs to be completely regulated until all air is clean and remains that way.

Manage Global Warming. Global warming is going to *decimate* the human civilization if left unchecked. Further actions must be necessary to either prevent or manage global warming. For instance, intentionally flood large portions of land to prevent the world's ocean from destroying coastal cities and farmland, redirect rivers to not deposit their water into the oceans but

into lakes, valleys, *canyons*, *aquifers*, empty oil fields, and where ever else possible, use seawater to flood large sections of unused land, such as deserts. These solutions will definitely have major consequences, but will not include the uncontrolled destruction of cities and countless lives.

Reading Comprehension

1. Jumbled sentences. Arrange the sentences in the abstract in a logical order.

1) The previous solutions above will help slow down global warming, but they will not prevent global warming.

2) Here are some recommendations of what has to be done to save both the planet and humanity.

3) Since the world cannot indefinitely support the entire human population, then the world's population needs to decrease to a level so that the planet can sustain both humanity and wildlife indefinitely.

4) Therefore, further actions must be necessary to either prevent or manage global warming.

5) Land that has become infertile because of man's actions, such as strip mining and deforestation, must be revived by law.

6) Instead of having our trash sent to landfills, everything that people consume and eventually throw out must be recycled.

7) Right now, the Earth cannot sustain the existing human population indefinitely, and this is not including the current population growth.

2. Answer the following questions.

1) Are we really changing the Earth's environment? Why?

2) What can be done to help save the Earth's environment?

3) Is it possible to develop natural resources?

4) What ways of supplying energy do you know?

5) Do land, air and water work as an ecosystem to maintain the "great chain of life"?

6) Can the ecological problems be solved on a local scale?

7) What's the use of recycling?

8) Can nature protection be an effective substitute for national conflicts?

Language Development

! Future: Present Progressive, be going to and will

We use **Present Progressive, be going to** to talk about *future actions* and events that have some present reality. If we say that something in the future *is happening* or *going to happen*, it is usually already planned or decided, or it is starting to happen, or we can see it coming now.

The Present Progressive **(subject + am/is/are + verb -ing + object)** is used mostly to talk about personal arrangements and fixed plans, especially when the time and place have been decided, e.g. *We are having a conference*

next month. We often use the present progressive with verbs of movement, to talk about actions which are just starting.

be going + infinitive

This structure, too, can be used to talk about plans and often emphasizes the idea of intention, of a decision that has already been made, e.g. *The Earth is going to be the first planet terraformed.* Another use is to predict the future on the basis of present evidence – to say that a future action or event is on the way, or starting to happen. In many cases, both structures can be used to express the same idea. But there are some differences.

The Present Progressive can emphasise the idea of 'fixed arrangement'; **going to** can emphasise the idea of 'intention', or 'previous decision'. **The Present Progressive** is not generally used to make predictions about events that are outside people's control.

Look at the sentence from the article. *Therefore, business will eventually have to convert to strictly self sustainable and renewable resources in the near future*. We can use **will** as an auxiliary verb when we make predictions about the future. **Will** can either express certainty or confidence about present or future situations.

1. Look through the article, find and underline the examples to the given rules. Explain the meaning and translate the sentences.

! Note that present tenses are often used instead of **will + infinitive** to refer to the future in subordinate clauses, mainly in clauses of TIME after conjunctions of time like *when, until, after, before, as soon as,* and in CONDITIONAL CLAUSES *(if, whether, on condition that)* (see text B above).

2. Fill in the gaps with the proper tense: Present Simple, Present Progressive, will, be going to.

1) Its policies also _____ (aim) at protecting the ozone layer and at ensuring that the climate dimension _____ (be) appropriately present in all Community policies and that adaptation measures _____ (reduce) the European Union's vulnerability to the impacts of climate change.

2) The politicians_____ (may/want) to reduce carbon emissions, but it _____ (be) the designers and engineers that _____ (decide) whether it can be done, together with the specifiers and installers who _____ (make) it a reality.

3) It's a future that _____(present) new opportunities and challenges for us all, as well as one that _____(bring) great change to the type of products and services we _____ (offer).

4) The restriction and prohibition of various forms of pollutants that _____ (have) a potentially damaging effect on the environment _____ (be) prominent green issues that _____ (affect) us all, especially those people who _____ (live) in large towns and cities where the air quality _____ (be) frequently very poor.

5) Low carbon electricity _____ (mean), to most greens, renewable sources of energy which_____ (provoke) something approaching a full-scale revolt.

3. Look at the sentence from the article. *Here are some recommendations of what has to be done to save both the planet and humanity.*

! **Some** is a determiner. It often suggests an indefinite quantity or number, and is used when it is not important to say exactly how much/ how many we are thinking of. With this meaning, **some** is most common in affirmative clauses, and in questions which expect or encourage the answer 'yes'. In other cases, **any** is used. With a singular countable noun, **some** can refer to an unknown person or thing, e.g. *There must be **some** job I could do.*

4. Look at the sentence from the article. The human race is destroying vast regions of the planet, so much so that the planet's ability of supporting life is decreasing.

! **So much/many** indicates a particular but unspecified quantity. We can either use **much** with singular nouns and **many** with plurals. We can use them before noun phrases as determiners. We do not generally use **of** when there is no other determiner, e.g. article or possessive. However, **much of** can be used before personal and geographical names, e.g. *Not **much of** Denmark is hilly.* **Much** and **many** are used mostly in questions and negative clauses. They are unusual in affirmative clauses except after **so**, **as** and **too**; other words and expressions are used. There is not much difference between **a lot of** and **lots of**: they are both used mainly before singular uncountable and plural nouns, and before pronouns. When **a lot of** is used before a plural subject, the verb is plural; when **lots of** is used before a singular subject, the verb is singular.

5. Look at the sentence from the article. *This may be obvious to most people, but few people realize that this fact is a problem that can be solved.*

! **(A) few** with plurals, and **(a) little** are quantifiers, and are normally used before nouns. We use **(a) few** with plurals, and **(a) little** with singular (uncountable) words.

6. Fill in the gaps using *some/any, much/many/a lot (of).*

What causes global warming?

1.___ things cause global warming. One thing that causes global warming is electrical pollution. Electricity causes pollution in **2.** ___ ways, **3.** ___ worse than others. In most cases, fossil fuels are burned to create electricity. Fossil fuels are made of dead plants and animals. **4.** ___ examples of fossil fuels are oil and petroleum. **5.** ___ pollutants (chemicals that pollute the air, water, and land) are sent into the air when fossil fuels are burned. **6.** ___ of these chemicals are called greenhouse gasses.

We use these sources of energy **7. ___** more than the sources that give off **8.____** pollution. Petroleum, one of the sources of energy, is used **9. ___.** It is used for transportation, making electricity, and making **10. ___** other things. Although this source of energy gives off **11. ___** pollution, it is used for 38 % of the United States' energy.

When you do these things, you are causing more greenhouse gasses to be sent into the air. Greenhouse gasses are sent into the air because creating the electricity you use to do these things causes pollution. If you think of how **12. ___** times a day you do these things, it's **13. ___.** You even have to add in how **14. ___** other people do these things! That turns out to be **15. ___** pollutants going into the air a day because of people like us using electricity. The least amount of electricity you use, the better.

7. Find and learn Russian equivalents for the following words and expressions:

1) to be capable of sustaining the world's population	a)
2) strip mining	b)
3) need to be recycled	c)
4) revived by law	d)
5) energy utilization	e)
6) deforestation	f)
7) coastal cities	g)
8) intentionally	h)
9) major consequences	i)
10) uncontrolled destruction	j)

8. Find and learn English equivalents for the following words and expressions:

1) невозобновляемые источники	a)
2) приспосабливаться к изменениям	b)
3) вдобавок, в дополнение к, кроме того, к тому же	c)
4) существующие мусорные свалки	d)
5) энергосберегающий	e)
6) сокращаться, уменьшаться, убывать, истощаться	f)
7) неплодородная, скудная почва	g)
8) все народонаселение	h)
9) по оценкам	i)
10) водоносный слой	j)

9. Translate the following article from English into Russian.

The main reason why consumers mostly buy non-recycled goods is because these goods are cheaper than recycled goods. This may be obvious to most people, but few people realize that this fact is a problem that can be solved. A simple yet practical solution for this problem is to heavily tax non-recycled goods, and use the money collected to subsidize recycled goods.

This would have two major benefits. First, the plundering and looting that is destroying the environment should decrease substantially and maybe one day even stop. Second, this would drastically increase the amount of recycling. Therefore, the economy of scale of recycling will also dramatically increase, thus the cost of recycling will significantly decrease. Eventually, the cost of recycling without subsidies should decrease to below the cost of using non-recycled resources that are untaxed. Once this has been achieved, then the taxes on non-recycled resources can be stopped.

Similarly, environmentally unfriendly energy sources are currently much more cost effective than environmentally friendly and renewable sources of energy. If the cost of environmentally unfriendly energy sources were to be artificially more than the alternatives, then eco-friendly energy sources would become much more popular. Eventually, the large scale demand and utilization of these environmentally friendly energy sources should decrease the cost of renewable energy to below the current costs of environmentally harmful power sources. Again once the cost of using eco-friendly power sources become truly cost effective on a large scale, then the taxes on unfriendly power sources can be removed too.

*In essence, this simple solution would protect the environment by giving bigger incentives to recycle everything and to use environmentally friendly power sources. Unfortunately, it is now necessary for the environment to come first, and profits for large corporations to come second. Keep in mind that corporations will still make profits during this eco-friendly transition period, and corporations will resume making ridiculously huge profits in the new eco-friendly business environment. Therefore, let the new world mantra be "**The environment first, profits second!**"*

http://www.philforhumanity.com/The_Environment_First.html

Over to you

Human beings have a responsibility to take care of this planet. As guardians of nature, one can follow these simple tasks to help preserve this world for the next generation.

1. Look through and say which of them is/are the most important and why.

Conserve Energy:

- Wash clothes with warm or cold water instead of hot;
- Use compact fluorescent light bulbs to save money and energy;
- Lower the thermostat on your water heater to 120;

Create Less Trash:

- Reuse items like bags and containers when possible;
- Use reusable plates and utensils instead of disposable ones;
- Buy products that you can reuse;

Save water:

- Check and fix any water leaks;
- Install water-saving devices on your faucets and toilets;
- Don't wash dishes with the water running continuously;

Become Proactive: If you walk past garbage, pick it up and threw it away next to the garbage can that is probably five feet away.

Reduce Toxocity:

- Use traps instead of rat and mouse poisons and insect killers;
- Have your home tested for radon;
- Create a wildlife habitat in your yard;

Register For E-statements, it saves gas and trees. Also pay bills online and email instead of writing letters.

Protect our air:

- Shut off electrical equipment in the evening when you leave work;
- Report smoking vehicles to your local air agency;
- Avoid slow-burning, smoldering fires. They produce the largest amount of pollution.

2.  Prepare a presentation on the topic being discussed.

Writing

Clear cutting, acid rain, the greenhouse effect, pollution. Most of us have heard of these methods by which our planet is being killed. But how many people are aware of the damage being done to our oceans by over-fishing, scraping bottom, or cruise ships? Write your ideas in the form of an essay giving arguments for and against.

Project

WWWF, Formly known as the World Wildlife Fund (www.wwf.org or www.panda.org) and Greenpeace (www.greenpeace.org) are two of the world's best known environmental campaign groups. Both of them have branches in many countries. Look at their websites and find out what they are doing in or near your country. Write to them to find out what conservation and environmental issues are important. Send them your written work about an environmental problem.

UNIT 2

WATER, AIR & SOIL POLLUTION

Vocabulary

Match the words with their definitions:

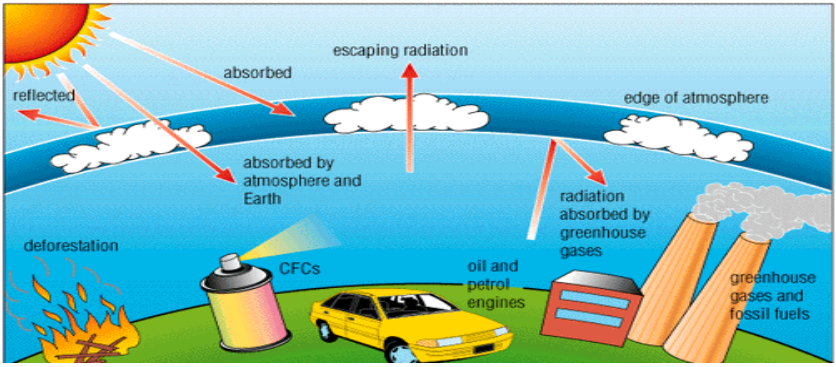
1) contaminant (n.)	[kən'tæmınənt]	a) a colorless, odorless gas that forms about 78 % of the earth's atmosphere
2) sulphur (n.)	['sʌlfə]	b) an act of clearing (an area) of forests or trees
3) diverse (v.)	[daı'vɜːs]	c) something that pollutes a substance such as water or food
4) nitrogen (n.)	['naıtrədʒən]	d) take in or soak up (energy or a liquid or other substance) by chemical or physical action
5) absorb (v.) [with obj]	[əb'zɔːb]	e) a strong colourless acid containing nitrogen, hydrogen, and oxygen
6) spread (v.) [no obj.+ adv.-al]	[spred]	f) to manage to continue or exist in spite of difficult circumstances
7) inhale (v.)[+obj]	[ın'heıl]	g) to show a great deal of variety; very different
8) nitric acid	['naıtrık'æsıd]	h) extend over a large or increasing area
9) deforestation (n.)	[dı'fɔrısteiʃən]	i) a yellow chemical which has a strong smell
10) survival (n.)	[sə'vaıv(ə)l]	j) breathe in (air, gas, smoke, etc.)

Watching

Watch the cartoon 'Delivery' and then discuss with your partner what can cause pollution.

Before you read

1. You are going to read an article about environmental pollution. Before you read, look at the picture. What does it tell you about it?



2. Discuss with your partner what you know about air pollution.

3. Skim the text to check your ideas.

Reading A

ENVIRONMENTAL POLLUTION

Scientists have estimated that every day, an average person *inhales* about 20,000 liters of air. Every time we breathe, we risk inhaling dangerous chemicals that have found their way into the air. Air pollution includes all *contaminants* found in the atmosphere. These dangerous substances can be either in the form of gases or particles. Air pollution can be found both outdoors and indoors. Pollutants can be trapped inside buildings, causing indoor pollution that lasts for a long time. The sources of air pollution are both natural and human-based. As one might expect, humans have been producing increasing amounts of pollutants as time has progressed, and they now account for the majority of pollutants released into the air.

The effects of air pollution are *diverse* and numerous. Air pollution can have serious consequences for the health of human beings, and also severely affects natural ecosystems. Because it is located in the atmosphere, air pollution is able to travel far off places easily. As a result, air pollution is a global problem and has been the subject of both global cooperation and conflict. Some areas now suffer more than others from air pollution. Cities with large numbers of automobiles or those that use great quantities of coal often suffer most severely from problems of air pollution.

Historically, air pollution comes from industries and transport. Factories, power stations and cars burn oil and coal. This rises into the air as different forms of *sulphur* and *nitrogen*. The sulphur and nitrogen combine with water in the air to make sulphuric or *nitric acid*. This falls to the ground as acid rain.

We burn large quantities of coal and oil, and this creates millions of tonnes of acid rain. The wind carries the rain long distances, and this creates problems. One country makes acid rain, and it falls to the ground in another country, for example, Canada gets a lot of acid rain from the USA, and Norway gets a lot of acid rain from Britain.

Industrial countries also cause the greenhouse effect as you know. Burning coal and oil produces carbon dioxide (CO_2). The CO_2 increases in the Earth's atmosphere, and retains heat from the sun (it works like the glass in a greenhouse – it lets heat in, but doesn't let the heat out).

The Earth is getting hotter. Weather patterns are changing: some places have no water for years, and some places have floods. When a country has no water, the effects are very hard – in Chile in 1999, the result was electricity cuts around the country. There was no either water for the hydroelectric power stations. The ozone layer is a band of gas around the Earth. It protects us from dangerous ultraviolet (UV) radiation from the sun. It is vital to human and animal *survival.*

Unfortunately, we are producing chemicals which destroy the ozone layer. The damage starts in the Antarctic and *spreads*. Sheep in the Magallanes are becoming blind because the ozone layer is thinner. In Australia, a lot of people are getting skin cancer from the sun.

Output control, the opposite method, seeks to fix the problems caused by air pollution. This usually means cleaning up an area that has been damaged by pollution. Input controls are usually more effective than output controls. Output controls are also more expensive, making them less desirable to tax payers and polluting industries. Current air pollution control efforts are not all highly effective. However, in developing countries and even in countries where pollution is strictly regulated, much more needs to be done.

Reading Comprehension

1. Are the statements True or False?

1) The text describes different types of air pollution. ☐
2) Canada sends acid rain to the USA. ☐
3) Global warming is also called climate change. ☐
4) Industrial countries cause the "greenhouse effect". ☐
5) You can see the effects of ozone layer depletion in Chile. ☐
6) Sheep are damaging the ozone layer. ☐
7) There is pollution only outdoors. ☐

2. Read the text and divide it into some extracts. Give a heading to each extract.

Language Development

! To form **adjectives from verbs and nouns**, we add the following suffixes: **-able, -al, -ant, -ful, -ible, -ive, -ous, -(t)ic, -y, -ed, -ing**, e.g. *afford – afford**able**; culture-cultur**al**; collapse-collaps**ible**; destruction-destruct**ive**; courage-courage**ous**; scare-scar**y**.*

To form **nouns from verbs**, we add the following suffixes: **-al, -nt, -ance, -sion, -(a)tion, -ty, -ence, -ure, -ment, -y, -ness,** e.g.*survive-surviv**al**, tolerate-toler**ance**, pollute-pollu**tion**, treat-treat**ment**, participate-participa**nt**,save-saf**ty**, discover-discover**y**.* If you need to form **nouns from adjectives**, just add: **-(an)ce, -ness, -(at)ion, -th, -ty, -cy, -y, -(en)ce, -(il)ity**, e.g. tolerant-toler**ance**, violent-violence**,** responsible-responsib**ility**, warm-warm**th**.

We add **-en** to certain **adjectives to form verbs**, e.g. *broad-broad**en**, long-length**en**, wide-wid**en.***

If you want to make the word **negative**, use the following prefixes: **dis-, il-, im-, in-, ir-, mis-, un-**, e.g. *obedient-**dis**obedient, legal-**il**legal, mature-**im**mature, possible-**im**possible, flexible-**in**flexible, regular-**ir**regular, behave-**mis**behave, fit-**un**fit, usual-**un**usual,* or suffix**-less***, e.g. harm-harm**less.***

1. Combine the suffixes with the words in the box, and then complete the text below:

-able	**-ive**	**-ity**	**-ous**
-ity	**-ant**	**-ence**	**-ist**

science		**major**	
effect		**danger**	
diverse		**desire**	
pollute		**consequent**	
contaminate		**deforest**	

1) Many _____ are worried that the global warming is increasing nowadays. 2) The _____ of the _____ comes from smoke from factories, car fumes and dumping. 3) We have to make _____ arrangements to stave off the _____ chemicals to find their way into the air. 4) The _____ destroy the ozone layer which stop harmful radiation from the sun reaching the Earth. 5) The _____ of the air pollution ate enormous and can affect people's health. 6) Not all the ways of protection are _____ for the country industry. 7) The _____ of gases which emit from burning coal and oil contributes to the green house effect. 8) One percent of Brazil's total forest cover is being lost every year to _____.

! Look at the following sentence from the article. *These dangerous substances can be <u>either</u> in the form of gases <u>or</u> particles.* We use *either ... or* to talk about a choice between two possibilities (and sometimes more than two). We use *either* before a singular noun to mean 'one or the other', e. g. *Either*

day is OK. Sometimes *either* can mean *each*, especially in the expressions *on either side* and *at either end.* We use *either of* before a pronoun or a determiner (the, my, these), e.g. *either of us/you/them.* After mentioning a negative idea or fact, we can add another negative point by using *not ... either.*

Also, as well and *too* (as mentioned above) are not normally used with *not* in this way, e.g. *The farmer is not here today. His wife* ***isn't*** *here* ***either***.

2. Find and underline another example with *either* in the text. Translate the sentence.

3. Find and learn Russian equivalents for the following words and expressions:

1) an average person	a)
2) released into the air	b)
3) input control	c)
4) far off places	d)
5) output control	e)
6) the subject of cooperation and conflict	f)
7) acid rain	g)
8) ultraviolet radiation	h)
9) absorbed	i)
10) edge of atmosphere	j)

4. Find and learn English equivalents for the following words and expressions:

1) опасные вещества	a)
2) количество загрязняющих веществ	b)
3) азотный дождь	c)
4) гидроэлектростанция	d)
5) вырубка леса	e)
6) приблизительно подсчитывать	f)
7) в форме/виде частиц	g)
8) электростанция	h)
9) создавать проблемы	i)
10) полоса газа	j)

5. Translate the following article from English into Russian.

What are the causes of air pollution? The causes of air pollution are the smokes coming from the vehicle that people used every day, the plastic that people used to burn. It is one of the biggest problem that people have to deal with, because many people are trying to stop from getting polluted our air, but there are also people that are lazy, who never listen, they just keep on going for their bad habit, like burning plastic, using some stuff that can cause pollution in the air, it is really hard to stop those people who are not listening,

time will come that our skies will be vanished, and one of it our oxygen will be gone also, and many people will get sick and die. Air pollution is really a big question to us. Many organization nowadays are being active by getting that problem done, but the problem is the people that are not listening for the cause of air pollution, they will just keep continuing doing things that can cause air pollution, this problem will stop if all the people will get united and change their bad habits by doing things that can cause air pollution.

6. Translate the following article from Russian into English.

Внедрение в атмосферу химикатов, твердых примесей или биологических веществ, наносящих ущерб, раздражающих живой организм или вредящих окружающей среде, известно как загрязнение воздуха. Главные причины загрязнения воздуха могут быть в виде твердых частиц, жидких капель или газа. Дым с примесью тумана является своего рода загрязнением воздуха. В небе его можно заметить по коричневатому оттенку или легкой дымке. Главными причинами загрязнения воздуха в современную эру, которые приводят к смогу, являются выхлопы транспортных средств, продуктов сгорания и промышленные выбросы. Выхлопы транспортных средств и промышленные выбросы образуют соединения с другими источниками эмиссии, что в результате приводит к фотохимическому смогу.

Over to you

1. Photochemical smog was first described in the 1950s as the product of a chemical reaction of sunlight striking nitrogen oxides and volatile organic compounds in the atmosphere. What do the major causes of air pollution include?

2. Although some smog is present in all modern cities, problems with smog are worse in cities with sunny, warm, dry climates. Why?

3.  Prepare a presentation on the topic being discussed.

Writing

You work for an advertising agency, and you have to create a campaign how to prevent air pollution. In groups, prepare a poster – with a picture and a slogan. Compare your work with other groups and vote for the best campaign.

WATER POLLUTION

Vocabulary

Match the words with their definitions:

1) dump (v.)	[dʌmp]	a) a chemical or natural substance added to soil to increase its fertility
2) disrupt (v.) [+ obj.]	[dɪs'rʌpt]	b) excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life
3) fertilizer (n.)	['fɜːtɪlaɪzə]	c) having the potential to cause cancer
4) impurity (n.)	[ɪm'pjuərətɪ]	d) green, blue, or white bacteria that grow on food that is not kept fresh or on other things that are not kept clean and dry
5) faeces (n.)	['fiːsiːz]	e) to deposit or dispose of (rubbish, waste, or unwanted material)
6) sewage (n.)	['suːɪʤ]	f) a substance produced by a living organism which acts as a catalyst to bring about a specific biochemical reaction
7) styrofoam (n.)	[ˈstaɪrəˌfəʊm]	g) a constituent which impairs the purity of something
8) mesotheliom a (n.)	[ˌmɛsə(ʊ) ˌθiːlɪ'əʊmə]	h) a condition in which faeces are discharged from the bowels frequently and in a liquid form
9) enzyme (n.)	['enzaɪm]	i) waste water and excrement conveyed in sewers
10) eutrophication (n.)	[ˌjuːtrəfɪ'keɪʃ(ə)n]	j) the chemical element of atomic number 90, a white radioactive metal of the actinide series
11) thorium (n.)	['θɔːrɪəm]	k) a cancer of mesothelial tissue, associated especially with exposure to asbestos
12) diarrhea (n.)	[ˌdaɪə'rɪə]	l) interrupt (an event, activity, or process) by causing a disturbance or problem
13) carcinogenic (adj.)	[ˌkɑːsɪnə'ʤenɪk]	m) a very light, plastic substance, used especially to make containers
14) mould (n.)	[məuld]	n) the solid waste substance that people and animals get rid of from their body by passing it through the anus

Listening & Watching

Watch the clip "Water pollution' and then discuss with your partner what can cause water pollution.

Before you read

1. You are going to read an article. Look at the headline and think what the text may be about.

2. Skim the text to check your ideas.

Reading B

WATER POLLUTION PROBLEMS: A REAL ISSUE

Water covers over 70 % of the Earth's surface and is a very important resource for people and the environment. Water pollution affects drinking water, rivers, lakes and oceans all over the world. This consequently harms human health and the natural environment. Here you can find out more about water pollution and what you can do to prevent it.

Sewage is the term used for wastewater that often contains *faeces*, urine and laundry waste. There are billions of people on Earth, so treating sewage is a big priority. Sewage disposal is a major problem in developing countries as many people in these areas don't have access to sanitary conditions and clean water. Untreated sewage water in such areas can contaminate the environment and cause diseases such as *diarrhoea*. Sewage in developed countries is carried away from the home quickly and hygienically through sewage pipes. Sewage is also treated in water treatment plants and the waste is often disposed into the sea. It is mainly biodegradable and most of it is broken down in the environment. In developed countries, sewage often causes problems when people flush chemical and pharmaceutical substances down the toilet. Moreover, when people are ill, sewage often carries harmful viruses and bacteria into the environment causing health problems.

can cause huge problems. Litter items such as 6-pack ring packaging can get caught in marine animals and may result in death. Different items take different lengths of time to degrade in water:

Cardboard – takes 2 weeks to degrade; newspaper, photodegradable packaging – 6 weeks; foam – 50 years; *styrofoam* – 80 years; aluminium – 200 years; plastic packaging – 400 years; glass – it takes so long to degrade that we don't know the exact time.

Industry is a huge source of water pollution, it produces pollutants that are extremely harmful to people

and the environment. Many industrial facilities use freshwater to carry away waste from the plant and into rivers, lakes and oceans. Briefly, pollutants from industrial sources include:

- Asbestos – This pollutant is a serious health hazard and *carcinogenic.* Asbestos fibres can be inhaled and cause illnesses such as asbestosis, *mesothelioma*, lung cancer, intestinal cancer and liver cancer.
- Lead – This is a metallic element and a non-biodegradable substance and can cause health and environmental problems. Lead is harmful to the health of many animals, including humans, as it can inhibit the action of bodily *enzymes.*
- Mercury – This is a metallic element and a non-biodegradable substance. It is hard to clean up once the environment is contaminated.
- Nitrates – The increased use of fertilisers means that nitrates are more often being washed from the soil and into rivers and lakes. This can cause *eutrophication,* which can be very problematic to marine environments.
- Phosphates – The increased use of fertilisers can cause eutrophication, which can be either very problematic to marine environments.
- Sulphur – This is a non-metallic substance that is harmful for marine life.
- Petrochemicals – This is formed from gas or petrol and can be toxic to marine life.

is produced from industrial, medical and scientific processes that use radioactive material. Nuclear waste can have detrimental effects on marine habitats. Nuclear waste comes from a number of sources, e.g. operations conducted by nuclear power stations produce radioactive waste. Nuclear-fuel reprocessing plants in northern Europe are the biggest sources of man-made nuclear waste in the surrounding ocean. Radioactive traces from these plants have been found as far away as Greenland. Mining and refining of uranium an*d thorium* are also causes of marine nuclear waste.

Oceans are polluted by oil on a daily basis from oil spills, routine shipping, run-offs and *dumping.* An oil spill from a tanker is a severe problem because there is such a huge quantity of oil being spilt into one place, and it causes a very localized problem but can be catastrophic to local marine wildlife such as fish, birds and sea otters. Oil cannot dissolve in water and forms a thick sludge in the water. No doubt this suffocates fish, gets caught in the feathers of marine birds stopping them from flying and blocks light from photosynthetic aquatic plants.

A tank or piping network that has at least 10 percent of its volume underground is known as an underground storage tank (UST). They often store substances such as petroleum, that are harmful to the surrounding environment should it become contaminated.

is the pollution of water caused by air pollution. In the atmosphere, water particles mix with carbon dioxide, sulphur dioxide and nitrogen oxides, this forms a weak acid. Air pollution means that water vapour absorbs more of these gases and becomes even more acidic. When it rains the water is polluted with these gases, this is called acid rain. When acid rain pollutes marine habitats such as rivers and lakes, aquatic life is harmed.

An increase in water temperature can result in the death of many aquatic organisms and *disrupt* many marine habitats. For example, a rise in water temperatures causes coral bleaching of reefs around the world.

is when the environment becomes enriched with nutrients. This can be a problem in marine habitats such as lakes as it can cause algal blooms.

Fertilisers are often used in farming, sometimes these fertilisers run-off into nearby water causing an increase in nutrient levels. This causes phytoplankton to grow and reproduce more rapidly, resulting in algal blooms. This bloom of algae block sunlight from photosynthetic marine plants under the water surface and disrupts normal ecosystem functioning and causes many problems. The algae may use up all the oxygen in the water, leaving none for other marine life. This results in the death of many aquatic organisms such as fish, which need the oxygen in the water to live.

The various processes for treating polluted water are *industrial water treatment, denitrification, septic tanks and ozone waste water treatment.*

Before raw sewage can be safely released back into the environment, it needs to be treated correctly in a water treatment plant. In a water treatment plant, sewage goes through a number of chambers and chemical processes to reduce the amount and toxicity of the waste. The sewage first goes through a primary phase. This is where some of the suspended, solid particles and inorganic material is removed by the use of filters. The secondary phase of the treatment involves the reduction of organic, this is done with the use of biological filters and processes that naturally degrade the organic waste material. The final stage of treatment is the tertiary phase; this stage must be done before the water can be reused. Almost all solid particles are removed from the water and chemical additives are supplied to get rid of any left-over *impurities*.

is an ecological approach that can be used to prevent the leaching of nitrates in soil, this in turn stops any ground water from being contaminated with nutrients. Fertilisers contain nitrogen, and are often applied to crops by farmers to help plant growth and increase the yield. Bacteria in the soil convert the nitrogen in the fertilizer to nitrates, making it easier for the plants to absorb. Immobilization is a process where the nitrates become part of the soil

organic matter. When oxygen levels are low, another form of bacteria then turns the nitrates into gases such as nitrogen, nitrous oxide and nitrogen dioxide. The conversion of these nitrates into gas is called denitrification. This prevents nitrates from leaching into the soil and contaminating groundwater.

treat sewage at the place where it is located, rather than transporting the waste through a treatment plant or sewage system. Septic tanks are usually used to treat sewage from an individual building. Untreated sewage from a property flows into the septic tank and the solids are separated from the liquid. Solid material is separated depending on their density. Heavier particles settle at the bottom of the tank whereas lighter particles, such as soap scum, will form a layer at the top of the tank. Biological processes are used to help degrade the solid materials. The liquid then flows out of the tank into a land drainage system and the remaining solids are filtered out.

is a method that is increasing in popularity. An ozone generator is used to break down pollutants in the water source. The generators convert oxygen into ozone by using ultraviolet radiation or by an electric discharge field. Ozone is a very reactive gas that can oxidise bacteria, *moulds*, organic material and other pollutants found in water. Using ozone to treat wastewater has many benefits. In particular, kills bacteria effectively and oxidises substances such as iron and sulphur so that they can be filtered out of the solution. There are no nasty odours or residues produced from the treatment. Ozone converts back into oxygen quickly, and leaves no trace once it has been used.

Virtually all types of water pollution are harmful to the health of humans and animals. Water pollution may not damage our health immediately but can be harmful after long term exposure.

http://www.water-pollution.org.uk

Reading Comprehension

1. Define if the statements are true or false:

1) With industrialization the water keeps getting clean. ☐
2) People who are just out to enjoy themselves on the sea throw their waste overboard or have a leaky engine. ☐
3) The fuel of tankers hardly causes serious damage to beaches and coral. ☐
4) The fertilizer and insecticides soak into the ground and get caught in a water system or river. ☐
5) Water pollution doesn't affect people's life. ☐

Language Development

1. Form the words from the given ones below and fill in the gaps.

1) poison	adjective	
2) dump	noun	
3) prevent	noun	
4) leak	adjective	
5) agriculture	adjective	
6) industry	adjective	
7) treat	noun	
8) generate	noun	
9) suppress	noun	
10) mortal	noun	

1) The general public needs to learn more information about primary ____.

2) Infant_____ is defined as the number of infant deaths.

3) Some ships have _____ engines and as a result the fuel gets all over marine life.

4) A diversity of _____ substances comes from farmers when they spray their fields the fertilizer.

5) Consequently, they have *immune system* _____, which leads to a diverse series of health issues.

6) A lot of factories do illegal _____ which hurts wildlife.

7) A _____ is a machine which produces electricity.

8) Domestic households, _____and _____ practices produce wastewater that can cause pollution of many lakes and rivers.

9) _____ is medical attention given to a sick or injured person or animal.

! Discourse markers

Discourse means 'pieces of language longer than a sentence'. Some words and expressions are used to show how discourse is constructed. They can show the connection between what the speaker is saying and what has already been said or what is going to be said; they can help to make clear the structure of what is being said; they can indicate what speakers think about what they are saying or what others have said. There a very large number of them. Here a few most common examples. Some of these words and expressions have more than one use; for more information, look in a good dictionary. Some discourse markers are used mostly in informal speech or writing; others are more common in a formal style. Note that a discourse marker usually comes at the beginning of a clause.

To balance two contrasting facts or ideas we use *on the other hand, while, whereas.*

To emphasise a contrast we use *however, nevertheless.*

To point that the main point is as follows we use *anyway, anyhow, at least.*

To show the structure of what we are saying we use *first(ly), first of all, second(ly), third(ly) etc; lastly, finally, to begin/start with; in the first/second/third place.*

When you want to add something you say *moreover (very formal), in addition, another thing is, besides, in any case.*

To generalize things use *on the whole, in general, generally speaking=virtuallyl.*

To give examples use *for instance, for example, e.g., in particular.*

To show logical consequence use *therefore, as a result, consequently, so, then.*

To persuade use *after all, no doubt.*

To sum up the ideas use *in conclusion, to sum up, briefly, in short.*

2. Look through the text, find and highlight the markers. Translate the sentences.

3. Find and learn Russian equivalents for the following words and expressions.

1) detrimental effects	a)
2) electric discharge field	b)
3) nasty odours or residues	c)
4) reproductive failure	d)
5) sewage pipes	e)
6) left-over impurities	f)
7) soap scum	g)
8) flush down	h)
9) coral bleaching	i)
10) thick sludge	j)

4. Find and learn English equivalents for the following words and expressions:

1) “цветение воды”, вызванное массовым развитием водорослей	a)
2) просачиваться	b)
3) растворимые минералы и соли	c)
4) субпродукты	d)
5) подавление иммунной системы	e)
6) острое отравление	f)
7) морские организмы	g)
8) выщелачивание/вымывание нитратов	h)
9) детская смертность	i)
10) санитарные условия	j)
11) ферменты в организме	k)

5. Translate the following article from English into Russian.

Virtually all types of water pollution are harmful to the health of humans and animals. Water pollution may not damage our health immediately but can be harmful after long term exposure. As we see, different forms of pollutants affect the health of animals in different ways:

Firstly, heavy metals from industrial processes can accumulate in nearby lakes and rivers. These are toxic to marine life such as fish and shellfish, and subsequently to the humans who eat them. Heavy metals can slow development; result in birth defects and some are carcinogenic.

Secondly, industrial waste often contains many toxic compounds that damage the health of aquatic animals and those who eat them. Some of the toxins in industrial waste may only have a mild effect whereas other can be fatal. They can cause immune suppression, reproductive failure or acute poisoning.

Thirdly, microbial pollutants from sewage often result in infectious diseases that infect aquatic life and terrestrial life through drinking water. Microbial water pollution is a major problem in the developing world, with diseases such as cholera and typhoid fever being the primary cause of infant mortality.

Fourthly, organic matter and nutrients causes an increase in aerobic algae and depletes oxygen from the water column. This causes the suffocation of fish and other aquatic organisms.

Fifthly, sulfate particles from acid rain can cause harm the health of marine life in the rivers and lakes it contaminates, and can result in mortality.

And finally, suspended particles in freshwater reduces the quality of drinking water for humans and the aquatic environment for marine life. Suspended particles can often reduce the amount of sunlight penetrating the water, disrupting the growth of photosynthetic plants and micro-organisms.

Over to you

Discuss the following questions in small groups:

1. Dumping into the rivers is cheap and easy.
2. Limited usage of fertilizer and insecticides doesn't cause any harm.
3. We cannot do anything about water pollution because such a problem is not to solve.
4.  Prepare a presentation on the topic being discussed.

Writing

Think about what we can do to keep the waters clean and the laws and conventions protecting them. Write some simple guidelines in your everyday life.

SOIL POLLUTION

Vocabulary

Match the words with their definitions:

1) wellness (n.)	['welnəs]	a) contaminate or pollute (something)
2) solvent (n.)	['sɔlvənt]	b) the action or process of making a way through or into something
3) conquest (n.)	['kɔŋkwest]	c) an area of redness and spots on a person's skin, appearing especially as a result of illness
4) leukemia (n.)	[lju:'ki:mıə]	d) assumption of control of a place
5) penetration (n.)	[penı 'treıʃ(ə)n]	e) able to dissolve other substances
6) deterioration (n.)	[dı,tıərıə 'reıʃ(ə)n]	f) the process of eroding or being eroded by wind, water, or other natural agents
7) kidney (n.)	['kıdnı]	g) the action of stopping something from happening or arising
8) prevention	[prı'venʃn]	h) becoming worse in some way
9) rash (n.)	[ræʃ]	i) the organs in your body that take waste matter from your blood and send it out of your body as urine
10) erosion (n.)	[ı'rəuʒ(ə)n]	j) the state or condition of being in good physical and mental health
11) taint (v.) [+ obj.]	[teınt]	k) a malignant progressive disease in which blood-forming organs produce increased numbers of abnormal leukocytes

Watching

Watch the clip 'Soil pollution' and discuss with your partner if it is a source for many environmental problems.

Before you read

You are going to read an article about soil pollution. Before you read, look at the picture. What does it tell you about it?

Discuss with your partner what you know about soil pollution. Write as many reasons of soil pollution as you can. Compare what other pairs have written.

Skim the text to check your ideas.

Reading C

HOW OFTEH HAVE WE THOUGHT OF CONTAMINATION OF SOIL?

Soil pollution! The earth itself is getting contaminated and polluted. Collectively, aren't we all responsible for this? The *conquest* of utilizing land and soil resources and conducting experiments on it, for our benefits, is quite understandable, but it certainly is not, at the cost of its health and *wellness*! Mankind has been trying out several different things and has made several arrangements in the soil, to make life happy and comfortable. However, how often have we thought of contamination of soil? It's never too late in life, so I think this is the right time, to know about soil pollution causes and effects.

Soil pollution can be described as the contamination of soil of a particular region. Soil pollution mainly is a result of *penetration* of harmful pesticides and insecticides, which on one hand serve whatever their main purpose is, but on the other hand, bring about *deterioration* in the soil quality. But there are many other leading causes of soil pollution too. Let us have a look at some of them.

Soil pollution is a result of many activities and experiments done by mankind:

- Industrial wastes, such as harmful gases and chemicals.
- Agricultural pesticides, fertilizers, insecticides, heavy metals and *solvent*s.
- Leakages from sanitary sewage.
- Acid rains.
- Fuel leakages from automobiles.

As the world becomes more industrialized, the long term effects of soil pollution are becoming more of a problem all over the world. It is thought that a full 150 million miles of China's farmland is contaminated.

Even when soil is not being used for food, the matter of its contamination can be a health concern. This is especially so when that soil is found in parks, neighborhoods or other places where people spend time .Health effects will be different depending on what kind of pollutant is in the soil. It can range from developmental problems, such as in children exposed to lead, to cancer. Some soil contaminants increase the risk of *leukemia*, while others can lead to *kidney* damage, liver problems and changes in the central nervous system. Those are just the long term effects of soil pollution. In the short term, exposure to chemicals in the soil can lead to headaches and skin *rashes*.

If contaminated soil is used to grow food, the land will usually produce lower harvest than it would if it were not contaminated. This, in turn, can cause even more harm because a lack of plants on the soil will cause more *erosion*, spreading the contaminants into land that might not have been tainted before. In addition, the pollutants will change the makeup of the soil and the types of microorganisms that will live in it. If certain organisms die off in the area, the larger predator animals will also have to move away or die because they've lost their food. Thus it's possible for soil pollution to change whole ecosystems.

Soil pollution can be cured by transporting the contaminated soil layer to some remote place, thus making it once again fit for use. Harmful chemicals from the soil can also be removed by aerating it. These are just 'tentative so-

lutions'. However, let us remember the proverb, 'prevention is better than cure' and follow soil management system, maintain sewage systems and avoid the overuse of fertilizers and pesticides in the soil. So let us begin the movement of soil pollution prevention from our own lands itself!

Reading Comprehension

1. Read the article carefully and answer these questions according to the information in the text.

1) What is soil pollution?
2) Soil pollution mainly is a result of penetration of harmful pesticides and insecticides, isn't it? Why (not)?
3) What causes soil pollution?
4) Does the world become less industrialized? Why (not)?
5) What are the effects of soil pollution?
6) Do some soil contaminants increase the risk of leukemia? Why (not)?
7) Can soil pollution be cured and how?

2. Match the summary with the correct paragraph.

	a)	A lack of plants on the soil will cause more erosion.
	b)	The responsibility for soil pollution.
	c)	Let us remember the proverb 'prevention is better than cure'.
	d)	Soil pollution mainly is a result of penetration of harmful pesticides and insecticides.
	e)	Acid rains can cause soil problems
	f)	Some soil contaminants increase the risk of leukemia.

Language Development

! Negative structures: negative questions

Look at the sentence from the article. *Collectively, aren't we all responsible for this?*

A negative question can ask for confirmation of a positive belief. In this case the question expects the answer 'Yes', and means 'Isn't it true that…?' Negative questions of this kind are common in exclamations and rhetorical questions, e.g. *Isn't it a lovely day!* Expressions of opinion can be made less definite by expressing them as negative questions, e.g. *Wouldn't it better to switch the lights on?*

A negative question can also ask for confirmation of a negative belief. In this case the question expects the answer 'no', and means 'Is it true that…not…?' e. g. *Can't they recycle that?* This kind of negative question can show that the speaker is surprised that something has not happened or is not happening.

Contracted and uncontracted negative questions have different word order, e.g. *Doesn't she understand?* (**auxiliary verb + n't + subject)**; *Does she not understand?* (**auxiliary verb + subject + n't**). Uncontracted negative questions are usually formal.

2. Think about your own examples on the given rules.

3. Find and learn Russian equivalents for the following words and expressions:

1) utilizing land	a)
2) soil resources	b)
3) conducting experiments	c)
4) the risk of leukemia	d)
5) deterioration in the soil quality	e)
6) arrangements	f)
7) to avoid the overuse of fertilizers	g)
8) kidney damage	h)
9) leakage	i)
10) tainted with chemicals	j)

4. Find and learn English equivalents for the following words and expressions:

1) промышленные отходы	a)
2) хищные животные	b)
3) пути решения	c)
4) проникновение вредных пестицидов и инсектицидов	d)
5) тяжелые металлы и растворители	e)
6) отдельно взятый, конкретный регион	f)
7) вредные химикаты	g)
8) кожная сыпь	h)
9) тяжелые металлы и растворители	i)
10) легче предупредить, чем вылечить	j)

5. Translate the following article from English into Russian.

The presence of man causes soil contamination by-made chemicals or other alteration in the natural soil environment. This type of contamination typically arises from the rupture of underground storage tanks, application of pesticides, percolation of contaminated surface water to subsurface strata, oil and fuel dumping, leaching of wastes from landfills or direct discharge of industrial wastes to the soil. The most common chemicals involved are petroleum hydrocarbons, solvents, pesticides, lead and other heavy metals. This occurrence of this phenomenon is correlated with the degree of industrialization and intensity of chemical usage.

The concern over soil contamination stems primarily from health risks, both of direct contact and from secondary contamination of water supplies. Mapping of contaminated soil sites and the resulting cleanup are time consuming and expensive tasks, requiring extensive amounts of geology, hydrology, chemistry and computer modelling skills. It is in North America and Western Europe that the extent of contaminated land is most well known, with many of countries in these areas having a legal framework to identify and deal with this environmental problem; this however may well be just the tip of the iceberg with developing countries very likely to be the next generation of new soil contamination cases.

http://www.scribd.com

Over to you

1. To *biodegrade* means to break down naturally. Sunlight, air, water and microorganisms help materials to biodegrade. Different materials break down at different rates.

Rank the following commonly littered items from 1 to 9. Use 1 for the item that will biodegrade the fastest, and 9 for the item that will biodegrade the slowest. Assume these items are on a roadside, and are exposed to the same conditions.

	Aluminum can
	Paper
	Glass bottle
	Plastic bottle
	Cigarette butt
	Orange peel
	Milk carton
	6-pack ring holders
	Gum

2. Items that go to the landfill are compacted several times by large machinery. Each day, the portion of the landfill that is currently in use is covered with several inches of ash or sand. Do you think the items above would biodegrade in the landfill? Why (not)?

3. Have a look at a Date File. What does the term "throw-away society" stand for? Is this concept appropriate for reflecting the actual state of affairs? Why (not)?

Date File

The average person in Los Angeles throws away 7 kilos of rubbish every day.

4.  Prepare a presentation on the topic being discussed.

Writing

Think of a beautiful natural place that you know. Write a description, including the plants and animals that live there.

UNIT 3

RENEWABLE SOURCES OF ENERGY

Vocabulary

Match the words with their definitions:

1) biomass (n.)	[ˈbaɪəʊˌmæs]	a) the force which causes things to drop to the ground.
2) geothermal (adj.)	[ˌdʒiːəʊˈθɜːməl]	b) the process of trying to achieve smth.
3) hydroelectric (adj.)	[ˌhaɪdrəuɪ'lektrɪk]	c) bring smth. under your control and use it
4) pursuit (n.)	[pə'sjuːt]	d) organic matter used as a fuel, especially in a power station for the generation of electricity
5) embargo(n.)	[em'bɑːgəu]	e) despite the prevailing circumstances
6) harness (v.)	['hɑːnɪs]	f) relating to or produced by the internal heat of the earth
7) replenish (v.) [+ obj.]	[rɪ'plenɪʃ]	g) relating to or involving electricity made from the energy of running water
8) regardless (adv.)	[rɪ'gɑːdləs]	h) an official ban on trade or other commercial activity with a particular country
9) gravity (v.)	['grævɪtɪ]	i) fill (something) up again

Listening & Watching

1. Watch the clip 'Alternative energy sources' and then discuss with your partner if our energy is our future.

2. Now watch and listen again and mark the statements true (T) or false (F).

a) The worst energy is coming from fossil fuels. ☐

b) When sun heats the solar panels the energy it produces can be converted into anything you want. ☐

c) Right now the solar energy is being massively used in big projects all over the world. ☐

d) Solar cars are massively produced and used by the public. ☐

e) Wind energy can provide people with power without harming the environment. ☐

f) Wind power is currently used to generate power from the lighthouses. ☐

g) Hydro energy is being used as a main source of energy now. ☐

Before you read

1. You are going to read an article about renewable resources of energy. Discuss with your partner the following questions.

- What do you know about the renewable resources of energy?
- Why do we need them?

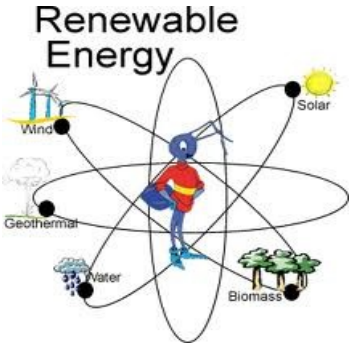
2. Skim the text to check your ideas.

Reading A

NEW ENERGY SOURCES

All living systems require energy to survive. A person requires energy in the form of food. A plant requires energy in the form of sunlight. All mechanical systems also require energy to function. A car needs gasoline to run.

A sailboat needs wind to move across the water. Energy, in one form or another, is needed for all living and nonliving activity on the planet. Energy does not actually exist as a thing itself, however. Instead, energy is an idea describing various sources of power. Long ago, humans relied upon the natural systems of the earth to meet their energy needs. Cliff dwellers of the Southwest built their homes to capture the heat of winter sunlight. Ancient Greeks bathed in water warmed by *geothermal* vents. Humans around the world used wood to cook their meals and warm their homes. The natural systems of the planet met all of these needs.



The *pursuit* of more powerful and consistent energy sources came about during the Industrial Revolution, which began in the late eighteenth century and continued through the beginning of the nineteenth century. For the first time, humans began burning fossil fuels in great quantities to meet their energy needs. Fossil fuels powered the factories they worked in, the farm equipment needed to produce large crops, and eventually, the cars they drove. It seemed as if fossil fuels were the perfect answer to the need for a quick and efficient form of energy.

It was not until the 1970s that serious problems from the use of fossil fuels began to be recognized. Oil-producing countries began to demand more money for their product. Oil-consuming countries, such as the United States, refused to accept these higher costs. Many countries put oil *embargoes* into place. This drove the cost of fossil fuels higher and higher. This series of events led to an energy crisis. People began to wonder what they would do if the cost of fossil fuels did not decline and, consequently, an interest in alternative energy sources began to develop.

Also, since the energy crisis of the 1970s, scientists have learned more about the environmental impact of fossil fuels. They have linked acid rain to

the sulfur dioxide released when fossil fuels are burned. Burning fossil fuels also releases large quantities of carbon dioxide.

Scientists have found a connection between the growing amount of carbon dioxide in the atmosphere and an increase in global temperatures, referred to as global warming. These discoveries about the effects of fossil fuels have also led to an increased interest in the development of alternative energy sources.

Currently, there are four main alternative energy sources being developed and used today: solar power, wind power, hydropower, and geothermal power. These energy sources, called renewable energy, are all powered by the natural systems of the earth. Unlike fossil fuels, they are also continuously *replenished* by the earth's natural systems regardless of whether or not they are used. Sunlight will stream down on the planet every day, whether it is captured with solar panels or not. Wind will blow across the land, *regardless* of turning the rotor of a windmill. Rivers will flow down mountains and geothermal vents will release energy, whether or not their energy is *harnessed*. A perfect example of renewable energy is energy from the sun, which comes in an abundant supply every day. Other examples of renewable sources of energy include the wind, the waves and tides, the gravitational pull of the earth, the heat at the earth's core (geothermal energy), landfill gases, and, to a limited degree, trees and plant material. Many of these renewable sources of energy can be used in their raw form. They are natural forces that create energy without the help of humans. All that is needed is for someone to decide how that energy can be used. Building a sail for a boat makes use of the wind. Building a waterwheel on a river makes use of the flowing water that is pulled downhill by the earth's *gravity*. Building a house out of glass–a greenhouse–traps the heat from sunlight inside, providing warmth and allowing plants to grow where they might not otherwise grow.

Renewable energy, also called "green energy," or "clean energy," does not deplete natural resources and creates little-to-no pollution when it is generated. The unique challenge of today is finding a way to supply renewable energy to entire populations. Large-scale energy production requires specialized equipment such as energy storage and transmission facilities. Many experts agree that renewable energy would provide numerous benefits. Because renewables do not use fossil fuels (most are entirely fuel-free) they are largely immune to the threat of future oil or gas shortages and fossil fuel price hikes. For the same reason, because most renewable technologies require no combustion, they are far kinder to the environment than coal, oil, and natural gas. Smog and acid rain could be eliminated with renewables. In addition to being virtually nonpolluting, renewable energy is thought to be cheaper for producers and consumers.

As the resources of the planet are used faster than they are replaced, people are turning to solar, wind, hydro, and geothermal energy to meet their energy needs. Supporting the use of energy sources that are replenished as fast, or faster, than they are used is helping to create a sustainable energy future. For such changes to happen effectively, however, it will take changes in government policies, more economic support for alternative energy producers, and individual consumers demanding a different choice. These factors will determine the direction of energy production in the coming decades.

www.clemson.edu

Reading Comprehension

1. Read the text carefully and answer these questions according to the information in the text.

1) Is there more than one source of energy?
2) What is meant by a renewable energy source?
3) What is meant by a non-renewable energy source?
4) Are there any major differences between non-renewable and renewable/alternative energy sources?
5) Do you know of any places where renewable/alternative energy sources are regularly being used?

2. Jumbled sentences. Arrange the sentences in the abstract in a logical order.

1) These factors will determine the direction of energy production in the coming decades.
2) Scientists have found a connection between the growing amount of carbon dioxide in the atmosphere and an increase in global temperatures, referred to as global warming.
3) Cliff dwellers of the Southwest built their homes to capture the heat of winter sunlight.
4) Energy, in one form or another, is needed for all living and nonliving activity on the planet.
5) Humans began burning fossil fuels in great quantities to meet their energy needs.
6) Many of these renewable sources of energy can be used in their raw form.
7) Many countries put oil embargoes into place.
8) Many experts agree that renewable energy would provide numerous benefits.
9) Renewable energy is also called "green energy" or "clean energy".
10) Scientists have learned more about the environmental impact of fossil fuels.

Language Development

! To talk about a period of past time which is related to the present, we use the Present Perfect Tense **(have/has + Participle II).** This is very useful when discussing changes in the environment.

1. Look at this sentence from the article and underline the Present Perfect Tense: *Scientists have found a connection between the growing amount of carbon dioxide in the atmosphere and an increase in global temperatures, referred to as global warming.*

2. Match up these time phrases and clauses. Choose the best combinations.

1) Since the energy crisis of the 1970s, …	a) these discoveries about the effects of fossil fuels have also led to an increased interest in the development of alternative energy sources
2) Recently…	b) scientists have learned more about the environmental impact of fossil fuels

3) In the last two or three years…	c) they have linked acid rain to the sulfur dioxide released when fossil fuels are burned.

! To talk about events in the past which are now finished and there is no connection to the present, we use the Simple Past Tense **(regular verb + ed** or **the second form of the irregular verb)**.

3. Look at these sentences from the article and underline the Simple Past Tense:

Cliff dwellers of the Southwest built their homes to capture the heat of winter sunlight Ancient Greeks bathed in water warmed by geothermal vents.

4. Find and underline other examples in the text.

5. Fill in the gaps with the proper Present Perfect or Past Simple Tense.

Throughout history the humans **1) _____ (use)** the wind as an energy source for such things as transportation and food production. For centuries farmers **2) _____ (use)** windmills to harness the wind to grind grain into flour for baking. Humans also **3) _____ attempt)** to use solar power for their own benefit throughout history. Native Americans of the Southwest **4) _____ (choose)** to build their homes into the south-facing sides of cliffs to capture the sun's warmth. They **5) _____ (observe)** that the sun **6) _____ (be)** in the southern sky during the coldest months of the year and **7) _____ (position)** their dwellings to trap the heat from the sun. The Romans **8) _____ (take)** a similar approach, only they also **9) _____ (develop)** and **10) _____ (install)** glass in their windows, which **11) _____ (allow)** light in but **12) _____ (keep)** heat from escaping.

! To talk about imaginary situation or action (unreal present), we use the 2nd Conditional. Often there is an If-clause with the Simple Past Tense in the same sentence **(If + subject + past simple + object, subject + would + bare Infinitive)**.

6. Look at this sentence from the article and highlight the 2nd Conditional:

People began to wonder what they would do if the cost of fossil fuels did not decline and, consequently, an interest in alternative energy sources began to develop.

7. Use the prompts to make sentences with *if + past simple* and *would.*

1) people (use) renewable energy, it (not threaten) the environment and (cause) pollution.

2) there (not be) greenhouse gases, they (not trap) the sun's heat and (lead) to global warming.

3) Pollutants (continue) to cause serious lung diseases (such as asthma), (harm) the aquatic and botanic life, and (contribute) to smog we (not use) renewable energy resources.

4) renewable energy (not be) generally more expensive than conventionally produced supplies, it (not be) a question of values and what we spend our money on.

5) photovoltaic, or solar-electric, systems (not capture) light energy from the sun's rays and (convert) it into electricity, these solar units (not power) everything from small homes to large office buildings.

8. Find and learn Russian equivalents for the following words and expressions:

1) in an abundant supply	a)
2) gravitational pull	b)
3) landfill gases	c)
4) in raw form	d)
5) transmission facilities	e)
6) energy storage	f)
7) cost-effective	g)
8) determine the direction	h)

9. Find and learn English equivalents for the following words and expressions:

1) жители скал	a)
2) геотермальный проход	b)
3) диоксид серы	c)
4) практически без	d)
5) в небольших объемах	e)
6) рост, повышение цен	f)
7) не требуют сжигания	g)
8) удовлетворять потребности в энергии	h)

10. Translate the following article from English into Russian.

The introduction and implementation of new, revolutionary energy sources will change the course of man everywhere on the planet. This power source will rank with fire, the wheel, and the internal combustion engine as a shaper of man's destiny. Every industry on earth will change, and eventually every person on earth will be affected. There will be no more air pollution from internal combustion engines. Many urban areas will be given a new lease on their environmental lives because these energy sources are absolutely non-polluting. The air will be clean again, because most air pollution comes from burning fossil fuel. Oil business will be relegated to the supply needed to manufacture plastics, lubricants, and hydraulic fluid. There will be no more nuclear power sources needed for submarine or electrical generation, and a huge hazardous waste disposal dilemma will become manageable.

http://www.secret-solutions.com/newenergy.htm

Over to you

1. Go to the site and learn about the advantages and disadvantages of renewable and non-renewable energy.

http://www.childrensuniversity.manchester.ac.uk/interactives/science/energy/advantages.asp

2. Have a short quiz then and answer the questions.


3. Prepare a presentation on the topic being discussed.
Write about advantages and disadvantages for each source of energy

Writing

Coal, Oil and Natural gas, nuclear fuel, wave, tidal, geothermal, solar, biomass, hydroelectric.

SOLAR ENERGY

Vocabulary

Match the words with their definitions:

1) obstacle (n.)	['ɔbstəkl]	a) take into one's possession or control by force
2) resistance (n.)	[rɪ'zɪst(ə)n(t)s]	b) the action of spending smth
3) capture (v.) [with obj]	['kæptʃə]	c) a desert in southern California, southeast of the Sierra Nevada and north and east of Los Angeles
4) escape (v.)	[ɪs'keɪp]	d) a range of mountains extending along the border between France and Spain from the Atlantic coast to the Mediterranean.
5) expenditure (n.)	[ɪk'spendɪʧə]	e) the refusal to accept or comply with something
6) trough (n.)	[trɔf]	f) an apparatus containing a movable mirror, used to reflect sunlight in a fixed direction
7) Mojave (n.)	[məʊ'hɑ:vi]	g) a very thin, light panel
8) Pyrenees (n.)	[ˌpɪrə'ni:z]	h) relating to the production of electric current at the junction of two substances exposed to light
9) heliostat (n.)	['hi:lɪə(ʊ)stat]	i) a long narrow container
10) photovoltaic	[ˌfəʊtəʊvɒl 'teɪɪk]	j) (of a gas, liquid, or heat) leak from a container
11) circumvent	[ˌsɜ:kəm'vent]	k) a thing that blocks one's way or prevents or hinders progress
12) wafer	['weɪfə]	l) find a way around (an obstacle)

Listening

1. Watch the clip 'Fox News & Solar power' and say what the problem is.

2. Discuss with your partner if there is really any controversy over installation of solar panels in New Jersey.

Before you read

You are going to read an article about sunlight as an energy source. Discuss with your partner the following questions.

- What do you know about the solar power?
- Is it really effective?
- Why do we need it?

Skim the text to check your ideas.

Reading B

SUNLIGHT AND ITS PROS AND CONS

Sunlight is an energy source that is available to varying degrees every single day. Sunlight has been used in various ways since the beginning of human history. Today, advanced technologies are used to deliver the power generated from sunlight through small-scale solar power collection sites, as well as through power-generating plants that serve large populations. Solar power technology is still being developed and has also met with strong *resistance* by the government and large oil companies. Despite these *obstacles* this technology holds great potential for generating nonpolluting energy for the world.

Native Americans of the Southwest chose to build their homes into the south-facing sides of cliffs to *capture* the sun's warmth. The Romans took a similar approach, only they also developed and installed glass in their windows, which allowed light in but kept heat from *escaping*.

Using the sun's energy in this way is called passive heating and is only one of the many ways solar power can be harnessed. It is called passive because there is no *expenditure* of energy in trapping the power from the sun. This technique is still applied today. Flat plate collectors work in much the same way as using sunlight to heat a home. By running water through a glass-topped box, black inside and installed on the roof of a home, the energy from the sun can be used to heat the water.

A common design includes a series of black tubes, filled with water or antifreeze that runs through the box. The water or antifreeze in these tubes can heat up to more than 160 degrees Fahrenheit in less than an hour under direct sunlight. With a flat plate collector that holds water, the homeowner can shower, bathe, wash clothes, or do dishes using the heated water directly from the flat plate collector. If the tubes hold antifreeze, then the heated antifreeze fluid can be pumped through tubes in a water storage tank, heating the water in the tank for use in the home.

Although there are over eight hundred thousand solar water heaters, such as flat plate collectors, in operation in America today, most of these

serve only the needs of individual homes or small businesses. Scientists have been working hard to find ways to make solar heating more applicable to large populations. Solar *trough* collectors are one solution scientists in the *Mojave Desert* of California have been examining as a way to serve large numbers of people at once. At this site, nine sets of sixty-four curved mirrors are used to focus sunlight onto tubes that run along the center of the curved mirrors. Because the fluid inside the tubes is so hot, merely running the tube through a large vat of water causes the water to boil. The steam from the boiling water is then used to drive a turbo generator, which creates electricity.

The power generated in this fashion is not yet efficient, costing more than twice as much as fossil fuels. However, scientists are researching how to improve this type of solar energy collection and decrease the cost of the materials.

In the *Pyrenees* Mountains of France is another large-scale experimental solar power system. In the 1970s scientists constructed a solar furnace capable of reaching temperatures so high that it can melt metal. The builders of the furnace chose a location at about five thousand feet up in the mountains to guarantee clear skies for their project.

The solar furnace is much larger than a solar trough, mainly because it uses hundreds of flat mirrors, called *heliostats*, to collect sunlight over a much larger area. This sunlight is bounced onto a single curved mirror the size of a ten-story building. Since the mirror is curved, the sunlight can be focused onto one central tower opposite it. Like the solar trough collector, this central tower, which looks somewhat like a large water tower, uses the sunlight to create electricity by heating fluids to create steam to run through a turbo generator.

However, it is still used as a research site, as duplicates of the furnace are still too expensive to build and operate competitively.

Sunlight can also be captured in *photovoltaic* (PV) cells, which make up the common solar panel seen on everything from calculators to rooftops. A PV cell is constructed of a thin, small wafer of silicon that is about two inches square. One side of the *wafer* is dipped in a boron solution. This is a solution that contains atoms that want to give up electrons. The other side of the wafer is dipped in a phosphorus solution that has atoms that want to take electrons. When sunlight strikes the top side of the wafer, it gives boron atoms a lot of energy. This burst of energy causes the boron atoms to give up their additional electrons. A thin metal wire is attached to both sides of a PV cell. The electrons that were given up by the boron atoms move toward the wire and travel down it in the form of electricity. An appliance or machine plugged into the wire can then use the electricity. When the electricity has run through the appliance or machine, it returns via the wire to the phosphorus side of the PV cell. These electrons can be used over and over to create electricity.

Many of these PV cells must be linked together to create enough electricity to power most electrical motors. When PV cells are linked together by running a wire from one PV cell to the next, they are called modules. The more cells col-

lecting energy and funneling it to one destination, such as an electric motor, the more power that motor receives. The National Aeronautics and Space Administration (NASA) first used solar modules in 1959 to power the Vanguard 1 satellite. This was a perfect solution to the power needs of space exploration, as solar modules are lightweight, durable, and require maintenance. Sunlight is also in constant abundance in space. Today, people are finding that solar modules are an excellent option. More commonly seen, perhaps, is the use of solar modules to power traffic signals, road signs, and streetlights. Road departments choose to use solar modules to generate electricity from the sun to power the equipment. These solar modules also may be attached to the roof of a home or may be on freestanding bases. In either case, the modules are angled toward the sun to capture the most energy. As the sun angle to the earth varies throughout the year, the owners often reset the angle of the modules to capture the most energy from the sun. There are many benefits to using solar power. First and foremost, solar power is available wherever the sun shines–which is, for the most part, anywhere on the planet. People living in developing countries are using more and more solar power as they begin to establish cities and towns. Up to 80 percent of the solar modules created in the United States are exported to third world countries. These countries are using solar energy to power everything from village wells to the first solar-powered hospital, as is being done in Mali, Africa.

A solar power system has a high initial investment cost, but once it is paid for there is little-to-no maintenance cost. The savings from not having energy bills to pay will cover the cost in five to ten years. After that, energy is free for the lifetime of the solar modules, which are usually guaranteed for at least twenty-five years. In many cases, using solar energy not only frees people of monthly energy bills, but local power companies will buy the excess power generated by solar power systems if the homes are connected to the utility company through their power lines. Unused electricity can then be of financial benefit to the solar power system owner and can be made available for use by other customers.

PV technology is an inherently clean source of electricity. During power generation, PV arrays produce no noise, acid rain, smog, carbon dioxide, water pollutants, or nuclear wastes.

Although solar power could be seen as the answer to the world's energy needs, it does have some significant drawbacks.

It is true that solar power is available for use wherever the sun is shining. One major problem, however, is that the sun only shines during daylight hours. Cloudy days also reduce the effectiveness of solar modules. Unfortunately, the evening hours and cloudy days are the times when energy needs are at their highest. On a cloudy day people use a lot of energy to heat their homes. This means another source of energy needs to be used in the evening hours or during a particularly cloudy day. Some people *circumvent* the need for a generator by storing the energy generated by their solar modules during the day in a series of deep cell batteries. These batteries are designed to have a long life of ten to twenty years

and not to be damaged by daily recharging. Yet once these batteries have expired, they too become a source of pollution that needs to be carefully disposed of. Another reason solar power is not widely used is because it often is greatly misunderstood by members of the general public. During the energy crisis of the 1970s many people became interested in alternative energy sources. One of the main sources explored was solar power. At the time, much was still unknown about solar power, and scientists were still discovering the best ways for this energy to be utilized. Today, most people do not realize how simple asolar power system is to install and operate and the energy potential it can offer.

Reading Comprehension

1. Read the text and define which title below matches to which paragraph:

The Electrical Side of Solar Power – PV Cell Modules – The Limitations of Solar Power – The Solar Furnace – Sunlight: Free and Nonpolluting – Solar Power Technology – Flat Plate Collectors – Passive Heating – Solar Trough Collectors

2. Read the text carefully and mark the statements are true (T) or false (F):

1) A solar power system has a high start-up investment cost.	
2) Today, people are finding that solar modules are an excellent option when they have immediate access to electricity through conventional power lines.	
3) When PV cells are linked together by running a wire from one PV cell to the next, they are called flat plate collectors.	
4) Up to 80 percent of the solar modules created in Belarus are exported to third world countries.	
5) The solar furnace is much larger than a solar trough, mainly because it uses hundreds of flat mirrors, called heliostats, to collect sunlight over a much larger area.	
6) Humans have endeavoured to use solar power for their own benefit throughout history.	
7) The power generated in this fashion is efficient, costing less than fossil fuels.	
8) There are many benefits to using solar power	

Language Development

! To talk about an activity in the recent past, a job or activity which is not finished, an action or activity which began in the past and has continued up to the present, results of the activity that can be seen, we use the Present Perfect Progressive Tense **(have/has +been + verb-ing).**

1. Look at this sentence from the article and underline the Present Perfect Progressive Tense: *Scientists have been working hard to find ways to make solar heating more applicable to large populations.*

2. Find and <u>underline</u> other examples in the text.

3. Fill in the gaps with the proper Present Perfect or Present Perfect Progressive Tense.

California utilities still **1)**_____ **(up)** their plans for solar power after the state raised its renewable energy standard this year.

The company **2)** _____ **(build)** 48-megawatt first phase of the facility with Tempe-based First Solar (Nasdaq: FSLR) panels, and **3)** _____**(serve)** as the project's engineer, procurement manager and construction contractor.

The government **4)** _____ **(start)** a generous scheme that pays households for the solar energy that they produce – even if they use it themselves. These payments are tax free and guaranteed for 25 years, but the rates available to those who **5)** _____ **(install)** panels this year are expected to be lower.

On average, the tariffs are expected to pay back the cost of installing a solar power system within 10 years, but there **6)** _____ **(be)** warnings from consumer groups that some energy companies **7)** _____ **(oversell)** the panels, claiming that they will pay for themselves within a far shorter time.

! To emphasize the action in a sentence, rather than the person who carries/carried out the action we use the Passive. To say who does the action of a passive verb, add **by + noun phrase (agent)** after the verb phrase. The passive form of the verb contains this pattern: **subject** + **be + Past Participle + object.**

Simple { *is used* / *are used* / *was used* / *were used* };

Modal pattern { *will be used* / *could be used* / *can be used* / *may be used* / *must be used* / *might be used* };

Progressive { *is being used* / *are being used* / *was being used* / *were being used* };

Perfect { *has* / *have* *been used* / *had been used* };

Modal Perfect { *might have been used* / *could have been used* }

The passive is rare in 'speech', but common in academic 'writing'.

4. Look at these sentences from the article, <u>underline</u> and name the Passive forms:

Sunlight has been used in various ways since the beginning of human history.
This technique is still applied today.
Sunlight can also be captured in photovoltaic (PV) cells.
At the time, much was still unknown about solar power.
Solar power technology is still being developed and has also met with strong resistance by the government and large oil companies.

5. Find and underline other examples in the text.

There are some examples of **passive infinitive (subject + verb + to-Infinitive + object)** in the text which can be used with some verbs, e. g. 'need'. We use 'need' to talk about things which are necessary. 'Be able' is not normally used in passive structures.

6. Highlight and translate the structures from the text.

7. Make up another sentence with the same meaning using passive structures.

1) They designed the batteries to have a long life of ten to twenty years.

_____

2) They don't widely use solar power because people often greatly misunderstand it.

_____

3) People destroyed trees and lakes in many parts of the world.

_____

4) They use advanced technologies to deliver the power generated from sunlight.

_____

5) People are finding that solar modules are an excellent option for them.

_____

6) The photovoltaic effect directly relates to the photoelectric effect.

_____

7) Many countries use sun for getting power.

_____

8) The French Government tests nuclear weapons in the Pacific Ocean.

_____

9) Pouring oil into the water will cause the destruction of our seas and rivers.

_____

10) Alexandre-Edmond Becquerel was the first who observed the photovoltaic effect in 1839.

_____

8. Find and learn Russian equivalents for the following words and expressions:

1) flat plate collectors	a)
2) solar trough collector	b)
3) power-generating plants	c)
4) streetlight	d)
5) sun angle	e)
6) first and foremost	f)
7) budding market	g)
8) shoddy goods	h)
9) to dispose of the waste	i)
10) the ways for this energy to be utilized	j)

9. Find and learn English equivalents for the following words and expressions:

1) сферическое зеркало	a)
2) солнечная печь	b)
3) борный раствор	c)
4) направлять энергию	d)
5) фотоэлектрический модуль	e)
6) Национальное агентство по аэронавтике и исследованию космического пространства	f)
7) в избытке	g)
8) традиционные линии электропередач	h)
9) стойкое недоверие	i)
10) по сути, по своему существу, в своей основе	j)

10. Translate the following article from English into Russian.

Photovoltaics *(PV) is a method of generating electrical power by converting solar radiation intodirect current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of cells containing a photovoltaic material. Materials presently used for photovoltaics include monocrystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride, and copper indium selenide/sulfide. Due to the growing demand for renewable energy sources, the manufacturing of solar cells and photovoltaic arrays has advanced considerably in recent years.*

Driven by advances in technology and increases in manufacturing scale and sophistication, the cost of photovoltaics has declined steadily since the first solar cells were manufactured. Net metering and financial incentives, such as preferential feed-in tariffs for solar-generated electricity, have supported solar PV installations in many countries. The photovoltaic effect was first observed by Alexandre-Edmond Becquerel in 1839.

Over to you

1. Discuss with your partners: What new facts have you learnt about solar power? How can this energy source be used? Do the costs of the technologies described in the text make them prohibitive for common use? Why or why not?

2. Prepare a presentation on the topic being discussed.

Writing

Go to the site http://reference.findtarget.com/search/A. %20E. %20 Becquerel/ and find more information about Alexandre-Edmond Becquerel. Write a short essay about this scientist.

WIND POWER

Vocabulary

Match the words with their definitions:

1) cargo (n.)	['kɑ:gəu]	a) the flat part of a tool, weapon, or machine (such as a fan) that normally has a cutting edge and/or pointed end
2) pump (n.)	[pʌmp]	b) capable of working successfully; feasible
3) blade (n.)	[bleɪd]	c) occurring at irregular intervals; not continuous or steady
4) nacelle (n.)	[nə'sel], [næ'sel]	d) having or involving a sensation of spinning around and losing one's balance
5) prairie (n.)	['prɛərɪ]	e) likely or liable to suffer from, do, or experience something unpleasant or regrettable
6) viable (adj.)	['vaɪəbl]	f) a thing that is very ugly, esp. a building that disfigures a landscape
7) prone to/to do smth.) (adj.)	[prəun]	g) goods carried on a ship, aircraft, or motor vehicle
8) intermittent	[ˌɪntə 'mɪt(ə)nt]	h) a large open area of grassland, especially in North America
9) eyesore (n.)	['aɪsɔ:]	i) a mechanical device using suction or pressure to raise or move liquids, compress gases, or force air into inflatable objects such as tyres
10) dizzy (adj.)	['dɪzɪ]	j) a streamlined housing or tank for something on the outside of an aircraft or motor vehicle

Listening & Watching

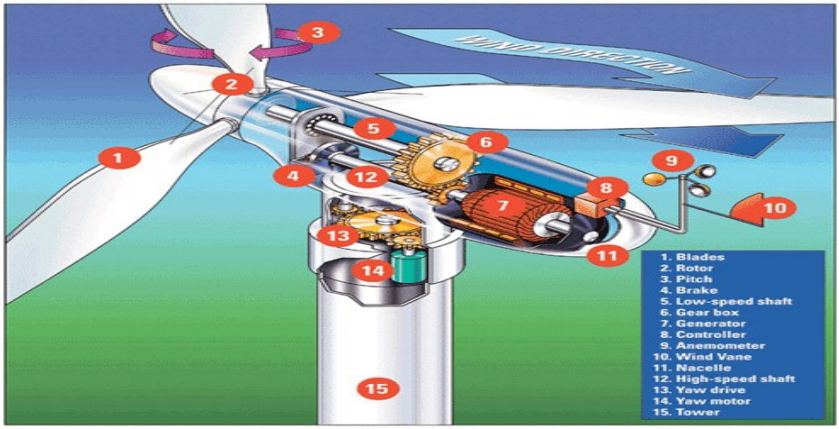
1. Wind power is one of the fastest growing forms of alternative energy in the world. A new form of wind power is now designed to work in an urban environment. Watch the clip 'New wind turbine design' and then discuss with your partner if the new design is a really good one.

2. Now watch and listen again and note the advantages of the new form of wind power.

Before you read

3. You are going to read an article about wind power. Discuss with your partner the following questions.

- What do you know about the wind power?
- Why do we need it?



4. Skim the text to check your ideas.

Reading C

WIND APPLICATION

Throughout history the wind has been used by humans as an energy source for such things as transportation and food production. Energy released by the trade winds–winds that almost always blow in the same direction–was first captured in the sails of ships and used to transport the ship and its *cargo* across oceans. There are few large ships that still use wind power, although many people continue to enjoy sailing smaller crafts using the power of wind.

Food production, such as grinding flour for baking bread, was sometimes powered by wind-driven windmills. Those windmills were eventually modified to run water *pumps* and even later, to generate electricity. Today, the modern windmill, called a wind turbine, is used to generate large quantities of electricity. Through advances in technology, energy producers can even generate electricity from a whole series of wind turbines, called a wind farm. These wind farms are beginning to spread through the whole world.

For centuries farmers have used windmills to harness the wind to grind grain into flour for baking. Windmills were known to be in use in Europe as long ago as the twelfth century. In more recent history, the windmill was adapted for pumping water to irrigate fields, to provide drinking water, or to run small sawmills.

A classic windmill has a fairly simple design with several *blades* on a rotor that turns on top of a tower as the wind blows through them. Blades may be constructed of various materials, including wood, cloth, and metal. They generally have a large surface to capture as much wind power as possible. The tower they sit atop can also be quite tall, sometimes up to fifty feet, as the wind tends to be stronger higher above the ground.

As the wind blows, it turns the blades of the windmill, which spin a central shaft (or pole) that extends from the top to the bottom of the tower of the windmill. The spinning shaft may be attached to many different mechanisms at the

base of the windmill, depending upon the windmill's use. If a farmer wishes to grind grain, the spinning shaft is attached to a gear that turns a grain mill; if the farmer wants to pump water into the fields, the shaft is designed to drive a pump.

Wind turbines work much like windmills, but they are used specifically to generate electricity. A wind turbine usually has fewer blades and is made of lighter materials, such as plastics, which allow the blades to turn more quickly and with less wind. The blades of the wind turbine capture the energy of the wind and send it down a shaft inside the *nacelle*. This shaft spins the turbines of a generator. Inside the generator is a large pole with metal wires wrapped around it. On the inside walls of the generator are magnets. As the turbine poles spin, the magnets draw electrons from the wire and produce electricity. A wind turbine can produce enough electricity to satisfy the needs of a home. In some cases, a single turbine may also produce excess energy that can be stored in batteries or sold to a local utility company.

Wind turbines can also be grouped together to create large quantities of electricity. This is referred to as a wind farm. Wind farms are becoming more widespread throughout the world. In Denmark, for example, 10 percent of its power needs are met with wind farms. Denmark has also created laws that allow wind machine owners to easily sell their excess electricity to local utility companies. Often, individual families in Denmark will buy several large wind machines that produce enough electricity to power the homes of fifty to seventy-five families. Since the Danish government fully supports this form of green energy, the use of wind power is expected to keep increasing in their country. The number of wind machines is expected to increase even more as several developing countries, such as Argentina, Pakistan, and some African countries, are exploring the use of wind farms as they establish their own energy infrastructures.

Like solar power, wind power is a renewable energy source. The energy of the sun drives the production of wind. Since the sun is in daily supply, the energy required to create wind is continuously available. Unlike solar power, however, the energy of wind is also present during the nighttime as land and water absorb the heat of the sun.

Wind power can also be available in great supply. Strong and consistent winds tend to occur where there are large areas of flat land, such as *prairies* and deserts that are heated by sunlight. The desert sands trap the heat of the sun and slowly release the energy throughout the troposphere during the night.

Wind power can be an easily *viable* source of energy for many people, but there are some drawbacks. Perhaps the biggest drawback to wind power is that a person must live in a windy area to harness it. These areas tend to be rather flat or desert like and do not often attract many people. In addition, few people tend to use standalone systems in these areas, as more traditional sources of electricity are already available. These areas can still be used to build wind farms, however, as the electricity produced can be connected to the grid.

Even when living in a windy area, the wind cannot be counted on to always be blowing. Some days are windier than others and some seasons are *prone to* higher winds than others. With such an *intermittent* source of power, the electricity produced by wind turbines often requires battery storage. These

batteries generally have a long life span of about ten to twenty years, but eventually require replacement. As with solar power systems that use batteries to store energy, battery disposal is an issue as the materials used to create batteries are toxic to the environment. Wind machines can also cause noise pollution. The whirling of the blades and the spinning of the turbine in a ten-kilowatt wind machine positioned three hundred feet from a home produces noise that is comparable to wind blowing through trees. Many people find this noise to be an irritant and consider it noise pollution. For some people wind machines are a pleasing sight. The straight lines against a blue sky make a beautiful view. For others wind machines and wind farms are an *eyesore.* They disrupt the view and break up the natural landscape. The blades are *dizzying*, the towers block the sun, and their bases are large blocks of unattractive cement.

Wind machines can also have an environmental impact on wildlife. They are considered something of a hazard to migratory birds. The birds fly into the blades and are killed. For this reason, scientists are studying the flight patterns of migratory birds more thoroughly, and wind farmers are trying not to build in migratory birds' flight paths. Researches also think about painting the blades with different colours. Some of the specifics of the investigations include redesigning the shape of the blades and the materials they are made of, improving the internal mechanisms, and exploring optimum locations for the machines.

http://www.scienceclarified.com/

Reading Comprehension

Read the text carefully and retell the text using the following plan.

1) Harnessing the wind.
2) Wind turbines: the modern windmill.
3) Plentiful winds.
4) Some drawbacks.
5) Deadly to birds
6) A changing industry.

Language Development

!To talk about situations which are changing or developing around present, ether at this precise moment, or something which is in progress around the present, but not necessarily at the moment of speaking, we use the Present Progressive Tense **(subject + am/is/are + verb -ing + object).**

1. Look at this sentence from the article and underline the Present Progressive Tense: *These wind farms are beginning to spread through the whole world.*

2. Find and underline other examples in the text and name the situation.

3. Translate the following sentences from Russian into English using the Present Continuous Tense.

Сейчас ученые проводят эксперимент, используя метод окраски лопастей для того, чтобы птицы могли их заметить. Например, вместо того, чтобы использовать обычную белую краску, они окрашивают лопасти в черно-оранжевые полосы. Ветряные мельницы становятся все более популярными, так как растет и их надежность.

4. Fill in the proper prepositions:

to x3, **with** x2, **at** x2, **by** x2, **in** x2, **for** x2, **of** x3, **from** x2, **around**, **on** x2

1) Compared_____ other renewable energy sources, wind power competes_____ conventional energy_____ a price less than 4 cents per kilowatt-hour, Collins said.

2) Wind energy projects _____ the world now generate enough energy to power nine million typical U.S. homes, according _____ the American Wind Energy Association, a Washington, D.C.-based trade group.

3) One of the newest trends _____ wind power is the construction _____ offshore wind farms, clusters _____ electricity-generating turbines erected _____ open-water areas _____ strong winds.

4) While few homes generate their own wind power in the U.S., many power companies allow consumers to opt _____ power generated _____ a wind plant or other renewable source.

5) On Tuesday, Colorado voters will consider a ballot initiative that would require power companies to provide 10 percent _____ their electricity _____ wind and other renewable sources _____ 2015.

6) "If that passes, power companies will offer more rebates _____ homeowners" to encourage renewable energy production, said Sheila Hayter, an NREL senior engineer.

7) Humans relied_____the natural systems of the earth to meet their energy needs.

8) Smog and acid rain could be eliminated _____ renewables.

9) Renewable sources of energy have been used _____ various peoples to supply power _____ their specific needs, but always _____ a small scale.

5. Find and learn Russian equivalents for the following words and expressions:

1) a top	a)
2) energy infrastructure	b)
3) release energy	c)
4) viable source of energy	d)
5) standalone systems	e)
6) intermittent source	f)
7) gasoline-powered	g)
8) to disrupt the view	h)
9) flight paths	i)
10) maintenance	j)

6. Find and learn English equivalents for the following words and expressions:

1) электростанция общего назначения	a)
2) ветровая электростанция	b)
3) поля орошения	c)
4) лесопилка; лесопильный завод	d)
5) приемлемый источник энергии	e)
6) продолжительный срок службы	f)
7) энергетическая система	g)
8) раздражающий	h)
9) перелетные птицы	i)
10) внутренний механизм	j)

Over to you

1. Think about advantages and disadvantages of using wind power and make a list. Discuss with your partners.

2.  Prepare a presentation on the topic being discussed.

Writing

Go to one of these sites and write a short report on it.

Wind power blog www.mywindpowersystem.com for wind power news and how to do it yourself

News, views and analyses from the world's leading independent wind energy magazine, Windpower Monthly, at **www.windpower-monthly.com**

The British Wind Energy Association at **www.bwea.com**

Wind generators for home use: **www.windsave.com**

UNIT 4

NUCLEAR ENERGY

Vocabulary

Match the words with their definitions:

1) nucleus (n)	['nju:klɪəs]	a) (not in technical usage) another word for speed
2) fission (n.)	['fɪʃ(ə)n]	b) the act or process of splitting or breaking into parts
3) emission (n.)	[ɪ'mɪʃ(ə)n]	c) a species of atom characterized by its atomic number and its mass number
4) velocity (n.)	[vɪ'lɔsətɪ]	d) a corrosion-resistant toxic silvery-white metallic element that occurs chiefly in beryl and is used mainly in X-ray windows and in the manufacture of alloys.
5) nuclide (n.)	['nju:klʌɪd]	e) to produce (a substance) by a chemical process
6) incoming (adj.)	['ɪnˌkʌmɪŋ]	f) reconstruct
7) beryllium (n.)	[be'rɪlɪəm]	g) coming in; entering
8) restore (v.)	[rɪ'stɔ:]	h) energy, in the form of heat, light, radio waves, etc., emitted from a source
9) generate (v.)	['ʤen(ə)reɪt]	i) the positively charged dense region at the centre of an atom, composed of protons and neutrons, about which electrons orbit

Watching and Listening

1. You are going to watch and listen to a science lecturer giving explanation how nuclear energy is produced.

2. Before you listen, think about the process of producing nuclear energy. What substances are used in the process? What is the process called? Do you think it is a complicated process?

3. Now watch and listen to the part of a lecture and answer the questions:

1) To generate nuclear energy how many substances are required? Name them.
2) Is plutonium a natural substance?
3) What substance is a byproduct?
4) Which of the substances is active?
5) What is the purpose of a moderator? How important is it?
6) Is the fuel used to produce nuclear energy renewable?
7) Why are power stations recommended to be built outside cities?

4. Now listen to the professor again and fill in the gaps the part of the presentation with one of these words or expressions

TRANSPORTATION SHUT IT DOWN PUSHED INTO HEAT THE SAME IN THE CORE ONCE A GENERATOR A COAL POWER STATION DRIVE A TURBINE UNLIKE INTO STEAM CONTROL RODS WHEREASON THE AMOUNT OF

... In addition we have things called 1._____which can be 2._____ the nuclear reactor when it's working, and 3. _____. And they do that by controlling the reaction 4. _____. All a nuclear power station does, on a nuclear reactor does, is produce 5. _____. What we then have to do is take the heat away and 6. _____ we've taken it away we can take it away and turn it 7. _____, which can 8. _____, which drives 9. _____. This is exactly 10. _____ as in a conventional power station. 11. ____ most means of generating heat, the reactor is very economical 12. _____fuel needed. For example, here twenty-eight tons for a year of working, 13. _____ a power station–14. _____ would need two thousand tons a week, this needs only twenty-eight tons a year. So we don't have large 15. _____ large amounts of fuel…

5. You are going to read an article about nuclear energy. Discuss with your partner the following questions.

- **What is nuclear energy?**
- **How does nuclear energy work?**

6. Skim the text to check your ideas.

Reading A

PHYSICS OF URANIUM AND NUCLEAR ENERGY

Neutrons in motion are the starting point for everything that happens in a nuclear reactor. When a neutron passes near to a heavy nucleus, for example uranium-235 (U-235), the neutron may be captured by the nucleus and this may or may not be followed by fission. Capture involves the addition of the neutron to the uranium nucleus to form a new compound nucleus. A simple example is U-238 + n ==> U-239, which represents formation of the nucleus U-239. The new nucleus may decay into a different nuclide. In this example, U-239 becomes Np-239 after emission of a beta particle (electron). But in certain cases the initial capture is rapidly followed by the fission of the new nucleus. Whether fission takes place, and indeed whether capture occurs at all, depends on the velocity of the passing neutron and on the particular heavy nucleus involved.

Fission may take place in any of the heavy nuclei after capture of a neutron. However, low-energy (slow or thermal) neutrons are able to cause fission only in those isotopes of uranium and plutonium whose nuclei contain odd numbers of neutrons (e.g. U-233, U-235, and Pu-239). Thermal fission may also occur in some other transuranic elements whose nuclei contain odd numbers of neutrons.

For nuclei containing an even number of neutrons, fission can only occur if the incident neutrons have energy above about one million electron volts (MeV).

The probability that fission or any another neutron-induced reaction will occur is described by the *neutron cross-section* for that reaction. The cross-section may be imagined as an area surrounding the target nucleus and within which the incoming neutron must pass if the reaction is to take place. The fission and other cross sections increase greatly as the neutron velocity reduces from around 20,000 km/s to 2 km/s, making the likelihood of some interaction greater. In nuclei with an odd number of neutrons, such as U-235, the fission cross-section becomes very large at the thermal energies of slow neutrons.

Using U-235 in a thermal reactor as an example, when a neutron is captured the total energy is distributed amongst the 236 nucleons (protons & neutrons) now present in the compound nucleus. This nucleus is relatively unstable, and it is likely to break into two fragments of around half the mass. These fragments are nuclei found around the middle of the Periodic Table and the probabilistic nature of the break-up leads to several hundred possible combinations. Creation of the fission fragments is followed almost instantaneously by emission of a number of neutrons (typically 2 or 3, average 2.5), which enable the chain reaction to be sustained. The chain reaction is started by inserting some beryllium mixed with polonium, radium or other alpha-emitter. Alpha particles from the decay cause a release of neutrons from the beryllium as it turns to carbon-12.

The delayed neutron release is the crucial factor enabling a chain reacting system (or reactor) to be controllable and to be able to be held precisely critical. At criticality the chain reacting system is exactly in balance, such that the number of neutrons produced in fissions remains constant. This number of neutrons may be completely accounted for by the sum of those causing further fissions, those otherwise absorbed, and those leaking out of the system. Under these circumstances the power generated by the system remains constant. To raise or lower the power, the balance must be changed (using the control system) so that the number of neutrons present (and hence the rate of power generation) is either reduced or increased. The control system is used to restore the balance when the desired new power level is attained.

The number of neutrons and the specific fission products from any fission event are governed by statistical probability, in that the precise break up of a single nucleus cannot be predicted.

An extract from Bluebells and Nuclear Energy ,by Albert Reynolds, 1996,CogitoPress updated September, 2010

Reading Comprehension

Jumbled sentences. Arrange the sentences in the summary in a logical order.

1) When the fissionable material can sustain a chain reaction by itself, the chain reacting system is in balance.

2) The capture of the neutron forms a new compound nucleus.

3) First of all, neutrons are in motion in a nuclear reactor.

4) By raising or lowering the number of neutrons, the rate of the generator can be decreased or increased to get the required power level.

5) Furthermore, at the thermal energies of slow neutrons the fission cross-section becomes very large for nuclei with odd number of neutrons.

6) In fact, the velocity of the passing neutron influences the fission and capture happens.

7) A certain group of neutrons is delayed and decayed within the fission process, which is the important factor providing the control over a chain reacting system.

8) For example, the compound nucleus of U-235 used in a thermal reactor is not very stable and may break into the fragments.

9) These are the examples of typical reaction products.

10) Heat is generated in the reactor even if it stops because of the radioactive decay; that's why it needs cooling.

11) When the neutron velocity decreases, the fission and cross-sections go up in any neutron-induced reactions.

12) Fission can occur after capture of a neutron, but if the neutrons are low-energy, fission can take place in the isotopes of the elements with odd number of their nuclei.

Language Development

! The **passive** is formed with the appropriate tense of the verb **to be + past participle**. Only transitive verbs can be put into the passive

The passive is used: when we are more interested in the action than the agent, such as processes, instructions, reports etc.; when the person who performs the action (agent is unknown, unimportant or obvious from the context.

1. Look at this sentence from the article and underline the passive form of the verb: *Using U-235 in a thermal reactor as an example, when a neutron is captured the total energy is distributed amongst the 236 nucleons (protons & neutrons) now present in the compound nucleus***.**

- to emphasize the agent.

2. Look at this sentence from the article and underline the passive form of the verb: *When a neutron passes near to a heavy nucleus, for example uranium-235 (U-235), the neutron may be captured by the nucleus and this may or may not be followed by fission.*

For more information about Passive consult English Grammar in Use by R. Murphy Units 42-44.

3. Fill in the gaps with the proper active or passive form of the verb. Mind the Tenses.

Fast Neutron Reactors

The Fast Breeder Reactor originally 1) _____ (conceive) to extend the world's uranium resources, and could do this by a factor of about 60. Although several countries 2) _____(run) extensive fast breeder reactor development programs, major technical and materials problems 3)_____(encounter). To the extent that these programs 4)_____ (per-

mit), it 5) _____(not establish) that any of the designs would have been commercially competitive with existing light water reactors. An important aspect of fast reactor economics 6) _____ (lie) in the value of the plutonium fuel which is bred; unless this shows an advantage relative to contemporary costs for uranium, there would be little benefit from the use of this type of reactor. This point 7) _____ (drive) home in the 1980s and 1990s by recognition of the abundance of uranium in geological resources and its relatively low price then.

Fast reactors 8) _____ (have) a strong negative temperature coefficient (the reaction 9) _____(slow) as the temperature 10) _____(rise) unduly), an inherent safety feature, and the basis of automatic load-following in some new designs.

An extract from Bluebells and Nuclear Energy ,by Albert Reynolds, 1996,CogitoPress updated September, 2010

4. Find and learn Russian equivalents for the following words and expressions:

1) a new compound nucleus	a)
2) low energy neutrons	b)
3) thermal fission	c)
4) probabilistic nature	d)
5) neutron-induced reaction	e)
6) neutron cross-section	f)
7) solid fuel	g)

5. Find and learn English equivalents for the following words and expressions:

1) являться причиной деления	a)
2) четное число	b)
3) нечетное число	c)
4) распад	d)
5) восстановить баланс	e)
6) решающий фактор	f)
7) статистическая вероятность	g)

6. Translate the following article from English into Russian.

The most common types of commercial power reactor use water for both moderator and coolant. Criticality may only be achieved with a water moderator if the fuel is enriched. Enrichment *increases the proportion of the fissile isotope U-235 about five- or six-fold from the 0.7 % of U-235 found in natural uranium. Enrichment is a physical process, usually relying on the small mass difference between atoms of the two isotopes U-238 and U-235. The enrichment processes in commercial use today require the uranium to be in a gaseous form and hence use the compound uranium hexafluoride (UF6). This becomes a gas at only 56^{o}C under atmospheric pressure, but is readily contained in steel cylinders as a liquid or solid under pressure.*

An extract from Bluebells and Nuclear Energy, by Albert Reynolds, 1996,CogitoPress updated September, 2010

Over to you

Prepare a presentation on one of the following topics

- Neutron Capture: Transuranic elements & activation products
- Fast Neutron Reactors
- Control of Fission
- Fission in uranium exploration
- Uranium enrichment
- Laser isotope separation

Writing

Write a description of

- *Constituents of Atomic Nuclie*
- *Physical Quantities Which Are Conserved in Nuclear Reactions*
- *The Nuclear Shell Model*

NUCLEAR POWER REACTORS

Vocabulary

Match the words with their definitions:

1) pressurized (adj.)	[preʃəraızd]	a) with increased concentration or abundance of one component or isotope in (a solution or mixture); concentrated
2) split (v.)	[splıt]	b) a fluid used to cool a system or to transfer heat from one part of it to another
3) enriched (adj.)	[ın'rıʧt]	c) with increased pressure on (a fluid)
4) malfunction (n.)	[ˌmæl 'fʌŋkʃ(ə)n]	d) the process of preventing the plasma in a controlled thermonuclear reactor from reaching the walls of the reaction vessel, usually by confining it within a configuration of magnetic fields
5) coolant (n.)	['ku:lənt]	e) a slim cylinder of metal, wood, etc.; stick or shaft
6) core (n.)	[kɔ:]	f) a material, such as heavy water or graphite, used for slowing down neutrons in the cores of nuclear reactors so that they have more chance of inducing nuclear fission
7) rod (n.)	[rɔd]	g) the region of a nuclear reactor in which the reaction takes place
8) moderator (n.)	['mɔdreıtə]	h) to function imperfectly or irregularly or fail to function
9) containment (n.)	[kən'teınmənt]	i) to separate or be separated from a whole

Watching and listening

1. Before you watch, think about of the stages of creating energy by a nuclear reactor. What are they?

2. Now watch and find out how nuclear energy is produced to bring electricity to homes with information from a science teacher on nuclear energy and science lessons. While watching, take notes of the stages of producing energy.

3. Now you will listen to the teacher again and read the script of his presentation. There are some gaps in the script. Try to fill the text using the words and expressions in the box before listening. Now listen again and check your answers.

WITHIN MATRIX CADMIUM RODS HE BASIC CORE A MODERATOR A CHAIN REACTION GRAPHITE AN EMERGENCY BANG HEAVY HYDROGEN BLOWS UP ACTUALLY FUEL RODS SLOTS CONTROL RODS CAREFUL THE NEUTRONS ROTATE THIS IS HOW CARBON ABSORBS TO PRODUCE STEAM

Hi I'm Steve Jones, and I'm going to briefly tell you how nuclear energy is produced. Now obviously this is not a drawing of a nuclear power station, simply because it's a very complex thing. But it's 1. _____ a very simple process. 2. _____the nuclear reactor at the center you have the reactor itself, which contains 3. _____. These are usually Uranium or Plutonium. And these fuel rods are in 4. _____ in a large 5. _____, in between the fuel rods are things called 6. _____. This is a material, sometimes 7. _____, carbon in the form of 8. _____. Or sometimes heavy water, that is water but made of 9. _____. These act as a moderator. This altogether produces what we call 10. _____ which makes the whole thing get very hot. And if it gets too hot it 11. _____. So you've got to be a bit 12. _____, and what you have is coming in from the top can be lowered in these 13. _____. These are 14. _____, and the ability of the cadmium rods is to stop the reaction happening. It 15. _____ neutrons and it's neutrons that make this thing work, the cadmium absorbs 16. _____, shuts the reactor down. So in 17. _____, in come the rods and it shuts it down. So this is 18. _____ of the reactor and all the reactor is doing is producing heat. So it gets hot, it heats water, that water then is used 19. _____ to drive turbines, and the turbines 20. _____ electrical generators, and the electrical generators generate of course electricity for us to use in our homes. So 21. _____ nuclear energy is produced.

Before you read

1. You are going to read an article about nuclear power reactors. Discuss with your partner the following questions.

- What types of nuclear reactors do you know?
- What are the main components common to nuclear reactors?

2. Skim the text to check your ideas.

Reading B

TYPES OF NPR

Most nuclear electricity is generated using just two kinds of reactors which were developed in the 1950s and improved since. New designs are coming forward and some are in operation as the first generation reactors come to the end of their operating lives. Over 16 % of the world's produced electricity coming from nuclear energy is considered to be more than from all sources worldwide in 1960.

A nuclear reactor produces and controls the release of energy from splitting the atoms of certain elements. In a nuclear power reactor, the energy released is used as heat to make steam to generate electricity. (In a research reactor the main purpose is to utilise the actual neutrons produced in the core. In most naval reactors, steam drives a turbine directly for propulsion.)

The principles for using nuclear power to produce electricity are the same for most types of reactor. The energy released from continuous fission of the atoms of the fuel is harnessed as heat in either a gas or water, and is used to produce steam. The steam is used to drive the turbines which produce electricity (as in most fossil fuel plants).

In the world's first nuclear reactors about two billion years ago, the energy was not harnessed since these operated in rich uranium orebodies for a couple of million of years, moderated by percolating rainwater. Those at Oklo in west Africa, each less than 100 kWt, consumed about six tonnes of that uranium.

There are several components common to most types of reactors:

Fuel. Uranium is the basic fuel. Usually pellets of uranium oxide (UO_2) are arranged in tubes to form fuel rods. The rods are arranged into fuel assemblies in the reactor core.

Moderator. This is material in the core which slows down the neutrons released from fission so that they cause more fission. It is usually water, but may be heavy water or graphite.

Control rods. These are made with neutron-absorbing material such as cadmium, hafnium or boron, and are inserted or withdrawn from the core to control the rate of reaction, or to halt it. In some PWR reactors, special control rods are used to enable the core to sustain a low level of power efficiently. (Secondary shutdown systems involve adding other neutron absorbers, usually as a fluid, to the system.)

Coolant. A liquid or gas circulating through the core so as to transfer the heat from it. In light water reactors the water moderator functions also as primary coolant. Except in BWRs, there is secondary coolant circuit where the steam is made.

Pressure vessel or pressure tubes. Usually a robust steel vessel containing the reactor core and moderator/coolant, but it may be a series of tubes holding the fuel and conveying the coolant through the moderator.

Steam generator. (not in BWR) Part of the cooling system where the primary coolant bringing heat from the reactor is used to make steam for the turbine. Reactors may have up to four "loops", each with a steam generator.

Containment. The structure around the reactor core which is designed to protect it from outside intrusion and to protect those outside from the effects of radiation in case of any malfunction inside. It is typically a metre-thick concrete and steel structure. There are several different types of reactors as indicated in the following Table.

http://www.world-nuclear.org/info/inf32.html (updated March 2011)

Reading Comprehension

Read the text carefully and answer these questions according to the information in the text.

1) How does a nuclear reactor produce energy?
2) How is the steam used in a nuclear reactor?
3) What is the basic aim in a reactor used for research?
4) How was the energy moderated in the world's first nuclear reactors?
5) What are the main components common to most types of reactors?
6) How is uranium used?
7) What is moderator?
8) What type of material are control rods made?
9) What is the main function of control rods?
10) What is pressure vessel made of?
11) How many steam generators may a reactor have?
12) How does containment protect the reactor core?

Language Development

!Participles

Participles have two forms:

Present participle or *-ing* form and past participle or *-ed* form; for irregular verbs it is the third form.

Present Participles are used as adjectives, to shorten relative clause.

Past Participles are used to shorten a relative clause in the passive.

1. Look at these sentences from the article and <u>underline</u> the Present Participle and the Past Participles:

In the world's first nuclear reactors about two billion years ago, the energy was not harnessed since these operated in rich uranium orebodies for a couple of million of years, moderated by percolating rainwater.

Over 16 % of the world's produced electricity coming from nuclear energy is considered to be more than from all sources worldwide in 1960.

2. Combine the following pairs of sentences into one using a participle.

1. Eight of the USA nuclear reactors have been decommissioned since 1978. They left the country with some 130 reactors.

2. The critics of nuclear energy have been citing the various nuclear plant disasters. The disasters occurred in the past.

3. This splitting of atoms produces copious amount of energy. It is used to heat water and produce steam.

4. Nuclear power is the power generated by nuclear reaction. The environment is controlled within the huge nuclear reactors.

5. Japan is a great country. It is known for fighting back.

3. Underline the correct participle.

Apart from over 200 nuclear reactors 1. **powered/powering** various kinds of ships, Rosatom in Russia has set up a subsidiary to supply **2. floated/floating** nuclear power plants **3. ranged/ranging** in size from 70 to 600 MWe. These will be mounted in pairs on a large barge, permanently **4.mooring/moored** where it is needed to supply power and possibly some desalination to a shore settlement or industrial complex. The first has two 40 MWe reactors **5. basing/based** on those in icebreakers and will operate at Vilyuchinsk, Kamchatka peninsula, to ensure sustainable electricity and heat supplies to the naval base there from 2013. The second **6. planning/planned** plant of this size is for Pevek on the Chukotka peninsula in the Chaun district of the far northeast, near Bilibino. **7. ExpectingExpected** electricity cost is much lower than from present alternatives.

The Russian KLT-40S is a reactor well proven in icebreakers and now proposed for wider use in desalination and, on barges, for remote area power supply. Here a 150 MWt unit produces 35 MWe (gross) as well as up to 35 MW of heat for desalination or district heating. These are designed to run 3–4 years between refuelling and it is envisaged that they will be operated in pairs to allow for outages, with on-board **8.refuelled\refuelling** capability and **9. using/used** fuel storage. At the end of a 12-year **10. operated/operating** cycle the whole plant is taken to a central facility for 2-year overhaul and removal of **11. using/used** fuel, before being returned to service. Two units will be mounted on a 21,000 tonne barge. A larger Russian factory-built and barge-mounted reactor is the VBER-150, of 350 MW thermal, 110 MWe. The larger VBER-300 PWR is a 325 MWe unit, originally **12.envisaging/envisaged** in pairs as a **13. floated/floating** nuclear power plant, **14. displaced/displacing** 49,000 tonnes. As a cogeneration plant it is rated at 200 MWe and 1900 GJ/hr.

4. Find and learn Russian equivalents for the following words and expressions:

1) to be in operation	a)
2) to utilize the actual neutrons	b)
3) propulsion	c)
4) percolating rainwater	d)
5) pellets of uranium oxide	e)
6) to slow down the neutrons	f)
7) the neutrons released from fission	g)
8) neutron-absorbing material	h)
9) the rate of reaction	i)
10) outside intrusion	k)

5. Find and learn English equivalents for the following words and expressions:

1) исчерпать свои возможности	a)
2) период эксплуатации, срок службы	b)
3) расщепление атомов	c)
4) главная\основная цель	d)
5) корабельный\судовой реактор	e)
6) потреблять	f)
7) замедлитель ядерных реакций	g)
8) полностью остановить	h)
9) вторичный охладитель, вторичный теплоноситель	i)
10) первичный охладитель, первичный теплоноситель	k)

6. Translate the following article from English into Russian.

In a world where the threat of global warming is looming over the future of our planet, it is becoming more and more important to look into renewable, alternative forms of energy. With energy use growing at a rate of 3 % per year, soon it will be inevitable to explore our options. Though it has been under much scrutiny in the past, the advantages of nuclear energy make it one form of powering our planet that should strongly be considered. By reducing emissions, the production of nuclear energy would in turn reduce the effects of global warming. In comparison with gas and coal fired power plants, nuclear energy plants create less than 1/100th of the CO2 created by the traditional power plants.

When considering the advantages of nuclear energy, it is also important to keep in mind the challenges that the process also comes with. Radiation accidents are at the top of the list. Since the 1950's, 17 accidents have been reported throughout the world, with only a few causing serious illness and death. While health and public safety are of utmost concern, we must consider the relatively low accident rates, and how further advances in technology could help prevent other accidents from occurring.

http://EzineArticles.com/

Over to you

1) Work in pairs and take it in turns to ask and answer these questions: What are the advantages of nuclear energy?

2) Why are nuclear power plants considered among the safest and most secure facilities in the world?

3) What additional safeguards protect nuclear power plants from extraordinary events?

4) How will the Fukushima Daiichi nuclear accident in Japan affect the nuclear industry?

5) How long can nuclear power plants operate?

6) What is the white cloud seen coming from some nuclear plants?

7) Why are new nuclear power plants necessary? Can't we just use wind or solar power?

Writing

Write a report with the detailed description and a scheme of one of the following reactors and how they work

- *Boiling Water Reactor (BWR)*
- *Pressurized Heavy Water Reactor (PHWR or CANDU)*
- *Advanced Gas-cooled Reactor (AGR)*
- *Light water graphite-moderated reactor (RBMK)*

PROS AND CONS OF NUCLEAR ENERGY

Vocabulary

Match the words with their definitions:

1) atomic number	['ətɔmɪk 'nʌmbə]	a) a measure of a physical quantity per unit of length, area, or volume
2) valence (n.)	['veɪl(ə)n(t)s]	b) to go or cause to go into solution
3) density (n.)	['den(t)sɪtɪ]	c) to become or cause to become liquid
4) half-life	[hɑ:flaɪf]	d) (in a nuclear reactor) the melting of the fuel rods as a result of a defect in the cooling system, with the possible escape of radiation into the environment
5) dissolve (v.)	[dɪ'zɔlv]	e) an action taken to avoid a dangerous or undesirable event
6) fissile (adj.)	['fɪsaɪl]	f) a disaster or misfortune, esp one causing extreme havoc, distress, or misery
7) liquefy (v.)	['lɪkwɪfaɪ]	g) the time taken for half of the atoms in a radioactive material to undergo decay
8) calamity (n.)	[kə'læmətɪ]	h) the number of protons in the nucleus of an atom of an element
9) meltdown (n.)	['meltdaun]	i) the phenomenon of forming chemical bonds
10) precaution (n.)	[prɪ'kɔ:ʃ(ə)n]	j) capable of undergoing nuclear fission as a result of the impact of slow neutrons

Watching and Listening

1. You will listen to a math and science teacher how nuclear energy is used nowadays.

2. Before you watch and listen, can you briefly describe the process of how nuclear energy works? Are the byproducts harmful? Is it expensive to produce nuclear energy?

3. Now watch and listen and discover from this video how many advantages of nuclear energy were mentioned by the lecturer?

4. Listen to the lecturer again and find answers to the following questions:

1) Is nuclear energy expensive to produce?
2) What is the main use of nuclear energy?
3) Why is nuclear energy a good alternative to other sources of energy?
4) Is it expensive to maintain nuclear bombs? Why?
5) What is another military use of nuclear energy except bombs?
6) What is one of the beneficial uses of nuclear reactor material?

Before you read

1. You are going to read an article about advantages and disadvantages of nuclear energy. Discuss with your partner the following questions.

- Can you describe the processing at nuclear power plant?
- What are possible risks of nuclear reactor accidents?

2. Can you name some of the advantages and disadvantages of nuclear energy?

3. Skim the text to check your ideas.

Reading C

HOW IT WORKS

Radioactive elements are used to generate nuclear power in a scientifically controlled atmosphere. Uranium and Thorium metal for generating nuclear power are mined deep in the earth. Uranium is a silvery white metallic element of atomic number 92. It consists of 92 protons and 92 electrons and has 6 valence electrons. The nucleus is bound between 141 and 146 neutrons with 6 isotopes. Isotope U 238 has 146 neutrons and Isotope U 235 has 143 neutrons. All the six isotopes are unstable and have weak radioactivity. Its density is 70 % more than Lead.

Uranium 238 (99.284 %) is found in nature and is commercially extracted from uranium-bearing minerals. It decays slowly emitting alpha particles. Its half-life is 4.5 billion years. With adequate concentration, the isotopes sustain a nuclear chain reaction that generates intense heat in nuclear reactors. Its byproduct is fissile material used for nuclear weapons. Uranium

metal reacts with nonmetallic elements with its reactivity increasing with temperature. Uranium also dissolves in hydrochloric and nitric acid.

Here is a basic step-by-step description of the processing of a nuclear power plant.

1. Intense heat is generated by nuclear fission.
2. Carbon dioxide gas is injected into the fission zone.
3. Hot gas converts water into superheated steam.
4. Steam drives the turbines.
5. Turbines drive the electrical generators.
6. Electricity is connected to supply grid.

The output is free from carbon dioxide and smoke. It produces large amounts of energy from a small quantity of nuclear fuel. A small amount of nuclear waste, which is dangerous, is generated. The discarded waste must be carefully sealed and buried deep in the earth to allow slow decay to reduce radioactivity. The decay process takes many years.

Nuclear meltdown is an informal designation. Nuclear meltdown causes severe nuclear reactor problems due to overheating of the reactor. This happens when a fission reaction exceeds its limits, and the uranium fuel rods begin to liquefy. The reactor becomes overheated beyond its safety limit. Water cooling of the reactor is auto-controlled. The reactor will leak when the cooling system fails, and it can explode if immediate corrective action is not taken. Shut down action should immediately follow. Overheating of the reactor increases superheated steam pressure, causing the steel body to develop a crack. A tremendous nuclear explosion is the end result. Failure of the water cooling system is the prime reason for this dangerous hazard. The Chernobyl plant in the USSR had several such nuclear meltdowns. The shutdown system was of improper design. A major explosion caused many deaths and inflicted cancer in many people who died later. There was a flaw in the reactor plant: it was not contained within a massive building to minimize explosion intensity. Major disasters happen if reliable and guaranteed safety precautions and norms are not adhered to. Maintaining and enforcing the stringent safety norms costs lots of money. Nuclear critics are relentlessly vociferous on the possible risks of nuclear reactor accidents, the vexing problems of disposing nuclear waste, and the imminent dangers of nuclear fuel transportation. These are facts which cannot be taken lightly.

The trend in the increase of nuclear plants is growing in the world. Add to that the ever increasing number of dangerous nuclear weapons. The world has not considered natural calamities like volcanoes, massive destructive floods, and earth quakes. In such situations destruction of a nuclear plant is practically unavoidable. World debate on nuclear issues must ponder inevitable dangerous catastrophes.

Considering all these facts, it is definitely sensible to use harmless solar energy, wind power, geothermal energy, rice husk fuel, ocean energy, and hydraulic power. These are economical, free, and natural renewable resources. In March 2011, Japan experienced one of the greatest earthquakes in the history of humankind. Japan, a country known for pioneering nuclear technology and setting up numerous nuclear power plants could not handle

the pressure of earthquake tremors that shook its nuclear energy program badly. Two major nuclear power plants were destroyed by the earthquake aftershocks and the surrounding area was instantaneously vacated. Japan is a great country and it is known for fighting back. The country will definitely fight back and rebuild itself but this is certainly a wakeup call for those developing countries which are amassing nuclear weapons and building nuclear power plants without having any sound disaster-control technology.

Reading Comprehension

1. Read the text carefully and answer these questions according to the information in the text.

1) What are the main radioactive elements?
2) How many isotopes does the nucleus of Uranium have?
3) Are the isotopes of Uranium stable?
4) Where can Uranium 238 be found?
5) What is its byproduct? And how is it used?
6) Can Uranium be dissolved?
7) How long is the decay process?
8) What can cause problems in nuclear reactors?
9) When does a reactor become overheated beyond its safety limits?
10) What is the main reason for a nuclear explosion?
11) What are the three issues raised by nuclear critics?
12) In what situations is the destruction of a nuclear plant inevitable?
13) Why is the earthquake in Japan considered to be *a wake up call*?

Language Development

! Articles (a/an/the) precede nouns and some other words in a noun phrase, e. g. *few, little*, adjectives. The article is usually the first word in a noun phrase

1. Look at this sentence from the text: Radioactive elements are used to generate nuclear power in a scientifically controlled atmosphere.

We use the indefinite article (a/an) with singular countable nouns: a nuclear explosion, an alpha particle. We use the definite article (the) with singular countable nouns (the reactor), with plural nouns (the earthquake aftershocks) and uncountable nouns (the radioactivity). We use a/an when the topic is not known to our listener or reader; we use the when it is known.

2. Look at these sentences from the text: Nuclear meltdown is an informal designation. Nuclear meltdown causes severe nuclear reactor problems due to overheating of the reactor.

We usually use a/an for the first reference to a topic in a text, but then we use the for subsequent references.

3. Look at these sentences from the text: Japan, a country known for pioneering nuclear technology and setting up numerous nuclear power plants… The country will definitely fight back and rebuild itself…

We do not always have to mention something for it to be known tom the listener.

The is used before only, last, first (used as adjectives), e.g. the only major nuclear accident. No article is normally used before the words each, every, other, another. e.g. every person on Earth.

For more information about articles and their correct use, consult ENGLISH GRAMMAR IN USE by R. Murphy Units 71–77.

4. Fill in the gaps with the proper article if necessary. Given that there are some 440 nuclear reactors worldwide you'd expect 1. ____ risk of radiation to be high. However, 2.___ only major nuclear accident that saw radiation escape over 3._____large areas has to date been 4.___ Chernobyl. We hope 5.____2011 Japanese nuclear situation will not be added. A limited number of people died in 6.____ Chernobyl event and there are various estimates of how many people will be affected over the long term. It should be pointed out that 7 _____ Chernobyl plant lacked 8.___protective housing, unlike almost all other nuclear reactors and that the shut-down procedures followed were contra-indicated. Then 9._____ Japanese reactors did have such 10. _____housing but it was not enough to shield 11._____ plants from them blowing up, as a result of multiple factors going wrong, notably 12. ____ tsunami that killed off 13.____energy supply to cooling 14.____ reactor core. 15._____D/distinguished scientist James Lovelock, an author of The Revenge of Gaia: Earth's Climate Crisis and the Fate of Humanity and 16._____other books, holds that 17._____every person on Earth has radioactive elements in their bodies from past nuclear bomb tests. However he also holds that 18._____cancer rates have not demonstrably risen as a result. According to him 19. ____ risks of nuclear energy are minimal and outweigh the risks posed by global warming by the use of 20.____fossil fuels. Of course others vehemently disagree. Obviously one serious accident is too many, like 21. _____ March 2011 Japanese earthquake and its effects on 22. _____nuclear reactors there show. As well, 23____ each nuclear bomb and depleted uranium-tipped missile is one too many. Nuclear energy then, like any other energy has 24. ____ advantages and disadvantages. But perhaps we are now forcibly learning that 25. _____disadvantages are too great a risk.

5. Find and learn Russian equivalents for the following words and expressions:

1) emitting alpha particles	a)
2) to sustain a nuclear chain reaction	b)
3) to generate intense heat	c)
4) fissile material	d)
5) hydrochloric and nitric acid	e)
6) to be injected into the fission zone	f)
7) discarded waste	h)
9) immediate corrective action	j)
10) safety precautions and norms	k)
11) the imminent dangers of	l)

6. Find and learn English equivalents for the following words and expressions:

1) глубоко в земле	a)
2) атомное число	b)
3) урансодержащая руда	c)
4) период полураспада радиоактивного элемента	d)
5) ядерное оружие	e)
6) растворять(ся)	f)
7) продукт, выпуск продукции	g)
8) громадный ядерный взрыв	h)
9) система автоматического отключения устройства	j)
10) твердо придерживаться чего-либо	k)

7. Translate the following article from English into Russian.

Although only ever one serious nuclear accident has occurred, in Chernobyl in 1986, such an accident affects many thousands of people, livestock and agricultural production over a large geographical area. In the case of Chernobyl in the Ukraine, nuclear fall-out reached as far as areas of the UK.

Supposedly poor reactor design at Chernobyl allowed the emission of radioactivity and this has not been repeated elsewhere. However one accident is too many.

It is not easy to handle the highly toxic plutonium that is needed to produce a nuclear bomb. So, for terrorists this is nigh impossible. Constructing a 'dirty' nuclear bomb for instance is much easier. However, some governments of nuclear states may now or in the future be regarded as terrorist in their willingness to use nuclear weapons or sell uranium to states that have not signed the international nuclear proliferation treaty.

Over to you

Work in pairs and take it in turns to ask and answer these questions

- What can we do with nuclear waste?
- What's the difference between a nuclear reactor and a bomb?
- Is nuclear power renewable?
- Do radioactive things glow?
- How long does nuclear fuel stay in a reactor?

Writing

Write a composition about advantages and disadvantages of nuclear energy.

UNIT 5

GREEN TOURISM

Vocabulary

Match the words with their definitions and then translate them into Russian. Write the transcription of the words.

1) emerge (v.)	[ɪ'mɜːʤ]	a) capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage
2) endanger (v.)	[ɪn'deɪnʤə]	b) causing a good result; advantageous
3) sustainable (adj.)	[sə'steɪnəbl]	c) involving practical experience of equipment
4) penetrate (v.)	['penɪtreɪt]	d) protection, preservation, and careful management of natural resources and of the environment
5) beneficial (adj.)	[ˌbenɪ'fɪʃ(ə)l]	e) to catch (game, fish, etc.) illegally by trespassing on private property
6) hands-on (adj.)	[ˌhændz'ɔn]	f) to come into view, to become apparent
7) rainforest (n.)	['reɪnˌfɔrɪst]	g) to put in danger
8) setting (n.)	['setɪŋ]	h) dense forest found in tropical areas of heavy rainfall. Also called: selva
9) conservation (n.)	[ˌkɔn(t)sə'veɪʃ(ə)n]	i) to find or force a way into or through (something); pierce; enter
10) poach (v.)	[pəuʧ]	j) the surroundings in which something is set; scene
11) revenue (n.)	['rev(ə)njuː]	k) to make a start
12) getaway (n.)	['getəweɪ]	l) the income accruing from taxation to a government during a specified period of time, usually a year

Listening & Watching

1. You will view the wildlife in Castlewood Canyon State Park which includes various species of birds and animals.

2. Before you watch, check the meanings of the following birds and animals' names in the dictionary:

elk, deer, mountain lion, bobcat, mouse, ticks, coyote, rattlesnake, red tailed hawk, golden eagle, mountain bluebird, Turkey Vulture.

3. Now watch the video answer these questions.

1) What are the best times to visit the park?
2) What are you recommended to bring?
3) If you are lucky, what animals can you see?
4) What time does a coyote look for its prey?
5) What are the smallest animals in the park?
6) Who can help you to do birding?
7) What are the species you can see in the sky?
8) Do you think visiting the park is a form of green tourism? Why? Why not?

Before you read

1. You are going to read an article about ecotourism and its different aspects. Before you read think of what you know about ecotourism. Have you ever been a green-tourist?

2. Discuss with your partner the following questions:

- What are the examples of ecotourism?
- How to do ecotourism
- Ecotourism and biodiversity
- What do people gain from ecotourism?

3. Skim the text to check your ideas.

Reading A

ECOTOURISM: THE PROMISE AND PERILS OF ENVIRONMENTALLY-ORIENTED TRAVEL

By Heather E. Lindsay

Ecotourism, defined as responsible tourism focused on the natural world, has emerged as a concept that unites the interests of environmentalists and developers. Proponents of ecotourism see it as potential salvation of some of the world's most endangered ecosystems, and an opportunity for communities that possess biological resources to develop sustainable economic strategies, instead of pursuing environmentally-damaging patterns of resource use. However, finding a compromise between preservation and development is often challenging, and ecotourism can generate additional environmental problems for the very regions it is intended to protect.

Ecotourism is intended to be sustainable, focused on the natural world, and beneficial to local communities. The IUCN (World Conservation Union) defines it as environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature that promotes conservation, has low negative visitor impact, and provides for beneficially active socio-economic involvement of local populations.

Practically speaking, ecotourism includes activities in which visitors enjoy hands-on experiences, such as bird-watching in the Brazilian rainforest, hiking in the mountains of Nepal, participating in a traditional village celebration, or taking

a canoe trip down a river. Local guides usually accompany small groups of tourists on expeditions, teaching them about the local flora, fauna, and culture of the region. Ecotourism is characterized by small-scale outfits in remote locations where commercialization and mass-tourism outfits have not yet penetrated.

Tourists typically stay with local families, or at small, environmentally-friendly hotels called ecologies. These opportunities for personal contact with members of the host community facilitate cross-cultural exchange and add greatly to the value of ecotourism experiences for some people. Ecotourism is rooted in a conservation ethic and has a mission to support the biological and cultural resources of the community. Revenues from safari expeditions, for instance, may go to protecting the animals from poaching, while the entry fees from visiting a village may go to supporting education and health care for the local children. Prime locations where ecotourism has become popular include Latin America, Southeast Asia, and Australia.

Worldwide, tourism generates annual revenues of nearly 3 trillion dollars and contributes nearly 11 % of the global GNP (Gross National Product), making it the world's largest industry. Although the events of September 11th rocked the tourism industry and made it difficult to predict long-term trends, ecotourism is a growing component of the larger tourism industry, and several factors indicate that it is likely to thrive over time. These factors include increased awareness of environmental problems among tourist populations, willingness of tourists to engage in socially-aware travel, and interest in visiting lesser-known countries like Thailand and Belize rather than traditional vacation getaways.

http://www.cofan.org/links.htm

Reading Comprehension

1. Read the article again. Write T (true), F (false) or NI (no information) in the boxes next to these statements.

a) Ecotourism can solve all environmental problems of the region. ☐

b) To find a compromise between preservation and development is not an easy thing. ☐

c) An eco-tourist can travel alone or be accompanied by a local guide. ☐

d) Lodges are comfortable enough to stay in. ☐

e) The money taken for visiting a local village goes to supporting local people in different ways. ☐

f) Ecotourism is more predictable in comparison with tourism. ☐

g) People are afraid to go to faraway places. ☐

2. Read the article carefully and answer these questions according to the information in the text.

1) What is the definition of ecotourism?
2) To what areas is ecotourism aimed?
3) Can local population be involved in ecotourism? If yes, how?
4) What kind of activities does ecotourism include?
5) What type of accommodation does an eco-tourist usually get?

6) Where does the money from ecotourism go to?
7) Why is ecotourism better predictable than tourism?
8) Why do people travel to remote places?

Language Development

! There are three main groups of prepositions:

- Place: in, at, on;
- Place and movement (1): in, into, out of, on, onto, off, inside, outside;
- Place and movement (2): above, below, over, under, in front of, behind, opposite, between, near, next to;
- Place and movement (3): along, across, through
- Time: at, in, on

For more information about preposition read *English Grammar in Use* by R. Murphy Units 114–120.

1. Choose the right preposition.

Tourism is now the world's largest industry, accounting **for\on\to** more than 10 % of the world's GDP, and is predicted to double **at\in\on** size every ten years or so. **-\To\Along** with this growth comes a clear sustainability challenge, as moving millions of people around **on\at\in** land, sea and air creates problems of transport emissions and other forms of pollution. Aware **in\-\of** these factors, governments have started introducing new regulations, particularly **in\at\for** the transport sector. Airlines and airports, for example, have been obliged **with\to\in** progressively minimise noise levels and cruise operators have had to establish codes of conduct **to\with\for** waste disposal.

If people want to travel **on\in\to** ways that are less environmentally damaging and stay **at\on\in** places that are less polluted, they will use companies that practise sustainability, thus creating a virtuous circle of demand and response. That will mean 'wise growth' which retains the economic benefits of one of the world's fastest growth industries and minimises the adverse impacts.

2. Find and learn Russian equivalents for the following words and expressions:

1) to unite the interests	a)
2) a proponent	b)
3) to generate environmental problems	c)
4) relatively undisturbed natural areas	d)
5) appreciate nature	e)
6) socio-economic involvement of local populations	f)
7) environmentally-friendly hotels	g)
8) negative impacts on the environment	h)
9) contribute to	i)
10) to thrive over time	j)

3. Find and learn English equivalents for the following words and expressions:

1) разработчик	a)
2) потенциальное спасение	b)
3) небольшое снаряжение	c)
4) облегчать межкультурный обмен	d)
5) плата за вход (въезд)	e)
6) поддерживать образование и здравоохранение	f)
7) разрабатывать стандарты	g)
8) пополнение знаний	h)
9) валовой национальный продукт	i)
10) осведомленность/информированность	j)

4. Translate the following passage from English into Russian.

One conservation objective is to ensure that construction and maintenance of ecolodges follow environmental protocols to avoid degrading the very areas that tourists value for their pristine qualities. Low consumption, efficient use, and strict recycling of resources are key. Modern-day tourists are used to having clean sheets in their bedrooms daily. In order to conserve water, power, and labor, an ecolodge might have to adopt a weekly schedule of linen-changing. Tourists are also used to throwing away large amounts of packaging and other trash in the course of their daily activities. Binna Burra, an ecolodge in Australia, provides visitors with biodegradable toiletries and offers boxed lunches for hikers in reusable containers, generating no trash.

5. Translate the following passage from Russian into English.

Для экологов экотуризм дает возможность долгосрочной защиты территории и ее ресурсов. Это особенно ценно, учитывая, что проблемные места биологического разнообразия – это обычно самые бедные регионы в мире, где экономическая необходимость наиболее вероятно заставляет людей преследовать цели, которые наносят вред окружающей среде. Экотуризм – это возможность сохранить экосистемы и биологическое разнообразие, которые иначе были бы утрачены. Это также и шанс получать доход для дальнейших исследований.

Over to you

Discuss the following questions:

1. How is ecotourism different from nature tourism, sustainable tourism, responsible tourism?
2. How has ecotourism evolved over the years?
3. Why is ecotourism important?
4. Who are eco-tourists?
5. Why should I become involved in ecotourism?
6. Prepare a presentation on the topic being discussed.

Writing

Write a composition on the topic "Greenways in Belarus"

AN ISOLATED PLACE TO VISIT

Vocabulary

1. Match the words with their definitions.

1) colonize (v.)	['kɔlənaɪz]	a) to begin or enable (someone) to begin
2) uncorrupted (adj.)	[ʌnkə'rʌptid]	b) a person who goes on holiday
3) set up (v.)	[setʌp]	c) gloomy
4) holidaymaker (n.)	['hɔlədɪˌmeɪkə]	d) to keep in proper or good condition
5) sepulchral (adj.)	[sɪ'pʌlkr(ə)l]	e) any international agreement
6) implication (n.)	[ˌɪmplɪ 'keɪʃ(ə)n]	f) something that is implied; suggestion
7) maintain (v.)	[meɪn'teɪn]	g) to send colonists to or establish a colony in an area
8) treaty (n.)	['triːtɪ]	h) not contaminated
9) utilitarian (adj.)	[ˌjuːtɪlɪ 'tɛərɪən]	i) any small boat, powered by sail, oars, or outboard motor
10) dinghy (n.)	['dɪŋgɪ]	j) designed for use rather than beauty
11) heritage tourism	['herɪtɪdʒ 'tuərɪz(ə)m]	k) not really travelling at all but using computer-generated images
12) space tourism	[speɪs'tuərɪzm]	l) travel based on visiting places of historical and cultural interest
13) virtual tourism	['vɜːʧuəl 'tuərɪz(ə)m]	m) travel into space, perhaps going to the Moon

Before you read

1. You are going to read an article about the unusual place to visit, Antarctica. What type of tourism is it? What do you know about Antarctica?

2. You have won a prize of a two-week holiday in Antarctica. How would you feel?

- disappointed – you'd rather stay in a luxury hotel in your own country.
- horrified – won't it be cold, uncomfortable and dangerous?
- concerned – is nowhere safe from tourism?
- thrilled – you'll be able to visit a place few other people have ever set foot in.

3. Skim the text to check your ideas.

Reading B

WELCOME TO THE WORLD'S LONELIEST TOURIST SPOT

Guide books to Antarctica? The notion that the last wilderness is being colonized by tourists tends to provoke the kind of shock-horror reaction associated with tabloid headlines. Is nothing scared? Apparently not. Thirty two years ago, not a single tourist visited Antarctica. Now, as many as 10,000 tourists visit it each year. What next? Package holidays at the South Pole?

The idea of mass tourism on the ice is shocking, of course, because Antarctica is a powerful symbol of the uncorrupted earth – the planet before we mucked it up. It is a blank in time, the last wilderness and the only geographical symbol of innocence left unless we set up colonies in space.

The dangerous implications of tourism in Antarctica, however, have been exaggerated. 10,000 people aren't actually all that many on a continent one and a half times the size of Europe. In addition, almost all tourists arrive on cruise ships and spend only a few hours on the continent itself. There is no accommodation available to holidaymakers on the ice, so they are obliged to return to their cruise ships in inflatable dinghies to sleep in heated cabins. Nor are there shops or food or water in Antarctica. Antarctic tourism is now well-policed and all reputable organizations adhere to the environmental regulations of the Antarctic Treaty and the guidelines laid down by IAATO, the International Association of Antarctica Tour Operators. Whilst it is essential to maintain strict control over all visitors to the sepulchral wastes, the reality is that the vast majority of the continent has never seen a Nikon and probably never will.

This doesn't mean that Antarctica has not developed a human culture of its own. No: despite the fact that it has no indigenous population, since the first man stepped onto the continent in about 1821, explorers, scientists, base workers and mountaineers have come to the ice and given it a history. At the beginning they lived only in tents, or in the cramped quarters of their ships, or in prefabricated huts they had brought from home. Now, life in the tiny clusters of human life on the continent is rather more sophisticated. McMurdo, the largest of the three American bases in Antarctica, resembles a small Alaskan mining town. It has roads, three-story buildings, the ill-matched architecture of a utilitarian institution and a summer population of more than a thousand people.

As many as 200 research camps function in Antarctica in the summer, and about thirty remain manned during the winter. They belong to a variety of national programmes, and each country transports its culture to the bottom of the world. I ate Antarctica's best food at the Italian station, Terra Nova Bay, had sweet, syrupy dumplings with Chinese at Great Wall and drank vodka at the Russian base at Bellinghausen.

But none of these people were tourists, and their overall impact on the continent of Antarctica was minimal. To return to the point I made at the beginning about the alarming rise of Antarctic tourism, people often ask me if I am afraid that some entrepreneurial spirit is going to arrive on the ice to start building huge hotels and shopping malls. The reality is that Antarctica is different from Spain or Greece or Thailand. Even if someone is prepared to con-

travene the Antarctic Treaty, there are still the almost intractable problems of building and operating a service industry in a place where there is no running water, a place where each barrel of oil has to be transported many hundreds of miles across the worst seas on the planet and which is shrouded in darkness for five months of the year. And despite the complicated politics of the Antarctic treaty, on the continent itself there is no concept of ownership. In the end, neither tourism nor tourist guides can taint the majesty of Antarctica.

Reading Comprehension

1. Read the article again. Choose the best option A, B, C or D, to answer the questions or finish the statements below.

1. What are the implications of the appearance of guide books to Antarctica?
A They will attract even more tourists.
B They may encourage the wrong type of tourists
C They are an indication of the growth of tourisms.
D They give an exaggerated idea of the dangers.

2. The writer sees Antarctica as symbolic because it is
A untouched by man.
B unspoiled.
C timeless.
D empty.

3. The writer suggests that tourists visiting Antarctica
A travel in comfortable conditions.
B may be disappointed by how little they actually see.
C are not aware of its history and culture.
D have little effect on the environment.

4. People working in Antarctica
A are causing more damage than tourists.
B have developed their own lifestyle.
C travel over most of the continent.
D have to adapt their culture to the new environment.

5. The buildings at the American base in McMurdo
A are not well suited to the environment.
B are not attractive, but are practical.
C are sophisticated and comfortable.
D are typically American.

6. How does the writer feel about the changes that are taking place in Antarctica?
A She is generally positive about them.
B She feels they have led to unrealistic expectations.
C She is very concerned about their effects.
D She accepts they are necessary.

Language Development

For information about articles and their use, read ENGLISH GRAMMAR IN USE by R. Murphy Units 71–77.

1. Fill in the gaps with the correct article if necessary.

Given that 500 million tourists roam 1) ____ world each year, I cannot disagree with the need to minimize 2) _____ impacts of tourism – but how should this be done? 3) ____Critics of mass tourism suggest that only low-volume, 'green' tourism should be allowed. Yet the irony is that 4) ____green tourists go to some of 5) ____ most ecologically sensitive spots on 6) ____earth, where their environmental impact may be just as severe. Others bemoan the social changes that come in the wake of tourism. But do local people want to stay as they are? Why should they not enjoy 7) ____ fruits of tourism? Tourism is in 8) ____many places actually keeping alive or even reviving 9) _____local traditions and crafts. Once, at 10) ____ South Pacific Tourism Conference, I warned delegates against allowing tourism to spoil paradise. 11) ____ islander retorted: "My great grandfather was a cannibal and your Scottish missionaries converted him to Christianity. The social changes that 12) ____tourism will bring are small compared to that."

So, how the explosion of tourism should be managed? The travel industry can set standards in 13) ____ areas of 14) _____energy reduction, waste disposal and water savings. Many hotels now recycle waste and encourage energy efficiency. Increasingly, tourist destinations are realizing that inappropriate development may spoil their natural attractions – 15) ____ Caribbean island of St. Lucia recently turned down a scheme to put 16)____ cable car and restaurant on 17) _____ top of its beautiful twin mountain peak, 18) ____ Pitons. A lot of little steps like these can, I believe, combine to create 19) ____ major change in 20) ____ practices.

2. Find and learn Russian equivalents for the following words and expressions.

1) the notion	a)
2) the last wilderness	b)
3) to muck smth up	c)
4) to set up colonies	d)
5) to adhere to the environmental regulations	e)
6) the bottom of the world	f)
7) the alarming rise of	g)
8) an intractable problem of	h)
9) to be shrouded in darkness	i)
10) the concept of ownership	j)

3. Find and learn English equivalents for the following words and expressions.

1) провоцировать	a)
2) связанный с	b)
3) очевидно\похоже	c)
4) нетронутая земля	d)
5) вынужденный	e)
6) напоминать что-то	f)
7) общее воздействие	g)
8) предпринимательский дух	h)
9) нарушить соглашение\закон	i)
10) ее величество Антарктика	j)

4. Translate the following passage from English into Russian.

The Environmental Protocol of the Antarctic Treaty became law in 1998 after legislation in each of the member countries. One of the ways in which this protects Antarctica is by only allowing visitors to Antarctica by member nations as long as they are given a permit to do so. The granting of a permit is dependent on the visitors agreeing to adhere to certain rules and guidelines. Each nations rules are not the same in the detail, though they are similar in the general principles.

In Britain for example, the following activities require a permit from the Secretary of State for Foreign & Commonwealth Affairs:

British expeditions travelling to Antarctica.

British stations in Antarctica.

British registered vessels and aircraft going to Antarctica.

Mineral resource activities for scientific research or for certain construction purposes.

The taking of, or harmful interference with, fauna or flora.

The introduction of non-native animals or plants.

Entry into areas protected under the Protocol (Antarctic Specially Protected Areas – ASPA) or under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) (CEMP Monitoring Sites)

http://www.coolantarctica.com

5. Translate the following passage from Russian into English.

До 1960-х некоторые виды китов и тюленей были на грани выживания из-за деятельности человека в Антарктике. Мусор и отходы оставлялись там, где и бросались, сжигались на кострах или выбрасывались в океан. Рыболовство не существовало или было в очень маленьком масштабе и было полностью нерегулируемым. С тех пор, как Антарктическая конвенция вступила в силу, все растения и животные в Антарктике защищаются и принимаются меры по предотвращению загрязнения этой первозданной среды.

Существует много резолюций и принято много мер по защите Антарктики, ее фауны и флоры. Учреждены особо охраняемые зоны, которые представляют научный интерес. Запрещены выбросы в море

в зоне действия Антарктической конвенции всех токсичных и ядовитых химикатов, нефти и нефтяных отходов, пластмассы и других форм неразлагающихся отбросов. Выбросы других отходов, таких как мусор, с кораблей и баз строго контролируется.

Over to you

Discuss with your partner the following questions:

1. *What wildlife can be found in Antarctica?*
2. *What is unusual about Antarctica?*
3. *Is Antarctica a country?*
4. What are the major environmental problems facing Antarctica?
5. Is there really a 'hole' in the ozone layer over Antarctica and the southern part of South America? If so, what effect is taking place and how is it being monitored?
6. Prepare a presentation on the controls needed for tourism in Antarctica you would like to see brought in and why.

Writing

Describe an isolated place you would like to visit and give your reason why.

FOR AND AGAINST TOURISM

Vocabulary

Match the words with their definitions.

1) expense (n.)	[ɪk'spen(t)s]	a) a document on which a police officer enters details of the charge against a prisoner and the court in which he will appear
2) value (n.)	['vælju:]	b) having committed an offence or adjudged to have done so
3) means (n.)	[mi:nz]	c) money needed for individual purchases; cost; charge
4) charity (n.)	['ʧærɪtɪ]	d) the medium, method, or instrument used to obtain a result or achieve an end
5) menial (adj.)	['mi:nɪəl]	e) the state of being rich
6) unequivocal (adj)	[ˌʌnɪ 'kwɪvək(ə)l]	f) a group of, usually twelve, people, sworn to deliver a true verdict, according to the evidence upon a case, presented in a court of law
7) guilty(adj.)	['gɪltɪ]	g) not ambiguous; plain
8) a charge sheet	[ʧɑ:ʤ ʃi:t]	h) consisting of or occupied with work requiring little skill, esp. domestic duties such as cleaning
9) jury(n.)	['ʤuərɪ]	i) the giving of help, money, food, etc., to those in need
10) wealth (n.)	[welθ]	j) the moral principles and beliefs or, accepted standards of a person or, social group

Listening and Watching

1. There are a lot of arguments against tourism. They say it's a classic case of killing the goose that lays the golden egg. What do you think of this? Do you think that camping is the best form of tourism? Why? Why not?

2. Watch the video and say if you can better understand the environment on camping trips and why?

3. How effective do you think the video is? Why?

Before you read

1. Read the title of the following passage. What do you think the passage is about?

2. What arguments can you think of for and against tourism? Think of two arguments for and against.

3. Skim the text to compare your ideas with the text.

Reading C

TOURISM ON TRIAL

International tourism is on trial, and *the charge sheet* is as long as it is damning. Mass tourism is associated with rising crime, begging and other social problems. It stands accused of imposing itself on some of the world's most fragile ecosystems and of being a force for environmental destruction. Powerful international companies are charged with robbing local people of water and other precious natural resources, of forcing them from their homes, their lands and *means* of survival.

Tourists to the developing world behave badly. They disrespect their hosts by failing to observe dress codes and other cultural norms. Moreover, it is alleged, tourism works to promote dominant Western *values* at the expense of proud and ancient cultures. The trade is fixed by multinational companies from the richest countries that cream off the lion's share of the profits, leaving little for local people, bar *menial* jobs. Those accusing the companies include *charities* and human rights groups, communities affected by tourism, and academics.

Such accusations are hard to reconcile with the defendant in the dock – the tourist industry which is, after all, the 'funshine' industry. It promises some of our happiest times – those two weeks in paradise that we spend the rest of the year longing and saving for.

The claim that developing countries do not benefit from tourism simply does not square with the facts. The industry creates over ten per cent of the world's income and provides employment for one in 25 people on earth. A fast-growing proportion of that trade is going to poorer countries – rather

than being a freeloader, the industry is throwing an economic lifeline to emerging nations. It is a quick, lead-free engine of *wealth* creation, driving fledgling economies and creating much-needed foreign exchange. The plea from the dock is unequivocal: ‘not guilty'.

If charges were brought before a real court the case might well split the jury. The search for the truth means looking at a series of complex economic and social activities that cross many cultures and visit different destinations. Causal relationships about the real effects of tourism are hard to establish. While some entire communities have been dispossessed, others have discovered business opportunities and valued waged employment.

Furthermore, even if international tourism is dominated by multinational companies bent on exploiting the new frontiers of the developing world, this hardly distinguishes it from any other form of trade. So if tourism is not so different, why has it become one of the most talked about issues in development?

Tourism is different. It is different because there is an expectation that it should be a force for fair social change. The industry has billed itself as a place where cultures meet, a catalyst to international understanding and to the transfer of wealth from visitor to visited. Even those most sceptical about the industry's track record in this field are up-beat about the development potential of tourism – if only it were regulated. Tourism is talked about precisely because there is still much to be won – and lost – from discussions that may shape its future. For the development of 'third world' tourism is perhaps the most eloquent metaphor for the unjust world in which we live. Fuelled by the growing gaps in income and ever cheaper travel, tourism has become something the world's rich do to the world's poor. In the words of one Namibian school pupil, ‘When I grow up I want to be a tourist'.

If there is one truth about the effects of tourism, it is yet to be found. But the search for a mote just and sustainable form of tourism is still a noble enterprise.

From Proficiency Gold Coursebook by Jacky Newbrook and Judith Wilson

Reading Comprehension

Read the article again carefully, and then answer the questions.

1) What are three main charges made against international tourism?

2) In what two ways does tourism harm local culture and economies?

3) Why is it strange to accuse the tourists industry of creating misery?

4) What is the main argument the writer makes in support of the tourism industry?

5) How does the writer suggest that tourism might be similar to other major industries?

6) What reasons does the writer give for feeling that tourism is actually different from other industries?

7) What does the writer feel is needed to secure the future development of tourism?

8) Why does the writer feel that tourism in the third world is ‘a metaphor for the unjust world in which we live’?

Language Development

1. Review the use of grammar tenses in English and put the verb in the brackets in the correct tense.

It's over 35 years since travel writer Dervla Murphy set off on her bike from Ireland and (1. to arrive), several months later, on India. She (2. to pedal) relentlessly ever since – not quite so fast now that's she is nearly 70, but even more furiously as she (3. to see) countries from South America to Asia despoiled by meddlesome development and disfigured by western values.

Travel writing (4.not to be) a fashionable genre in the early 1960s; so, in describing her trip, Murphy (5. to follow) the solitary stars of two other dauntless female wanderers whose work she (6. to admire); the Victorian Isabella Bird, and Freya Stark, who (7.to start) writing in the 1930s.Since then, she (8. to continue) to indulge her insatiable appetite for travel and adventure, and to delight her readers along the way.

Unlike other big names in travel writing, Murphy (9. to stay) true to the form: she doesn't intersperse her narratives with chunks of tiresome and self-indulgent autobiography, and she is contemptuous of authors who (10. to attempt) to fire their reader's interest by starting their narrative with a dramatic incident in the middle of the jungle. She just (11. to tell) a straightforward tale of her circuitous journeys, from day one through to the last.

The book Murphy currently (12. to work) on is about the Balkans. There are prizes and penalties for ageing authors. In Africa, her white hair (13. to earn) her boundless respect; the Balkans were frustrating because local people (14. to feel) an Irish grandmother had no business being there. Usually the journey is relatively easy; the writing more laborious. This time, both (15. to be) tough going. Happily, there's a Murphy's law that (16. to say), come what may, the book (17. finish).

2. Find and learn Russian equivalents for the following words and expressions.

1) the charge sheet	a)
2) to be/stand accused of	b)
3) a force for environmental destruction	c)
4) to be charged with	d)
5) to be alleged	e)
6) to cream off the lion's share of the profits	f)
7) to square with the facts	g)
8) a freeloader	h)
9) one of the most talked about issues	i)
10) sustainable form of tourism	j)

3. Find and learn English equivalents for the following words and expressions.

1) самая хрупкая экосистема в мире	a)
2) ценные природные ресурсы	b)
3) проявлять неуважение	c)
4) трудно примириться с	d)
5) устанавливать различия	e)
6) ожидание	f)
7) место, где пересекаются культуры	g)
8) несправедливый мир	h)
9) по словам…	i)
10) святое дело	j)

4. Translate the following passage from English into Russian.

Tourism may seem to assure those involved of untold riches, but in reality it can promise more than it delivers. For a start, it depends on a host of factors beyond our control – climate, economics, even politics. In addition, the success of a place as a tourist destination may lead to it losing the features that first attracted the tourists there – that is to say, its unspoiled landscape and welcoming people. But this does not seem to have slowed down the expansion of tourism. Rather the reverse – more and more countries are opening up their doors to the tourists. Not surprisingly, no place can remain untouched by time. Tourists may be the way out of a life of grinding poverty for people who can see no other hope and they naturally welcome the chance to give their children a better life than they had. So all things considered, it seems that tourism is here to stay – all over the planet.

Over to you

Discuss the following questions in the group:

1. How far do you consider that tourism is or can be "a place where cultured meet, a catalyst to international understanding and to the transfer of wealth from visitor to visited"? Give examples to support your opinion

2. What regulations would you introduce to try to bring about "more just and sustainable form of tourism"?

3. In what ways do you think people can benefit from foreign travel?

Writing

Write a balanced composition on the question "Is tourism beneficial or harmful to the world and its people"?

UNIT 6

BELARUS & ITS NATURE-CONSERVATIVE AREAS

Vocabulary

Match the words with their definitions:

1) lichen (n.)	['laɪkən]	a) a type of large deer with big, flat horns called antlers and are found in Northern Europe, Asia, and North America (moose)
2) amphibian (n.)	[æm'fɪbɪən]	b) a narrow place where the sea comes a long way into the land
3) reptile (n.)	['reptaɪl]	c) a group of tiny plants that looks like moss and grows on the surface of things such as rocks, trees, and walls
4) invertebrate (n.)	[ɪn'vɜːtɪbreɪt]	d) Any plant of the genus Astragalus
5) elk (n.)	[elk]	e) a stream or river that flows into a larger one
6) swamp (n.)	[swɔmp]	f) a group of cold-blooded animals which have skins covered with small hard plates called scales and lay eggs
7) tributary (n.)	['trɪbjət(ə)rɪ]	g) an animal lacking a backbone such as mollusc
8) ravine (n.)	[rə'viːn]	h) an area of low-lying, uncultivated ground where water collects; a bog or marsh
9) creek	[kriːk]	i) animals such as frogs and toads that can live both on land and in water
10) rattleweed	['rætlwid]	j) a deep, narrow gorge with steep sides

Listening & Watching

1. Watch the clip 'Belarus' and discuss with your partner if there are any things Belarus can be proud of. Why (not)?

2. Watch again and listen to the song in the clip. Comment on the things you've heard.

Before you read

1. You are going to read an article about Belarus wildlife areas. Discuss with your partner the following questions.

- What do you know about them and can you name any of them?
- Why do we need them?

2. Skim the text to check your ideas.

Reading A

PARKS AND WILDLIFE SANCTUARIES

Belovezhskaya Pushcha National Park (BPNP) and a Biosphere Reserve is located in the western part of the country in Brest Region's Kamenets and Pruzhany districts and Grodno Region's Svisloch District, 380 km from Minsk. It forms a single nature reserve with Poland's Belovezhski National Park. The area of the Belarusian part of the reserve is 163,505 hectares, while the Polish part is 10,501 hectares. BPNP was set up in 1991 and it is one of the oldest nature reserves in the world. The intact wood of BPNP was first mentioned in chronicles in the 10th century, and in the 14th century Lithuanian Prince Yagailo proclaimed these lands a reserve. BPNP is an Europe's last surviving primeval forest which has preserved its prehistoric nature with relic plants and animals, the European bison in the first place. In 1992 UNESCO gave the Pushcha the status of biosphere reserve and placed on the United Nations World's Heritage list. Thus Pushcha entered a world system for surveying changes in the environment.

The flora and fauna is remarkable because of the great number of various types of plants and animals. The flora is represented by 958 vegetative plants, around 260 moss species, over 290 *lichens*, 570 kinds of mushrooms. The reserve's flora contains 65 endangered species. Experts registered here more than 1000 oaks aged 300–700 years, 450-year-old ash-trees, 220-year-old pine-trees, 150-year-old junipers. You can also find here white firs, various types of spruce, pines, hornbeams. The fauna of the reserve counts 59 mammals (including 6 rare species), 253 bird species, 11 *amphibian*s, 7 *reptiles*, 24 fish species and over 11,000 *invertebrates*. Eleven mammals, 52 fowl species, 2 reptiles, 1 amphibian, 8 fish species and 38 insects were included in Belarus' Red Book. Other large animals found in BPNP include the deer, the boar, the *elk*, the wolf, the fox. About one-third of the territory of the reserve is occupied by *swamp*s. One of the largest swamps in Europe – Dikoye – is located here. The reserve is crossed by a number of rivers (the Narev, the Lesnaya Pravaya, etc.). In addition, there are two reservoirs (Bolshoye Lyadskoye and Maloye Lyadskoye). The national park contains lots of landmarks of ancient culture, such as settlements of the Stone Age, burial places and shrines.

One of the most prominent monuments of architecture situated here is Belaya Vezha (the White Tower Citadel), and the famous royal road. Another important site is Viskuli Residence, the former mansion of Duke Tyshkevich. Belovezhskaya Puscha has been known as a place of royal hunting since the 15th century.

National Park "Pripyatsky" is situated in the very centre of the Belarusian Polesie, 250 km to the south from Minsk, on the banks of the river Prypyats in Gomel Region's Zhitkovichi, Lelchitsy and Petrikov districts.

The protected territory in the Pripyat area – the State Landscape Hydrological Reserve – was set up in 1969, and the National Park was established here in 1996 to preserve the unique natural landscape of Belarus' Polesse area and study climate changes that resulted from the drainage of Polesse lowlands.

The total area of the park is more than 83,000 hectares. Its territory stretches for 64 km from west to east and is a vast plain in the south of the Pripyat Polesie consisting of the area at the river Pripyat and terraces, which turned into a glacial plain at the very south. In the postglacial period the area used to be occupied with a huge water reservoir that was known as the Polesse Sea or the Herodotus Sea (since the ancient Greek historian mentioned these lands in his books). Today much of the area is occupied by turf swamps. Meadows here are mixed with shrubs, and multiple lakes are mixed with sand dunes. The park's major waterway is the River Prypyats – the longest *tributary* of the River Dnieper. The borders of the park are formed by the tributaries of the Prypyats – the *creeks* of Stviga and Ubort. The number of lakes here is about 300 and may cover up to 70 % of the park during the flood period.

Local flora is represented by 943 vascular plants including 38 rare species, 196 kinds of moss. The fauna park includes 45 types of animals, 250 fowl species, 51 mammals, 265 types of birds, 7 types of reptiles, 11 types of amphibians, 37 fish species, including four mammals and 65 birds that were included in Belarus' Red Book. Local forests have large populations of elks, boars and roes. Other dwellers here are also European bison, badgers, lynxes, black storks, grey cranes, snake-birds, eagle-owls, big sub-eagles, marsh turtles, reed toads, grass-snakes, starlets.

The most frequently found trees are birch, aspen, black adler, ash and hornbeam, 184 lichen species and 321 waterweed types. The park serves as a vital transit corridor for birds migrating from Western Europe to Russia and hosts a unique population of globally endangered fowl species, such as the Schrenk's warbler and the crake. Pike, bream, sabre fish, roach and ide spawn right on the park's flood plains during snowmelt floods.

Srednyaya Prypyats landscape reserve and a wildlife sanctuary, located in Brest Region's Pinsk, Stolin, Luninets districts and Gomel Region's Zhitkovichi District is 90,447 hectares. The reserve's landscape is formed by oak woods, swamplands, meadows, rivers and lakes. Among numerous representatives of fauna there are five globally endangered fowl species and 52 bird species that were included in Belarus' Red Book. The flora of the reserve counts 725 plant species, and the fauna includes 36 mammals (the elk, the boar, the roe, the fox, the wolf, the raccoon dog, the beaver), 182 fowl species, 6 reptiles, 10 amphibians and 37 fish species. The River Prypyats plays a key role in the conservation of some endangered fowl species, such as the gray duck, the swamp owl, the corncrake, the eagle-owl, etc.

Volma River Biological Reserve (Volmyanski), a Landscape protection area, situated in Smolevichi District, Minsk Region is 637,7 hectares. The western border of the reserve is formed by the river Volma. The reserve was established to preserve valuable woods populated with endangered animal and plant species. The reserve's landscape that was formed by the glacier is characterized by a great number of hills and barrows. The northern part of the reserve contains 5-10-metre-high kames. Another peculiar feature of the local landscape in the natural floodland of the River Volma. The reserve contains eleven valuable plant communities, including aspen woods, pinewoods and spruce

woods with small inclusions of oaks and maples. Nine of locally available plants have been included in Belarus' Red Book (list of endangered species), such as the bugle-weed, the club moss, the wolf's bane, the crisped lily, the bitter vetchling, the sword lily, etc. The waters of the Volma are populated by such species as trout, minnow, perch, char, roach. The local fauna is represented by the beaver, the elk, the roe, the pine marten, the otter, the hare, the squirrel. Camping and burning fire in the reserve is prohibited.

Naroch region. National Park "Narochanski", 170 km from Minsk, is famous for lake Naroch, a pearl of the Belarusian nature, and the most picturesque Blue Lakes in the northwest of Belarus. The park was formed in 1999 to preserve the unique local environment and ensure the efficient use of natural resources. It occupies the territory of Minsk Region's Myadel and Vileika districts, Vitebsk Region's Postavy District and Grodno Region's Smorgon District that is 94 thousand hectares, 37.9 thousand of which are covered with forests. There are 42 lakes covering 18.3 thousand hectares here. The area is famous for its mineral waters, too. This land also means quiet rustle of pine forests and the largest recreational and resort complex in the country. The beauty of the Naroch, wonderful woods and soft climate were the main reasons for establishing of a great recreational centre at the lake's shores. Nowadays there are 18 sanatoriums and rest-homes here. The park's fauna counts around 900 plant species including over 30 endangered ones. Part of the park called Golubye Ozera (blue lakes) is a botanical area of international importance. The fauna is represented by 243 species, including 10 amphibians, 5 reptiles, over two hundred bird species and 49 mammals. The park takes particular pride in a herd of 50 royal stags that has been recently added to its animal population. Rare fowl species found at Lake Naroch National Park include the snow grouse and the goosander. Local rivers and lakes are populated with 32 fish species, including trout, chub, minnow, char, tiddler, vendace, orfe, etc. In addition, the park has many other historical sites, such as Mesolithic settlements near the villages of Kusevschina, Strugolapy, Laposi, Krasyany and Neolithic items by the villages of Nikoltsy and Kochergi, ancient ceramic facilities near Nikoltsy, Rybki, Rassokhi and Iron Age barrows and ruins near Oleshki, Guski, Shklyanikovo and Zasvir.

Ruzhanskaya Puscha Biological Reserve and a wildlife sanctuary, situated in Pruzhany District, Brest Region, was set up to preserve the unique piece of nature with valuable trees and herbs. Beautiful oaks, hornbeams, limes, pines, spruces, larches attract lots of tourists. Rare plant species found in the reserve include the lady's slipper, the butterfly orchid, the salmonberry, the ramson, the lily of the valley, the thyme and the holy grass. The most recent additions on the list of the reserve's flora are the aspen, the alder, the birch and the silver fir. The reserve also contains rare kinds of mushrooms. The most typical representatives of the local fauna are the deer, the roe, the elk, the boar, the lynx, the hare, the beaver, the otter, the raccoon dog, the squirrel, the wolf. The fowl family is represented by the black stork, the black cock, the owl. Local rivers abound in roach, pike, perch, bream and ide. However, hunting and fishing in the reserve is banned.

http://belarustourism.by

Reading Comprehension

1. Read the text carefully and answer these questions according to the information in the text.

1) What is the most attractive park in Belarus? Why?
2) Have you ever been to these places?
3) If not, which place would you like to visit to?
4) Why flora and fauna remarkable?
5) What flora and fauna are represented by in each reserve?
6) What can you say about landmarks of ancient culture? Give the examples.
7) Who such historical places used to belong to?
8) Why a lot of species are included in Belarus' Red Book?
9) For what purpose were these sanctuaries set up?
10) Why many botanists call the reserves a natural museum?

Language Development

1. Match the following phonetic symbols to the words in the text. Read the words according to the transcription. Translate the words. If there are any problems, consult the dictionary.

a	b	c
['bædʒə]		
['i:gl'aul]		
['dʒu:nɪpə]		
[sʌb'i:gl]		
[bɔ:]		
[stɔ:k]		
[spru:s]		
['hɔ:nbi:m]		
['skwɪr(ə)l]		
[bɜ:ʧ]		
['æspən]		
['ɔtə]		
['mɪnəu]		
[pɜ: ʧ]		
[ʧɑ:]		
['tɪdlə]		
['vɛndɪs]		
[ɔ:f]		
[bri:m]		
[lɑ:ʧ]		
['bɜ:bət]		

2. Find and learn Russian equivalents for the following words and expressions:

1) fowl species	a)
2) marsh turtles	b)
3) reed toads	c)
4) grass-snake	d)
5) otter chub	e)
6) sabre fish	f)
7) crisped lily	g)
8) a wildlife sanctuary	h)
9) bitter vetchling	i)
10) pine marten	j)
11) wild carp	k)
12) lady's slipper	l)
13) the lily of the valley	m)
14) the ramson	n)
15) holy grass	o)

3. Find and learn English equivalents for the following words and expressions:

1) места погребения и усыпальницы	a)
2) сосудистое растение	b)
3) камышевка чернобровая	c)
4) половодье	d)
5) енотовидная собака	e)
6) холмы и возвышенности	f)
7) холм, образованный ледниковыми отложениями	g)
8) живучка ползучая	h)
9) арника горная	i)
10) чебак/язь	j)
11) большой крохаль	k)

4. Look through the article and transform the <u>underlined</u> sentences using *used to.*

5. Translate the following article from English into Russian.

Braslav Lakes National Park (Braslavskiye Ozera) *was set up in 1995 to preserve the unique ecosystem of the area and ensure the rational use of its recreation potential. The unique landscape of the reserve was formed by the glacier. It is characterized by a great number of lakes, hills (the height of which reaches 30 meters) and ravines. The lakes of Braslav, Strusto, Snudy, Nespish and Nedrovo have particularly picturesque landscapes. One-fourth of the territory of the park is covered with woods, and 16 % is occupied with bogs. The woods are united into several tracts, namely, Boginski, Vidzovski, Belmont, Druiski, Boruny. The flora of the national*

park counts over 800 vegetative plant species, including 20 rare ones, registered in the Red Book and under the State protection. There are more than 30 types of fish in the lakes, including eel, carp, pike, bream, wild carp, ide, the burbot, perch, etc. One of them is the eel, which is industrially grown. About 35 % of all the birds nesting in Belarus are concentrated on the territory of the park. 45 of them are registered in the Red Book. There are rare animals as badgers, lynxes, brown bears, fly-squirrels, lots of elks, wild boars, roe deer. Hunting is permitted in an area that lies 1–60 km away from the recreation zone.

6. Translate the following article from Russian into English.

Ландшафтный заказник «Мозырские овраги», расположенный в северо-западной части Мозырской гряды в Гомельской области, был создан с целью сохранения уникального для Беларуси природного элемента. Общая площадь – 1141,5 га. Название заказника говорит само за себя. Овраги, рассекающие Мозырскую гряду в пределах и в окрестностях Мозыря, представляют собой своеобразный ландшафтный комплекс. Кое-где глубина оврагов достигает 40 метров. Верхние части оврагов обнесены и покрыты относительно нетронутой естественной растительностью (сосной, березой, дубом, черной ольхой). На территории заказника произрастает ветреница лесная, известная местному населению под названием «лесной нарцисс» и клопогон европейский, включенные в Красную книгу Республики Беларусь. В заказнике выявлено 496 видов сосудистых растений, древесных пород – 18 видов, кустарников – 38 и травянистых растений свыше 700. Многие ученые, изучающие растения, называют этот заказник природным музеем.

Over to you

1. Discuss with your partners the advantages and disadvantages of each reserve.

2.  Prepare a presentation on the topic being discussed.

Writing

Imagine that you are going to make a report for the international conference about national parks in Belarus. Write about the things which could interest the guests.

DOKUDOVSKOE

Vocabulary

Match the words with their definitions:

1) peatland (n.)	['piːtləndl]	a) a common and invasive tall reed
2) bog (n.)	[bɔg]	b) once more covering or soaking with a liquid, such as water
3) fen (n.)	[fen]	c) a country on the SE shore of the Baltic sea
4) humidity (n.)	[hjuː'mɪdətɪ]	d) an area of wet muddy ground that is too soft to support a heavy body
5) Lithuania (n.)	[ˌlɪθju'eɪnɪə]	e) possible and practical to do easily or conveniently
6) Sweden (n.)	['swiːd(ə)n]	f) land consisting largely of peat or peat bogs
7) rewetting	[riː'wetɪŋ]	g) a quantity representing the amount of water vapour in the atmosphere or in a gas
8) co-firing	[kəu 'faɪərɪŋ]	h) relating to time, forming or following in a logical order or sequence
9) feasible (adj.)	['fiːzəbl]	i) a low and marshy or frequently flooded area of land
10) phragmites	[frag'mʌɪtiːz]	j) logical change of ecosystems that exist or change one after another
11) succession	[sək'seʃ(ə)n]	k) mutual action of setting fire to something
12) chrono-sequential	['krɔnə sɪ'kwen(t)ʃ(ə)l]	l) a country occupying the eastern part of the Scandinavian peninsula

Before you read

1. You are going to read an article about Belarus peatland. **Discuss with your partner the following questions.**

- What do you know about them and can you name any of them?
- Why do we need them?

1. Skim the text to check your ideas.

Reading B

DOKUDOVSKOE PEATLAND

Dokudovskoe *peatland* is located in Grodno region, Lida district. It is partly extracted – the extracted part is located southwest of the village Sterkovo and 2 km west of the village Dokudovo. The overall peatland area is 7,811 ha, the area of the depleted site area 3,583 ha. The peatland consist of 13 % *bogs*, 3 % transitional peatland, and 84 % *fen*. The main present land users are 'Lidsky Forestry' (2,744 ha) and peat factory 'Lidskoe' (384

ha). It is planned to rewet the extracted parts of the peatland by the peat factory successively. The current water level in the degraded peatland is 1.2–1.5 m below soil surface. Peat fires occur frequently.

The peat factory near Lida was constructed in 1974. It is more or less constructed in the same way and has the same capacity as another 26 peat factories in Belarus. 300–500 t of briquettes are produced per day. Excavated peat has a water content of 38–48 %. Within the process the peat is dried with steam at a temperature of 120–140°C. The fuel for this is chipped wood and briquettes breakage. Heat from the factory is delivered to other consumers. The temperature whilst compaction is up to 150 dc. There is no norm for the density of briquettes but there is one for the *humidity* (about 16 %) and the ash content of the briquettes. Transport is done by trucks. Products from the peat factory are exported to *Sweden*, *Lithuania*, and Poland. Dokudovskoe peatland is interesting as a model site as it is closely located to Lida peat factory, which is interested in manufacturing biomass briquettes. As the site is partly already rewetted, chronosequential investigations could be carried out at different vegetation stages after *rewetting*.

Currently biomass is no alternative for the peat factory for the total replacement of peat because only basic experiences exist on that until now. On the long run such a development is conceivable. In this regard, the mixture of peat either with straw of rape (0.4 %) or shives from flax production (5 %) and wood chips is noteworthy. The biomass raw materials (flax and rape) are transported to the factory by railway goods trucks.

By law, currently the biomass content in peat cannot be higher than 5 %. According to the deputy director of the factory 30–50 % of the peat could be replaced by biomass, depending on size of the biomass material (not bigger than 8 mm): The smaller the material, the higher the biomass content in briquettes could be. The price for flax shives is about 22 $ / ton. The peat stock at the Lida site will last approx. another 30 years; investigations on remaining peat are planned. The material is highly decomposed (35–40 %) fen peat. The ash content is about 10–18 %. The heating value is 3.600–3.800 kcal/kg (15–17 MJkg). Rape straw would have a heating value of about 3.900 kcallkg. Flax shives are normally directly burned at the flax factory and accordingly difficult to get. Rape straw is more easily available. It would be possible to harvest reeds in fen and transition mires rewetted excavated sites near Lida that are available for biomass harvesting (in the short run 264 ha). Since the year 2000 about 3.000–4.000 ha of extracted parts of Dokudovskoe have already been rewetted by the factory and have been given to the forestry fund. Currently they are in different stages of *succession*. The biomass could be used in the regional heating facility, in private houses or in public buildings. In the near future it is planned to construct a block heat and power plant in Lida that could also use biomass from re-wetted sites as fuel for *co-firing*.

(Thematic Programme for Environment and sustainable management of natural resources, including energy)

Reading Comprehension

1. Read the text carefully and answer these questions according to the information in the text.

1) Where is Dokudovskoe located?
2) What does it consist of?
3) What happens frequently? Why is it dangerous?
4) What kind of fuel is used for drying the peat with steam?
5) Why is Dokudovskoe interesting as a model site?
6) Why can't the peat be totally replaced by biomass?
7) What is succession?
8) Where can the biomass be used?
9) What are the objectives for trials to be done in Dokudovskoe?
10) Why is the question of economy crucial?

Language Development

! Gerunds are **-ing** forms of the verb that are used as nouns. Gerunds name actions. Although gerunds are used in a clause as nouns, they keep the qualities of verbs. Many compound nouns are made from a gerund and another noun. They usually show the purpose to which the head noun is put, e.g. *postrewett**ing** vegetation succession – succession for postrewetting.*

Notice the difference between the *-ing* form of the verb and *-ing* nouns and *-ing* adjectives.

-ing nouns:

1) often have a plural: e.g. *meet**ing(s)***;

2) can follow the determiner (the, a, an) or an adjective or a noun: e. g. *chemical engineer**ing.***

-ing adjectives:

1) can come before a noun:e.g. *grow**ing** standards*;

2) come after adverbs of DEGREE (very, quite, rather, so, too, as):*quite promis**ing***.

-ing forms of the verbs go:

1) before an object, e.g. *harvest**ing the biomass***;
2) before a complement, e.g. *be**ing** successful*;
3) before an adverbial, e.g. *harvest**ing** quickly*;
4) purpose, e.g. *for process**ing***;
5) after prepositions, e.g. *after harvest**ing***;
6) after verbs that can be followed by –ing form, e.g. *depend on rewett**ing***.

2. Find and <u>underline</u> other examples in the text. Explain the usage of ing-forms.

! To translate the gerund you need some rules. If gerund is:

1) Subject, you translate it as a noun or infinitive.

e.g. ***Rewetting** peatlands is difficult. – **Повторное заболачивание** торфяников (**заболачивать** торфяники) трудоемко.*

2) Predicate Nominative, you translate it as a noun or infinitive.

e.g. *The main idea of it is **briquetting.** – Основная идея – это **брикетирование**.*

3) Compound Predicate, you translate it as complement infinitive.

e. g. *The workers finished **harvesting** the biomass. Рабочие закончили **собирать** биомассу.*

4) Direct and indirect object, you translate it as a noun or infinitive or subordinate clause.

e. g. *I simply **love visiting** Dokudovskoe. – Я просто обожаю **приезжать** в Докудовский.*

e. g. *Thank you **for harvesting.** – Благодарю вас за то, что собрали урожай.*

5) Attribute, you translate it as a noun or infinitive.

e. g. *There are different ways **of solving** this problem. – Имеются различные способы **решения** этой проблемы.*

6) Adverbial modifier, you translate it as an adverbial participle.

e. g. *One can demonstrate this **by making** a very simple experiment. – Можно продемонстрировать это, **сделав** очень простой эксперимент.*

3. Find and learn Russian equivalents for the following words and expressions:

1) the area of the depleted site area	a)
2) transitional peatland	b)
3) chipped wood and briquettes breakage	c)
4) ash content	d)
5) shives from flax production	e)
6) is noteworthy	f)
7) stages of succession	g)
8) BRP	h)
9) willow encroachment	i)
10) aquatic warbler	j)
11) greater spotted eagle	k)
12) straw of rape	l)
13) paludiculture	m)

4. Find and learn English equivalents for the following words and expressions:

1) деградированные (выработанные) торфяники	a)
2) добытый торф	b)
3) плотность брикета	c)
4) исследования стадий развития растительности	d)
5) допустимое развитие	e)
6) потенциальный пилотный объект	f)
7) сукцессия после повторного заболачивания	g)
8) в конечном итоге	h)
9) использования торфа в качестве топлива	i)
10) поверхность почвы	j)
11) испытания на примере биомассы	k)
12) интенсивность дробления	l)

5. Translate the following article from English into Russian.

Also in Belarus people move away from the rural areas and try to fmd better and more comfortable conditions in urbanized areas. The implementation of paludiculture for bio fuel production shows potentials for different aspects of rural development. Because the main workloads occur in autumn and winter time, people may be kept in work during this time where agriculture does not provide much senseful activities. The "harvesting season" is prolonged during the whole autumn and winter time as far as nature protection (ground breeder protection in late summer and early spring) or climate aspects (rainfall or snow coverage) do not prevent any on site activity. On the other hand processing of biomass like production of briquettes and marketing of bio fuels needs full year engagement and sustainable follow up and workers could be kept in employment.

Over to you

1. Discuss with your partners if there any difference between wildlife sanctuary and partial reserve. How many of them are there in Belarus and can you name them? What are national parks? Can you name them?

2. **The Fire Information for Resource Management System (FIRMS)** integrates remote sensing and GIS technologies to deliver global MODIS hotspot/fire locations and burned area information to natural resource managers and other stakeholders around the World. **Go to** http://maps.geog.umd.edu/firms/ **and identify peatland fires. This is an interactive tool to identify hotspot/fire locations around the world.**

3.  Prepare a presentation on the topic being discussed.

Writing

Think about other reasons for choosing Dokudovskoe as a pilot site and write your ideas.

SPORAVA

Vocabulary

1. Match the words with their definitions:

1) alluvial (adj.)	[ə'lu:vɪəl]	a) a plant that looks like grass and grows in wet ground
2) floodplain	['flʌdplein]	b) rich in nutrients and so supporting a dense plant population, the decomposition of which kills animal life by depriving it of oxygen
3) corncrake (n.)	['kɔ:nkreɪk]	c) an area of water or marshland dominated by reeds
4) sedge	[sedʒ]	d) plants with brightly coloured, unusually shaped flowers
5) reedbed	['ri:dbed]	e) an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding
6) meander	[mɪ'ændə]	f) the area near or surrounding a particular place
7) eutrophic	[ju:'trəʊfɪk]	g) a secretive Eurasian landrail inhabiting coarse grasslands
8) orchid	['ɔ:kɪd]	h) oils which consist of earth and sand left behind on land which has been flooded or where a river once flowed
9) vicinity	[vɪ'sɪnətɪ]	i) cease to support or look after (someone); desert
10) abandon (v.)	[ə'bændən]	j) to follow winding course, not in a straight line from one place to another

Listening

Watch the clip 'The life side by side with us' and discuss with your partner if the wildlife so important for us. Why (not)?

Before you read

1. You are going to read an article about Belarus nature-conservative areas. Discuss with your partner the following questions.

What do you know about them and can you name any of them? Why do we need them?

2. Skim the text to check your ideas.

Reading C

SPORAVA PEATLAND

The Sporava peatland is located in the *floodplain* of the Yaselda river. It is one of the largest, least modified floodplain mires in Belarus and Europe. The seasonally flooded site comprises a large flat *alluvial* plain and peatlands extend along a 35 km stretch of the Yaselda river. The vegetation is dominated by *sedge* communities and wet meadows, with associated *reedbeds,* willow thick-

ets and agricultural grasslands. The area is partly used for haymaking and cattle grazing. The current water management seems to be beneficial for the site.

The peatland can be divided into two parts. The first part, located between Peschanka and Mlynok villages is a narrow, very wet floodplain strip of the Yaselda (25 km). The highly *meandered* river bed occupies the centre of the mire, and is partially overgrown by vegetation. A reedbed of 10–100 m wide is situated along both banks. Strongly waterlogged *eutrophic* peatlands occupy a 50–100 m wide strip adjacent to the reedbed, whilst the rest of the floodplain is represented by a 500–2000 m wide mesotrophic lowland mire. The outer edges of the floodplain are surrounded by open or forested elevations. The second part is the significantly extended Yaselda floodplain, and is more diverse. It includes fens of different trophic levels, with shrubs and scattered elevated islands which are open or covered with low woodland stands. The Yaselda river has a well formed river bed here, crossing the large, natural, highly productive Sporovskoe Lake.

The site comprises an extensive area of suitable breeding habitat for the globally threatened aquatic warbler *Acrocephalus paludicola.* The site holds approx. 9 % of the European breeding population of the species (2006: 2373–2531 singing males). It supports 112 species of breeding birds, including 17 Red Data bird species for Belarus and internationally important populations of corncrakes, great snipes and bittern. The site supports also a rich non-avian biodiversity with 18 Red Data plant species for Belarus, including many globally threatened *orchids*, one Red Data reptile for Belarus, two European Red Data book invertebrates, and at least 10 Red Data invertebrate species for Belarus.

The site supports an internationally significant proportion of the *Caricetum elatae* vegetation community, and nationally important stands of the *Molinetum caeruleae* and *Corynephoretum canescentis* communities. Today, the site is in dire need of vegetation management. Overgrowing with bushes is enormous and fast with an estimated annual rate of 5 % loss of open mire habitat, presumably rather accelerating.

(Thematic Programme for ESM)

Reading Comprehension

Read the text carefully and answer these questions according to the information in the text.

1) Where is Sporava located?

2) Can Sporava be chosen as a model site for additional investigations in the potential nature protection areas of conflict and for comparative investigations to Dokudovskoe? Why? Why not?

3) What is vegetation dominated by?

4) What are the peculiarities of this peatland?

5) What are the peculiarities of this site?

6) What does the site support?

7) Why is it in dire need of vegetation management?

8) What is needed to be checked further?

9) What are the main objectives for biomass harvesting and processing at Sporava?

10) Which activities are necessary?

Language Development

! ***A/An& The***

A/An is used only with singular countable nouns to talk about things in general. We don't use a/an with uncountable or plura1 nouns. We can use **some** instead. **A/An** is often used after the verbs **be** and **have.**

e.g. A cat is a domestic animal. (Which cat? Cats in general.) Bring me some *milk. please!*

We can use **a** or **the** before a singular countable noun to refer to a class of people, animals or things. However. we omit **a/an** or **the** before a noun in the plural when it represents a class.

e.g. ***A/The*** *dolphin is a mammal.* Also: *Dolphins are mammals.* Exception: Man is a *mammal too.*

The is used with singular and plural nouns, countable and uncountable ones, to talk about something specific, or when the noun is mentioned for a second time.

Whose *is the* van *parked* in *front of our* house? (*Which van?* The one *parked in* front *of our house.*)

He found a cat in the park. *He* took the cat home. (*The word – cat*·is *mentioned for* a *second time*.)

The is also used with the words *beach, cinema, country(side), ground, jungle, radio, sea, seaside,theatre, world etc.*

We normally omit "the" before the words **last** and **next** when we talk about a period of time immediately before or after the moment of speaking.

e.g. *The scientists finished their experiment* ***last*** *year.*

1. Find and <u>underline</u> other examples in the text. Explain the usage of the article.

2. Fill in: a, an or the.

1)_____ tiger is 2) _____ large carnivorous animal which belongs to 3) _____ cat family. 4) _____ males are about three feet high and can be as long as twelve feet, including 5) _____ tail. There are about eight varieties of tiger found around 6) _____ world. 7) _____ tiger is 8) _____ wild animal, which lives in 9) _____ jungle where wa1er and prey are plentiful. 10) _____ tiger will only attack 11) _____ person if it is slarving or if it is threatened. 12) _____ tiger is 13) _____ easily recognized animal as n has 14) _____ thick yellow or white coat with distinctive black stripes.

! The definite article is used with: nouns which are unique: e.g. *the Earth;* mountain ranges: e.g. *the Andes, the Rockies, the Himalayas;* groups of islands/ states: e.g. *the West Indies, the Bahamas, the USA;* names of; deserts: e.g. *the Sahara desert;* oceans: e.g. *the Atlantic;* canals: e.g. *the Suez Canal; the equator, the North/South Pole, the north of England, the South/West/North/East; only, last, first* (used as adjectives)

The definite article is NOT used with: proper nouns: e.g. *Kate;* names of countries/ cities: e.g. *Turkey, Minsk;* squares, parks, stations, individual mountains, islands; lakes; continents; two-word names whose first word is the name of a person or place: e.g. *Kennedy Airport;* months; means of transport; *most* (used as a determiner followed by a noun: e.g. *Most people believe it.*

! NB: ***the Argentine, the Netherlands, (the) Sudan, the Hague, the Vatican.***

3. Find and underline other examples in the text. Explain the usage of the article.

! The definite article is translated as an adjective (текущий, нынешний, (ныне) существующий, действующий и т.д.), demonstrative pronouns (тот, тот самый, этот, эти, те, все, всё и т.д.). e.g. They didn't encourage **the** idea. – Они не одобрили **эту** мысль. The context of the sentence, paragraph or the whole text shows the correct translation.

! The indefinite article is translated with (один из, один, некий, какой-либо, какой-то, новый, такой, известный, определенный, любой, каждый и др.).

When the indefinite article is used for generalization the defined noun is often translated by plural noun.

4. Find and learn Russian equivalents for the following words and expressions:

1) sedge communities	a)
2) willow thickets	b)
3) meandered river bed	c)
4) waterlogged eutrophic peatlands	d)
5) strip adjacent to the reedbed	e)
6) non-avian	f)
7) Red Data plant species	g)
8) significant vegetation community	h)
9) briquetting machine;	i)
10) with shrubs and scattered elevated islands	j)

5. Find and learn English equivalents for the following words and expressions:

1) выпас скота	a)
2) мезотрофное низменное болото	b)
3) большая выпь	c)
4) бекас	d)
5) беспозвоночные из Европейской Красной книги	e)
6) в основном доминируют осоки	f)
7) тестирование возможностей распространения продукции	g)
8) уборочная техника	h)
9) сушильное оборудование	i)
10) гнездящиеся птицы	j)

Over to you

1. Discuss with your partners the advantages and disadvantages of the pilot site.

2.  Prepare a presentation on the topic being discussed.

Writing

Imagine that you are going to make a report for the international conference about partial reserves in Belarus. Write about the things which could interest the guests.

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