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Оглавление

Unit 1

The problem with plastics – and how they're changing the environment

https://www.ted.com/talks/patricia_villarrubia_gomez_the_problem_with_plastics_and_how_they_re_changing_the_environment

Plastics come in all shapes, forms and colors. They are everywhere. They are in our makeup, it packages our food and insulates our homes. They are in airplanes and our favorite electronic devices. They are truly a remarkable material. But so are its troubles. And we produce and consume plastics in staggering quantities. Since it's been mass-produced, the world has created over 10 billion metric tons of it. Half of them just in the past 20 years.

The dominant narrative about plastics tell us that this is a consumer's and a waste management problem. We need to think of plastics from a systemic perspective. Plastics contribute to climate change from before the moment they are produced to long beyond the moment they are disposed of or drift into the ocean. And it will remain in the environment for centuries, degrading ecological processes.

For 99 percent of all plastics the starting point is fossil fuel hydrocarbons. Oil, gas and coal are extracted and refined to produce plastic and other synthetic chemicals. And those processes generate greenhouse gases such as CO2 and methane. Studies indicate that if nothing is done, the production of single-use plastic alone will contribute to more than 10 percent of all greenhouse gas emissions by 2050.

And the thing is that our use of plastic last often just a few minutes or a few hours, then we throw them away, and that generates further emissions. And we know that our recycling system doesn't work. It's broken everywhere. And recycling plastics is hard and not cost-competitive. Most of the waste that has not been landfilled or incinerated domestically is shipped across the planet, and it reaches low-income countries where they are expected to be recycled. But this is one of those hypocrisies of globalization where rich countries outsource their problems to low-income countries. And we know that these countries do not have the capacity nor the technology to deal with them in a soundly manner. And so huge amounts of plastics are illegally incinerated, informally dumped or get lost at sea. And as a result, millions of tons of plastic every year get into our environment. But even plastics that are soundly managed emit greenhouse gases.

Once plastics enter the environment, landfill, are dispersed in soil or water, they start a process of breaking down into micro and nanoparticles called microplastics. And this process of breaking down emits powerful gases such as methane, ethylene and CO2. And that's true for both traditional and biodegradable plastics. On the surface of microplastics, new microbial communities can grow. We call them the plastisphere. And their biological activity also releases additional CO2 and nitrous oxide into the environment, creating the possibility of further magnifying the climate problem. It means that microplastic can also impair the growth and the photosynthesis capacity of phytoplankton, which are the microorganisms producing much of the oxygen we breathe. But also microplastics can have toxic effects on zooplankton, and the health of these organisms is essential for the functioning of all aquatic food webs.

And unfortunately, the problems run even deeper. Microplastics bind with the so-called marine snow, which are made out of the clumps of bacteria, plankton and other organic material that sinks down into the ocean depth, acting like a biological carbon pump. But microplastics risk affecting this marine snow and potentially decreasing the capacity of the ocean to absorb and sequester carbon from the atmosphere. And microplastics can be decreasing the reflective properties of snow and ice, potentially accelerating the melting of glaciers and polar ice.

So we have early enough indications that plastic pollution is starting to change the processes that allow the Earth's climate system to work. And this pollution is not a localized phenomenon. Microplastics are everywhere, from the mountain tops of Everest to the deepest sediment in the Mariana Trench. They are in the air we breathe, the water we drink and the food we eat. They are now found in our bloodstream and our lungs as well as in the placenta of our unborn children.
Now, of course, plastic is a great material, it's versatile and durable, and in many ways it has allowed modern civilization to develop in the way it has. But it also comes with a lot of problems and the outlook is worrying. Today, the total mass of plastic is twice the total mass of all living organisms on the planet. But still, fossil fuel companies see hydrocarbon as their primary growth sector projecting a 30 percent increase of virgin plastic for single-use plastic just in the next five years. We already see an accelerating pace in producing and releasing new chemicals because there are many, many kinds of plastic. Each one the result of a different chemical formula. And we know that this is incompatible with staying within the safe operating space for humanity. And given how plastics impact the climate and the world's social ecological system, this would spell a catastrophe.
But there are solutions. And it's that worldwide, entrepreneurs and companies are creating new designs and material that can substitute traditional single-use plastic. And social movements are consolidating and educating people to reduce their plastic footprint and pressuring local and world policy makers to enact strong policies. And scientists are collaborating more than ever, communicating the urgency to limit not only the volume, but the chemical diversity of plastics. And earlier this year, representatives from over 170 nations at the UN Environment Assembly adopted an initiative to end plastic pollution, committing all these countries to participate in creating, by 2024, a legally binding agreement that addresses the full life cycle of plastics, from production to design to disposal.
We need to stop thinking of plastic just as a waste problem, one that can be solved by changing consumers' habits alone and stopping using plastic bags. We need to think of plastics as a climate problem, as a product that creates damage along all its journey, from the drilling up of hydrocarbons to the spread of microplastics. And that can only be addressed in a systemic way.

Task 1
Listen and write down the missing numbers

For _____ percent of all plastics the starting point is fossil fuel hydrocarbons. Oil, gas and coal are extracted and refined to produce plastic and other synthetic chemicals. And those processes generate greenhouse gases such as CO2 and methane. Studies indicate that if nothing is done, the production of single-use plastic alone will contribute to more than _____ percent of all greenhouse gas emissions by _____.

Task 2
Listen and match the sentence halves

1) Once plastics enter the environment, landfill, are dispersed in soil or water
2) And this process of breaking down emits powerful gases
3) On the surface of microplastics,
4) And their biological activity also releases additional CO2 and nitrous oxide
5) It means that microplastic can also impair the growth and the photosynthesis capacity
6) But also microplastics can have toxic effects on zooplankton,

a) of phytoplankton, which are the microorganisms producing much of the oxygen we breathe.
b) such as methane, ethylene and CO2.
c) and the health of these organisms is essential for the functioning of all aquatic food webs.
d) new microbial communities can grow.
e) they start a process of breaking down into micro and nanoparticles called microplastics.
f) into the environment, creating the possibility of further magnifying the climate problem.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1) Why has mass-production of plastics become a problem?
2) Why do low-income countries suffer from current plastics utilization protocols?
3) How do plastics damage the environment?
4) Explain the concept of virgin plastic.
5) What are the solutions to the plastics waste problem?

Task 5
Mark the following statements as True or False, correct the False ones.

1. Plastics contribute to climate change only in case they drift into the ocean.
2. The production of single-use plastic alone will contribute to more than 10 percent of all greenhouse gas emissions by 2050.
3. Rich countries and low-income countries recycle plastics domestically.
4. Plastisphere is a number of new microbial communities growing on the surface of microplastics.
5. Microplastics do not affect the capacity of the ocean to absorb and sequester carbon from the atmosphere.
6. Microplastics can only be found in water bodies.
7. All nations at the UN Environment Assembly adopted an initiative to end plastic pollution.

Task 6
Match the words and expressions to their definitions

carbon pump	the disposal of waste material by burying it, especially as a method of filling in and reclaiming excavated pits.
cost-competitive	the process of capturing and storing atmospheric carbon dioxide
landfill	convert a substance into simpler compounds by chemical action
recycling	matter that settles to the bottom of a liquid
to break down	the processes and actions required to manage waste from its inception to its final disposal
carbon sequestration	cheap compared to other similar products, or services
waste management	the action or process of converting waste into reusable material
sediment	the transformation of carbon dioxide and nutrients into organic carbon, its sinking into the in the deep ocean, and its decomposition at depth

Task 7
Fill in the gaps and translate the sentences into Russian

microbial community ***dump*** ***fossil fuel*** ***to dispose of*** ***biodegradable plastics*** ***aquatic*** ***food web*** ***reduce*** ***landfill*** ***photosynthesis***

1. Cyanobacteria live in shallow seas and require good light for _____.
2. Carbon dioxide gas is released into the atmosphere when the _____ is burned for energy.
3. These carbohydrates are used as a source of energy for all organisms in _____.
4. Economically _____made from starch can cost almost 10 times as much per kilogram as traditional petroleum-based plastics as they are made from virgin materials and require significantly more ENERGY to produce.
5. Sediments represent an important source of pollutants to_____ organisms.
6. Environmental problems can include windblown litter and_____ fires.
7. Diversity in the soil _____ should be maintained to ensure nutrient cycles and other soil functions continue.
8. Underground injection wells used _____ hazardous materials can lead to groundwater contamination.
9. The oceans have also been used as places to _____ the waste of metropolitan centers.
10. This would _____ erosion of the cliffs and slow this supply of sediment to the intertidal zone.

Task 8
Translate the sentences into English using the expressions from the box

toxic effect emission recycling
sequester carbon synthetic chemicals
cost competitive
waste management durable
degrading greenhouse gas

1. Переработка — это один из методов сохранения невозобновляемых ресурсов.
2. Современные синтетические химикаты заменили мышьяк во многих пестицидах, но он остается компонентом некоторых гербицидов.
3. Леса поглощают углерод, а пожары возвращают его в атмосферу.
4. Повышенные концентрации кальция снижают токсическое действие тяжелых металлов как на водоросли, так и на рыб.
5. Промышленные системы компостирования все чаще используются в качестве альтернативы полигонам, что делает их важным инструментом управления отходами.
6. Зарядка сетевым электричеством конкурентоспособна по стоимости, но оказывает воздействие на окружающую среду.
7. Нынешние тенденции развития и воздействие растущей урбанизации и индустриализации неуклонно приводят к деградации хрупких экосистем.
8. Гранит является самой прочной из магматических пород.
9. Сокращение выбросов может замедлить изменения снежного покрова в будущем.
10. Бензол является парниковым газом, способствующим потеплению атмосферы.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words

Some people say we should use less microplastics. Others claim it is more important to improve utilization protocols. Discuss both views and give your own opinion.

Unit 2

A new economic model for protecting tropical forests

https://www.ted.com/talks/nat_keohane_a_new_economic_model_for_protecting_tropical_forests
Tropical forests are one of the world's most important carbon sinks, absorbing over one fifth of the emissions from burning fossil fuels every year. The latest research suggests that without them the world would already be nearly one degree Celsius hotter. We can't solve climate change without tropical forests. But right now, instead of protecting forests, we're cutting them down. Already, about one sixth of the Amazon has been lost, and some scientists fear that we're nearing a tipping point that could mean loss of the entire forest. Forests in Indonesia and Malaysia, even the vast forests of Central Africa, are under threat as well. And deforestation means carbon pollution. In fact, tropical deforestation worldwide accounts for almost as much emissions as all the world's cars and trucks combined. So losing tropical forests means losing any hope of limiting the rise in global temperatures to 1.5 or even two degrees Celsius.
The heart of the problem is economic. As long as it's profitable to chop down forests for timber or clear them for agriculture, we'll continue to lose them. Now, I'm not suggesting that we try to halt capitalism in its tracks. We need to fix the market, not abandon it. We need a new and better economic development model for tropical forest countries. And that means changing the incentives so that forests are worth more alive than dead. If we can do that, we will drive investment into tropical forest protection while also producing the goods and services we need.
This is the Amazon forest in Mato Grosso, a Brazilian state that's as large as Texas and a chunk of California combined, and one of the world's largest producers of beef and soy. Mato Grosso is now a model of economic development and forest protection. But back in 2004, Mato Grosso was one of the world's largest carbon polluters entirely because of tropical deforestation. Since then, deforestation is down over 85 percent. How? Well, Mato Grosso didn't reduce emissions by shutting down agriculture. Instead, with support from the governments of Germany and Norway, it stepped up enforcement against illegal land grabbers. It empowered local communities and indigenous populations to protect their territories. It worked with agricultural producers and traders across the supply chain to invest in new and more sustainable production methods. These efforts were supported by a broad array of NGOs and businesses and Indigenous organizations. And they worked so well that when a new governor was elected in 2018, he immediately affirmed his commitment to reducing deforestation and continued the state’s policies. Because he saw how these new policies were attracting new investment and laying the foundation for sustainable growth. If we're going to stave off climate catastrophe, the world needs many more Mato Grossos.
Now, Mato Grosso began its bold experiment with public funding. But if we're going to preserve and extend those gains and scale them up to jurisdictions around the world, we need a new and more durable and much larger source of forest finance. And the key to unlocking that finance? Making forests worth more alive than dead. That means putting a value on standing forests in a way that channels new investment, hard cash, into sustainable green growth that protects the forests while supporting the livelihoods of people who live there. It's a development model that could make Brazil and Indonesia and other forest nations the world’s first green economic superpowers, that allows them to capture the full value of their natural resources.
This is the goal of the LEAF Coalition. LEAF stands for Lowering Emissions by Accelerating Forest finance. It's a coalition of 12 companies and three countries that has committed one billion dollars in finance for forest protection at scale over the next five years, one of the largest-ever public-private investments in forest protection. That first billion dollars will pay for 100 million tons of emissions reductions, with the prospect of many more billions to come. These three building blocks are essential to any credible market. Accurate measurement, a standard for quality and a platform for transactions.

First, credible forest transactions require accurate and precise measurement, and thanks to advances in satellite data and remote sensing, we can measure the amount of carbon a forest contains and track changes in real time.
The second building block is a standard for quality so that buyers of emissions reductions can be certain they're getting the real thing. At LEAF we use a new approach that focuses on the performance not of individual forests, but of entire official jurisdictions, like a state or nation. It builds in buffers against risks like forest fire, and it requires countries, forest nations, to increase their ambition over time.
The third and final building block is a platform for transactions. We created a financial intermediary called Emergent that connects sellers, forest nations that have emissions reductions that they can sell, with buyers who include companies that are looking to make good on their voluntary climate commitments. You put those three building blocks together and you get a reliable and robust market for forest carbon that enables economies to thrive while protecting the forest.
We know it's possible. In Mato Grosso, soy production more than doubled and cattle increased by over a quarter, even as deforestation plummeted. So the LEAF model promises better outcomes for forests, better outcomes for the people who live there and better outcomes for the forest nations as a whole.
But you may be asking, what's in it for the companies? Well, now more than ever, companies see a business case for climate action. Their customers are demanding it, their investors are, so are their employees. And companies recognize that truly leading on climate means doing two things. First, reducing emissions in their own operations and supply chains. And the companies that are part of LEAF have all been required to set science-based targets for their own emissions. Second, they must contribute to the broader fight. And one of the most important ways that these companies, or any company, can help solve climate change outside their own operations and supply chains is by protecting tropical forests. So that bears repeating. Companies in LEAF are investing in forest protection over and above what they're doing to reduce their own emissions. It's not a substitute, it's a supplement. Because if we're going to solve climate change, we need to achieve both deep cuts in fossil fuel emissions and dramatic reductions in forest emissions.
It took over a decade to put all of the building blocks in place that made LEAF possible. And the results so far are enormously encouraging. In the next ten years, if we can expand LEAF globally, we can stop tropical deforestation, protect some of the largest carbon sinks on the planet, and enable forest nations and local populations to thrive and grow. All because we harness the power of the market to reflect the full value of standing forests and make them worth more alive than dead.

Task 1
Listen and write down the missing words

Tropical forests are one of the world's most important _____ sinks, absorbing over one fifth of the emissions from burning _____every year. The latest research suggests that without them the world would already be nearly _____ Celsius hotter. We can't solve climate change without _____. But right now, instead of protecting forests, we're cutting them down. Already, about _____of the Amazon has been lost, and some scientists fear that we're nearing a _____that could mean loss of the entire forest. Forests in Indonesia and Malaysia, even the vast forests of Central Africa, are _____as well. And deforestation means _____. In fact, tropical deforestation worldwide accounts for almost as much _____as all the world's cars and trucks combined. So losing tropical forests means losing any hope of _____the rise in global temperatures to 1.5 or even two degrees Celsius.

Task 2
Listen and match the sentence halves

1) Mato Grosso is now a model
2) Mato Grosso was one of the world's largest

3) With support from the governments of Germany and Norway,
4) It worked with agricultural producers and traders across the supply chain
5) When a new governor was elected in 2018, he immediately affirmed
6) If we're going to stave off climate catastrophe,

a) it stepped up enforcement against illegal land grabbers.
b) the world needs many more Mato Grossos.
c) carbon polluters entirely because of tropical deforestation.
d) to invest in new and more sustainable production methods.
e) of economic development and forest protection.
f) his commitment to reducing deforestation and continued the state's policies.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. How much of the emissions from burning fossil fuels do tropical forests absorb every year?
2. What does losing tropical forests mean for the overall climate change?
3. What solutions are there to secure tropical forests?
4. Explain the concept of sustainable green growth.
5. What are the three building blocks which made the LEAF project possible?

Task 5
Mark the following statements as True or False, correct the False ones.

1. We can solve climate change without tropical forests.
2. Mato Grosso serves as an example of forest conservation as well as sustainable development.
3. LEAF is a coalition of businesses and governments working together to preserve forests.
4. In Mato Grosso the decrease in deforestation was facilitated by the decline in agricultural activities.
5. Companies in LEAF can choose between investing in forest protection and reducing their own emissions.

Task 6
Match the words and expressions to their definitions

fossil fuel	the point at which a series of small changes or incidents becomes significant enough to cause a larger, more important change.
green growth	It provides satellite imagery and earth observation data of the earth's surface and its atmosphere.
harness	a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.
satellite data	forested landscapes in tropical regions
shut down	fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.

supply chain	cease business or operation.
tipping point	control and make use of (natural resources), especially to produce energy.
tropical forest	the sequence of processes involved in the production and distribution of a commodity.

Task 7

Fill in the gaps with the words from the box and translate the sentences into Russian

preserve under threat
tropical forests remote sensing fossil fuels
indigenous populations precise
carbon sinks deforestation

1. Degradation is often a precursor to _____ as areas that are logged often increase access and result in clearing.
2. Burning of_____ is the main cause of emission of huge amount of various polluting gases.
3. For the 350 million so-called _____ of the earth today, nature and human identity are inseparable.
4. By the 1950s the fish 's total population had _____to fewer than 200 individuals.
5. _____include forests and ocean areas that absorb CO2 produced by the burning of fossil fuels.
6. There is often a perception of conflict between the need to _____ biodiversity and the goal of economic development.
7. _____have high biological diversity and contain about 15 percent of the world’s plant species.
8. Human impacts are responsible for driving a multitude of species to such low numbers that much of the world 's biodiversity is _____.
9. With the development of radioactive dating it became possible to refine _____ or absolute ages for specific rock units.
10. Often the objective is to directly link the _____ data to biophysical variables that describe the coastal ecosystem

Task 8

Translate the sentences into English using the expressions from the box

preserve tipping point carbon sinks
tropical forests reducing emissions
supply chain deforestation
timber under threat fossil fueled

1. Деревья функционируют как поглотители углерода, удерживая углерод на протяжении всей своей жизни и улавливая его из атмосферы.

2. Вырубка лесов и другие изменения экосистем признаются основными факторами, влияющими на климат в будущем.
3. Производство электроэнергии на ТЭЦ, работающих на ископаемом топливе, является самой дешевой технологией.
4. Биология охраны природы пытается остановить вымирание и сохранить биоразнообразие.
5. Сокращение выбросов уменьшит масштабы климатических изменений и связанных с ними последствий.
6. Для реализации крупномасштабной системы поставок биомассы необходимы разработки в области технологий и логистики цепочки поставок.
7. Деревья, используемые в лесном хозяйстве, представлены специальными сортами, выращенными из-за их повышенного качества и объема заготовок.
8. Говорят, что достигнут переломный момент и что в ближайшие десятилетия Арктика будет свободна ото льда в летний период.
9. Тропические леса поглощают почти столько же углерода, сколько умеренные и бореальные леса вместе взятые.
10. Сегодня живые ресурсы моря находятся под угрозой из-за чрезмерной эксплуатации, загрязнения и освоения суши.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words
Businesses should invest more in preservation of forests. At what extend to you agree or disagree.

Unit 3

How carbon capture networks could help curb climate change

https://www.ted.com/talks/bas_sudmeijer_how_carbon_capture_networks_could_help_curb_climate_change?language=en

If you're in charge of a major metropolitan city, it's almost a must these days to be sustainable. Us city dwellers pride ourselves on living in places that are taking action on climate change and achieving net zero.

But what if you're Don Iveson? You're the mayor of oil and gas town Edmonton, in northern Alberta, Canada. Or across the Atlantic, Holly Mumby-Croft, UK member of parliament for Scunthorpe, home to one of the last steel plants of Britain. Or much smaller, you're Dave Smiglewski. You're the mayor of the little city of Granite Falls, Minnesota, with a large-scale ethanol production facility nearby. All these places, no matter how far apart and how different in size, have something big in common: millions of tons of greenhouse gas emissions linked to significant local employment. And we're going to have to find a way to maintain the critical economic and social functions of these towns if we're to have any hope of combating climate change. Not an easy feat, if you think that we can't really put a solar panel on a gas processing facility or a steel mill.

Fortunately, these places have another interesting thing in common, which might offer some hope to these local officials. The main sources of pollution in their areas are in close proximity to rock formations with the ability to trap carbon dioxide, the greenhouse gas we often call CO2. And this puts into reach a potential solution to both their problems: pollution and employment. It's called "carbon capture and storage." It's the process whereby we capture the CO2, which results from burning fossil fuels, before it's emitted into the atmosphere and instead bury it underground. Effectively, we take part of what we've extracted from the earth -- the carbon -- back to where it came from.

Now, this is not a new idea. People have been experimenting with this technology for decades. Today, however, there are very few operational carbon capture facilities in the world, capturing about 14 million tons of CO2 equivalent per year. And while that may sound like a big number, it's less than .1 percent of global greenhouse gas emissions.

The International Energy Agency predicts that we need to capture between four and seven gigatons -- that's four to seven billion metric tons -- of CO2 per year by 2040 to stay at or below two degrees Celsius warming. And that's a more than 100 to 200 times increase in today's carbon capture capacity. To get us there will definitely require a price on greenhouse gas pollution. There is a cost, and it needs to be settled. And if we're not smart about it, the price could be very high. Should we then solely rely on the future improvements in the fundamental technology? No. There is another way. And it's the need for well-thought-through rollouts of what might be called CO2 networks.

In BCG, I lead a team of consultants, analysts and data scientists whose focus is on advancing carbon capture utilization and storage. By our estimates, if we want to hit the IEA forecast, we need at least 110 billion dollars per year for the next 20 years to build out the required carbon capture and storage infrastructure. And there's only one way to bring down this essential but hefty price tag, which is to share the cost through networks. Consider it the waste disposal service for CO2. Our research suggests that policymakers and companies can learn a lot by looking at a map -- lots of maps, actually, both the ones that you and I look at on our smartphones as well as the less common ones that show what lies below the surface in terms of depleted oil and gas fields and saline aquifers with the ability to trap CO2 underground. And by looking at these maps, we can look for the optimal distances between both the sources of emissions, like Scunthorpe's steel plant, and the sinks, like the saline aquifers of Alberta.

We had a first go, and it yields interesting results. By building up a detailed database of emitters as well as potential sinks, we found up to 200 clusters that have the ability to be scaled up to low-cost

carbon networks. And they can capture more than one gigaton of emissions, a big step to the four to seven gigatons that we need. And when we dig a little deeper, we find that optimization of distances between sinks and sources matters. It matters a lot in terms of the cost. Network effects, which is the mechanism whereby the benefits of a system to a user increases with the amount of others' use of it, can reduce the capture and storage cost of many emitters by up a third, to below 100 dollars per ton of CO2 captured, based on current costs of technology. And while that is still a substantial cost, it starts to get in the range of carbon taxes and market mechanisms that governments of Western economies are starting to think about or have already put in place. And we would not be able to achieve it without collaboration and sharing of infrastructure between neighboring emitters.

Let us walk through some of the cities I mentioned. In assessing areas to build CO2 networks, we look for three different things. Firstly, proximity to storage. Secondly, a cluster of at least a few sources with high amounts of CO2 in their flue gas; the more CO2 in the exhaust, the cheaper it is to capture. And thirdly, an ability to scale up the network and lower the cost quickly with few emitters. Edmonton and its surrounding areas provide a good example of this idea at work. Suitable underground rock layers that can trap CO2 are abundant, well exceeding what is needed, and it also meets the second and third criteria in that it has a good combination of both high- and low-concentration CO2 streams associated with different industrial processes. And it can scale up to low cost quickly. In one of the clusters, we find the number of emitters with very low capture and storage cost in the range of 40 to 50 dollars per ton, but they only represent 1.2 megatons per year. The total cluster, however, can scale up to 12 megatons -- up to 10 times its original size. But those first megatons of emissions played a crucial role in scaling up the network and reducing the cost and risk for others down the line. That's your network effect in action.

And it's not just Edmonton. If we take Scunthorpe in Lincolnshire in the UK, we see similar dynamics and potential. The North Sea offers sufficient storage, and while storing CO2 offshore is more expensive than onshore, there's the potential to reduce this cost by reusing and repurposing existing oil and gas infrastructure. If the steel mill standalone would have to capture and store its CO2, it would prove very costly. But it can reduce this cost by sharing the infrastructure with refining and chemical emitters en route to the North Sea. Many of them have cheaper capture cost with the ability to improve the overall economics and kick-start a network that has the ability to scale up to 28 megatons. Two examples in two different countries with 14 megatons of potential -- already double versus what we have today.

And this network effect applies anywhere and is actually not uncommon when it comes to building out infrastructure. In fact, CO2 networks could very much follow the principles of the past in terms of how our energy and utility infrastructure was developed around us, whether it's water, gas, electricity, local supply chains -- all these networks apply local economies of scale and were built up over time with favorable, marginal cost of adding new connections. The big difference here is we're reversing the flow. And these networks have the potential to enable future innovation of using CO2 in chemical processes to make, for example, building materials instead of burying the CO2 underground.

Our analysis is a pure economic one. It does not account for political and local geographical barriers, but creating a favorable regulatory environment and removing these barriers will be critical. Take these two neighboring states in the US, for example: North Dakota, with ample, cheap storage and existing CO2 pipelines, and the state has put in place tax incentives and financial assistance to use it. Go next door to Minnesota: no storage within several hundred miles, but home to 18 large-scale ethanol production facilities, including the one in Granite Falls, all of which create a highly concentrated stream of CO2 emissions. Can the blue and the red state work together to add 40 megatons to our carbon capture tally?

We have no more than 20 years to bend the curve and combat climate change -- potentially less. The gas networks in my two home countries of the Netherlands and the UK were built in similar time frames after the Second World War -- massive undertakings in infrastructure buildup and at a time of similar high national debt. It's time to build another network, one for CO2. It does not need to last forever. It can be there just for the transition away from fossil fuels. But we need it now to preserve

local manufacturing jobs and our communities and provide a hope for a better and more sustainable future.
It is critical that governments, both local and national, as well as companies, assess the potential for carbon capture at a local level, start to capture the cheapest sources of CO2 and build up the network from there. Only in that way can local communities like the ones in Edmonton, Granite Falls, Scunthorpe and beyond thrive both economically and sustainably.

Task 1

In BCG, I lead a team of consultants, analysts and data scientists whose focus is on advancing carbon capture_____. By our estimates, if we want to hit the IEA _____., we need at least 110 billion dollars per year for the next 20 years to build out the required _____. and storage infrastructure. And there's only one way to bring down this essential but hefty _____., which is to share the cost through networks. Consider it the _____. for CO2. Our research suggests that policymakers and companies can learn a lot by looking at a map -- lots of maps, actually, both the ones that you and I look at on our smartphones as well as the less common ones that show what lies below the surface in terms of _____. oil and gas fields and saline _____. with the ability to trap CO2 underground. And by looking at these maps, we can look for the optimal distances between both the _____., like Scunthorpe's steel plant, and the sinks, like the saline aquifers of Alberta.

Task 2
Listen and match the sentence halves

1) We found up to 200 clusters
2) They can capture more than one gigaton of emissions,
3) We find that optimization of distances
4) Network effects can reduce the capture
5) While that is still a substantial cost,
6) We would not be able to achieve it

a) and storage cost of many emitters by up a third.
b) a big step to the four to seven gigatons that we need.
c) without collaboration and sharing of infrastructure between neighboring emitters.
d) between sinks and sources matters.
e) it starts to get in the range of carbon taxes and market mechanism.
f) that have the ability to be scaled up to low-cost carbon networks.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. How does carbon capture and storage work?
2. How much CO2 do we need to capture by 2040 to meet the targets on global warming?
3. What impact does network effect have on the price of capturing CO2?
4. What solution does the text offer for reducing the price of CO2 storage in the North Sea?
5. How can CO2 be reused in the future?

Task 5
Mark the following statements as True or False, correct the False ones

1. Industrial facilities generate excessive CO2 emissions.
2. Industrialized areas offer no solution for capturing greenhouse gases.
3. Nowadays there aren't any carbon capture facilities.
4. The only key to reduction of carbon sequestration price is the network mechanism.
5. The team of researchers found 12 clusters which have the potential to be arranged into carbon networks.
6. Modern technologies can reduce the CO2 capture and storage cost to exactly 100 dollars per ton.
7. Storing CO2 in the North sea is more expensive than storing it onshore.

Task 6
Match the words and expressions to their definitions

net zero	a tax on fossil fuels, especially those used by motor vehicles, intended to reduce the emission of carbon dioxide
production facility	a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms
source of pollution	used up the supply or resources of
fossil fuel	a district where natural gas is produced in commercial quantities
depleted	a target of completely negating the amount of greenhouse gases produced by human activity, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.
gas field	any place from which stems or condition which may cause pollution of a ground or surface water supply
carbon tax	a mixture of gases produced by the burning of fuel or other materials in power stations and industrial plants and extracted via ducts
flue gas	a building or area where goods are made

Task 7
Fill in the gaps with the words from the box and translate the sentences into Russian

carbon tax ***gas fields*** ***rock formation***
fossil fuel ***exhaust*** ***thrive*** ***source of pollution***
marginal cost ***solar panels*** ***flue gases***

1. _____on the roofs of homes are a familiar sight in city and rural settings.
2. Coal burning remained the most serious _____ until modern times
3. This hardness is derived from contact with soil and _____ such as limestone.
4. Natural gas is abundant in shallow crustal reservoirs and is useful as a _____.
5. The European Union has discussed a _____covering its Member States, and has implemented a carbon emissions trading scheme.

6. The optimal level of pollution is determined where the _____of emissions and marginal benefits are equal.
7. There are more than 50 species of sea snakes that _____in marine environments.
8. Fracturing allows for extended production in older oil and natural _____.
9. The removal of acidic pollutants from the_____ from installations such as incinerators.
10. It is a major constituent of automobile_____ gases and a common component of urban photochemical smog.

Task 8
Translate the sentences into English using the expressions from the box

fossil fuels	**marginal costs**	**source of pollution**
carbon tax	**solar panel**	**rock formations**
carbon capture and storage		
thrive	**production facility**	**gas fields**

1. Система водоотделяющей колонны является важным компонентом глубоководного производственного объекта.
2. Солнечная панель потребляет солнечный свет и вырабатывает постоянное напряжение, которое поступает на контроллер заряда.
3. Значительные изменения электропроводности могут свидетельствовать о попадании в реку сброса или наличии другого источника загрязнения.
4. Добыча полезных ископаемых в твердых и мягких горных породах требует различных методов.
5. Улавливание и хранение углерода — новая технология сокращения выбросов парникового газа из крупных источников, в первую очередь угольных электростанций.
6. Были приняты различные подходы к поощрению использования возобновляемых источников энергии и снижению энергетической зависимости от ископаемых видов топлива.
7. Цель налога на выбросы углерода является как финансовой (как и все налоги), так и экологической.
8. В начале 1970-х годов экономисты начали изучать способы уменьшения загрязнения, при которых учитывались бы различия в предельных затратах компаний на сокращение загрязнения.
9. Растительность определяет виды животных, которые наиболее вероятно будут изобиловать в данном районе.
10. Подводный манифольд играет важную роль в разработке глубоководных месторождений нефти и газа.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words
Discuss the pros and cons of network effect on the economy and environment.

Unit 4

How cities are detoxing transportation

https://www.ted.com/talks/monica_araya_how_cities_are_detoxing_transportation

We have known for a long time that air pollution kills people. We also know that a climate emergency is happening. These are hardly motivating facts to start a conversation, but I'm actually here to share good news.
For the first time in our lifetimes, a big detox of transportation is possible, despite the many problems we have, or perhaps because of them. The lockdowns of 2020 have been tough, but they also give us a glimpse of life without the usual noise, congestion and pollution, confronting us with questions about the way we live. The tailpipe is a symbol of our worst habits -- habits that we have normalized for too long: the burning of 100 million barrels of oil every 24 hours and the extraction behind that oil, the fumes choking our cities, the greenhouse gases going up in the atmosphere and overheating our planet. None of that is normal, nor is air pollution, which can shorten life expectancy by up to 10 years, depending on where you live. This is also a matter of environmental justice because air pollution hurts everyone, but it hurts the poor and minorities disproportionately.
The good news is that things are changing. Take cities. First, people around the world are demanding clean air and cities are responding by banning petrol and diesel cars, mostly by 2030 and 2040; over 30 cities and regions are already doing this.
Second, the city space is going through an overhaul. Too much space was given to cars, and cities are reversing this by blocking traffic from certain streets, by giving the streets back to pedestrians, by making the streets greener and safer, especially for children.
And third, cities are also prioritizing active mobility, such as biking and walking. And the pandemic accelerated many of these decisions. From Barcelona to Bogotá, cities are opening spaces for bike lanes, for commuters. Sales of bikes and e-bikes are booming in many places. Paris is pioneering the 15-minute city to put essentials within a walk or a bike ride, all within 15 minutes.
I live in Amsterdam, where a profound transformation is underway. Amsterdam already promotes biking, public transit, walking. So you might be surprised to hear that even in Amsterdam there is a problem with air pollution because of road transportation. That is why the city of Amsterdam has a plan to go emissions-free by 2030. And the plan builds on the idea of an expanding zero-emission zone going from the center outwards in three phases.
By 2022, all buses and coaches circulating in the city center must be emissions-free. By 2025, the zone expands and all public and commercial traffic must be emissions-free. Public buses, coaches, taxis, vans, small, medium and large trucks. That also includes mopeds, ferries and boats. By 2030, the zone expands further, and by then all transportation must be emissions-free, including personal cars and motorcycles. No more tailpipes. And that is just nine years away. Living here and witnessing firsthand how Amsterdam becomes a front-runner of electric mobility is a powerful reminder that the big societal imperative of halving carbon emissions by 2030 goes beyond nudging people away from personal cars.
The systemic change we need requires that all modes of transportation go emissions-free powered by renewables, and we have to achieve that while making sure that our needs are met as citizens and as business. And to do this, we need to electrify pretty much everything. Cities cannot do this alone, so we need national governments to play a fundamental role too.
The European Union, for example, has CO2 emission standards for vehicle manufacturers, and over a dozen of European countries have set up plans to phase out petrol and diesel cars -- France by 2040, the United Kingdom by 2035. China and California have mandates to accelerate the manufacturing of zero-emission models. California just passed a rule that requires that 50 percent of the sales of

trucks in the state are zero-emissions by 2035 and all of them must be zero-emission by 2045. This is a game changer for the trucking industry.
Vehicle manufacturing is shifting towards electrification. Look at some of the milestones, which were unthinkable a few years back. Volkswagen has converted a traditional plant into one that will produce only electric vehicles. Daimler is halting all the development of internal combustion engines. And Tesla is more valuable today than ExxonMobil. This year, public charging plugs hit the one million mark around the world. Fleet owners are shifting towards zero-emission models. Amazon alone has ordered 100,000 electric delivery vans and nearly 90 global companies have joined EV100, an international initiative to electrify fleets by 2030 starting now.
These are still small steps compared to the scale of our oil addiction, but they signal a new direction of travel. What's really exciting is that the technologies we need for this transformation are here today, commercially available, getting cheaper and getting better. Look at batteries. Their cost went down 90 percent in 10 years, and there are new opportunities to repurpose these batteries for energy storage or to recycle them once they wear down.
The race to zero needs capital. So we need more urgency and directionality in the financial industry because it is heavily invested in fossil fuels. To reach scale and speed, we will need clever combinations of finance and policy. Look at what's going on with electric buses. China has a fleet of 420,000 electric buses compared to 600 in the entire United States. To put that into perspective, Santiago de Chile alone has 455 electric buses, and growing, thanks to an ingenious financial arrangement. Africa now has its first manufacturing plant of electric buses. And P4G, a global initiative, is working with emerging economies that want to scale up the electrification of buses. Colombia is first in line, designing a fund of 2.2 billion dollars to electrify 6,000 buses over time.
There is, and there will be, resistance to change. There is even an inability to imagine that change is possible. In reality, change happens exponentially. Look at what happened to solar energy. Exponential change can bring turmoil if the decline of old industries is not managed. It can bring economic dislocation and job disruption. So wouldn't it be wiser to prepare and design just transitions now rather than later?
Here's the bottom line. The end of internal combustion engine is within sight. The question is no longer whether this will happen, but when. Ten years? Twenty years? It depends on us and the choices that we make this decade. So now is the time to go bigger and faster towards a future without a tailpipe, a future where we can meet our transportation needs and have people-friendly streets, a future with a thriving economy and clean air, a future we choose for the climate and for our health.

Task 1
Listen and write down the missing words

For the first time in our lifetimes, a big detox of _____ is possible, despite the many problems we have, or perhaps because of them. The _____ of 2020 have been tough, but they also give us a glimpse of life without the usual noise, _____, confronting us with questions about the way we live. The tailpipe is a symbol of our _____ habits -- habits that we have normalized for too long: the _____ of 100 million barrels of oil every 24 hours and the _____ behind that oil, the fumes choking our cities, the _____going up in the atmosphere and _____ our planet. None of that is normal, nor is _____, which can shorten _____by up to 10 years, depending on where you live. This is also a matter of _____because air pollution hurts everyone, but it hurts the poor and minorities disproportionately.

Task 2
Listen and match the sentence halves

1) By 2022, all buses and coaches circulating in the city center

2) All transportation must be emissions-free,
3) Amsterdam becomes a front-runner
4) Halving carbon emissions by 2030
5) The systemic change we need requires that all modes of transportation
6) We need national governments

a) go emissions-free powered by renewables.
b) to play a fundamental role too.
c) including personal cars and motorcycles.
d) of electric mobility.
e) must be emissions-free.
f) goes beyond nudging people away from personal cars.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. How did the lockdowns of 2020 change the perception of city traffic?
2. What alternatives to cars and buses do cities offer?
3. What countries have plans to phase out petrol and diesel cars?
4. Explain the concept of an emission-free vehicle.
5. Which country has the biggest fleet of electric buses?

Task 5
Mark the following statements as True or False, correct the False ones

1. Air pollution has no impact on how long people live.
2. Active mobility means driving an automobile actively.
3. Amsterdam has not yet resolved the problem of air pollution.
4. Commercial traffic includes public buses, coaches, taxis, vans, small, medium and large trucks.
5. To do emission-free we need to switch to electricity powered vehicles.
6. In the past decade the price of batteries has plummeted dramatically.
7. Electric vehicles are now being produced on all continents besides Africa.

Task 6
Match the words and expressions to their definitions

air pollution	emissions stemming from the burning of fossil fuels and the manufacture of cement
climate emergency	an area where only zero-emission vehicles (ZEVs), pedestrians, and cyclists are granted unrestricted access
detox	to concentrate in a small or narrow space
congestion	make or become too hot
overheating	the presence in or introduction into the air of a substance which has harmful or poisonous effects

life expectancy	a process or period of time in which one abstains from or rids the body of toxic or unhealthy substances; detoxification
zero-emission zone	a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it
carbon emission	the average period that a person may expect to live

Task 7

Fill in the gaps and translate the sentences into Russian

fumes	***life expectancy***	***congestion***
carbon emissions	***tailpipe***	***renewables***
internal combustion engine		
environmental justice	***phase out***	***air pollution***

1. _____concentrations in mountain valleys tend to be greatest during the colder months.
2. Increased traffic_____ may result in increased expenditures for law enforcement personnel, for example.
3. Biodiesel reduces _____particulate matter, hydrocarbon, and carbon monoxide emissions from most modern four-stroke compression ignition engines.
4. Ventilation is required to clear toxic_____ from blasting and removing exhaust fumes from diesel equipment.
5. In the modern context, the forebears of radical environmental and_____ groups that question the exploitation of labor and the environment in the pursuit of profits.
6. Economic assessment should assume a_____of up to 50 years before major repairs or reconstruction will be required.
7. It is desirable that these novel technologies should also contribute to mitigate _____under a green growth strategy.
8. It requires power suppliers to derive from_____a specified proportion of the electricity they supply to their customers.
9. This was the policy used to_____lead in gasoline in the 1980s.
10. Carcinogenic aldehydes such as formaldehyde are produced when ethanol is burned in _____.

Task 8

Translate the sentences into English using the expressions from the box

fumes	***life expectancy***	***congestion***
carbon emissions	***tailpipe***	***renewables***
internal combustion engine		
zero emission	***phase out***	***air pollution***

1. Отработанные газы являются причиной большинства промышленных загрязнений воздуха.
2. Сингапур был первым городом, где ввели плату за пробки.
3. Для снижения выбросов угарного газа в выхлопных газах используется бензин с содержанием кислорода 2,7 % по весу.
4. Газы осаждаются в подвалы зданий, колодцы и ливневые стоки.
5. Многие факторы могут увеличить продолжительность жизни и снизить уровень смертности.

6. Преимуществом таких систем является нулевой уровень выбросов.
7. Возобновляемые источники энергии не только снижают затраты, но и сокращают выбросы углерода.
8. Гидроэнергетика, вторая после древесины среди возобновляемых источников энергии, ежегодно увеличивается почти на 4 процента.
9. Производство и использование тетрахлорметана было прекращено в 1996 году.
10. Потенциальные возможности использования этанола в качестве топлива для снижения выбросов двигателей внутреннего сгорания были широко изучены.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words

It has been noted that introduction of emission free commercial transport requires substantial initial investments. To what extent should governments participate in funding green vehicle transition?

Unit 5

These bacteria eat plastic

https://www.ted.com/talks/morgan_vague_these_bacteria_eat_plastic?language=en

Plastics: you know about them, you may not love them, but chances are you use them every single day. By 2050, researchers estimate that there will be more plastic in the ocean than fish.

Despite our best efforts, only nine percent of all plastic we use winds up being recycled. And even worse, plastic is incredibly tough and durable and researchers estimate that it can take anywhere from 500 to 5,000 years to fully break down. It leaches harmful chemical contaminants into our oceans, our soil, our food, our water, and into us.

So how did we wind up with so much plastic waste? Well, it's simple. Plastic is cheap, durable, adaptable, and it's everywhere. But the good news is there's something else that's cheap, durable, adaptable and everywhere. And my research shows it may even be able to help us with our plastic pollution problem.

I'm talking about bacteria. Bacteria are microscopic living beings invisible to the naked eye that live everywhere, in all sorts of diverse and extreme environments, from the human gut, to soil, to skin, to vents in the ocean floor, reaching temperatures of 700 degrees Fahrenheit. Bacteria live everywhere, in all sorts of diverse and extreme environments. And as such, they have to get pretty creative with their food sources. There's also a lot of them. Researchers estimate that there are roughly five million trillion trillion -- that's a five with 30 zeros after it -- bacteria on the planet. Now, considering that we humans produce 300 million tons of new plastic each year, I'd say that our plastic numbers are looking pretty comparable to bacteria's.

So, after noticing this and after learning about all of the creative ways that bacteria find food, I started to think: could bacteria in plastic-polluted environments have figured out how to use plastic for food? Well, this is the question that I decided to pursue a couple of years ago. Now, fortunately for me, I'm from one of the most polluted cities in America, Houston, Texas.

In my hometown alone, there are seven EPA-designated Superfund sites. These are sites that are so polluted, that the government has deemed their cleanup a national priority. So I decided to trek around to these sites and collect soil samples teeming with bacteria. I started toying with a protocol, which is fancy science talk for a recipe. And what I was trying to cook up was a carbon-free media, or a food-free environment. An environment without the usual carbons, or food, that bacteria, like us humans, need to live.

Now, in this environment, I would provide my bacteria with a sole carbon, or food, source. I would feed my bacteria polyethylene terephthalate, or PET plastic. PET plastic is the most widely produced plastic in the world. It's used in all sorts of food and drink containers, with the most notorious example being plastic water bottles, of which we humans currently go through at a rate of one million per minute. So, what I would be doing, is essentially putting my bacteria on a forced diet of PET plastic and seeing which, if any, might survive or, hopefully, thrive.

See, this type of experiment would act as a screen for bacteria that had adapted to their plastic-polluted environment and evolved the incredibly cool ability to eat PET plastic. And using this screen, I was able to find some bacteria that had done just that. These bacteria had figured out how to eat PET plastic.

So how do these bacteria do this? Well, it's actually pretty simple. Just as we humans digest carbon or food into chunks of sugar that we then use for energy, so too do my bacteria. My bacteria, however, have figured out how to do this digestion process to big, tough, durable PET plastic.

Now, to do this, my bacteria use a special version of what's called an enzyme. Now, enzymes are simply compounds that exist in all living things. There are many different types of enzymes, but basically, they make processes go forward, such as the digestion of food into energy. For instance, we humans have an enzyme called an amylase that helps us digest complex starches, such as bread,

into small chunks of sugar that we can then use for energy. Now, my bacteria have a special enzyme called a lipase that binds to big, tough, durable PET plastic and helps break it into small chunks of sugar that my bacteria can then use for energy. So basically, PET plastic goes from being a big, tough, long-lasting pollutant to a tasty meal for my bacteria. Sounds pretty cool, right?
And I think, given the current scope of our plastic pollution problem, I think it sounds pretty useful. The statistics I shared with you on just how much plastic waste has accumulated on our planet are daunting. They're scary. And I think they highlight that while reducing, reusing and recycling are important, they alone are not going to be enough to solve this problem. And this is where I think bacteria might be able to help us out.
But I do understand why the concept of bacterial help might make some people a little nervous. After all, if plastic is everywhere and these bacteria eat plastic, isn't there a risk of these bacteria getting out in the environment and wreaking havoc? Well, the short answer is no, and I'll tell you why. These bacteria are already in the environment. The bacteria in my research are not genetically modified frankenbugs. These are naturally occurring bacteria that have simply adapted to their plastic-polluted environment and evolved the incredibly gnarly ability to eat PET plastic.
So the process of bacteria eating plastic is actually a natural one. But it's an incredibly slow process. And there remains a lot of work to be done to figure out how to speed up this process to a useful pace. My research is currently looking at ways of doing this through a series of UV, or ultraviolet, pretreatments, which basically means we blast PET plastic with sunlight. We do this because sunlight acts a bit like tenderizer on a steak, turning the big, tough, durable bonds in PET plastic a bit softer and a bit easier for my bacteria to chew on.
Ultimately, what my research hopes to do is create an industrial-scale contained carbon-free system, similar to a compost heap, where these bacteria can thrive in a contained system, where their sole food source is PET plastic waste. Imagine one day being able to dispose of all of your plastic waste in a bin at the curb that you knew was bound for a dedicated bacteria-powered plastic waste facility. I think with some hard work this is an achievable reality.
Plastic-eating bacteria is not a cure-all. But given the current statistics, it's clear that we humans, we could use a little help with this problem. Because people, we possess a pressing problem of plastic pollution. And bacteria might be a really important part of the solution.

Task 1
Listen and write down the missing words

Bacteria are _____living beings invisible to the naked eye that live everywhere, in all sorts of diverse and _____, from the human gut, to _____, to skin, to vents in the _____, reaching temperatures of 700 degrees Fahrenheit. Bacteria live everywhere, in all sorts of _____ and extreme environments. And as such, they have to get pretty creative with their _____. There's also a lot of them. Researchers _____ that there are roughly five million trillion trillion -- that's a five with 30 zeros after it -- bacteria on the planet. Now, considering that we humans _____**e** 300 million tons of new plastic each year, I'd say that our _____are looking pretty comparable to bacteria's.

Task 2
Listen and match the sentence halves

1) My bacteria use a special version
2) Enzymes are simply compounds
3) They make processes go forward,
4) We humans have an enzyme called an amylase
5) My bacteria have a special enzyme
6) PET plastic goes from being a big, tough, long-lasting pollutant

a) to a tasty meal for my bacteria.
b) that helps us digest complex starches, such as bread.
c) that exist in all living things.
d) such as the digestion of food into energy.
e) called a lipase that binds to big, tough, durable PET plastic.
f) of what's called an enzyme.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1) How much of the plastics is being recycled now?
2) How can bacteria assist in solving the plastics pollution problem?
3) What kind of plastics do bacteria eat in the experiment?
4) How do bacteria digest plastics?
5) Are the bacteria in the experiment artificially modified?

Task 5
Mark the following statements as True or False, correct the False ones

1. It takes plastic up to 1000 years to fully break down.
2. Bacteria can live only in specific conditions.
3. In the experiment bacteria were placed in the environment without food or carbon.
4. No bacteria survived in the experiment.
5. Bacteria use enzyme called amylase to digest plastics.
6. Plastics eating bacteria are unlikely to distort the environment.
7. Eating plastics is not a fast-paced process for bacteria.

Task 6

Match the words and expressions to their definitions

compost	convert a substance into simpler compounds by chemical action
compound	any system where wastes are enclosed and emissions to air are passed through a bio-filter or other designed abatement system
contained system	use again or more than once
extreme environment	convert (waste) into reusable material
recycle	does not use fossil fuels or does not emit carbon
reusing	decayed organic material used as a fertilizer for growing plants
break down	a substance formed from two or more elements chemically united in fixed proportions

carbon-free media	places where humans would not survive – for example, environments that have very high temperatures or pressure

Task 7
Fill in the gaps with the words from the box and translate the sentences into Russian

extreme environment	***compost***	***leaching***
chemical contaminants	***cleanup***	***durable***
plastic wastes	***compounds***	***recycle***	***reusing***

1. The answer probably lies in combinations of characteristics and mechanisms that generate and _____ nutrients.
2. They found that worm holes may extend to 1 meter below the surface and can be quite_____.
3. Much attention has been devoted to assessing the optimal quantity of water that must be applied to cause_____.
4. A relatively concentrated mass of emitted _____ spreading in the environment.
5. Huge amount of_____produced may be treated with suitably designed method to produce fossil fuel substitutes.
6. The primary adaptation of the vegetation is to the_____and not in response to competition for space or resources.
7. As well as losses from tourism there are continual costs of beach_____efforts that take time and money.
8. The_____are mixed with water and fed into the water with inexpensive solution feed pumps.
9. The stability of the_____can be measured either by the carbon dioxide production or oxygen consumption.
10. The biodiesel yield after 5 times of_____the catalyst was 84.5 %.

Task 8
Translate the sentences into English using the expressions from the box

cleanup	***reusing***	***chemical contaminant***
extreme environments	***compounds***	***leached***
plastic waste	***recycling***	***compost***
wreaking havoc		

1. Общественная программа утилизации, требующая от граждан сдавать предметы для переработки в специально отведенное место для сбора.
2. Химические загрязнители могут выщелачиваться, т. е. растворяться при проникновении в грунтовые воды.
3. Сток из этих городских районов может содержать химические загрязнители, которые затем могут задерживаться в лагунах в виде более мелкозернистых отложений.
4. Поскольку большинство пластиковых отходов имеют высокую теплоемкость, их сжигают.
5. Микроорганизм, обитающий в экстремальных условиях, например, в горячих источниках или в сильно соленой воде.
6. Последующая очистка представляет собой крупнейшую из когда-либо проводившихся полевых биоремедиаций.
7. Большинство органических соединений могут быть получены из алканов.
8. Культуры с более длительным периодом роста могут лучше использовать компост.

9. Франция давно придерживается политики переработки и повторного использования отработавших топливных стержней.
10. Происходит критическое опреснение воды океана, смещение океанских течений и разрушение мирового климата.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words

Some people think we should use less plastics, but other people think it is necessary to come up with new reusing and recycling solutions. Discuss both opinions and give your own opinion.

Unit 6

Buildings that blend nature and city

https://www.ted.com/talks/jeanne_gang_buildings_that_blend_nature_and_city?language=en

Today, urban habitats are out of balance. Climate change, together with political and economic troubles, are having an impact; they're adding up and stressing out cities and us, the people who live in them.

For me, the field of ecology has provided important insight, because ecologists don't just look at individual species on their own, they look at the relationships between living things and their environment. They look at how all the diverse parts of the ecosystem are interconnected, and it's actually this balance, this web of life, that sustains life. My team and I have been applying insights from ecology to architecture to see how physical space can help build stronger relationships. The projects I'm going to show you today use the idea of building relationships as the key driver for design.

Here's an example of what I mean. Recently, we were asked to design a center for social justice leadership called the Arcus Center. They asked us for a building that could break down traditional barriers between different groups and in doing so, create possibilities for meaningful conversations around social justice. The students wanted a place for cultural exchange. They thought a place for preparing food together could do that. And they wanted to be welcoming to the outside community. They thought a fireplace could draw people in and help start conversations. And everybody wanted the work of social justice to be visible to the outside world. There really wasn't a precedent for this kind of space, so we looked around the globe and found examples of community meeting houses. Community meeting houses are places where there's very specific relationships between people, like this one in Mali, where the elders gather. The low roof keeps everybody seated and at equal eye level. It's very egalitarian. I mean, you can't stand up and take over the meeting. You'd actually bump your head.

In meeting houses, there's always a central space where you can sit around a circle and see each other. So we designed a space just like that right in the middle of the Arcus Center, and we anchored it with a fireplace and a kitchen. It's pretty hard to get a kitchen and a fireplace in a building like this with the building codes, but it was so important to the concept, we got it done. And now the central space works for big social gatherings and a place to meet one-on-one for the very first time. It's almost like this three-way intersection that encourages bumping into people and starting a conversation. Now you can always pass the kitchen and see something going on. You can sit by the fireplace and share stories. You can study together in big groups or in small ones, because the architecture sets up these opportunities.

Even the construction is about building relationships. It's made of cordwood masonry, which is using logs the way you would use bricks. It's super low-tech and easy to do and anyone can do it -- and that's the entire point. The act of making is a social activity.

And it's good for the planet, too: the trees absorbed carbon when they were growing up, and they gave off oxygen, and now that carbon is trapped inside the walls and it's not being released into the atmosphere. So making the walls is equivalent to taking cars right off the road. We chose the building method because it connects people to each other and to the environment.

But is it working? Is it creating relationships and nurturing them? How can we know? Well, more and more people are coming here, for one, and as a result of the fireside chats and a full calendar of programming, people are applying for the Arcus Fellowships. In fact, applications have increased tenfold for the Arcus Fellowship since the building opened. It's working. It's bringing people together.

So I've shown how architecture can connect people on this kind of horizontal campus scale. But we wondered if social relationships could be scaled up -- or rather, upward -- in tall buildings. Tall

buildings don't necessarily lend themselves to being social buildings. They can seem isolating and inward. You might only see people in those awkward elevator rides. But in several major cities, I've been designing tall buildings that are based on creating relationships between people.
This is Aqua. It's a residential high-rise in Chicago aimed at young urban professionals and empty nesters, many of them new to the city. With over 700 apartments, we wanted to see if we could use architecture to help people get to know their neighbors, even when their homes are organized in the vertical dimension. So we invented a way to use balconies as the new social connectors. The shapes of the floor slabs vary slightly and they transition as you go up the tower. The result of this is that you can actually see people from your balcony. The balconies are misregistered. You can lean over your balcony and say, "Hey!" just like you would across the backyard. To make the balconies more comfortable for a longer period of time during the year, we studied the wind with digital simulations, so the effect of the balcony shapes breaks up the wind and confuses the wind and makes the balconies more comfortable and less windy.
Now, just by being able to go outside on your balcony or on the third floor roof terrace, you can be connected to the outdoors, even when you're way above the ground plane. So the building acts to create community within the building and the city at the same time. It's working. And people are starting to meet each other on the building surface and we've heard --
they've even starting getting together as couples. But besides romantic relationships, the building has a positive social effect on the community, as evidenced by people starting groups together and starting big projects together, like this organic community garden on the building's roof terrace.
So I've shown how tall buildings can be social connectors, but what about public architecture? How can we create better social cohesion in public buildings and civic spaces, and why is it important? Public architecture is just not as successful if it comes from the top down.
About 15 years ago in Chicago, they started to replace old police stations, and they built this identical model all over the city. And even though they had good intentions of treating all neighborhoods equally, the communities didn't feel invested in the process or feel a sense of ownership of these buildings. It was equality in the sense that everybody gets the same police station, but it wasn't equity in the sense of responding to each community's individual needs. And equity is the key issue here.
You know, in my field, there's a debate about whether architecture can even do anything to improve social relationships. But I believe that we need architecture and every tool in our tool kit to improve these relationships. In the US, policy reforms have been recommended in order to rebuild trust. But my team and I wondered if design and a more inclusive design process could help add something positive to this policy conversation. We asked ourselves simply: Can design help rebuild trust?
So we reached out to community members and police officers in North Lawndale; it's a neighborhood in Chicago where the police station is perceived as a scary fortress surrounded by a parking lot. In North Lawndale, people are afraid of police and of going anywhere near the police station, even to report a crime. So we organized this brainstorming session with both groups participating, and we came up with this whole new idea for the police station. It's called "Polis Station." "Polis" is a Greek word that means a place with a sense of community. It's based on the idea that if you can increase opportunities for positive social interactions between police and community members, you can rebuild that relationship and activate the neighborhood at the same time.
Instead of the police station as a scary fortress, you get highly active spaces on the public side of the station -- places that spark conversation, like a barbershop, a coffee shop or sports courts as well. Both cops and kids said they love sports. These insights came directly from the community members and the police officers themselves, and as designers, our role was just to connect the dots and suggest the first step. So with the help of the city and the parks, we were able to raise funds and design and build a half-court, right on the police station parking lot.
It's a start. But is it rebuilding trust? The people in North Lawndale say the kids are using the courts every day and they even organize tournaments like this one shown here, and once in a while an officer joins in. But now, they even have basketballs inside the station that kids can borrow. And recently they've asked us to expand the courts and build a park on the site. And parents report something

astonishing. Before, there was fear of going anywhere the station, and now they say there's a sense that the court is safer than other courts nearby, and they prefer their kids to play here.
So maybe in the future, on the public side of the station, you might be able to drop in for a haircut at the barbershop or reserve the community room for a birthday party or renew your driver's license or get money out of an ATM. It can be a place for neighbors to meet each other and to get to know the officers, and vice versa. This is not a utopian fantasy. It's about how do you design to rebuild trust, trusting relationships?
You know, every city has parks, libraries, schools and other public buildings that have the potential to be reimagined as social connectors. But reimagining the buildings for the future is going to require engaging the people who live there. Engaging the public can be intimidating, and I've felt that, too. But maybe that's because in architecture school, we don't really learn how to engage the public in the act of design. We're taught to defend our design against criticism. But I think that can change, too.
So if we can focus the design mind on creating positive, reinforcing relationships in architecture and through architecture, I believe we can do much more than create individual buildings. We can reduce the stress and the polarization in our urban habitats. We can create relationships. We can help steady this planet we all share.

Task 1
Listen and write down the missing words

For me, the field of _____ has provided important insight, because _____ don't just look at individual _____ on their own, they look at the relationships between living things and their _____. They look at how all the diverse parts of the _____ are interconnected, and it's actually this balance, this _____, that sustains life. My team and I have been applying insights from _____ to architecture to see how physical space can help build stronger relationships. The projects I'm going to show you today use the idea of building relationships as the _____ for design.

Task 2
Listen and match the sentence halves

1) The trees absorbed carbon
2) Now that carbon is trapped inside the walls
3) So making the walls is equivalent
4) We chose the building method
5) Is it creating relationships

a) and nurturing them?
b) to taking cars right off the road.
c) and it's not being released into the atmosphere.
d) because it connects people to each other and to the environment.
e) when they were growing up, and they gave off oxygen.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. What does the science of ecology study according to the text?

2. What was the idea behind the Arcus center?
3. What tasks did the architects intend to solve by creating a common space with a fireside?
4. What downsides do tall buildings have according to the text?
5. What changes did the architects introduce to make the police station more people-friendly?

Task 5
Mark the following statements as True or False, correct the False ones

1. The team of architects investigated how sustainable construction impacts social aspects of people's lives.
2. The students designed a library to foster cultural exchange.
3. All meeting houses have a room where everyone can gather.
4. The number of Arcus fellowship members has been slowly increasing since the community building opened.
5. In the Aqua residential building the hallways are used to bring people together.
6. Innovative architecture brings people together in couples or communities.
7. In future common spaces in the cities will serve as places for people to meet and spend time together.

Task 6
Match the words and expressions to their definitions

absorbed carbon	the experience of feeling close and connected to others
interconnected	an input field or combination of input fields that has a statistically significant effect on a target field
key driver	not even, stable, or in correct proportions
low-tech	the places within our towns and cities where nature sets up home too
out of balance	A diagram showing the relationships between different living and non-living parts of an ecosystem by a series of interconnected lines
urban habitat	the use of carbon to remove waste and other substances from air or water
web of life	having all constituent parts linked or connected
social connector	using or requiring only low technology

Task 7
Fill in the gaps and translate the sentences into Russian

urban habitats	***communities***	***reinforced***
oxygen	***polarization (×2)***	***web of life***
social justice	***interconnected***	***inward***

1. An impermeable body of rock which contains no _____ openings or interstices and therefore neither absorbs nor transmits water.
2. Various species in nature coexist through some very complex dependencies and feedback loops the so-called_____.
3. Sometimes these differences in moisture are so pronounced that different plant_____ grow on the windward and leeward sides.

4. Producers give off the extra_____ atoms that are generated during photosynthesis as oxygen gas.
5. A primary tissue in roots and stems of vascular plants that extends_____ from the epidermis to the phloem.
6. The facing of the wall has been considered either to be made of continuous or discrete_____ concrete panels.
7. Signal separation based on_____ is a technique often used in the study of atmospheric aerosols.
8. As _____ and their suburban extensions have become more common, the wildlife of these human landscapes has become the focus of attention and study.
9. Real sustainable development must recognize the interconnectedness between human beings and the environment if true environmental and_____ is to be obtained.
10. The scattered radiation does not undergo a change of frequency but its phase and_____ may change considerably.

Task 8

Translate the sentences into English using the expressions from the box

scaling up	***social activity***	***web of life***
oxygen	***inward***	***interconnected***	***polarizations***
community	***reinforcing***	***urban habitats***

1. Несмотря на неблагоприятные аспекты городской среды обитания, удивительное разнообразие дикой природы существует на более или менее постоянной основе.
2. Ученые выявили множество взаимосвязанных причин возникновения эффекта городского острова тепла.
3. Поддержание сети жизни, включающей эти организмы, необходимо для выживания человека.
4. Задействованные механизмы широко изучены и связаны с микробным сообществом в почве или ризосфере.
5. Вода на океанской стороне устья содержит меньше кислорода, чем вода на речной стороне.
6. Проекты восстановления малого масштаба продемонстрировали крайнюю сложность перехода к эффективному крупномасштабному восстановлению.
7. Скорость приземных ветров увеличивается по мере того, как они дуют против часовой стрелки и внутрь по направлению к этому центру.
8. Примитивное земледелие как форма социальной деятельности появилось только в эпоху неолита, и одомашнивание шло полным ходом.
9. Они представляют собой мелкие частицы и оказывают укрепляющее действие на тонкую пленку краски.
10. На каждой длине волны измеряются как горизонтальная, так и вертикальная поляризации.

Task 9

Summarize the key points of the lecture

Task 10

Write an essay of 150-180 words

Discuss advantages and disadvantages of sustainable approach to architectural design.

Unit 7

Let’s clean up the space junk orbiting earth

https://www.ted.com/talks/natalie_panek_let_s_clean_up_the_space_junk_orbiting_earth?language=en

Our lives depend on a world we can't see. Think about your week so far. Have you watched TV, used GPS, checked the weather or even ate a meal? These many things that enable our daily lives rely either directly or indirectly on satellites. And while we often take for granted the services that satellites provide us, the satellites themselves deserve our attention as they are leaving a lasting mark on the space they occupy.

People around the world rely on satellite infrastructure every day for information, entertainment and to communicate. There's agricultural and environmental monitoring, Internet connectivity, navigation. Satellites even play a role in the operation of our financial and energy markets. But these satellites that we rely on day in and day out have a finite life. They might run out of propellant, they could malfunction, or they may just naturally reach the end of their mission life. At this point, these satellites effectively become space junk, cluttering the orbital environment.

So imagine you're driving down the highway on a beautiful, sunny day out running errands. You've got your music cranked, your windows rolled down, with the cool breeze blowing through your hair. Feels nice, right? Everything is going smoothly until suddenly your car stutters and stalls right in the middle of the highway. So now you have no choice but to abandon your car where it is on the highway. Maybe you were lucky enough to be able to move it out of the way and into a shoulder lane so that it's out of the way of other traffic. A couple of hours ago, your car was a useful machine that you relied on in your everyday life. Now, it's a useless hunk of metal taking up space in a valuable transportation network. And imagine international roadways all cluttered with broken down vehicles that are just getting in the way of other traffic. And imagine the debris that would be strewn everywhere if a collision actually happened, thousands of smaller pieces of debris becoming new obstacles.

This is the paradigm of the satellite industry. Satellites that are no longer working are often left to deorbit over many, many years, or only moved out of the way as a temporary solution. And there are no international laws in space to enforce us to clean up after ourselves.

So the world's first satellite, Sputnik I, was launched in 1957, and in that year, there were only a total of three launch attempts. Decades later and dozens of countries from all around the world have launched thousands of more satellites into orbit, and the frequency of launches is only going to increase in the future, especially if you consider things like the possibility of 900-plus satellite constellations being launched.

Now, we send satellites to different orbits depending on what they're needed for. One of the most common places we send satellites is the low Earth orbit, possibly to image the surface of Earth at up to about 2,000 kilometers altitude. Satellites there are naturally buffeted by Earth's atmosphere, so their orbits naturally decay, and they'll eventually burn up, probably within a couple of decades. Another common place we send satellites is the geostationary orbit at about 35,000 kilometers altitude. Satellites there remain in the same place above Earth as the Earth rotates, which enables things like communications or television broadcast, for example. Satellites in high orbits like these could remain there for centuries. And then there's the orbit coined "the graveyard," the ominous junk or disposal orbits, where some satellites are intentionally placed at the end of their life so that they're out of the way of common operational orbits.

Of the nearly 7,000 satellites launched since the late 1950s, only about one in seven is currently operational, and in addition to the satellites that are no longer working, there's also hundreds of thousands of marble-sized debris and millions of paint chip-sized debris that are also orbiting around

the Earth. Space debris is a major risk to space missions, but also to the satellites that we rely on each and every day.
Now, because space debris and junk has become increasingly worrisome, there have been some national and international efforts to develop technical standards to help us limit the generation of additional debris. So for example, there are recommendations for those low-Earth orbiting spacecraft to be made to deorbit in under 25 years, but that's still a really long time, especially if a satellite hasn't been working for years. There's also mandates for those dead geostationary spacecraft to be moved into a graveyard orbit. But neither of these guidelines is binding under international law, and the understanding is that they will be implemented through national mechanisms. These guidelines are also not long-term, they're not proactive, nor do they address the debris that's already up there. They're only in place to limit the future creation of debris. Space junk is no one's responsibility.
Now, Mount Everest is actually an interesting comparison of a new approach to how we interact with our environments, as it's often given the dubious honor of being the world's highest garbage dump. Decades after the first conquest of the world's highest peak, tons of rubbish left behind by climbers has started to raise concern, and you may have read in the news that there's speculation that Nepal will crack down on mountaineers with stricter enforcement of penalties and legal obligations. The goal, of course, is to persuade climbers to clean up after themselves, so maybe local not-for-profits will pay climbers who bring down extra waste, or expeditions might organize voluntary cleanup trips. And yet still many climbers feel that independent groups should police themselves. There's no simple or easy answer, and even well-intentioned efforts at conservation often run into problems. But that doesn't mean we shouldn't do everything in our power to protect the environments that we rely and depend on, and like Everest, the remote location and inadequate infrastructure of the orbital environment make waste disposal a challenging problem. But we simply cannot reach new heights and create an even higher garbage dump, one that's out of this world.
The reality of space is that if a component on a satellite breaks down, there really are limited opportunities for repairs, and only at great cost. But what if we were smarter about how we designed satellites? What if all satellites, regardless of what country they were built in, had to be standardized in some way for recycling, servicing or active deorbiting? What if there actually were international laws with teeth that enforced end-of-life disposal of satellites instead of moving them out of the way as a temporary solution? Or maybe satellite manufacturers need to be charged a deposit to even launch a satellite into orbit, and that deposit would only be returned if the satellite was disposed of properly or if they cleaned up some quota of debris. Or maybe a satellite needs to have technology on board to help accelerate deorbit.
There are some encouraging signs. The UK's TechDemoSat-1, launched in 2014, for example, was designed for end-of-life disposal via a small drag sail. This works for the satellite because it's small, but satellites that are higher or in larger orbits or are larger altogether, like the size of school buses, will require other disposal options. So maybe you get into things like high-powered lasers or tugging using nets or tethers, as crazy as those sound in the short term.
And then one really cool possibility is the idea of orbital tow trucks or space mechanics. Imagine if a robotic arm on some sort of space tow truck could fix the broken components on a satellite, making them usable again. Or what if that very same robotic arm could refuel the propellant tank on a spacecraft that relies on chemical propulsion just like you or I would refuel the fuel tanks on our cars? Robotic repair and maintenance could extend the lives of hundreds of satellites orbiting around the Earth.
Whatever the disposal or cleanup options we come up with, it's clearly not just a technical problem. There's also complex space laws and politics that we have to sort out. Simply put, we haven't found a way to use space sustainably yet.
Exploring, innovating to change the way we live and work are what we as humans do, and in space exploration, we're literally moving beyond the boundaries of Earth. But as we push thresholds in the name of learning and innovation, we must remember that accountability for our environments never goes away. There is without doubt congestion in the low Earth and geostationary orbits, and we cannot keep launching new satellites to replace the ones that have broken down without doing something

about them first, just like we would never leave a broken down car in the middle of the highway. Next time you use your phone, check the weather or use your GPS, think about the satellite technologies that make those activities possible. But also think about the very impact that the satellites have on the environment surrounding Earth, and help spread the message that together we must reduce our impact.
Earth orbit is breathtakingly beautiful and our gateway to exploration. It's up to us to keep it that way.

Task 1
Listen and write down the missing words

People around the world rely on _____every day for information, entertainment and to _____. There's agricultural and _____, Internet connectivity, _____. Satellites even play a role in the operation of our financial and _____. But these satellites that we rely on day in and day out have a _____. They might run out of _____, they could malfunction, or they may just naturally reach the end of their _____. At this point, these satellites effectively become _____, cluttering the orbital environment.

Task 2
Listen and match the sentence halves

1) We send satellites to different orbits
2) One of the most common places we
3) Satellites there are naturally buffeted
4) Another common place we send
5) Satellites there remain in the same place
6) There's the orbit coined "the graveyard,"

a) satellites is the geostationary orbit.
b) above Earth as the Earth rotates.
c) the ominous junk or disposal orbits.
d) depending on what they're needed for.
e) by Earth's atmosphere, so their orbits naturally decay.
f) send satellites is the low Earth orbit.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. What role do satellite play in our everyday life?
2. What happens to the satellites at the end of their life?
3. What regulations are there regarding space debris?
4. What features of construction does the text suggest all satellites should have in future?
5. Who has to develop the space sustainability regulations?

Task 5
Mark the following statements as True or False, correct the False ones

1. Satellites are used for agricultural and environmental monitoring.
2. At the end of life satellites swiftly burn up in the atmosphere.

3. Low orbit is where the most of satellites are concentrated.
4. Since the beginning of the space exploration nearly 10,000 satellites have been launched.
5. The low-Earth satellites are recommended to deorbit in 20 years.
6. If the satellite breaks down, it is nearly impossible to repair it.
7. The abundance of satellites already existing on the low-Earth orbit hampers further launches.

Task 6

Match the words and expressions to their definitions

debris	normally at an altitude of less than 1000 km but could be as low as 160 km above Earth
decay	a group of artificial satellites working together as a system
deorbit	the state or process of rotting or decomposition
end-of-life disposal	scattered pieces of rubbish or remains
environmental monitoring	disposing of the existing product responsibly, transitioning to a different product and ensuring that disruption will be minimal
low-Earth	disused satellites and other man-made debris in orbit around the earth
satellite constellation	tool to assess environmental conditions and trends, support policy development and its implementation, and develop information for reporting to national policymakers, international forums and the public
space junk	the flight of a vehicle that begins with the final command to commit to a perigee below 70 nautical miles (approximately 130 kilometers), and ends when all vehicle components come to rest on the Earth

Task 7

Fill in the gaps with the words from the box and translate the sentences into Russian

disposal debris satellite constellation propellants decayed malfunction collision space missions environmental monitoring space exploration

1. Furthermore, _____ for the global Earth system is becoming increasingly important.
2. Other_____ are available, such as butane, which is highly flammable and therefore only suitable for spraying water-based products.
3. The damage from aloft often looks like a star with_____spreading out from the center in straight lines.
4. The vertical force due to the water flow in the breakwater varies during the_____of a wave group.

5. They can begin as surface fires but burn peat or partially_____leaves below the ground surface.
6. Debris from satellites has rendered LEO more dangerous to piloted_____and poses a steadily increasing hazard to functioning satellites.
7. Composting also diverts organic wastes that would otherwise end up in landfills or other_____sites.
8. The GPS Navstar_____is configured in such a way that at any point on the Earth 's surface, the user of a GPS receiver should be able to detect signals from at least six Navstar satellites.
9. Most of the advances expected depend on research activity in microcomputers and information processing, in genetics and biochemistry, in remote sensing and_____.
10. The data were deemed to be sound since no evidence was found for_____of the instruments during the corresponding period.

Task 8

Translate the sentences into English using the expressions from the box

collision	***space missions***	***finite life***	
burn up	***disposal***	***clutter***	***environmental monitoring***
debris	***decay***	***propellants***	

1. Будут продолжать возникать новые требования к мониторингу окружающей среды и прогнозированию состояния атмосферы и океана.
2. Намыв пляжей, как правило, является непродолжительным и действует только для замедления процесса эрозии.
3. Предполагается, что использование фторуглеродных пропеллентов будет практически прекращено, за исключением медицинских целей.
4. Помехи на земле могут скрывать или искажать эхо-сигналы от осадков вблизи антенны радара.
5. Эти наблюдения соответствуют классическому описанию фазовых превращений селевых потоков.
6. Процесс, при котором частицы растут в результате столкновения с частицами облаков или другими частицами осадков и их ассимиляции.
7. Радон - ядовитый газ, выделяющийся при радиоактивном распаде урана.
8. Если метеорит достаточно велик, он может не сгореть в атмосфере и затем врезаться в Землю.
9. Недавно космические полеты к астероидам и дистанционное зондирование позволили интегрировать наблюдения за астероидами в космосе с данными, полученными из образцов метеоритов, собранных на Земле.
10. На обработку и утилизацию осадка может приходиться 40% затрат на очистку сточных вод.

Task 9

Summarize the key points of the lecture

Task 10

Write an essay of 150-180 words

Propose a system of regulations for the space debris disposal.

Unit 8

How human noise affects ocean habitats

https://www.ted.com/talks/kate_stafford_how_human_noise_affects_ocean_habitats

In 1956, a documentary by Jacques Cousteau won both the Palme d'Or and an Oscar award. This film was called, "Le Monde Du Silence," or, "The Silent World." The premise of the title was that the underwater world was a quiet world. We now know, 60 years later, that the underwater world is anything but silent.

Although the sounds are inaudible above water depending on where you are and the time of year, the underwater soundscape can be as noisy as any jungle or rainforest. Invertebrates like snapping shrimp, fish and marine mammals all use sound. They use sound to study their habitat, to keep in communication with each other, to navigate, to detect predators and prey. They also use sound by listening to know something about their environment.

Take, for an example, the Arctic. It's considered a vast, inhospitable place, sometimes described as a desert, because it is so cold and so remote and ice-covered for much of the year. And despite this, there is no place on Earth that I would rather be than the Arctic, especially as days lengthen and spring comes.

To me, the Arctic really embodies this disconnect between what we see on the surface and what's going on underwater. You can look out across the ice -- all white and blue and cold -- and see nothing. But if you could hear underwater, the sounds you would hear would at first amaze and then delight you. And while your eyes are seeing nothing for kilometers but ice, your ears are telling you that out there are bowhead and beluga whales, walrus and bearded seals. The ice, too, makes sounds. It screeches and cracks and pops and groans, as it collides and rubs when temperature or currents or winds change. And under 100 percent sea ice in the dead of winter, bowhead whales are singing.

And you would never expect that, because we humans, we tend to be very visual animals. For most of us, but not all, our sense of sight is how we navigate our world. For marine mammals that live underwater, where chemical cues and light transmit poorly, sound is the sense by which they see. And sound transmits very well underwater, much better than it does in air, so signals can be heard over great distances.

In the Arctic, this is especially important, because not only do Arctic marine mammals have to hear each other, but they also have to listen for cues in the environment that might indicate heavy ice ahead or open water. Remember, although they spend most of their lives underwater, they are mammals, and so they have to surface to breathe. So they might listen for thin ice or no ice, or listen for echoes off nearby ice.

Arctic marine mammals live in a rich and varied underwater soundscape. In the spring, it can be a cacophony of sound.

But when the ice is frozen solid, and there are no big temperature shifts or current changes, the underwater Arctic has some of the lowest ambient noise levels of the world's oceans. But this is changing. This is primarily due to a decrease in seasonal sea ice, which is a direct result of human greenhouse gas emissions. We are, in effect, with climate change, conducting a completely uncontrolled experiment with our planet.

Over the past 30 years, areas of the Arctic have seen decreases in seasonal sea ice from anywhere from six weeks to four months. This decrease in sea ice is sometimes referred to as an increase in the open water season. That is the time of year when the Arctic is navigable to vessels. And not only is the extent of ice changing, but the age and the width of ice is, too.

Now, you may well have heard that a decrease in seasonal sea ice is causing a loss of habitat for animals that rely on sea ice, such as ice seals, or walrus, or polar bears. Decreasing sea ice is also

causing increased erosion along coastal villages, and changing prey availability for marine birds and mammals.
Climate change and decreases in sea ice are also altering the underwater soundscape of the Arctic. What do I mean by soundscape? Those of us who eavesdrop on the oceans for a living use instruments called hydrophones, which are underwater microphones, and we record ambient noise -- the noise all around us. And the soundscape describes the different contributors to this noise field. What we are hearing on our hydrophones are the very real sounds of climate change. We are hearing these changes from three fronts: from the air, from the water and from land.
First: air. Wind on water creates waves. These waves make bubbles; the bubbles break, and when they do, they make noise. And this noise is like a hiss or a static in the background. In the Arctic, when it's ice-covered, most of the noise from wind doesn't make it into the water column, because the ice acts as a buffer between the atmosphere and the water. This is one of the reasons that the Arctic can have very low ambient noise levels. But with decreases in seasonal sea ice, not only is the Arctic now open to this wave noise, but the number of storms and the intensity of storms in the Arctic has been increasing. All of this is raising noise levels in a previously quiet ocean.
Second: water. With less seasonal sea ice, subarctic species are moving north, and taking advantage of the new habitat that is created by more open water. Now, Arctic whales, like this bowhead, they have no dorsal fin, because they have evolved to live and swim in ice-covered waters, and having something sticking off of your back is not very conducive to migrating through ice, and may, in fact, be excluding animals from the ice. But now, everywhere we've listened, we're hearing the sounds of fin whales and humpback whales and killer whales, further and further north, and later and later in the season. We are hearing, in essence, an invasion of the Arctic by subarctic species. And we don't know what this means. Will there be competition for food between Arctic and subarctic animals? Might these subarctic species introduce diseases or parasites into the Arctic? And what are the new sounds that they are producing doing to the soundscape underwater?
And third: land. And by land ... I mean people. More open water means increased human use of the Arctic. Just this past summer, a massive cruise ship made its way through the Northwest Passage -- the once-mythical route between Europe and the Pacific. Decreases in sea ice have allowed humans to occupy the Arctic more often. It has allowed increases in oil and gas exploration and extraction, the potential for commercial shipping, as well as increased tourism. And we now know that ship noise increases levels of stress hormones in whales and can disrupt feeding behavior. Air guns, which produce loud, low-frequency "whoomps" every 10 to 20 seconds, changed the swimming and vocal behavior of whales. And all of these sound sources are decreasing the acoustic space over which Arctic marine mammals can communicate.
Now, Arctic marine mammals are used to very high levels of noise at certain times of the year. But this is primarily from other animals or from sea ice, and these are the sounds with which they've evolved, and these are sounds that are vital to their very survival. These new sounds are loud and they're alien. They might impact the environment in ways that we think we understand, but also in ways that we don't. Remember, sound is the most important sense for these animals. And not only is the physical habitat of the Arctic changing rapidly, but the acoustic habitat is, too. It's as if we've plucked these animals up from the quiet countryside and dropped them into a big city in the middle of rush hour. And they can't escape it.
So what can we do now? We can't decrease wind speeds or keep subarctic animals from migrating north, but we can work on local solutions to reducing human-caused underwater noise. One of these solutions is to slow down ships that traverse the Arctic, because a slower ship is a quieter ship. We can restrict access in seasons and regions that are important for mating or feeding or migrating. We can get smarter about quieting ships and find better ways to explore the ocean bottom. And the good news is, there are people working on this right now. But ultimately, we humans have to do the hard work of reversing or at the very least decelerating human-caused atmospheric changes.
So, let's return to this idea of a silent world underwater. It's entirely possible that many of the whales swimming in the Arctic today, especially long-lived species like the bowhead whale that the Inuits say can live two human lives -- it's possible that these whales were alive in 1956, when Jacques

Cousteau made his film. And in retrospect, considering all the noise we are creating in the oceans today, perhaps it really was "The Silent World."

Task 1
Listen and write down the missing words

Although the sounds are _____above water depending on where you are and the time of year, the _____can be as noisy as any jungle or _____. _____like snapping shrimp, fish and marine _____ all use sound. They use sound to study their _____, to keep in communication with each other, to navigate, to detect _____ and prey. They also use sound by listening to know something about their _____.
Take, for an example, the Arctic. It's considered a vast, _____place, sometimes described as a desert, because it is so cold and so _____ and ice-covered for much of the year. And despite this, there is no place on _____that I would rather be than the Arctic, especially as days lengthen and spring comes.

Task 2
Listen and match the sentence halves

1) The underwater Arctic has some of the lowest
2) This is primarily due to a decrease in seasonal sea ice,
3) We are, in effect, with climate change,
4) Areas of the Arctic have seen decreases
5) This decrease in sea ice is sometimes
6) And not only is the extent of ice changing,

a) but the age and the width of ice is, too.
b) which is a direct result of human greenhouse gas emissions.
c) conducting a completely uncontrolled experiment with our planet.
d) referred to as an increase in the open water season.
e) ambient noise levels of the world's oceans.
f) in seasonal sea ice from anywhere from six weeks to four months.

Task 3
Listen to the recording and translate the sentences into Russian

Task 4
Read the text and answer the questions

1. Is the underwater world completely silent?
2. Why is sound so important for marine mammals?
3. What problems does the decrease in seasonal ice cause?
4. Why do Arctic whales have no dorsal fin?
5. What can be done to improve the situation with the anthropogenic underwater noise?

Task 5
Mark the following statements as True or False, correct the False ones

1. Ice never makes sounds.
2. Arctic mammals use sounds to navigate under the ice.
3. The amount of underwater sounds is equal throughout the world.

4. Climate change impacts the scale and scope of underwater sounds in the Arctic.
5. With the change of seasonal ice Arctic mammals migrate south.
6. As the ice melting increases so does human activity in the Arctic ocean.
7. We should reduce underwater noise of anthropogenic origin.

Task 6
Match the words and expressions to their definitions

acoustic space	the natural home or environment of an animal, plant, or other organism
alter	the profile of a sound over its surrounding environment
ambient noise	(of an environment) harsh and difficult to live in
decelerate	an animal lacking a backbone, such as an arthropod, mollusc, annelid, coelenterate, etc.
habitat	aquatic mammals that rely on the ocean and other marine ecosystems for their existence
inhospitable	make structural changes to
invertebrates	reduce or cause to reduce in speed
marine mammal	refers to all noise present in a given environment

Task 7
Fill in the gaps with the words from the box and translate the sentences into Russian

underwater	***inhospitable***	***decelerates***
marine mammals	***altering***	***habitat***
remote	***vital***	***invertebrates***	***prey***

1. Soils and sediments in the lithosphere contain abundant microorganisms and _____at shallow levels.
2. _____suitability for spawning may vary seasonally in association with natural erosion and accretion cycles
3. This reduces dissolved oxygen and creates an _____environment for fish.
4. Small isopods are often parasites on fish and _____.
5. _____sensing measurements of the boundary layer are used in a wide variety of applications.
6. The flow _____after peak velocity, with deceleration being slightly lower for the rough beach.
7. Clouds impact climate primarily by _____the radiative balance in the region where they form.
8. Clouds are _____aspects of the air masses that collide and form fronts where warm and cold masses meet.
9. Aquaculture can be most simply defined as_____agriculture.
10. All hydroids are carnivores that capture_____with stinging tentacles.

Task 8
Translate the sentences into English using the expressions from the box

1. Огромный подводный мир - увлекательное царство, которое захватывает воображение людей во всем мире.
2. Рыбы и птицы охотятся на беспозвоночных
3. Увеличившиеся площади солончаков обеспечивают больше местообитаний для природных видов.
4. Эти организмы эволюционировали около 3000 миллионов лет назад и считаются основными колонизаторами неблагоприятных экосистем.
5. Киты - это морские млекопитающие, обитающие во всех мировых океанах.
6. Современные методы дистанционного зондирования используют больший диапазон электромагнитного спектра, чем аэрофотосъемка.
7. Ветер достигает своей максимальной скорости над вершиной холма, а затем замедляется с подветренной стороны.
8. Уровень окружающего шума может быть очень низким в Арктике.
9. Экосистемы также могут быть изменены изменением гидродинамики и акустического шума, создаваемого машинами.
10. Вода на суше является жизненно важной частью круговорота воды.

Task 9
Summarize the key points of the lecture

Task 10
Write an essay of 150-180 words

Some people claim that industrial exploration of Arctic is inevitable. Others say that we should hold back to secure unique aquatic life of Arctic. Which opinion do you agree with and why?

App. 1

Glossary

UNIT	ENGLISH	DEFINITION	RUSSIAN
6	absorbed carbon	the use of carbon to remove waste and other substances from air or water	поглощенный углекислый газ
1	accelerate	increase in rate, amount, or extent.	разгонять; ускорять
1	accelerating pace	If the process or rate of something accelerates or if something accelerates it, it gets faster and faster.	усиление; убыстрение
8	acoustic space	the profile of a sound over its surrounding environment	акустическое пространство
5	adaptable	able to adjust to new conditions	легко приспосабливающийся
7	agricultural monitoring	a network of wireless sensors which collect data from several nodes placed on the field	сельскохозяйственный мониторинг
2	agricultural producer	a rancher or farmer.	производитель сельскохозяйственной продукции
4	air pollution	the presence in or introduction into the air of a substance which has harmful or poisonous effects	атмосферное загрязнение
8	alter	make structural changes to (a building)	менять, изменять
8	ambient noise	refers to all noise present in a given environment	окружающий шум
1	aquatic	relating to water	водный; водяной
4	bike lane	a part of a road that is separated by a line from the rest of the road, for the use of people riding bicycles	велосипедная дорожка
1	biodegradable plastics	Biodegradable plastics are plastics that can be decomposed by the action of living organisms, usually microbes, into water, carbon dioxide, and biomass.	биологически разлагающаяся пластмасса
4	bottom line	the fundamental and most important factor	наиболее важный аспект
8	bowhead	an Arctic right whale with black skin, feeding by skimming the surface for plankton	полярный кит
1,5	break down	convert a substance into simpler compounds by chemical action	разлагать
8	buffer	lessen or moderate the impact of (something)	смягчать
7	buffet	knock (someone) off course	наносить удар
7	burn up	be destroyed by heat	выгорать; сгорать
8	cacophony	a harsh discordant mixture of sounds	какофония
1	capacity	the amount that something can produce.	производственный потенциал

2	capture	an act of catching, winning, or gaining control by force, stratagem, or guile.	захватывать, поглощать
3	carbon capture and storage	the process of trapping carbon dioxide produced by burning fossil fuels or other chemical or biological processes and storing it in such a way that it is unable to affect the atmosphere, with the aim of mitigating the effects of global warming	улавливание и хранение углерода
4	carbon emission	emissions stemming from the burning of fossil fuels and the manufacture of cement	углеродосодержащие выбросы
2	carbon pollution	Human activities generate CO_2 through deforestation, land clearing, and (mainly) burning fossil fuels.	загрязнение атмосферы углекислым газом
1	carbon pump	The transformation of carbon dioxide and nutrients into organic carbon, its sinking into the in the deep ocean, and its decomposition at depth, is known as the biological carbon pump.	угольный насос
2	carbon sink	a forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.	сток углерода; поглотитель углерода
3	carbon tax	a tax on fossil fuels, especially those used by motor vehicles, intended to reduce the emission of carbon dioxide	"углеродный" налог
5	carbon-free media	does not use fossil fuels or does not emit carbon	декарбонизированная среда
4	charging plug	any charging connector that is able to charge an electric vehicle, regardless of plug type or standard	зарядный штепсель
5	chemical contaminant	substances that are unintentionally present in food or feed	химический загрязнитель
2	chop down	to cut (a tree, bush, etc.) at the bottom so that it falls to the ground.	срубить
2	chunk	a thick, solid piece of something.	часть, фрагмент
3	city dweller	a person who lives in a city	городской житель
5	cleanup	an act of cleaning a place	чистка; очистка; очищение
4	climate emergency	a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it	резвычайная климатическая ситуация
3	close proximity	near to each other	непосредственная близость
7	clutter	cover or fill (something) with an untidy collection of things	приводить в беспорядок
1	CO2	Carbon dioxide	углекислый газ
1	coal	a combustible black or dark brown rock consisting chiefly of carbonized	уголь

		plant matter, found mainly in underground seams and used as fuel.	
7	collision	an instance of one moving object or person striking violently against another	столкновение
2	commit	perpetrate or carry out (a mistake, crime, or immoral act)	считать своим долгом или обязанностью
6	community	a group of people living in the same place or having a particular characteristic in common	сообщество
6	community member	all the people who live in a particular area or place	член сообщества
4	commuter	a person who travels some distance to work on a regular basis	пассажир, регулярно совершающий поездки из пригорода в город и обратно (обыкн. на работу)
5	compost	decayed organic material used as a fertilizer for growing plants	компостная земля
5	compound	a substance formed from two or more elements chemically united in fixed proportions	соединение химическое
4	congestion	to concentrate in a small or narrow space	затор движения
6	connect the dots	bringing together information from different places	сопоставить факты
5	contained system	any system where wastes are enclosed and emissions to air are passed through a bio-filter or other designed abatement system	самодостаточная система
1	contribute	give in order to help achieve or provide something.	вносить вклад
1	cost-competitive	a product or service that is cost competitive is cheap compared to other similar products, or services	оптимальный по соотношению "цена-качество"
3	critical	having the potential to become disastrous; at a point of crisis	катастрофический
5	cure-all	a medicine or other remedy that will supposedly cure any ailment	универсальное лекарство
5	daunting	seeming difficult to deal with in prospect; intimidating	обескураживающий
7	debris	scattered pieces of rubbish or remains	мусор
7	decay	the state or process of rotting or decomposition	дегенерация, деградация, перерождение, распад
8	decelerate	reduce or cause to reduce in speed	снижать скорость
4	decline	become smaller, fewer, or less; decrease	снижать; уменьшать
2	deforestation	the action of clearing a wide area of trees	обезлесивание
1	degrading	causing or associated with a low, destitute, or demoralized state	распадающийся, разлагающийся

7	deorbit	deorbit means the flight of a vehicle that begins with the final command to commit to a perigee below 70 nautical miles (approximately 130 kilometers), and ends when all vehicle components come to rest on the Earth	ходить с орбиты; снижаться с орбиты
3	depleted	used up the supply or resources of	истощать; опустошать
4	detox	a process or period of time in which one abstains from or rids the body of toxic or unhealthy substances; detoxification	удаление токсичных соединений
5	digest	break down (food) in the alimentary canal into substances that can be absorbed and used by the body	переваривать (о пище)
8	disconnect	break the connection of or between	отключить
1	disperse	distribute or spread over a wide area.	рассеивать
1	dispose of	to get rid of someone or something	утилизировать
1	dominant narrative	A dominant narrative is an explanation or story that is told in service of the dominant social group's interests and ideologies.	основной довод
8	dorsal fin	an unpaired fin on the back of a fish or whale, e.g. the tall triangular fin of a shark or killer whale	спинной плавник
7	dubious honor	the supposed honor of being selected to do a difficult or unpopular task or the supposed honor associated with receiving a questionable award	сомнительная честь
1	dump	deposit or dispose of (rubbish, waste, or unwanted material)	сбрасывать, разгружать, выливать
1,5	durable	able to withstand wear, pressure, or damage; hard-wearing	прочный; долговременный
8	eavesdrop	secretly listen to a conversation	подслушивать
2	economic development	programs, policies or activities that seek to improve the economic well-being and quality of life for a community.	рост экономики
8	embody	include or contain (something) as a constituent part	воплощать
1, 2	emission	the production and discharge of something, especially gas or radiation.	сброс (напр., сточных вод)
4	emission-free	refers to an engine, motor, process, or other energy source, that emits no waste products that pollute the environment or disrupt the climate	без вредных выбросов в атмосферу
3	emitter	a thing which emits something	источник выбросов
2	empower	give (someone) the authority or power to do something.	предоставлять возможность (сделать что-либо)
6	empty nester	a parent whose children have grown up and left home	человек, дети которого выросли и живут отдельно

7	end-of-life disposal	disposing of the existing product responsibly, transitioning to a different product and ensuring that disruption will be minimal	утилизация по окончании срока службы
1	entrepreneur	a person who sets up a business or businesses, taking on financial risks in the hope of profit.	предприниматель
4	environmental justice	he fair treatment and meaningful involvement of all people regardless of race, color, national origin	экологическое правосудие
7	environmental monitoring	tool to assess environmental conditions and trends, support policy development and its implementation, and develop information for reporting to national policymakers, international forums and the public	экологический мониторинг
5	enzyme	a substance produced by a living organism which acts as a catalyst to bring about a specific biochemical reaction	энзим (Представитель группы протеиновых катализаторов, производимых живыми клетками, которые помогают химическим жизненным процессам, а сами при этом не изменяются и не расходуются)
1	ethylene	a colorless flammable gas found in coal gas or obtained from petroleum and used to ripen fruits or as an anesthetic.	этилен
3	exhaust	waste gases or air expelled from an engine, turbine, or other machine in the course of its operation	выхлоп
4	exponentially	more and more rapidly	многократно
2	extend	cause to cover a wider area; make larger.	расширяться, простираться
1, 3	extract	remove or take out	добывать, извлекать
5	extreme environment	places where humans would not survive – for example, environments that have very high temperatures or pressure	экстремальные условия окружающей среды
7	finite life	a lifespan which is limited to a certain number of years, months, weeks or days	ограниченный срок службы
3	flue gas	a mixture of gases produced by the burning of fuel or other materials in power stations and industrial plants and extracted via ducts	отработанный газ
1	food web	a system of interlocking and interdependent food chains.	трофическая сеть

2	forest protection	Forest protection is a branch of forestry which is concerned with the preservation or improvement of a forest	защита лесов
1, 2, 3	fossil fuel	a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.	ископаемое топливо
4	front-runner	the contestant that is leading in a race or other competition	фаворит, лидер
4	fume	an amount of gas or vapour that smells strongly or is dangerous to inhal	дымовой газ
3	gas field	a district where natural gas is produced in commercial quantities	месторождение природного газа
3	gas processing facility	a facility where natural gas is received and processed to separate gas, LPG, condensate etc.	установка по подготовке газа
7	geostationary spacecraft	an earth-orbiting satellite, placed at an altitude of approximately 35,800 kilometers (22,300 miles) directly over the equator	геостационарная космическая станция
4	glimpse	a momentary or partial view	быстро промелькнувшая перед глазами картина
2	green growth	fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.	экологически-ориентированный рост
1	greenhouse gas	a gas that contributes to the greenhouse effect by absorbing infrared radiation. Carbon dioxide and chlorofluorocarbons are examples of greenhouse gases.	парниковый газ
8	habitat	the natural home or environment of an animal, plant, or other organism	среда обитания
2	harness	control and make use of (natural resources), especially to produce energy.	использовать энергию; ставить на службу; эксплуатировать
3	hefty	large and heavy	заметный; объёмистый; вместительный
1	hydrocarbon	A hydrocarbon is an organic compound consisting of hydrogen and carbon found in crude oil, natural gas, and coal.	углеводород
1	impair	weaken or damage (something, especially a faculty or function).	причинить ущерб
2	incentive	a thing that motivates or encourages someone to do something.	стимул
1	incinerate	destroy (something, especially waste material) by burning.	сжигать
1	incompatible	(of two things) so different in nature as to be incapable of coexisting.	несовместимый

2	indigenous population	Indigenous peoples are the descendants of the earliest known inhabitants of an area	коренное население
8	inhospitable	(of an environment) harsh and difficult to live in	негостеприимный
1	insulate	protect (something) by interposing material that prevents the loss of heat or the intrusion of sound.	покрывать изоляцией
6	interconnected	having all constituent parts linked or connected	взаимосвязанный
4	internal combustion engine	an engine which generates motive power by the burning of petrol, oil, or other fuel with air inside the engine, the hot gases produced being used to drive a piston or do other work as they expand	двигатель внутреннего сгорания
7	internet connectivity	the way people are hooked up to the Internet	подключение к Интернету
6	intimidating	having a frightening, overawing, or threatening effect	вселяющий страх
8	invertebrates	an animal lacking a backbone, such as an arthropod, mollusc, annelid, coelenterate, etc.	беспозвоночные
6	inward	directed or proceeding towards the inside; coming in from outside	внутренний
6	key driver	an input field or combination of input fields that has a statistically significant effect on a target field	ключевой фактор роста
3	kick-start	rovide an impetus to start or resume (a process)	дать толчок
1	landfill	the disposal of waste material by burying it, especially as a method of filling in and reclaiming excavated pits.	полигон для захоронения отходов
7	launch	start or set in motion (an activity or enterprise)	запуск
2	lay foundation	to create a usually stone or concrete structure that supports a building from underneath	закладывать основу
5	leach	drain away from soil, ash, or similar material by the action of percolating liquid, especially rainwater	промывать (засоленную почву); выносить (питательные элементы)
4	life expectancy	the average period that a person may expect to live	средняя продолжительность жизни
7	low-Earth	ormally at an altitude of less than 1000 km but could be as low as 160 km above Earth	околоземный; близкий к Земле
1	low-income country	low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,085 or less in 2021	страна с низким уровнем доходов

6	low-tech	using or requiring only low technology	несложный в техническом отношении
7	malfunction	a failure to function normally	перебои в работе
3	marginal cost	the cost added by producing one additional unit of a product or service	предельная себестоимость
8	marine mammal	aquatic mammals that rely on the ocean and other marine ecosystems for their existence	морское млекопитающее
1	mass-produced	manufactured in large quantities by an automated mechanical process.	изготовленный серийно
6	meet one-on-one	nvolving a direct encounter between one person and another	встречаться один на один
1	melting	becoming liquefied by heat	плавить; расплавлять
1	methane	a colourless, odourless flammable gas which is the main constituent of natural gas. It is the simplest member of the alkane series of hydrocarbons.	метан (горючий газ)
3	metropolitan city	a set of two or more municipalities where a city with a population of at least 100,000 is located, and whose urban area	мегаполис
1	microbial community	a group of microorganisms that share a common living space	колония бактерий
1	microorganism	a microscopic organism, especially a bacterium, virus, or fungus.	микроорганизм
5	naked eye	unassisted vision, without a telescope, microscope, or other device	невооружённый глаз
3	net zero	a target of completely negating the amount of greenhouse gases produced by human activity, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.	углеродная нейтральность
2	NGO	a non-profit organization that operates independently of any government, typically one whose purpose is to address a social or political issue.	неправительственная организация
5	notorious	famous or well known, typically for some bad quality or deed	печально известный
4	nudge away	to push someone or something out (of something or some place) gently or incrementally	оттолкнуть от
3	offshore	made, situated, or registered abroad, especially in order to take advantage of lower taxes or costs or less stringent regulation	осуществляемый в других странах
7	ominous	giving the worrying impression that something bad is going to happen; threateningly inauspicious	не предвещающий ничего хорошего
3	onshore	situated or occurring on land, in the country where it originated	осуществляемый внутри страны

7	orbital environment	Space stations, platforms and vehicles are exposed to various environmental influences	внешние условия в орбитальном полёте
6	out of balance	not even, stable, or in correct proportions	несбалансированный
1	outsource	obtain (goods or a service) by contract from an outside supplier.	отдать работу на сторону
4	overhaul	take apart (a piece of machinery or equipment) in order to examine it and repair it if necessary	капитальный ремонт
4	overheating	make or become too hot	избыточный нагрев
6	oxygen	a colourless, odourless reactive gas, the chemical element of atomic number 8 and the life-supporting component of the air	кислород
4	phase out	withdraw something from use in gradual stages	постепенно выводить из обращения
1	photosynthesis	the process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water.	фотосинтез
1	phytoplankton	phytoplankton are microscopic organisms that live in watery environments, both salty and fresh.	фитопланктон
1	plastic footprint	A plastic footprint is the total weight of plastic used or produced over a defined period of time.	площадь загрязнения пластиковыми отходами
5	plastic waste	a category of solid waste and recyclable materials including only materials and products that are completely or almost completely made of plastic	пластмассовые отходы
5	plastic-polluted	accumulation in the environment of synthetic plastic products to the point that they create problems for wildlife	загрязненный пластмассами
2	plummet	fall or drop straight down at high speed.	быстро падать
6	polarization	division into two sharply contrasting groups or sets of opinions or beliefs	поляризация
2	precise	marked by exactness and accuracy of expression or detail.	определённый; точный
2	preserve	maintain (something) in its original or existing state.	сохранить; хранить
5	pressing problem	a pressing problem, need, or issue has to be dealt with immediately	актуальная проблема
8	prey	an animal that is caught and killed by another for food	добыча
7	proactive	creating or controlling a situation rather than just responding to it after it has happened	действующий на упреждение
3	production facility	a building or area where goods are made	производственный объект

7	propellant	a substance that propels something	пропеллент
2	public funding	Public funding is money that comes from the government, often through taxes, that's used to help the public through goods and services.	бюджетное финансирование; финансирование за счёт государственных средств
5	pursue	follow or chase (someone or something)	преследовать (кого-либо); придерживаться намеченного плана (курса)
6	raise funds	the process of seeking and gathering voluntary financial contributions by engaging individuals, businesses, charitable foundations, or governmental agencies	привлекать финансовые средства
5	recycle	convert (waste) into reusable material	перерабатывать
1	recycling	the action or process of converting waste into reusable material.	рециклинг, повторное использование
1	reduce	make smaller or less in amount, degree, or size.	сокращать
2	reduce emission	Emission reduction refers to lowering the greenhouse gas (GHG) emissions generated by an individual, organisation or country.	сокращать выбросы
1	refine	remove impurities or unwanted elements from (a substance), typically as part of an industrial process.	очищать
6	reinforce	strengthen or support (an object or substance), especially with additional material	усилить, укрепить
8	remote	(of a place) situated far from the main centres of population; distant	отдаленный
2	remote sensing	the scanning of the earth by satellite or high-flying aircraft in order to obtain information about it.	дистанционное зондирование
4	renewables	a natural resource or source of energy that is not depleted by use, such as water, wind, or solar power	возобновляемые энергоресурсы
6	residential high-rise	any residential-type facility that exceeds three stories and thirty-five feet in height	многоэтажное жилое здание
5	reusing	use again or more than once	повторное использование
2	robust	strong and healthy; vigorous.	надёжный в эксплуатации; прочный
3	rock formation	rock that is arranged or formed in a certain way	образование горных пород
7	rotate	move or cause to move in a circle round an axis or centre	вертеться; вращать;
7	run errands	to go out to buy or do something	ездить по делам
8	rush hour	a time during each day when traffic is at its heaviest	час пик

3	saline aquifer	porous and permeable reservoir rocks that contain saline fluid in the pore spaces between the rock grains.	засоленный водоносный горизонт
7	satellite constellation	a group of artificial satellites working together as a system	спутниковая группировка
2	satellite data	Satellite data provides satellite imagery and earth observation data of the earth's surface and its atmosphere.	данные спутника
2, 6	scale up	increase something in size, number or extent, especially by a constant proportion across the board	повысить; увеличивать; увеличивать масштаб (чего-либо); увеличивать размер (чего-либо)
2	science-based targets	SBTs are a way for companies to define emissions reduction targets.	научно обоснованные цели
5	scope	the extent of the area or subject matter that something deals with or to which it is relevant	диапазон; возможности
1	sediment	matter that settles to the bottom of a liquid	осадок
1	sequester carbon	Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide.	удалять углерод; улавливать углерод
7	shoulder lane	the graded or surfaced area of the roadway, on the side of and adjacent to the pavement	обочина
2	shut down	cease business or operation.	завершать работу
1	single-use	designed to be used once and then disposed of or destroyed.	предназначенный для однократного использования
1	sink down	to (cause something or someone to) go down below the surface or to the bottom of a liquid or soft substance	опускаться
6	social activity	therapeutic, educational, cultural enrichment, recreational, and other activities on site or in the community in a planned program to meet the social needs and interests of the participant	общественная деятельность
6	social cohesion	the extent of connectedness and solidarity among groups in society	социальная сплочённость
6	social connector	the experience of feeling close and connected to others	социальное связующее звено
6	social justice	justice in terms of the distribution of wealth, opportunities, and privileges within a society	социальная справедливость
3	solar panel	a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating	солнечная панель
8	soundscape	a piece of music considered in terms of its component sounds	звуковой ландшафт

3	source of pollution	any place from which stems or condition which may cause pollution of a ground or surface water supply	источник загрязнения
7	space exploration	investigation, by means of crewed and uncrewed spacecraft, of the reaches of the universe beyond Earth's atmosphere	освоение космоса
7	space junk	disused satellites and other man-made debris in orbit around the earth	космический мусор
7	space mission	a journey , by a manned or unmanned vehicle , into space for a specific reason (normally to gather scientific data)	космическая программа
1	staggering	deeply shocking; astonishing.	ошеломительный
2	stave off	avert or delay something bad or dangerous.	отсрочить; предотвратить
3	steel mill	a mill (as for coffee or oats) that operates machines with steel grinding surfaces	сталеплавильный завод
3	steel plant	a factory where steel is made	сталелитейный завод
3	storage infrastructure	all storage devices, storage servers and network elements that intersect with the rest of the overall IT technology infrastructure	инфраструктура системы хранения
6	stress out	suffering from high levels of physical or especially psychological stress	расстраивать
1	substitute (v)	use or add in place of.	замещать
2	substitute (n)	a person or thing acting or serving in place of another.	замена; заменитель
2	supplement	a thing added to something else in order to complete or enhance it.	дополнение; добавление
2	supply chain	the sequence of processes involved in the production and distribution of a commodity.	логистическая цепочка
1	synthetic chemicals	Synthetic products are made from chemicals or artificial substances rather than from natural ones	синтетическое химическое вещество
1	systematic perspective	Systemic perspective is looking at an entire organism of an operation, entity or business in relationship to its environment.	систематический подход
4	tailpipe	the rear section of the exhaust pipe of a motor vehicle	выхлопная труба
3	tally	a current score or amount	подсчет
7	temporary solution	a temporary correction of a Defect in order to restore an Integrated Product or the part thereof into operation	временное решение
5	tenderizer	a substance such as papain which is rubbed on to meat or used as a marinade to soften the fibres	размягчитель

2, 3	thrive	prosper; flourish.	преуспевать; процветать
2	timber	wood prepared for use in building and carpentry.	
2	tipping point	the point at which a series of small changes or incidents becomes significant enough to cause a larger, more important change.	переломный момент
1	toxic effect	Toxic effect is an adverse change in the structure or function of an experimental animal as a result of exposure to a chemical substance.	токсическое воздействие
2	trader	a person who buys and sells goods, currency, or shares.	торговец
4	traffic	vehicles moving on a public highway	дорожное движение
3	trap carbon dioxide	a term used to refer to all the mechanisms and materials able to trap the carbon dioxide in air or water	поглощать углекислый газ
2	tropical forest	Tropical forests (a.k.a. jungle) are forested landscapes in tropical regions	тропический лес
4	turmoil	a state of great disturbance, confusion, or uncertainty	смятение, беспорядок
2	under threat	If a person or thing is under threat, there is a danger that something unpleasant might be done to them, or that they might cease to exist.	под угрозой
8	underwater world	a environment of, and immersed in, liquid water in a natural or artificial feature (called a body of water), such as an ocean, sea, lake, pond, reservoir, river, canal, or aquifer	подводный мир
6	urban habitat	the places within our towns and cities where nature sets up home too	городская среда
4	vehicle	a thing used for transporting people or goods, especially on land, such as a car, lorry, or cart	транспорт
1	versatile	able to adapt or be adapted to many different functions or activities.	разносторонний
8	vessel	a ship or large boat	судно
1	virgin plastic	a polymer in its pure form.	первичная пластмасса (Пластмасса в форме таблеток, гранул, порошка и т.д., которая не использовалась и не была подвергнута обработке, помимо той, которая требовалась для ее изготовления
8	vital	absolutely necessary; essential	жизненно важный
8	walrus	a large gregarious marine mammal related to the eared seals, having two large downward-pointing tusks and found in the Arctic Ocean	морж

1	waste management	Waste management or waste disposal includes the processes and actions required to manage waste from its inception to its final disposal.	управление ликвидацией отходов, отведением и очисткой сточных вод
6	web of life	A diagram showing the relationships between different living and non-living parts of an ecosystem by a series of interconnected lines	паутина жизни
5	wind up	gradually or finally bring an activity to a conclusion	завершать процесс
7	worrisome	causing anxiety or concern	доставляющий беспокойство; вызывающий беспокойство
5	wreak havoc	to cause great damage	вызывать разрушения
4	zero-emission zone	an area where only zero-emission vehicles (ZEVs), pedestrians, and cyclists are granted unrestricted access	зона с нулевым уровнем выбросов
1	zooplankton	plankton consisting of small animals and the immature stages of larger animals.	зоопланктон

App. 2

Summary cliches

1) The title of the article I am going to speak about is …
2) The article (the paper) under review is titled …
3) The given article deals with … studies … discusses … is concerned with … is devoted to … is about … speaks about … describes …
4) The article provides some information on ….
5) The author of the article touches upon the problem of …
6) The author believes/ supposes/ thinks that …
7) Really, this paper is very important because …
8) The most interesting problem of the article is …
9) I wouldn't say that this article is very close to the topic of my research but still it is …
10) The article gives us many details concerning …
11) Let me cite the following …
12) As far as I know …
13) It is necessary to mark that …
14) Taking into consideration the fact that I'd like …
15) In conclusion the author points out …
16) There is no doubt that …
17) In my opinion …
18) To my mind …
19) Summing up I should say …
20) It is very urgent to think about it because …

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Keys

Unit 1. The problem with plastics

Task 1

For **99** percent of all plastics the starting point is fossil fuel hydrocarbons. Oil, gas and coal are extracted and refined to produce plastic and other synthetic chemicals. And those processes generate greenhouse gases such as CO2 and methane. Studies indicate that if nothing is done, the production of single-use plastic alone will contribute to more than **10** percent of all greenhouse gas emissions by **2050**.

Task 2

1) Once plastics enter the environment, landfill, are dispersed in soil or water, they start a process of breaking down into micro and nanoparticles called microplastics.
2) And this process of breaking down emits powerful gases such as methane, ethylene and CO2. And that's true for both traditional and biodegradable plastics.
3) On the surface of microplastics, new microbial communities can grow.
4) And their biological activity also releases additional CO2 and nitrous oxide into the environment, creating the possibility of further magnifying the climate problem.
5) It means that microplastic can also impair the growth and the photosynthesis capacity of phytoplankton, which are the microorganisms producing much of the oxygen we breathe.
6) But also microplastics can have toxic effects on zooplankton, and the health of these organisms is essential for the functioning of all aquatic food webs.

Task 3

Sentence 1. Hot temperatures and dry conditions have a much greater influence on photosynthesis than do ambient **CO2** levels.
Sentence 2. Current development trends and pressures from increasing urbanization and industrialization are steadily **degrading** fragile ecosystems
Sentence 3. The public feels that no wastes of any sort can be safely **disposed of** into the sea.
Sentence 4. Annual **emissions** from all developing countries surpassed those of developed countries in 2004.
Sentence 5. We believe that the methane formation was from **ethylene** decomposition in the stainless steel tubes.
Sentence 6. The **food webs** of estuaries are atypical when compared to more familiar terrestrial systems.
Sentence 7. **Greenhouse gas** emissions do not only depend on the energy consumption but also on regional electricity mix.
Sentence 8. A small proportion of waste tyres are **incinerated** to reclaim some heat energy in specially designed furnaces.
Sentence 9. High concentrations of **methane** could also pose an explosion threat.
Sentence 10. Waste **recycling** and reuse have become accepted practices in many industrial sectors.

Task 5

1. **FALSE** Plastics contribute to climate change from before the moment they are produced to long beyond the moment they are disposed of or drift into the ocean.
2. **TRUE**
3. **FALSE** . Most of the waste that has not been landfilled or incinerated domestically is shipped across the planet, and it reaches low-income countries where they are expected to be recycled.
4. **TRUE**
5. **FALSE** But microplastics risk affecting this marine snow and potentially decreasing the capacity of the ocean to absorb and sequester carbon from the atmosphere.

6. **FALSE** Microplastics are everywhere, from the mountain tops of Everest to the deepest sediment in the Mariana Trench.
7. **FALSE** Over 170 nations at the UN Environment Assembly adopted an initiative to end plastic pollution

Task 6

carbon pump	the transformation of carbon dioxide and nutrients into organic carbon, its sinking into the in the deep ocean, and its decomposition at depth
cost-competitive	cheap compared to other similar products, or services
landfill	the disposal of waste material by burying it, especially as a method of filling in and reclaiming excavated pits.
recycling	the action or process of converting waste into reusable material
to break down	convert a substance into simpler compounds by chemical action.
carbon sequestration	the process of capturing and storing atmospheric carbon dioxide.
waste management	
sediment	matter that settles to the bottom of a liquid

Task 7

11. Cyanobacteria live in shallow seas and require good light for **photosynthesis**
12. Carbon dioxide gas is released into the atmosphere when the **fossil fuel** is burned for energy.
13. These carbohydrates are used as a source of energy for all organisms in a **food web** .
14. Economically , **biodegradable plastics** made from starch can cost almost 10 times as much per kilogram as traditional petroleum-based plastics as they are made from virgin materials and require significantly more ENERGY to produce.
15. Sediments represent an important source of pollutants to **aquatic** organisms.
16. Environmental problems can include windblown litter and **landfill** fires.
17. Diversity in the soil **microbial community** should be maintained to ensure nutrient cycles and other soil functions continue.
18. Underground injection wells used **to dispose of** hazardous materials can lead to groundwater contamination.
19. The oceans have also been used as places to **dump** the waste of metropolitan centers.
20. This would **reduce** erosion of the cliffs and slow this supply of sediment to the intertidal zone.

Task 8

1. **Recycling** is one method of conserving finite resources.
2. Modern **synthetic chemicals** have replaced arsenic for many pesticide uses , but it remains a component of some herbicides.
3. Forests **sequester carbon** , and fires return it to the atmosphere.
4. Increased concentrations of calcium reduce the **toxic effect** of heavy metals on both algae and fish.
5. Industrial composting systems are increasingly being utilized as landfill alternatives , making them an important tool for **waste management** .

6. Charging with grid electricity is **cost competitive** but has environmental impacts.
7. Current development trends and pressures from increasing urbanization and industrialization are steadily **degrading** fragile ecosystems.
8. Granite is the most **durable** of igneous rocks.
9. **Emission** reductions could decelerate snow cover changes in the future.
10. Benzene is a **greenhouse gas** contributing to the warming of the atmosphere.

Unit 2. A new economic model for protecting tropical forests

Task 1.

Tropical forests are one of the world's most important **carbon** sinks, absorbing over one fifth of the emissions from burning **fossil fuels** every year. The latest research suggests that without them the world would already be nearly **one degree** Celsius hotter. We can't solve climate change without **tropical forests**. But right now, instead of protecting forests, we're cutting them down. Already, about **one sixth** of the Amazon has been lost, and some scientists fear that we're nearing a **tipping point** that could mean loss of the entire forest. Forests in Indonesia and Malaysia, even the vast forests of Central Africa, are **under threat** as well. And deforestation means **carbon pollution**. In fact, tropical deforestation worldwide accounts for almost as much **emissions** as all the world's cars and trucks combined. So losing tropical forests means losing any hope of **limiting** the rise in global temperatures to 1.5 or even two degrees Celsius.

Task 2.

Mato Grosso is now a model of economic development and forest protection.
Mato Grosso was one of the world's largest carbon polluters entirely because of tropical deforestation.
With support from the governments of Germany and Norway, it stepped up enforcement against illegal land grabbers.
It worked with agricultural producers and traders across the supply chain to invest in new and more sustainable production methods.
When a new governor was elected in 2018, he immediately affirmed his commitment to reducing deforestation and continued the state's policies.
If we're going to stave off climate catastrophe, the world needs many more Mato Grossos.

Task 3.

Sentence 1. Forests act as **carbon sinks** through the process of photosynthesis.
Sentence 2. **Deforestation** results from the human need for lumber for construction and land for agriculture.
Sentence 3. Methane is more environmentally friendly than are **fossil fuels**
Sentence 4. Per capita food production has **plummeted** 20 per cent from its peak in 1967
Sentence 5. We must **reduce emissions** of greenhouse gases beginning now.
Sentence 6. The logistics system is not a simple **supply chain** from the forest to the energy producer.
Sentence 7. After the **tipping point** , positive feedback in the system accelerates the warming or cooling trend.
Sentence 8. Arid and semiarid lands harbour only a very small number of species compared with **tropical forests**
Sentence 9. One third of the coastline is considered to be **under threat** from developments and other human activities.
Sentence 10. **Remote sensing** is the acquisition of information about an object without being in direct physical contact with that object.

Task 5

1. FALSE. We can't solve climate change without tropical forests.

2. TRUE. Mato Grosso is now a model of economic development and forest protection.
3. TRUE. It's a coalition of 12 companies and three countries that has committed one billion dollars in finance for forest protection at scale over the next five years.
4. FALSE. In Mato Grosso, soy production more than doubled and cattle increased by over a quarter, even as deforestation plummeted.
5. FALSE. Companies in LEAF are investing in forest protection over and above what they're doing to reduce their own emissions. It's not a substitute, it's a supplement.

Task 6

fossil fuel	a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.
green growth	fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.
harness	control and make use of (natural resources), especially to produce energy.
satellite data	It provides satellite imagery and earth observation data of the earth's surface and its atmosphere.
shut down	cease business or operation.
supply chain	the sequence of processes involved in the production and distribution of a commodity.
tipping point	the point at which a series of small changes or incidents becomes significant enough to cause a larger, more important change.
tropical forest	forested landscapes in tropical regions

Task 7

11. Degradation is often a precursor to **deforestation** as areas that are logged often increase access and result in clearing.
12. Burning of **fossil fuels** is the main cause of emission of huge amount of various polluting gases.
13. For the 350 million so-called **indigenous populations** of the earth today , nature and human identity are inseparable.
14. By the 1950s the fish 's total population had **plummeted** to fewer than 200 individuals.
15. **Carbon sinks** include forests and ocean areas that absorb CO2 produced by the burning of fossil fuels.
16. There is often a perception of conflict between the need to **preserve** biodiversity and the goal of economic development.
17. **Tropical forests** have high biological diversity and contain about 15 percent of the worlds plant species.
18. Human impacts are responsible for driving a multitude of species to such low numbers that much of the world 's biodiversity is **under threat**
19. With the development of radioactive dating it became possible to refine **precise** or absolute ages for specific rock units.
20. Often the objective is to directly link the **remote sensing** data to biophysical variables that describe the coastal ecosystem

Task 8

1. Trees function as **carbon sinks** , retaining carbon for the duration of their lives and sequestering it from the atmosphere.

2. **Deforestation** and other ecosystem changes are recognized as major factors in the future of the climate.
3. Electricity generation from **fossil fueled** steam plants is the lowest cost existing technology.
4. Conservation biology attempts to stop that destruction and **preserve** species diversity.
5. **Reducing emissions** will decrease the magnitude of the changes in climate and their related impacts
6. Developments in technology and **supply chain** logistics are needed to see the realization of a large-scale biomass supply system.
7. Trees used in forestry are also special selections grown for their enhanced quality and yield of **timber**
8. Some said that a **tipping point** had been reached and that the Arctic could experience ice-free summers within a decade or two.
9. **Tropical forests** contain almost as much carbon as do the temperate and boreal forests combined.
10. Today, the living resources of the sea are **under threat** from overexploitation , pollution , and landbased development.

Unit 3. How carbon capture networks could help curb climate change

Task 1

In BCG, I lead a team of consultants, analysts and data scientists whose focus is on advancing carbon capture **utilization and storage**. By our estimates, if we want to hit the IEA **forecast**, we need at least 110 billion dollars per year for the next 20 years to build out the required **carbon capture** and storage infrastructure. And there's only one way to bring down this essential but hefty **price tag**, which is to share the cost through networks. Consider it the **waste disposal service** for CO2. Our research suggests that policymakers and companies can learn a lot by looking at a map -- lots of maps, actually, both the ones that you and I look at on our smartphones as well as the less common ones that show what lies below the surface in terms of **depleted** oil and gas fields and saline **aquifers** with the ability to trap CO2 underground. And by looking at these maps, we can look for the optimal distances between both the **sources of emissions**, like Scunthorpe's steel plant, and the sinks, like the saline aquifers of Alberta.

Task 2

Listen and match the sentence halves (6)

1) We found up to 200 clusters that have the ability to be scaled up to low-cost carbon networks.
2) They can capture more than one gigaton of emissions, a big step to the four to seven gigatons that we need.
3) We find that optimization of distances between sinks and sources matters.
4) Network effects can reduce the capture and storage cost of many emitters by up a third.
5) While that is still a substantial cost, it starts to get in the range of carbon taxes and market mechanism.
6) We would not be able to achieve it without collaboration and sharing of infrastructure between neighboring emitters.

Task 3

Sentence 1. Currently , most new US fuel ethanol production facilities utilize dry-grind processes.
Sentence 2. In this study estimated solar radiation is used in optimizing solar panel size.
Sentence 3. The use of sewage sludge as fertilizer on agricultural land is another source of pollution.
Sentence 4. Gas containing 50–90 % methane found trapped in certain types of rock formations.

Sentence 5. Carbon capture and storage technologies are proven but are still seen as ' too expensive ' for widespread adoption
Sentence 6. Burning of fossil fuels is the main cause of emission of huge amount of various polluting gases
Sentence 7. A carbon tax is a tax on energy sources which emit carbon dioxide into the atmosphere.
Sentence 8. Flue gases are the cause of most industrial air pollution.
Sentence 9. The condensation may come directly from the water vapor added to the air from engine exhaust .
Sentence 10. Initial life forms on the planet were various types of bacteria that thrived in the anoxic environment.

Task 5

1. TRUE. Millions of tons of greenhouse gas emissions linked to significant local employment.
2. FALSE. The main sources of pollution in their areas are in close proximity to rock formations with the ability to trap carbon dioxide, the greenhouse gas we often call CO2.
3. FALSE. Today, however, there are very few operational carbon capture facilities in the world, capturing about 14 million tons of CO2 equivalent per year.
4. TRUE. And there's only one way to bring down this essential but hefty price tag, which is to share the cost through networks.
5. FALSE. By building up a detailed database of emitters as well as potential sinks, we found up to 200 clusters that have the ability to be scaled up to low-cost carbon networks.
6. FALSE. **to below** 100 dollars per ton of CO2 captured, based on current costs of technology.
7. TRUE. storing CO2 offshore is more expensive than onshore

Task 6

net zero	a target of completely negating the amount of greenhouse gases produced by human activity, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.
production facility	a building or area where goods are made
source of pollution	any place from which stems or condition which may cause pollution of a ground or surface water supply
fossil fuel	a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms
depleted	used up the supply or resources of
gas field	a district where natural gas is produced in commercial quantities
carbon tax	a tax on fossil fuels, especially those used by motor vehicles, intended to reduce the emission of carbon dioxide
flue gas	a mixture of gases produced by the burning of fuel or other materials in power stations and industrial plants and extracted via ducts

Task 7

11. Solar panels on the roofs of homes are a familiar sight in city and rural settings.
12. Coal burning remained the most serious source of pollution until modern times
13. This hardness is derived from contact with soil and rock formations such as limestone.
14. Natural gas is abundant in shallow crustal reservoirs and is useful as a fossil fuel
15. The European Union has discussed a carbon tax covering its Member States, and has implemented a carbon emissions trading scheme.

16. The optimal level of pollution is determined where the marginal cost of emissions and marginal benefits are equal.
17. There are more than 50 species of sea snakes that thrive in marine environments.
18. Fracturing allows for extended production in older oil and natural gas fields.
19. The removal of acidic pollutants from the flue gases from installations such as incinerators.
20. It is a major constituent of automobile exhaust gases and a common component of urban photochemical smog.

Task 8

1. The riser system is a critical component in a deepwater production facility
2. Solar panel consumes sunlight and produce DC voltage which goes to the solar charge controller.
3. Significant changes in conductivity could indicate that a discharge or some other source of pollution has entered a stream
4. Mining in hard and soft rock formations require different techniques
5. Carbon capture and storage is an emerging technology for reducing GHG emissions from large sources , primarily coal-fueled power plants
6. Different approaches have been made to encourage dependence on renewable energy and reduce fossil fuel based energy dependence.
7. The purpose of a carbon tax is both financial (like all taxes) and environmental.
8. In the early 1970s , economists had begun to explore ways to reduce pollution that took differences in firms ' marginal costs of pollution reduction into account.
9. Vegetation determines a range of animal species most likely to thrive in the area.
10. And the subsea manifold is playing a much more important role in the development of deepwater oil and gas fields

Unit 4. How cities are detoxing transportation

Task 1

For the first time in our lifetimes, a big detox of **transportation** is possible, despite the many problems we have, or perhaps because of them. The **lockdowns** of 2020 have been tough, but they also give us a glimpse of life without the usual noise, **congestion and pollution**, confronting us with questions about the way we live. The tailpipe is a symbol of our **worst** habits -- habits that we have normalized for too long: the **burning** of 100 million barrels of oil every 24 hours and the **extraction** behind that oil, the fumes choking our cities, the **greenhouse gases** going up in the atmosphere and **overheating** our planet. None of that is normal, nor is **air pollution**, which can shorten **life expectancy** by up to 10 years, depending on where you live. This is also a matter of **environmental justice** because air pollution hurts everyone, but it hurts the poor and minorities disproportionately.

Task 2

By 2022, all buses and coaches circulating in the city center must be emissions-free.
All transportation must be emissions-free, including personal cars and motorcycles.
Amsterdam becomes a front-runner of electric mobility.
Halving carbon emissions by 2030 goes beyond nudging people away from personal cars.
The systemic change we need requires that all modes of transportation go emissions-free powered by renewables.
We need national governments to play a fundamental role too.

Task 3

Sentence 1. Air pollution problems began when people tried to keep warm by burning wood and coal.
Sentence 2. During heavy traffic congestion , the car would experience frequent stops.
Sentence 3. When cars and trucks burn gasoline, toxic air pollutants are emitted from the tailpipe

Sentence 4. Fumes are usually released as a result of certain metal working and chemical processes.
Sentence 5. The constructions are intended to withstand storm wave attack over a life expectancy of 30 to 50 years.
Sentence 6. Producing the solar panels themselves requires a significant amount of energy and emissions, but once installed they operate with zero emissions for a long time.
Sentence 7. The main contribution to the carbon emission was due to forest cutting in tropical areas.
Sentence 8. While the development of marine renewables is policy , the protection of the environment is the law.
Sentence 9. Older facilities will gradually be phased out and not replaced.
Sentence 10. Internal combustion engines are responsible for most of the CO in the outdoor air.

Task 5

1. FALSE. Air pollution, which can shorten life expectancy by up to 10 years, depending on where you live.
2. FALSE. Active mobility, such as biking and walking.
3. TRUE. Even in Amsterdam there is a problem with air pollution because of road transportation.
4. FALSE. That also includes mopeds, ferries and boats.
5. TRUE. The systemic change we need requires that all modes of transportation go emissions-free powered by renewables. And to do this, we need to electrify pretty much everything
6. TRUE. Look at batteries. Their cost went down 90 percent in 10 years.
7. FALSE. Africa now has its first manufacturing plant of electric buses

Task 6

air pollution	the presence in or introduction into the air of a substance which has harmful or poisonous effects
climate emergency	a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it
detox	a process or period of time in which one abstains from or rids the body of toxic or unhealthy substances; detoxification
congestion	to concentrate in a small or narrow space
overheating	make or become too hot
life expectancy	the average period that a person may expect to live
zero-emission zone	an area where only zero-emission vehicles (ZEVs), pedestrians, and cyclists are granted unrestricted access
carbon emission	emissions stemming from the burning of fossil fuels and the manufacture of cement

Task 7

11. Air pollution concentrations in mountain valleys tend to be greatest during the colder months.
12. Increased traffic congestion may result in increased expenditures for law enforcement personnel, for example.
13. Biodiesel reduces tailpipe particulate matter , hydrocarbon , and carbon monoxide emissions from most modern four-stroke compression ignition engines.
14. Ventilation is required to clear toxic fumes from blasting and removing exhaust fumes from diesel equipment.
15. In the modern context , the forebears of radical environmental and environmental justice groups that question the exploitation of labor and the environment in the pursuit of profits.

16. Economic assessment should assume a life expectancy of up to 50 years before major repairs or reconstruction will be required.
17. It is desirable that these novel technologies should also contribute to mitigate carbon emissions under a green growth strategy.
18. It requires power suppliers to derive from renewables a specified proportion of the electricity they supply to their customers.
19. This was the policy used to phase out lead in gasoline in the 1980s.
20. Carcinogenic aldehydes such as formaldehyde are produced when ethanol is burned in internal combustion engines .

Task 8

1. Flue gases are the cause of most industrial air pollution
2. Singapore was the first city to introduce a congestion charge.
3. For tailpipe carbon monoxide emission reductions , gasoline containing 2.7 % oxygen by weight is used.
4. The trapped fumes then escape into the basements of buildings , water wells and storm drains.
5. Many factors can increase life expectancy and reduce mortality rates.
6. The advantage of such systems is " zero emission "
7. Renewable energy is not only cost saving but also reduces carbon emission .
8. Hydropower, second to wood among the renewables , has been expanding at nearly 4 per cent annually.
9. Production and use of carbon tetrachloride was phased out in 1996.
10. The potential of ethanol fuel in reducing the emission pollution of internal combustion engines has been extensively investigated.

Unit 5. These bacteria eat plastic

Task 1

Bacteria are **microscopic** living beings invisible to the naked eye that live everywhere, in all sorts of diverse and **extreme environments**, from the human gut, to **soil**, to skin, to vents in the **ocean floor**, reaching temperatures of 700 degrees Fahrenheit. Bacteria live everywhere, in all sorts of **diverse** and extreme environments. And as such, they have to get pretty creative with their **food sources**. There's also a lot of them. Researchers **estimate** that there are roughly five million trillion trillion -- that's a five with 30 zeros after it -- bacteria on the planet. Now, considering that we humans **produce** 300 million tons of new plastic each year, I'd say that our **plastic numbers** are looking pretty comparable to bacteria's.

Task 2

My bacteria use a special version of what's called an enzyme.
Enzymes are simply compounds that exist in all living things.
They make processes go forward, such as the digestion of food into energy.
We humans have an enzyme called an amylase that helps us digest complex starches, such as bread.
My bacteria have a special enzyme called a lipase that binds to big, tough, durable PET plastic.
PET plastic goes from being a big, tough, long-lasting pollutant to a tasty meal for my bacteria.

Task 3

Sentence 1. The sorting and **recycling** of mixed household waste may be undertaken at a materials recovery facility.
Sentence 2. Generally igneous rocks are strong and **durable**.
Sentence 3. Calcium and magnesium enter water mainly by the **leaching** of rocks.

Sentence 4. Once **chemical contaminants** have entered groundwater , they cannot be easily removed.
Sentence 5. Degraded **plastic waste** partly substitutes the virgin material.
Sentence 6. To survive in such **extreme environments** , frogs have evolved an impressive range of adaptations.
Sentence 7. Organic **compounds** consisting predominantly of carbon and hydrogen.
Sentence 8. Moisture content is also important for the structural integrity and sufficient porosity of the **composting** pile.
Sentence 9. As water supplies become limited , there is growing economic incentive to conserve water by **reusing** it.
Sentence 10. The carbon must **wind up** either in the oceans, or in biomass.

Task 5

1) FALSE. plastic is incredibly tough and durable and researchers estimate that it can take anywhere from **500 to 5,000** years to fully break down.
2) FALSE. Bacteria live everywhere, in all sorts of diverse and extreme environments.
3) TRUE. what I was trying to cook up was a carbon-free media, or a food-free environment. An environment without the usual carbons, or food, that bacteria, like us humans, need to live.
4) FALSE. See, this type of experiment would act as a screen for bacteria that had adapted to their plastic-polluted environment and evolved the incredibly cool ability to eat PET plastic. And using this screen, I was able to find some bacteria that had done just that. These bacteria had figured out how to eat PET plastic.
5) FALSE. my bacteria have a special enzyme called a lipase that binds to big, tough, durable PET plastic and helps break it into small chunks of sugar that my bacteria can then use for energy
6) TRUE. Well, the short answer is no, and I'll tell you why. These bacteria are already in the environment. The bacteria in my research are not genetically modified frankenbugs. These are naturally occurring bacteria that have simply adapted to their plastic-polluted environment and evolved the incredibly gnarly ability to eat PET plastic.
7) TRUE. So the process of bacteria eating plastic is actually a natural one. But it's an incredibly slow process.

Task 6

compost	decayed organic material used as a fertilizer for growing plants
compound	a substance formed from two or more elements chemically united in fixed proportions
contained system	any system where wastes are enclosed and emissions to air are passed through a bio-filter or other designed abatement system
extreme environment	places where humans would not survive – for example, environments that have very high temperatures or pressure
recycle	convert (waste) into reusable material
reusing	use again or more than once
break down	convert a substance into simpler compounds by chemical action
carbon-free media	does not use fossil fuels or does not emit carbon

Task 7

11. The answer probably lies in combinations of characteristics and mechanisms that generate and **recycle** nutrients.
12. They found that worm holes may extend to 1 meter below the surface and can be quite **durable** .

13. Much attention has been devoted to assessing the optimal quantity of water that must be applied to cause **leaching** .
14. A relatively concentrated mass of emitted **chemical contaminants** spreading in the environment.
15. Huge amount of **plastic wastes** produced may be treated with suitably designed method to produce fossil fuel substitutes.
16. The primary adaptation of the vegetation is to the **extreme environment** and not in response to competition for space or resources.
17. As well as losses from tourism there are continual costs of beach **cleanup** efforts that take time and money.
18. The **compounds** are mixed with water and fed into the water with inexpensive solution feed pumps.
19. The stability of the **compost** can be measured either by the carbon dioxide production or oxygen consumption.
20. The biodiesel yield after 5 times of **reusing** the catalyst was 84.5 %.

Task 8

1) A community recycling program requiring citizens to take items for **recycling** to a designated location for collection.
2) Chemical contaminants can be **leached** , meaning dissolved by infiltrating groundwater.
3) Runoff from these urban areas can contain **chemical contaminants** , which can then be retained within the lagoons finer-grained sediments.
4) As most **plastic waste** has high heat content so it is incinerated.
5) A microorganism that lives in **extreme environments** , such as hot springs or highly saline water.
6) The subsequent **cleanup** represents the largest field bioremediation ever undertaken.
7) Most organic **compounds** can be derived from alkanes.
8) Crops with longer growth periods can make better use of **compost**
9) France has long followed a policy of reprocessing and **reusing** spent fuel rods.
10) A critical desalination of the ocean's water occurs , shifting ocean currents and **wreaking havoc** on the world's climate.

Unit 6. Buildings that blend nature and city

Task 1

For me, the field of **ecology** has provided important insight, because **ecologists** don't just look at individual **species** on their own, they look at the relationships between living things and their **environment**. They look at how all the diverse parts of the **ecosystem** are interconnected, and it's actually this balance, this **web of life**, that sustains life. My team and I have been applying insights from **ecology** to architecture to see how physical space can help build stronger relationships. The projects I'm going to show you today use the idea of building relationships as the **key driver** for design.

Task 2

1) The trees absorbed carbon when they were growing up, and they gave off oxygen.
2) Now that carbon is trapped inside the walls and it's not being released into the atmosphere.
3) So making the walls is equivalent to taking cars right off the road.
4) We chose the building method because it connects people to each other and to the environment.
5) Is it creating relationships and nurturing them?

Task 3

Sentence 1. Urban habitat corridors serve similar purposes as they do in the natural environment.
Sentence 2. Food webs are complex networks of interconnected food chains.
Sentence 3. On a larger scale , the many interrelationships between non-living matter and living things make up what is known as a web of life or a food web.
Sentence 4. An ecosystem consists of the community of species as well as the environment of a given site.
Sentence 5. The hydrogen and oxygen atoms needed to form glucose come from molecules of water.
Sentence 6. This makes it an important issue in ecology to scale up from the properties of individual species to ecosystem processes.
Sentence 7. Corrosion starts at the surface of a material and moves inward .
Sentence 8. Climate change also directly affects many other economic and social activities that in turn affect land-use patterns.
Sentence 9. Economic and social development can and should be mutually reinforcing
Sentence 10. The economic value of marine parks has been the key driver for much of their development especially in tropical areas.

Task 5

1. **TRUE** I have been applying insights from ecology to architecture to see how physical space can help build stronger relationships
2. **FALSE.** The students wanted a place for cultural exchange. They thought a place for preparing food together could do that.
3. **TRUE.** In meeting houses, there's always a central space where you can sit around a circle and see each other.
4. **FALSE.** people are applying for the Arcus Fellowships. In fact, applications **have increased tenfold** for the Arcus Fellowship since the building opened.
5. **FALSE.** So we invented a way to use **balconies** as the new social connectors.
6. **TRUE.** And people are starting to meet each other on the building surface and we've heard - they've even starting getting together as couples. But besides romantic relationships, the building has a positive social effect on the community, as evidenced by people starting groups together and starting big projects together, like this organic community garden on the building's roof terrace.
7. **TRUE.** You know, every city has parks, libraries, schools and other public buildings that have the potential to be reimagined as social connectors.

Task 6

absorbed carbon	the use of carbon to remove waste and other substances from air or water
interconnected	having all constituent parts linked or connected
key driver	an input field or combination of input fields that has a statistically significant effect on a target field
low-tech	using or requiring only low technology
out of balance	not even, stable, or in correct proportions
urban habitat	the places within our towns and cities where nature sets up home too
web of life	A diagram showing the relationships between different living and non-living parts of an ecosystem by a series of interconnected lines
social connector	the experience of feeling close and connected to others

Task 7

11. An impermeable body of rock which contains no interconnected openings or interstices and therefore neither absorbs nor transmits water.
12. Various species in nature coexist through some very complex dependencies and feedback loops the so-called web of life .
13. Sometimes these differences in moisture are so pronounced that different plant communities grow on the windward and leeward sides.
14. Producers give off the extra oxygen atoms that are generated during photosynthesis as oxygen gas.
15. A primary tissue in roots and stems of vascular plants that extends inward from the epidermis to the phloem.
16. The facing of the wall has been considered either to be made of continuous or discrete reinforced concrete panels.
17. Signal separation based on polarization is a technique often used in the study of atmospheric aerosols.
18. As urban habitats and their suburban extensions have become more common , the wildlife of these human landscapes has become the focus of attention and study.
19. Real sustainable development must recognize the interconnectedness between human beings and the environment if true environmental and social justice is to be obtained.
20. The scattered radiation does not undergo a change of frequency but its phase and polarization may change considerably.

Task 8

1. Despite the forbidding features of **urban habitats** , a surprising variety of wildlife manages to exist on a more or less permanent basis.
2. Scientists have identified many **interconnected** causes for the urban heat island effect.
3. Maintaining the **web of life** that includes these organisms is necessary for human survival.
4. The mechanisms involved have been studied extensively and are linked to the microbial **community** in soil or the rhizosphere.
5. Water on the ocean side of the estuary holds less **oxygen** than water on the river side.
6. Small scale restoration projects have demonstrated the extreme difficulty of **scaling up** to effective, large scale restoration.
7. Surface winds increase in speed as they blow counterclockwise and **inward** toward this center.
8. It was not until the Neolithic Period that primitive agriculture appeared as a form of **social activity** , and domestication was well under way.
9. They are fine particles and have a **reinforcing** effect on thin film of the paint.
10. At each wavelength both horizontal and vertical **polarizations** are measured.

Unit 7. Let’s clean up the space junk orbiting Earth

Task 1

People around the world rely on **satellite infrastructure** every day for information, entertainment and to **communicate**. There's agricultural and **environmental monitoring**, Internet connectivity, **navigation**. Satellites even play a role in the operation of our financial and **energy markets**. But these satellites that we rely on day in and day out have a **finite life**. They might run out of **propellant**, they could malfunction, or they may just naturally reach the end of their **mission life**. At this point, these satellites effectively become **space junk**, cluttering the orbital environment.

Task 2

1. We send satellites to different orbits depending on what they're needed for.
2. One of the most common places we send satellites is the low Earth orbit.
3. Satellites there are naturally buffeted by Earth's atmosphere, so their orbits naturally decay.
4. Another common place we send satellites is the geostationary orbit.
5. Satellites there remain in the same place above Earth as the Earth rotates.
6. There's the orbit coined "the graveyard," the ominous junk or disposal orbits.

Task 3

Sentence 1. A physical and **environmental monitoring** program is being conducted to verify the expected effects of the projects.
Sentence 2. Chlorofluorocarbons were used widely as refrigerants and as **propellants** in spray cans.
Sentence 3. Flooding causes **malfunctioning** of irrigation channels and transverse drains in the irrigated areas.
Sentence 4. It may also influence the presence of sea ice or the rates of subaerial weathering and coastal **debris** supply.
Sentence 5. Energy from precipitating particles in the auroral oval is dissipated as heat through **collisions** with the neutral gas.
Sentence 6. Organic matter derives from **decaying** plant matter in the watershed.
Sentence 7. Small objects hit the Earth many times every day but **burn up** in the atmosphere.
Sentence 8. Tornadoes are rapidly **rotating** columns of air with a circulation that reaches the ground.
Sentence 9. Low Earth orbit altitudes are monitored for **space junk** by ground-based radar systems that track objects larger than 5 centimeters
Sentence 10. Any increased costs of bio solids **disposal** are expected to promote beneficial use.

Task 5

1. **TRUE** There's agricultural and environmental monitoring, Internet connectivity, navigation.
2. **FALSE.** Satellites that are no longer working are often left to deorbit over many, many years, or only moved out of the way as a temporary solution.
3. **TRUE.** One of the most common places we send satellites is the low Earth orbit, possibly to image the surface of Earth at up to about 2,000 kilometers altitude.
4. **FALSE.** Of the nearly 7,000 satellites launched since the late 1950s
5. **FALSE.** there are recommendations for those low-Earth orbiting spacecraft to be made to deorbit in under 25 years,
6. **TRUE.** The reality of space is that if a component on a satellite breaks down, there really are limited opportunities for repairs
7. **TRUE.** There is without doubt congestion in the low Earth and geostationary orbits, and we cannot keep launching new satellites to replace the ones that have broken down without doing something about them first.

Task 6

debris	scattered pieces of rubbish or remains
decay	the state or process of rotting or decomposition
deorbit	the flight of a vehicle that begins with the final command to commit to a perigee below 70 nautical miles (approximately 130 kilometers), and ends when all vehicle components come to rest on the Earth
end-of-life disposal	disposing of the existing product responsibly, transitioning to a different product and ensuring that disruption will be minimal

environmental monitoring	tool to assess environmental conditions and trends, support policy development and its implementation, and develop information for reporting to national policymakers, international forums and the public
low-Earth	normally at an altitude of less than 1000 km but could be as low as 160 km above Earth
satellite constellation	a group of artificial satellites working together as a system
space junk	disused satellites and other man-made debris in orbit around the earth

Task 7

11. Furthermore , environmental monitoring for the global Earth system is becoming increasingly important.
12. Other propellants are available , such as butane , which is highly flammable and therefore only suitable for spraying water-based products.
13. The damage from aloft often looks like a star with debris spreading out from the center in straight lines.
14. The vertical force due to the water flow in the breakwater varies during the collision of a wave group.
15. They can begin as surface fires but burn peat or partially decayed leaves below the ground surface.
16. Debris from satellites has rendered LEO more dangerous to piloted space missions and poses a steadily increasing hazard to functioning satellites.
17. Composting also diverts organic wastes that would otherwise end up in landfills or other disposal sites.
18. The GPS Navstar satellite constellation is configured in such a way that at any point on the Earth 's surface, the user of a GPS receiver should be able to detect signals from at least six Navstar satellites.
19. Most of the advances expected depend on research activity in microcomputers and information processing , in genetics and biochemistry , in remote sensing and space exploration .
20. The data were deemed to be sound since no evidence was found for malfunction of the instruments during the corresponding period.

Task 8

1) New demands for **environmental monitoring** and atmospheric and oceanic prediction will continue to arise.
2) Beach nourishment generally has a **finite life** and only acts to delay the erosion process.
3) The use of fluorocarbon **propellants** is intended to be virtually terminated except for medical purposes.
4) Ground **clutter** may hide or confuse precipitation echoes near the radar antenna.
5) These observations are in compliance with the classical phase transformation description of **debris** flows.
6) The process in which particles grow by **collision** with and assimilation of cloud particles or other precipitation particles.
7) Radon is a poisonous gas released during radioactive **decay** of the uranium.
8) If the meteorite is large enough, it may not **burn up** in the atmosphere and will then strike Earth.

9) Recently **space missions** to asteroids and remote sensing have enabled observations of asteroids in space to be integrated with the data from samples taken from meteorites collected on Earth.
10) The treatment and **disposal** of sludge can account for 40 % of the cost of wastewater treatment.

Unit 8. How human noise affects ocean habitats

Task 1

Although the sounds are **inaudible** above water depending on where you are and the time of year, the **underwater soundscape** can be as noisy as any jungle or **rainforest**. **Invertebrates** like snapping shrimp, fish and marine **mammals** all use sound. They use sound to study their **habitat**, to keep in communication with each other, to navigate, to detect **predators** and prey. They also use sound by listening to know something about their **environment**.

Take, for an example, the Arctic. It's considered a vast, **inhospitable** place, sometimes described as a desert, because it is so cold and so **remote** and ice-covered for much of the year. And despite this, there is no place on **Earth** that I would rather be than the Arctic, especially as days lengthen and spring comes.

Task 2

1) The underwater Arctic has some of the lowest ambient noise levels of the world's oceans.
2) This is primarily due to a decrease in seasonal sea ice, which is a direct result of human greenhouse gas emissions.
3) We are, in effect, with climate change, conducting a completely uncontrolled experiment with our planet.
4) Areas of the Arctic have seen decreases in seasonal sea ice from anywhere from six weeks to four months.
5) This decrease in sea ice is sometimes referred to as an increase in the open water season.
6) And not only is the extent of ice changing, but the age and the width of ice is, too.

Task 3

Sentence 1. Many species of **invertebrates** and algae live on or within rocky habitat and provide a diverse range of foods.
Sentence 2. Populations of the same species commonly occupy different **habitats** during their lives or across their geographic ranges.
Sentence 3. The open sea is an **inhospitable** home for most marine plants.
Sentence 4. Social organization is strong among some types of **marine mammals** but less evident in others.
Sentence 5. **Remote** sensing and geographical information systems technologies were then combined in specialized systems for earth observation.
Sentence 6. It is implied that emission reductions could **decelerate** snow cover changes in the future.
Sentence 7. Climate change **alters** ecosystems by changing vegetation growth and weather patterns.
Sentence 8. It is of **vital** significance in the transfer of surplus energy from the tropics to the poles.
Sentence 9. Used in ancient times, the dive bell was the first invention to allow a human to breathe **underwater**.
Sentence 10. Predators play a keystone role by regulating populations of **prey** animals and thereby maintaining balance within food webs.

Task 5

1. FALSE. The ice, too, makes sounds. It screeches and cracks and pops and groans, as it collides and rubs when temperature or currents or winds change.
2. TRUE. Arctic marine mammals have to hear each other, but they also have to listen for cues in the environment that might indicate heavy ice ahead or open water.
3. **FALSE.** But when the ice is frozen solid, and there are no big temperature shifts or current changes, the underwater Arctic has some of the lowest ambient noise levels of the world's oceans.
4. TRUE. Climate change and decreases in sea ice are also altering the underwater soundscape of the Arctic.
5. **FALSE.** Second: water. With less seasonal sea ice, subarctic species are moving north, and taking advantage of the new habitat that is created by more open water.
6. **TRUE.** More open water means increased human use of the Arctic.
7. **TRUE.** We can't decrease wind speeds or keep subarctic animals from migrating north, but we can work on local solutions to reducing human-caused underwater noise.

Task 6

acoustic space	the profile of a sound over its surrounding environment
alter	make structural changes to
ambient noise	refers to all noise present in a given environment
decelerate	reduce or cause to reduce in speed
habitat	the natural home or environment of an animal, plant, or other organism
inhospitable	(of an environment) harsh and difficult to live in
invertebrates	an animal lacking a backbone, such as an arthropod, mollusc, annelid, coelenterate, etc.
marine mammal	aquatic mammals that rely on the ocean and other marine ecosystems for their existence

Task 7

11. Soils and sediments in the lithosphere contain abundant microorganisms and invertebrates at shallow levels.
12. Habitat suitability for spawning may vary seasonally in association with natural erosion and accretion cycles
13. This reduces dissolved oxygen and creates an inhospitable environment for fish.
14. Small isopods are often parasites on fish and marine mammals
15. Remote sensing measurements of the boundary layer are used in a wide variety of applications.
16. The flow decelerates after peak velocity , with deceleration being slightly lower for the rough beach.
17. Clouds impact climate primarily by altering the radiative balance in the region where they form.
18. Clouds are vital aspects of the air masses that collide and form fronts where warm and cold masses meet.
19. Aquaculture can be most simply defined as underwater agriculture.
20. All hydroids are carnivores that capture prey with stinging tentacles.

Task 8

1. This immense **underwater world** is a fascinating realm that captures the imaginations of people everywhere.
2. Fish and birds prey on the **invertebrates**
3. Increased areas of saltmarsh provide more **habitats** for nature species.
4. These organisms evolved about 3,000 million years ago and are considered to be the primary colonisers of the **inhospitable** ecosystems.
5. Whales are **marine mammals** that occur in all the world's oceans.
6. Modern techniques of **remote** sensing employ a greater range of the electromagnetic spectrum than aerial photographs.
7. The wind reaches its maximum speed above the hill top and then **decelerates** on the lee side.
8. that the Arctic can have very low ambient noise levels.
9. Ecosystems can also be **altered** by change of hydrodynamics and acoustic noise generated by the machines.
10. Water on the land is a **vital** part of the water cycle.

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