Министерство науки и высшего образования Российской Федерации

Федеральное государственное бюджетное образовательное учреждение высшего образования
Санкт-Петербургский горный университет

Кафедра иностранных языков

ИНОСТРАННЫЙ ЯЗЫК ЭКОЛОГИЯ И ПРИРОДОПОЛЬЗОВАНИЕ

FOREIGN LANGUAGE MANAGEMENT OF THE ENVIRONMENT AND NATURAL RESOURCES

Методические указания к практическим занятиям для студентов бакалавриата направления 05.03.06

САНКТ-ПЕТЕРБУРГ
2023

УДК 811.111(073)

ИНОСТРАННЫЙ ЯЗЫК. Экология и природопользование: Методические указания к практическим занятиям. / Санкт-Петербургский горный университет. Сост. *А.Ю. Маевская.* СПб, 2023. 31 с.

Методические указания предназначены для студентов, обучающихся по направлению подготовки 05.03.06 «Экология и природопользование», направленность (профиль) «Природопользование» и согласованы с программой по иностранному языку для студентов неязыковых вузов.

Предлагаемый материал направлен на совершенствование навыков профессионально-ориентированного чтения на английском языке. Данные методические указания включают тексты на языке оригинала, а также комплекс лексико-грамматических упражнений и заданий, способствующих развитию речевой, языковой, социокультурной и информационной компетенций студентов, необходимых для общения в сфере профессиональных интересов. Предназначены как для практических занятий по английскому языку со студентами, так и для самостоятельной работы.

Научный редактор доцент канд. филос. наук *Ю.В. Борисова*

Рецензент доцент *Н.Э. Горохова* (Санкт-Петербургский государственный экономический университет)

ПРЕДИСЛОВИЕ

Данные методические указания предназначены для учебно-методического сопровождения курса английского языка для студентов неязыковых вузов, обучающихся по специальности 05.03.06 «Экология и природопользование», специализация «Природопользование».

Методические указания содержат учебные и аутентичные тексты на английском языке с разработанным комплексом упражнений. Изучение предложенного материала направлено на развитие умений просмотрового и изучающего чтения текстов по направлению подготовки, а также их перевода на русский язык с последующим использованием полученной информации для речевой практики; совершенствование навыков и умений всех видов чтения (изучающего, ознакомительного, поискового и просмотрового) и перевода специальной научно-технической литературы для извлечения информации, ознакомление с узкоспециализированной горной терминологией на английском языке.

Методические указания состоят из 5 разделов, включающих разное количество текстов по горной тематике, а также для работы предлагаются разнообразные виды упражнений. Предложенные материалы предназначены как для работы в аудитории, так и для самостоятельной работы.

UNIT I. THE PROBLEM OF POLLUTION

1. Before reading the text discuss the major and specific types of pollution.

2. Read the text and guess the meaning of words and word combinations from the context. If there are some problems, find their definitions in the dictionary. Pay a special attention to their pronunciation:

Environmental pollution, harmless form, air pollution, water pollution, land pollution, types of pollutants, noise pollution, light pollution, plastic pollution, radioactive waste, contaminants, anthropogenic source, human activity, human population, respiratory health of people, chronic bronchitis, respiratory tract infection.

Text 1. Pollution

Environmental pollution is the addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form. The major kinds of pollution (classified by environment) are air pollution, water pollution, and land pollution.

Modern society is also concerned about specific types of pollutants, such as noise pollution, light pollution, plastic pollution, and radioactive waste. Although environmental pollution can be caused by natural events such as forest fires and active volcanoes, use of the word *pollution* generally implies that the contaminants have an anthropogenic source – that is, a source created by human activities. Pollution has accompanied humankind ever since groups of people first congregated and remained for a long time in any one place. Indeed, ancient human settlements are frequently recognized by their pollutants – shell mounds and rubble heaps, for instance. Pollution was not a serious problem as long as there was enough space available for each individual or group. However, with the establishment of permanent settlements by great numbers of people, pollution became a problem, and it has remained one ever since.

Cities of ancient times were often noxious places, fouled by human wastes and debris. Beginning about 1000 ce, the use of coal for fuel caused considerable air pollution, and the conversion of coal to coke for iron smelting beginning in the 17th century exacerbated the problem. In

Europe, from the Middle Ages well into the early modern era, unsanitary urban conditions favored the outbreak of population-decimating epidemics of disease, from plague to cholera and typhoid fever. Through the 19th century, water and air pollution and the accumulation of solid wastes were largely problems of congested urban areas. But, with the rapid spread of industrialization and the growth of the human population to unprecedented levels, pollution became a universal problem.

Air pollution begins as emissions from sources such as industrial smokestacks. The pollutants released into the air may impact the respiratory health of people working in and living near such facilities.

In the second week of December 1952, a disastrous fog occurred in London. High levels of sulfur dioxide and particulate pollution (and probably also sulfuric acid) led to the deaths of more than 4,000 people during that week and over the subsequent three weeks. Many, but not all, of the victims already had chronic heart or lung disease.

The great London smog of 1952 led to the passage of legislation banning open coal burning, the factor most responsible for the pollution. This form of pollution, which is still known as "London smog," is common in many cities using coal as heating fuel, and it is associated with excess mortality and increased prevalence of chronic bronchitis, respiratory tract infections in the young and old, and possibly lung cancer. Today many industrial cities have legislation restricting the use of specific fuels and mandating emission-control systems in factories.

3. Match the words with their Russian equivalents.

1. heating fuel	a. перенаселенные городские районы
2. noxious	b. промышленные дымовые трубы
3. industrial smokestacks	c. нездоровый, загрязненный
4. congested urban areas	d. мусор, обломки, пустая порода
5. debris	e. сооружения, имущества, промышленные площадки
6. rubble	f. галька, камень, булыжник, обломки горных пород
7. facilities	g. отопительное горючее

4. With the help of additional material, make up a report about the ecological situation in your native town/city.

Text 2. The major kinds of pollution

1. Read the following names of chemical elements and compounds. If you are not sure how to pronounce the words correctly, look them up in the dictionary.

Nitrogen, oxygen, argon, carbon dioxide, methane, hydrogen, helium, water vapour, aerosol, fertilizer, pesticide, synthetic organic chemicals, inorganic chemicals, radioactive substance, oil, arsenic, sulfuric acid, mercury.

2. Read and translate the text paying attention to the meaning of the following words and word combinations. Use specialized dictionaries if needed.

Clean and safe atmosphere, municipal solid waste, construction and demolition waste, debris, garbage, rubbish, trash, sludge, chemical manufacturing company, petroleum refinery, paper mill, smelter, subsurface sewage disposal, septic tank, non-biological chemical compound, power-plant cooling water, point source pollutant, dispersed source pollutant, sewage discharge, outfall pipe, gritty materials, petroleum residues from automobile, road deicing chemicals.

Pollution in the air

Clean, dry air consists primarily of nitrogen and oxygen – 78 percent and 21 percent, respectively, by volume. The remaining 1 percent is a mixture of other gases, mostly argon (0.9 percent), along with trace (very small) amounts of carbon dioxide, methane, hydrogen, helium, and more. Water vapor is also a normal, though quite variable, component of the atmosphere, normally ranging from 0.01 to 4 percent by volume; under very humid conditions the moisture content of air may be as high as 5 percent.

This fundamental resource – a clean and safe atmosphere – is under constant assault by the release of various gases, finely divided solids, or finely dispersed liquid aerosols at rates that exceed the natural capacity of the environment to dissipate and dilute or absorb them. These substances may reach concentrations in the air that cause undesirable health, economic, or aesthetic effects.

Pollution on land

All around the world solid or liquid waste materials are deposited on land or underground in a manner that can contaminate the soil and groundwater, threaten public health, and cause unsightly conditions and nuisances. The waste materials that cause land pollution are broadly classified as municipal solid waste (MSW, also called municipal refuse), construction and demolition (C&D) waste or debris, and hazardous waste. MSW includes nonhazardous garbage, rubbish, and trash from homes, institutions (e.g., schools), commercial establishments, and industrial facilities. C&D waste (or debris) includes wood and metal objects, wallboard, concrete rubble, asphalt, and other inert materials produced when structures are built, renovated, or demolished.

Hazardous wastes include harmful and dangerous substances generated primarily as liquids but also as solids, sludge, or gases by various chemical manufacturing companies, petroleum refineries, paper mills, smelters, machine shops, dry cleaners, automobile repair shops, and many other industries or commercial facilities. In addition to improper disposal of MSW, C&D waste, and hazardous waste, contaminated effluent from subsurface sewage disposal (e.g., from septic tanks) can also be a cause of land pollution, as can the presence of non-biological chemical compounds in soils.

Pollution in the water

Water pollution is the release of substances into subsurface groundwater or into lakes, streams, rivers, estuaries, and oceans to the point where they interfere with beneficial use of the water or with the natural functioning of ecosystems. In addition to the release of substances such as chemicals or microorganisms, water pollution may also include the release of energy, in the form of radioactivity or heat, into bodies of water.

General types of water pollutants include pathogenic organisms, oxygen-demanding wastes, plant nutrients, synthetic organic chemicals, inorganic chemicals, sediments, radioactive substances, oil, and heat.

Sewage is the primary source of the first three types. Farms and industrial facilities are also sources of some water pollutants. Sediment from eroded topsoil is considered a pollutant because it can damage aquatic ecosystems, and heat (particularly from power-plant cooling water) is considered a pollutant because of the adverse effect it has on dis-

solved oxygen levels and aquatic life in rivers and lakes. Water pollutants may originate from point sources or from dispersed sources.

A point-source pollutant is one that reaches water from a single pipeline or channel, such as a sewage discharge or outfall pipe. Dispersed sources are broad, unconfined areas from which pollutants enter a body of water. Surface runoff from farms, for example, is a dispersed source of pollution, carrying animal wastes, fertilizers, pesticides, and silt into nearby streams. Urban storm water drainage – which may carry sand and other gritty materials, petroleum residues from automobiles, and road deicing chemicals – is also considered a dispersed source because of the many locations at which it enters local streams or lakes.

3. Work in pairs. Describe the major kinds of pollution mentioned in the text and discuss with your partner what substances may cause undesirable health, economic, or aesthetic effects.

4. Match the words (1-10) with their definitions (a-j). Translate the words using a dictionary, then choose any three and make up your own sentences.

1. pollutant	a. a natural or chemical substance that is spread on the land or given to plants, to make plants grow well
2. fertilizer	b. waste material or unwanted things that you throw away
3. sewage	c. a harmful substance that causes pollution
4. nuisance	d. a chemical that combines two or more elements
5. paper mill	e. the system of carrying away waste water and human waste from houses and other buildings through large underground pipes or passages
6. garbage	f. the act of destroying something such as a building
7. refinery	g. sand, stones, etc. that slowly form a layer of rock
8. demolition	h. a factory where substances in their natural state, such as oil or sugar, are made pure
9. sediments	i. something or someone that annoys you or causes trouble for you
10. compound	j. a factory where paper is made

Text 3. Other forms of pollution

1. Skim through the text to get the general idea of it. Find key words that you can use to speak about the other forms of pollution.

2. Read and translate the text paying attention to the meaning of the following words and word combinations. Use specialized dictionaries if needed.

Deleterious effect, combustion of fossil fuels, fossil-fueled power plant emissions, synthetic plastic resins, drainage system, large-scale pollutant, nuclear power plant, reactor core, nuclear fission, nucleus, coolant, turbine, radioactive decay, gamma rays, X-rays, neutrons, electrons, positron, nuclear fuel cycle.

3. Read the text and choose from the list, A-D, the headline which best summarises each paragraph (1-4). Translate the text.

A. *Plastic pollution*
B. *Radioactive waste*
C. *Noise pollution*
D. *Light pollution*

In addition to being defined by the environment (air, water, and land) that is being despoiled, pollution can be identified by the material or energy that is being projected into the environment. Such is the case with noise pollution, light pollution, plastic pollution, and radioactive waste – forms of pollution that are being encountered with greater frequency in modern life and that periodically have aroused great public concern.

(1) Noise pollution is unwanted or excessive sound that can have deleterious effects on human health and environmental quality. Commonly generated inside many industrial facilities and some other workplaces, noise pollution also comes from highway, railway, and airplane traffic and from outdoor construction activities.

(2) Like noise pollution, light pollution – unwanted or excessive artificial light – is a form of waste energy that can cause adverse effects and degrade environmental quality. Moreover, because light (transmitted as electromagnetic waves) is typically generated by electricity, which itself is usually generated by the combustion of fossil fuels, it can be said

that there is a connection between light pollution and air pollution (from fossil-fueled power plant emissions).

Control of light pollution therefore will help to conserve fuel (and money) and reduce air pollution as well as mitigate the more immediate problems caused by the excessive light. Although light pollution may not appear to be as harmful to public health and welfare as pollution of water resources or the atmosphere, it is an environmental quality issue of no small significance.

(3) In 1907 the invention of Bakelite brought about a revolution in materials by introducing truly synthetic plastic resins into world commerce. By the end of the 20th century, however, plastics were found to be persistent polluters of many environmental niches, from Mount Everest to the bottom of the sea. Whether being mistaken for food by animals, flooding low-lying areas by clogging drainage systems, or simply causing significant aesthetic blight, plastics have attracted increasing attention as a large-scale pollutant.

(4) Some 20 percent of the electricity generated in the United States originates in nuclear power plants. At the core of a nuclear power plant is the nuclear reactor, a device that can initiate and control a self-sustaining series of nuclear fissions. Fission is the process in which a heavy nucleus splits into two smaller fragments.

A large amount of energy is released in this process, and this energy is the basis of the power plant. The heat released by fission is removed from the reactor core by a coolant circulated through the core. Some of the thermal energy in the coolant is used to heat water and convert it to high-pressure steam. This steam drives a turbine, and the turbine's mechanical energy is then converted into electricity by means of a generator.

Most of the energy of fission – about 85 percent of it – is released within a very short time after the process occurs. The rest of the energy comes from the radioactive decay of fission products. Radioactive decay continues when the fission reaction has been stopped, and its energy must be dealt with in any proper reactor design. In particular, significant measures must be taken to prevent the exposure of living tissue to the products of radioactive decay – namely, gamma rays, X-rays, and such high-energy particles as neutrons, electrons, and positrons – at all

stages in the nuclear fuel cycle, from fabrication of fuel rods through controlled fission in the reactor core to the storage and disposal of spent fuel and other forms of radioactive waste.

4. Work in pairs. Describe the forms of pollution mentioned in the text and discuss with your partner the following problems:

1. Where do noise pollution and light pollution come from?
2. Which form of pollution is more harmful to public health?
3. What measures can help to reduce noise pollution and light pollution?

5. With the help of additional material, explain why plastics and radioactive waste are found to be persistent polluters of many environmental niches, from Mount Everest to the bottom of the sea, and make up a report on this problem.

UNIT II. ENVIRONMENTAL IMPACT OF MINING

1. Before reading the texts, discuss the environmental impact of mining. What do you know about this problem?

The environmental impact of mining includes erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater, surface water by chemicals from mining processes. In some cases, additional forest logging is done in the vicinity of mines to increase the available room for the storage of the created debris and soil. Besides creating environmental damage, the contamination resulting from leakage of chemicals also affects the health of the local population. Mining companies in some countries are required to follow environmental and rehabilitation codes, ensuring the area mined is returned to close to its original state. Some mining methods may have significant environmental and public health effects.

Erosion of exposed hillsides, mine dumps, tailings dams and resultant siltation of drainages, creeks and rivers can significantly impact the surrounding areas, a prime example being the giant Ok Tedi Mine in Papua New Guinea. In areas of wilderness mining may cause destruction and disturbance of ecosystems and habitats and in areas of farming it may disturb or destroy productive grazing and croplands. In urbanized environments mining may produce noise pollution, dust pollution and visual pollution.

Text 1. Water pollution

2. Before reading the text, discuss the problem of water pollution. What sources and causes of water pollution do you know?

3. Skim through the text to get the general idea of it. Find key words that you can use to speak about the problem of groundwater and surface water contamination by chemicals from mining processes.

4. Read and translate the text paying attention to the meaning of the following words and word combinations. Use specialized dictionaries if needed.

Protective measures, subsurface, rock debris, submarine tailings disposal, land storage, damaging compound, mine drainage, mine cooling, aqueous extraction, bioleaching.

Mining can have bad effects on surrounding surface and ground water if protective measures are not taken. The result can be unnaturally high concentrations of some chemicals, such as arsenic, sulfuric acid, and mercury over a significant area of surface or subsurface. Runoff of mere soil or rock debris -although non-toxic also devastates the surrounding vegetation. The dumping of the runoff in surface waters or in forests is the worst option here. Submarine tailings disposal is regarded as a better option (if the soil is pumped to a great depth). Mere land storage and refilling of the mine after it has been depleted is even better, if no forests need to be cleared for the storage of the debris.

There is potential for massive contamination of the area surrounding mines due to the various chemicals used in the mining process as well as the potentially damaging compounds and metals removed from the ground with the ore. Large amounts of water produced from mine drainage, mine cooling, aqueous extraction and other mining processes increases the potential for these chemicals to contaminate ground and surface water. In well-regulated mines, hydrologists and geologists take careful measurements of water and soil to exclude any type of water contamination that could be caused by the mine's operations.

The reducing or eliminating of environmental degradation is enforced in modern American mining by federal and state law, by restricting operators to meet standards for protecting surface and ground water

from contamination. This is best done through the use of non-toxic extraction processes as bioleaching. If the project site becomes nonetheless polluted, mitigation techniques such as acid mine drainage (AMD) need to be performed.

The five principal technologies used to monitor and control water flow at mine sites are diversion systems, containment ponds, groundwater pumping systems, subsurface drainage systems, and subsurface barriers. In the case of AMD, contaminated water is generally pumped to a treatment facility that neutralizes the contaminants.

5. Sum up the main information given in the text.

6. Match the left and the right.

careful	waters
pumping	measurements
large	vegetation
surface	system
acid mine	contamination
water	amounts
surrounding	drainage

Text 2. Effects of mining activity on biodiversity

1. Before reading the text, discuss the main causes of biodiversity losses.

2. Skim through the text to get the general idea of it. Find key words that you can use to speak about some effects of mining activity on biodiversity.

3. Read and translate the text paying attention to the meaning of the following words and word combinations. Use specialized dictionaries if needed.

Exploitation site, mine-waste residuals, anthropogenic substance, biodiversity, habitat, direct/indirect poisoning, mine extracted material, endemics species, bioavailability of the contaminant, food chain, anthropogenic disturbance, remediation.

The implantation of a mine is a major habitat modification, and smaller perturbations occur on a larger scale than exploitation site, mine-waste residuals contamination of the environment for example. Adverse effects can be observed long after the end of the mine activity. Destruction or drastic modification of the original site and anthropogenic substances release can have major impact on biodiversity in the area.

Destruction of the habitat is the main component of biodiversity losses, but direct poisoning caused by mine extracted material, and indirect poisoning through food and water can also affects animals, vegetals and microorganisms. Habitat modification such as pH and temperature modification disturb communities in the area. Endemics species are especially sensitive, since they need really specific environmental conditions. Destruction or slight modification of their habitat put them at the risk of extinction. Habitats can be damaged as well by non-chemicals products, such as large rocks from the mines that are discarded in the surrounding landscape with no concern for impacts on natural habitat.

Concentration of heavy metals is known to decrease with distance from the mine, and effects on biodiversity follow the same pattern. Impacts can vary a lot depending on mobility and bioavailability of the contaminant: less mobile molecules will stay inert in the environment while highly mobile molecules will easily move into another compartment or be taken up by organisms. For example, speciation of metals in sediments could modify their bioavailability, and thus their toxicity for aquatic organisms.

Bioaccumulation plays an important role in polluted habitats: mining impacts on biodiversity should be, assuming that concentration levels are not high enough to directly kill exposed organisms, greater on the species on top of the food chain because of this phenomenon.

Adverse mining effects on biodiversity depends on a great extent on the nature of the contaminant, the level of concentration at which it can be found in the environment, and on the nature of the ecosystem itself. Some species are really resistant to anthropogenic disturbances, while some other will completely disappear from the contaminated zone. Time alone does not seem to allow the habitat to recover completely from the contamination. Remediation takes time, and in most of the cases will not enable the recovery of the diversity present before the mining activity.

4. With the help of additional material, make up a report about the measures that should be taken to eliminate direct poisoning caused by mine extracted material, and indirect poisoning through food and water that can affect animals, vegetals and microorganisms.

5. Sum up the main information given in the text using the following examples:

1. Introduction:
The subject of the text / the passage / the extract is …
The text / the passage / the extract tells us about / describes / is devoted to …
The text / the passage / the extract is about …
This text / the passage / the extract deals with …
2. Text structure analysis:
The text / the passage / the extract can be (sub)divided / split into … logical parts.
The text / the passage / the extract falls into … logical parts.
The first / the second / the third part is about / describes / is devoted to / analyses / points out …
In the first / the second / the third part the author writes about / analyses the problem of / gives his point of view on …
In the first / the second / the third part the author writes about / analyses the problem of / gives his point of view on …
3. Conclusion:
By way of summing up, …
In conclusion, I can say that … .
I want to say that … .
The text / the passage / the extract is of great interest as … .
It is very informative / entertaining / interesting … .

Text 2a. Aquatic organisms

1. Before reading the text, discuss what factors can impact aquatic biodiversity.

2. Skim through the text to get the general idea of it.

3. Read and translate the text paying attention to the meaning of the following words and word combinations. Use specialized dictionaries if needed.

Mine drainage, aquatic organisms, microorganism, algae biomass, solubilization, pyrite, acidophil bacteria, acidic water, diatom, phytoplankton and zooplankton mass, planktonic species, planktonic diatom community, cyst, crustacean community, predator, invertebrates, pH diminution, trophic completeness.

Mining industry can impact aquatic biodiversity through different ways. Direct poisoning is the first one, and risks are higher when contaminants are mobile in the sediment or bioavailable in the water. Mine drainage can modify water pH, and it is hard to differentiate direct impact on organisms from impacts caused by pH changes. Effects can nonetheless be observed and proved to be caused by pH modifications. Contaminants can also affect aquatic organisms through physical effects: streams with high concentrations of suspended sediment limit light, thus diminishing algae biomass. Metal oxide deposition can limit biomass by coating algae or their substrate, thereby preventing colonization.

Factors that impact communities in acid mine drainage sites vary temporally and seasonally: temperature, rainfall, pH, salinization and metal quantity all displays variations on the long-term, and can heavily affect communities. Changes in pH or temperature can affect metal solubilization, and thereby the bioavailable quantity that directly impact organisms. Moreover, contamination persists over time: ninety years after a pyrite mine closure, water pH was still really low and microorganisms' populations consisted mainly of acidophil bacteria.

Microorganisms

Algae communities are less diverse in acidic water containing high zinc concentration, and mine drainage stress decrease their primary production. Diatoms community is greatly modified by any chemical change. pH phytoplankton assemblage and high metal concentration diminishes the abundance of planktonic species. Some diatom species may however grow in high metal concentration sediments. In sediments close to the surface, cysts suffer from corrosion and heavy coating. In really polluted conditions, total algae biomass is really low, and the planktonic diatom community missing. In case of functional complementarity how-

ever, it is possible that phytoplankton and zooplankton mass remains stable.

Macroorganisms

Water insect and crustacean communities are modified around a mine, resulting in a low trophic completeness, community being dominated by predators. However, biodiversity of macro invertebrates can remain high, if sensitive species are replaced with tolerant ones. When diversity is on the contrary reduced, there is sometimes no effect of stream contamination on abundance or biomass, suggesting that tolerant species fulfilling the same function take the place of sensible species in polluted sites. pH diminution in addition of elevated metal concentration can also have adverse effects on macro invertebrates behavior, showing that direct toxicity is not the only issue. Fishes are also affected by pH, temperature variations and chemical concentrations.

4. Work in pairs and discuss with your partner the factors that can impact aquatic biodiversity.

5. Find 10 words connected with aquatic organisms hidden in the grid.

c	o	o	a	x	p	b	c	i	b	l	z	t	o
b	q	q	l	i	l	a	y	j	i	l	o	t	r
a	i	j	g	q	t	c	s	m	o	y	o	y	g
d	n	g	a	s	q	t	t	g	m	p	p	i	a
m	s	p	e	c	i	e	s	e	a	w	l	j	n
k	e	z	d	u	w	r	r	j	s	w	a	f	i
y	c	t	d	y	z	i	r	i	s	q	n	v	s
i	t	r	k	p	w	a	i	q	w	s	k	y	m
j	i	n	v	e	r	t	e	b	r	a	t	e	s
p	h	y	t	o	p	l	a	n	k	t	o	n	w
o	q	s	o	x	g	y	o	w	m	x	n	q	q

Text 2b. Terrestrial organisms

1. Skim through the text below and point out the general idea of it.

2. Read and translate the following words and word combinations. Use specialized dictionaries if needed. If you are not sure how to pronounce the words correctly, look them up in the dictionary.

*Terrestrial organism, **v**egetal, forbs, shrubs, waste-material reject, perturbation, physiology, non-native species, ecological niche, arsenic, bryophytes, nutrient availability, acreage, cultivated crop, neighborhood, aerial organ, cadmium and zinc, copper, lead, antimony, ants species, gene, microbial biomass, arbuscular mycorrhiza fungi, biodisponibility, microbes, hydrogen sulfide, toxin.*

3. Read and translate the text. Five sentences have been removed from the text. Choose from sentences, (A-E), the one that best fits each gap (1-5) to complete the text.

A. Cultivated crops might be a problem in mines neighborhood.
B. so there is a greater chance of survival of the species due to the existence of resistance or tolerance genes in some colonies, as long as modifications are not too extreme.
C. They are fewer number of ants species in soil containing high copper levels, in the vicinity of a copper mine.
D. Some tree roots avoid the deeper soil layer in order to avoid the contaminated zone, and thus miss acreage and might be uprooted by the wind when their height and shoot weight increase.
E. Some species are more resistant and will survive these levels.

Vegetals. Soils texture and water content can be greatly modified in disturbed sites, leading to plants communities' changes in the area. Most of the plants have a low concentration tolerance for metals in the soil, but sensitivity differs among species. Grass diversity and total cover is less affected by high contaminant concentration than forbs and shrubs. Mines waste-material rejects or traces due to mining activity can be found in the vicinity of the mine, sometimes pretty far away from the source. Established plants cannot move away from perturbations, and will eventually die if their habitat is contaminated by heavy metals or metalloids at concentration too elevated for their physiology. 1)

_____, and some non-native species that can tolerate these concentrations in the soil, will migrate in the mine surrounding lands to occupy the ecological niche.

Plants can be affected through direct poisoning, for example arsenic soil content reduces bryophyte diversity. Soil acidification through pH diminution by chemical contamination can also lead to a diminished species number. Contaminants can modify or disturb microorganism, thus modifying nutrient availability, causing a loss of vegetation in the area. 2) _____. In general, root exploration is reduced in contaminated areas compared to non-polluted ones. Even in reclaimed habitats, plant species diversity is lower than in undisturbed areas.

3) _____ . Most of our crops can grow on weakly contaminated sites, but yield is generally lower than it would have been in regular growing conditions. Plants also tend to accumulate heavy metals in their aerial organs, possibly leading to human intake through fruits and vegetables. Regular consumptions might lead to health problems caused by long-term metal exposure. Cigarettes made from tobacco growing on contaminated sites might as well have adverse effects on human population, as tobacco tends to accumulate cadmium and zinc in its leaves.

Animals. Habitat destruction is one of the main issues of mining activity. Huge areas of natural habitat are destroyed during mine construction and exploitation, forcing animals to leave the site.

Animals can be poisoned directly by mine products and residuals. Bioaccumulation in the plants or the smaller organisms they eat can also lead to poisoning: horses, goats and sheep are exposed in certain areas to potentially toxic concentration of copper and lead in grass. 4) _____. If fewer ants are found, chances are great that other organisms leaving in the surrounding landscape are strongly affected as well by these high copper levels, since ants are a good environmental control: they live directly in the soil and are thus pretty sensible to environmental disruptions.

Microorganisms. Because of their size, microorganisms are extremely sensitive to environmental modification, such as modified pH, temperature changes or chemicals concentration. For example, the presence of arsenic and antimony in soils led to a diminution in total soil bac-

teria. Moreover, as in water, a small change in the soil pH can provoke the remobilization of contaminants, in addition of direct impact on pH-sensitive organisms.

Microorganisms have a wide variety of genes among their total population, 5) _____. Nevertheless, survival in these conditions will imply a big loss of gene diversity, resulting in reduced potential adaptations to subsequent changes.

The presence of few developed soil in heavy metal contaminated areas could be a sign of reduced activity by soils micro fauna and microflora, indicating a reduced number of individuals or reduced activity. Twenty years after disturbance, even in rehabilitation area, microbial biomass is still greatly reduced compared to undisturbed habitat.

Arbuscular mycorrhiza fungi are especially sensitive to the presence of chemicals, and the soil is sometimes so disturbed that they are no longer able to associate with root plants. Some fungi possess however contaminant accumulation capacity, soil cleaning capacity by changing the biodisponibility of contaminants, and can protect plants from damages caused by chemicals. Their presence in contaminated sites could prevent loss of biodiversity due to mine-waste contamination, or allow bioremediation, that is, the removal of undesired chemicals from contaminated soils. On the contrary, some microbes can deteriorate the environment: elevated SO4 in the water can also increase microbial production of hydrogen sulfide, a toxin for many aquatic plants and organisms.

4. Work in pairs and discuss with your partner the factors that can impact aquatic biodiversity.

5. Open the brackets and transform the sentences into Passive voice.

1. Soils texture and water content can … greatly (modify) in disturbed sites.
2. Grass diversity … less (affect) by high contaminant concentration.
3. Huge areas of natural habitat … (destroy) during mine construction and exploitation.
4. Animals … (poison) directly by mine products and residuals.

5. Plants can … (affect) through direct poisoning, for example arsenic soil content reduces bryophyte diversity.

UNIT III. MINING AND WATER POLLUTION

1. Skim through the text below and point out the general idea of it.

2. Read and translate the following words and word combinations. Use specialized dictionaries if needed.

Prerequisite development, processing ore, mine effluent, seepage from tailings, waste rock, waste rock impoundment, low grade ore, open-pit mining, target mineral, acid-generating sulphides, free-draining pile, bedrock.

3. Read the text and think of the questions you might ask about.

Text 1. "Mining's most common casualty"

Water is essential to life on our planet. A prerequisite of sustainable development must be to ensure uncontaminated streams, rivers, lakes and oceans. There is growing public concern about the condition of fresh water in the world. Mining affects fresh water through heavy use of water in processing ore, and through water pollution from discharged mine effluent and seepage from tailings and waste rock impoundments. Increasingly, human activities such as mining threaten the water sources on which we all depend. Water has been called "mining's most common casualty" (James Lyon, interview, Mineral Policy Center, Washington DC). There is growing awareness of the environmental legacy of mining activities that have been undertaken with little concern for the environment. The price we have paid for our everyday use of minerals has sometimes been very high. Mining by its nature consumes, diverts and can seriously pollute water resources.

Negative impacts can vary from the sedimentation caused by poorly built roads during exploration through to the sediment, and disturbance of water during mine construction. Water pollution from mine waste rock and tailings may need to be managed for decades, if not centuries, after closure. These impacts depend on a variety of factors, such as the sensitivity of local terrain, the composition of minerals being mined,

the type of technology employed, the skill, knowledge and environmental commitment of the company, and finally, our ability to monitor and enforce compliance with environmental regulations. One of the problems is that mining has become more mechanized and therefore able to handle more rock and ore material than ever before. Therefore, mine waste has multiplied enormously. As mine technologies are developed to make it more profitable to mine low grade ore, even more waste will be generated in the future.

Ore is mineralized rock containing a valued metal such as gold or copper, or other mineral substance such as coal. Open-pit mining involves the excavation of large quantities of waste rock (material not containing the target mineral) in order to extract the desired mineral ore.

The ore is then crushed into finely ground tailings for processing with various chemicals and separating processes to extract the final product. In Canada on average for every tons of copper extracted 99 tons of waste material (made up of soil, waste rock and the finely ground "tailings") must also be removed.

The Canadian mineral industry generates one million tons of waste rock and 950,000 tons of tailings per day, totaling 650 million tons of waste per year. After being removed, waste rock, which often contains acid-generating sulphides, heavy metals, and other contaminants, is usually stored above ground in large free-draining piles. This waste rock and the exposed bedrock walls from which it is excavated are the source of most of the metals pollution caused by mining in British Columbia. In other regions of North America tailings also represent a major source of heavy metals contamination of waterways.

4. Discuss in groups the main factors that lead to water pollution from mining.

5. Sum up the main information and write a summary of the text.

6. With the help of additional material, make up a report about the measures that should be taken to protect surface and ground water from contamination resulted in mining operations.

Text 2. Types of Water Pollution from Mining

1. Read and translate the following words and word combinations. Use specialized dictionaries if needed.

Drainage, sulphuric acid, sulphide mineral, Thiobacillusferroxidans, oxidation and acidification process, leaching, trace metal, source rock, watershed vegetation, riverbed.

2. Skim through the text and think of the questions you might ask about.

3. Read the text and discuss in groups each type of mining impacts on water quality.

There are four main types of mining impacts on water quality.

1. Acid Mine Drainage

Acid Rock Drainage (ARD) is a natural process whereby sulphuric acid is produced when sulphides in rocks are exposed to air and water. Acid Mine Drainage (AMD) is essentially the same process, greatly magnified. When large quantities of rock containing sulphide minerals are excavated from an open pit or opened up in an underground mine, it reacts with water and oxygen to create sulphuric acid. When the water reaches a certain level of acidity, a naturally occurring type of bacteria called Thiobacillusferroxidans may kick in, accelerating the oxidation and acidification processes, leaching even more trace metals from the wastes. The acid will leach from the rock as long as its source rock is exposed to air and water and until the sulphides are leached out – a process that can last hundreds, even thousands of years. Acid is carried off the mine site by rainwater or surface drainage and deposited into nearby streams, rivers, lakes and groundwater. AMD severely degrades water quality, and can kill aquatic life and make water virtually unusable.

2. Heavy Metal Contamination & Leaching

Heavy metal pollution is caused when such metals as arsenic, cobalt, copper, cadmium, lead, silver and zinc contained in excavated rock or exposed in an underground mine come in contact with water. Metals are leached out and carried downstream as water washes over the rock surface. Although metals can become mobile in neutral pH conditions,

leaching is particularly accelerated in the low pH conditions such as are created by Acid Mine Drainage.

3. Processing Chemicals Pollution

This kind of pollution occurs when chemical agents (such as cyanide or sulphuric acid used by mining companies to separate the target mineral from the ore) spill, leak, or leach from the mine site into nearby water bodies. These chemicals can be highly toxic to humans and wildlife.

4. Erosion and Sedimentation

Mineral development disturbs soil and rock in the course of constructing and maintaining roads, open pits, and waste impoundments. In the absence of adequate prevention and control strategies, erosion of the exposed earth may carry substantial amounts of sediment into streams, rivers and lakes. Excessive sediment can clog riverbeds and smother watershed vegetation, wildlife habitat and aquatic organisms.

4. Complete the sentences.

1. There are four main types of mining impacts on water quality …
2. Heavy metal pollution is caused when …
3. Metals are leached out and carried downstream as …
4. Mineral development disturbs soil and rock in …
5. In the absence of adequate prevention and control strategies, erosion of the exposed earth may …

5. With the help of additional material, make up a report about the main types of mining impacts on water quality in your region.

UNIT IV. TAILINGS

1. Skim through the text to get the general idea of it. Find key words that you can use to speak about the nature of tailings.

2. Read and translate the following words and word combinations. Use specialized dictionaries if needed. If you are not sure how to pronounce the words correctly, look them up in the dictionary.

Mine dump, slime, tails, leach residue, gangue, overburden, waste rock, barren rock, placer mining, valuable minerals, hard rock mining, micrometer, mill, slurry, heap leaching, host ore, arsenic, barite,

calcite, fluorite, mercury, sulfur, sulfide compound, pyrite, cadmium, hydrocarbons.

3. Read the text and think of the questions you might ask about.

Text 1. The nature of tailings

Tailings, also called mine dumps, slimes, tails, leach residue, or slickens, are the materials left over after the process of separating the valuable fraction from the uneconomic fraction (gangue) of an ore. Tailings are distinct from overburden or waste rock, which are the materials overlying an ore or mineral body that is displaced during mining without being processed.

The extraction of minerals from ore can be done two ways: placer mining, which uses water and gravity to extract the valuable minerals, or hard rock mining, which uses pulverization of rock, then chemicals. In the latter, the extraction of minerals from ore requires that the ore be ground into fine particles, so tailings are typically small and range from the size of a grain of sand to a few micrometers. Mine tailings are usually produced from the mill in slurry form (a mixture of fine mineral particles and water).

Tailings represent an external cost of mining, and this is particularly true of early mining operations which did not take adequate steps to make tailings areas environmentally safe after closure. Modern day mines, particularly in jurisdictions with well-developed mining regulations and/or operated by responsible mining companies; incorporate the rehabilitation and proper closure of tailings areas in the mining costs and activities.

The composition of tailings is directly dependent on the composition of the ore and the process of mineral extraction used on the ore.

Certain types of extraction process, like heap leaching for example, may result in quantities of chemicals used to perform the leaching remaining in the material once leaching has been completed. Older forms of mineral extraction, such as those utilized during the early gold boom years of Australian gold mining, resulted in large heaps of fine tailings being left dotted around the landscape. These tailings dumps would continue to leach residual chemicals into the environment, and if weather

conditions allowed it the finer fraction would become windborne, blowing around the townships surrounding the now-dormant mining areas.

Typically, the bulk quantity of a tailings product will be barren rock, crushed and ground to a fine size ranging from coarse sands down to a talcum powder consistency.

Tailings may contain trace quantities of metals found in the host ore, and they may contain substantial amounts of added compounds used in the extraction process. Elements are rarely in elemental form, more often as complex compounds.

Common minerals and elements found in tailings include:

Arsenic - Found in association with gold ores
Barite
Calcite
Fluorite
Radioactive materials - Naturally present in many ores
Mercury
Sulfur - Forms many sulfide compounds / pyrites
Cadmium
Hydrocarbons - Introduced by mining and processing equipment (oils & greases).

Tailings present a long-term cost to the mining industry. If the company leaves or goes bankrupt, the local government can find itself with responsibility for the maintenance and monitoring of tailings dumps essentially forever - this, and other costs of cleanup, can impose liabilities that were estimated at up to 12 billion dollars in the US alone in 2005.

4. Mark the following statements as True or False.

1. The extraction of minerals from ore can be done two ways: placer mining or hard rock mining
2. The composition of tailings is not dependent on the composition of the ore.
3. Tailings may contain trace quantities of metals found in the host ore, and they may contain substantial amounts of added compounds used in the extraction process.
4. Tailings are distinct from overburden or waste rock, which are the materials overlying an ore or mineral body that is displaced during mining without being processed.

Text 2. Environment considerations

1. Skim through the text below and point out the general idea of it.

2. Read the text and think of the questions you might ask about.

3. Find key words that you can use to retell the text.

The elements and compounds uncovered and liberated through mining and processing, which are not usually part of the ecological systems (in such a form or concentration) have the potential to alter the receiving environment to its detriment. Most mining and minerals processing wastes contain minerals, such as sulphides, which are formed at higher temperatures and pressures at geological depth. When exposed to aerobic surficial conditions, or as a result of processing, minerals may breakdown releasing elements from their mineralogical bindings which may not be easily absorbed by unaccustomed ecosystems without impact (this process is sometimes known as Acid and Metaliferous Drainage). It is precisely, because these elements did not interact with the overlying ecosystems before mining that they may pose issues to ecosystems and communities post-mining.

Disposal of mine tailings is one of the most important environmental issues for any mine during the project's life. While significant pressure is placed on mining projects in developed countries to conform to stringent environmental standards, many projects in developing nations do not take significant steps to prevent or mitigate environmental damage.

The sustainability challenge in the management of tailings and waste rock is to dispose of material, such that it is inert or, if not, stable and contained, to minimize water and energy inputs and the surface footprint of wastes and to move toward finding alternate uses.

Although ideally the tailings would be made up of gangue materials (i.e. silica), to some degree, the sought-after mineral also appears in the tailings. Tailings also commonly contain unmineralized sulphides that can breakdown and release metals and generate acidic conditions. In operations that recover lead, uranium and other toxic heavy metals, this represents a significant environmental hazard. In addition to the minerals themselves, some processing methods involve marine pollutants such as copper sulfate, xanthate or cyanide which will be present to some degree

in the tailings. In some operations, components of the gangue may also be toxic, though it is rare for these materials to be present above trace levels. An example is thallium in sulfide ores.

In order to prevent the uncontrolled release of tailings material into the environment, mines usually have a disposal facility which quite often takes the form of a dam or pond. This is a convenient method of storage since tailings are often in the form of slurry when they are discharged from the concentrator. These facilities often require the clearing of more land than the rest of the mine (including open-pit operations) combined, and failure of the wall can result in a massive release of tailings. As such they are of great environmental concern.

Tailings release and subsequent damage to the environment can also occur without catastrophic failure of the storage facility. These kinds of release are much less obvious and may take the form of acid drainage or dry tailings dust being blown away from the storage area. Several major environmental disasters have been caused by tailings dam failures and other release of tailings into the environment. Some examples are the Ok Tedi environmental disaster, the Buffalo Creek Flood, the 2000 Baia Mare cyanide spill and the Ajka alumina plant accident.

4. With the help of additional material, make up a report about one of the environmental disasters (mentioned in the text) caused by tailings dam failures or other release of tailings into the environment.

5. Retell the text.

UNIT V. WHEN A MINE CLOSES

1. Skim through the text below and point out the general idea of it.

2. Read the text and decide which word from the box best fits each space.

Mining, study, closed, fulfill, countries, difficult, lands, money, damaged

Text 1. When a mine closes

Before a mining operation begins, the company must study what the environmental and social effects of the mine will be. This _____,

called an Environmental Impact Assessment or EIA should plan for ways to reduce harm and to clean up the site when the mine is closed. It should also make sure that people and communities harmed by mining activities are paid for any damage they suffer.

When a mine is _____, the mining operator, with oversight from the government mining authority, is responsible for restoring the site to make it safe for future use. _____ companies and mine operators should:

• remove toxic materials, machinery, and mining structures.

• fill holes, close off tunnels, fence dangerous areas, and clearly mark these areas with signs.

• stabilize cliff faces, pit walls, and waste dumps to reduce erosion and prevent collapse.

• restore soil and cover the area with healthy soil and plants.

• restore _____ waterways.

• treat polluted water for as long as necessary.

In some _____, mining companies are required to put up money (called a bond) before they begin work. The bond is a way to make sure that the company cleans the site after the mine closes. The bond money is used if the company goes bankrupt or does not have enough _____ to restore the area. If the amount of the bond is less than the costs of restoring land and paying for damages from mining, the company may not fulfill its responsibilities. To make sure that companies _____ their responsibilities, communities or governments need to negotiate for a bond that is high enough. It is usually better to demand one large bond for an entire project, rather than smaller bonds for each separate part of the project.

Restoring damaged land

If land is damaged by erosion and loss of topsoil, it can be restored over time. But land that is badly damaged by mine waste and chemicals may be very difficult and costly to restore, if it can be restored at all. It is so _____, in fact, that few mines have been completely restored.

Restoring and replanting damaged land should be the responsibility of mine owners and operators. But mining communities, with or without support from government, usually must pressure the mining companies to make sure they fulfill this responsibility.

To restore and replant mined _____, toxic waste must be prevented from washing or blowing away, and acid mine drainage must be prevented. It takes a lot of work over many years to bring land back to a healthy state. If land cannot be mined safely and responsibly, it should not be mined at all.

REFERENCES

1. Conant, Jeff "A community guide to environmental health" / by Jeff Conant and Pam Fadem. – Berkeley, California, USA, 2008. – 623 p.
2. Curley, Robert "New thinking about pollution" / edited by Robert Curley. – 21st Britannica Educational Publishing, USA, 2011. – 280 p.

INTERNET LINKS

1. Environmental impact on mining [Электронный ресурс]. Режим доступа: http://en.wikipedia.org/wiki/Environmental_impact_of_mining.
2. Mining Impacts to the Human and Natural Environments [Электронный ресурс]. Режим доступа: http://itech.fgcu.edu/faculty/ndemers/Miningconference/mcindex.htm
3. Mining and water pollution [Электронный ресурс]. Режим доступа: https://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf
4. Tailings [Электронный ресурс]. Режим доступа: http://www.pollutionissues.com/knowledge/Tailings.html#ixzz3Ov3vcQRU

CONTENTS

ИНОСТРАННЫЙ ЯЗЫК
ЭКОЛОГИЯ И ПРИРОДОПОЛЬЗОВАНИЕ

FOREIGN LANGUAGE
MANAGEMENT OF THE ENVIRONMENT
AND NATURAL RESOURCES

Методические указания к самостоятельным работам
для студентов бакалавриата направления 05.03.06

Сост.: *А.Ю. Маевская*

Печатается с оригинал-макета, подготовленного кафедрой
иностранных языков

Ответственный за выпуск *А.Ю. Маевская*

Лицензия ИД № 06517 от 09.01.2002

Подписано к печати 08.02.2023. Формат 60×84/16.
Усл. печ. л. 1,8. Усл.кр.-отт. 1,8. Уч.-изд.л. 1,6. Тираж 50 экз. Заказ 94.

Санкт-Петербургский горный университет
РИЦ Санкт-Петербургского горного университета
Адрес университета и РИЦ: 199106 Санкт-Петербург, 21-я линия, 2