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TOWARDS A GREENER ECONOMY IN ENGLISH

Учебное пособие

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Цель пособия – формирование у обучающихся практических умений и навыков, необходимых для чтения специализированной литературы, устного и письменного профессионального общения в сфере зеленой экономики на английском языке.

В издании, подготовленном в соответствии с Федеральным государственным образовательным стандартом, учтены особенности преподавания иностранного языка в неязыковых вузах. Предназначено для бакалавров, обучающихся по ФГОС ВО по направлениям «Экология и природопользование», «Экономика», «Менеджмент».

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The purpose of the manual is to form students' practical skills and abilities necessary for reading specialized literature, oral and written professional communication in the field of Green Economy in English.

The publication, prepared in accordance with the Federal State Educational Standard, takes into account the peculiarities of teaching a foreign language in non-linguistic universities. It is intended for bachelor students studying under the Federal State Educational Standard in the areas of "Ecology and Nature Management", "Economics", "Management".

Предисловие

Учебное пособие предназначено для студентов бакалавриата, магистратуры, аспирантуры по направлениям подготовки «Экология и природопользование», «Экономика», «Менеджмент» и содержит текстовые и аудио-видео материалы по основным проблемам зеленой экономики и смежным темам, а также лексико-грамматические задания, направленные на развитие навыков чтения и перевода специальной литературы, аудирования и устной речи для подготовки к профессиональному общению на иностранном языке в области зеленой экономики.

Материал пособия служит важным инструментом для создания требуемого лексического запаса для перевода научных текстов с английского языка на русский и с русского на английский, а также для устной и письменной коммуникации в будущей научной и академической деятельности студентов.

Учебное пособие состоит из 6 разделов (Units), каждый из которых состоит из двух модулей (Modules) и включает материал как для самостоятельной, так и для аудиторной работы. Количество и последовательность выполнения заданий определяется преподавателем в зависимости от уровня владения иностранным языком в группе.

Структура модулей:

Lead-in activity служит для разогрева обучающихся в начале изучения модуля для ознакомления с целями и задачи модуля в целом.

Vocabulary включает лексический материал модуля и упражнения для закрепления новой лексики.

Reading разделен на предтекстовые, текстовые и послетекстовые упражнения с целью понимания и изучения новых терминов и смысловой обработки текстов, в том числе, без словаря. Рекомендуется выполнять перевод прочитанного текста.

Video / Listening предназначен для отработки аудирования. Видео- и аудиозапись является неотъемлемой частью изучения иностранного языка. Данный вид работы необходим, чтобы привлечь внимание, стимулировать вовлеченность обучающихся в образовательный процесс.

Grammar затрагивает определенные грамматические темы (система времен активного залога, модальные глаголы, условные предложения, порядок слов в предложении, герундий vs инфинитив, adjectives / comparisons, countable/uncountable nouns, articles, сложное предложение/ союзы), служит для повторения и закрепления изученного на предыдущем этапе обучения грамматичекого материала, необходимого для профессиональной коммуникации в области зеленой экономики.

Speaking дает обучающимся возможность попрактиковаться в языковых элементах (лексика, грамматические функции и т.д.). Цель языковой практики – развить способность обучающихся говорить бегло и в интерактивном режиме.

Writing помогает обучающимся критически осмыслить изученный материал, а также побуждает их понять, систематизировать и интегрировать предыдущие знания с новыми концепциями.

CONTENT

MODULE 1.   *WHAT IS GREEN ECONOMY?*

By the end of this module you will be able to:

    - understand the concept of Green Economy, evolution of the concept of Green Economy, its advantages and disadvantages;

    - extract specific and detailed information;

    - write an opinion essay.

LEAD-IN

Discuss. Can you answer the questions?

    1. What is a green economy and how does it differ from a traditional economy?

    2. Why is the concept of a green economy gaining prominence in recent years?

    3. What are the key principles and goals of a green economy?

    4. How can transitioning to a green economy help address environmental challenges such as climate change and biodiversity loss?

    5. What are some examples of sectors or industries that are part of the green economy?

If you are not sure, make your best guess and write down any notes and questions you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practise their pronunciation. Translate the examples into Russian.

	Word / Collocation	Transcription	Translation	Example
1	**Green Economy**	/ɡriːn ɪˈkɒnəmɪ/	Зеленая экономика	To achieve sustainable development goals, the *green economy* is an important tool.
2	**to gain**	/ɡeɪn/	получать, набирать, приобретать	You will *gain* several serious personal skills.
3	**recession**	/rɪˈseʃ.ən/	рецессия, спад, падение, снижение, удаление	Therefore, growth is faster after a *recession*.

4	**environment**	/ɪnˈvaɪ.rən.mən t/	окружающая среда, обстановка, окружение,	Here are ten ways recycling actually hurts the *environment*.
5	**to generate**	/ˈdʒen.ə.reɪt/	порождать, генерировать, производить	Green restrictions can themselves *generate* growth and jobs.
6	**prosperity**	/prɒsˈper.ə.ti/	процветание, преуспевание, успех	The *prosperity* and well-being of mankind strongly depend on actions and measures we adopt.
7	**to reduce**	/rɪˈdʒuːs/	уменьшить, уменьшать, снижать, сокращать	Bio-fuels significantly *reduce* greenhouse gas emissions.
8	**externality**	/ɪkˌstɜːˈnæl.ə.ti/	внешность, наружная, внешняя сторона	Electric cars are perceived as a positive *externality* of consumption on the society.
9	**to bear**	/beər/	переносить, перевозить	Nevertheless, the company began to *bear* its first losses in 1990.
10	**renewable**	/rɪˈnjuː.ə.bəl/	восстановимый, возобновляемый	Industry must ensure that *renewable* energy sources become competitive.
11	**consumption**	/kənˈsʌmp.ʃən/	потребление	Fruit *consumption* rose though vegetable *consumption* experienced a drop from 1988.
12	**inherently**	/ɪnˈher.ənt.li/	по существу, от природы, по сути	Economic development is *inherently* medium-term and long-term in focus.
13	**planetary**	/ˈplæn.ɪ.tər.i/	планетарный, планетный, земной	They believed that *planetary* movements had an effect on deeds.
14	**sustainable**	/səˈsteɪ.nə.bəl/	устойчивый; жизнеспособный	Societies can only become *sustainable* if they are built upon *sustainable* local communities.
15	**notable**	/ˈnəʊ.tə.bəl/	заметный, примечательный, значительный	We see some *notable* differences, none of which are accidental.

16	**ability**	/əˈbɪl.ə.ti/	способность, возможность, умение	The *ability* to find quick answers largely determine the quality of life.
17	**prevention**	/prɪˈven.ʃən/	предупреждение, предотвращение, предохранение, профилактика	The overall theme will cover conflict *prevention*, management and resolution, focusing on conflict *prevention* from economic perspectives.
18	**poverty**	/ˈpɒv.ə.ti/	бедность, нищета, скудость, нужда	Regarding the definition of *poverty*, a distinction is made between exposure to *poverty* and acute *poverty*.
19	**alleviation**	/əˌliː.viˈeɪ.ʃən/	облегчение, смягчение	Social welfare policy should be more clearly directed towards the root causes of poverty rather than its *alleviation*.
20	**to deliver**	/dɪˈlɪv.ər/	поставлять, доставлять, передавать, наносить, выпускать	The problem is to extract these resources and *deliver* them to Earth.

2. Use some of the words from the list above to complete the gaps in the sentences.

1) Even with all _____ reserves we cannot survive without the sun.

2) Anyone with a four-year degree can _____ employment.

3) Entrepreneurs and companies should focus on _____ ecosystems.

4) Several representatives said that the _____ should benefit all and be socially inclusive.

5) Progress was also _____ in emergency contexts.

6) The natural world has _____ to replicate, and this one does it eternal.

7) Malaria _____ activities included the promotion and use of insecticide-treated nets.

8) Strong downtrend was observed in all 3 important _____ indicators namely percentage, gap and severity.

9) The joint efforts undertaken by the international community had, to a certain extent, contributed to the _____ of the debt burden for some developing countries.

10) You can _____ this letter yourself.

You can also practice the new vocabulary here
https://stepik.org/lesson/893045/step/3?unit=897990

READING

3. Before reading the text, discuss the following questions.

- What are the potential economic benefits of investing in green economy?
- How does the concept of green economy align with sustainable development goals?

4. Match the picture and the term:

poverty alleviation	job creation	natural capital	resource efficiency
	pollution prevention	clean energy technologies	

1 _____

2 _____

3 _____

4_____

5_____

6_____

5. Match the word with the synonym from the text (in bold).

1) receive
2) fall
3) safety
4) shorten
5) survive

6) production
7) capacity
8) possibility
9) liaison
10) durable

6. Make word combinations and then use them to complete the definitions.

a)

1) Green (2)
2) environment
3) Environmental
4) economic
5) sustainable
6) environmentally friendly
7) resource
8) clean energy

a) activities
b) output
c) industries
d) Economy
e) efficiency
f) development
g) Jobs
h) Externalities

9) poverty   i) alleviation

                                               j) technologies

b)

1) In the United Nations Environment Programme (UNEP) _____ are defined as "positions in agriculture, manufacturing, R&D, administrative, and service activities aimed at substantially preserving or restoring environmental quality".

2) _____ are activities that promote awareness on how to care for the planet.

3) _____ are the negative consequences on nature and biodiversity that result from human activity.

4) _____ is an economy that aims at reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment.

5) _____ is the total value of all goods and services produced in an economy.

6) _____ aims to improve the quality of life for those people currently living in poverty.

7) _____ is an organizing principle that aims to meet human development goals while also enabling natural systems to provide necessary natural resources and ecosystem services to humans.

8) _____ is a green industry business uses sustainable materials to make its products.

9) _____ is a proven method of sustainably strengthening a company's economic situation and competitiveness.

10) _____ are renewable in nature and offer less environmentally invasive ways to power the global community.

7. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

recession	reduce	environmental	prosperity	externality
assert	degrowth	sustainable	linkage	alleviation

8. Read the text and find answers to questions in Ex. 3.

WHAT IS A GREEN ECONOMY?

The term **Green Economy** is not a new one. It first appeared in 1989 in the book Blueprint for a Green Economy. During the 1990s and most of the 2000s the concept of Green Economy was not widely used but it **gained** a new life after the financial crises of 2008 when many governments around the world needed to stop economic **recession** while also furthering **environmental and climate protection**.

At that time, some international organizations, most notably UNEP, United Nations Environmental Program, proposed that financially supporting **environment** and climate

activities could also help to stimulate economic growth. They brought this idea to the Rio+20 Global Summit in 2012. UNEP defined a Green Economy as one that **generates** increasing **prosperity** while at the same time **reducing** our environmental impact.

In essence, it is possible to combine the need for development, and at the same time respect the limit of the local, regional, and global environmental systems. This is, of course, a very general definition, which can be interpreted in a variety of different ways. There are more narrow interpretations of the term *Green Economy,* which can include proper pricing, also called Environmental **Externalities**. Externality is the term for the costs which society has to **bear** because of degradation of ecosystems and environmental pollution.

Some interpretations call for adopting the Polluter Pays Principle. This means that those companies and individuals who are responsible for environmental impacts should be made to bear their costs. Others call for financial investments in **renewable energy**, energy efficiency which help to both generate jobs and reduce **greenhouse gas emissions**. Wider interpretations of a Green Economy **assert** that current levels of **consumption** and production in western societies are **inherently unsustainable**, and that very radical changes are required to save **planetary** ecosystems from a collapse.

One of these ideas includes **degrowth** which means deliberately reducing **economic output** in order to decrease pressure on the environment. There are several concepts which are related; they're not equivalent to the idea of Green Economy. **Sustainable development** is the most **notable** of these. This is the notion that meeting the needs of the present generation should not compromise the **ability** of future generations to meet their needs.

Then there is Ecological Modernization, the idea that clean, **environmentally friendly industries** can help to develop and modernize industries and sciences. Lastly, we have the concept of **Green Jobs**, that the environmental sector, and particularly green energy, can significantly contribute to new **employment opportunities**. So we now know about the origin of the idea of Green Economy, its different interpretation, and some related terms.

The term covers **linkages** and analysis between **resource efficiency**, **job creation**, **pollution prevention**, **clean energy technologies**, **poverty alleviation**, greenhouse gas emissions, and **natural capital**, among several other issues. If we want to make transition towards Green Economy, policies need to be substantially more ambitious and integrated to **deliver** meaningful transformation.

Reading comprehension tasks

9. True or False? Correct the false statements or add information to the correct statement to support the idea.

1) The term Green Economy was first introduced in 1989.
2) The concept of Green Economy gained popularity in the 1990s and 2000s.
3) The financial crises of 2008 led to the revival of the Green Economy concept.
4) UNEP proposed the idea of financially supporting environment and climate activities at the Rio+20 Global Summit in 2012.
5) UNEP defined a Green Economy as one that generates increasing prosperity

without considering environmental impact.

6) The Polluter Pays Principle suggests that companies and individuals responsible for environmental impacts should bear the costs.

7) Some interpretations of a Green Economy call for financial investments in renewable energy and energy efficiency.

8) Degrowth is a concept related to the Green Economy that focuses on increasing economic output to reduce pressure on the environment.

9) Sustainable development is a concept that is equivalent to the idea of Green Economy.

10) Green Jobs refer to employment opportunities in the environmental sector, particularly in green energy.

10. Answer the questions.

1) When did the concept of Green Economy gain popularity?
2) What was the role of UNEP in promoting the idea of Green Economy?
3) How does UNEP define a Green Economy?
4) What are some narrow interpretations of Green Economy?
5) What is the Polluter Pays Principle and how does it relate to Green Economy?
6) What are some examples of financial investments that can contribute to Green Economy?
7) According to wider interpretations, why are radical changes necessary for a sustainable future?
8) How does the concept of degrowth relate to the idea of Green Economy?
9) What is the principle of sustainable development?
10) How can the environmental sector, particularly green energy, contribute to employment opportunities?

VIDEO

11. Look through the script for a video by *Greenpeace UK*. Before watching the video, think of the words or word combinations that can be used to complete the gaps. Then watch the video and check if you are right.

WHAT IS A GREEN ECONOMY?

In recent weeks, you may have heard the term green _____ (1) or green economy. As we begin to imagine life beyond coronavirus, the government is setting out major plans to rebuild the country, and what's decided now will impact us for decades to come. But the coronavirus _____ (2) has shown us what we desperately don't want to go back to. How unequal our society is, how _____ (3) we are in times of crises, and how our planet is struggling.

A green economy is a way to rebuild the country whilst taking all of this into consideration. A green economy prioritizes the health of people and the planet, and sees these things as interconnected. It means solar and wind power, not coal, oil or new gas. Better public transport and electric _____ (4), not petrol and diesel ones. Energy efficient homes, not cold and draughty ones, and protecting nature and having a circular economy, not a single use throwaway culture.

It would mean massive investment in renewables, housing and transport, and rolling out training programs to skill people up for new jobs in all of these areas. This wouldn't just be good for the planet, it would be good for the economy too. A major investment like this could create hundreds of thousands of jobs. And with the oil and gas industries also now in deep trouble and renewables being the cheapest way to generate electricity, switching to _____ (5) would be a win-win situation providing both jobs and clean energy.

Sam Chetan-Welsh, Political Campaigner at Greenpeace UK: "So, some might say that in order to recover from the coronavirus crisis, what the government needs to do is tighten its belt financially and introduce cuts to spending. Well, that simply isn't true. That's what the government tried to do in 2010 when they introduced _____ (6) and slashed public sector spending. Now, not only was that a disaster for our most vulnerable people and our environment and vital services like the NHS, it was also a disaster economically. The best way for the government to rebuild the country is with a green recovery plan that creates hundreds of thousands of jobs."

There are major advantages for public health and wellbeing as well: better insulated homes are warmer, and cut energy bills as well as emissions. Better public transport will mean less commuting time. Cleaner air will help save lives. Coronavirus has shown us that to _____ (7) ourselves we need to start looking after the planet because without a major change, we can fully expect to see many more crises like this one. And not just pandemics.

The climate emergency is already having _____ (8) for all life on earth, in particular for the most vulnerable and those that have contributed the least to it. To ignore this would be disastrous and unjust. We have to act now to limit catastrophic climate change and to protect ourselves and the planet we live on. The government is talking a big talk about a green recovery, but we have to make sure that these aren't empty words.

Rebecca Newsom, Head of Politics at Greenpeace UK: "The government's really been starting _____ (9) on the green recovery, which is great, but unfortunately they have already started to _____ (10) out billions of pounds of loans to companies with no strings attached at all, and that is a huge missed opportunity. They do have a big chance now to set us on the right track to a green and fair recovery, so let's hope they turn their warm words into action."

The government needs to make sure that they put people and the planet first, and put us on course for a smart green economy.

What new facts are mentioned in the video compared to the text in Ex. 8?

VOCABULARY

12. Pick up the parts of the sentences to continue the following statements (check against the video script in Ex. 11).

1. There are major advantages for	a) that to look after ourselves, we need to start looking after the planet, because without a major change, we can fully expect to see many more crises like this one.
2. But the coronavirus pandemic has shown us	b) the government is setting out major plans to rebuild the country.
3. Coronavirus has shown us	c) public health and wellbeing as well.
4. As we begin to imagine live beyond coronavirus,	d) a way to rebuild the country whilst taking all of this into consideration.
5. A green economy is	e) what we desperately don't want to go back to.

GRAMMAR

13. Verb Tense Revision: Can you answer the questions? (you can use the following link
https://dictionary.cambridge.org/grammar/british-grammar/tenses-and-time**).**

- Do you know the difference between tenses and time?
- What tenses do we use to talk or write about different times?
- How do we form the past, present and future tenses in English?

a) Find the examples of the different forms of a verb or verb phrase in the text and script in Ex. 8 and Ex. 11.

b) Make the following sentences in the correct tense form according to the model.

*Since 1989 many governments around the world _____ (stop) economic recession. – Since 1989 many governments around the world **have been stopping** economic recession.*

1) The term Green Economy first _____ (appear) in 1989 in the book Blueprint.
2) During the 1990s and most of the 2000s the concept of Green Economy _____ (gain) a new life.
3) International organizations _____ (bring) the idea of supporting the environment to the Rio+20 Global Summit in 2012.

10

4) UNEP _____ (define) a Green Economy as one that generates increasing prosperity.

5) Companies and individuals having an impact on the environment _____ (bear) the costs last year.

6) Companies _____ deliberately _____ (reduce) economic output in order to decrease pressure on the environment.

7) The present generation _____ (not to compromise) the ability of future generations to meet their needs.

8) Green Jobs _____ (contribute) to new employment opportunities in the environmental sector next decade.

9) At the Global Summit in 2012 we _____ (hear) about the origin of the idea of the Green Economy.

c) Read and translate the following sentences. Mind the tense form of the verbs.

1) He added that investments in renewable energy sources create jobs that require higher qualifications.

2) "Green Economy" is considered as the fight against global climate change and radical energy efficiency.

3) These programs will support the environment, climate action, sustainable consumption and production, energy, gender equality, counter-terrorism and education.

4) There had been only three replies to a UNEP questionnaire on the subject.

5) We should start by having a Global Summit on Nuclear Security that the United States will host within the next year.

6) Thousands of people are planting trees and are directly engaged in the project via the "Green Jobs" initiative.

7) This year, costs have again exceeded income, so our reserves have been reduced.

8) Unfortunately, these efforts have borne no fruit.

9) Modern civilization still depends on agriculture, it has overloaded the ecosystem.

10) The landscape approach will clearly benefit the accounting process and decisions relating to natural capital.

SPEAKING

14. Discuss the questions in pairs or groups, summarize your ideas, then choose one person to speak for your group.

1) How can green economy contribute to the recovery of a country after a pandemic?
2) In what ways can green economy help vulnerable populations?
3) What role do vehicles play in transitioning towards green economy?
4) What steps can individuals take to support the growth of solar and wind power industries?
5) Green technologies are often more expensive than traditional alternatives. Is it worth

the cost to protect the environment?

WRITING

15. What are advantages and disadvantages of green economy?

1) It promotes sustainable development and reduces environmental impact.
2) Initial costs of transitioning to green technologies can be high.
3) Potential job losses in traditional industries like coal mining.
4) It creates new job opportunities in renewable energy sectors.
5) It reduces reliance on fossil fuels, leading to lower greenhouse gas emissions.
6) It requires significant infrastructure upgrades and investments.
7) Variability of renewable energy sources may lead to intermittent power supply.
8) Dependence on foreign countries for rare earth metals used in renewable technologies.
9) It improves air quality and public health by minimizing pollution.
10) It enhances energy security by diversifying energy sources.

Can you add any other advantages and disadvantages to the list above?

16. Write an opinion essay (200-250 words) on the topic *The concept of green economy is often criticized as unrealistic and idealistic. Do you think so?* **You can use the tips on how to write this kind of essay at** https://learnenglishteens.britishcouncil.org/skills/writing/b1-writing/opinion-essay

MODULE 2. *WHAT IS NATURVATION?*

By the end of this module you will be able to:
 - identify the main point or important information about Cities, Nature and Innovation;
   - guess the meaning of unknown words from context;
   - understand and use the vocabulary of this unit in speaking and writing;
   - write a blog post / a series of tweets / email.

LEAD-IN

Work in groups and discuss the questions. Then briefly tell the class what you have learned. As a warm-up, please try to come up with answers as you understand the questions.
   - What do you know about Nature and Innovation?
   - What is the international overview about Nature and Innovation?
   - What is NATURVATION?

If you are not sure, make your best guess and write down any notes and questions you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practise their pronunciation. Translate the examples into Russian.

№	Word/ word collocation	Transcription	Translation	Example
1	**to tackle**	/ˈtæk(ə)l/	хватать, энергично браться, заниматься, решать	I'll tackle this difficult task.
2	**core**	/kɔ:/	суть, сущность, ядро, стержень	Debt is at the core of the problem.
3	**to ensure**	/ɪnˈʃʊə/	обеспечивать; гарантировать	We will ensure equal opportunities for all.
4	**widespread**	/ˈwaɪdspred/	широко распространенный, раскинувшийся	The problem is causing widespread concern among scientists.
5	**to grapple**	/ˈgræp(ə)l/	бороться, схватиться,	They grappled for the key.

			схватить, сцепиться	
6	**resilient**	/rɪˈzɪlɪənt/	упругий, эластичный, жизнерадостный, неунывающий	The local economy is remarkably resilient.
7	**to emphasize**	/ˈemfəsaɪz/	подчеркивать, акцентировать, выделять, придавать особое значение, напирать	Her gesture emphasized her words.
8	**equity**	/ˈekwɪtɪ/	справедливость, беспристрастность	In making these decisions we should be governed by the principle of equity.
9	**justice**	/ˈdʒʌstɪs/	юстиция, правосудие, справедливость, судья, управа	Justice will prevail.
10	**to enhance**	/ɪnˈhaːns/	повышать, усиливать, увеличивать, совершенствовать, усугублять	Their living expenses are constantly enhancing.
11	**to coin**	/kɔɪn|	чеканить, придумывать, штамповать	He's coining money.
12	**umbrella term**	/ʌmˈbrelətɜːm/	обобщающее понятие, общее название, собирательный термин, сводный термин	Within the umbrella term "dementia" there are many different kinds of disease.
13	**to inspire**	/ɪnˈspaɪə/	вдохновлять, вселить, внушать, воодушевить	Her courage has inspired us.
14	**cost-effective**	/kɒstɪˈfektɪv/	доходный, прибыльный, рентабельный, затрато-эффективный	It is the least cost-effective way of selling.
15	**simultaneously**	/ˌsɪmlˈteɪnɪəslɪ/	одновременно, в то же время	To appear simultaneously
16	**societal**	/səˈsaɪt(ə)l/	социальный, общественный	societal changes
	social	/ˈsəʊʃ(ə)l/	общественный, социальный, дружеский, общительный	social contacts
17	**seascape**	/ˈsiːskeɪp/	Морской пейзаж, марина	seascapepainter
18	**deliberate**	|dɪˈlɪbərət|	преднамеренный, обдуманный	deliberate plan
	to deliberate	|dɪˈlɪbəreɪt|	обсуждать, совещаться, обдумывать	to deliberate what to do
19	**to mainstream**	/ˈmeɪnstriːm/	стать общедоступным, широко внедрить, делать основным направлением, придать значение, заострить	The objective is to mainstream the concerns.
20	**uptake**	|ˈʌpteɪk|	поглощение, понимание	They developed paper napkins with a greater uptake of liquids.

21	**to neglect**	*/nɪˈglekt/*	пренебрегать, незаботиться, упускать	He sometimes neglected that duty.
22	**rolling**	*/ˈrəʊlɪŋ/*	прокрутка, прокатка, вальцевание, обкатка	a popular model for rolling out solar panels
23	**to instill**	*/ɪnˈstɪl/*	внушать, вселять, пускать по капле, прививать, закапывать	We must instill a sense of duty in our children.
24	**to replicate**	*/ˈreplɪkeɪt/*	копировать, повторять, делатьреплику	The virus will infect a cell and then it will begin to replicate.
25	**inequality**	*/ɪnɪˈkwɒlɪtɪ/*	неравенство, разница, различие	People are concerned about corruption and social inequality.
26	**to emerge**	*/ɪˈmɜːdʒ/*	появляться, возникать, всплывать, выясняться	What results emerged from your talks?

2. Use some of the words from the list above to complete the gaps in the sentences.

1) You'll also _____ projects for real clients.
2) However, there are risks with which the industry is only now starting to _____.
3) Farming must become more _____ to disruptive events like floods and droughts.
4) Economic efficiency and social _____ are the two poles of social development of any country.
5) Interventions designed for whole populations are _____.
6) The great begins with the small, one cannot _____ any opportunities.
7) We must _____ patriotism into the young people of today.
8) No country can _____ another's experience.

You can also practice the new vocabulary here
https://stepik.org/edit-lesson/893049/step/4

READING

3. Before reading the text, discuss the following questions.

- What is NATURVATION and when did it start?
- What are nature-based solutions (NBS) and how can they address urban challenges?

4. Match the picture and the term.

recreation area	green roofs	wetlands	storm water
permeable surface		rain garden	

1 _____

2 _____

3 _____

4_____

5_____

6_____

5. Match the word with the synonym from the text (in bold).

1) to reveal
2) to diminish
3) to percolate
4) to pick up
5) imaging

6) sturdy
7) to conquer
8) to gather pace
9) to reproduce
10) to install

6. Make word combinations and then use them to complete the definitions.

a)

1) in a sustainable
2) urban
3) recreation
4) green
5) permeable
6) storm
7) building
8) task
9) partner
10) close

a) challenges
b) roofs
c) water
d) areas
e) momentum
f) way
g) cities
h) surfaces
i) collaboration
j) force

b)

1)   Living _____ means that people try to manage their needs in a way that will allow future generations to do the same.
2)   The _____ are affordable housing, urban pollution, and urban inequality.
3)   _____ would include land that is designed, constructed, designated, or used for recreational activities.
4)   _____ (also known as porous or pervious surfaces) allow water to percolate into the soil to filter out pollutants and recharge the water table.
5)   _____ can be defined as the water that results from precipitation, which includes rainwater, subsoil water or spring water.

6) _____ are ballasted roofs consisting of a waterproofing membrane, growing medium (soil) and vegetation (plants) overlying a traditional roof.

7) If a process or movement _____, it keeps developing or happening more quickly and keeps becoming less likely to stop.

8) _____ is a group or committee, usually of experts or specialists, formed for analyzing, investigating, or solving a specific problem.

9) A sister city, _____ or a twin town relationship is a form of legal or social agreement between two geographically and politically distinct localities for the purpose of promoting cultural and commercial ties.

10) _____ is the situation of two or more people working together to create or achieve the same thing.

7. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

| permeable surface | recreation area | transdisciplinary | building momentum |
| close collaboration | multi-functional impact | assessment approach | implementation gap |

8. Read the text and find answers to questions in Ex. 3.

NATURVATION

NATURVATION (NATure-based URban innoVATION) is a Horizon 2020 project, funded by 7.8 million Euros by the European commission, that started in November 2016.

Nature-based solutions (**NBS**) are actions which are **inspired** and supported by nature. They have the potential to address urban challenges, as climate change, **in a sustainable way** while contributing to economic activities and social well-being. Examples are parks that **reduce** heat stress and provide **recreation areas**, **green roofs**, **wetlands** and ponds that holds **storm water** and **permeable surfaces**, vegetation and rain gardens that **infiltrate** storm water.

To **unlock** the potential of NBS for sustainable urban development, NATURVATION takes a **transdisciplinary**, internationally comparative approach to **capture** the multiple impacts and values of these solutions. The project has three main objectives: advance assessment approaches, enable innovations and realise the potential of NBS.

Researchers from **CEC** (Commission for Environmental Cooperation) will work with advancing assessment approaches for **mapping** and evaluating the multi-functional and systemic impacts of NBS to create a **robust** evidence base and tools for decision-making. This will be done together with researchers from **PBL** (Problem Based Learning), Utrecht University, Central European University and **IFL** (The Institute for Learning) in **close collaboration** with the **URIPs** (Urban-regional innovation partnerships) led by the partner cities. Lund University will work especially close to Malmö city and the associated URIP.

NATURVATION will **overcome** implementation gaps by **building momentum** of NBS through creation of new partnerships, knowledge platforms, processes and tools required to support policy, business and civil society organisations in cities across European.

The NATURVATION **Task Force** (including **UN-HABITAT**, **Arup**, White Architects, Ramboll Living City Laboratory, **Climate-KIC**, the African Centre for Cities, the Environment Agency UK, The **IPBES** Indigenous and Local Knowledge Task Force and the University of Munich) will operate as a critical friend and 'real world' testing ground for the developed knowledge, recommendations, processes and tools to enable us to disseminate, **replicate** and **embed** this work internationally.

Source: https://www.cec.lu.se/research/finished-research-projects/naturvation
(accessed 08/11/2023)

Reading comprehension tasks

9. Use the list of abbreviations to complete the gaps in the sentences. Specify one word from the list that is not an abbreviation:

NATURVATION	NBS	CEC	PBL	IFL	URIP
UN-HABITAT		Arup	KIC	IPBES	

1) _____ is nature-based urban innovation, a 4-year project, funded by the European Commission and involving 14 institutions across Europe in the fields of urban development, geography, innovation studies and economics.

2) _____ are Nature-based solutions, actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.

3) _____ is Commission for Environmental Cooperation, an international organization established by the United States, Canada, and Mexico under the 1994 North American Agreement on Environmental Cooperation (NAAEC).

4) _____ is Problem Based Learning, a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem.

5) _____ is The Institute for Learning, a voluntary membership, UK professional body.

6) _____ is Urban-regional innovation partnership, a vibrant community of practice to explore and co-create nature-based solutions.

7) _____ is The United Nations Human Settlements Programme, mandated by the UN General Assembly to promote socially and environmentally sustainable towns and cities.

8) _____ is Arup Group Limited, a British multinational professional services firm headquartered in London that provides design, engineering, architecture, planning, and advisory services across every aspect of the built environment.

9) _____ is Knowledge and Innovation Community, working to accelerate the transition to a zero-carbon, climate-resilient society.

10) _____ is The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, an independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the

conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.

10. Can you answer the questions?

1) Can you give examples of nature-based solutions mentioned in the text?
2) What are the three main objectives of the NATURVATION project?
3) Which organizations are involved in advancing assessment approaches for NBS?
4) How will NATURVATION overcome implementation gaps?
5) Who is part of the NATURVATION Task Force and what is their role?

VIDEO

11. Look through the script for a video from *Coursera MOOC* (https://www.coursera.org/learn/gte-sustainable-cities/lecture/7G4Tu/cities-nature-and-innovation-international-overview). Before watching the video, think of the words or word combinations that can be used to complete the gaps. Then watch the video and check if you are right.

CITIES, NATURE AND INNOVATION – INTERNATIONAL OVERVIEW

Nature-based solutions are an increasingly popular means for _____ **(1)** urban sustainability challenges. The idea that we can use nature to work with us in order to improve our cities is now seen as vital. How the **core** of this development is the idea that nature is able to provide services and values that can contribute to wider goals for economic, social, and environmental sustainability.

This belief that cities should become more sustainable is now very **widespread**, but it's actually a relatively new idea. It was in the 1980s that the Brundtland Report, Our Common Future, put cities at the heart of the sustainability debate. Since then, a central challenge that cities have _____ **(2)** with is how they can address climate change, both by reducing the greenhouse gas emissions that contribute to change in the global atmosphere, and by **ensuring** that they are **resilient** to the impacts of climate change itself.

The Paris Agreement reached in 2015 **emphasized** the increasing importance of cities in achieving global targets for climate change. The Sustainable Development Goals that were also agreed by the global community in 2015 have shown that addressing urban sustainability also means realizing other important goals like protecting biodiversity, reducing pollution, and enabling **equity** and social **justice**. These challenges can sometimes appear to be in conflict with one another and to compete for political attention, public interest, and resources.

As cities have started to take action on climate change and sustainability, it has become clear that some of the most effective responses are those that have multiple benefits. For example, reducing greenhouse gases and improving local air quality, or _____ **(3)** resilience and also creating areas of public space in the city. And the importance of finding approaches that can address multiple urban sustainability challenges at the same time has led to a growing interest in nature-based solutions.

The term "nature-based solutions" was _____ **(4)** in the European Union and is an **umbrella term** for a number of different approaches that use nature to improve urban sustainability,

like green infrastructure, green space, restoring rivers, ecosystem services, and ecosystem-based adaptation. For the European Commission, nature-based solutions are defined as solutions that are **inspired** and supported by nature, which are **cost-effective**, **simultaneously** provide environmental, social, and economic benefits, and help build resilience.

Such solutions bring more and more diverse nature and natural features and processes into cities, **landscapes**, and **seascapes** through locally adapted, resource efficient, and systemic interventions. For the International Union for the Conservation of Nature, a non-governmental organization that promotes nature conservation, nature-based solutions are actions to protect, sustainably managed, and restore natural or modified ecosystems that address _____ **(5)** challenges, effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.

While these two definitions vary, both see nature-based solutions as _____ **(6)** interventions that seek to use the properties of nature to address societal challenges. In both cases, it is the potential to provide multiple benefits that seems to be key to the value of nature-based solutions. Like for example, managing flooding to securing improved health outcomes for different groups of society or building green roofs on city parks that limit heat stress, city lagoons that store water and **permeable** surfaces, vegetation and rain gardens to intercept storm water. Yet, despite it attracting increasing interests, the usage of nature-based solutions remains marginal, fragmented, and highly uneven within and between cities, and gray infrastructure and technology-driven solutions continue to dominate urban development.

From the design of wastewater systems to efforts to improve energy efficiency in the built environment, the NATURVATION project funded by the Horizon 2020 Sustainable Cities and Communities Program at the European Union is developing our understanding about how nature-based solutions are currently being used. We have developed the urban nature atlas to show just how nature-based solutions are being implemented in a 100 cities in Europe.

Our work shows that it is clear that nature-based solutions are an increasingly popular means of tackling many urban sustainability challenges. But there is more limited evidence that nature-based solutions are becoming _____ **(7)** within urban planning, policy, and development. Enabling the wider **uptake** of nature-based solutions means tackling four key issues.

The first issue is assessment methods. Although there is a growing body of evidence about the ecosystem services that nature can provide, we have a limited understanding of how this works in an urban context. Many of our assessment tools focus on the ecological benefits of nature, and its economic, social, and cultural values can be _____ **(8)**. We therefore need new approaches for assessing nature-based solutions that are able to also take these different and sometimes conflicting values into account.

The second issue is business models. The benefits of technologies or behavior changes to improve sustainability are relatively easy to calculate, and this has led to business models which can capture these benefits in economic terms and ensure that there is a return on investment for those involved. For example, the rental roof approach has been a popular model for **rolling** out solar panels in European cities. But nature-based solutions do not come with ready-made business models, and often the value created is distributed between different actors, such as the private firm that **instills** a Green wall for installation, and the local community that benefits from reduced air pollution. We need to experiment with new business models that can work for nature-based solutions and create the means through which these can be _____ **(9)** in different urban contexts.

The third issue is governance strategies. Municipal governments are important for addressing urban sustainability, yet our work suggests that they cannot act alone. The capacity to address urban sustainability challenges relies on multilevel governance structures, as well as the development of different modes of governance. This means that municipal governance need to work with stakeholders and communities to create the partnerships, resources, plans, and demonstration projects needed to accelerate the uptake of nature-based solutions. We need to examine the different governance strategies being used to advanced nature-based solutions in cities, and consider the ways

in which they are able to address conflicts and the _____ (**10**) that may **emerge** from their implementation.

The fourth issue is innovation pathways. Mainstreaming nature-based solutions requires that we understand the key challenges and opportunities that are facing projects on the ground. The innovation has to go on a journey from the initial idea and its demonstration to its wider uptake within policy, industry, and society. Along this journey, getting the assessment of the value of nature-based solutions, the business models required and the governance strategies that can support that uptake will be critical.

Perhaps, most important is identifying the combination of measures that supports successful nature-based solutions. We call this combination of measures the innovation pathway. By understanding the conditions that enable nature-based solutions to become established in our cities and towns and how that benefits can be shared by society, we hope to contribute to developing sustainable cities for the future.

Source: https://www.coursera.org/learn/gte-sustainable-cities/lecture/7G4Tu/cities-nature-and-innovation-international-overview *(accessed on 30.11.2023)*

What new facts are mentioned in the video compared to the text in Ex. 8?

VOCABULARY

12. Unscramble and write (check against the video script).

1) The idea / is / that / nature / we can use / with us / in order / to improve / to work / our cities / now / seen / as vital. (Идея о том, что мы можем использовать природу чтобы улучшить города, сегодня рассматривается как жизненно важная.)

2) This belief / very / cities / more / sustainable / that / is / should / become / now / widespread. (Убежденность в том, что города должны стать более устойчивыми, сегодня очень широко распространена.)

3) The / the / Paris / Agreement / reached / change. / 2015 / of cities / emphasized / increasing / achieving / importance / for / in / in / global / targets / climate (В Парижском соглашении, достигнутом в 2015 году, подчеркивается возрастающая роль городов в достижении глобальных целей по борьбе с изменением климата.)

4) The term / term / approaches / is / use / improve / umbrella / for / an / a number of / different / that / nature / to / urban / "nature-based solutions" / sustainability. (Термин «природоориентированные решения» является обобщающим для ряда различных подходов, использующих природу для повышения устойчивости городов.)

5) Nature-based / nature. / are / are / solutions / solutions / defined / inspired / supported / as / that / and / by (Природоориентированные решения определяются как решения, вдохновленные и поддерживаемые природой.)

6) Such / bring / efficient / natural / resource / features / through / and / into / more and more / seascapes / solutions / landscapes, / interventions. (Такие решения позволяют привнести в ландшафты и морские пейзажи все больше природных особенностей за счет ресурсосберегающего вмешательства.)

7) multiple benefits / the value / The potential / to be / to provide / nature-based

21

solutions. / seems / key / to / of (Потенциальная возможность получения многочисленных выгод является ключевым фактором, определяющим ценность решений на основе природы.)

8) created / reduced / distributed / is / between / The value / different actors, / from / such as / a Green wall / air pollution. / for installation, / and / the private firm / the local community / that benefits / that instills (Созданная стоимость распределяется между различными субъектами, например, между частной фирмой, которая устанавливает «зеленую стену», и местным сообществом, которое получает выгоду от снижения уровня загрязнения воздуха.)

GRAMMAR

13. Countable/Uncountable Nouns Revision: Can you answer the questions? (you can use the following link https://dictionary.cambridge.org/grammar/british-grammar/nouns-countable-and-uncountable?q=Countable+and+uncountable+nouns+with+different+meanings)**.**

- Do you know the difference between countable and uncountable nouns?
- Can countable nouns be singular or plural? What are the rules for forming the plural of nouns?
- What quantity expressions do you know?
- What determiners for uncountable nouns do you know?
- Do you know some nouns that can be used either countably or uncountably, but with different meanings?
- What are uncountable nouns that are used countably?

a) Find the examples of the countable/uncountable nouns in the text and script in Ex. 8 and Ex. 11.

b) Put the following nouns in singular.

Glasses, resources, emissions, people, goals, cities, impacts, teeth, keys, cargoes, approaches, areas, children, boxes, tomatoes, bushes, feet, mice, trays, leaves, umbrellas, responses, gentlemen, zeros, chiefs, chairs, benefits, brushes, women, greenhouse gases, news, coats, loaves, rivers, challenges, watches, calves, villages, services, tongues, knees, eyes.

c) Put the following nouns in plural.

Branch, action, feature, box, atlas, technology, measure, usage, swine, deer, pie, journey, case, intervention, community, man, knife, ecosystem, sheep, wolf, hero, daughter, property, lie, truth, luck, goose, child, bush, hen, zoo, landscape, roof, park, garden, church,

town, job, interest, policy, business, degree, safe, society, stomach, loaf, valley, value, possibility, capacity, plant, tooth, tool, mountain, dish, pathway, calf, cow, future, progress, process, fun.

d) Make the following sentences plural according to the model. Mind the rules for forming the plural of nouns.

City needs to become more sustainable. – Cities need to become more sustainable.

1) Nature-based solution is an increasingly popular means.
2) He achieves a global target for climate change.
3) The global community protects biodiversity.
4) The most effective response has a benefit.
5) There is an umbrella term for an approach that uses nature to improve urban sustainability.

e) Make the following sentences singular according to the model. Mind the rules for forming the plural of nouns.

Cities need to become more sustainable. – City needs to become more sustainable.

1) Such solutions bring diverse natural processes into cities, landscapes, and seascapes through locally resource efficient interventions.
2) The funded projects are advancing our understanding of how nature-based solutions are currently used.
3) Our assessment tools focus on the ecological benefits of nature.
4) We need new approaches to take these values into account.
5) Municipal governments are important for addressing urban sustainability.

SPEAKING

14. Work individually or in groups, choose one activity and summarize your ideas, after a few minutes share your ideas with the whole class.

1. Create three benefits you think nature-based solutions can provide for urban sustainability.
2. Divide into four groups and assign each group one of the four issues mentioned in the text (assessment methods, business models, governance strategies, innovation pathways). Brainstorm possible solutions or strategies for addressing your assigned issue in the context of nature-based solutions.
3. Think about a specific urban sustainability challenge in your own city or country. Write down how nature-based solutions could be used to address this challenge, including

possible benefits and considerations. Share your ideas in pairs or small groups and discuss the feasibility and potential impact of your proposed nature-based solutions.

WRITING

15. Get Creative with Your Writing!

1. Write a blog post about the importance of nature-based solutions in creating sustainable cities. Use the target vocabulary to explain how these solutions can help mitigate the challenges of climate change and improve environmental sustainability.

2. Compose a series of tweets advocating for the implementation of nature-based solutions in urban areas. Use the target vocabulary to highlight the benefits of using green infrastructure and public spaces to limit heat stress and reduce greenhouse gas emissions.

3. Imagine you are writing an email to a city council member, urging them to invest in rain gardens and permeable surfaces in your community. Use the target vocabulary to explain how these nature-based solutions can improve the resilience of your city and contribute to its economic, social, and environmental sustainability.

Target Vocabulary: cities, landscapes, seascapes, permeable surfaces, rain gardens, limit heat stress, nature-based solutions, NATURVATION, Sustainable Cities, umbrella term, challenges, resilience, widespread, environmental sustainability, climate change, reducing greenhouse gases, public space.

16. Write a blog post / a series of tweets / email (150-200 words) using Ex. 15. You can use the tips and instructions on:
- **how to write a blog post** https://wordpress.com/go/content-blogging/how-to-write-a-good-blog-post/
- **how to write tweets** https://nealschaffer.com/how-to-write-a-tweet-drive-traffic-twitter/
- **how to write professional emails** https://www.youtube.com/watch?v=3Tu1jN65slw

MODULE 1. *WHAT IS SUSTAINABLE URBAN TRANSFORMATION?*

By the end of this module you will be able to:
- identify the main information in texts about sustainable urban transformation;
- guess the meaning of new words/expressions from context;
- use the vocabulary of this unit in speaking and writing;
- distinguish between various types of writing;
- write a a blog post / a comment on a social media post / professional email.

LEAD-IN

Work in groups and discuss the questions. Then briefly tell the class what you have learned. As a warm-up, please try to come up with answers as you understand the questions.
- What do you know about Sustainable Development Goals (SDGs)?
- Why are the United Nations' 2030 Sustainable Development Goals (SDGs) relevant to cities?
- How has the global pandemic affected urban transformation plans that support the SDGs?

If you are not sure, make your best guess and write down any notes and questions you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practice their pronunciation. Translate the examples into Russian.

№	Word/ word collocation	Transcription	Translation	Example
1	**demand**	/dɪˈmɑːnd/	спрос, требование, потребность, запрос	World oil *demand* is booming.
2	**consumption**	/kənˈsʌmp.ʃən/	потребление, расход	The solution to the problem is to reduce the *consumption* of fossil fuels.
3	**target**	/ˈtɑː.ɡɪt/	мишень, цель; объект	Our long-term *target* is to achieve a measure of regional self-reliance, and it is one that deserves the

				support of the developed world.
4	**to stall**	/stɔːl/	останавливать, стопорить, тормозить	Future sanctions may stall even these paltry efforts.
5	**to boost**	/buːst/	помогать выдвинуться, активно поддерживать, способствовать росту популярности	The production and marketing of high-value mountain products can *boost* local mountain economies.
6	**to align**	/əˈlaɪn/	выровнять, выравнивать	To start, companies must *align* their definition of competition with investors.
7	**to gather**	/ˈgæð.ər/	собирать, почерпнуть	In the past we couldn't *gather* the data and analyze it.
8	**to incentivize**	/ɪnˈsen.tɪ.vaɪz/	побуждать; стимулировать; мотивировать	One of the most heated debates involving innovation revolves around how to best *incentivize* people to develop and implement new ideas.
9	**to prioritize**	/praɪˈɒr.ɪ.taɪz/	отдавать предпочтение, определять приоритеты	Having a good grasp of the issues and knowing how to *prioritize* are essential when it comes to decision-making.
10	**convenient**	/kənˈviː.ni.ənt/	удобный, подходящий	Travelling by Swiss public transport is comfortable and *convenient*.
11	**congestion**	/kənˈdʒes.tʃən/	перегруженность, пробка	Many climate-smart investments can also reduce air pollution and *congestion*.
12	**artificial intelligence (AI)**	/ˌɑː.tɪ.fɪʃ.əl ɪnˈtel.ɪ.dʒəns/	Искусственный интеллект	The behaviour of the robot is determined by the set of algorithms, that forms its *artificial intelligence*.
13	**AI-powered chat**		чат на базе искусственного интеллекта	*AI-powered chatbots* are chatbots that employ a variety of AI technologies.
14	**query**	/ˈkwɪə.ri/	запрос, вопрос	*Query* text must not be empty.
15	**digital twins**	/ˌdɪdʒ.ɪ.təl twɪns/	Цифровые двойники	Our engineers conduct virtual tests and participate in the creation of "*digital twins*" of products and their production processes.
16	**to anticipate**	/ænˈtɪs.ɪ.peɪt/	предвидеть, ожидать, предвосхищать	*Anticipate* unfavorable events (tornadoes, attacks, etc.) and react quickly to avoid setbacks.
17	**cybersecurity**	/ˌsaɪ.bə.sɪˈkjʊə.rə.ti/	Информационная безопасность, кибербезопасность	*Cybersecurity* measures can be both secure and usable.
18	**paramount**	/ˈpær.ə.maʊnt/	первостепенный, важнейший	The *paramount* factor affecting human rights is security.
19	**to disrupt**	/dɪsˈrʌpt/	срывать, подрывать, разрывать	These devices are dangerous and can *disrupt* stability in the area.
20	**resilience**	/rɪˈzɪl.jəns/	устойчивочть,	This means that investing in

			сопротивляемость	climate *resilience* creates jobs and saves money.
21	**malefactor**	/ˈmæl.ɪ.fæk.tər/	злоумышленник, правонарушитель, преступник	The victim was able to give a clear description of the *malefactor* to the police.
22	**myriad**	/ˈmɪr.i.əd/	мириады, несчетное число	There are *myriad* tools cyber-criminals use to break into an enterprise security system.
23	**circular economy**	/ˈsɜː.kjə.lər iˈkɒn.ə.mi/	круговая экономика, безотходная экономика	As an innovation, the previous programmes of waste handling and management of the environment have been merged into one *circular economy* programme.
24	**incentive**	/ɪnˈsen.tɪv/	побудительный, стимулирующий	The cash bonus provides a powerful *incentive* to workers.
25	**green bond**	/griːn bɒnd/	Зеленая облигация	The main green finance instrument is a *green bond*.
26	**hand-wringing**	/hænd rɪŋɪŋ/	Отчаяние, выкручивание рук	There is a persistent *hand-wringing* about the low population density, adverse climate and labor shortages.
27	**gambit**	/ˈɡæm.bɪt/	гамбит, уловка, маневр	Each *gambit* consists of three parts: a target, an action, and a priority.
28	**sprawl**	/sprɔːl/	Разрастание, расползание	Suburban *sprawl* contributes significantly to deforestation, reducing the capacity of the planet to absorb the increased CO_2 we emit.
29	**to intimidate**	/ɪnˈtɪm.ɪ.deɪt/	пугать, запугивать; угрожать	Their strategy was to try to *intimidate* us.
30	**vigor**	/ˈvɪɡ.ɚ/	сила, энергия	Power, *vigor*, and competence of potential competitors.

2. Use some of the words from the list above to complete the gaps in the sentences.

1) At the same time the organization have the ability to constantly monitor the demand and _____ of goods and services.
2) Our long-term _____ is to achieve a measure of regional self-reliance, and it is one that deserves the support of the developed world.
3) Another interesting aspect of blockchain-powered cities is how they can _____ citizens to make positive decisions.
4) Professions built on human relationships cannot replace _____.
5) Administrators should _____ problems before they occur.
6) _____ is clearly a field that helps protect and empower people.
7) It has _____ industrial, medical and scientific applications, from the production of biofuels to the development of vaccines.
8) This _____ has never been satisfactorily answered.

27

You can also practice the new vocabulary here
https://stepik.org/lesson/893043/step/1?unit=897988

READING

3. Before reading the text, discuss the following questions. Then correct them if you were not right.

1) According to the Deloitte study, what are some key urban transformation trends that cities need to align their planning with by 2030?
2) What percentage of total city emissions do buildings currently account for?
3) How can digital technology help improve building efficiency and develop sustainable solutions?
4) What factors should cities consider to ensure a successful transition to cleaner mobility?
5) Why is cybersecurity important for cities as they adopt more digital technologies?

4. Match the picture and the name of up-to-date innovations.

| digital twin | digital technology | autonomous vehicle |
| AI-powered chat assistant | artificial intelligence | carbon reduction |

1 _____   2 _____   3 _____

4_____   5_____   6_____

5. Match the verbs with the synonym from the text (in bold).

1) to retard
2) to move forward
3) to set in a line
4) to pick up
5) to tend to

6) to tend to
7) to stimulate
8) to look forward to
9) to break
10) to start out

6. Make word combinations and then use them to complete the definitions.

a)

1) urban transformation	1) plan
2) Sustainable Development	2) technology
3) climate	3) vehicle
4) digital	4) intelligence
5) carbon	5) Goals
6) autonomous	6) twin
7) artificial	7) privacy
8) digital	8) waste
9) data	9) change
10) non-recyclable	10) reduction

b)

1) _____ means a set of planning measures and requirements which significantly change the features of built-up part of a building area by changing the urban network of public areas, purpose and shape of construction works and/or arrangement, shape and size of building plots.

2) The _____ are a collection of seventeen interlinked objectives designed to serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future": no poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; partnerships for the goals.

3) _____ is the significant variation of average weather conditions becoming, for example, warmer, wetter, or drier, over several decades or longer. It is the longer-term trend that differentiates climate change from natural weather variability.

4) _____ are electronic tools, systems, devices and resources that generate, store or process data. Well known examples include social media, online games, multimedia and mobile phones.

5) _____ projects can either remove carbon emissions from the atmosphere or prevent carbon emissions from being released into the atmosphere.

6) An _____ is a car capable of sensing its environment and operating without human involvement.

7) _____ is the simulation of human intelligence processes by machines, especially computer systems.

8) A _____ is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision making.

9) _____ is the ability of individuals to control their personal information.

10) _____ is waste that can't be recycled, or isn't biodegradable can be used as fuel

in EfW (energy from waste).

7. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

global consumption	Sustainable Development Goals	urban transformation
environmental challenges	prioritize	incentivize
convenient future	lower congestion	autonomous vehicle
artificial intelligence	dynamic replica	cybersecurity and data privacy

8. Read the text and find answers to questions in Ex. 3.

PLANNING WITH A PURPOSE:
URBAN TRANSFORMATION AND SUSTAINABILITY

By 2030, urban areas are projected to house 60% of the world's population, account for three-quarters of total global energy **demand**, and comprise 81% of global **consumption**. Clearly, the future is urban.

So it's to be expected that, as the world becomes more urban, the United Nations' 2030 Sustainable Development Goals (SDGs) include a **target** devoted to "Sustainable Cities and Communities." And with the remaining targets of critical import to cities, it's also no surprise that a study of 167 cities worldwide found that 77% included SDGs in their planning.

It's true that the global pandemic has **stalled** many urban transformation plans that support the SDGs. But with the crisis comes an opportunity to **boost** a sustainable economic recovery that leads to a better normal. That is, the chance to shape the recovery to address social, economic, and environmental challenges. To do this, cities will need to **align** their planning with some key urban transformation trends by 2030, as outlined in the Deloitte study, Urban Future with a Purpose: 12 trends shaping the future of cities. Supported by insights from experts – Including mayors, urban planners, international organizations, and urban policy institutions – the study identifies where cities need to focus their efforts and resources to achieve truly sustainable cities.

Trending toward transformation

The trends impacting cities range across the ESG spectrum – from green planning to inclusive services. While all are critical, a few trends that focus on the large challenges of climate change and the use of digital technology have the potential to reinforce and support objectives across the board. Shared below, these trends can help a city set itself up for future progress.

Buildings and Infrastructure

Buildings are currently responsible for 30% to 40% of total city emissions. To achieve the goal of keeping temperature rise below 1.5 degrees Celsius by 2050, emissions from buildings must be 80% to 90% lower than they are today. Buildings will need to make the most of digital technology that can improve building efficiency as well as enable the **gathering** and sharing of data that can be used to develop sustainable solutions. Cities should also stimulate and **prioritize** sustainable renovation, construction, and restoration to ensure carbon reduction and **incentivize** the use of sustainable materials.

Mobility

Innovative urban mobility and planning solutions help to create a **convenient**,

connected, user-friendly, and sustainable urban future. COVID-19 highlighted this need, with its demand for more walking and cycling spaces that allowed for physical distance as well as the very real lesson that fewer cars on the road meant lower pollution and **congestion**. But cities must consider some critical factors to ensure a successful transition to cleaner mobility. This includes understanding the total mobility mix and finding ways to manage the entire transport system as well as investing in the necessary infrastructure and uptake of new technologies such as autonomous vehicles.

Artificial intelligence

An increasing range of cities' operations can be performed and powered by process automation and **artificial intelligence (AI)** – promoting both operational efficiency and improved decision-making. For example, **AI-powered chat** assistants that can handle simple **queries** and tasks for the public can allow city employees more time to focus on providing more effective social and environmental services. Machine learning and **digital twins** – dynamic replicas of a city's physical assets – can be used for urban planning purposes, **anticipating** and measuring the impact of each decision on the environment and overall sustainability. To successfully implement, however, cities need to balance AI with the protection of civil liberties and institute measures that build public trust as to the use of personal data.

Cybersecurity

With the increased use of digital technologies as described above, cybersecurity and data privacy will be of **paramount** importance for cities. The consequences of a cyber incident are significant and could extend well beyond data loss to include financial impact, reduced social trust, and **disrupted** city services and infrastructure. To develop the **resilience** critical to complex and integrated digital systems, cities must develop a professional, methodical, and long-term approach to cybersecurity. They should also respond to **malefactors** by drawing on the insights provided by the **myriad** connected individuals and devices.

Circular economy

Waste within cities is a major offender when it comes to sustainability: on average a car is parked more than 90% of the time, an office used only 35-50% of the time. Thirty percent of food is wasted. To combat this waste, cities are adopting circular models based on a healthy circulation of resources and the principles of sharing, re-use, and restoration. Cities can encourage a circular economy by financing investment in locally produced energy via municipal and **green bonds** or providing **incentives** through regulation, such as tariffs on non-recyclable waste.

No time for hand-wringing

Building sustainable cities that meet the SDGs will require collaboration across the entirety of the urban ecosystem. And the challenges run the economic, social, and environmental **gambit**: deficits, segregation, urban **sprawl**, pollution – the list goes on.

But leaders can't be **intimidated** by the scope of the issue. Rather they need to learn from the pandemic and **tackle** these challenges with renewed **vigor**. Identifying and understanding the trends impacting cities can help urban leaders and city planners not only plan for 2030 but do so with a sense of purpose.

Source: https://www.forbes.com/sites/deloitte/2023/05/10/ai-and-the-future-of-government/?sh=3ffd83423c64 *(accessed 30.11.2023)*

Reading comprehension tasks

9. True or False? Correct the false statements, or add information to the correct statement to support the idea.

1) By 2030, urban areas are projected to house 70% of the world's population.
2) The United Nations' 2030 Sustainable Development Goals (SDGs) do not include any targets related to "Sustainable Cities and Communities.
3) A study of 167 cities worldwide found that only 23% included SDGs in their planning.
4) The global pandemic has accelerated urban transformation plans that support the SDGs.
5) The Deloitte study, "Urban Future with a Purpose: 12 trends shaping the future of cities," was conducted by experts including mayors, urban planners, international organizations, and urban policy institutions.
6) Buildings are responsible for 30% to 40% of total city emissions.
7) To achieve the goal of keeping temperature rise below 1.5 degrees Celsius by 2050, emissions from buildings must be 80% to 90% lower than they are today.
8) COVID-19 has shown that more cars on the road lead to lower pollution and congestion.
9) Artificial intelligence (AI) can be used to improve operational efficiency and decision-making in cities.
10) Cybersecurity and data privacy are not significant concerns for cities as they adopt digital technologies.

VIDEO

10. Look through the script for a video from *Coursera MOOC*. Before watching the video, think of the words or word combinations that may be used to complete the gaps. Then watch the video and check if you were right.

SUSTAINABLE URBAN TRANSFORMATION

The 21st century has been called the Urban Century by UN-Habitat, which is the United Nations agency responsible for sustainable human _____ (1). This is not only because more and more people are living in cities. In fact, over 50% of the global population now lives in **urban** areas, and this trend will continue. It's also because of the strategic importance of cities in relation to sustainable development and the green economy.

Furthermore, it's **increasingly** recognized that policies by international bodies and national governments need to be **implemented** at the city level to have an **impact**. Cities play a dominant role in global **consumption**, production, and **pollution**. And they are associated with some big problems like air pollution, _____ (2), **waste**, and **poverty**.

But the concentration of population, activities, and resource use in cities also brings potentials for important efficiency increases, as well as for multi-purpose solutions,

combining different **sustainability** goals. Cities are also centers of innovation and creativity, where **incredible** change is possible.

The _____ (3) of sustainable urban transformation **places a strong emphasis on** structural transformation processes that are **broad**, multi-**dimensional**, and have a potential for radical change. These processes can effectively direct urban development towards sustainability. It also means understanding cities as a source of possibilities for sustainability, promoting active collaboration among diverse_____ (4), and integrating different perspectives and bodies of knowledge and expertise.

There are three key areas to discuss when it comes to sustainable urban transformation: _____ (5) and planning, innovation and business, and lifestyles and consumption. When we talk about governance, we mean the act of **governing**, rather than government itself. Governance involves multiple public and private actors in debates, conflicts, and power **struggles**, as well as interactions between international, national, regional, and local levels. It also relates to processes and decisions that **seek** to define actions, grant power, and verify performance.

Government refers to formal structures or systems by which a state or territory is organized and _____ (6). Effective strategic planning and the integration of policy instruments is very important. Such efforts should be interconnected across sectors and be adapted for specific urban and national policy conditions to ensure **empowerment**, **engagement**, and collaboration of relevant stakeholders. But for strategic planning to be effective, there are three key policy challenges that have to be taken into account.

Policies must be ambitious, but politically and economically realistic. Policies must be developed quickly and with **flexibility** for **rapidly** changing urban conditions, and contradictory policies have to be eliminated. There are also significant challenges in **reconciling** economic growth and maintaining or **restoring** the local and global environment.

Innovation and clean technology are a key part of a green economy, but also for **fostering** urban _____ (7) in a globalizing economy. Sustainable urban economic development must encourage symbiotic relationships among industries, governments, universities, and citizens to ensure sustainable management of human ecological and economic capital. The negative **implications** of over-consumption are particularly evident in cities.

UN-Habitat suggests that harmony within cities **hinges** not only on **prosperity** and its benefits, but on two **pillars** that make **harmony** possible: _____ (8) and sustainability. By defining an improved quality of life and creating visions of sustainable lifestyles, it will be possible to outline how to design, support, and govern more sustainable cities where people have a good life. **Intelligently** designed cities can respond to the major environmental, social, and economic challenges of the 21st century.

We have many great examples here in Scandinavia, like Copenhagen, Stockholm, and Malmö. _____ (9), or the World Wide Fund for Nature, concludes, depending on how we develop and manage our urban infrastructures during the next three **decades**, they could become either a force for environmental destruction or a primary source of ecological _____(10). Cities therefore represent both a complex challenge and an amazing opportunity for greening our economies and advancing sustainable development.

Source: https://www.coursera.org/learn/gte-sustainable-cities/lecture/hbCx5/sustainable-urban-transformation (accessed 18.11.2023)

What new facts are mentioned in the video compared to the text in Ex. 8?

VOCABULARY

11. True or False? Correct the false statements, or add information to the correct statement to support the idea (check against the video script).

1) Over 50% of the global population currently lives in urban areas.
2) Sustainable urban transformation focuses on narrow, one-dimensional changes.
3) Cities are associated with problems such as air pollution, greenhouse gas emissions, waste, and poverty.
4) Sustainable urban transformation encompasses three key areas: governance and planning, innovation and business, and lifestyles and consumption.
5) Policies for sustainable urban transformation must be ambitious, but politically and economically realistic.
6) Innovation and clean technology are not important for fostering urban competitiveness.
7) Harmony within cities depends on prosperity, equity, and sustainability.
8) Intelligently designed cities can address the major challenges of the 21st century.
9) WWF believes that urban infrastructures have no impact on environmental destruction or ecological rejuvenation.
10) The United Nations agency responsible for sustainable human settlements is called UN-Habitat.

GRAMMAR

12. Pronouns Revision: Can you answer the questions? You can use the following links:
https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/pronouns ;
https://usefulenglish.ru/miscellany/types-of-pronouns

- What types of pronouns do you know?
- Why are pronouns important in grammar?
- What are the most common types of pronouns?
- What are noun pronouns and their use?
- What are adjective pronouns and their use?
- Do you know forms and properties of pronouns?
- When do we use relative pronouns?

a) Find the examples of the English pronouns in the text and script in Ex. 8 and Ex.10.

b) Identify the type of pronouns in bold. Translate the sentences into Russian.

1) **They** play a dominant role in global consumption, production, and pollution.
2) By 2030 cities will need to align **their** planning with some key urban transformation trends.
3) We didn't incentivize the use of sustainable materials **ourselves**. **Someone** else did **it** for **us**.
4) **He** called for an end to the data loss in a city, **where** the authorities were doing **their** utmost to ensure the cybersecurity.
5) **These** trends can help a city set **itself** up for future progress.
6) **What** should cities prioritize to ensure carbon reduction?
7) Urban and rural areas should incentivize **each other** the use of sustainable materials.
8) **There** is an opportunity to boost a sustainable economic recovery.
9) **They** need to learn from the pandemic and tackle **these** challenges with renewed vigor.
10) **It**'s true that **it** has stalled many urban transformation plans that support **them**.

SPEAKING

13. Make sentences using these words.

1) UN-Habitat / agency / responsible
2) half / world's / population
3) trend / urbanization / continue
4) crucial / sustainable / development
5) international / national / policies
6) influence / global / consumption
7) major / role / production
8) Urban Century / 21st century / referred
9) strategic / important / cities
10) percentage / people / living

WRITING

14. Get Creative with Your Writing!
Use at least 5 target vocabulary words in your writing.

1. Write a blog post discussing the crucial role of cities in sustainable development and the responsibility of governments to implement policies for sustainable urban transformation.

2. Imagine you are a city planner and write an email to your colleagues discussing the implications of population growth on sustainability in your city.

3. As a concerned citizen, write a comment on a social media post by your local government discussing their recent initiative to promote sustainability in the city.

Target Vocabulary: responsible, population, crucial, increasingly, implement, consumption, sustainability, incredible, Government, govern, flexibility, implication, prosperity, pillar, hinge.

15. Write a blog post / a comment on a social media post / email (100-150 words) using Ex. 14. You can use the tips and instructions on:

- **how to write a blog post** https://wordpress.com/go/content-blogging/how-to-write-a-good-blog-post/

- **how to write a comment on a social media post** https://learnenglish.britishcouncil.org/skills/writing/a1-writing/social-media-posts ; https://sproutsocial.com/insights/social-media-comments/

- **how to write professional emails** https://www.youtube.com/watch?v=3Tu1jN65slw

MODULE 2.   *WHAT IS THE URBAN GREEN?*

By the end of this module you will be able to:
- extract specific and detailed information about Urban Green;
- infer the meaning of unknown words from context;
- analyse and use appropriate language of this unit in speaking and writing;
- create and organise a project.

LEAD-IN

Work in groups and discuss the questions. Then briefly tell the class what you have learned. As a warm-up, please try to come up with answers as you understand the questions.

- What do you know about the Urban Green?
- Do you know how leading green cities around the world are responding to the environmental challenges?
- What is GDP?

If you are not sure, make your best guess and write down any notes and questions you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practise their pronunciation. Translate the examples into Russian.

№	Word/ word collocation	Transcription	Translation	Example
1	**challenge**	/ˈtʃælɪn(d)ʒ/	вызов, проблема	Learning a new language is always a *challenge*.
2	**irreversible**	/ɪrɪˈvɜːsɪb(ə)l/	необратимый, нереверсивный, неотменяемый, не подлежащий отмене	Fossil fuels have caused *irreversible* damage to the environment.
3	**to stem from sth**	/stem/	быть вызванным, являться следствием	Her success *stems from* hard work.
4	**array**	/əˈreɪ/	масса, множество, совокупность, набор, комплект	He faced a whole *array* of problems.

5	**inspirational**	/ˌɪnspɪˈreɪʃ(ə)n(ə)l/	вдохновляющий, воодушевляющий, вдохновенный	She had a sudden *inspiration*.
6	**to strive**	/straɪv/	стараться, бороться, прилагать усилия	They continue to *strive* toward their goals.
7	**livable**	/ˈlɪvəbl/	уживчивый, пригодный для жилья, терпимый; сносный; приемлемый	We need to do more to make the neighborhood more *livable*.
8	**scale**	/skeɪl/	масштаб, шкала, гамма, размер, уровень	to stimulate wide *scale* change
9	**struggle**	/ˈstrʌg(ə)l/	борьба, усилие, напряжение	Maths is a real *struggle* for her.
10	**GDP (Gross domestic product)**	/grəʊs/ /dəˈmestɪk/ /ˈprɒdʌkt/	ВВП (валловой внутренний продукт)	*GDP* is a monetary measure of the market value of all the final goods and services produced in a specific time period by countries.
11	**to shift**	/ʃɪft/	перемещать; передвигать; перекладывать	to *shift* from fossil fuel towards renewable energy
12	**thirdly**	/ˈθɜːdlɪ/	в-третьих	We have to look *thirdly*
13	**biodiversity**	/ˌbaɪə(ʊ)daɪˈvɜːsɪtɪ/	биоразнообразие, биологическая вариативность	A high level of *biodiversity* is desirable.
14	**tremendous**	/trɪˈmendəs/	огромный, потрясающий, громадный	We're missing out on a *tremendous* opportunity.
15	**inflow**	/ˈɪnfləʊ/	приток, наплыв, впуск	Energy *inflow*
16	**outflow**	/ˈaʊtfləʊ/	утечка, выход, вытекание	*outflow* of capital
17	**Vancouver**	/vænˈkuːvə/	Ванкувер (город в Канаде)	From 1971 to 1976, West *Vancouver* experienced zero population growth.
18	**vibrant**	/ˈvaɪbr(ə)nt/	вибрирующий, трепещущий, дрожащий, живой, полный жизни, сил, энергии	*vibrant* private sector
19	**to campaign**	/kæmˈpeɪn/	проводить кампанию; агитировать; выступать в поддержку	Jones ran a good *campaign*.
20	**to marry**	/ˈmærɪ/	соединять, сочетать	How to *marry* a government to the residents
21	**the Urban Green**	/ˈɜːb(ə)n/ /griːn/	Городская зеленая зона	*Urban green* space is defined as all urban land covered by

			vegetation of any kind. This covers vegetation on private and public grounds, irrespective of size and function, and can also include small water bodies such as ponds, lakes or streams ("blue spaces").

2. Use some of the words from the list above to complete the gaps in the sentences.

1) Finding a solution to this problem is one of the greatest _____ faced by scientists today.
2) If we don't mend our ways, they say, climate change will soon be _____.
3) Their disagreement _____ from a misunderstanding.
4) The quote she read was a great source of _____.
5) The rent in this area is affordable making it a very _____ neighborhood.
6) The country's _____ has been steadily growing over the past decade.
7) Their teamwork resulted in a _____ success for the company.
8) Due to the economic crisis, there has been a significant _____ of immigrants from this country.
9) The government is implementing policies to encourage the _____ of foreign investments.
10) The city's art scene is very _____, with new exhibitions and events happening every month.
11) The _____ project aims to add more green spaces in the city to improve air quality.

You can also practice the new vocabulary here
https://stepik.org/edit-lesson/893048/step/1

READING

3. Before reading the text, discuss the following questions.

1) What are communities around the world currently faced with?
2) What is already being developed and implemented in cities around the globe?
3) What does a doubling of the global earth infrastructure depend on in the next 30 years?
4) How many the global GDP will be invested in urban infrastructure and its use over the next 30 years?
5) What are the three main actions that cities have to take?
6) What is one of the most ambitious climate action plans and where has it been adopted?
7) What are ten targets of an action plan to make Vancouver the world's greenest city by

2020?
8) What is really the innovation?
9) Is it possible to create a fossil fuel-free city?
10) What is a new goal of residents of Vancouver?

4. Match the word with the synonym from the text (in bold).

1) to come across
2) to be due to
3) not liable to variation
4) quantity
5) inhabitable

6) fighting
7) gigantic
8) full of life
9) to go out on an election trail
10) to joint

5. Make word combinations and then use them to complete the sentences.
a)

1) outflows of
2) an array
3) vibrant and inclusive
4) to shift from fossil fuel
5) a number of
6) irreversible
7) to marry a government
8) urban challenges
9) GDP
10) to create

a) large scale environmental challenges
b) climate changes
c) of concrete solutions
d) livable and sustainable cities
e) will be invested in urban infrastructure
f) towards renewable energy
g) are tremendous
h) energy
i) neighborhoods
j) to the different civil society groups

b)
1) _____ of energy from outdated and inefficient buildings contribute significantly to greenhouse gas emissions.
2) The city has implemented an _____ of concrete solutions such as energy-efficient infrastructure and renewable energy sources.
3) The goal is to create _____ and inclusive neighborhoods where people can live, work, and play in harmony with nature.
4) It is crucial for cities to shift from fossil fuel towards _____ in order to combat climate change.
5) Urban challenges are _____, but with the help of innovative solutions we can turn them into opportunities for a greener future.
6) Many _____ changes could have been prevented if cities had taken action earlier.
7) Our city has successfully _____ the government to different civil society groups to create a strong and united front in the fight against air pollution.
8) The _____ invested in urban infrastructure will greatly impact the city's ability to create a sustainable and livable environment for its citizens.
9) In order to create truly _____ cities, we must invest in the well-being of our

communities, not just economic growth.

10) With a strong focus on sustainability, our city is taking bold steps to create _____ cities for generations to come.

6. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

tremendous environmental challenges, irreversible climate change, an array of concrete solutions, inspirational journey, livable and sustainable cities, the global earth infrastructure, a sustainable and resilient way, biodiversity, vibrant and inclusive neighborhoods

7. Read the text and find answers to questions in Ex. 3.

URBAN GREEN

Communities around the world are currently faced with a number of large scale environmental **challenges** including dangerous **irreversible** climate change. Many of these challenges **stem** from cities and are resource intensive lifestyles.

Fortunately, an **array** of concrete solutions to these challenges are already being developed and implemented in cities around the globe. So we set of on an **inspirational** journey to explore the most innovative ideas, technologies, and initiatives being used by cities today as they **strive** to create more **livable** and sustainable cities. And with the potential to stimulate wide **scale** change, which would set us on the path towards a one-planet future where humans live in harmony with nature.

The **struggle** for a sustainable future on this planet will be won or lost in our cities. In the next 30 years we expect a doubling of the global urban population. With that, a doubling of the global earth infrastructure. That is a very short window of opportunity to get things right. So urban investment decisions taken today will determine whether people will be locked into resource inefficient and fossil fuel dependent infrastructure and lifestyles, or if they will enable cities to become places where we can live attractive and healthy and sustainable lives.

Over the next 30 years, more than five times the global **GDP** will be invested in urban infrastructure and its use. So it's critical that those investments are made in a sustainable and resilient way.

A number of actions that cities have to take, and actually take together is first of all to try to become low carbon, to **shift** from fossil fuel towards renewable energy, secondly, to become resilient. We are going to face the impacts of climate change. They will be different from one part of the world to the other part. We have to look **thirdly** into how can our existing ecosystems, our **biodiversity** we have in urban areas. How can that support us in our sustainability?

Well the urban challenges in the world are **tremendous**. I mean, we'll soon have 75% of the world population living in cities. I would argue that the number one challenge for cities is actually not inside the city, it's to recognize that it has to be sustainable in its entire **inflows** and **outflows** of energy, of water, of food, of all materials. So to see itself like a part of a

wider ecosystem, so that you plan every urban area, for every citizen. That it keeps itself within a circular economic model in terms of resources in and out. And the second most important thing is build resilient cities.

So how are leading green cities around the world responding to this enormous challenge? One of the most ambitious climate action plans has been adopted by the city of **Vancouver**, whose goal is to run the city on 100% renewable energy by 2050.

Vancouver's plan focuses on **vibrant** and inclusive neighborhoods. Creating a city that meets the needs of generations to come. They intend to achieve this by working with a broad range of stakeholders throughout society. When I first **campaigned** for mayor in 2008, one of my key priorities was to make Vancouver the world's greenest city by 2020, so we put together an action plan, worked with citizens and businesses and neighborhoods. We put together ten targets in water, food clean air, green business, green jobs, reducing our carbon, reducing our consumption, and zero waste.

At the beginning, we were worried this was too much for people, that they wouldn't be able to see a point of entry into it, and we were totally wrong. We've had over 35,000 residents, 180 organizations who engaged in writing our plan. Tens of thousands of residents who've been involved in implementing, because when they write the plan, they own the plan.

And as a result we've had over 150 separate city policy initiatives that range from big farms in the middle of a dense city like Vancouver, waste recovery that we've had. We've had technology that we're doing, and green economy.

We've raised green jobs by 19%. We've reduced our water usage by 18%. Greenhouse gas emissions are way down, because many more people are biking and walking and taking transit. But it's really the innovation, is how you **marry** a government to the residents, to the businesses, to the different civil society groups, and make it a collective effort. Creating a fossil fuel-free city is possible, but requires a shift to green energy in all areas.

Our new goal is to be 100% renewable in the city of Vancouver with all of our energy sources. It will be a challenge with transportation in particular. We don't know when we will have electric vehicles for the whole city. We're waiting on the industry side to get a clear sense of what year that's possible. We're planning out the timeline right now, basically making decisions to eliminate fossil fuels from our city.

Source: https://www.coursera.org/learn/gte-sustainable-cities/lecture/zDw0J/the-urban-green-part-1 *(accessed 30.11.2023)*

Reading comprehension tasks

8. Match the words with the correct definition of the word as it is used in the article.

1)	a biodiversity	a)	a new or difficult task that tests somebody's ability and skill
2)	inspirational	b)	that cannot be changed back to what it was before
3)	vibrant	c)	providing exciting new ideas; making somebody want to create something, especially in art, literature or music
4)	tremendous	d)	a group or collection of things or people, often one that is large or impressive

5) a challenge	e) to move from one setting or context to another
6) irreversible	f) the existence of a large number of different kinds of animals and plants which make a balanced environment
7) an array	g) extremely good or very great
8) to marry	h) the movement of a lot of money, people or things into a place from somewhere else
9) to shift	i) full of life and energy
10) an inflow	j) to combine two different things, ideas, etc. successfully

9. Read the article again and continue the following statements.

1) Many environmental challenges stem from …
2) An array of concrete solutions to environmental challenges are …
3) Urban investment decisions will determine …
4) The global GDP will be …
5) A number of actions that cities have to take are …
6) The urban challenges in the world are…
7) We'll soon have 75%   …
8) The number one challenge for cities is …
9) Vancouver's plan focuses on …
10) Creating a fossil fuel-free city is …

VIDEO

10. Match the picture and the urban term.

| fossil fuel | traffic congestion | solar panels | city-dwellers |
| light rail networks | | low-density suburban | |

1 _____

2 _____

3 _____

4_____

5_____

6_____

11. Look through the script for a video from *Coursera MOOC*. Before watching the video, think of the words or word combinations that can be used to complete the gaps. Then watch the video and check if you are right.

SUSTAINABLE CITIES

My name is James Evans. I'm a professor at the University of Manchester and a visiting researcher here at the University of Lund. My research focuses on urban sustainability. Particularly, I'm interested in how cities learn to become more sustainable through staging experiments with new ways to develop.

Sustainable cities provide people with a high quality of living environment without using huge amounts of natural resources. Sustainability involves finding ways to design cities that makes them good places to live as well as being more efficient. Luckily, there are lots of ways to do this.

Amsterdam is a great example of a more sustainable city. In the 1970s they decided to promote cycling as the primary mode of transport in the city, to deal with growing _____ (1) and a **spate of road deaths**. Unlike _____ (2), cycling doesn't require _____ (3), it takes up far less space and it improves people's health. As a result of this, the city can be less **spread out**, the air quality is better, and the quality of life is improved because the streets are safer for _____ (4) to walk along and for children to play in.

Cycling is a great example of how something that is more sustainable also produces more attractive places and a better quality of life for the _____ (5). In terms of energy in cities, reducing **reliance** on the burning of fossil fuels is really the critical challenge, the sustainability. Cities are primarily trying to reduce energy use in buildings and for transport by using new technologies and by changing the ways in which people **behave** in cities. Cities are also becoming places that produce their own renewable energy, for example, by encouraging homeowners to install _____ (6) on their roofs or **subsidizing** the use of renewable technologies like _____ (7).

The key activities on mobility in cities essentially involve getting people out of their cars by promoting other forms of transport. This is things like active transport, cycling, walking, but also through investing in mass transport, _____ (8), bus networks, and so on. Which are more efficient than cars, in terms of taking up less space and using less fuel per **passenger mile**. The thing that **fascinates** me in relation to mobility is how the way in which a city is planned influences the ways in which people have to use it and get around.

So in the USA, in the 1970s and 1980s, cities really **sprawled** across large areas, and you had this spread of _____ (9) housing, of course you have really huge areas. This created a lower population density and huge distances. And one of the results of that was that public transport, buses, railways and so on, were completely **uneconomical**. Just couldn't **justify** spending money creating that infrastructure for so few people.

The result of this, essentially was that motor cars, individually owned motor cars, became the only way to get around. You had huge highways, super _____ (10) spending four hours **commuting** each way to work and so on. So one of the best ways to make cities more sustainable is to avoid that. To make sure that new urban developments are relatively high density, and through building cities like that **facilitating** more sustainable forms of mobility.

Buildings use the majority of energy in cities, and this applies equally whether we're in a cold climate or in a hot climate. In cold climates buildings use a lot of energy for heating, but in warmer climates air conditioning is also a major consumer of energy. So a key priority for cities is to encourage more energy-efficient buildings. This can be done by requiring new buildings to be designed in different ways, for example to make more use of passive heating and cooling, in cold climates that might involve orienting buildings so they capture more natural sunlight. Another issue is around **retrofitting** older buildings that maybe aren't that efficient in terms of insulation with new technologies so that they meet higher standards.

Government is what we often think of when we think of more traditional forms of politics. So government involves a body of people voting for a politician who then makes laws and policies that we live by until the next election. By contrast, governance involves a greater range of people in the process of developing laws and policies and making decisions.

It recognizes that effective responses to tricky challenges like climate change, which we've never dealt with before, require the input, opinions and buy-in from a far wider range of groups, if they're going to be successful. In cities, this effectively means that any groups who might be affected by a decision or a development, should be involved in all the stages of decision making.

Making cities more sustainable is crucially important. Cities produce three quarters of the world's greenhouse gas emissions, they're home to well over half the world's population right now. By the end of this century that proportion will rise to around three quarters. That equates to about another two and a half billion **city-dwellers**, many of whom will be living in new cities in Asia. So in terms of protecting the world's environment, limiting global warming to that two degrees C, decarbonizing our cities so that they are more sustainable is perhaps the most critical challenge that we face.

Source: https://www.coursera.org/learn/gte-sustainable-cities/lecture/9Kwek/sustainable-cities *(accessed on 30.11.2023)*

What new facts are mentioned in the video compared to the text in Ex. 7?

VOCABULARY

12. Match the words with the correct definition of the word as it is used in the article.

1)	congestion	a)	the state of being crowded and full of traffic
2)	to spread out	b)	to strew or distribute over an area
3)	pedestrian	c)	a person walking in the street and not travelling in a vehicle
4)	reliance	d)	the state of needing somebody/something in order to survive, be successful, etc.
5)	solar panel	e)	a piece of equipment, often on the roof of a building, that uses light and heat energy from the sun to produce hot water and electricity
6)	to subsidize	f)	to give money to somebody or an organization to help pay for something
7)	to fascinate	g)	to attract or interest somebody very much
8)	to sprawl	h)	to go, come, or spread in a rambling or

irregular way

9) suburb   i)   an area where people live that is outside the centre of a city

10) commuter   j)   a person who travels into a city to work each day, usually from quite far away

13. Match words 1-10 to words a-j to form collocations. Try to do it without looking at the text. Translate the collocations into Russian.

1)	urban	a)	sustainability
2)	new ways	b)	to develop
3)	to provide people	c)	with a high quality of living environment
4)	to promote cycling	d)	as the primary mode of transport in the city
5)	traffic	e)	congestion
6)	reducing reliance	f)	on the burning of fossil fuels
7)	to reduce energy use	g)	by using new technologies
8)	light rail	h)	network
9)	a lower population	i)	density
10)	buildings use	j)	a lot of energy for heating

GRAMMAR

14. Modal Verbs Revision: Can you answer the questions? (you may use the following link
https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/modal-verbs;

https://dictionary.cambridge.org/grammar/british-grammar/modal-verbs-and-modality?q=Modal+verbs+and+modality**).**

- What do you know about modality?
- How can you express certainty, possibility, willingness, obligation, necessity and ability?
- What are the main verbs we use to express modal meanings?
- What are other words and expressions in English, apart from the main modal verbs, which also express modal meanings?

a) Find the examples of the countable/uncountable nouns in the text and script in Ex. 7 and Ex.10.

b) Choose the most appropriate answer for expressing ability.

1)   A sustainability researcher **may / can / could / has to** type 80 words per minute.

2) City-dwellers *may / can / could / has to* speak French and German.

3) The city authorities say that the residents *could / can / will be able to / will have to* use solar panels in half a year.

4) I *would / should / could / can* meet the Sustainability Conference participants at the airport tomorrow.

5) I'm sure that commuters *won't be able to / won't have to / ccouldn't / can't* spend four hours commuting each way to work.

6) Pedestrians *mightn't be able to walk / mightn't have been able to walk / couldn't have walked / couldn't walk* boldly along the streets when they were younger.

7) One of the boys *was able to / could / might / had to* get out of the cave. He ran to the village for help.

8) Several social services *could / might / managed to / had to* implement key urban mobility activities.

9) I wanted to talk to a city authority yesterday, but I *couldn't / might not / wouldn't / didn't* find him.

10) Anyone *is able to / could / can / may* make a mistake.

c) Choose the most appropriate answer to express the idea specified in parentheses.

1) You *may not / must not / don't have to / had better not* commute there with me. I can handle it; it's not difficult. (Absence of necessity)

2) *Could you / Can't you / Would you mind / Why don't you* produce your own renewable energy? (Request)

3) I *must not / should not / may not / can't* give you a lift to the station. My car broke down yesterday. (Ability)

4) I don't know what to do. – You *are able to ask / could ask / must ask / have to ask* your city authority for advice. (Suggestion)

5) He didn't go to the park with us yesterday because he *should / must / had to / could* write a Greenhouse gas emissions report. (Necessity)

6) Vancouver officials have released a plan that focuses on vibrant and inclusive neighborhoods. You *may have seen / must have seen / were able to see / could see* it! (Strong probability)

7) You *had better pay / should pay / ought to pay / should have created* a fossil fuel free city two decades ago. (Advice)

8) I don't know how to help you. Try asking civil authorities for help. They *must / have to / might / will* be able to find a solution. (Possibility)

9) I *had to / was able to / used to / could* cycle every day when I lived in Amsterdam. (Repeated action in the past)

10) Making cities more sustainable is crucially important. So we *must / should / may / are able to* subsidize the use of renewable technologies like ground heat pumps. (Strong probability)

LISTENING

15. Listen to the audio and answer the questions. After you finish, click 'check' and 'get result!' to see your score for the whole test https://ielts-up.com/listening/ielts-listening-sample-7.4.html

SPEAKING

16. Work individually or in groups, choose one activity and summarize your ideas, after a few minutes share your ideas with the whole class.

1. Think and share your ideas on how you can contribute to creating a sustainable city. Discuss the feasibility and benefits of each idea with a partner or in small groups.

2. Split into two groups and assign each group a role, one group representing the city council and the other group representing the residents. Discuss and come up with three sustainable initiatives or policies you would propose or support in your city. Present your ideas, explain your reasoning and persuade the other group to support their proposals.

3. Create a list of sustainable technologies or practices, such as solar panels, electric vehicles, recycling programs, and energy-efficient buildings (you may use texts of this unit). Write a short paragraph explaining the importance and benefits of one of the items on the list. Share and discuss your paragraphs with a partner, in small groups or in the class.

WRITING

17. Get Creative with Your Project!

Personal project topics:
1. How living in a sustainable city has positively impacted my lifestyle and choices.
2. My experience volunteering for a community garden project in my sustainable city.
3. The role of public transportation in creating a more sustainable city and how it has affected my daily commute.
4. My journey of reducing waste and living a more eco-friendly lifestyle in a sustainable city.
5. How sustainable city initiatives have brought my community together and fostered a sense of environmental responsibility.

General project topics:
1. Sustainable cities are often seen as a solution to the environmental challenges facing our planet. To what extent do you agree or disagree with this opinion?
2. Some people argue that sustainable cities are too expensive and not feasible for all communities. Do you think this is a valid concern?
3. The use of renewable energy sources in sustainable cities is becoming more widespread. Is this a positive or negative development?

4. In order to make cities more sustainable, some governments have implemented strict regulations on waste management and energy usage. To what extent should individuals be responsible for their own sustainability practices?

5. Some people believe that living in a sustainable city means sacrificing convenience and comfort. To what extent do you agree or disagree with this statement?

Choose a topic or create your own and make a presentation of 10-12 slides. You may use Power Point, Prezi.com, or other digital tools to do this. You can use the tips and instructions on:

- **how to make a good PowerPoint Presentation (Tips)** https://www.youtube.com/watch?v=grJ0FbpfvOw

- **how to give a good presentation that captivates any audience** https://www.betterup.com/blog/how-to-give-a-good-presentation

- **how to make an effective presentation with visme (Guide, Tips & Examples)** https://visme.co/blog/how-to-make-a-presentation/

- **5 simple steps to create great Prezi presentations** https://support.prezi.com/hc/en-us/articles/360009264613-5-simple-steps-to-create-great-Prezi-presentations

MODULE 1.   *HOW DOES NATURE INSPIRE SUSTAINABLE INNOVATION?*

By the end of this module you will be able to

– talk about examples of biomimicry in various fields and their impact on sustainability;

– choose between the gerund or the infinitive when you talk about nature inspired innovations;
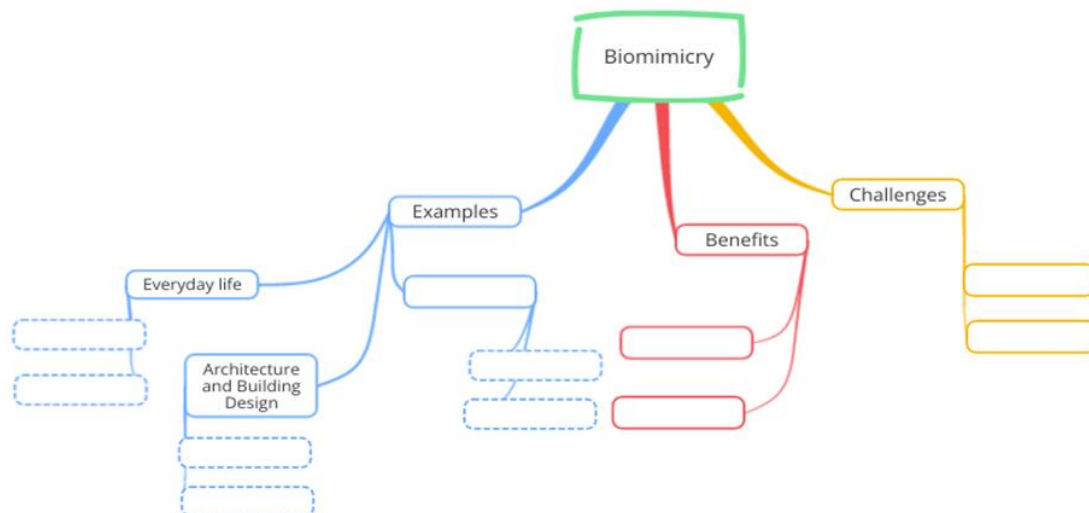
– write an opinion essay.

LEAD-IN

Discuss. Can you answer the questions?

– Nature is full of diverse and remarkable creatures. Can you think of any animals, plants, or natural phenomena that you find fascinating because they are really good at solving problems and adapting to their environment?

– How do you think nature's smart ideas differ from the methods people use to solve problems?

– Why do you think studying nature's adaptations and designs could be useful for scientists, engineers, and designers?

– Have you ever heard of biomimicry before? If so, what do you know about it? If not, what do you think it might be?

Biomimicry is studying nature's shapes, processes, and ecosystems, and then copying them to create more sustainable designs. It's like getting smart ideas from nature and using them to create solutions that are good for both us and the planet.

Create a mind map on the topic of biomimicry. Include some examples of human-made designs or technologies that were inspired by nature. Explore the benefits and challenges of applying biomimicry. Share your mind map with the other students.

VOCABULARY

1. Learn the words, practise their pronunciation. Translate the examples into Russian.

	Word / Collocation	Transcription	Translation	Example
1	**solution (to)**	/səˈluːʃən/	решение	There's no easy *solution to* this problem.
2	**durable**	/ˈdjʊərəbl/	прочный, долговечный	The plastic cups are not very *durable*; they might break easily.
3	**efficient**	/ɪˈfɪʃənt/	продуктивный, рациональный	Email is a quick and efficient way of contacting people.
4	**scale**	/skeɪl/	размер, масштаб, уровень, шкала	We don't yet know the *scale* of the problem. How would you rate her work on a scale of 1-10? My parents used to entertain friends on a large *scale*.
5	**to remove**	/rɪˈmuːv/	удалять	You can *remove* a red wine stain from a carpet by sprinkling salt over it.
6	**to release**	/rɪˈliːs/	сбрасывать, выбрасывать (вредные вещества); отпускать; выпускать	Dangerous chemicals were accidentally *released* into the river. The dog brought the ball back to us but wouldn't *release* it. The company decided to *release* a new version of their

51

				popular smartphone.
7	**to identify**	/aɪˈdentɪfaɪ/	устанавливать, определять, выявлять; опознавать	You need to *identify* your priorities. Even the smallest baby can *identify* its mother by her voice.
8	**to reflect**	/rɪˈflekt/	отражать, отражаться; размышлять, раздумывать	The statistics *reflect* a change in people's spending habits. The light *reflected* off the surface of the water. The manager needs time to *reflect* on what to do.
9	**cutting-edge**	/ˌkʌtɪŋˈedʒ/	передовой, современный	The startup company is working on a *cutting-edge* app that could revolutionize online shopping.
10	**current**	/ˈkʌrənt/	текущий, нынешний; поток, течение	What is your *current* address? The river's *current* was too strong for swimming.
11	**particle**	/ˈpɑː.tɪ.kəl/	частица, крупица	Dust *particles* must have got into the motor.
12	**to evolve**	/ɪˈvɒlv/	развивать(ся)	The company has *evolved* over the years into a multi-million dollar organization.
13	**to prevent (from doing sth)**	/prɪˈvent/	предотвращать, препятствовать	The use of seat belts can *prevent* serious injuries in car accidents. Regular exercise and a healthy lifestyle can *prevent* you *from getting* certain diseases.
14	**to reduce**	/rɪˈdjuːs/	сокращать, уменьшать, снижать	The green economy encourages businesses to *reduce* their environmental impact by adopting cleaner production methods.
15	**to comprise**	/kəmˈpraɪz/	состоять из, составлять	The exhibition *comprises* sculptures, paintings, and multimedia installations. The minerals and elements *comprise* the composition of the Earth's crust.

16	**to figure out**	/ˈfɪgər/	понимать	I can't figure out why he did it.
17	**performance**	/pəˈfɔːməns/	результаты, показатели	The teacher praised the student's outstanding academic *performance* throughout the semester.
18	**property**	/ˈprɒpəti/	свойство	Rubber can stretch without breaking because it has a special *property* called flexibility.
19	**application to apply (to)**	/ˌæplɪˈkeɪʃən/	применение применять(ся)	This technology has many practical *applications*. He wants a job in which he can *apply* his foreign languages. The same method can be *applied to* other situations.
20	**to distribute**	/dɪˈstrɪbjuːt/	раздавать, распределять, поставлять	The teacher will *distribute* the worksheets to the students.

2. Use some of the words from the list above to complete the gaps in the stories. Each word can only be used once, and remember to use the past tense of verbs when necessary.

Story 1: The Super Seed Coating
In a world struggling with agricultural challenges, a group of scientists found a brilliant [1]_____ for boosting crop yields. They [2]_____ the unique [3]_____ of seeds to grow into plants. Inspired by this natural process, they developed a seed coating that could enhance plant growth. This innovative solution proved to be [4]_____ in diverse environments.

Story 2: The Gecko Adhesive
In engineering, researchers faced a challenge: how to prevent objects from falling in zero-gravity environments. Seeking inspiration from nature, they [5]_____ the gecko's ability to attach and [6]_____ their feet from surfaces. This led to the creation of a [7]_____ adhesive that mimicked the gecko's technique and marked a significant breakthrough in space exploration.

Story 3: Fast Trains and the Wise Bird
Japan's speedy trains, called Shinkansen or "bullet trains", are famous for being really fast and [8]_____. Can you believe that they got the idea for these trains from a little bird called a kingfisher? This bird is great at catching fish in the water, and engineers noticed something amazing about its beak. It's shaped so well that it doesn't make big splashes when it dives into the water.

They looked at the kingfisher's beak and [9]_____ its shape to the front of the trains.

53

The ^{10}_____ trains were okay, but the new design ^{11}_____ the trains' noise level and increased their speed, as they didn't make a lot of noise when entering tunnels. This is an example of how technology can ^{12}_____ or get better over time.

You can also practise the new vocabulary here https://goo.su/eL6lJ

READING

3. Before reading the text, discuss the following questions.

- Why don't fish freeze in the Arctic?
- What are the key adaptations of polar bears to survive in the Arctic?

4. Make word combinations and then use them to complete the definitions.

1) water	a) point
2) freezing	b) shafts
3) freeze-thaw	c) detergent
4) laundry	d) fat
5) heat	e) retention
6) hair	f) treatment
7) wastewater	g) damage
8) subcutaneous	h) resistance

1) _____ means how well something can stop water from getting inside or damaging it. It's important for things like clothes, gadgets, and buildings to work well even when they come into contact with water.
2) _____ is the temperature at which a liquid becomes solid because it gets very cold. For water, this happens at 0 degrees Celsius (32 degrees Fahrenheit), and it turns into ice.
3) _____ is like how well something can keep heat inside.
4) _____ are the part of the hair above the scalp.
5) _____ is the process of cleaning and purifying water that has been used to remove dirt, chemicals, and other things before it's released back into the environment or reused.
6) _____ is a cleaning product used for washing clothes. It helps to remove dirt, stains, and smells from your clothes when you put them in the washing machine.
7) _____ is the problem that can occur when something becomes cold and then warms up. This can cause various materials to weaken, crack, or break over time.
8) _____ is the layer under our skin that stores energy, helps

regulate body temperature, and protects our muscles and organs.

5. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

mechanisms	tissues	ultralightweight	molecular	molecules
ingenuity	enzymes	subcutaneous	insulating	sequence

6. Read the interview with Dr. Elizabeth Summers, a renowned expert in biomimetics and nature-inspired technologies. However, the interviewer' questions and Dr. Elizabeth Summers' answers have been mixed up. Your task is to match the questions with the answers. Write the paragraph number next to each question that, in your opinion, contains the answer to each of the provided questions.

INTERVIEW WITH DR. ELIZABETH SUMMERS

Interviewer:	Dr. Elizabeth Summers:
A. Welcome to today's interview. We have the pleasure of speaking with Dr. Elizabeth Summers, a renowned expert in biomimetics and nature-inspired technologies. Dr. Summers, thank you for joining us.	Thank you for having me. It's a pleasure to be here.
B. Let's start with a fascinating question that has puzzled many, including children: Why don't fish freeze in the Arctic? Can you shed some light on this?	
C. Antifreeze proteins? That sounds intriguing. Could you tell us more about them?	
D. So, how does this protein actually work?	
E. That's truly remarkable. How has the discovery of antifreeze proteins influenced various aspects of our daily lives beyond their original applications?	
F. Fascinating. Shifting our focus to another remarkable Arctic dweller, the polar bear. How do these bears survive in freezing conditions?	
G. Can you tell us more about the materials inspired by polar bear hair?	
H. That's truly remarkable how nature's designs inspire technological advancements. Lastly, could you explain the link between cold water seaweed and laundry detergent I read about the other day?	
I. So, they engineered a protein based on this enzyme?	
J. That's an excellent example of how nature's solutions can enhance our daily lives. Dr. Summers, it has been a pleasure discussing these incredible applications of biomimetics. Before we conclude, is	

55

there anything else you'd like to add?	
K. Thank you, Dr. Summers, for sharing your insights and inspiring us with the potential of biomimetics.	Thank you for your kind words.

Dr. Elizabeth Summers' Answers

1. In the last few decades, humans have not only identified the mechanisms behind such abilities – we've learned how to replicate them, giving birth to a whole new field of research and development combining science, technology, and engineering: biomimetics. Scientists and engineers have begun replicating these natural mechanisms to create a range of innovative solutions. Antifreeze proteins, for instance, are now being developed for various applications. They are used in preserving cells and tissues for biomedical research and treatments, making super-durable concrete resistant to freeze-thaw damage, and even keeping ice cream soft and crystal-free.

2. Certainly. Polar bears are unique among mammals in that their hair is hollow – a feature that's also responsible for their white appearance. The structure of each fiber has evolved to optimize heat retention and water resistance while remaining extremely lightweight and flexible – all desirable qualities in the class of ultralightweight materials known as aerogels.

Last year, a team of scientists at the University of Science & Technology of China (USTC) developed a carbon based aerogel that mimics the hollow structure of these hairs. By weaving together microscopic hollow carbon tubes, they were able to form a small block of material that was lighter than most other aerogels, while still offering better heat and water resistance than polar bear hair. Once researchers can replicate their laboratory production process at an industrial scale, the new material could see wide application in the aerospace and building industries.

3. Absolutely. Until relatively recently, this was indeed a mystery. However, in the last few decades, scientists have made significant progress in understanding this phenomenon. Arctic surface water temperatures in the winter are around just above -1.8 degrees Celsius, which is about the freezing point of salt water. But fish blood freezes at around -0.9 degrees Celsius – which, on the face of it, doesn't recommend the Arctic as a habitat. Unless, that is, you have antifreeze in your blood. So nature has a solution: antifreeze proteins.

4. Certainly. In the 1960s, molecular biologist Arthur de Vries made a remarkable discovery. He identified a protein in fish blood that prevents the formation of ice particles, effectively lowering the temperature at which their blood freezes. What wasn't understood at the time was how the protein actually worked.

5. It wasn't until more than 40 years later that scientists figured out the molecular process behind it: the protein slows the usually breakneck bond-forming that occurs in water molecules, thus preventing them from forming ice crystals. That's a pretty nifty trick, and one that's far more efficient than the kind of antifreeze that's commonly used on vehicle windscreens, which needs to actively bond with water molecules to work.

6.   Thank you for having me. I believe biomimetics reminds us of the remarkable ingenuity of evolution. Not just in the miraculous properties that exist in nature, but in the fact that evolution brought forth a species – we humans – that can act as its agent, bringing that ingenuity into new arenas, from vehicles capable of traveling through space to pods we pop in our washing machines to clean our clothes. And since nature is the source of all this innovation – including us – it's urgent that we safeguard it. There are many small things we can do to make a difference. For example, In Europe, on average, up to 60 percent of the greenhouse gas emissions from laundry come from heating the water in our washing machines – more than packaging or ingredients. Dialing down the temperature by just a few degrees can dramatically reduce energy waste.

7.   Certainly. So called biological detergents have been using enzymes to improve washes since the sixties, and scientists are continually working to improve their performance – again looking to nature for inspiration. For Ariel, that meant turning to a tiny microbe that lives on seaweed… The microorganism – a bacteria – uses the seaweed as a food source and a safe haven, binding itself to surface of the seaweed. When it is ready to move on, it releases an enzyme to "unstick'' itself and drift off on the ocean current. Researchers at Newcastle University realized that the enzyme could be developed for use in consumer products. That doesn't mean scientists are harvesting seaweed to make detergent – the specific phosphodiesterase enzyme in nature provided a prototype.

8.   Polar bears have a very different method of not freezing to death – equally remarkable given they sometimes spend days at a time swimming in Arctic waters. They have three key adaptations that keep them warm – a thick layer of subcutaneous fat, black skin that absorbs the sun's infrared rays and the bear's own body heat, and finally, a dense, insulating undercoat and fur comprising hollow hair shafts that reflect light. It's that last feature that researchers have used as an inspiration for the kind of cutting-edge materials that are evolving our exploration of space.

9.   Exactly. Scientists, led by Ariel Research Fellow Neil Lant in collaboration with biotech partner Novozymes, were able to engineer a protein that would significantly improve the performance of Ariel's biological laundry detergents. That process involved first identifying a similar enzyme with optimal performance from nature, then optimizing its amino acid sequence to get the required balance of stability and performance within liquid laundry detergent. The end product is Purezyme – a patented enzyme that is highly effective at removing sticky soils from textiles, even in colder water, while breaking down harmlessly as it goes through wastewater treatment and back out into the water cycle.

Reading comprehension tasks

7. Word Quest Game. Your mission is to find a word or phrase in a given paragraph of the text (Dr. Elizabeth Summers' answers). The winner will be the player who has given more correct answers. Read the instructions carefully, think quickly, and enjoy the challenge!
There are 4 categories with 5 questions each, making a total of 20 questions.

WORDS AND PHRASES

Read the definition and find a word or phrase with the given meaning.

1) paragraphs # 1 and 3:
the answer to a problem _____

2) paragraph # 4:
a very small piece of something _____

3) paragraph # 9:
to take something away _____

4) paragraph # 6:
to have an effect on a situation _____

5) paragraph # 3:
an idiom used when you are describing how a situation seems, when this is different to what it is really like _____

COLLOCATIONS

Collocations are fixed word combinations. In English, words often have multiple meanings, so the same word can form different collocations depending on its meaning.
You need to find a word that can complete a gap in EACH collocation.

6)   paragraph 2:

the _____ of the problem; _____

on a _____ of 1-10;
a bathroom/ kitchen   _____;
to _____ a wall;
to practise _____s on the piano;
on a global/national/international _____;
_____ of fish, snakes;
a map with a _____ of one centimetre per ten kilometres.

7)   paragraphs 1, 4, and 9:
to _____ interests, limits; _____
to _____ problems, risks;
to _____ a person/ faces.

8)   paragraph 8:
to _____ in the water/ mirror; _____
to _____ a change;
to _____ on what to do;
to _____ light/ heat/ energy/ sound.

9)   paragraph 7:
to _____ wastes; _____
to _____from prison;
to _____ an album;
to _____ information;
to _____ anger;
to _____ a parachute;
to _____ a brake.

10) paragraph 7:
a _____ air; _____
to swim against/ with the _____;
an electrical _____;
_____ issues/ week;
_____ law.

SYNONYMS
Synonyms are words of the same part of speech that have the same or similar meanings but are spelled differently.
You need to find a synonym for the given word.
11) paragraphs 1, 2: *to copy/ to repeat* _____
12) paragraphs 4, 5: *to stop* _____
13) paragraph 8: *to consist of* _____
14) in paragraph 6: *to lower/ to decrease* _____
15) in paragraph 5: *to understand* _____

KNOWN VS. NEW MEANINGS
You need to find a word that you know with one meaning but is used in the text with a new meaning.
16) paragraph 5: _____
Known Meaning: *distant*
New Meaning in the Text: *very much*
17) paragraph 9: _____
Known Meaning: *acting, singing, dancing to entertain people*
New Meaning in the Text: *results showing how successful someone or something is*
18) paragraph 1: _____
Known Meaning: *based on facts*
New Meaning in the Text: *a hard substance that is used in building and is made by mixing sand, water, small stones, and cement*
19) paragraph 6: _____
Known Meaning: *an object (a thing, building or area of land) that belongs to someone*
New Meaning in the Text: *a quality of a substance or material*
20) paragraphs 1 and 2: _____
Known Meanings: 1) *an official request for something in writing (for a job...); 2) a computer program for a particular purpose*
New Meaning in the Text: *a way in which something can be used for a particular purpose*

8. Can you answer the questions?

1) Why did researchers use fish blood to explore freezing in the Arctic?
2) How do antifreeze proteins in fish blood work?
3) What advantage do antifreeze proteins offer over traditional antifreeze?
4) How are antifreeze proteins being applied in various industries?
5) What adaptations do polar bears have to survive in Arctic waters?
6) How does the hollow structure of polar bear hair inspire advanced material

development?

7) Could you explain the link between cold water seaweed and laundry detergent?

VIDEO

9. Watch the video with Janine Benyus (https://youtu.be/M_5Xxy2T3kA), an American naturalist and researcher, known for her work in the field of biomimicry, and the author of a series of books on biomimicry.

Examine the provided screenshots from the video and explain the relationship between them.

1)
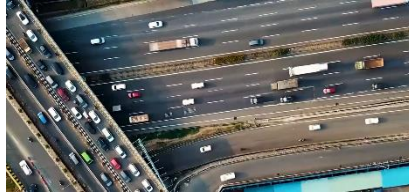
2)

VOCABULARY

10. Fill in the gaps with the preposition.

1) The strategies that dolphins use to work together in hunting apply _____ team collaboration in business as well.

2) The microstructures on butterfly wings are highly effective _____ inspiring colorful and light-reflective displays for electronics.

3) The way ants communicate and coordinate within their colonies _____ a micro-scale has inspired researchers to develop more efficient communication systems for tiny sensors.

4) The structure of a beaver's dam prevents water _____ flowing freely, creating a habitat for other species to thrive.

5) The structure of a lotus leaf, which is naturally resistant _____ water and dirt, has inspired the development of self-cleaning surfaces for various applications.

6) Engineers often look _____ the design of spider silk when developing stronger and more durable synthetic materials.

7) _____ the face of it, imitating the self-cooling mechanism of termite mounds might seem challenging, but it has inspired architects to design more energy-efficient buildings.

8) The observation of how seashells efficiently strengthen themselves has given birth ____ new approaches in engineering materials for improved durability.

9) As scientists reflect _____ the incredible adaptability of chameleon skin, they find inspiration for the development of color-changing materials used in various applications.

GRAMMAR

11. Infinitives and Gerunds Revision: Can you answer the questions? (you can consult the following link
 https://learnenglishteens.britishcouncil.org/grammar/a1-a2-grammar/verb-ing-or-verb-infinitive).

- How do we form the Infinitive in English?
- How do we form the Gerund in English?
- What is the bare infinitive?
- Give a few verbs that are commonly followed by gerunds.
- What are some verbs that are typically followed by infinitives?
- What verbs are followed by the bare infinitive?
- How do you form the negative gerund and infinitive?
- Provide a few verbs that can be followed by either a gerund or an infinitive? Is there any difference in meaning?
- Should we use a gerund or an infinitive after
  - adjectives/nouns?
  - prepositions?
  - what, whom, which, when, where, how…?
  - it's no use, it's worth, it's like, be busy, what about, how about, go (for activities)?
  - advise, allow, recommend, encourage?
  - need, require, want?

Find the examples of infinitives and gerunds in the text (Interview with Dr. Elizabeth Summers).

12. Complete the sentences with the correct form of the verbs in brackets.
1) It's worth *exploring* (explore) nature's secrets to create innovative solutions.
2) Engineers often spend time _____ (observe and analyze) natural phenomena.
3) Architects advise _____ (study) termite mounds to create energy-efficient buildings with natural ventilation systems.
4) Biomimicry encourages architects _____ (design) more efficient skyscrapers by studying how trees grow tall and efficiently transport nutrients.
5) By closely observing the structure of lotus leaves, scientists understand how _____ (develop) self-cleaning surfaces through biomimicry.
6) Scientists succeeded in _____ (create) more efficient solar panels by _____

(imitate) the structure of leaves and their ability to capture sunlight.

7) Biomimicry makes us _____ (realize) that efficient transportation systems can be designed by _____ (mimic) the complex networks of leaf veins found in nature.

8) They regret _____ (not apply) biomimicry concepts to their engineering project, as they now understand how nature's solutions could have improved their design's efficiency and functionality.

9) They try _____ (use) the flexibility of bamboo stems to enhance the building's resilience.

10) Researchers promised _____ (create) energy-efficient lighting systems inspired by fireflies' ability to emit light without heat.

11) The bumps on humpback whale flippers can _____ (inspire) better airflow over the wings of airplanes, reducing fuel consumption.

12) Engineers expect _____ (improve) solar panel efficiency by _____ (replicate) the way leaves capture sunlight.

SPEAKING

13. Discuss the questions in groups, summarize your ideas. Then choose one person to speak for your group.
   – In what ways can biomimicry contribute to addressing global issues, such as climate change, resource shortage, or pollution?
   – How do scientists, engineers, and designers collaborate to use nature's designs and principles in order to develop innovative solutions and technologies?

WRITING

14. Which of the statements do you agree/disagree with?
   1) Nature-inspired technologies are more sustainable and environmentally friendly compared to traditional approaches.
   2) Biomimicry is just a trend in technology and will be replaced by more advanced methods.
   3) The study of biomimicry can lead to a deeper understanding and respect of the natural world.
   4) Biomimicry has the potential to significantly accelerate innovation across multiple industries.
   5) Copying nature's designs through biomimicry is limiting human creativity in technology development.
   6) The field of biomimicry opens up new career paths at the intersection of biology and engineering.

Can you add any other ideas to the list above?

15. Write an opinion essay on the topic *Do Nature's Ideas Make Our Inventions Smarter?* **(200-250 words). Find essay writing tips at this link:** https://learnenglishteens.britishcouncil.org/skills/writing/b1-writing/opinion-essay

MODULE 2. *WHAT ARE NATURE-INSPIRED TECHNOLOGIES?*

By the end of this module you will be able to
- talk about examples of nature-inspired technologies in various fields and their impact on sustainability
- write a post

LEAD-IN

Discuss. Can you answer the questions?
- How do you see the future of biomimicry and its impact on various industries?
- What areas do you believe will benefit the most from nature-inspired technologies in the coming years?
- What strategies and methods of studying nature can contribute to finding new ideas?

VOCABULARY

1. Learn the words, practise their pronunciation. Translate the examples into Russian.

	Word / Collocation	Transcription	Translation	Example
1	**pattern**	/ˈpætən/	модель, образец, шаблон; узор, рисунок	The design is so good it's sure to set the *pattern* for many others. Damage to the ozone layer has caused a change in weather *patterns*.
2	**implications**	/ˌɪmplɪˈkeɪʃən/	последствия	This scheme has serious *implications* for the local economy.
3	**available**	/əˈveɪləbl/	доступный, имеющийся в наличии	This information is *available* free on the Internet.
4	**excess**	/ɪkˈses/	избыток	An *excess* of oil on the markets has caused the prices to fall sharply.

5	**tough**	/tʌf/	трудный; строгий, жесткий	We've had to make some *tough* decisions. *Tough* new safety standards have been introduced for cars.
6	**to handle**	/ˈhændl/	иметь дело с чем-либо, справляться	Some people are brilliant with computers, but have no idea how to *handle* other people.
7	**to confirm**	/kənˈfɜːm/	подтверждать	The hotel has *confirmed* our reservation.
8	**abundant**	/əˈbʌn.dənt/	обильный, изобилующий, богатый	It is a region with *abundant* natural resources.
9	**to incorporate**	/ɪnˈkɔːpəreɪt/	включать (в состав чего-либо)	The film *incorporates* elements of fantasy and science fiction.
10	**to adjust**	/əˈdʒʌst/	регулировать, подгонять, приспосабливаться	They found it hard *adjusting* to life in a new country. If the chair is too high you can *adjust* it to suit you.
11	**humidity**	/hjuːˈmɪdəti/	влажность	Tomorrow will be hot, with high *humidity*.
12	**mutual**	/ˈmjuː.tʃu.əl/	взаимный, общий	Both countries are acting to their *mutual* advantage.
13	**essential**	/ɪˈsen.ʃəl/	существенно важный, необходимый, обязательный	Water is *essential* for/to living things. The books on this list are *essential* reading for the course.
14	**to respond (to)**	/rɪˈspɒnd/	отвечать, реагировать	The government has *responded* by sending food and medical supplies to the region. She's *responding* well to drug treatment.
15	**to distinguish**	/dɪˈstɪŋgwɪʃ/	различать, распознавать, выделять, делать особенным	It's important to *distinguish between* scientific fact *and* fiction. His great skill *distinguishes* him *from* the rest of the team.

16	**to enable**	/ɪˈneɪ.bəl/	давать возможность, делать возможным	Computerization should *enable* us to cut production costs by half.
17	**to come up with**		придумывать, разрабатывать	They *came up with* a plan to make us more efficient.
18	**school**		косяк (рыб), стадо (китов)	As the sun began to set, a *school* of dolphins gracefully glided through the sparkling waves.
19	**charge**	/tʃɑːdʒ/	заряд; цена, плата; руководство, ответственность; обвинение	The electron has a negative *charge* and the proton has a positive *charge*. Is there a *charge* for children or do they go free? He has been arrested on a *charge* of murder. His boss asked him to take *charge* of the office for a few days while she was away.
20	**transparent**	/trænˈspærənt/	прозрачный	Grow the bulbs in a *transparent* plastic box, so the children can see the roots growing.
21	**film**		слой, налет	A thick *film* of dust covered the furniture.

2. Use some of the words from the list above to complete the gaps in the stories.

Story 1:

In recent years, nature-inspired technologies have become particularly relevant in the world of science and innovation. One example of such technologies is the development of systems capable of automatically regulating ¹_____ inside buildings. These systems enable buildings to ²_____ to changing conditions, creating a more comfortable and energy-efficient environment.

Story 2:

In the field of materials science, researchers are constantly seeking ways to ³_____ natural patterns and structures into new materials. For example, they have created ⁴_____ materials with the strength of spider silk. These materials have ⁵_____ applications in various industries, from aerospace to healthcare, due to their unique properties. Nevertheless, it's essential to carefully ⁶_____ these materials for their potential impact on the environment.

Story 3:

Scientists studying fish behavior have discovered that fish often swim together in a ⁷_____, which helps them conserve energy and navigate efficiently. This observation has inspired the development of autonomous underwater vehicles that can move in a similar

coordinated manner. These vehicles have significant [8]_____ for marine research and underwater exploration.

You can also practise the new vocabulary here https://goo.su/du68U7G
READING

3. Before reading the text, discuss the following questions.

- Can you provide examples from your own observations of how organisms in nature recycle materials?
- What are some examples of cooperative relationships in nature?
- What are some key principles or rules that humans can learn from nature?

4. Make word combinations and then use them to complete the definitions.

1) electrical	a) efficient
2) peak	b) benefits
3) energy	c) load
4) mutual	d) bones
5) structural	e) table
6) living	f) appliances
7) periodic	g) integrity
8) brittle	h) being

1) _____ is a creature, like a plant, animal, or person that can grow, reproduce, and interact with its environment.
2) _____ are devices or machines that are powered by electricity and designed to perform specific functions or tasks to make daily life more convenient and efficient.
3) _____ refers to the maximum amount of electrical power or energy consumption experienced within a specific time period, typically a day or a year.
4) _____ is a chart that organizes all known chemical elements based on their unique properties and atomic numbers.
5) _____ means something is strong and stable enough to do its job without breaking or collapsing.
6) _____ refers to a characteristic of a device, system, or process that effectively utilizes energy while minimizing waste and reducing overall energy consumption.
7) _____ are advantages that are shared by all parties, resulting in a positive outcome for everyone.
8) _____ describe a condition where the skeletal structure is delicate

and breaks easily.

5. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practice saying the words, mind the stress.

tremendous	ceramics	disturbances	precious	adequate
chimney	decentralized	chemical	sparingly	resources

6. Read the text and find answers to questions in 3.

NATURE'S UNIFYING PATTERNS:
BIOLOGY EXAMPLES AND DESIGN APPLICATIONS

Nature's unifying patterns are lessons from the natural world that have profound implications for what and how we design. Taking these fundamental lessons into consideration helps ensure that your designs will fit in well with all of life on earth.

1. Nature uses only the energy it needs and relies on freely available energy.

Energy is expensive to organisms. The risk of using excess energy is death. Therefore, organisms use it sparingly and make use of energy that is renewable, is found nearby, and doesn't require a lot of energy to obtain.

Biology Examples

Condors are large, soaring birds that rely on rising warm currents of air in order to get aloft. Condors are huge, and it would take a tremendous amount of energy to propel themselves by flapping their wings. They are able to glide all day looking for food. While gliding, the birds use the same amount of energy they would if they were just resting on their nests.

The abalone's shell is 200 times stronger than our toughest high-tech ceramics. While our ceramics are made using very high temperatures, high pressures, and materials mined from the ground, abalones construct their shells at seawater temperature and pressure, out of minerals pulled from the seawater.

2. Nature recycles all materials.

In nature, one organism's waste or decomposing body becomes a source of food and materials for other organisms. While we talk about recycling, what happens in nature is more appropriately called upcycling.

Biology Example

Trees

In nature, the recycling loop isn't direct. Wood doesn't directly become wood again. Instead, wood gets broken down into its various chemical components by a host of organisms, and then those components can be utilized by even more organisms. At every stage of a log's decay, some organism finds a use for the log. It becomes a shelter for some, a place to perform a mating dance for others, and a place to store seeds or acorns. Even before a dead tree falls, other organisms start breaking down the carbohydrates and proteins in the trunk and branches, drawing energy from them and creating by-products or waste that other organisms can use. Some fungi are able to break down a complex chemical compound called lignin, which few other organisms can handle. The fungus makes the components in lignin available to other organisms to use as building blocks for new chemicals.

68

3. Nature is resilient to disturbances.

If an organism is resilient, it can recover after disturbances or significant changes in the local environment.

Biology Examples

Large fires swept across Yellowstone National Park, USA, in 1988. Afterward, the lodgepole pine forests were able to grow back because the pines have two types of cones: regular cones that open to release seeds in normal conditions and special serotinous cones that are sealed shut with a resin and open only when exposed to the high heat of a fire. This diversity of cones provides options for reseeding, depending on conditions.

4. Nature tends to optimize rather than maximize.

Because energy and materials are so precious, nature seeks a balance between resources taken in and resources expended.

Biology Example

Bones respond to stresses placed upon them by adding material (calcium) where more is needed to provide strength. This is why women are encouraged to do weight-bearing exercises to prevent brittle bones as they age. While a heavy bone may be stronger (e.g., the weight is maximized), the energy costs of the body carrying around extra weight is high.

Therefore, if the body senses that the bone doesn't need strength in some areas, it removes the calcium (e.g., the weight is optimized).

5. Nature provides mutual benefits.

While there are many examples of predation, parasitism, and competition in nature, the prevailing relationships are those that are cooperative. Cooperative relationships may occur between two organisms or among many different ones. Some common types of cooperation are mutualism – where both partners benefit from the relationship – and commensalism – where one partner benefits and the other receives neither benefit nor harm.

6. Nature runs on information.

Organisms and ecosystems need to receive information from the environment and be able to act appropriately in response to that information in order to be attuned to their environment. This system of send, receive, and respond has been finely tuned through millions of years of evolution. Organisms and ecosystems incorporate feedback loops to gain information in order to survive. Feedback loops are utilized both internally within a body or cell and externally.

Acacia tree

On the African plains, groups of acacia trees have evolved a simple yet sophisticated sensory detection strategy to respond to threats from herbivores. When a giraffe begins browsing the leaves of an acacia tree, the acacia emits ethylene gas to warn the other acacia trees. Those trees receive this signal and respond, as part of a feedback loop, by also releasing ethylene gas, thereby warning other trees nearby. Detection of the ethylene also signals the acacias to manufacture and deliver a toxin in their leaves, as part of a response to further deter the herbivores.

Songbirds

Young songbirds have brightly colored mouths, including some bright coloration around the edge of the beak that disappears as they mature. A chick opens its mouth wide to show the color, creating a bright target and a signal to its parent that it's hungry. It supplements this with raucous calls. The hungriest chick makes the most noise and opens its mouth the widest. This stimulates the parent to feed the one most in need. As the chick starts feeling full, it sends a less strong signal, or stops signaling completely, causing the parent to

react to the next chick who is signaling the most. This is a feedback loop that takes place repeatedly throughout the day.

7. Nature uses chemistry and materials that are safe for living beings.

Biology Example

There are 118 chemical elements in the periodic table of elements (with four of those yet to be confirmed), but nature uses only 28 of them. All living things use 11 elements. Carbon, hydrogen, nitrogen, and oxygen are common, plus seven rarer ones. Five other elements are also found in small, essential amounts in all organisms (including some metals), and 12 elements are found in trace amounts in only some organisms. DNA (or RNA in the case of some viruses) is the molecule that contains the genetic instructions used in the development and functioning of all known living organisms. It is made up of only carbon, hydrogen, nitrogen, oxygen, and phosphorus, yet these few atoms are put together in unique ways to provide all the information needed to make every organism on earth.

8. Nature builds using abundant resources, incorporating rare resources only sparingly.

Nature's materials are abundant and locally sourced. This is true whether it's building something external to itself, like a termite mound or a nest, or assembling materials that go into a wing, shell, leaf, or horn. A few rarer minerals are also used, but these are found locally and are readily available.

Biology Examples

Caddisflies are aquatic insects. Their larvae gather local materials such as small fragments of rock, sand, shells, or small pieces of twig or aquatic plants to create protective cases held together by silk. Because they use local materials, the cases blend in, providing protection from predators. Caddisflies don't have to expend a lot of energy searching for materials, and they don't seek out rare materials, just abundant ones. Their food is also local, and often brought to them for free by the flowing water around their homes.

9. Nature is locally attuned and responsive.

Biology Examples

Termites in the sub-Saharan region of Africa need a steady supply of fresh oxygen and a way to get rid of excess carbon dioxide, just as we do. If the termites don't have adequate ventilation in their nests, they will suffocate. The solution to their dilemma is in how they construct their mounds. The mounds, measuring 2 to 3 meters (3 to 10 feet) above the ground, act as a ventilation system.

The mounds are like pears, with nests below and chimneys above. Wind makes air flow through the porous walls. This works like our breathing. Termite mounds are adaptive structures. As internal levels of oxygen, carbon dioxide, and water moisture change, the termites respond by adjusting the tunnels and the height of the mound. This maintains a balance, or homeostasis, within the mound.

10. Nature uses shape to determine functionality.

Biology Examples

The Venus flytrap is a carnivorous plant. It catches insects by folding its leaf. The leaf opens but snaps when triggered, forming a trap. Tiny hairs are on the leaf edges. Insect touch makes the leaf close instantly. The plant even distinguishes insects from raindrops. The leaf won't shut unless two nearby hairs move or one hair is touched twice. This smart mechanism saves plant energy, avoiding false closures.

Reading comprehension tasks

9. Read about three human-made inventions and discuss which of the 10 nature's unifying patterns (lessons) influenced their design.

Bicycle phone charger

In some emerging economies, the majority of people live in homes without electricity, yet many also own cell phones. To charge their phones, people often have to travel long distances to charging stations. The bicycle phone charger, designed in Tanzania by Bernard Kiwia of Global Cycle Solutions (GCS), piggy-backs on the popularity of bicycles for travel in these regions and enables users to charge their phones on the fly by tapping into the free energy produced by the spinning bike wheels. Designed to utilize scrap bike and radio parts, the device relies on materials that are readily available in Tanzania and keeps "waste" out of the landfill.

Self-healing concrete
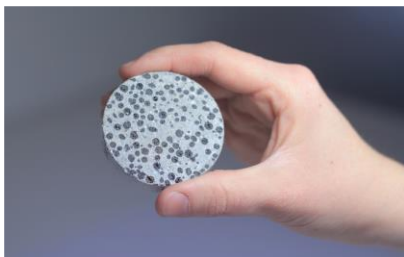
Concrete is one of the most commonly used building materials, but it is prone to cracking. From large crack to hairline fractures, cracks weaken the structural integrity of concrete. Engineers have developed self-healing concrete by mixing bacteria into concrete to create a bio-concrete. The bacteria grow into cracks as they form, releasing calcium carbonate as a waste material, which fills the cracks.

Regen Energy

Regen Energy has developed a device that allows electrical appliances in a building to communicate with each other to minimize how much power the appliances collectively use at a given point in time. The device considers local needs, like a fridge's temperature, while also reducing peak load. Unlike top-down methods, this decentralized approach manages energy efficiently in a balanced electricity system.

8. Can you answer the questions?

1) In what ways does nature efficiently use energy, and why is this energy-efficient approach essential for organisms?
2) How does the concept of "upcycling" in nature differ from traditional recycling, and what examples are provided in the text to illustrate this?
3) What strategies and mechanisms allow nature to be resilient to disturbances, and can you provide an example from the text that highlights this resilience?
4) How do nature's design principles prioritize optimization over maximization, and can you provide an example of optimization from the text?
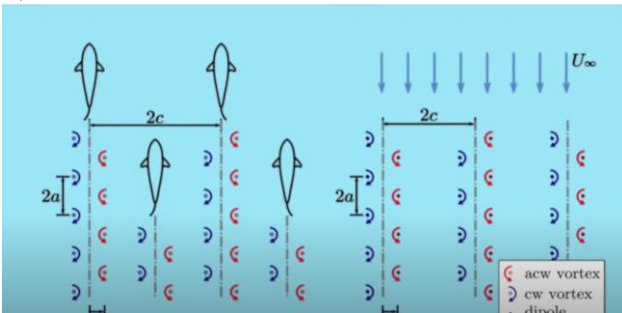
VIDEO

9. Watch the video in which Janine Benyus discusses unique phenomena in the natural world that we could use to make our world more sustainable (https://youtu.be/sf4oW8OtaPY). Watch the video from 00:09:00 to 00:19:00.

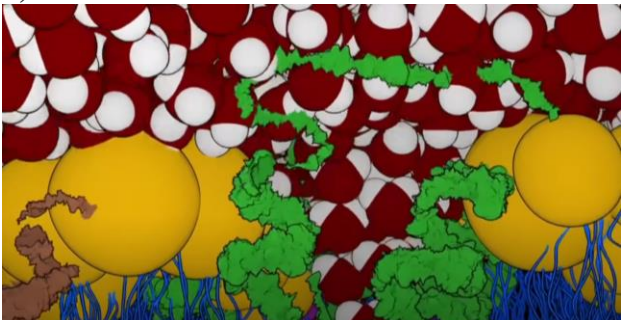**Carefully examine the screenshot from the video and remember what Janine Benyus talked about.**

1)

2)

3)

4)

5)

6)

7)

VOCABULARY

10. Fill in the gaps with the preposition (check against the text about nature's unifying patterns).

1) Self-cooling building designs adjust _____ the external temperature and airflow to reduce the need for air conditioning and conserve energy.
2) The solution _____ reducing carbon emissions may depend _____ bio-inspired technologies that mimic photosynthesis.
3) Some waste treatment plants use microbial biofilters to get rid _____ pollutants in water, mimicking the way wetlands naturally purify water.
4) The construction industry benefits _____ sustainable materials, such as bio-concrete that can self-heal.
5) Smart agriculture relies _____ sensors and data analysis to optimize crop yields,

responding _____ changing environmental conditions.
6) Green infrastructure in urban planning takes _____ consideration the natural landscape to manage stormwater and improve urban resilience.

GRAMMAR

11. Conditionals Revision: Can you answer the questions? You can consult the following links:
https://learnenglishteens.britishcouncil.org/grammar/b1-b2-grammar/conditionals

https://learnenglishteens.britishcouncil.org/grammar/b1-b2-grammar/third-conditional

– How many types of conditional sentences do you know?
– What is the difference between the zero conditional and the first conditional? Can you give examples?
– Compare and contrast the second and third conditionals. How are they similar, and how are they different? Can you give examples?
– Can you change the order of clauses in conditional sentences?
– Should you use any commas in conditional sentences?
– Can you use any other verbs, apart from would, in the second and third conditionals?
– Can you use any other words to replace if?

Find the examples of conditionals in the text about nature's unifying patterns.

12. Complete the sentences with the correct form of the verbs in brackets. You may need to use the negative form of the verb.
1) If you _____ (apply) a lotus leaf-inspired coating to a car's windshield, it _____ (repel) water effectively, improving visibility in the rain.
2) If you _____ (examine) the structure of a beehive, you _____ (see) how it efficiently manages airflow to maintain temperature and humidity.
3) If researchers fully _____ (understand) the natural regeneration abilities of salamanders, they _____ (apply) new approaches to human tissue regeneration.
4) If researchers _____ (can) replicate the self-healing properties of certain plants, they _____ (develop) materials with remarkable self-repair capabilities.
5) If biomimicry experts _____ (recognize) the potential of termite mound architecture earlier, we _____ (see) more sustainable building designs decades ago.
6) If biomimicry _____ (continue) to advance, we _____ (witness) remarkable innovations in various industries in the coming years.
7) If scientists and engineers _____ (collaborate) more closely on biomimicry projects, we _____ (see) even more rapid progress in developing nature-inspired

74

technologies.

8) Unless biomimicry engineers _____ (find) ways to replicate the resilience of certain tree bark, we _____ (have) effective solutions for protecting buildings from wildfires in the near future.

SPEAKING

13. Discuss one of the cases in groups, summarize your ideas, then choose one person to speak for your group. Your ideas should be environmentally friendly and mimic natural processes and phenomena. Compare your solutions with one of the possible options in the box.

Model:

Case: Chemical companies are interested in a self-cleaning paint. Imagine that you want to develop a sustainable self-cleaning paint by copying natural processes. What organisms have adapted to deal with a similar problem?

Solution:

While the lotus plant grows in muddy water, it remains dry and clean thanks to tiny bumps on the surface of its petals and leaves. These structures repel water and self-clean by making water droplets roll off, carrying away dirt particles. People can copy this mechanism.

Case 1: The glass and window company aims to create "smart" windows that automatically adjust their transparency based on the brightness of sunlight. . Imagine that you want to develop a sustainable material that can change its transparency depending on external conditions. What organisms have adapted to deal with a similar problem?

Solution:

The skin of a chameleon can change color and transparency because of special cells called chromatophores. These cells react to the environment and control how much light passes through the chameleon's skin, helping it hide or be seen as needed.

Case 2: Chemical companies are interested in creating biodegradable packaging for food products. Imagine that you want to develop biodegradable packaging for food products by copying natural processes. How can nature help develop such packaging?

Solution:

Certain plant leaves and husks can protect products and break down in nature. For instance, we can use banana leaves or corn husks as packaging because they're strong and biodegradable.

Case 3: Chemical companies are interested in creating a material that can regulate its thermal insulation depending on temperature. Imagine that you want to develop a sustainable material

that changes its thermal insulation based on the surrounding temperature to save energy in buildings. What natural examples can be used to develop such a material?

Solution:

_____

Animals like penguins can control how warm or cool they stay by puffing up or smoothing down their feathers. We can copy this mechanism.

WRITING

14. Write a post on the topic *What are Nature-Inspired Technologies?* **Select any nature-inspired technology, gather information about it, and prepare a post that includes:**
  – **a title or heading;**
  – **a brief description of the technology;**
  – **an explanation of the natural process or organism that served as an inspiration for the technology;**
  – **visual elements (images).**
Share your post about the nature-inspired technology on the online board.

MODULE 1. *WHAT IS RENEWABLE ENERGY?*

By the end of this module you will be able to
— talk about different types and sources of 'green' energy;
— describe the benefits of renewable energy;
— write a for-and-against essay.

LEAD-IN

Discuss. Can you answer the questions?
— What is green energy?
— What are the types of green energy?
— Why is green energy also called renewable?
— How can green/renewable energy benefit the environment?

If you are not sure, make your best guess and write down any notes and questions you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practice their pronunciation. Translate the examples into Russian.

	Word / Collocation	Transcription	Translation	Example
1	**renewable**	/rɪˈnjuːəbəl/	возобновляемый	Forests are *renewable* natural resources, but they must be treated with care.
2	**fossil fuels**	/fɒsəl fjuːəlz/	ископаемые виды топлива	*Fossil fuels* belong to nonrenewable sources of energy
3	**to replenish**	/rɪˈplenɪʃ/	пополнять(ся). возобновлять(ся)	Industrial fishing methods don't give fish stocks a chance to *replenish*.
4	**to generate**		производить, генерировать	Nowadays windmills can be used to *generate* electricity.

5	**to combat**	/kəmˈbæt/	бороться	A conference will be held on how to *combat* pollution of the oceans.
6	**consumption**		потребление	Gas and oil *consumption* always increases in cold winter.
7	**rural**		сельский	With the development of farming machinery, life in *rural* areas has changed dramatically.
8	**geothermal**		геотермальный	*Geothermal* energy is a renewable source because heat is continuously produced inside the earth.
9	**biomass**	/ˈbaɪəʊmæs/	биомасса	In biology *biomass* means dead plant and animal material suitable for using as fuel.
10	**greenhouse gas**		парниковый газ	*Greenhouse gases* are one of the reasons of climate change.
11	**emissions**		выбросы	Reducing the consumption of energy would help control *emissions*.
12	**wind farm**		ветровая электростанция	*Wind farms* work best when they are away from populated areas, because there's nothing to block the force of the wind.
13	**decrease**		понижать(ся)	They want to *decrease* their reliance on oil.
14	**threat to sth**	/θret/	угроза чему-л.	Pollution poses a *threat to* fish.
15	**to run out**		заканчиваться, истощаться	Oil supplies are low, but they have not *run out* yet.
16	**be within our reach**		быть в зоне досягаемости, недалеко	All major shops and entertainment facilities *are within our reach*.
17	**reliable**		надежный	Price is not always a *reliable* indicator of quality.
18	**affordable**	/əˈfɔːdəbəl/	доступный, недорогой	What might not be *affordable* today, will be *affordable* tomorrow.
19	**turbine**	/ˈtɜːbaɪn/	турбина	Steam *turbines* are now the main elements of electric power

				stations.
20	**facility**		оборудование, предприятие, установка	Renewable *facilities* don't cost a lot to operate.

2. Use some of the words from the list above (in the right form) to complete the gaps.

1) We can't write a report without _____ data.
2) _____ (coal, oil, gas) have, and continue to, play a dominant role in global energy systems.
3) Countries and corporations are making efforts to cut their greenhouse gas _____ .
4) The _____ _____ may be able to generate enough electricity for 2,000 homes.
5) The power station is equipped with numerous _____ .
6) All creatures need sleep to _____ their energies for the next awakening.
7) In order to _____ inflation the government imposed strict controls on foreign currency.
8) Bad air quality poses a serious _____ public health.
9) Energy _____ is steadily increasing with the development of technologies.
10) Renewable resources are the ones which are naturally _____ .

You can also practice the new vocabulary here https://stepik.org/edit-lesson/893048/step/1

READING

3. Before reading the text, discuss the following questions.

- What are the sources of renewable energy?
- Are there any other benefits of renewable energy except the environmental ones?

4. Match the picture and the name of the renewable energy source.

geothermal energy	solar energy	biomass energy
wind energy		hydroelectric energy
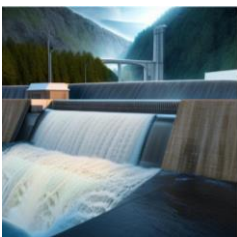
1 _____   2 _____   3 _____

4_____

5_____

5. Match the word with the synonym from the text (highlighted).

    1) very important (2)
    2) produce
    3) countryside
    4) advantages
    5) because of
    6) reduction
    7) use
    8) restored
    9) country
    10) distant

6. Make word combinations and then use them to complete the definitions.

1) renewable	a) survey
2) fossil	b) energy
3) economic	c) country
4) opinion	d) fuels
5) developing	e) benefit

1) _____ are compound mixtures made of fossilized plant and animal remnants from millions of years ago.

2) _____ is energy derived from natural sources that are replenished at a higher rate than they are consumed.

3) A _____ usually has little industrial and economic activity and its people generally have low incomes.

4) An _____ is a tool used to assess smb's opinions, feelings, perceptions and expectations regarding certain issues.

5) An _____ is a benefit that we can quantify in monetary terms.

7. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practise saying the words, mind the stress.

geothermal	generate	environment	biofuels	climate
technologies		efficiency		crucial

8. Scan the text and find answers to questions in Ex. 3.

WHAT IS RENEWABLE ENERGY?

Renewable energy is energy that is environment-friendly because it is collected from renewable resources, which are naturally replenished. Examples of these renewable resources include sunlight, wind, rain, tides, waves, and geothermal heat (i.e. the thermal energy generated and stored in the Earth). There is a distinction between *renewable energy* and *alternative energy*. The latter is generated from alternatives to <u>fossil fuel</u>s and need not be renewable.

Renewable energy often supplies energy in four essential sectors:
- the generation of electricity;
- cooling and heating of air;
- means of transport;
- rural energy services.

Benefits of renewable energy

There are a lot of benefits to using renewable energy.

First, naturally replenished energy resources are found over wide geographical areas, in contrast to **non-renewable resources**, which exist only in a limited number of countries. In addition to that, use of renewable energy will result in significant energy security, climate change mitigation, and economic benefits.

There are other undeniable advantages of renewable energy. Renewable technologies are also suited to rural and remote areas and developing countries, where energy is often crucial in human development.

Deployment of renewable energy

International public opinion surveys show that there is strong support for promoting renewable sources such as solar power and wind power. At least 30 nations around the world already have renewable energy contributing more than 20 percent of energy supply. National renewable energy markets are predicted to continue to grow strongly in the coming decade and beyond. Some places and at least two countries, Iceland and Norway, generate all their electricity using renewable energy already, and many other countries have set a goal to reach 100% renewable energy in the future. For example, in Denmark, the government decided to switch the total energy supply (electricity, mobility and heating/cooling) to 100% renewable energy by 2050.

Conclusion

Renewable energy systems are rapidly becoming more efficient and cheaper. Their share of total energy consumption is increasing. Growth in consumption of coal and oil could end in near future due to increased uptake of renewables and natural gas.

Reading comprehension tasks

9. True or False? Correct the false statements, or add information to the correct statement to support the idea.
1) Alternative energy means the same as renewable energy.
2) Sources of renewable energy are only available in a limited number of places.
3) At present there are a few countries that use only renewable energy to generate electricity.
4) Renewable energy systems are still quite expensive.

10. Can you answer the questions?
1) What is renewable energy?
2) What sectors does renewable energy supply in?
3) Are there many countries that use only renewable energy? What are they?
4) Is it possible to make renewable energy systems cheaper?

VIDEO

11. Look through the script for a video by *National Geographic* **(https://www.youtube.com/watch?v=1kUE0BZtTRc). Before watching the video, think of the words or word combinations that can be used to complete the gaps. Then watch the video and check if you are right.**

<div align="center">

RENEWABLE ENERGY

</div>

Around the world renewable energy use is on the rise, and these alternative energy sources could hold the key to combating 1) _____ _____.

What is renewable energy?

Renewable energy is generated from sources that naturally 2) _____ themselves and never run out. The most common sources are solar, wind, hydro, geothermal, and biomass. Over 80 percent of the total energy consumed by humans is derived from 3) _____ _____. However, 4) _____ are the fastest growing source of energy in the world.

Renewable energy has many 5) _____ . First, it can combat climate change because it creates no direct 6) _____ gas emissions. The only emissions that they produce are indirect, meaning those that result from manufacturing parts: installation, operation, and maintenance, but even those are minimal. Second, renewable energy can decrease pollution and, therefore, reduce threats to our 7) _____ . Wind, solar, and hydroelectric systems create no air pollution emissions; and geothermal and biomass energy systems emissions are much lower than non-renewable energy sources. Third, renewable energy is a reliable source of power because renewable energy sources are renewable: they

will never run out. Once built, renewable facilities cost very little to operate and the fuel is often free. As a result renewable energy prices tend to be stable over time.

While renewable energy has many advantages, it is not without 8) _____ . It is difficult for renewable energy sources to generate power on the same large scale as fossil fuels. Building wind farms and dams can disrupt wildlife and migration patterns and lead to ecological destruction. Both solar and wind energy are intermittent. They only 9) _____ power while the sun is shining or while the wind is blowing. Batteries can store excess energy for later use, however they are often 10)_____ .

While renewable energy presents some challenges, it also offers an environmentally friendly alternative to the greenhouse gas emissions and pollution of fossil fuels, and as advances in technology make renewable energy more accessible, affordable, and efficient; and end to climate change could be within our reach.

- **What new facts are mentioned in the video compared to the text in Ex.8?**

12. VOCABULARY REVISION: Fill in the gaps with the preposition (check against the text and the video script).

1) Alternative energy is generated ___ alternatives ___ fossil fuels.
2) Use of renewable energy will result___ significant energy security.
3) Non-renewable energy resources, ___ contrast ___ naturally replenished resources, exist only in a limited number of countries.
4) Renewable technologies are well suited ___ rural and remote areas.
5) Growth ___ consumption of coal and oil could end in near future ___ ___ increased uptake of renewables and natural gas.
6) Renewable energy can help reduce threats ___ our health.
7) It is difficult for renewable energy sources to generate power ___ a large scale.
8) Renewable energy prices tend to be stable ___ time.
9) Batteries can store excess energy ___ later use.
10) End ___ climate change could be ____ our reach.

GRAMMAR

13. Passive Voice Revision: Can you answer the questions? (you can revise the material here https://learnenglishteens.britishcouncil.org/grammar/b1-b2-grammar/passive-forms**).**
  – When do we use the Passive?
  – How do we form the Passive Voice in English?
  – How can you show who did the action in the Passive?

Find the examples of the Passive Voice in the text and script in Ex. 8 and Ex.11. Translate the sentences.

14. Make the following sentences passive according to the model. Mind the tense.

Model: This power station <u>generated</u> a lot of energy. – A lot of energy <u>was generated</u> by this power station.

1) We have discovered many alternative energy options.
2) You can choose different types of solar panels according to the price, efficiency, and other criteria.
3) Large dams and turbines produce a great amount of energy.
4) Renewable technologies have already created numerous jobs in developed countries such as the UK.
5) You will spend less money on maintenance and repair of wind farms, solar energy systems and hydropower stations.
6) Some renewable energy technologies can use leftovers and reduce the amount of waste materials.
7) We need more land for establishing renewable energy farms.
8) Fossil fuels cause unprecedented health issues.
9) Renewable technologies generated about 45% of the UK's electricity in 2020.
10) We should control the rise of greenhouse gas emissions.

15. We often use the Passive Voice to show that a statement is not our opinion or that we are not certain of a statement. Read and translate the following sentences.

1) It is considered that solar energy is one of the cleanest renewable sources.
2) It is regarded that biomass is a renewable energy source because we always regenerate organic materials, mostly plants.
3) It is believed that the renewable energy market will create a lot of new jobs.
4) It is sometimes argued that global warming is nor real.
5) It is estimated that fossil fuels still account for more than 80 percent of global energy production.
6) It is claimed that switching to clean sources of energy, such as wind and solar, will improve people's health.
7) It is said that investments in renewable energy will pay off.
8) It is thought that the transition from fossil fuels will not be easy, because renewable energy has its limitations.

SPEAKING

16. Discuss the questions in groups.

What kinds of renewable *energy can be used / are already used* in the region where you live?
What should be done to facilitate the use of renewable energy?

Summarize your ideas in the table, then choose one person to speak for your group.

Renewable energy already used	Renewable energy that can be used	What should be done?

WRITING

17. Which of the arguments are for or against renewable energy?

1) Renewable energy sources do not run out.
2) Renewable energy technologies cause less emissions compared to fossil fuels.
3) There are geographic limitations, including environmental factors, that could prevent building big wind or solar farms.
4) Renewable energy can make the global energy market more stable.
5) With renewable energy technologies, countries with no fossil fuel resources can reduce their energy dependence.
6) The efficiency of renewable technologies is not that high compared with traditional energy generation devices.

Can you add any other for or against arguments to the list above?

18. Write a for and against essay on the topic *Is renewable energy a better option for fossil fuels?* **(200-250 words). You can use the tips on how to write this kind of the essay at** https://learnenglishteens.britishcouncil.org/skills/writing/b1-writing/against-essay

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UNIT 5

GREEN ECONOMY

MODULE 2.   *RENEWABLE ENERGY FOR SUSTAINABLE AGRICULTURE*

By the end of this module you will be able to
- know how renewable energy can help farming be sustainable
- what green technologies can be used in farming
- use gerunds and infinitives after certain verbs
- explain the purpose of doing something using the infinitive

LEAD-IN

Discuss. Can you answer the questions?
   1. What is the impact of food production on climate change?
   2. What can farmers do to make agriculture more sustainable?
   3. How can renewable energy be used in farming?

If you are not sure, make your best guess and take notes or write down any questions

you have:

Facts I know	Facts I'm not sure about	Facts I would like to know

VOCABULARY

1. Learn the words, practice their pronunciation. Translate the examples into Russian.

1	Word / Collocation	Transcription	Translation	Example
2	**agrivoltaic**	/ˈæg.rivɒlˌteɪ.ɪk/	агроэлектрический	Agrivoltaic farming is the simultaneous use of areas of land for both solar power generation and agriculture.
3	**annual**	/ˈæn.ju.əl/	ежегодный	The company publishes annual reports to inform the public about the previous year's activities.
4	**alternative**	/ɒlˈtɜː.nə.tɪv/	альтернативный, альтернатива	Audiobooks are an interesting alternative _**to**_ reading.
5	**to benefit**	/ˈben.ɪ.fɪt/	приносить пользу	The new plan will definitely benefit the environment.
6	**biodiversity**	/ˌbaɪ.əʊ.daɪˈvɜː.sə.ti/	биологическое разнообразие	Biodiversity is closely related to ecosystem stability.
7	**boost**	/buːst/	увеличить, улучшить	We took various steps to try to boost sales.
8	**cater to sm/sth**	/ˈkeɪ.tə/	обеспечивать, удовлетворять	Internet shopping caters to every conceivable need.
9	**dairy**	/ˈdeə.ri/	молочный	dairy cattle dairy farmers dairy products
10	**to estimate**	/ˈes.tɪ.meɪt/	оценить, подсчитать	It is difficult to estimate how many trees have been destroyed.
11	**grazing**	/ˈgreɪ.zɪŋ/	содержание скота на пастбище выпас	In a grazing system, the animals mostly use natural meadow or cultivated grazing areas.
12	**greenhouse**	/ˈgriːn.haʊs/	теплица	It is important to maintain a

				constant temperature inside the greenhouse.
13	**to implement**	/ˈɪm.plɪ.ment/	внедрять, осуществлять	It can be difficult to implement the idea.
14	**to install**	/ɪnˈstɔːl/	установить	The company would like to install wind turbines on the hill.
15	**livestock**	/ɡeɪn/	получать, набирать, приобретать	You will *gain* several serious personal skills.
16	**maintain**	/meɪnˈteɪn/	содержать, роддерживать	The roads in the town are very poorly maintained.
17	**manure**	/məˈnjʊər/	навоз, органическое удобрение	Adding organic matter such as manure can improve the soil.
18	**poultry**	/ˈpəʊl.tri/	птица	Mediterranean diets favor fish and poultry over red meat.
19	**retail**	/ˈriː.teɪl/	розничная торговля	Food retail is extremely competitive.
20	**win-win**	/ˌwɪnˈwɪn/	взаимовыгодный, беспроигрышный	Flexible working hours are a win-win situation for employers and employees.

2. Use some of the words from the list above to complete the gaps in the sentences. The overgrazing of _____ and cutting down of brush and trees for firewood are held responsible for climate change.

1) The wind turbines are a _____ solution for farmers and homeowners.
2) There are a few online calculators that allow you to _____ your carbon emissions.
3) Best results are obtained by starting the plants off in a warm _____ .
4) The government must _____ measures to mitigate climate change immediately.
5) _____ farming is the practice of raising animals such as cows, goats and buffalo to produce milk for human consumption.
6) The prices of the goods do not reflect the full costs of production, which also include such things as soil erosion and _____ loss.
7) Using biomass to create energy is a better _____ than using coal because biomass comes from renewable resources.
8) The market has shown _____ growth of 20% for several years.
9) We should _____ new heating system to minimize costs.

You can also practise the vocabulary above here
 https://stepik.org/lesson/893045/step/3?unit=897990

READING

3. Before reading the text, discuss the following questions.

‒ What is the amount of the world's greenhouse gas emissions that agriculture is responsible for?
‒ Do you know any renewable energy technologies used in agriculture?
‒ What is agrivoltaic farming?

4. Attributive word combinations: Translate into Russian.
Mind that we usually start translating such word combinations starting from the last word as it the main one in the phrase.
Carbon footprint, food production system, food processing supply chains, biodiversity-boosting solar panels, on-site biogas plant, food and animal waste, electricity bill, biodiversity loss, climate-smart agriculture, water stressed land.

5. Make word combinations and then use them to complete the definitions.

1) carbon	a) sector
2) greenhouse	b) waste

3)	farming	c)	land
4)	heat	d)	footprint
5)	animal	e)	panel
6)	solar	f)	gases
7)	organic	g)	agriculture
8)	water-stressed	h)	bill
9)	electricity	i)	pump
10)	climate-smart	j)	matter

1) _____ is an approach to help the people who manage agricultural systems respond effectively to climate change.
2) A _____ is a device that collect sunlight and converts it into electric current.
3) A _____ a device that takes heat from the air or ground around a building and increases it to a temperature that keeps our homes and businesses warm inside.
4) An _____ is the amount of money you pay for the electricity consumed.
5) A _____ is an environmental indicator that represents the amount of greenhouse gases resulting from everyday economic and human activity.
6) _____ is discarded material from industries associated the production, processing, transportation and marketing of animals.
7) _____ the total amount of greenhouse gases generated by our actions..
8) _____ when the demand for water exceeds the available amount at a particular place.
9) _____ a sector of economy that includes crop and animal production.
10) _____ has come from a recently living organism; it is capable of decay or a product of decay.

6. PRONUNCIATION: If necessary, check the pronunciation of the words and phrases in a dictionary, practise saying the words, mind the stress.

quarter	emissions	geothermal	livestock	crisis
propane	to capture	regenerate	alternative	digital

7. Read the article and find answers to questions in Ex. 3.

Three Unusual Ways Renewable Energy is Giving Farming a Boost
Oct 10, 2023
This article is part of Annual Meeting of the Global Future Councils
The world's food production system produces more than a quarter of global greenhouse gas emissions. The United Nations says farming must become more sustainable in order to combat the climate crisis and feed a rapidly rising global population. Farmers around the world are using renewable energy in innovative ways to cut costs and reduce their carbon footprint. These include solar panels in sheep fields, geothermal energy to

grow flowers and biogas to keep birds warm. There will be 10 billion people in the world to feed by 2050, which will pose an "unprecedented challenge", the United Nations warns.

The global food production system produces a third of the world's greenhouse gas emissions, studies show. Over 70% of these come from livestock and fisheries, crop production and land use. The rest comes from food processing supply chains related to packaging, transport and retail.

So how can the farming sector maintain, or even increase, productivity while also reducing emissions and becoming more sustainable? Here are three examples of renewable energy and agriculture working together.

1. Biodiversity-boosting solar panels

Research has shown that solar panel arrays can have a positive effect on water-stressed land around them. A study in Oregon found that areas around panels were more than 300% more water efficient. Crops can also be grown under solar panels in a practice known as agrivoltaic farming.

However, they can also boost biodiversity. A four-year trial in Australia involving sheep farmers installing solar panels on their land has been hailed as a "complete win-win", reports ABC News. The farmers have reported that the sheep's wool has improved in both quantity and quality since the solar arrays were installed. The sheep's grazing has helped reduce grass growth, helping the panels from being obscured. They in turn provide shade which helps stop the soil being dried out. "It is actually quite astonishing. Some of the sheep look fantastic. They're growing exponentially and the wool cuts are in the top 5% in the district," wool broker Graeme Ostini told ABC.


Sheep and solar panels work well together, studies show. Image: Pexels/Vincent Delsuc

2. Geothermal greenhouses

Farms can use geothermal heat pumps, to both heat and cool buildings. They are able to exchange air and ground temperature all year round.

A family in the United States used a government grant to install renewable energy at their small flower farm. Rebecca Kutzer-Rice and her husband Mark Ginsberg say heating a greenhouse used to cost $1,000 a month using propane, but now costs just $100 a month

using geothermal energy. "During the day the greenhouse gets super hot ... and instead of just letting all that air vent out, the system actually captures it and pumps that heat back down into those pipes in the ground. And then at night when it's super cold outside, it pumps the heat back into the greenhouse ... We're pretty sure it's the first geothermal greenhouse for cut flowers in the US," the couple told NJ.com.
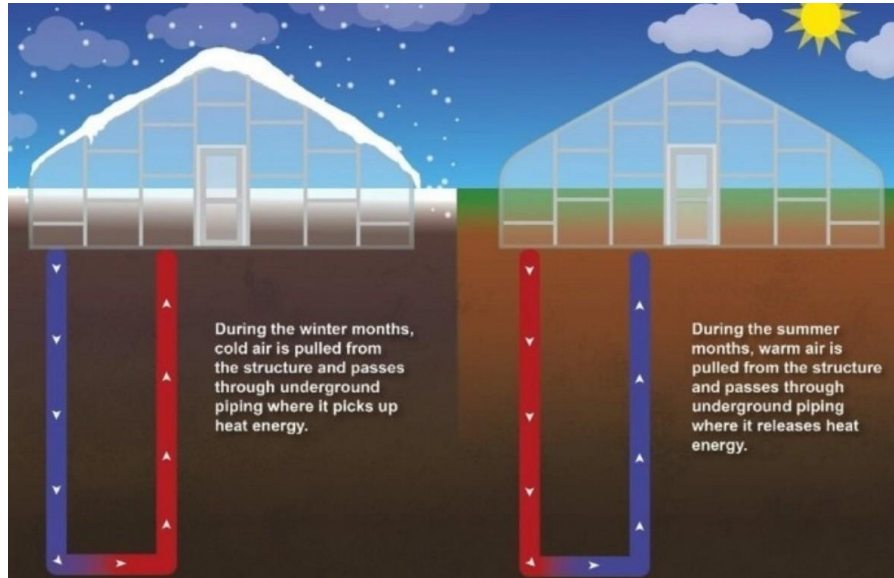
Geothermal systems can regulate temperatures seasonally. Image: NCAT

3. Using biogas to heat a poultry farm

Biogas is a renewable source of energy derived from organic matter such as food and animal waste. It can be used for cooking and heating as a more sustainable and often cheaper alternative to natural gas.

A farmer in Bhutan decided to use biogas on his poultry farm to reduce his electricity bills, according to the ANI news agency. San Man Subba's farm has 4,000 birds which need to be kept warm, especially during the winter months. He uses manure from pigs and dairy animals to fuel his own on-site biogas plant. He says the savings he has made mean he hopes to use biogas to also heat his piggery farm. "During one of the winter months I had to pay around $730 [for] an electricity bill. So, I had to think about an alternate way to warm up my poultry farm ... So, in this way, I can use the amount saved for other purposes," he says.

Making agriculture fit for the future

New and sustainable technologies offer farmers a way to optimize results for both their businesses as well as the planet, according to an April 2022 insight paper from the World Economic Forum. *Transforming Food Systems with Farmers: A Pathway for the EU* says "climate-smart and regenerative agricultural practices and digital innovations already show great promise in helping to mitigate these trends of climate change and biodiversity loss."

The report found that if an additional 20% of farmers in the EU adopted climate-smart agriculture, greenhouse gas emissions could be reduced by an estimated 6% by 2030.

They could also restore the soil health of more than 14% of the EU's total agricultural land, and add between $2bn and $10 billion annually to farmers' incomes.

8. Reading comprehension: Choose the right answer.

1. What percentage of greenhouse gas emissions come from livestock and fisheries, crop production, and land use?
  A. 70%
  B. 30%
  C. 50%
  D. 90%

2. How did solar panel arrays affect water efficiency in a study in Oregon?
  A. They had no effect on water efficiency.
  B. They reduced water efficiency.
  C. They increased water efficiency by 300%.
  D. They increased water efficiency by 100%.

3. What positive effect did solar panels have on sheep farmers in Australia?
  A. Improved wool quantity and quality
  B. Increased grass growth
  C. Reduced sheep grazing
  D. Hindered solar panel efficiency

4. How did geothermal energy impact the heating costs of a greenhouse?
  A. It increased the heating costs.
  B. It had no effect on the heating costs.
  C. It reduced the heating costs by 90%.
  D. It reduced the heating costs by 10 times.

5. What is biogas derived from?
  A. Natural gas
  B. Geothermal energy
  C. Organic matter
  D. Propane

6. Why did the farmer in Bhutan decide to use biogas on his poultry farm?
  A. To reduce his electricity bills
  B. To increase his electricity bills
  C. To improve the quality of his poultry
  D. To provide a more sustainable energy source

7. According to the World Economic Forum, what percentage of greenhouse gas emissions could be reduced if an additional 20% of farmers in the EU adopted climate-smart agriculture?

    A. 10%

    B. 6%

    C. 20%

    D. 14%

9. Article-based dialogue match.

Ben	Josh
1) Have you read that article on the global food production system?	a) Interesting. And what about biogas? Can also be used in farming?
2) It says the farming sector needs to reduce emissions and become more sustainable.	b) Wow, that's great! I hope more farmers can adopt these practices. Only in this case we'll be able to change the situation.
3) Well, there are some examples of renewable energy and agriculture working together. Like using solar panels for biodiversity and geothermal heat pumps in greenhouses.	c) But there's a lot of pressure on farmers. They also have to feed the growing population. How can they do that and still maintain productivity?
4) Yeah, one farmer in Bhutan used it to heat his poultry farm and saved a lot of money on electricity bills.	d) That's a positive step towards making our agriculture fit for the future. It is really necessary to do something to mitigate the the climate change.
5) According to this paper, if 20% more farmers in the EU adopted climate-smart agriculture, greenhouse gas emissions could be reduced by 6%.	e) Not yet. What does it say?
6) Absolutely. Sustainable technologies can benefit both businesses and the planet.	

VIDEO

10. Watch the video about Agrivoltaics, why is it so important to us and what Lightsource bp - an international solar business - have already been doing in this area at https://www.youtube.com/watch?v=ZDEQWtfSOPc **.**
Then choose the best summary for the video

1. The focus of the video is on the environmental benefits of agrovoltaic systems. It highlights how these systems help address concerns about using agricultural land for solar development. The video discusses the innovative solutions implemented by *Lightsource bp* in their agrovoltaic projects, such as combining solar energy generation with beekeeping and crop cultivation. It also mentions the company's plans to expand these projects globally, supporting various agricultural activities and benefiting local communities.

2. The video discusses agrovoltaic systems which combine solar energy generation with agricultural production. Different configurations of these systems cater to various agricultural activities, such as livestock grazing, beekeeping, growing crops, and fish and shrimp farms. The shading provided by the solar panels can benefit the crops and animals by protecting them from extreme weather and reducing water requirements. The video mentions that *Lightsource bp* has been implementing agrovoltaic solutions in projects worldwide and stresses the fact that these solutions must be suitable for a particular agricultural activity and should benefit the local communities and the environment.

3. It is mentioned in the video that agrovoltaic systems have little impact on agricultural production. The solar panels are installed solely for energy generation and have no benefit to the crops. *Lightsource bp* has been involved in a few agrovoltaic projects but it does not consider them important. The video concludes by stating that solar energy development should prioritize land resources and not focus on supporting traditional agriculture.

- **What new facts have you learned from the video compared to the text in Ex.7?**

GRAMMAR

11. Certain verbs in English require the use of either a gerund (V-ing) or the infinitive (to V) after them. Here you can find the lists of the most common verbs in English that take the infinitive or the gerun: https://stepik.org/lesson/893045/step/3?unit=897990 **.**
Study the information. Fill in the gaps with the correct form of the verb (to V or V-ing)

1) The ecologists tend (believe) that solar panels used in farming are beneficial for crops which can be grown under the shade of the panels.
2) It is worth (install) sun panels as it will allow (save) on your electricity bill in the long run.
3) I would like (discuss) the wind farm maintenance with the representatives of this company.
4) They decided (make) use of biogas on their poultry farm.
5) We must consider (use) renewable energy in farming to cut costs and reduce our carbon footprint.
6) Can you imagine (live) on a farm that operates thanks to renewable energy only?
7) The companies must agree (reduce) their economic output in order to decrease their

impact on the environment.

8) He suggested (increase) investment in renewable energy sources.

9) The government needs encourage farmers (use) modern green technologies in food production.

10) In poor countries the farmers can't afford (adopt) new green farming methods.

11) They admitted (pollute) the land around the farm and they will have to change something after paying a big fine.

12) Biotechnology helps the farmers (reduce) the effects of climate change.

13) Drones are becoming a mainstream smart farming tool, so their prices are likely (drop).

14) Fleet management involves (use) advanced GPS systems that can give detailed information on fuel usage, engine speed, and upcoming maintenance.

15) Digital sensors allow farmers (maximise) yields.

12. GRAMMAR / WRITING

We can use "to V" to describe our goal or purpose. We can say that it is used to explain why an action is done.

Can you continue the sentence? Explain the purpose.

e.g. New technologies are developed to (Why?) *make agriculture more sustainable*.

1) They decided to use sensors in crop production to _____

2) Robots can be used on farms to _____

3) Integrated Pest Management (IPM) is a modern approach that encourages the use of natural pest control mechanisms; it is used to _____

4) It is important to use irrigation monitoring to _____

5) Vertical farms can be built in urban and highly populated areas to _____

6) Organic farming uses crop rotations and manure to _____

7) Biotechnology can be used in farming to _____

8) No-till farming technology allows avoiding the use of heavy machinery, so it can be used to _____

9) Renewable energy can be used to _____

10) Wind turbines are used to _____

SPEAKING

13. Look at some other green farming methods, choose one of them and think in what ways they help make agriculture more sustainable. Brainstorm in pairs or groups, take notes of your ideas and summarize them. Then choose one person to speak for your group.

Biotechnology farming   Organic farming   Irrigation monitoring

КЛЮЧИ К ЗАДАНИЯМ

UNIT 1. GREEN ECONOMY

MODULE 1. WHAT IS A GREEN ECONOMY?

Ex. 2
Correct Answers: 1. Planetary; 2. Gain; 3. Sustainable; 4. green economy; 5. Notable; 6. Ability; 7. Prevention; 8. Poverty; 9. Alleviation; 10. Deliver.

Ex. 4.
Correct Answers: 1. resource efficiency; 2; job creation; 3. pollution prevention; 4. clean energy technologies; 5. poverty alleviation; 6. natural capital

Ex. 5.
Correct Answers: 1. Gain; 2. Recession; 3. Protection; 4. Reduce; 5. Bear; 6. Output; 7. Ability; 8. Opportunity; 9. Linkage; 10. sustainable

Ex. 6
a) Correct Answers: 1. Green Economy; Green Jobs; 2. environment activities; 3. Environmental Externalities; 4. economic output; 5. sustainable development; 6. environmentally friendly industries; 7. resource efficiency; 8. clean energy technologies; 9. poverty alleviation.

b) Correct Answers: 1. green jobs; 2. Environment Activities; 3. Environmental externalities; 4. green economy; 5. Economic output; 6. Poverty alleviation; 7. Sustainable development; 8. Environmentally friendly industry; 9. Resource efficiency; 10. Clean energy technologies.

Ex. 9
Correct Answers: 1) T; 2) F - It gained a new life after the financial crises of 2008. 3) T; 4) T; 5) F - UNEP defined a Green Economy as one that generates increasing prosperity while reducing environmental impact. 6) T; 7) T; 8) F - Degrowth means deliberately reducing economic output to decrease pressure on the environment. 9) F - Sustainable development is a related concept, but not equivalent to the idea of a Green Economy. 10) T.

Ex. 10
Correct Answers: 1. The concept of Green Economy gained new life after the financial crises of 2008. 2. UNEP proposed financially supporting environment and climate activities to stimulate economic growth and brought this idea to the Rio+20 Global Summit in 2012. 3. UNEP defines a Green Economy as one that generates increasing prosperity while reducing our environmental impact. 4. Narrow interpretations of a Green Economy can include proper pricing or adopting the Polluter Pays Principle. 5. The Polluter Pays Principle states that those responsible for environmental impacts should bear their costs. 6. Examples of financial investments that can contribute to a Green Economy include renewable energy and energy efficiency. 7. Wider interpretations argue that current levels of consumption and production in western societies are unsustainable and require radical changes to save planetary ecosystems from collapse. 8. Degrowth refers to deliberately reducing economic output to decrease pressure on the environment. 9. Sustainable development is the notion that meeting present needs should not compromise the ability of future generations to meet their needs. 10. The environmental sector, especially green energy, can create new employment opportunities in a Green Economy.

Ex. 11

Correct Answers: 1. Recovery; 2. Pandemic; 3. Vulnerable; 4. vehicles; 5. solar and wind power; 6. austerity policies; 7. look after; 8. devastating consequences; 9. to talk the talk; 10. Bail.

Ex. 12

Correct Answers: 1. - c; 2. - e; 3. - a; 4. - b; 5. - d;

Ex. 13

b) Correct Answers: 1. Appeared; 2. Gained; 3. Brought; 4. Defines; 5. Bore; 6. Have reduced; 7. does not compromise; 8. Will contribute; 9. Heard.

c) Correct Answers: 1. Он подчеркнул, что инвестиции в возобновляемые источники энергии способствуют созданию рабочих мест, требующих более высокой квалификации. 2. «Зеленая экономика» рассматривается в контексте борьбы с глобальным изменением климата и радикального повышения энергоэффективности. 3. Эти программы будут поддерживать окружающую среду, климатические действия, устойчивое потребление и производство, энергетику, гендерное равенство, борьбу с терроризмом и образование. 4. На вопросник, распространенный ЮНЕП в этой связи, были получены лишь три ответа. 5. Мы должны начать с Глобального саммита по ядерной безопасности, который пройдет в США в следующем году. 6. Тысячи людей сажают деревья и напрямую участвуют в проекте через инициативу «Зеленые рабочие места». 7. В этом году расходы вновь превысили доходы, поэтому наши резервы сократились. 8. К сожалению, эти усилия пока не принесли каких-либо результатов. 9. Современная цивилизация до сих пор сильно зависит от сельского хозяйства, оно перегрузило собой экосистему. 10. Ландшафтный подход, несомненно, принесет пользу процессу учета и принятия решений, связанных с природным капиталом.

Ex. 15

Correct Answers: **Advantages:** 1. Promotes sustainable development and reduces environmental impact. 2. Creates new job opportunities in renewable energy sectors. 3. Reduces reliance on fossil fuels, leading to lower greenhouse gas emissions. 4. Improves air quality and public health by minimizing pollution. 5. Enhances energy security by diversifying energy sources. **Disadvantages**: 1. Initial costs of transitioning to green technologies can be high. 2. Potential job losses in traditional industries like coal mining. 3. Requires significant infrastructure upgrades and investments. 4. Variability of renewable energy sources may lead to intermittent power supply. 5. Dependence on foreign countries for rare earth metals used in renewable technologies.

UNIT 1. GREEN ECONOMY

MODULE 2. WHAT IS NATURVATION?

Ex. 2

Correct Answers: 1. tackle; 2. grapple; 3. resilient; 4. equity; 5. cost-effective; 6. neglect; 7. instill; 8. replicate.

Ex. 3

Correct Answers: 1. NATURVATION is a Horizon 2020 project funded by the European Commission with 7.8 million Euros, starting in November 2016. 2. Nature-based solutions (NBS) are actions inspired and supported by nature that have the potential to address urban challenges, such as climate change, in a sustainable way while contributing to economic activities and social well-being.

Ex. 4

Correct Answers: 1. green roofs; 2; recreation area; 3. wetlands; 4. storm water; 5. permeable surface; 6. rain garden

Ex. 5

Correct Answers: 1. To unlock; 2. To reduce; 3. To infiltrate; 4. To capture; 5. mapping; 6. robust; 7. To overcome; 8. To build momentum; 9. To replicate; 10. To embed.

Ex. 6

a) Correct Answers: 1. in a sustainable way; 2. urban challenges; 3. recreation areas; 4. green roofs; 5. permeable surfaces; 6. storm water; 7. building momentum; 8. Task Force; 9. partner cities; 10. close collaboration

b) Correct Answers: 1. in a sustainable way; 2. urban challenges; 3. recreation areas; 4. permeable surfaces; 5. storm water; 6. green roofs; 7. builds momentum; 8. Task Force; 9. partner city; 10. close collaboration.

Ex. 9

Correct Answers: 1 NATURVATION; 2. NBS; 3. CEC; 4. PBL; 5. IFL; 6. URIP; 7. UN-HABITAT; 8. Arup;

9. KIC; 10. IPBES.

Arup is not an abbreviation. The company was founded in London in 1946 as Ove N. Arup Consulting Engineers by Sir Ove Arup, an English engineer.

Ex. 10

Correct Answers: 1. Examples of nature-based solutions mentioned in the text include parks that reduce heat stress and provide recreation areas, green roofs, wetlands and ponds that hold storm water, permeable surfaces, vegetation, and rain gardens that infiltrate storm water. 2. The three main objectives of the NATURVATION project are to advance assessment approaches, enable innovations, and realize the potential of nature-based solutions. 3. Researchers from CEC, PBL, Utrecht University, Central European University, and IFL are involved in advancing assessment approaches for NBS. 4. NATURVATION will overcome implementation gaps by building momentum through the creation of new partnerships, knowledge platforms, processes, and tools to support policy, business, and civil society organizations in cities across Europe. 5. NATURVATION will overcome implementation gaps by building momentum through the creation of new partnerships, knowledge platforms, processes, and tools to support policy, business, and civil society organizations in cities across Europe.

Ex. 11

Correct Answers: 1. tackling; 2. grappled; 3. enhancing; 4. coined; 5. societal; 6 deliberate; 7. mainstreamed; 8. neglected; 9. replicated; 10. inequalities.

Ex. 12

Correct Answers: 1) The idea that we can use nature to work with us in order to improve our cities is now seen as vital. 2) This belief that cities should become more sustainable is now very widespread. 3) The Paris Agreement reached in 2015 emphasized the increasing importance of cities in achieving global targets for climate change. 4) The term "nature-based solutions" is an umbrella term for a number of different approaches that use nature to improve urban sustainability. 5) Nature-based solutions are defined as solutions that are inspired and supported by nature. 6) Such solutions bring more and more natural features into landscapes, and seascapes through resource efficient interventions. 7) In both cases, it is the potential to provide multiple benefits that seems to be key to the value of nature-based solutions. 8) The value created is distributed between different actors, such as the private firm that instills a Green wall for installation, and the local community that benefits from reduced air pollution.

Ex. 13

d) Correct Answers: 1. Nature-based solutions are an increasingly popular means. 2. They achieve global targets for climate changes. 3. The global communities protect biodiversities. 4. The most effective responses have multiple benefits 5. There are umbrella terms for approaches that use nature to improve urban sustainability.

e) Correct Answers: 1. Such solution brings a natural process into city, landscape, and seascape through locally resource efficient intervention. 2. The funded project is advancing our understanding of how nature-based solution is currently used. 3. Our assessment tool focuses on the ecological benefit of nature. 4. He needs a new approach to take this value into account. 5. A municipal government is important for addressing urban sustainability.

UNIT 2. SUSTAINABLE CITIES

MODULE 1. WHAT IS SUSTAINABLE URBAN TRANSFORMATION?

Ex. 2

Correct Answers: 1. consumption; 2. target; 3. incentivize; 4. artificial intelligence; 5. anticipate; 6. Cybersecurity; 7. myriad; 8. query.

Ex. 3

Correct Answers: 1. According to the Deloitte study, some key urban transformation trends that cities need to align their planning with by 2030 include green planning, inclusive services, innovative urban mobility and planning solutions, artificial intelligence, circular economy, and cybersecurity. 2. Buildings currently account for 30% to 40% of total city emissions. 3. Digital technology can improve building efficiency and enable the gathering and sharing of data that can be used to develop sustainable solutions. 4. To ensure a successful transition to cleaner mobility, cities should understand the total mobility mix, manage the entire transport system, invest in necessary infrastructure, and promote the uptake of new technologies such as autonomous vehicles. 5. Cybersecurity is important for cities as they adopt more digital technologies to protect against cyber incidents, financial impact, reduced social trust, and disrupted city services

and infrastructure.

Ex. 4

Correct Answers: 1. digital technology; 2; carbon reduction; 3. autonomous vehicle; 4. artificial intelligence; 5 digital twin; 6. AI-powered chat assistant

Ex. 5

Correct Answers: 1. To stall; 2. To boost; 3. To align; 4. To gather; 5. To prioritize; 6. To incentivize; 7. To anticipate; 8. To disrupt; 9. To intimidate; 10. To tackle.

Ex. 6

a) Correct Answers: 1. urban transformation plan, 2. Sustainable Development Goals, 3. climate change, 4. digital technology, 5. carbon reduction, 6. autonomous vehicle, 7. artificial intelligence, 8. digital twin, 9. data privacy, 10. non-recyclable waste

b) Correct Answers: 1. Urban transformation; 2. Sustainable Development Goals (SDGs); 3. climate change; 4. digital technologies; 5. carbon reduction; 6. autonomous vehicle; 7. artificial intelligence; 8. digital twin; 9. data privacy; 10. non-recyclable waste.

Ex. 9

Correct Answers: 1. F - The text states that urban areas are projected to house 60% of the world's population. 2. F - The text explicitly mentions that the United Nations' 2030 Sustainable Development Goals (SDGs) include a target devoted to "Sustainable Cities and Communities. 3. F - The text states that a study of 167 cities worldwide found that 77% included SDGs in their planning. 4. F- The text mentions that the global pandemic has stalled many urban transformation plans that support the SDGs. 5. T 6. T 7. T 8. T 9. T 10. F - The text emphasizes the importance of cybersecurity and data privacy for cities as they adopt digital technologies.

Ex. 10

Correct Answers: 1. settlements; 2. greenhouse gas emissions; 3. emerging concept; 4. stakeholders; 5. governance; 6 governed; 7. competitiveness; 8. equity; 9. WWF; 10. rejuvenation.

Ex. 11

Correct Answers: 1) T. 2) F - Sustainable urban transformation focuses on broad, multi-dimensional changes. 3) T. 4. T. 5. T. 6. F- Innovation and clean technology are important for fostering urban competitiveness. 7) T. 8) T. 9) F - WWF believes that urban infrastructures can either be a force for environmental destruction or a primary source of ecological rejuvenation. 10) T.

Ex. 12

b) Correct Answers: 1) personal subject pronoun; 2) possessive; 3) reflexive; indefinite; personal object pronouns; 4) personal subject pronoun; relative object pronoun; possessive; 5) demonstrative; reflexive; 6) interrogative pronoun; 7) reciprocal pronoun; 8) dummy subject; 9) personal subject pronoun; demonstrative; 10) dummy subject; personal subject pronoun; personal object pronoun.

Ex. 13

Possible answers: 1. The UN-Habitat agency is responsible for sustainable urban settlements. 2. More than half of the world's population lives in cities now. 3. This trend of urbanization is expected to continue. 4. Cities are crucial for sustainable development and the green economy. 5. International and national policies must be implemented at the city level. 6. Cities have a significant influence on global consumption. 7. They also play a major role in production and pollution. 8. The 21st century is often referred to as the Urban Century. 9. According to UN-Habitat, cities are strategically important. 10. The percentage of people living in urban areas has surpassed 50%.

UNIT 2. SUSTAINABLE CITIES

MODULE 2. WHAT IS THE URBAN GREEN?

Ex. 2.

Correct Answers: 1. challenges; 2. irreversible; 3. stemmed; 4. inspiration; 5. livable; 6. Gross Domestic Product; 7. tremendous; 8. Outflow; 9. Inflow; 10. Vibrant; 11. Urban Green.

Ex. 3

Correct Answers: 1. Communities around the world are currently faced with a number of large scale

environmental challenges. 2. An array of concrete solutions to these challenges are already being developed and implemented in cities around the globe. 3. A doubling of the global earth infrastructure depends on a doubling of the global urban population in the next 30 years. 4. Over the next 30 years, more than five times the global GDP will be invested in urban infrastructure and its use. 5. The three main actions that cities have to take are first of all to try to become low carbon, to shift from fossil fuel towards renewable energy, secondly, to become resilient, thirdly how can our existing ecosystems, our biodiversity we have in urban areas support us in our sustainability. 6. One of the most ambitious climate action plans has been adopted by the city of Vancouver, whose goal is to run the city on 100% renewable energy by 2050. 7. Ten targets of an action plan to make Vancouver the world's greenest city by 2020 are water, food clean air, green business, green jobs, reducing our carbon, reducing our consumption, and zero waste. 8. It's really the innovation, is how you marry a government to the residents, to the businesses, to the different civil society groups, and make it a collective effort. 9. Creating a fossil fuel-free city is possible, but requires a shift to green energy in all areas. 10. A new goal is to be 100% renewable in the city of Vancouver with all of their energy sources.

Ex. 4

Correct Answers: 1. To face with; 2. To stem from; 3. irreversible; 4. array; 5. livable; 6. struggle; 7. tremendous; 8. vibrant; 9. To campaign; 10. To marry.

Ex. 5

a) Correct Answers: 1) outflows of energy; 2) an array of concrete solutions; 3) vibrant and inclusive neighborhoods; 4) to shift from fossil fuel towards renewable energy; 5) a number of large scale environmental challenges; 6) irreversible climate changes; 7) to marry a government to the different civil society groups; 8) urban challenges are tremendous; 9) GDP will be invested in urban infrastructure; 10) to create livable and sustainable cities.

b) Correct Answers: 1. Outflows; 2. array; 3. vibrant; 4. renewable energy; 5. tremendous; 6. irreversible climate; 7. married; 8. GDP; 9. livable and sustainable; 10. livable and sustainable.

Ex. 8

Correct Answers: 1 1 – f; 2 – c; 3 – i; 4 – g; 5 – a; 6 – b; 7 – d; 8 – j; 9 – e; 10 – h

Ex. 9

Correct Answers: 1. Many of these challenges stem from cities and are resource intensive lifestyles. 2. An array of concrete solutions to these challenges are already being developed and implemented in cities around the globe. 3. Urban investment decisions will determine whether people will be locked into resource inefficient and fossil fuel dependent infrastructure and lifestyles. 4. The global GDP will be invested in urban infrastructure and its use. 5 A number of actions that cities have to take are first of all to try to become low carbon, to shift from fossil fuel towards renewable energy, secondly, to become resilient, thirdly, to exist in biodiversity and have urban areas there. 6. The urban challenges in the world are tremendous. 7. We'll soon have 75% of the world population living in cities. 8. The number one challenge for cities is to recognize that it has to be sustainable in its entire inflows and outflows of energy, of water, of food, of all materials. 9. Vancouver's plan focuses on vibrant and inclusive neighborhoods. 10. Creating a fossil fuel-free city is possible, but requires a shift to green energy in all areas.

Ex. 10

Correct Answers: 1. city-dwellers; 2; traffic congestion; 3. fossil fuel; 4. solar panels; 5. light rail networks; 6. low-density suburban

Ex. 11

Correct Answers: 1. traffic congestion; 2. motorized transport; 3. fossil fuel; 4. pedestrians; 5. residents; 6 solar panels; 7. ground heat pumps; 8. light rail networks; 9. low-density suburban; 10. commuters.

Ex. 12

Correct Answers: 1 – d; 2 – c; 3 – i; 4 – f; 5 – a; 6 – b; 7 – j; 8 – g; 9 – e; 10 - h

Ex. 13

Correct Answers: 1 – d; 2 – c; 3 – i; 4 – f; 5 – a; 6 – b; 7 – j; 8 – g; 9 – e; 10 - h

EX. 14

b) Correct Answers: 1) can; 2) can; 3) won't be able to; 4) can; 5) will be able to; 6) couldn't walk; 7) was able to; 8) managed to; 9) couldn't; 10) can

c) Correct Answers: 1) don't have to; 2) Could you; 3) can't; 4) could ask; 5) had to; 6) must have seen; 7) should have created; 8) might; 9) used to; 10) must.

UNIT 4. BIOMIMICRY

MODULE 1. How does Nature Inspire sustainable innovation?

Ex. 2
1. solution; 2. identified; 3. property; 4. efficient; 5. figured out; 6. release; 7. cutting-edge; 8. durable; 9. applied; 10. current; 11. reduced; 12. evolve.

Ex. 4
B – 3; C – 4; D – 5; E – 1; F – 8; G – 2; H – 7; I – 9; J – 6.

Ex. 6
1. solution (to) решение;
2. particle   частица, крупица;
3. to remove удалять;
4. to make a difference (to)   влиять, иметь значение;
5. on the face of it на первый взгляд;
6. scale масштаб, шкала, весы, взбираться, гаммы, уровень, чешуйка, масштаб;
7. to identify устанавливать, выявлять, опознавать;
8. to reflect отражать, размышлять;
9. to release выбрасывать (вредные вещества), освобождать (из тюрьмы), выпускать (фильм или музыкальный альбом), сообщать/обнародовать (информацию), выпустить (гнев), раскрывать (парашют), отпустить (тормоза);
10. current поток, течение, ток, текущий, нынешний, действующий;
11. to replicate;
12. to prevent (from);
13. to comprise;
14. to reduce;
15. to figure out;
16. far далеко vs. гораздо;
17. performance представление vs. результаты, показатели;
18. concrete конкретный vs. бетон;
19. property собственность vs. свойство;
20. application заявление, приложение vs. применение.

Ex. 10
1. to; 2. at; 3. on/at; 4. from; 5. to; 6. to; 7. on; 8. to; 9. on.

Ex. 12
1. exploring; 2. observing and analyzing; 3. studying; 4. to design; 5. to develop; 6. creating, imitating; 7. realize, mimicking ; 8. not applying; 9. using; 10. to create 11. inspire 12. to improve, replicating.

UNIT 4. BIOMIMICRY

MODULE 2. WHAT ARE NATURE-INSPIRED TECHNOLOGIES?

Ex. 2
1. humidity; 2. respond; 3. incorporate; 4. tough; 5. abundant; 6. handle; 7. school; 8. implications.

Ex. 10
1. to; 2. to, on; 3. of; 4. from; 5. on, to; 6. into.

Unit 5 Green Energy
MODULE 1.
Ex.2
1. Reliable; 2. Fossil fuels; 3. Emissions; 4. Wind farm; 5. Turbines; 6. Replenish; 7. Combat; 8. Threat to 9. Consumption 10. replenished

Ex.5
1. essential, crucial 2. generate 3. rural 4. benefits 5.due to 6. mitigation 7. deployment 8. replenished 9. nation 10. remote

Ex.6
1. Fossil fuels 2. Renewable energy 3. developing country 4. opinion survey 5. economic benefit

Ex.9
1. False; 2. False; 3. True; 4. False

Ex.10
Possible answers:
1. Renewable energy is collected from renewable resources, which are naturally replenished (sun, wind, tides, …)
2. the generation of electricity; cooling and heating of air; means of transport; rural energy services
3. Not many. Two countries, Iceland and Norway, generate all their electricity using renewable energy already, and many other countries have set a goal to reach 100% renewable energy in the future, for example, Denmark.
4. Yes. It is, in fact, becoming cheaper.

Ex.11
1. climate change 2. replenish 3. fossil fuels 4. renewables 5. benefits 6. greenhouse 7. health 8. downsides 9. generate 10. costly

Ex.12
1. from, to 2. in 3. in, to 4. to 5. in, due to 6. to 7. on 8. over 9. for 10. to, within

Ex.17
1. For 2. For 3. Against 4. For 5. For 6. Against

MODULE 2. Reneable Energy for Sustainable Agriculture
Ex.2
1. livestock; 2. win-win; 3. estimate; 4. greenhouse; 5. implement; 6. dairy; 7. biodiversity; 8. alternative; 9. annual; 10. install.

Ex.5
Part 1: 1.d carbon footprint; 2.f greenhouse gases; 3.a farming sector; 4.i heat pump; 5.b animal waste; 6.e solar panel; 7.j organic matter; 8.c water-stressed land; 9..h electricity bill 10g climate-smart agriculture
Part 2: 1. climate-smart agriculture; 2. solar panels; 3. heat pump; 4. electricity bill; 5. greenhouse gases; 6. animal waste; 7. carbon footprint; 8. water-stressed land; 9. farming sector; 10. organic matter.

Ex.8
1. A 2. C 3. A 4. D 5. C 6. A 7. B

Ex.9
1) E); 2) C); 3) A); 4) B); 5) D)

Ex.10
Summary 2

Ex.11
1. to believe; 2. installing; 3. to discuss; 4. to make; 5. using; 6. living; 7. to reduce; 8. increasing; 9. to use; 10. to adopt; 11. polluting; 12. reduce; 13. to drop; 14. using; 15. to maximize

Ex.12 (possible answers)
1)   … get precise data which can help make informed decisions.
2)   … apply pesticides in a targeted way/ to avoid soil compaction.
3)   … grow healthy crops.

4)   … keep the environment healthy/to save water used in farming.
5)   … meet local food demands.
6)   … control pests, weeds and disease.
7)   … develop plants with specific characteristics.
8)   … reduce the amount of greenhouse gases.
9)   … replace fossil fuels.
10)   … convert the energy of the wind energy into electric power.