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GREEN PLANET

FOR ADVANCED LEARNERS

Textbook on sustainability
for 11th-12th grade secondary school students

KÉK·BOLYGÓ
ALAPÍTVÁNY

Alapértékek
Nonprofit Kft.

OKTATÁSI
HIVATAL

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GREEN
PLANET
ADVANCED

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THE BIG LESSON

THE BIG LESSON is a big lesson for all of us. We need to learn how to live well without consuming our own living space or that of future generations.

The threat is real, and scientists have been ringing the alarm bell for decades to no avail. It was not until we felt the effects of increasingly unpredictable weather patterns and hot summers, until we read about melting ice caps, dried-up lakes, and areas without drinking water driving masses of people to flee that politicians, businesses and individuals took it seriously enough to do something. Fortunately, for a few decades now, serious efforts have been made at both national and international level to improve the situation.

Instead of waiting for a miracle, you can create a miracle yourself. Little things can make a big difference: our lifestyle and attitude affect our immediate environment, which in turn affects our wider environment. Yet good intentions are not enough to prevent further damage due to our overenthusiasm. We need to know a lot about the nature of the phenomena, and of course, act on that knowledge.

The *Green Planet for Advanced Learners* textbook and workbook can help with this. You have already learned about sustainability and its basic concepts, such as an ecological or water footprint. We are now taking this to the next level, and trying to help you see the different processes in context.

We will look at sustainability from the perspective of nature, economy and society. This is because sustainability can only be achieved if these three areas are in harmony with one other. If they aren't, we will have to face a disproportionate use of natural resources, environmental pollution and major social disparities, which in the longer term will not only hinder social and economic development, but also threaten human existence on earth.

"Sustainable development can be compared to a three-legged table. We like three-legged tables because they don't wobble even if the ground is uneven. With a four-legged table, you often have to wedge one leg to keep it stable. A three-legged table also loses stability if the length of the three legs is very different."

REVIEW — **What you already know**

TERM	DEFINITION
sustainable development	In 1987, the United Nations defined sustainable development in the report *Our Common Future* as development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs. In 2015, UN member states adopted the *Sustainable Development Goals (SDGs)*, which provide an interconnected framework to guide all aspects of life with a view to achieving sustainability.

Source: Kerekes S., Tardy J.: Van jövőnk – Fiataloknak a fenntartható fejlődésről. Magyar Természettudományi Társulat. 2021. http://mtte.hu/sites/default/files/kiadvanyok/2021/2021.html

TERM	DEFINITION
globalisation	The unification process – that intensified in the 20th century and continues today – in the economic, financial, and cultural, etc. domains of the world, mainly through the spread of Western civilisation and the use of information and communication technologies. For example: the same products, brands, food, films, music, technologies and retail chains are available all over the world. The global market economy can undermine the autonomy of local societies and governments. The concept of globalisation was originally introduced into public thinking around the 1960s in the context of global environmental problems, indicating that local action has (can have) global effects. This was when the *Think global, act local!* slogan was born.
carbon footprint	A carbon footprint demonstrates the direct or indirect contribution of human activity to greenhouse gas emissions, converted to carbon dioxide equivalent (CO_2e). The carbon footprint is a significant part of the ecological footprint.
ecological footprint	Ecological footprint is an indicator, expressed in hectares, of the impact of humans on nature. It indicates the amount of land that is sufficient to produce the goods needed for the current human lifestyle and to neutralise the waste and emissions generated. For example: the area of land or water needed to produce food, housing and utility items, or the area of forest needed to neutralise carbon dioxide emitted during energy use.
ecosystem services	The goods and processes provided by an ecosystem along with the generated benefits are called ecosystem services. For example: clean air, drinking water, edible food, raw materials, recreation, carbon sequestration, temperature compensation. This term links nature to society, in particular to well-being and the economy. Unfortunately, the state of ecosystems is deteriorating and many services are being threatened or eliminated, which are costly or impossible to replace.
systems thinking	An approach that focuses on the context, looking for the wider implications of particular decisions, observing trends, and making day-to-day decisions in light of them. This approach helps us recognise the complexity of the world, deal with uncertainty, understand the root causes of problems and find better solutions. Issues of systems thinking and systems analysis are addressed by system dynamics. System dynamics examines the parts of a system not as individual elements, but in their context, in the way they interact with each other over time, etc., i.e. studies the system as a whole.
greenhouse gases	Greenhouse gases are gases that let solar radiation pass through, but they only release back into space a small fraction of the infrared rays reflected from the Earth's surface because of warming, the majority are reflected or re-radiated back into the atmosphere, leading to the greenhouse effect. The gases under this collective heading are mainly water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and other hydrocarbons.
greenhouse effect	The greenhouse gases present in the atmosphere (water vapour, carbon dioxide, methane, nitrous oxide) prevent radiation from the sun that warms the Earth's surface from being reflected back into space. It becomes "trapped" in the atmosphere, causing the Earth's atmosphere to warm up. The greenhouse effect is a natural phenomenon, without which there would be no life on Earth. However, its gradual intensification – due to an increase in greenhouse gas emissions – is threatening the balance of atmospheric processes leading to global climate change.
water footprint	The amount of water required to produce a product or carry out an activity, or for one's daily activities.

YOU CAN MAKE A DIFFERENCE!

Be a systems thinker, a sustainable development expert who can act and make the right decisions.
Do your best!

EVERYTHING IS CONNECTED

The great earth laboratory

SYSTEMS AND THEIR BEHAVIOUR

Before exploring the mysteries of the world, of societies and of the great earth laboratory, we should say a few words about the concept of systems and some of the issues involved in studying systems. This is very important because you will see that everything on our planet is connected. Even a small change can trigger a profound transformation.

IMAGINE!

IMAGINE!

The animal in the picture is neither a dog nor a wolf, it is just called a thylacine or Tasmanian wolf based on its external features. It became extinct due to both the introduction of dogs into its habitat by humans, and sheep farming. Settlers blamed the thylacine for the death of their sheep, and officially ordered its hunting.

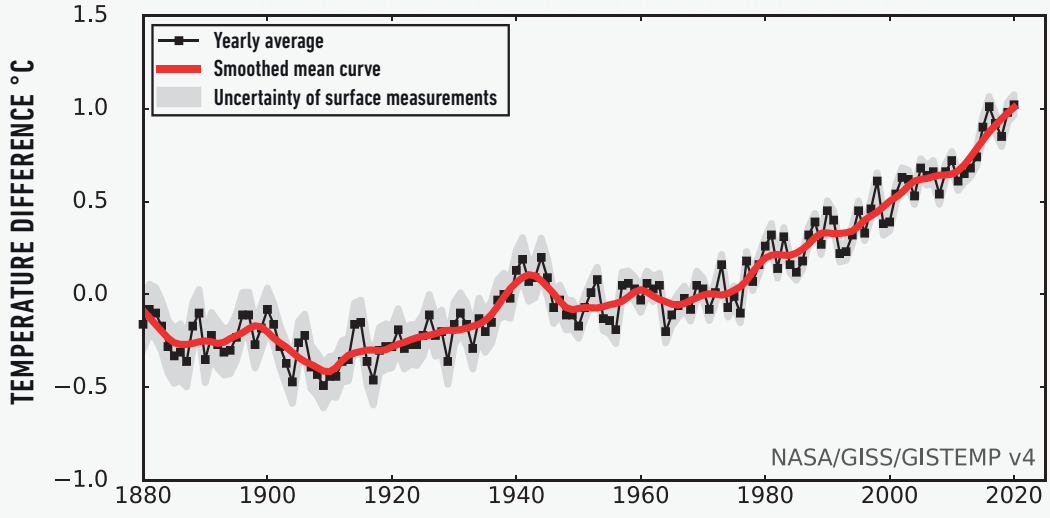
However, the Tasmanian wolf played a role in shaping its habitat's ecosystem by hunting marsupials and birds. Having become an apex predator in the area's food web, the population of its prey animals increased as the Tasmanian wolf declined. Its extinction therefore disturbed the balance of the area's ecosystem.

A system is a group of different units whose elements interact with one another. The elements of a system are connected by certain rules, with different dependencies between them. The properties and behaviour of a system cannot be derived directly from the characteristics of the individual system components.

Other general features of a system:

- it has boundaries;
- it changes over time – its current situation is called a state;
- it is characterised by reinforcing or balancing feedback or causal loops of *unidirectional* (positive) and *opposing* (negative) relationships.

It follows from the above that to understand a system, we need to look at it along the following lines:
1. Timeline: The timeline is usually illustrated by graphs. For example, global warming can clearly be seen by looking at the long-term data of temperature changes over decades.



Temperature difference compared to the 1951–80 average °C

Source: https://data.giss.nasa.gov/gistemp/graphs/

2. Causation: Causalities are typically depicted on charts and relations diagrams.

- Nature seeks balance. One basic type of causal effect is the **balancing** effect. This means that the system is balanced by action and reaction. Action is termed positive feedback, while reaction is negative feedback. This is how nature works without external influences.

Wolves and elks

In the north, wolves' favourite prey is elk. If the number of elks declines in winter due to wolf attacks, the surviving elks give birth to more and stronger calves. Fewer and stronger elks mean less food for the wolves. The number of wolves decreases.

Then elks can reproduce better, so there will be more food for the wolves, who will also reproduce, leading in turn to fewer elks. This is a balancing feedback loop, an equilibrium. Keep in mind that this relationship is part of a larger system, and the life of each species is influenced by the development of grasslands and forests, as well as hunters, diseases and many other factors.

- The other basic type is the **reinforcing** (feedback) loop, where positive feedback causes a steady increase or decrease and ultimately usually a collapse. One example of such a dangerous process is addiction, because it typically works like reinforcing feedback.

Peter is anxious

Peter is a procrastinator. He delays leaving home and getting to meetings on time, and he also puts off his deadlines. If someone calls him about an unpleasant matter, he doesn't answer the phone. Hence his problems are not solved, they multiply. This makes him more anxious, so he is more likely to run away from his problems.

Drought

In nature, drought can be an example of a reinforcing effect. In drying areas, plants that could bind water and evaporate it back into the air die out.

Nothing new under the sun: the archetypes

Systems have patterns of behaviour that repeat themselves over and over again. In systems theory they are called *archetypes*.

Such archetypes include:

Quick gains in the short term, big losses in the long term

- Some people want to make a quick profit and don't see or care that the source of their profit is finite, so they can only get rich at the expense of others. If they don't cooperate with others, everyone loses out in the long run.

Seeking a pseudo-solution instead of the real causes

- It is a similar behavioural archetype when someone passes the buck, puts off dealing with the problem, or rushes into the wrong solution by treating the symptoms. For example, it's no use finding a solution for humanity to escape from Earth to Mars: if we do not change our production and consumption habits, Mars will be "devoured" in the same way, and at most we just buy some time.

IMAGINE!

Why are we short-sighted?

Humans themselves function as a system, but they are also part of a larger system. However, they can only see a small piece of the big system, and often find it difficult to understand the overarching, long-term processes that characterise the complex system and affect their life.

They look for simple explanations for their limited experience, and listen to "kitchen scientists" or those who take advantage of people's credulity. This gives rise to misconceptions which often endanger the individual and their immediate and wider environment.

"He can't see beyond the end of his nose", we say when someone draws far-reaching conclusions from what they can perceive directly.

– Where is the warming here? Give me a break – he snarls on a cooler summer day.

– Pandemic? Give me a break. John only had a cold for three days.

As a systems thinker, it becomes obvious that to function in the world we all look for certainty, for simple explanations. The only way to protect ourselves against misinformation is to seek information from experts, from credible sources, and encourage others to do the same. Of course, science has its limits too, and the results of all interventions often cannot yet be seen. We must always do our best to prevent damage and take account of the potential risks – on both a "large" and "small" scale.

NOW IT'S YOUR TURN.

Talk about it. Give examples of situations where you made a quick, but wrong decision. What was the consequence of the wrong decision? What would have been the right decision?

SYSTEM DYNAMICS, BEHAVIOUR OF SYSTEMS

System dynamics is the science of systems thinking. It deals with the behaviour of systems examining things, processes and elements as they change over time and relate to each other.

When do we talk about a systemic approach?
When we examine at the same time

- the whole and the details,
- the behaviour of the system elements over time, including
- recurring features, events and their consequences,
- relationships between the elements and their impact on the whole system.

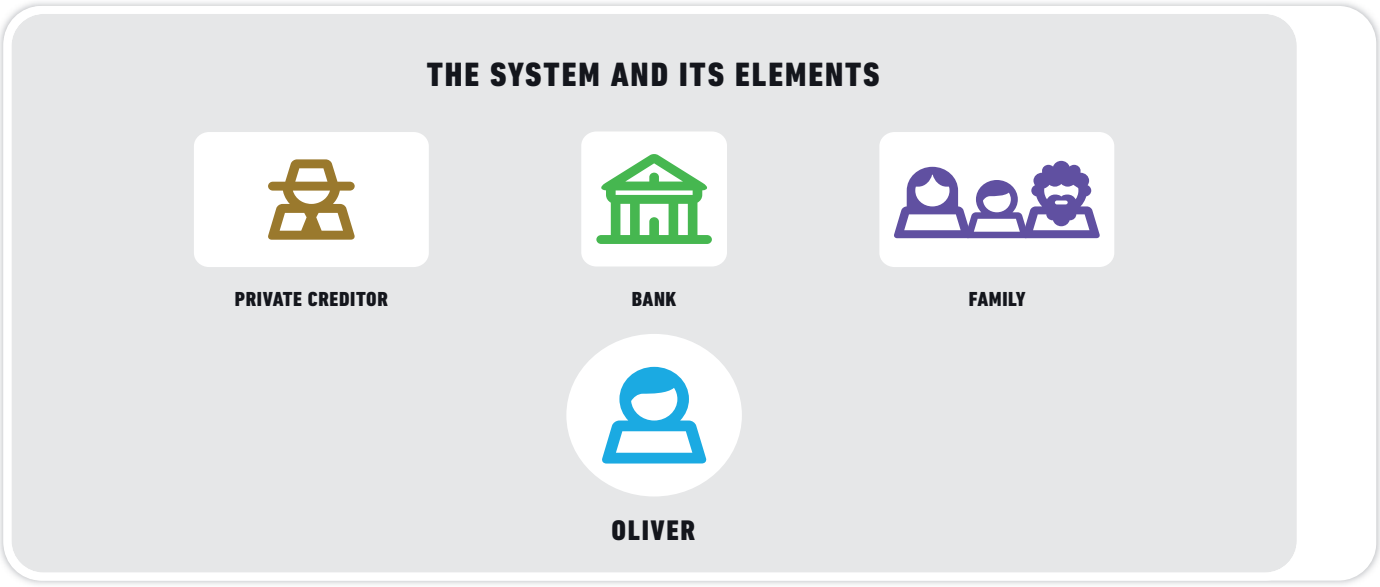
Let's discuss the following case as a systems thinker.

Oliver's challenge...

Oliver buys a motorbike, but it is beyond his means so he takes out a loan. In the meantime he loses his job, and can't pay the instalments. To avoid the bank recording a mortgage on his house, he gets a loan from a friend at a very high interest rate, which he quickly uses to repay the outstanding loan. But in the meantime, he accumulates a debt to his friend, and the high interest means he will have to pay back many times the original amount. He finds himself in a spiral of debt, and can only get out of it with great difficulty and external help. If we look at Oliver's life, we can see that this is not the first time this has happened to him.

Oliver is a system

These are the creditors and Oliver's family.



The Oliver system is one element of a larger system. Who is affected by Oliver's behaviour, i.e. who is part of the larger system?

Let's ask some questions.

1. What is the perceived problem?
   • Oliver is in debt.
2. Has anything similar happened in Oliver's life before?
   • Yes, several times.
3. What is the actual problem?
   • Errors in situation assessment, lack of risk management.
4. How was the problem solved before?
   • Someone took pity on him and helped him out.
5. If this were the real solution to the problem, would it happen again?
   • No.
6. What would an effective long-term solution be to the actual problem?
   • Help Oliver to change his behavioural patterns.

A systems thinker analyses not only the current disturbance, but also the cause of it. In this case, managing the problem is not always about helping Oliver, but about finding out why he is unable to anticipate risks and work out a plan to deal with such risks (such as unemployment), etc., and then try to support him in this.

What makes a system open or closed?
If you fill a jar with hot jam and close it, the jam (as a mass) cannot come out of the jar, only the heat escapes. This is called a closed system.

- In a **closed system**, there is no free mass flow between the system and its environment, but energy transfer is possible.
- In an **open system**, there is a free flow of mass and energy between the system and its environment.

Let's look at the small and the big picture.

What is the point of Aunt Olivia and Tom – who go about their simple daily lives – *"looking beyond the end of their noses"*?

Tom is suffering

Tom has a bad back. Aunt Olivia, who lives next door, advises Tom that it must have been a bad movement, so he shouldn't go to the doctor because doctors are all stupid. Then she gives him a drug advertised on the internet by a man calling himself an "aura surgeon". She convinces Tom that lots of people reviewed the product, and they all talked about miraculous healings. But Tom gets worse. In the end, it turned out it was not a musculoskeletal problem but an inflammation of the renal pelvis that caused the problem.

What happened? There was a lack of systems thinking.

1. A problem arose.
2. Instead of finding the root of the problem, they tried a quick, symptomatic treatment.
3. They did not take the knowledge of professionals into account.
4. Instead of expert support, they accepted suggestions from non-experts. (They were given explanations that were easier to understand.)
5. This led to a worsening of the problem.

CONSPIRACY THEORIES, BELIEFS AND MISCONCEPTIONS

Believe it or not, we can make very strange decisions if we don't take into account how systems work. Below we look at the consequences of a lack of systems thinking.

Preferably the lizardman

The coronavirus pandemic was already raging, health services around the world were fighting a life or death battle, tens of thousands of people were dying every day, but the only thing that convinced the doubters was if they or their loved ones were affected by this serious illness. And as usual, purveyors appeared who took advantage of people's anxiety, their lack of education and their credulity, and so did the manufacturers of "health care" products, creators of conspiracy theories, the beneficiaries of tragedies who kept telling us it was all a hoax – before coming up with their self-made panaceas.

IMAGINE!

IMAGINE!

Dialogue on the tram

– Vaccination? – Haha. They won't put a chip in me.
– Do you know what a chip is?
– It's the same thing that dogs have. When they're found, you just check it and know where the owner is.
– And why would they want to know where you are?
– To control me, to find out everything about me.
– Who?
– The rulers of the world.
– Who are they?
– Those with money.
– And what would they want from you?
– I don't know.
– And don't you think that anyone who does want to know would not already be able to find out where you are, who you are, what your interests are, what you do, and who your friends are?
– No.
– Really? And your phone? You checked in yesterday from Lake Balaton. And social media? I see you broke up with Emily because she put a picture of her new boyfriend on her Instagram. Oh, and your job's not the same? And why do you keep getting sailing ads nowadays, why aren't you receiving women's lingerie offers? Oh, you were browsing a sailing shop online? How do they know? You haven't been vaccinated!

It's not really a surprise. How much easier is it to say that evil releases pandemics and climate catastrophes on the world than to understand their natural, social, economic and sustainability reasons and the interconnections between them? Many people take the easy way out, and find security in less complicated solutions.

This is why we tend to believe a speaker with powers of persuasion rather than a scientist offering evidence.

After all, the lizardman is easier to imagine than deoxyribonucleic acid. Isn't that right?

SOME MISCONCEPTIONS ABOUT CLIMATE CHANGE

Misconception: Changes are caused by sunspots

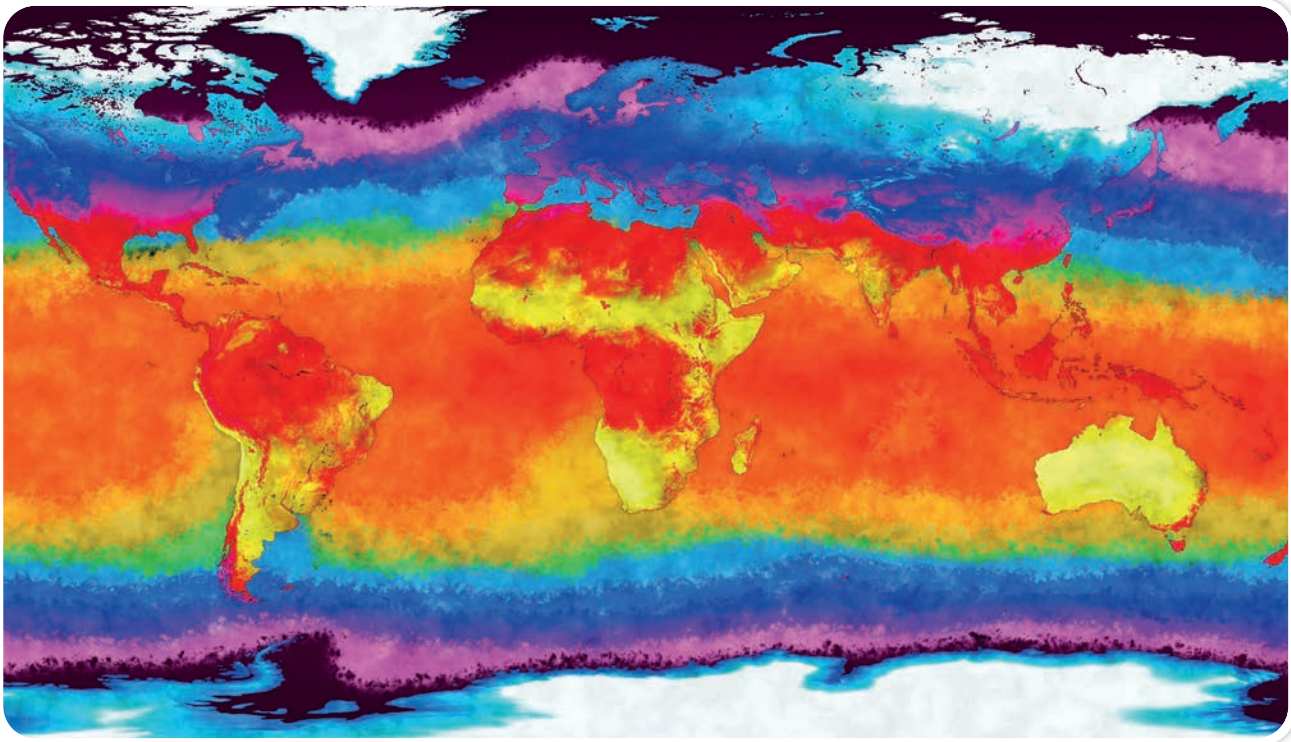
Sunspots are dark, cooler spots on the sun's surface that vary in number over time and can even affect the Earth's weather. Nevertheless, continuous measurements show that the power of the sun does not affect climate processes, so this can be ruled out as a cause. The same is true of cosmic radiation. Lay people think that radiation reduces cloud formation. But if there are fewer clouds, the Earth will be warmer. Measurements prove that for our planet as a whole, there is no strong relationship between cosmic radiation and cloud cover.

Misconception: Carbon dioxide is only a small part of the atmosphere, it cannot exert a large influence

American researcher Eunice Newton Foote performed experiments in the 19th century to demonstrate that a cylinder exposed to sunlight and filled with carbon dioxide absorbed more heat than one filled only with air. This was later confirmed by several scientific studies. This confirmed the greenhouse effect of carbon dioxide.

Misconception: Scientists manipulate data

Use your common sense. How would this work globally? It would take thousands of scientists from more than a hundred countries acting as some kind of secret cult. Nobody really takes that seriously, do they? What would be the purpose of it anyway? The truth is that data is constantly measured and recorded, and thanks to the latest technologies we obtain more, and more accurate, data.



Misconception: Climate models are unreliable

The model, simply put, is a "scale model" of some object or phenomenon. It maps reality to predict how certain phenomena will occur and what they contain. There are many different approaches to reality, and the modelling depends on which one you are looking at. Different data and different contexts are interesting from different perspectives.

Thanks to advances in digital technology, data is comparable and comes faster and from more and more sources, while models are constantly evolving and "improving", so the results are increasingly accurate. Today, more than 20 international centres produce climate models that can predict changes in the Earth's climate, from cloud formation to atmospheric circulation. These are compared with available data collected throughout history to give a fairly accurate picture of climate change. Unfortunately, all of the models predict significant warming if the amount of carbon dioxide in the atmosphere continues to increase. They forecast that the Earth's average surface temperature will rise by 1.4-5.8°C between 2000 and 2100, and the rate of temperature increase is expected to be well above that observed in the 20th century. So the extreme weather events and precipitation patterns that we are all experiencing will occur much more quickly than in the past.

The rapid change in forecasts is not the result of inaccurate models, but of increasingly fast changes in phenomena on Earth. And how good is it to be able to alert people to an unexpected storm within 1-2 hours, because – being prepared – risks can be significantly reduced.
Of course, it's not only the instruments that show changes, but also the various plant species and communities that indicate the changing climate. The effects of changing climatic conditions can be seen in the composition of vegetation cover, shifts in vegetation belts, the migration or decline of certain species, and faster or slower plant growth.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Discuss!
What impact will climate change have on local biodiversity? How will the composition of vegetation change?

So what is a misconception?

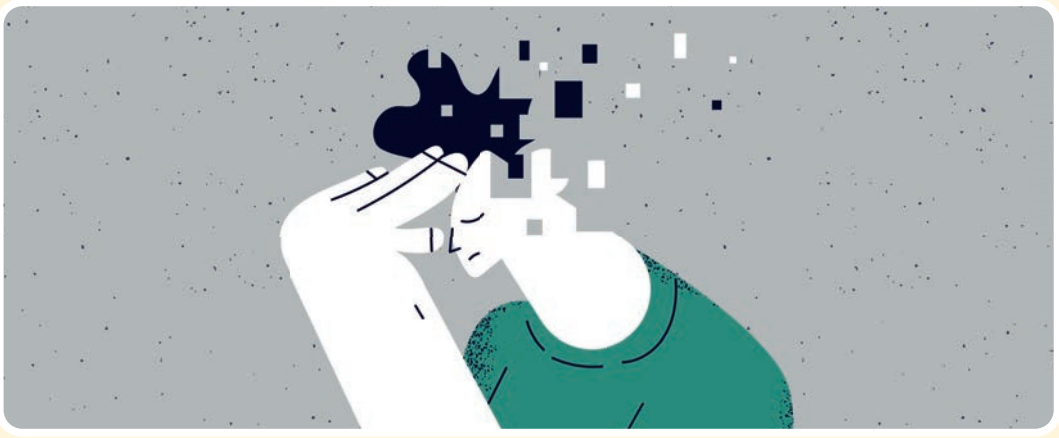
A misconception is a belief that has no scientific basis. Its subject has not been proven, there is no data to support its existence, and according to current scientific knowledge, the opposite has been proven. Therefore, misconceptions are actually mistakes that arise from our everyday thinking.

For example:
- overgeneralisation,
- selective memory, or
- inaccurate observation.

IMAGINE!

IMAGINE!

Limited memory
- Harry and his family celebrate together at Christmas every year. The last time they argued about where the cellar door was in their old house. Finally, someone managed to find a photo that settled the dispute. It turned out that no one remembered it well.
- Jessica was attacked in the street. There were several witnesses to the incident. One of them said the attacker was a man about 180 cm tall with black hair wearing a green sweater and trainers. Another described him as a shorter man, and stated firmly that he had brown leather shoes, while the third witness spoke of a dark-haired man and a blue sweater. Eventually, street cameras helped catch the attacker, and it turned out that each witness was right about something.
- Or let's look at an example of over-generalisation. If someone gets through an illness with relatively mild symptoms, it doesn't mean that everyone will experience it the same way, because we all have different immune systems, backgrounds, circumstances, etc.



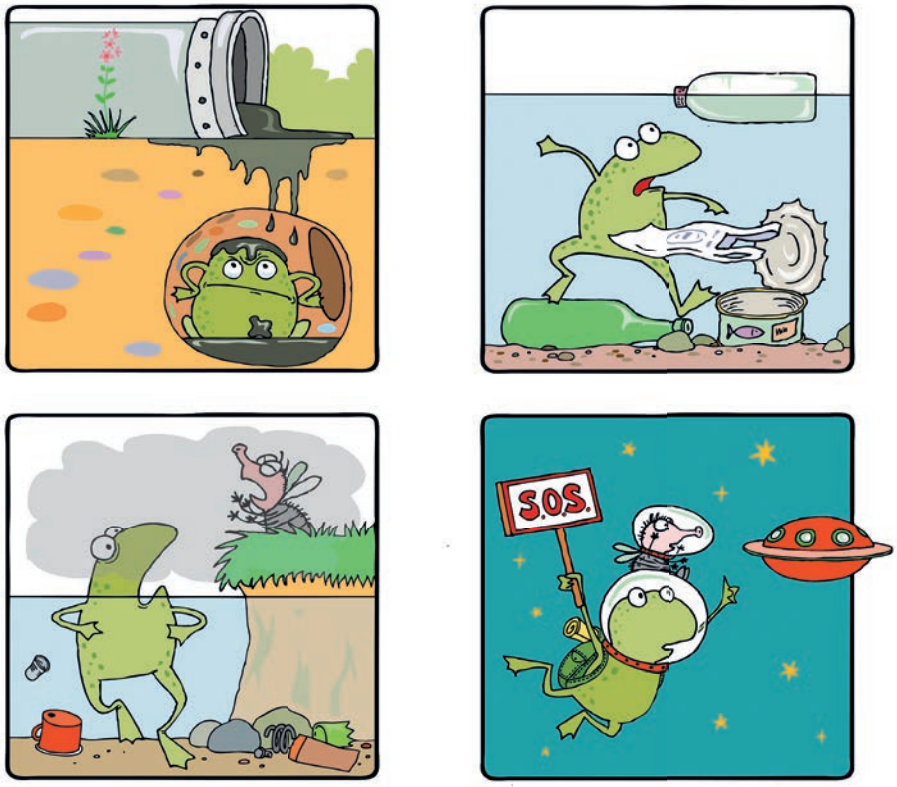
NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

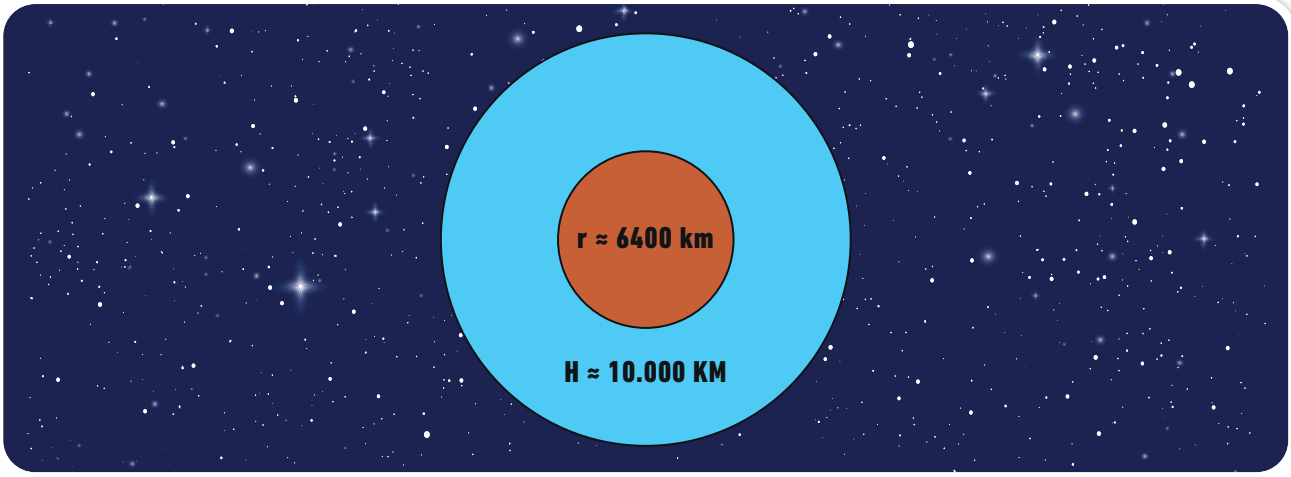
See how observant you are.
- Try to recall and draw a place (your street, a staircase, a route) where you find yourself every day. The drawing should include all the details you remember. For example: what pictures or graffiti are on the wall, where the light switch is, etc.
- Compare your map with reality. See what you missed or where you were wrong.
- It's good fun to have a competition to see who can remember what and who can recall and draw a map of the same location more accurately. Compare the results.

THE GREAT EARTH LABORATORY AS A SYSTEM

WHERE DOES THE EARTH END?



What do you think?
As mentioned before, every system has a well-defined boundary. But where is the Earth's boundary? Where does the Earth end and space begin?
The atmosphere is the Earth's outermost envelope, which is nothing but a mixture of various gases, liquid and solid particles that surround our planet. The Earth's boundary is determined by the part of the atmosphere that moves with the Earth due to gravity. It extends about 10,000 km from the Earth's surface.



Size of the atmosphere

THE EARTH AS A CLOSED SYSTEM

If we look at the Earth as a planet, and see how it relates to the world beyond the Earth, we can consider our planet a closed system. This means that it exchanges energy with its surroundings, as short-wave radiation from the sun reaches the Earth's atmosphere, and some of it even reaches the Earth's surface, then it is converted and emitted into space as long-wave radiation. However, there is essentially no exchange of matter, apart from a negligible amount of meteor showers and cosmic dust entering the atmosphere, as well as gas emissions, space instruments and space debris. However, there are already plans to start asteroid mining.

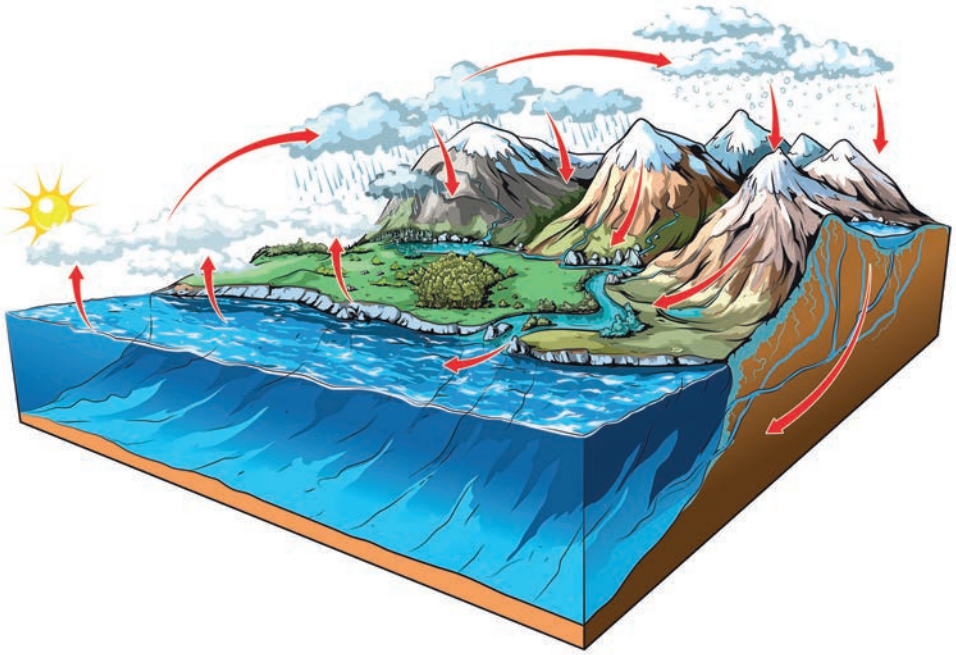
NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Who can name the most closed systems in their environment in 5 minutes? Remember to recall the features of closed systems.

EARTH SPHERES AS OPEN SYSTEMS

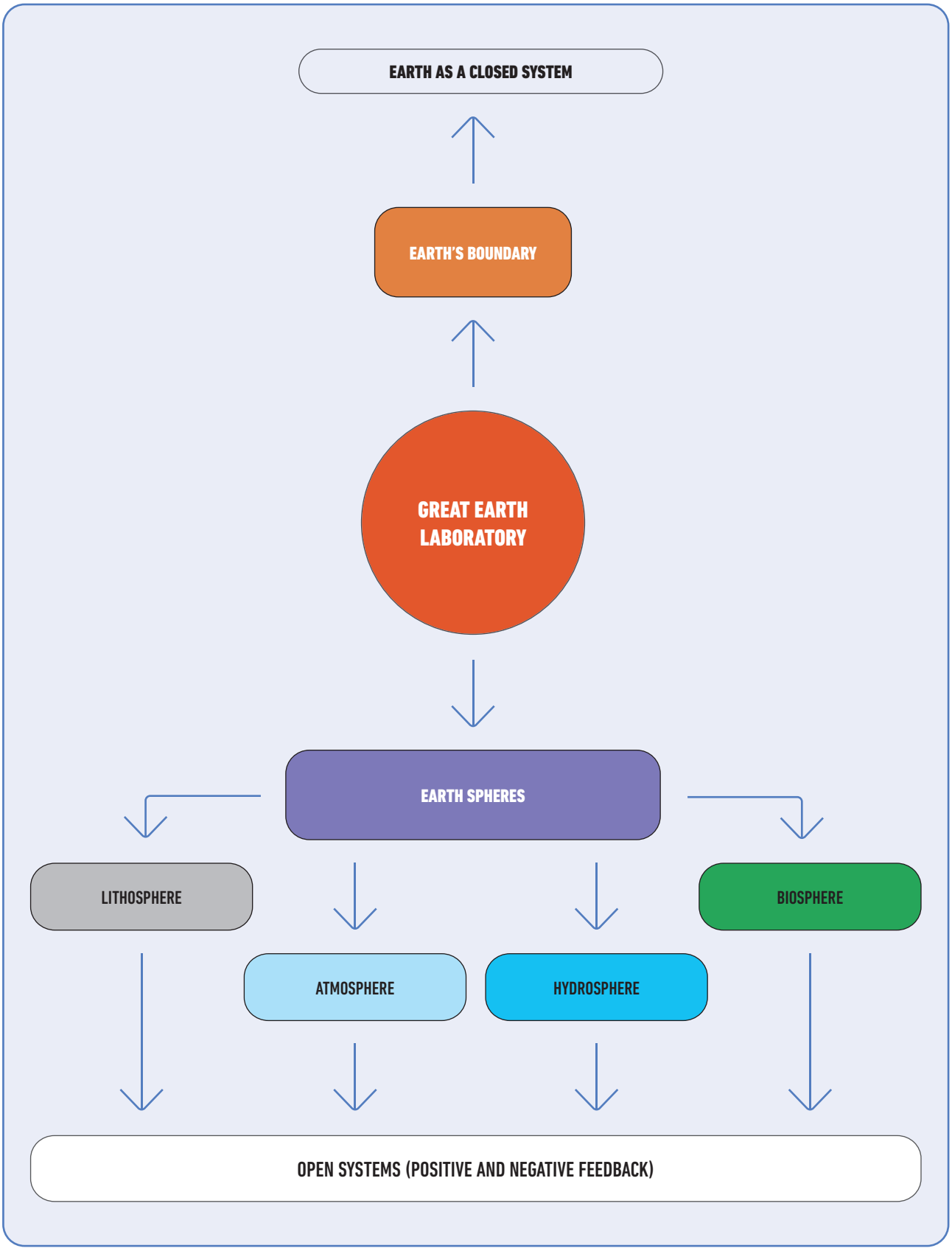
The Earth is generally thought of as a planet, but some parts of it can be divided into different envelopes according to certain properties. These are known as spheres, and can be described as the lithosphere, the rocky shell composed mainly of solid rocks, the atmosphere, which consists primarily of gases, the hydrosphere, which is made up of water, mainly in liquid form, and the biosphere, which is the zone of life on Earth integrating all living things.



Earth's spheres

The spheres can be considered open systems, as each sphere can exchange matter and energy with all other spheres through complex biogeochemical processes. These are dynamic processes, meaning that changes in one sphere affect the others, potentially triggering chain reactions that have a global impact. So one of the main challenges for Earth system scientists is to study these processes. Examining them can help predict the likely consequences of changes in any part of the system.

OVERVIEW


EARTH AS A CLOSED SYSTEM
EARTH'S BOUNDARY
GREAT EARTH LABORATORY
EARTH SPHERES
LITHOSPHERE
ATMOSPHERE
HYDROSPHERE
BIOSPHERE
OPEN SYSTEMS (POSITIVE AND NEGATIVE FEEDBACK)

OMNIPOTENT SYSTEMS OF NATURE

THE GREAT EARTH CYCLES

All processes on Earth are based on energy. The cycles that arise from the exchange of matter and energy are called Earth cycles.

The changes that occur in these cycles require energy. This can come from three sources at the Earth's level:

1. the Earth's *internal heat*, which basically drives the internal forces (plate movements, volcanism, mountain formation, earthquakes, and partly biogeochemical cycles);
2. another energy source is *solar radiation*, which drives the water cycle on our planet and part of the biogeochemical cycles through photosynthesis, and
3. fusion energy, which is leaving an ever greater mark on the planet.

These cycles have ensured the stability of the great Earth systems as well as life on Earth over the course of its history, and they continue to do so today.

The main cycles are:

1. energy cycle,
2. hydrological cycle,
3. biochemical cycles and
4. rock cycle.

Output, input, feedback

It is important to know that these cycles do not operate separately – they have a number of interconnections that take on the form of energy or material inflows (*"input"*) or outflows (*"output"*).

When two systems interact, and the *"output"*of one system serves as an *"input"* for the other, prompting it to respond in a way that again affects the original system, we talk about *"feedback"*, or as we termed it earlier, causal loops.

IMAGINE!

IMAGINE!

Why did you do that? You're asking me?

While there is no material flow, the reinforcing effect can be observed in everyday situations. Hansel and Gretel fight all the time. The quarrels follow a similar script.

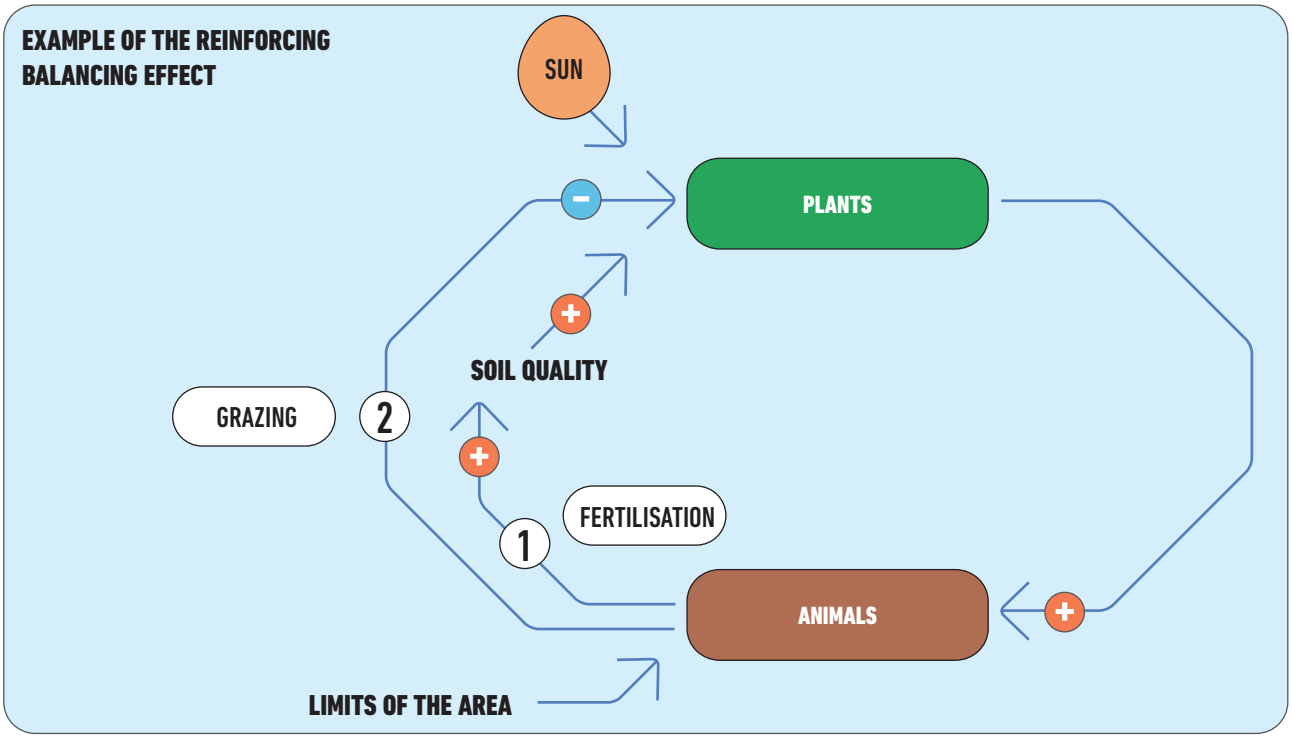
- **Hansel (his output is input for Gretel): Why did you put (the glass, plate, knife, fork, scissors, bottle, etc.) here? So someone could knock it over?**
- **Gretel (received input, responds, here comes her output): You're asking me? I just tripped over your pants that you throw on the floor! And I didn't say anything.**
- **Hansel (receives Gretel's output, which is input for him): I didn't throw them, they fell down.**

And so on...

What is the stabilising effect?

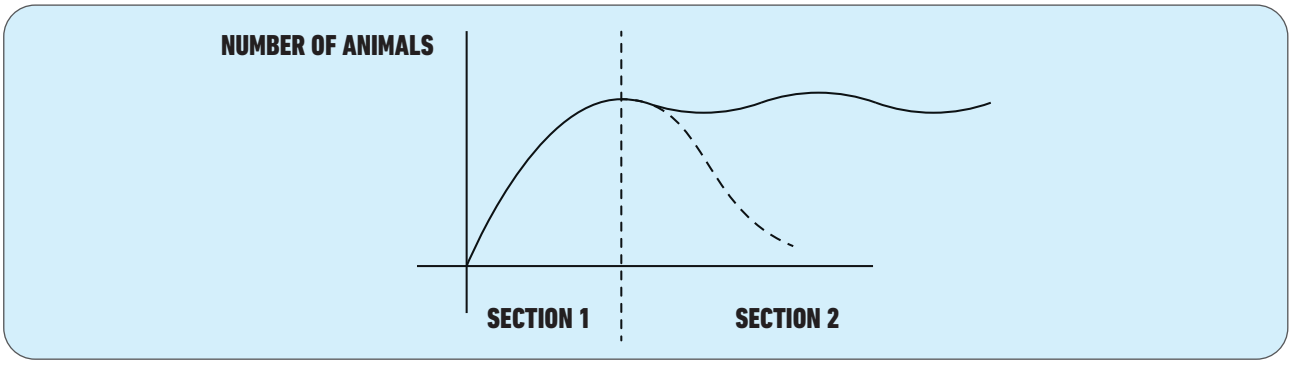
Imagine a meadow with nothing but grazing animals and the plants that feed them.
Fertilisation has a positive impact on soil quality. If there are more animals, there will be more manure, which makes the soil better; and vice versa, fewer animals means less manure and poorer soil. There is also a positive correlation between soil and vegetation. Richer soil results in more, and lusher, vegetation, while soil with less nutrients makes vegetation less plentiful. There is a similarly positive connection between plants and animals because more abundant and thicker vegetation means more animals can graze. So the first, reinforcing inner circle works.

For the system of animals and plants, the input is solar energy and soil. Manure is input for the soil and output of the animals. Plants are the output of the soil, and input for the animals, as they are food for them.



For a given area, both vegetation and livestock can increase continuously (stage 1) until the limits of the area's carrying capacity are reached. Thereafter, the system (provided it doesn't collapse – dashed line) becomes self-regulating, i.e. the balancing, stabilising effect applies (stage 2). The presence of too many animals leads to the overgrazing of plants, less food means fewer animals, and fewer animals graze less, so the vegetation can regenerate.

The behaviour of the system over time is illustrated in the figure below.



What do you think?

Staying with the everyday example of Hansel and Gretel: which of them gives positive and which of them gives negative feedback? Remember that "positive" and "negative" in systemic terms are not synonyms for good and bad, but for change in the same or opposite direction. Do they stir up trouble or does someone calm things down? Natural systems do not break down if the positive, continuously reinforcing effects are balanced by negative feedback, so the system can move towards its equilibrium state. We will look at some examples of this below. When would Hansel and Gretel's system break down (divorce)? What would it take for this not to happen? Write a dialogue that could point towards the survival of the system. Human and emotional relationships, however, work in their own way. It might not be enough to resolve a spousal quarrel or a family conflict by sending a "love message" to get out of the argument spiral. However, the causes of problems in relationships – be they related to school class, couples or even a community –, the underlying fears, grievances and behavioural patterns can also be revealed through systems thinking. And once identified, solutions should be sought together.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

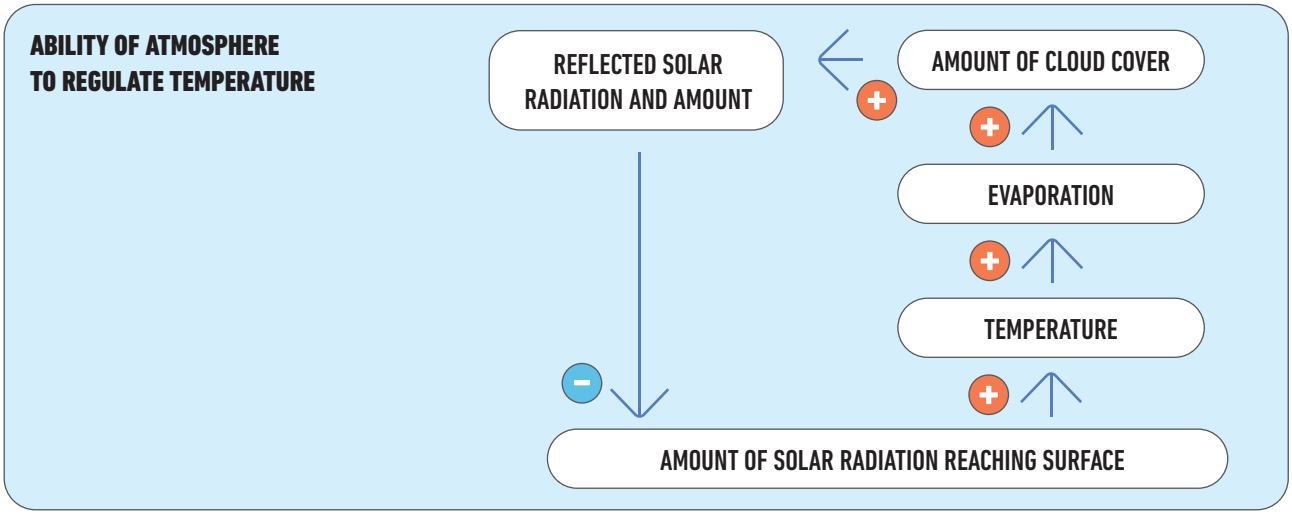
Research!

Find concrete examples of negative feedback. What role do they play in managing global environmental issues? Your previous studies in biology and ecology can help you a lot.

An example of negative feedback

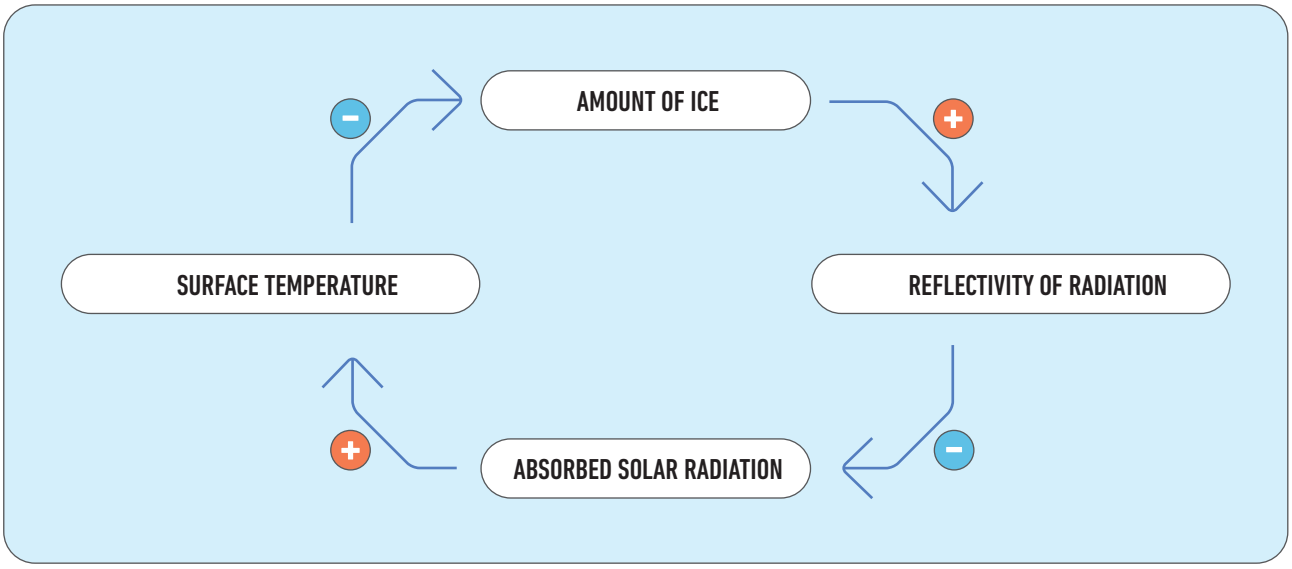
A very good example of a balancing *causal loop* or negative feedback as it is called in many fields, is the temperature-regulating ability of the atmosphere. The warming of the atmosphere increases evaporation and triggers cloud formation. With cloud cover increasing, more of the sun's rays are reflected back into space than before, meaning that the Earth's surface loses radiation and the atmosphere cools.

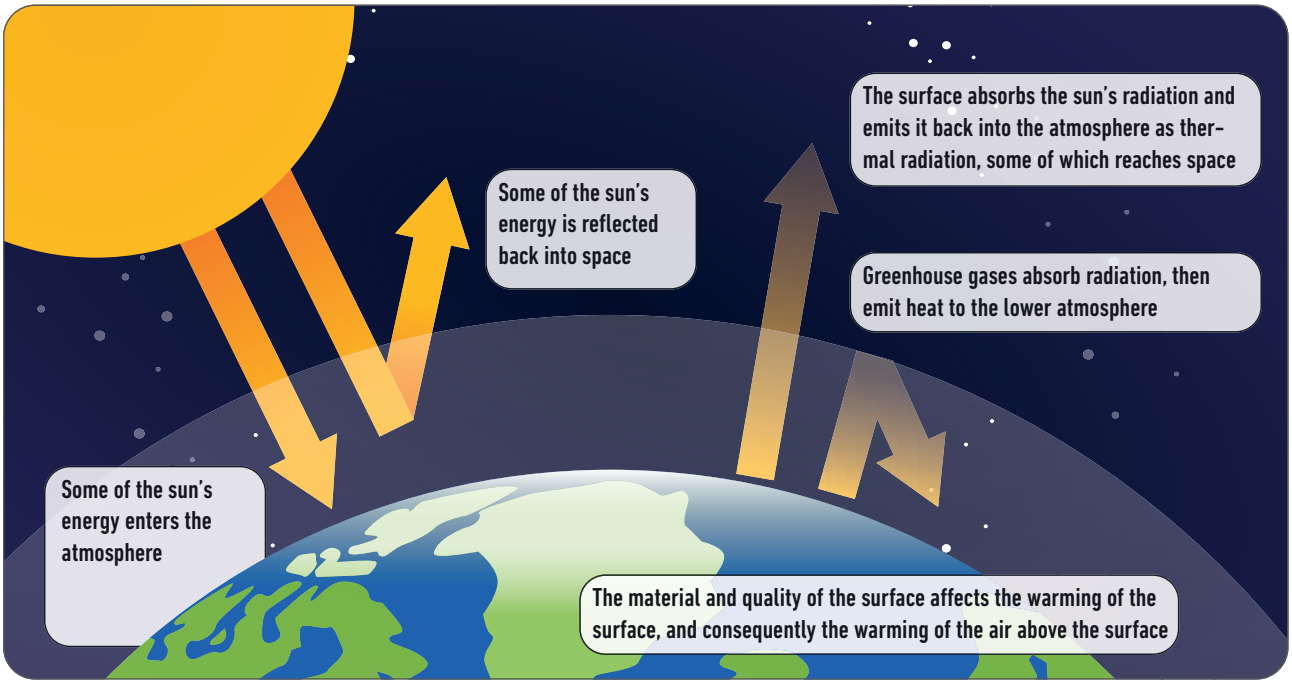
The lower temperatures prompt a decline in evaporation, which leads to fewer clouds and an increase in solar radiation reaching the surface, so the temperature decrease stops over time and even starts to rise again. As a result of the opposite changes in the reflected solar radiation reaching the Earth's surface, the temperature of the atmosphere remains within certain limits, i.e. a balancing causal loop is created. The problem comes if humans intervene in this system that has worked well for millions of years, and accelerate the process in one or other direction. This happens when the burning of fossil fuels releases large amounts of carbon dioxide into the atmosphere. It may not be possible for the Earth's system to regulate such a substantial change, which is why we talk about global climate change.



If the links in the examined system intensify the effect of the original outcome, there is a positive feedback, a reinforcing causal loop. Let's take a climate-related example. We can talk about a positive feedback loop in relation to the melting of Arctic Ocean ice, which has a worldwide impact.

The warming linked to global climate change causes the Arctic Ocean to be ice-free for longer and longer periods of the year. However, the surface of the open water replacing the ice has reduced reflectivity (*albedo*) compared to ice, which causes the surface to absorb more solar radiation, leading to further warming and consequently further melting. Here you can see that in a causal loop, two links moving in opposite directions act as if there were only positive links between them, that is, they intensify the phenomenon. From an environmental perspective, it is therefore extremely dangerous if positive (reinforcing) feedback loops prevail, because they amplify the adverse environmental effects in the system, which can ultimately lead to the total destruction of the system. This is why it is always important to examine these models in a more complex system, to see what other effects influence – in this case – melting, and how the amplifying effect can be mitigated.





Melting ice in the Arctic Ocean intensifies the warming of the atmosphere

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

CHALLENGE!

1. Working in groups of 2–3, draw a diagram of the most important biogeochemical cycles (water cycle, oxygen cycle, carbon cycle, nitrogen cycle, phosphorus cycle, sulphur cycle).
2. Mark positive feedback in red, and negative feedback in blue.
3. At the end of the exercise, find the links between the cycles.
4. Discuss the extent to which human activity changes the natural functioning of each cycle.

Unfortunately, it is these very reinforcing feedback loops that humans contribute to through their various socio-economic activities. The effects are already being felt in all of the Earth's spheres. Global climate change, air pollution, and the degradation or disappearance of wetlands are all signs that we have brought about huge changes to our planet in a very short time. It is time to learn to mitigate these impacts.

SYSTEM AND SUSTAINABILITY

In 1987, the United Nations defined sustainable development in the report 'Our Common Future'. "Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs." This requires a deeper understanding of how the very complex Earth system works, in order to find a way to reverse what has gone wrong. Impacts must be assessed not only from an environmental perspective, but also from economic and social angles. Today, the term sustainable development is increasingly being replaced by the even broader concept of sustainability.

In general, countries and large professional/political associations can do the most to achieve this through legislation, agreements, partnerships and enforcing these, multinational and smaller companies in the economy can have an effect through sustainable green operations and campaigns, while education can rely on knowledge transfer and raising awareness.

You, or him, or us?
We are the miracle workers.

We create the miracle with our lifestyle, knowledge and actions. Not just for ourselves, but for our children and grandchildren. It's an investment worth more than initially meets the eye.

GEOSPHERE SERVICES

As a systems thinker, here we look at
- what the lithosphere, the atmosphere and the hydrosphere give us for our living conditions;
- how these systems are damaged by human intervention, and
- what consequences this damage has on our lives and the lives of future generations;
- what we can do, big and small, to heal the wounds.

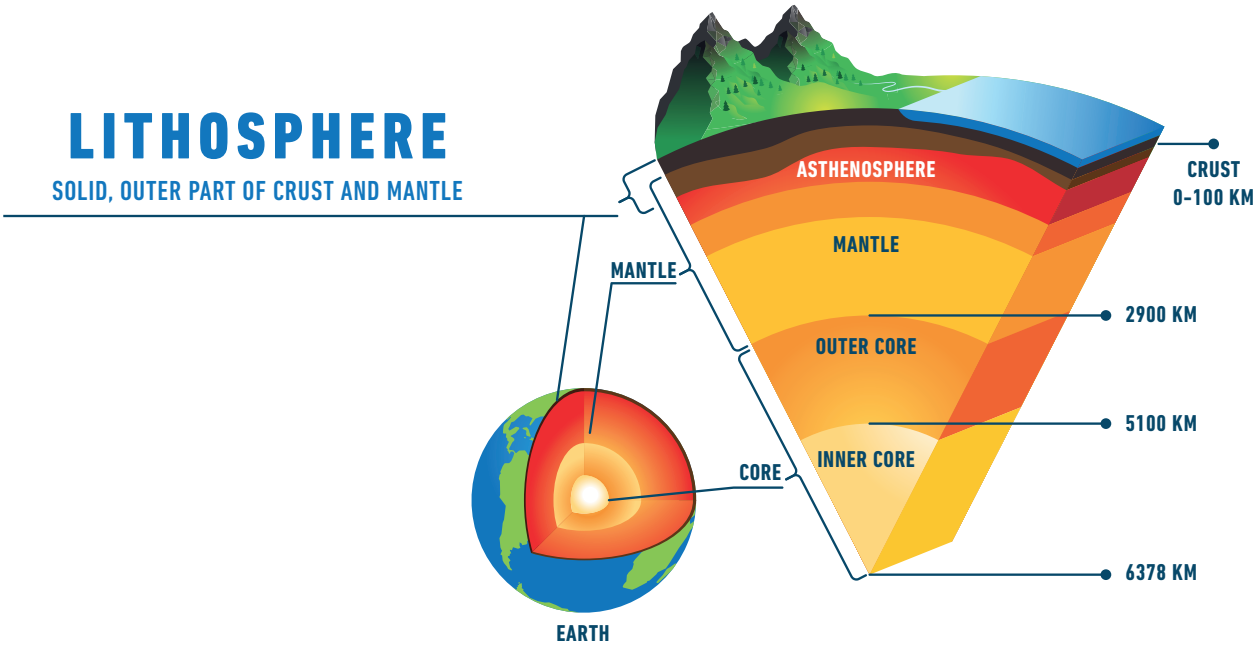
WHAT DOES THE LITHOSPHERE GIVE US?

The lithosphere, like the other spheres of the Earth, is essential to the daily life of our society. The lithosphere provides us with energy sources and other minerals from which the (energy) industry produces energy and resources for all aspects of life. The lithosphere also includes soil, which is essential for food production. And let's not forget the landscape, formed by the internal forces of the lithosphere, which is important for recreation, and physical and mental regeneration through tourism.

HOW THE LITHOSPHERE WORKS

What is the lithosphere?

The lithosphere is the rocky shell of the Earth. It is about 70 to 150 km thick. This is where the processes take place that have shaped the Earth as it is today: volcanism, mountain formation and earthquakes.



FIND OUT!

FIND OUT!

1. Where are the hot spots on our planet linked to volcanism and earthquakes? Why there exactly?
2. On 26 December 2004, the north-west coast of Sumatra, Indonesia, was hit by a devastating tsunami. The tragic event is commemorated every year around the world.
   a) Find out which areas were affected.
   b) What were the consequences of the undersea earthquake in nearby populated areas?
   c) What was the impact on the lives of the people and communities living there?
   d) Write an analysis of how the events of that time affected local economic and social life and the way people thought.

Use credible sources only.

Destruction caused by tsunami

SOIL

The uppermost fertile part of the lithosphere is **soil,** the quality and quantity of which are essential for the survival of humankind.
It also determines:

- natural vegetation cover, and
- the basis for agriculture and forestry.

How is migration related to soil?

The settlement of nomadic and pastoral peoples led to a surge in population numbers and the need for – more, and more secure access to – food. This required clearing the grassy plains, under which the best quality soil on the planet, black soil (chernozem), was formed. This is how arable farming started to spread.

What were the consequences of the expansion of arable farming and livestock farming?

- A lot of valuable area has diminished or disappeared and many species have become endangered or completely extinct on Earth. These species have lost their habitats and feeding grounds, or the food chain has been disrupted. These include, for example, the crane and the Great white pelican, which nest in Hungary.
- In many places where animal husbandry has been banned, insects that provide food for many species of bird, for instance, have disappeared along with the livestock. This led to a decline in the population of sand martins. This is because the lifestyles of many insects are closely linked to livestock farming. Who hasn't seen a cattle herd full of flies? Flies feed on cattle droppings and lay their eggs in them, so their life processes are inseparable from cattle.
- At the same time, crop production and extensive livestock farming has led to an increase in the populations of other species. These include the great bustard, the eastern imperial eagle, the saker falcon and the red-footed falcon. They are the "winners". The large cereal fields provided an excellent food source as well as hiding and breeding places for many rodents. Their presence and proliferation attracted birds of prey close to agricultural land, which kept the number of rodents under control, thus creating a new "agro-ecosystem".

Great bustard

Sand martin

FIND OUT!

FIND OUT!

a) What could 'black soil' refer to?
b) Which species have recently been affected by agricultural encroachment in Hungary?
c) Do you know where the Great Bustard Visitor Centre is in Hungary? What does it "offer" to visitors?

WHAT'S DAMAGING? ENVIRONMENTAL PROBLEMS OF DIFFERENT SOILS

Soil loss – soil degradation

Inappropriate farming methods lead to soil degradation.
Why soil degradation happens:

- erosion due to loss of natural vegetation cover, landslides (e.g. the soil washes into the ocean due to mangrove clearance);
- cultivation of energy crops,
- when all organic substances other than soil are removed from an area and there is no natural regeneration.

Production with large machinery significantly compacts the soil, which has a negative impact on the soil's water and air balance. This requires a loosening of the soil as otherwise crop yields significantly decline.

FIND OUT!

FIND OUT!

1. Why is composting useful in gardens?
2. What are energy crops?
3. Energy crops are not just harmful, they're also very useful. Why?

IMAGINE!

IMAGINE!

When tropical rainforests are cleared, not only do we lose huge amounts of forest cover, but the soil underneath is also destroyed. The primary reason for deforestation in these areas is to acquire arable land.
Consequence:

- The poor soil with very low humus content will be completely depleted in a few years, making it uneconomic to grow crops on it.
- The abundant rainfall every day washes away the soil residue from the cleared slopes, in many cases down to the bedrock.
- The degraded soil is carried by tropical rivers (e.g. Amazon, Congo, Mekong) to the oceans where the large amounts of sediment can even cause the death of corals.
- As more and more forests are cut down and burned to maintain agricultural production, the rainforests, once considered the largest carbon sink, have become carbon emitters.

Rainforest clearance

FIND OUT!

FIND OUT!

Tropical rainforests have a rich flora, which is degraded by constantly high temperatures and rainfall.

a) Why is tropical soil of such poor quality?

b) What prevents humus formation?

IMAGINE!

IMAGINE!

Within the tropical zone, the African Savannah is also at risk of soil degradation. The ideal conditions for crop production are no longer present in the dry savannah, so pastoral farming is the dominant activity. Due to rapid population growth, more and more animals are kept and grazed, leading to overgrazing. Animals feed excessively from one area of land, which makes it impossible for plants to start to grow again, so the soil dries out and dust is blown away by the wind leaving a desert behind. Today this area is called the Sahel (famine) zone.

Desertification of the savannah

FIND OUT!

FIND OUT!

a) Where is the Sahel?

b) What animals graze here?

c) What social structure is typical of these countries?

A phenomenon similar to that in the Sahel can be found in temperate grasslands, such as the North American prairies. This is where the land was cleared centuries ago, and drought-tolerant vegetation was replaced by maize fields. After harvesting the crop, the bare soil was left to dry out and the wind could transport it unhindered. The solution to this problem is to plant hedges, which tend to act as windbreaks, and to stop growing the crop.

Land degradation

Secondary salinisation
In addition to soil degradation and quantitative soil loss, large areas are also affected by soil contamination, leading to land degradation. One example is secondary salinisation. This degradation can be reversible, or irreversible.

Salinisation is the process by which water-soluble salts accumulate in the soil. Naturally formed saline soils and their biota have a very high conservation value. They are protected areas.

Cause of secondary salinisation
Agricultural production was typically preceded by water management, which led to the salinisation of the area. Changes in surface and subsurface water conditions, often inappropriate irrigation and significant droughts led to water-soluble salts in the soil being brought to the surface through evaporation and precipitated.

This created extreme chemical conditions (extremely alkaline pH) that cannot be tolerated by arable crops, so the area became unsuitable for agriculture.

Salinisation

FIND OUT!

FIND OUT!

a) Where can you find large saline areas in Hungary?
b) How do we use these areas?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

If you have the chance, visit a saline area in Hungary. Use litmus paper to measure the pH of the aqueous solution of the saline soil.

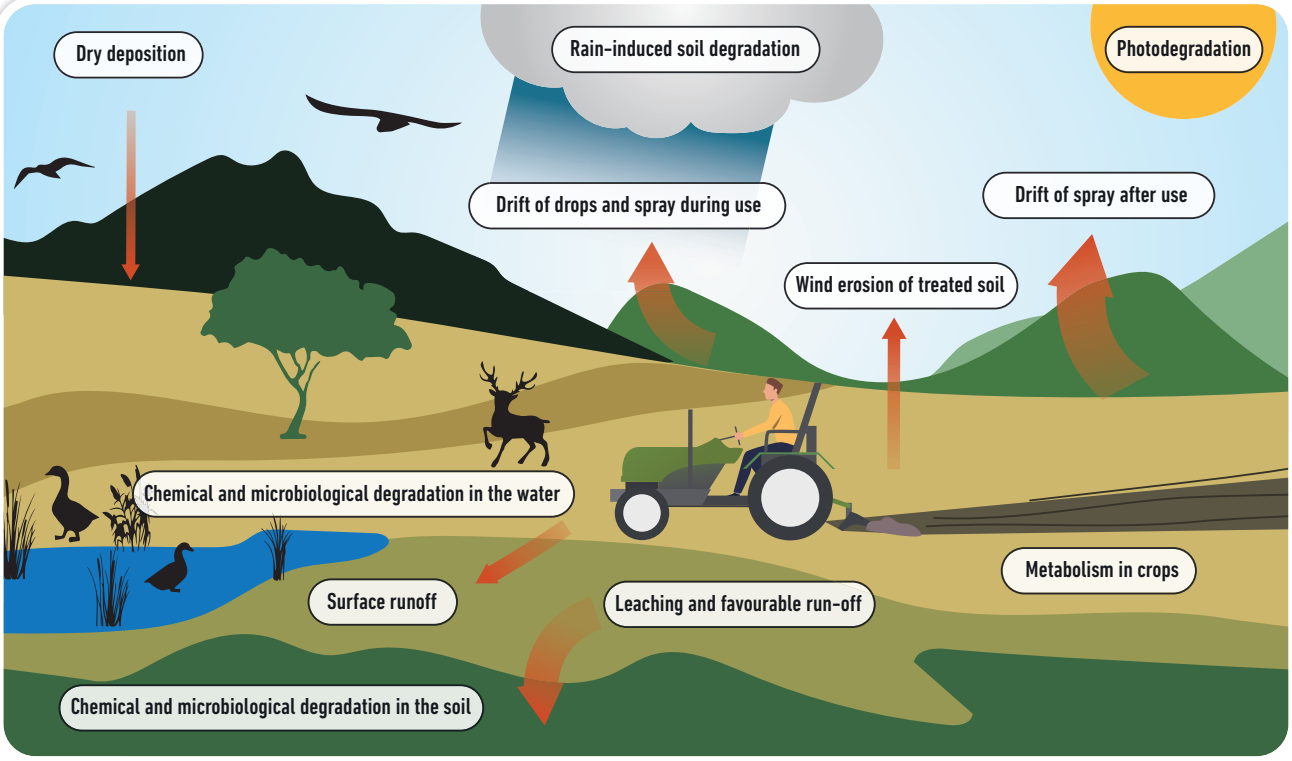
a) Take soil samples in small containers.
- Drizzle 10% hydrochloric acid over the dry soil. What do you observe?
- Drizzle with 30% hydrogen peroxide to determine the organic matter content of the saline soil.

b) Do the kneading test on the soil.

c) Summarise your findings in a table.

d) Discuss your results with your classmates.

e) Don't forget that your work has produced hazardous waste that you must take to a suitable landfill.



How can the misuse of pesticides and fertilisers put pressure on the environment?

Excessive use of chemicals

Overuse of chemicals is also typical of intensive agriculture. In most places, fertiliser is applied to the land, and the excess of chemicals used in inappropriate quantities leaches into the flowing water, causing eutrophication.

IMAGINE!

IMAGINE!

- Eutrophication is the process by which the amount of nutrients (mainly nitrogen and phosphorus) needed by plants increases in the water, so they reproduce much more rapidly than before. As a result, large amounts of organic sediment are deposited on the substrate, which, among other things, reduces the average water depth and in turn accelerates the ageing of flowing waters.
- Excessive use of fertiliser to increase yields can also lead to soil depletion and a reduction in the nutrient content (composition) of soil. For example, the green meadows in the Alps that often seem well-kept and are the envy of many are mown too often, so the soil gradually loses its water retention capacity and becomes cracked and depleted.

The road to hell is paved with good intentions

The insecticide DDT (dichlorodiphenyltrichloroethane) was invented by the Swiss chemist Paul Müller, who won the Nobel Prize for his work. Use of DDT in large quantities began in the 1940s, and became widespread worldwide during World War II. After the war, it was very useful against insects that spread typhus, the plague, malaria and yellow fever. It was then used in crop protection, to kill the potato beetle for example. Besides harmful insects, however, other organisms also fell victim to the insecticide, and it entered the food chain. The damage resulting from use of DDT was already evident as early as the 1950s and 1960s. By this time it had destroyed the biodiversity of large areas, and it was banned in developed countries in 1968. Today it is still found in natural waters, irrigation water and in the human body. Let's look at an everyday example.

All that glistens is not hydrochloric acid.

Hydrochloric acid is an excellent scavenger of contaminants. Yes, but it also makes tiles porous and chrome surfaces mottled with dirt, which starts to rust. Its fumes can cause severe respiratory problems and have further environmental impacts.

What is the lesson to be learned?
A quick and seemingly effective response to a problem is not a real solution without analysing the root of the problem and the risks of the solution.

FIND OUT!

FIND OUT!

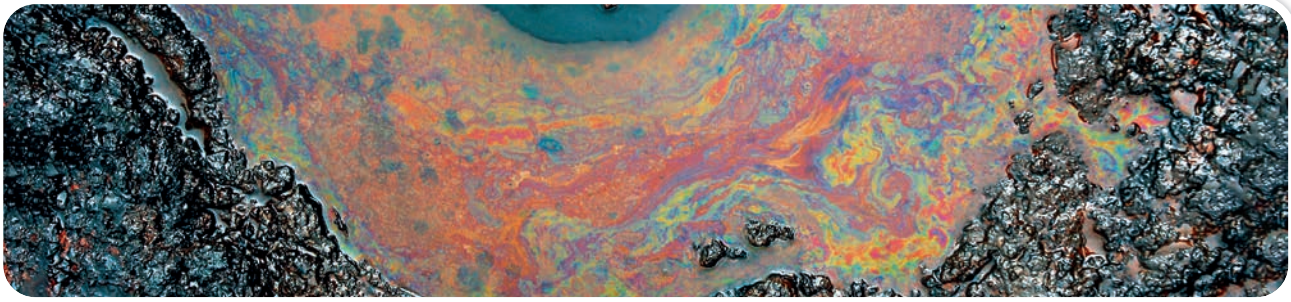
The story is similar for Freon gas. Find out what happened to Freon gas and share it with your classmates.

IMAGINE!

IMAGINE!

The global response to environmentally damaging activities and the launch of the environmental movement is linked to the publication of marine biologist Rachel Carson's book Silent Spring. Carson studied the effects of pesticides, especially DDT, and warned humanity of the dangers of such activity in a book that envisaged an apocalyptic future: "Intoxicated with a sense of his own power, mankind seems to be going farther and farther into more experiments for the destruction of himself and his world."

Disaster
In many cases, soil contamination is not the result of agricultural cultivation, but of disastrous accidents. *A disaster is an accident, damage or emergency caused by a natural catastrophe or other human activity.* They can have very serious effects locally, but quick detection helps to initiate damage control measures quickly. The method depends on the quality of the contaminants. In less severe cases, aeration of the soil or using bacterial strains designed to break down contaminants is sufficient, but in many cases the entire soil has to be replaced.



Soil contaminated by crude oil

FIND OUT!

FIND OUT!

The table below shows the geographical distribution of soil affected by erosion in the counties of Hungary.

a) Which counties are most vulnerable to soil erosion?

b) Compare the results with the topography, hydrography and wind conditions of the county in question.

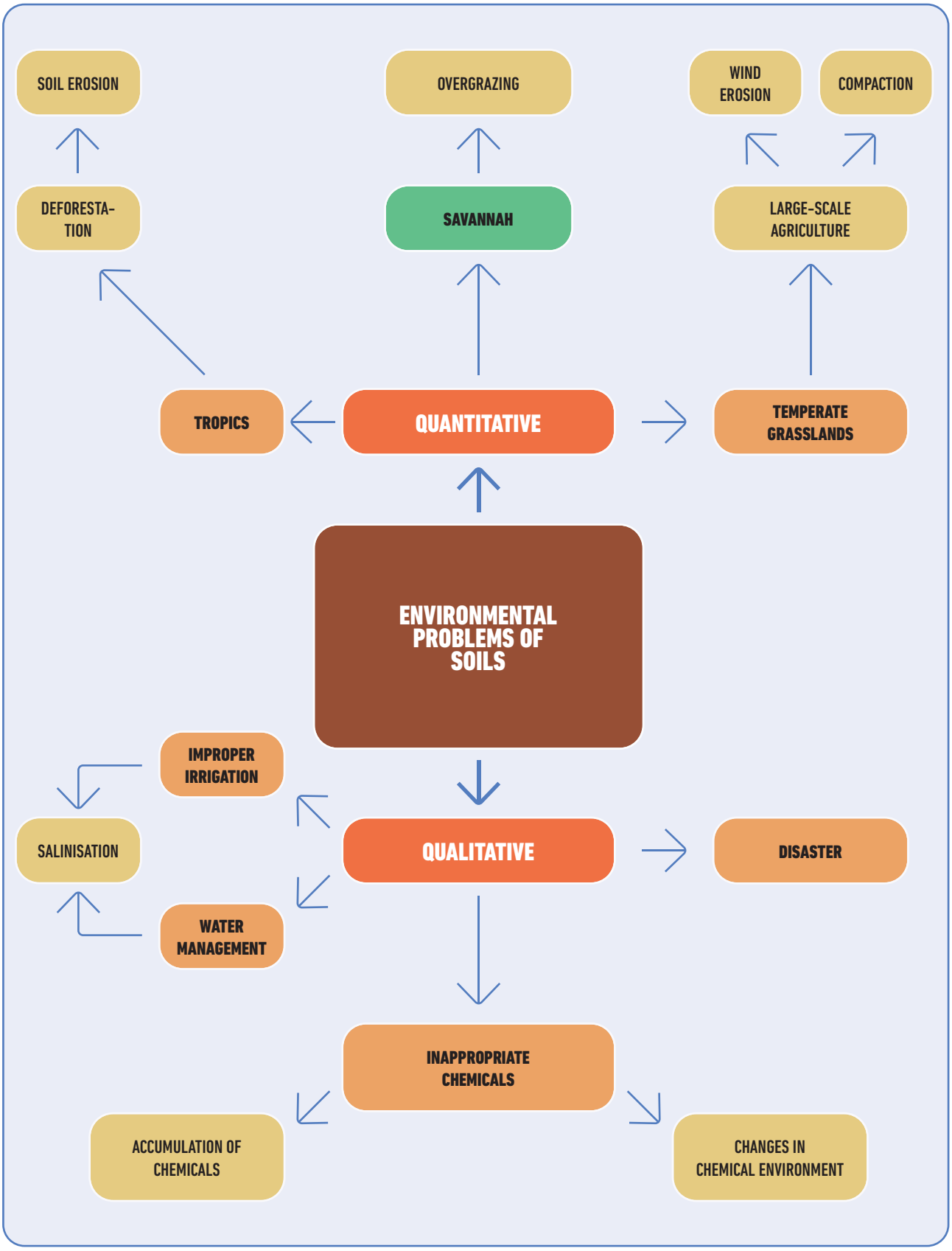
c) Write an analysis of the results and present it to your classmates.

Counties	Severely	Moderately	Slightly	Total
		eroded soil (thousand ha)		
Vas	29	36	45	110
Zala	44	83	47	174
Somogy	37	162	121	320
Baranya	24	67	70	161
Veszprém	144	52	51	247
Győr-Moson-Sopron	12	26	59	97
Komárom-Esztergom	17	65	100	182
Fejér	28	46	130	204
Tolna	40	90	75	205
Nógrád	63	59	25	147
Pest	43	44	52	139
Heves	19	39	29	87
Borsod-Abaúj-Zemplén	54	116	54	224
Total	**554**	**885**	**858**	**2,297**

Source: Stefanovits, 2019

Soil erosion

OVERVIEW


SOIL EROSION
OVERGRAZING
WIND EROSION
COMPACTION
DEFORESTA-TION
SAVANNAH
LARGE-SCALE AGRICULTURE
TROPICS
QUANTITATIVE
TEMPERATE GRASSLANDS
ENVIRONMENTAL PROBLEMS OF SOILS
IMPROPER IRRIGATION
SALINISATION
QUALITATIVE
DISASTER
WATER MANAGEMENT
INAPPROPRIATE CHEMICALS
ACCUMULATION OF CHEMICALS
CHANGES IN CHEMICAL ENVIRONMENT

Many human interventions that damage the environment – such as deforestation, overgrazing, inappropriate irrigation or excessive use of chemicals – can be prevented or the damage can be mitigated through appropriate regulation, well-planned risk management and expertise.

We can do many things, big and small

For example, we can improve the soil not only in large agricultural areas, but also in small gardens.
Soil improvement is an intervention to improve soil fertility.

- Mechanical soil improvement

Soil problems can be eliminated mechanically, for example by deep soil turning and subsoiling.

- Chemical soil improvement

Eliminating soil problems by chemical methods such as liming.

- Biological soil improvement

Eliminating soil problems by means of cultivated crops, e.g. crop rotation or green manuring.

All soil improvement methods have an impact on other soil properties too. For example, physical soil improvement has both chemical and biological consequences. Chemical soil improvement also affects the physical properties of the soil, while biological soil improvement has an impact on both aspects.

IMAGINE!

IMAGINE!

Persistent droughts, food shortages, conflicts over dwindling natural resources and mass migration to Europe are just some of the consequences of climate change and land degradation.
The Great Green Wall is an initiative launched in the Sahel region in 2007, which aims to

- **convert 100 million hectares of degraded land into productive land,**
- **sequester 250 million tonnes of carbon dioxide, and**
- **create 10 million jobs by 2030, through a continuous "living wall" of 8,000 kilometres, thus putting an end to mass emigration.**

This example shows that if there is a will, resources and expertise, interdisciplinary cooperation can be achieved. Even in challenging places like the Sahel, we can overcome difficulties and build a better world for future generations.

Women working in agriculture in Kenya

IN DEEP: TREASURES OF THE LITHOSPHERE

Caves

Caves are naturally formed cavities in the lithosphere that are at least 2 metres long and passable by humans. In Hungary, all caves (including newly discovered ones) are protected by law. Caves are most often discovered during construction work. Remains and artifacts found in the caves as well as natural phenomena observed have facilitated a number of scientific discoveries describing the environmental conditions, the way of life and the eating habits of people at the time, etc.

IMAGINE!

IMAGINE!

Ghosts, tunnels, shelters

Budapest is also known as the city of caves. Under Buda Castle there is a particularly interesting system of caves that has served the local inhabitants for centuries. They were used to provide drinking water, store crops, escape from fires or enemies, or save their valuables from tax collectors. Legend has it that a pasha of Buda banished his concubines to the caves after he got tired of them, or threw them into the wells. The Harem Lady Well in the Castle Cave, for example, is a reminder of this. Legends also tell of secret underground passages linking remote settlements. According to one story, two young men rented part of the cave to grow mushrooms. They were still bustling about at midnight when the candles went out and a ghost galloped past them. The incident was reported but the reason for the nightmarish scene was rather prosaic, as a woman's slippers and a button from a Hussar uniform were found in one of the cellars. It turned out that a soldier of the guard had been making love to a servant girl.

NOW IT'S YOUR TURN

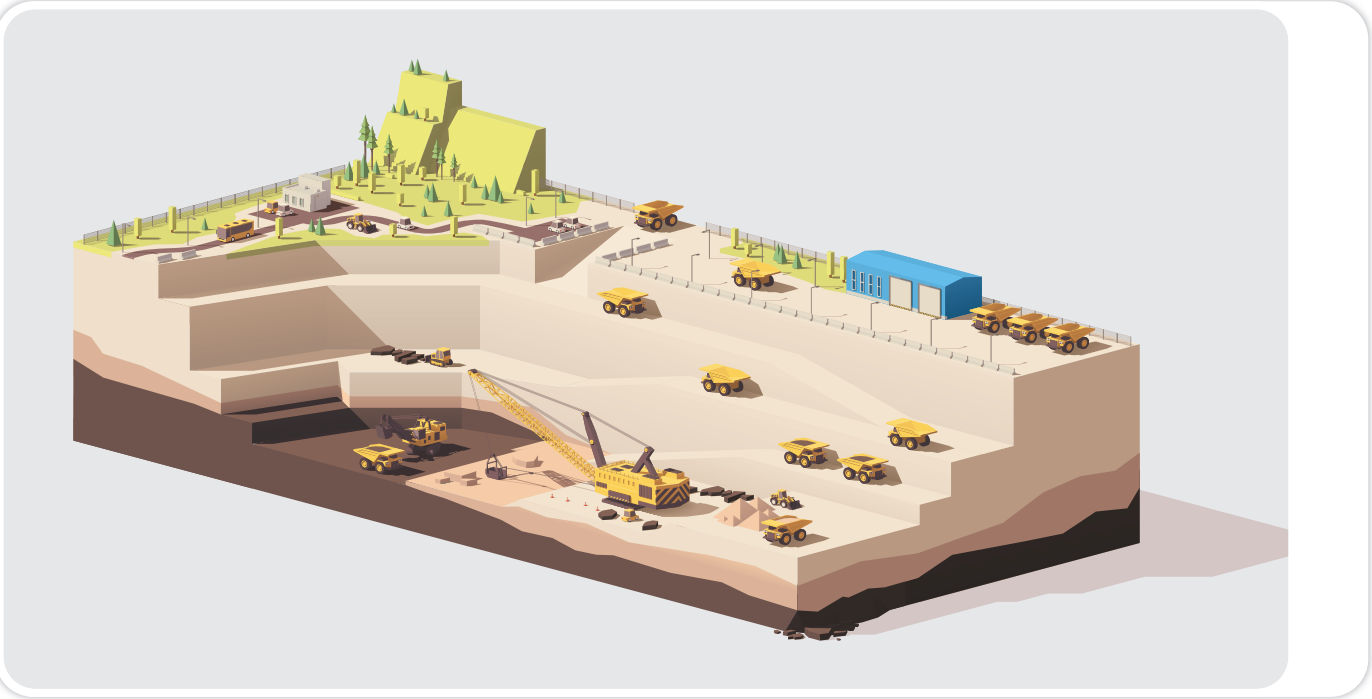
NOW IT'S YOUR TURN.

Organise a cave tour.

For more information visit the website of the Danube-Ipoly National Park.

MINERAL RESOURCES AND THE ECONOMY

Types of mineral resources:
- solid (ore, coal, silicates),
- liquid (oil, water),
- gaseous (natural gas),
- geothermal energy.



Solid minerals are extracted by surface or deep mining, and gaseous and liquid minerals by deep drilling.

Mineral resources contained in the lithosphere are a key determinant of economic processes. So one might think that the wealth of a country depends on whether it has mineral resources. Global economic power, however, does not depend primarily on the geographical location of mineral resources, but on who has the means (money, expertise, experience) to extract them.

The extraction of *energy resources* (ores, non-metallic minerals), their rapid decline or the unprofitability of extraction will lead to a drastic change in the structure of economies in the coming decades, and is expected to cause social conflicts and instability in many places.

For example, the scarcity of *rare earth metals* (such as tantalum) could cause difficulties in ICT and electric car manufacturing, while the decline in sand reserves could have a serious impact on construction and glass production.

Social inequalities also arise partly from inequalities and injustices regarding access to resources.

FIND OUT!

FIND OUT!

a) What are the most important minerals extracted on Earth?
b) What are they used for?
c) What are fossil fuels?
d) What would happen if all the earth's reserves of them suddenly ran out?
e) Discuss how this would change the global economy and your daily lives.

Environmental impacts of mining

Besides having an effect on the economy, mining also has a very significant environmental impact. In addition to deforestation, mining damages landscapes, and the transporting and processing of extracted minerals also pollutes the air, water and soil.

IMAGINE!

IMAGINE!

The exploration for aluminium ore, bauxite, began in Hungary in the early 20th century and extraction started in the 1920s. Most of the bauxite mines were located in the central hills of the Transdanubian Mountains (Bakony, Vértes). In the Bakony mines, active protection of water resources was deployed to facilitate the extraction by pumping out underground karst water before the extraction started, thereby lowering the local water level and allowing mining to take place in a water-free environment. This came at a heavy price as the local reduction in karst water levels also had an impact at regional level.

The Tapolca Lake Cave and several springs in the Bakony area dried up for almost 20 years, but the consequences of the water reduction were also observed in the Buda karst area: the water yields of springs decreased. After the mines closed down, the karst water level and the water yields of the springs slowly began to rise, so today we can again go boating in the lake cave. It is important to note, however, that the end of the mining does not mean the reserves are depleted. Extraction is currently not economically efficient, but it is possible that in the future it will become economically viable again. So this could lead to a reopening of extraction sites, which could again threaten groundwater resources.

Environmental impacts of solid minerals mining

Solid minerals mining is carried out using two types of operation:
- deep mining, and
- surface mining.

In the case of deep mining, mine shafts can be drilled even several kilometres deep.

Deep mining

With surface mining, the material to be extracted is found at or near the surface, so only the overburden needs to be removed to start extraction.

Landscape transformed by surface mining

FIND OUT!

FIND OUT!

a) What could have been the positive and negative socio-economic impacts of artificially lowering karst water levels over many years?
b) Use Google Maps to find open-pit mining sites in Hungary or abroad.
c) Make a presentation and show how the surface has changed as a result of mining.
d) Use the scale of the map to estimate the size of the mined area. Compare it to areas you know the size of (e.g. football pitch, school playground, etc.).

Environmental impacts of mining liquid and gaseous minerals

The mining of both liquid and gaseous minerals has a significant environmental impact. Rig failures cause oil spills, resulting in soil and water pollution and, in many cases, ecological disaster. Many drilling rigs are not sunk on land but in the continental *shelves* of seas and oceans. Explosions or oil spills in these areas damage marine ecosystems.

IMAGINE!

IMAGINE!

Verespatak, the Chernobyl of the Tisza Valley

Unfortunately, ore extraction and processing, inadequate treatment and storage of waste generated after the technological process have already caused a number of devastating accidents. A sad example in Hungary was the cyanide disaster on the Tisza river in 2000, also known as the Chernobyl of the Tisza Valley. An Australian company used cyanide technology to extract gold in Transylvania, but its leachate impoundment dam burst, releasing 100,000 cubic metres of cyanide and wastewater containing heavy metals into the environment, and through the network of flowing water into the Tisza river in Hungary. More than 1,000 tonnes of fish were killed and almost the entire biodiversity as well as the livelihoods of nearly 15,000 people were threatened. The further expansion towards Verespatak of the company responsible for the pollution was first stopped by a strong local and international civil society alliance, and Verespatak was declared a World Heritage Site in Danger by UNESCO in 2021.

Red mud disaster
A similarly devastating disaster, which also claimed human lives, occurred on 4 October 2010 when the villages of Kolontár, Devecser and Somlóvásárhely were flooded by highly alkaline red sludge, a by-product of the aluminium industry.

Child labour
It is not just natural problems that are caused by mining and the processing of raw materials. In many developing countries, teenagers or even younger children are illegally employed to do hard physical labour in narrow underground galleries.

Accessing mineral resources

Exploration means
- mapping materials suitable for mining,
- selecting and
- constructing the mining sites.

Mining drastically transforms the original surface, destroying both the land cover and the wildlife on it. It is mainly surface mining that has the most obvious environmental impact, such as landscape scarring and vegetation removal, which, due to *albedo* changes, has a major impact on local climatic conditions and consequently on water flow. And if mining activities lead to deforestation or the removal of native grasslands, this also contributes indirectly to climate change.

Surface mining

IMAGINE!

IMAGINE!

Albedo (α) is a radiation metric, expressing the radiation reflected by a unit surface of a given material divided by the radiation incident on the unit surface. Albedo is a Latin word meaning whiteness. It is denoted by the Greek letter alpha and has a value from 0 to 1, with zero being a totally absorbing black surface, and one being a completely reflecting surface. The darker an object is, the more efficiently it absorbs radiation (think of water warming up in a barrel painted black in summer). The Earth's total albedo is 0.29**, meaning that our planet reflects about 29% of incoming solar radiation. This value is derived from the average albedo of different surface types.

Some albedo values:

- ocean: 0.07–0.10
- coniferous forest: 0.08–0.15
- deciduous forest: 0.15–0.18
- grass: 0.25
- desert sand: 0.40
- ocean ice: 0.50–0.70
- fresh snow: 0.80–0.90

Exploration is different for oil (in liquid form) and gas (in gaseous form) extraction. Nowadays, deposits are no longer discovered at random. The work is preceded by theoretical geological and field research and computer modelling.

Oil rigs

IMAGINE!

IMAGINE!

The first records mentioning natural gas date back to more than 4000 years ago in Iraq. They described a flame burning in a huge rock cavity.

Does mining provide benefits beyond the extraction of minerals?

As a systems thinker, we always examine the complexity of the phenomena, the gains and losses, the risks and the causes and consequences in order to get the full picture.

So we don't throw the baby out with the bathwater. Of course, mining also has many positive effects. For example, it has revealed both spectacular and scientifically significant internal structures of rock strata, without which the science of geology would be much poorer. We could also mention that as a "by-product" of oil and gas exploration, a number of medicinal water deposits have been discovered in Hungary and spas have been opened.

FIND OUT!

FIND OUT!

a) Use the atlas to find the areas in Hungary where spas have been established alongside hydrocarbon extraction.
b) Make a presentation on the history and characteristics of each spa.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Visit Hegyestű, located in the Balaton Uplands. An open-air exhibition in a former basalt mine where you can walk inside a volcano and see the characteristic octagonal columns formed by the solidification of cooled lava in the crater. For details, visit the **Balaton Uplands National Park** website.

Exploration of minerals

Mining and mineral extraction can start once the mine has been opened. The work of miners is not without danger. Mines are also classified according to "mining hazards".

The most common hazards are:

- Firedamp – an explosive mixture of methane and air in underground mining. As it is colourless and odourless, it is very difficult to detect, and is therefore one of the biggest mining hazards, especially in coal mines.
- Gas explosion
- Dust hazard
- Coal dust explosion
- Water hazards
- Radiation hazards

IMAGINE!

IMAGINE!

The deepest mine on Earth

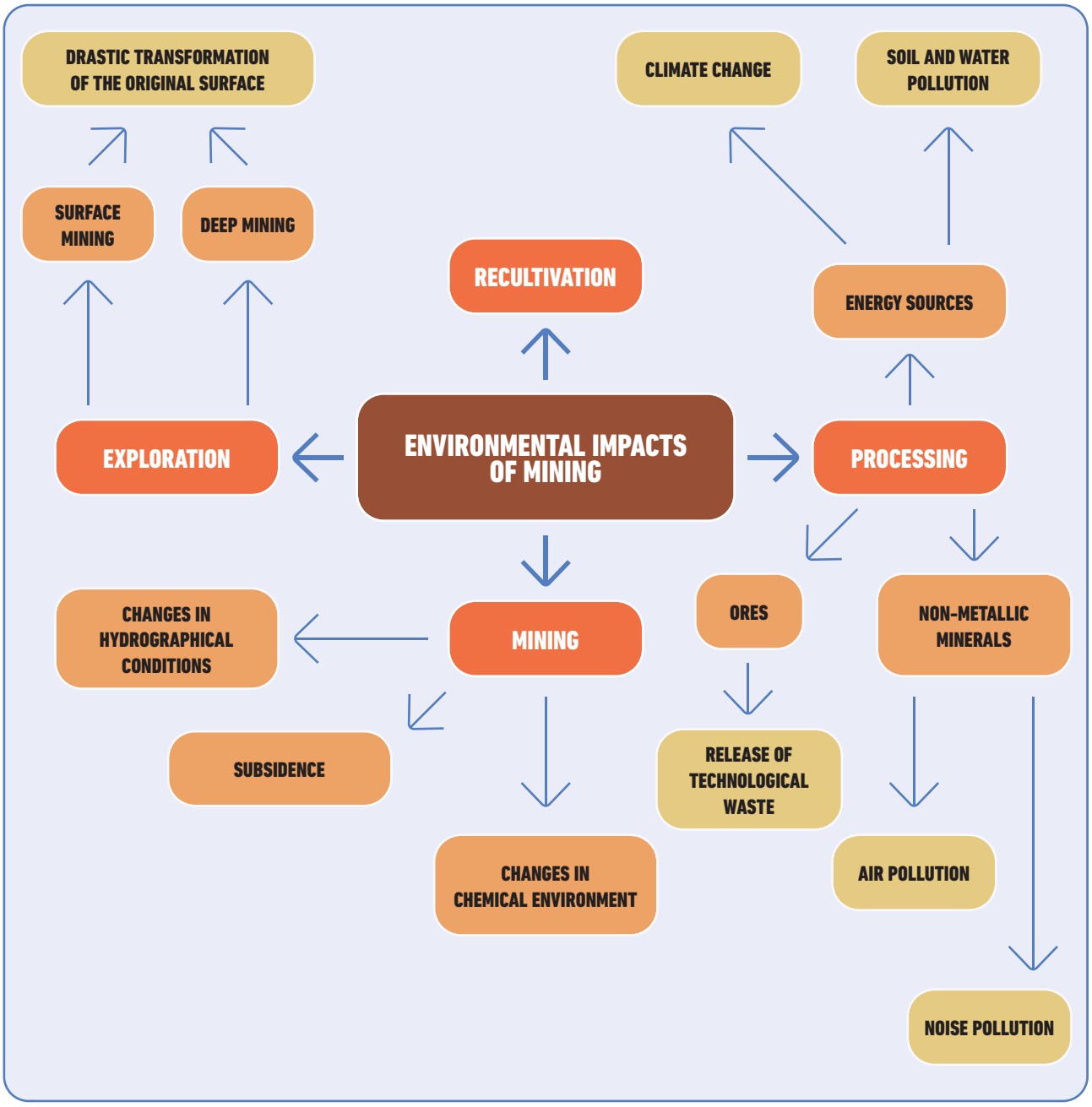
South Africa is home to the world's deepest mine, where the world's longest lift takes an hour and a half to transport miners down to the work site. Temperatures at this depth are typically between 60 and 65°C, reduced to around 30°C by an air-circulation system. Working in the hot climate is really challenging and unhealthy.

FIND OUT!

FIND OUT!

a) When and where were the last mining accidents? What caused them?
b) List the characteristics of the most common mining hazards.
c) Make a table showing the type of industry that could be located for each mining activity. Using the atlas or the internet include a specific location, either domestic or foreign, for each industry.
d) Look for articles and data on similar disasters and write an essay analysing the causes of the problems, the mitigations or the social and economic impacts of the disasters.

OVERVIEW



Recultivation

Recultivation means the reclamation of an abandoned mine area with the intention of restoring the degraded land to a condition similar to its original state. After the closure of mining operations, mining companies around the world are required by law to do so, but in many cases it is doubtful to what extent this is carried out. If the mining company has gone bust, the recultivation is carried out on behalf of governments, ultimately with taxpayers' money.

For underground mines, recultivation includes filling in underground galleries to avoid subsidence. In most cases, this is done with the previously excavated spoil, which has the added benefit of removing the spoil tip scarring the landscape.

IMAGINE!

IMAGINE!

A quarry lake is nothing more than a huge pit left over after the abandonment of mining activities, which is later filled with spring, ground- or rainwater.

FIND OUT!

FIND OUT!

Which are the most beautiful quarry lakes in Hungary?

Partially reclaimed mining sites

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Majsabakos is an imaginary town of 15,000 inhabitants in the mountains. In the past it was a popular tourist destination, mainly based on ecotourism. The sand mine that opened on its outskirts and then closed 5 years later created jobs and brought in significant revenue, but the streams have become polluted and the soil is showing signs of degradation. Trees in the small surrounding forests were cut down, so the air quality is not what it used to be. Restaurants catering to hikers closed and were replaced by drink stores. The town has ceased to be a tourist destination. Those who had an interest in rural tourism went bankrupt and took jobs in the mines. Medicinal water was discovered when the mine was excavated, but it was never exploited. The mining company went bankrupt, so it couldn't recultivate the area.

At the mayor's request, prepare a mine reclamation plan. First, write down what data and on-site investigations are needed to make the plan feasible.
Aspects

a) Restore the original ecosystem in Majsabakos.
b) Make it a tourist destination again, especially for ecotourism.
c) Local residents should find ways to make a living in the town, and emigration should be reduced.

THANK YOU, ATMOSPHERE.

IMAGINE!

IMAGINE!

In the primordial atmosphere when the Earth was formed, the concentration of oxygen was only 0.1% of the current level. It started to rise 3.5 billion years ago with the presence of the first photosynthetic organisms, and stabilised at its current level only about 400 million years ago. So it was plants that made atmospheric air breathable for humans. The reverse, of course, is also true. If plants were to die, so would living organisms.

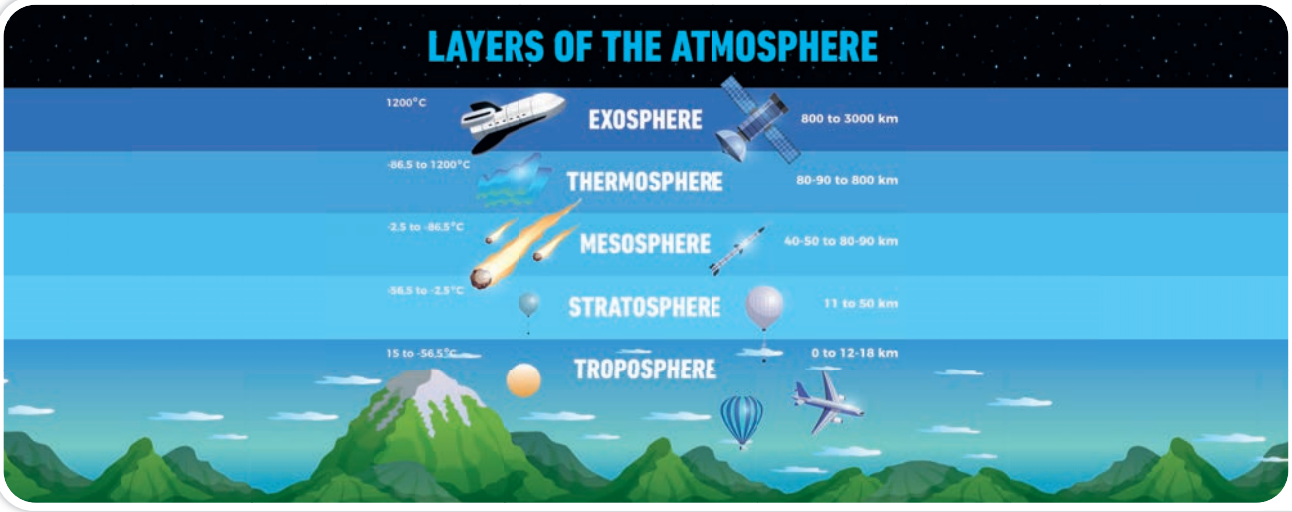
FIND OUT!

FIND OUT!

1. What processes were typical of the land surface surrounded by the primordial atmosphere?
2. How can we imagine the Earth's environment at that time?

Atmosphere

The gas envelope that connects the Earth to space is called the atmosphere.



It mainly comprises a mixture of gases, but also contains a small amount of liquid and solid components. The lower layers of the atmosphere (troposphere, stratosphere) are of particular importance for humans, as

- they contain about 99% of the mass of the entire atmosphere, and
- all the atmospheric water,
- and this is also where weather phenomena (cloud formation, precipitation and air movement) take place, and
- the ozone layer (O_3), which is formed from oxygen gas (O_2) produced by the sun's ultraviolet rays, and absorbs most of the ultraviolet rays that are harmful to living organisms, is concentrated in the middle of the stratosphere (around 20-30 kilometres above the Earth's surface).

IMAGINE!

The ozone in the stratosphere protects life on Earth from the sun's harmful rays, without which life on land would be impossible. It is not common knowledge that ozone can be present close to the Earth's surface on hot summer days, but this is harmful because it is highly toxic if inhaled. Advertisers promoting the "clean, ozone-rich" air of mountain resorts are probably unaware of the harmful effects of ozone, and that mountain air contains far less ozone than the air in big cities.

SERVICES OF THE ATMOSPHERE

What is oxygen used for?

Many organisms get the oxygen they need to survive from the atmosphere (they are referred to as aerobic organisms), but oxygen is also needed for combustion, producing energy, or to break down dead organisms.

Why is global warming mitigated by vegetation cover?

Carbon dioxide from the atmosphere is incorporated by green plants into their bodies through photosynthesis using solar energy (autotrophs). This allows them to absorb huge amounts of carbon dioxide. This is why we say that planting trees, preserving, increasing and creating green surfaces lowers atmospheric carbon dioxide levels, which plays an important role in reducing global warming.

Over the last two hundred years, human activities have caused a significant increase in carbon dioxide levels in the atmosphere. This is partly because the burning of fossil fuels has resulted in the CO_2 stored in them over millions of years returning to the atmosphere in just over 200 years, and partly because the increasing deforestation, the clearing and cultivation of ancient grasslands has gradually reduced the carbon storage capacity of the biosphere.

NOW IT'S YOUR TURN.

How much has atmospheric carbon dioxide increased since the industrial revolution? Discuss what measures would need to be taken to bring carbon dioxide levels down. Summarise the solutions that are being outlined at global level. Do you think they will be effective?

Animals and humans (heterotrophs) obtain organic matter by consuming plants. In other words, the atmosphere also plays a key role in the healthy functioning of food webs. All living organisms need nitrogenous substances to build their bodies and to keep them healthy. These substances include proteins and nucleic acids, for which nitrogen is an important building block.

Air contains significant amounts of nitrogen, but very few organisms can use atmospheric nitrogen directly. Nitrogen-fixing bacteria can fix molecular nitrogen in the atmosphere and transport it through the food chain to higher levels of consumption. Interestingly, human activity also increases the amount of nitrogen available to living organisms, and ultimately the biomass. Nitrogen-based fertiliser production involves artificially fixing atmospheric nitrogen (the Haber-Bosch process).

Spreading nitrogen-based fertiliser on agricultural land inputs additional nitrogen to the biosphere. It is one of the largest, but rarely mentioned, interventions in the functioning of the living world. It is also important for nature conservation: with nitrogen-poor habitats disappearing, organisms adapted to this environment (e.g. insectivorous plants) will also disappear.

Among plants, the Fabaceae family lives in symbiosis with nitrogen-fixing bacteria. Many of them are crops, but the acacia, for example, which is very common in Hungary, also belongs to this group. Herbaceous plants are widely cultivated for food and fodder in Hungary, while acacia raises serious conservation concerns, and requires a lot of attention and effort to keep it under control. At the same time, we should not forget that acacia is also a useful plant, and we use its wood and honey. Moreover, local wildlife adapts to it too. For example, in Nagy-hegy (Great Hill) of Tarpa, Bereg, the specially protected Carabus hampei now lives in acacia, so acacia trees are not being completely cut down in this protected area.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Where does acacia come from, when was it introduced into Hungary and why?
2. Discuss and argue why acacia has economic benefits, which economic sectors use it, and what the disadvantages are from a conservation point of view.

Acacia in bloom

Why is ideal air humidity important?

Humidity plays a major role in shaping both the living and non-living environment. Chemical processes on the surface of our planet take place in aqueous environments, which means that atmospheric humidity plays a primary role in the weathering of rocks. Air humidity helps plants survive dry and drought periods.

IMAGINE!

IMAGINE!

How does the atmosphere affect the climate of our planet?
Without greenhouse gases in the atmosphere, our planet's climate would be 34°C colder. The atmosphere, and in particular the ozone layer, reduces the harmful cosmic radiation reaching the surface, and burns up dangerous meteorites that enter the atmosphere.

The atmosphere as a habitat
The atmosphere can also be seen as a habitat. But we should not only think of visible, flying animals such as birds, bats and arthropods, but also the thousands of aeroplankton per cubic metre of air that are transported by the wind. These include many viruses, bacteria, fungal spores, significant amounts of pollen and airborne seeds.

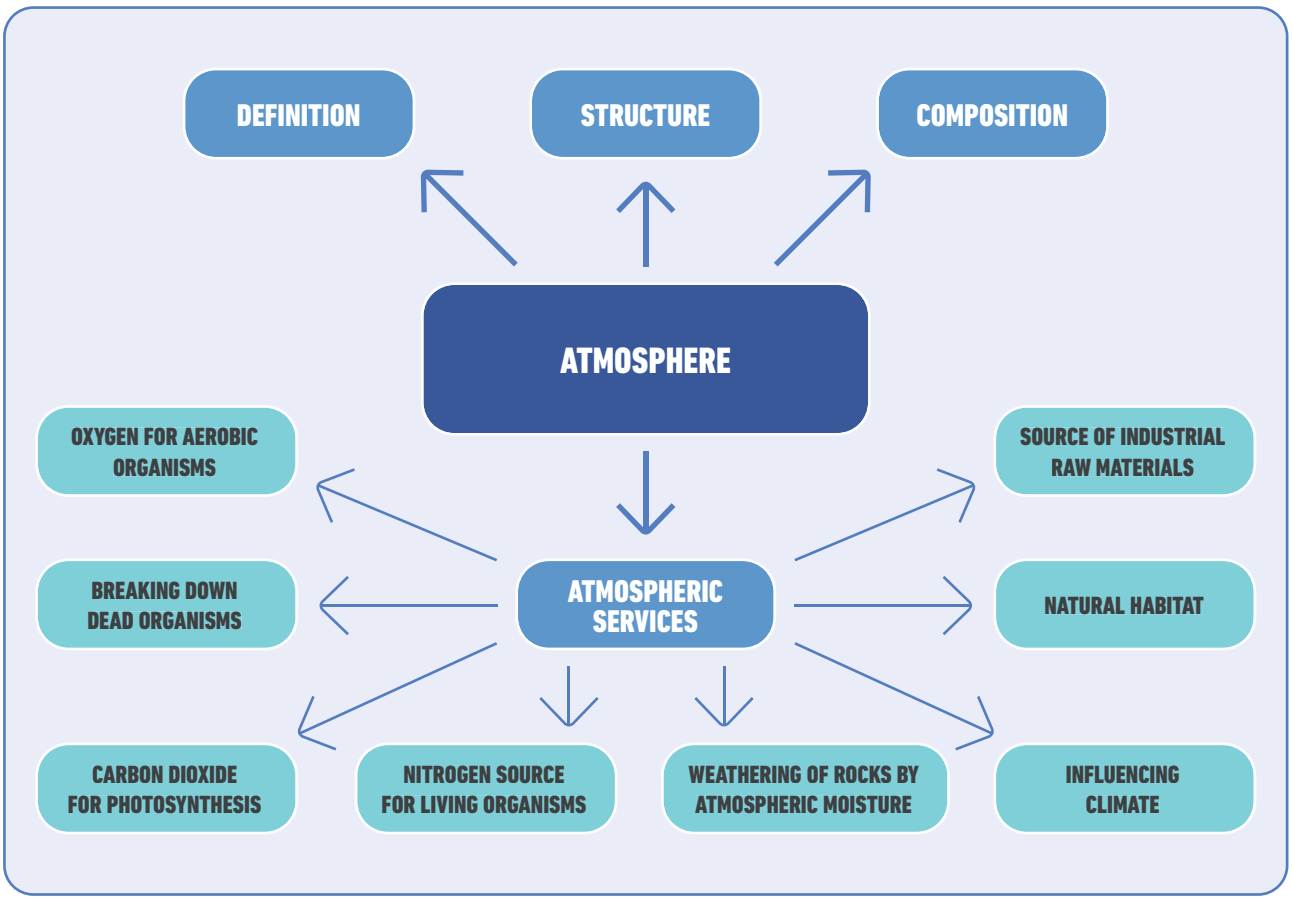
The atmosphere as a source of raw materials
The atmosphere also contains important industrial raw materials. In addition to oxygen and nitrogen, we also extract many noble gases from the atmosphere; neon and krypton can only be "extracted" from the air for example.

FIND OUT!

FIND OUT!

What are noble gases used for in industry?

OVERVIEW



WHAT IS WRONG WITH THE ATMOSPHERE?

Why Helsinki?

The primary cause of air pollution is the burning of fossil fuels in power plants, vehicles or for residential use. The most visible impact of acid rain linked to sulphur dioxide emissions was the destruction of pine forests in Scandinavia. So it is not by chance that it was Helsinki where an international agreement to reduce emissions of sulphur dioxide was signed in 1985.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

- Create a mind map of air pollutants.
- Group them according to their source, state, and effect.

MAIN TYPES OF AIR POLLUTION

Air pollution is one of the greatest environmental problems of our time. As winds can carry polluted air far away, in many cases the effects of pollution occur thousands of kilometres away from the place of the initial release. What are the different types of air pollution?

Acid rain

Most energy is produced by burning fossil fuels (coal, hydrocarbons). Here we are not just talking about power stations or industrial plants, but also transportation. Depending on their quality, various types of coal contain sulphur to differing extents, which is converted into sulphur dioxide during combustion. In addition, nitrogen oxides are released into the air from fuel burned in internal combustion engines. Both substances react with the moisture in the air to produce acidic sulphuric acid or nitric acid, which, falling to the surface of the earth with precipitation, acidifies flowing water and soil, as well as dissolving and weathering rocks, buildings and sculptures. Some plants (e.g. gymnosperms, lichens) are particularly sensitive to sulphur dioxide in the air, and above a certain concentration, they die out in the affected area.

IMAGINE!

IMAGINE!

Lichens are organisms that have evolved from the coexistence (symbiosis) of fungi and photosynthetic microorganisms, and are very sensitive to air quality. Lichen mapping means determining the number of lichens and lichen species at specific points in the study area, and producing a thematic map. This can be used, for example, to identify lichen deserts within a city (e.g. the more polluted inner city areas) and areas with higher concentrations of lichen species (e.g. green belt around the city, suburbs).

Lichen

FIND OUT!

FIND OUT!

1. Draw a flow diagram of acid rain formation.
   a) List the most important sources and effects.
   b) Discuss ways to reduce the amount of pollutants released.
2. What can we do individually to reduce emissions of air pollutants?
3. Make a list of everyday habits that you should change. What would be easy to change and what would be the most difficult? Why?

Particulate pollution

The combustion of fuels releases not only gaseous but also solid air pollutants into the air. Larger particles get caught in our noses and are not transported to the lungs. Particles smaller than 10 µm, however, can pass down the throat and cause serious illness. These fine particulate matters, as distinguished from larger particles that settle in a few hours, are called PM (particulate matter). PM10 is the particle size below 10 µm in diameter, while PM2.5 is the size that cannot be cleared, or only with great difficulty, from the lungs. These two particulate fractions are of major importance from a health point of view.

Example sources of particulate pollution

Power plants

The reason for particulate pollution from power plants is that fossil fuel combustion is not complete, and large amounts of solid slag and fly ash are produced along with the energy. Nowadays, these materials are largely captured in chimneys and transported to landfills. However, landfill sites can be a major source of particulate pollution if the technology is not appropriate.

IMAGINE!

IMAGINE!

Residential combustion
There are no filters to prevent the harmful effects of residential combustion, but there is a big difference in air pollution between burning good quality fuel (firewood or bio-briquettes) properly prepared and stored, and burning unsuitable fuel (such as wet or contaminated wood or plastic waste).
In most cases, air pollution from heating is not caused by ignorance but by fuel poverty. Those who cannot afford fuel will heat with whatever waste they find, regardless of the environmental and health consequences.
To prevent air pollution, the burning of dry leaves was banned in Hungary in 2020.

Motor vehicles
Motor vehicles, especially diesel vehicles, are also a major source of particulate pollution. Using electric vehicles may be the answer to this problem, but if we take the environmental impact of mining and battery production into account, the environmental balance of electric cars may not be positive. The mining of metals for battery production is a highly polluting activity, and the raw materials needed are mostly extracted from hellishly hot African mines. The harmful effects of battery factories are also affecting more and more people in Hungary, from Komárom to Göd and Sóskút, and we haven't even mentioned the hazards of the battery waste generated.

Industrial production
Industrial production can also be a major source of particulate pollution, for example in cement production, where large amounts of dust particles can be released into the air during the grinding of limestone into powder and the loading of transport vehicles.

IMAGINE!

IMAGINE!

How does particulate pollution damage the living world?
Pollutants settle on the leaves of plants, reducing their assimilating surface, clogging their stomata, impeding water uptake and reducing photosynthesis and cellular respiration. Alkaline cement and lime dust is particularly damaging to plants. If vegetation is damaged, fauna will also be affected.

Particulate pollution can occur in nature too, for example in volcanic eruptions or forest fires. In many places around the world, such as Indonesia, expensive logging is being replaced by simply burning the forest to make way for oil palm plantations, or in Malaysia where schooling has been suspended for days due to smoke clouds and air pollution.

INSULATION, ROOF, ASBESTOS

Asbestos is a natural mineral, chemically defined as magnesium silicate. For a long time it was used in the construction industry as insulating material mixed with cement (asbestos cement) until it was found to be extremely harmful to the human body. It has been proven to cause cancer if it enters the respiratory system. It was banned in Hungary in the 1980s, yet there are still plenty of buildings and roofs with insulation material containing asbestos. Rain, sun, wind and snow cause harmful asbestos fibres to be released from the slate roof into the air, posing a serious risk to people living nearby.

Magnified view of asbestos fibre

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Check the particulate matter in the air where you live or go to school.
What should be done?
Put a Petri dish with petroleum jelly in the window for a week. After a week, use a microscope to see how many particles of dust are stuck in the petroleum jelly and what size they are. It may be interesting to do the test by setting up one test point in a window facing a busy road and the other in a window facing a park. You can also change the time of the test. What do you observe on busy weekdays and on weekends?

FIND OUT!

FIND OUT!

What should you know about the dangers of asbestos insulation?

Ozone depletion

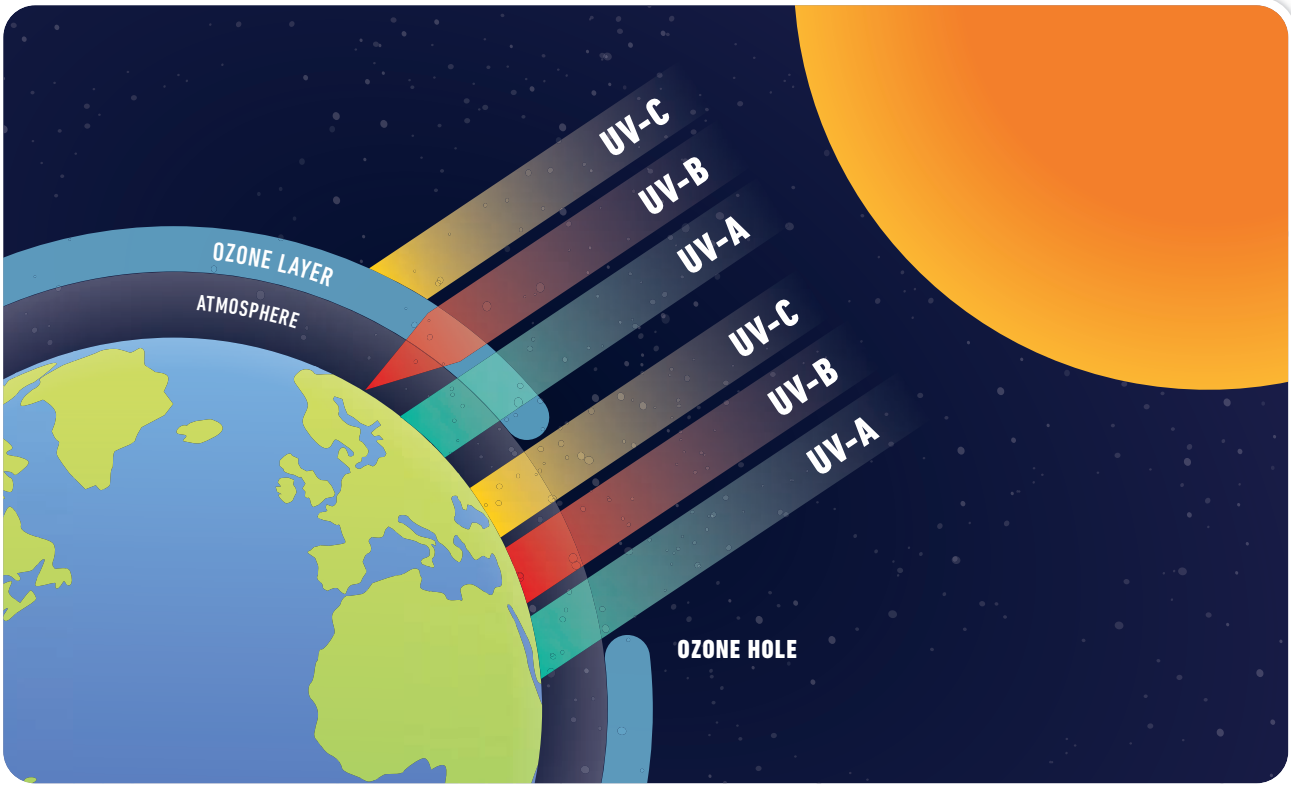
The ozone layer contains ozone molecules circulating in the atmosphere at an altitude of 15 to 40 kilometres above the Earth's surface. At this altitude, the ozone molecules condense forming a veritable shield around the Earth. Its density is not uniform, its thickness decreases from the equator to the poles, and its concentration is lower in winter than in summer.

What is the ozone hole?

The ozone hole is a phenomenon where the concentration of ozone over a given area decreases, weakening the UV protection of the area. Scientists first detected abnormally low levels of ozone over the South Pole in July 1985 (the harshest winter time in Antarctica). The concentration has increased over the last 30 years. A similar phenomenon was observed over the Arctic in February 2020, but the ozone level recovered by April.

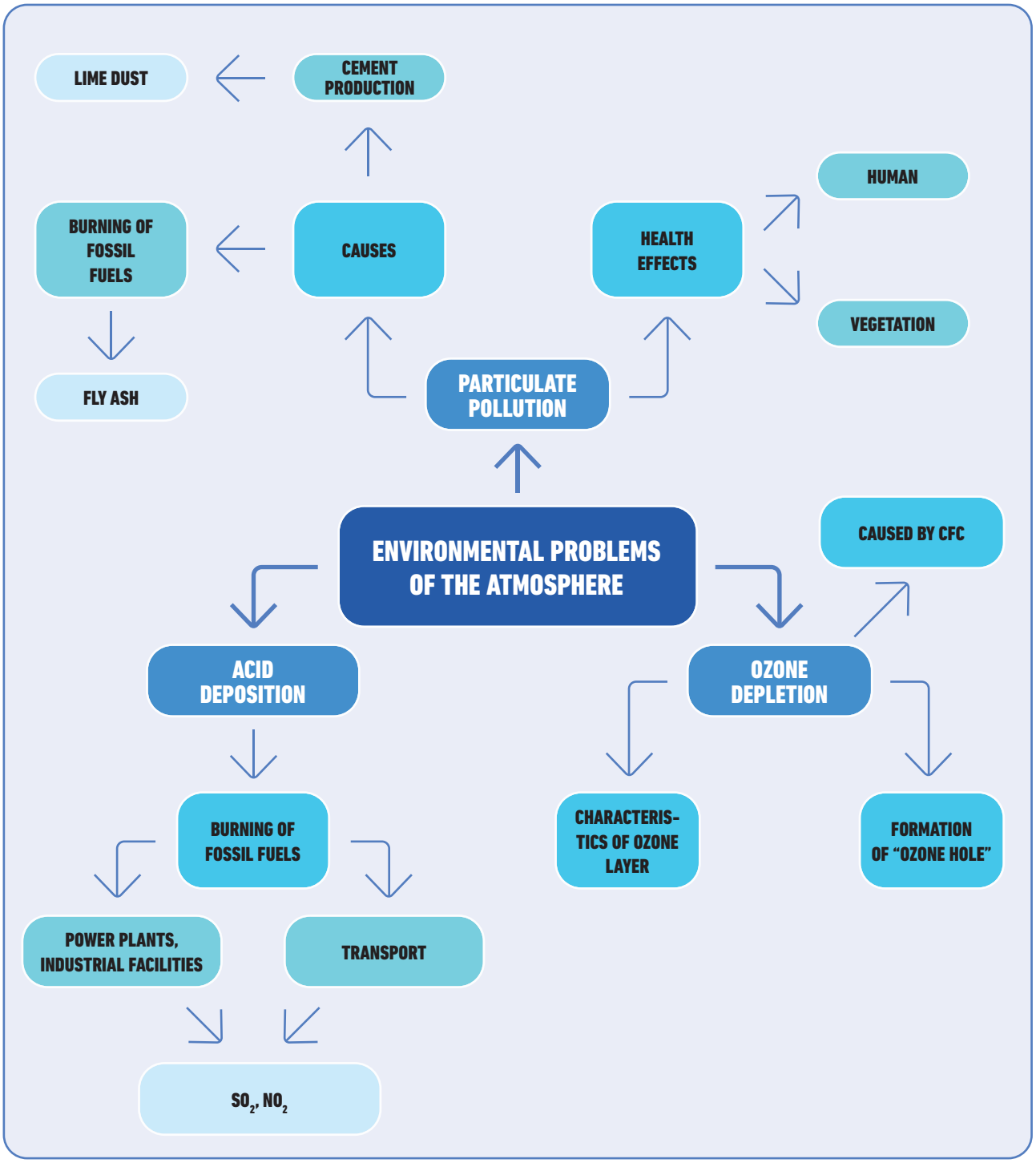
Why are ozone concentrations the lowest above the poles?

CFC gases, or Freons, are the main cause of ozone depletion. These substances have been used mainly in coolants and propellants since the 1930s. CFC gases break their bonds when exposed to sunlight, producing highly reactive compounds that react readily with the oxygen in unstable ozone molecules. Cold acts as a catalyst in the reaction, accelerating the process. This is why the ozone concentration is the lowest above the poles.



Consequences of ozone depletion (ozone hole)

OVERVIEW



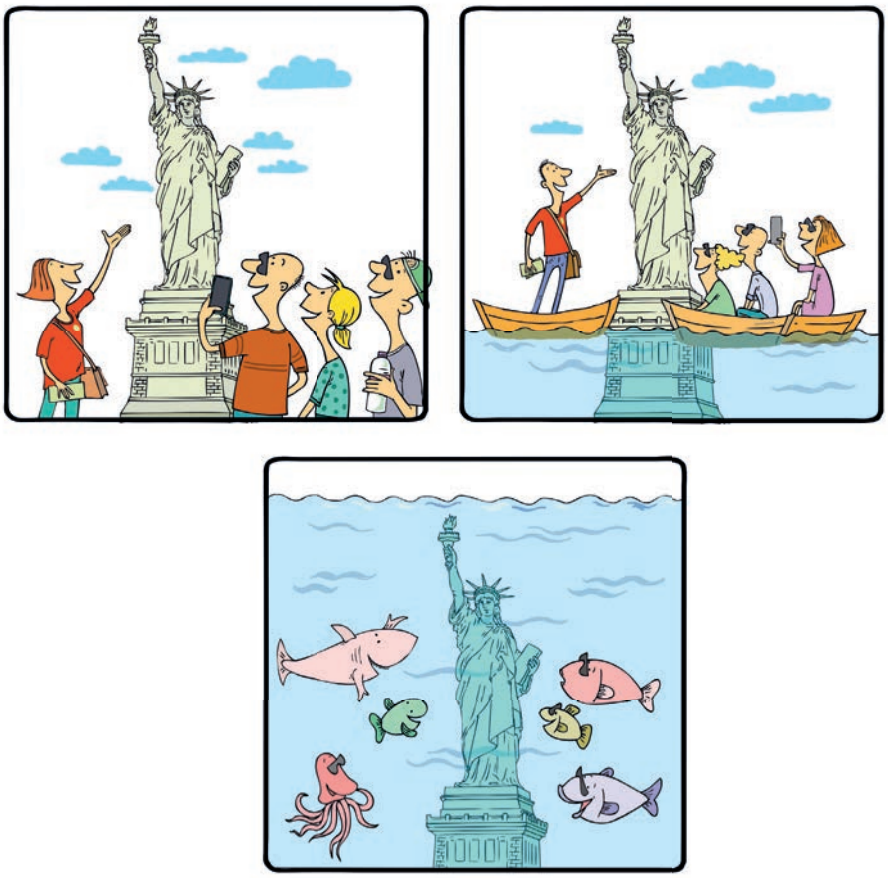
NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

- Make a plan. How could you adapt your family's lifestyle to minimise air pollutant emissions?
- What are the habits that are easy to change, and those that are difficult?

WHY IS GLOBAL CLIMATE CHANGE A PROBLEM?

The Amazon rainforest is often referred to as the lung of the Earth, as its vegetation is able to absorb huge amounts of carbon dioxide offsetting increasing emissions from human activity.



Recent research shows that deforestation and the resulting increase in forest fires tipped the balance, so rainforests are no longer a buffer against climate change but rather a contributor to it: it has gone from being a net absorber to a net emitter. Forest fires are considered to be the most damaging, and in most cases they are not accidental, but caused by humans in order to gain new territory.

Moreover, forests play an important role not only in absorbing carbon dioxide but also in generating rain by evaporation. This drives the process towards further degradation through the positive feedback loop: less rain means a drier climate, which leads to more natural forest fires, and fewer trees are able to evaporate less and less.

The Amazon rainforest covers the territory of several countries, but its "services" benefit the whole world, so active international cooperation is needed to stop the destruction of rainforests.

FIND OUT!

FIND OUT!

What can be done to reduce deforestation?

PROCESS OF GREENHOUSE EFFECT

The greenhouse effect is a natural process. Greenhouse gases are present in the atmosphere even without human activity. Without them, the average temperature of our planet would be -19°C instead of 15°C today, which would probably make life on Earth impossible.

The most abundant greenhouse gases in the Earth's atmosphere are:
- water vapour,
- carbon dioxide,
- methane,
- nitrous oxide,
- ozone.

The greenhouse effect is a process in which about half the solar radiation is absorbed by the Earth's surface. The sunlight is converted into heat energy and tries to radiate out in the form of infrared radiation, but some of the infrared radiation is trapped by the atmospheric layer of greenhouse gases. This heat energy retained and left in the system warms the planet.

From the greenhouse effect to climate change

The human-induced greenhouse effect is called the anthropogenic greenhouse effect. This is one of the most important sub-processes of climate change, or, as it is more often referred to, the global climate catastrophe. The process is often called global warming, but this term is not entirely correct, as it is not simply a matter of global temperatures rising, it is a much more complex and multifaceted process. It is true, however, that it is basically warming that causes the changes.

Melting ice cover and its consequences

Rising global average temperatures cause ice covers and glaciers in the Arctic to melt and the volume of warming water to increase. These two factors result in
- ocean and sea levels rising, with the consequence that low-lying coastal areas are submerged;
- and as a result of the melting, larger areas of land appear, which absorb more sunlight and therefore increase local temperatures, which
- further melts the ice cover...

Melting sea ice collapsing in the Antarctic

FIND OUT!

FIND OUT!

Which areas of our planet are most at risk from a rise in the sea level?

Extreme weather, changing rainfall patterns

Flooding, Budapest, 2010

Some regions of the world see increased precipitation, usually accompanied by more extreme weather events. Devastating floods have become more frequent, often coupled with a deterioration in water quality, and in some regions even with a serious threat to water resources.

Weather and precipitation anomalies can have very different effects globally and even within Europe. People in the region will need to prepare for this in the coming years.

a) Where have there been floods, forest fires or other climate disasters recently?
b) Choose a region that has recently been affected by an environmental disaster related to global climate change. Find out how much the climate of the area has changed compared to previous decades. Make a report.

Heat waves are forecast to become more frequent in central and southern Europe, while northern Europe will see a significant increase in precipitation and a rise in the frequency of previously unusual winter floods.

Developing countries least responsible for climate change are the most vulnerable. Their people's livelihoods are highly dependent on the weather and natural environment, and their financial means to protect their health and livelihood are limited.

IMPACT ON BIODIVERSITY

Climate change can also significantly change our biodiversity. This is because the changes are happening so fast that neither plants nor animals can adapt to the changing environmental conditions. As a result, many terrestrial and aquatic species are moving into new habitats where they were not previously found. Other low-mobility species may become extinct in their own habitat, or in the worst-case scenario, on Earth as a whole.

FIND OUT!

FIND OUT!

1. Make a list of plant and animal species that will appear in Hungary as a result of climate change.
2. Include the species that are likely to disappear from the local habitat.

IMPACT ON PEOPLE AND HUMAN SOCIETIES

Global climate change has a direct impact not only on the natural environment, but also on human health. These effects are already obvious. Increasing heat in some regions and extreme cold in others have serious health impacts, not to mention the presence of pathogens that spread tropical diseases not previously seen in temperate zones.

ECONOMIC IMPACT

In addition to damage to infrastructure, property and human health, sectors of the economy such as agriculture, forestry or tourism that are fundamentally dependent on weather, including temperature and precipitation, are particularly vulnerable to the effects of climate change. Researchers are already experimenting with a number of new heat- and drought-tolerant plant varieties, as the weather is becoming more extreme with torrential rainfall over a very short period of time followed by prolonged periods of drought. Climate change may also lead to a shift in tourist seasons, with a possible re-evaluation of seasons with more pleasant weather conditions away from the heat of summer.

Sightseeing in summer heat

These issues are being addressed by scientists, politicians and civil society. For example, a group of researchers in Hungary has set up a research project to improve drought tolerance in crops, and thus prevent a significant reduction in yields. It has been shown that the microbial community of the plant root system and the root environment has a profound effect on the quality of germination, nutrient uptake, yield and the resistance to pathogens. A treatment with certain micro-organisms changes the root structure and increases its length, thus creating a larger root surface area, which makes water and nutrient uptake more efficient. In the case of rapeseed, plants treated with the appropriate microbes displayed normal growth despite the water deficit, and no yield loss was experienced, while soil moisture content continued to decrease.

The highest level of progress towards achieving solutions is global or regional international agreements. These agreements include principles, objectives and, in many cases, proposals for solutions. There have been many international agreements on environmental protection over the past 50 years, including air pollution control.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Choose and present an international agreement adopted in the last 50 years to solve environmental problems.
   - When, where and between which countries was it concluded?
   - What tangible impact has it had?
2. Choose a national law with a similar purpose, and find out what the sanctions are for not complying with it. (Some suggestions: legislation on banning the burning of dry leaves, regulating emissions, imposing a smog alert, watering roads, etc.)

What can individuals do?

One way to combat pollution from energy production is to reduce energy consumption, for example by

- optimising the temperature in your home, or
- insulating your house or flat,
- organising transport in the most environmentally friendly way possible, by walking, cycling or using public transport;
- driving acquaintances travelling in the same direction (if you cannot do without a car).

SERVICES OF THE HYDROSPHERE

Why a blue planet?

Water is the basis of and prerequisite for life on Earth. Water makes up the largest percentage of the body of any living organism. For example, 98% of jellyfish, 84% of snails and 55-65% of an adult human body consists of water, and even dry seeds have a water content of 12-14%.

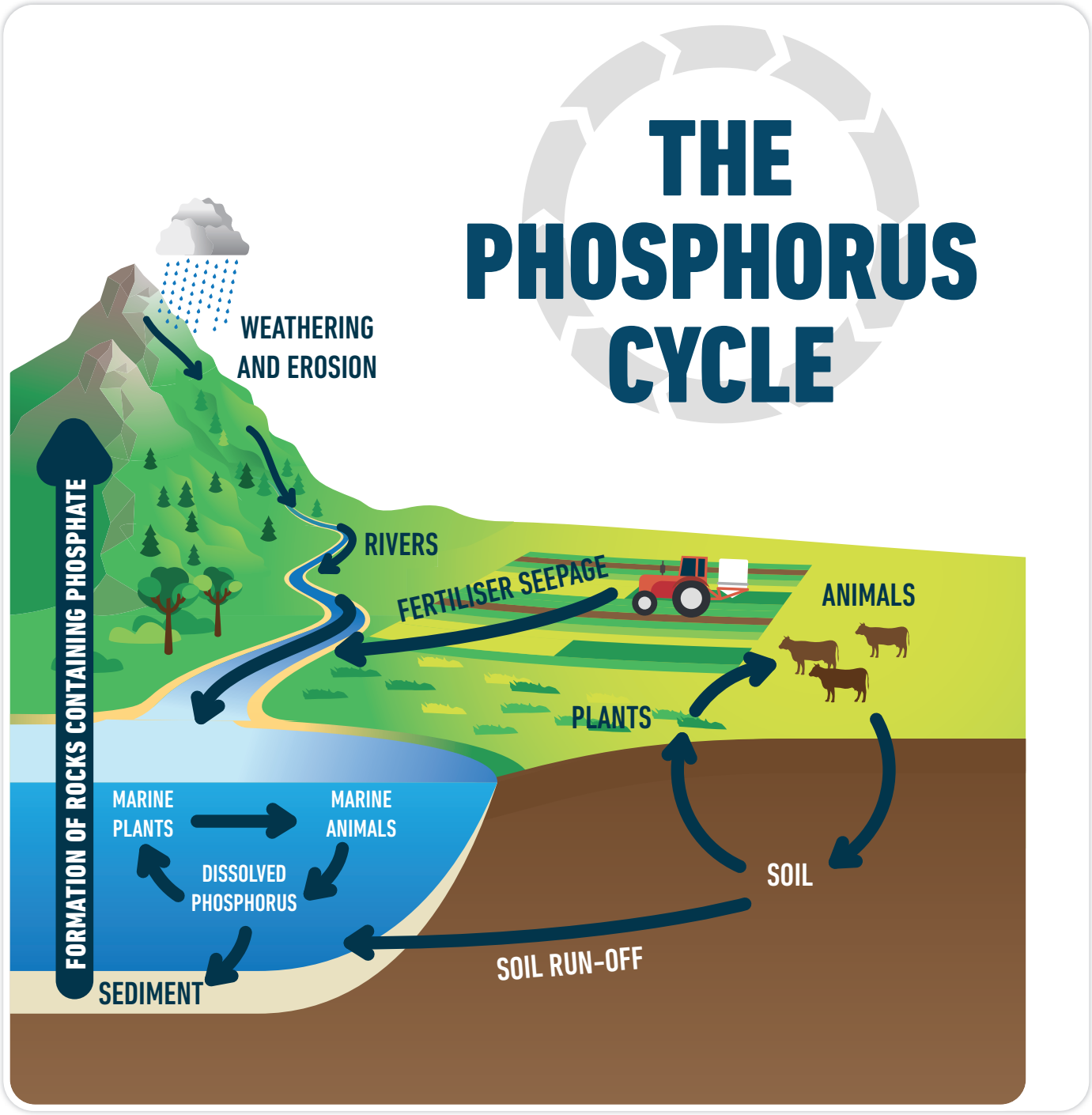
This is why the Earth is called the "blue planet", since water is present in huge quantities. It can be found in the atmosphere, in cracks between rocks and even in their crystals, in the soil and in living organisms as well. There's so much water on Earth that if it were evenly distributed over the surface, it would cover it nearly 2,700 metres high.

However, 97% of water resources in the seas and oceans are highly saline, and therefore unsuitable for human consumption. Only 3% of Earth's water is freshwater, much of it in the form of ice, and only a small percentage is surface water, rivers, lakes and aquifers.

The water cycle

Water is the cradle of life, as the first organisms evolved in it nearly 3.5 billion years ago. Water is the only substance in nature that exists in all three states simultaneously. As liquid water (oceans, lakes, seas, rivers), as ice in solid form (glaciers, high mountain and polar ice caps) and as a gas (vapour, clouds). Solar radiation causes water to evaporate from surface water bodies and turn into vapour.

Vapour cools in the atmosphere and the molecules combine with water vapour to form droplets. This is how clouds are formed. If the humid air cools even more, its water vapour content is precipitated out as water droplets like rainfall, and this water is returned to rivers, lakes, seas, oceans – and the whole process starts all over again.



IMAGINE!

IMAGINE!

Due to their phosphorus content, bird droppings are a great treasure, which is why, for example, guano deposits are mined. They are used as fertiliser and as a base material for fertilisers.

But there can be too much of a good thing.
Excessive use of fertilisers increases the nutrient concentration in groundwater, which seeps into standing water and has a negative impact on the entire aquatic ecosystem. The accumulation of nutrients favours algal growth. They form a "biofilm" on the surface of the water, blocking light and oxygen from aquatic life. In their absence, organisms die in a short time and eventually the entire biocenosis can be destroyed.

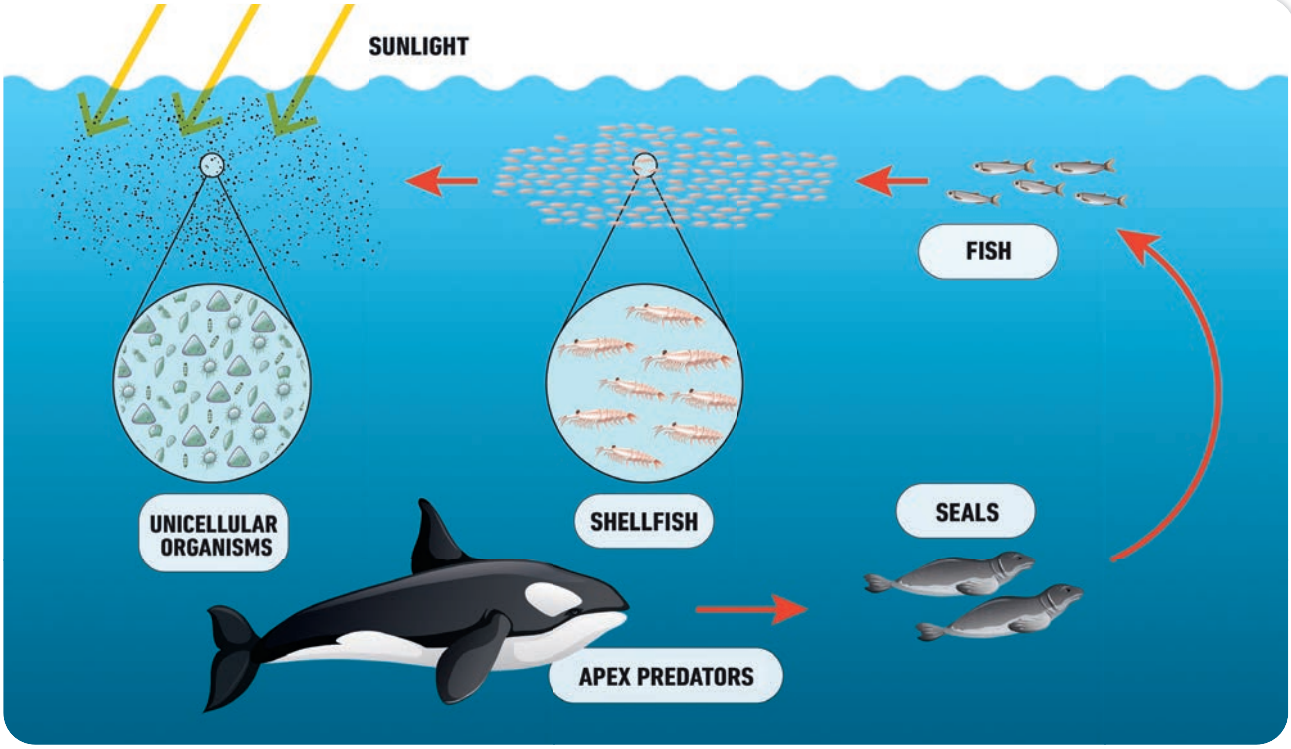
How do living organisms get water?

- directly from saline or fresh water,
- from the humidity in the air,
- from the water in the soil.

Water is needed for life processes such as

- drinking water,
- a solvent,
- a carrier or as a thermostat.

The water cycle – through the food chain – maintains and regulates the functioning of marine ecosystems, which is based on their biodiversity.



Ocean food chain

SELF-PURIFICATION OF WATERS

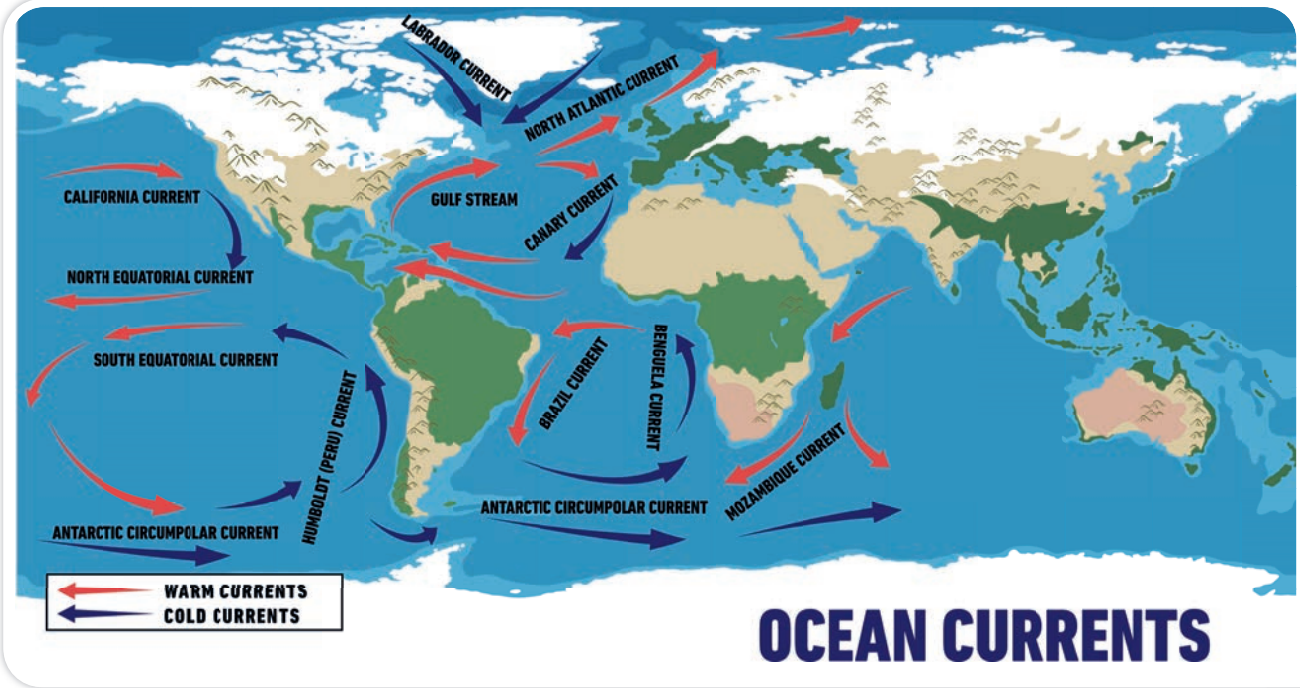
One important characteristic of the hydrosphere is its ability to self-clean. Purification is mainly carried out by algae and various bacteria during aerobic decomposition, while invertebrates such as tunicates, sponges and cnidarians remove suspended matter from the water by filtering.

HOW THE HYDROSPHERE WORKS AND THE BALANCE OF INTERACTIONS BETWEEN SPHERES

Role of temperature and salinity

Ocean currents are driven by differences in temperature and salinity. They are in constant motion to compensate for these differences. One of the most important of these ocean currents is the Gulf Stream (North Atlantic Drift), which binds oxygen near the surface and transports it to the northern waters where it cools and thus sinks to great depths.

The currents have a major impact on marine ecosystems, as the water sinking to the seafloor supplies oxygen to deep-sea life. The Gulf Stream, like all ocean currents, also affects the physical changes in the air column above it, thereby influencing the weather, cyclone formation, precipitation and coastal temperatures. As a result, for example, we can find ice-free harbours even in the winter months.



IMAGINE!

IMAGINE!

Not since 1854 has such a strong positive temperature anomaly been measured for the Gulf Stream as in January 2021. The current also affects the coastal economy through climate regulation.

It is evident that the different spheres are in constant interaction, and influence each other. The question now is: what would the consequences be of irreversibly disrupting one sphere?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Based on the data below, draw a pie chart of the distribution of the Earth's water resources.
The Earth's total water resources are 1386 million cubic kilometres, of which 97% is salt water, oceans and seas, while only 3% is freshwater.

Of the 3% freshwater:
- more than two-thirds is glacier, snow or ice cover, which is difficult to access;
- 30% is subsurface water (groundwater, aquifers, karst water), which is also difficult to access;
- only about 1.3% is surface water, of which
  - 87% is freshwater lakes,
  - 11% is swamps, and
  - 2% is rivers.

Thus readily available surface freshwater accounts for only 0.007% of the total water shared by all terrestrial life, including humanity. This value is called the hydrological James Bond ratio. Wonder why!

2. Water is in a continuous cycle in nature, powered by the energy of the sun. Recall your previous studies. Draw a diagram of the water cycle and name the main stages in the process.

WATER QUALITY

Water quality is affected by
- natural processes such as precipitation, solar radiation, atmospheric temperature and geological soil conditions, as well as
- human interventions such as pollutant emissions from activities in catchment areas.

IMAGINE!

IMAGINE!

One day, a group of US researchers discovered that the deep seas off the Arctic Circle were poor in nutrients. They were shocked to find that the case was not unique, as low levels had been measured for years.

During their research they noticed that there were news reports of declining food supplies in Western Europe. Some reported a drop of almost a third.
Could there be a link?

Rainfall that reaches the surface feeds bodies of surface water: rivers and lakes.
- precipitation seeps into the ground,
- is stored as soil moisture, and
- becomes available to plants,
- which absorb it through their roots and use it in their metabolic processes.

Maintaining and improving soil quality is important to preserve the soil's water retention capacity. Plants use water to absorb the nutrients they need.
So our agriculture and food supply also depend on soil moisture.

- What happens if there is not enough rainfall?

In such cases, surface water is used to irrigate agricultural land.

- What happens if too much water seeps into the soil?

If more water seeps into the soil than it can hold as soil moisture, the water will accumulate as groundwater above the first aquifer.

IMAGINE!

IMAGINE!

Obstacles to the renewal of water resources

Groundwater accounts for 80% of Europe's water resources, and its supply depends on both rainfall and geological conditions. Some groundwater systems were formed millions of years ago in a climate with high rainfall, and are not able to renew under current climate conditions. For example, the groundwater system of the Nubian sandstone in the Sahara holds approximately 75,000 km^3 of water, but some estimates suggest it has a renewal time of 75,000 years.

WHAT WE GET FROM THE HYDROSPHERE

REGULATING ATMOSPHERIC CARBON DIOXIDE LEVELS

Algae in the oceans play a huge role in regulating atmospheric carbon dioxide levels. Some of the atmospheric carbon dioxide is absorbed by terrestrial plants, but the majority is captured by marine algae. They use the sun's energy to take in inorganic carbon dioxide from the atmosphere and convert it through photosynthesis into oxygen, which is used in the respiration of plants and animals.

Some of the absorbed carbon dioxide is incorporated into oil, natural gas, coal, limestone and dolomite, and, as a result, the stored carbon dioxide disappears from the material cycle for millions of years. So these tiny organisms reduce the carbon dioxide levels in the atmosphere and keep the greenhouse effect in check, helping to prevent global warming.

DRINKING WATER SUPPLY

IMAGINE!

IMAGINE!

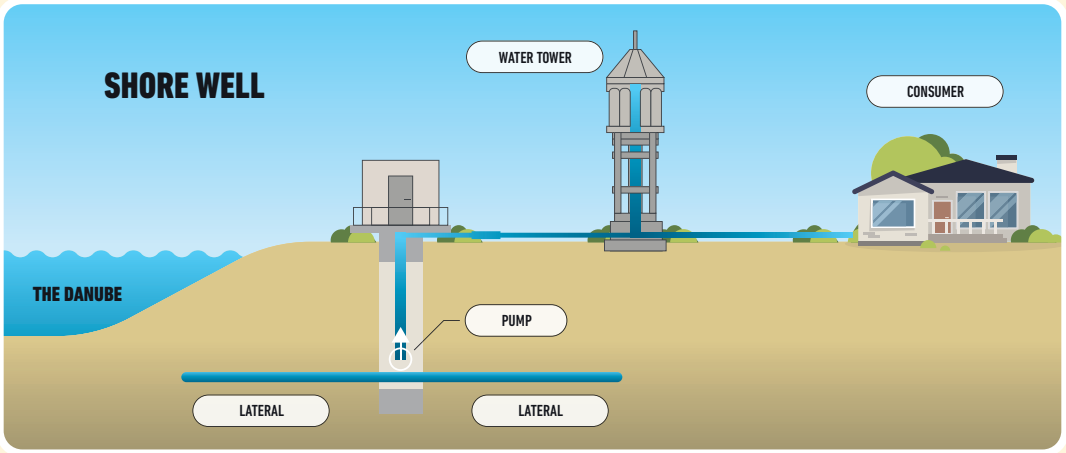
Wells

Dug wells

In dug wells, water was traditionally drawn from the first aquifer. Unfortunately, groundwater – in Hungary too – is heavily contaminated nowadays due to excessive use of fertilisers and pesticides, inadequate sewage treatment or waste pollution. For this reason, we no longer use it for drinking water, preferring instead groundwater collected in the deeper aquifers and water from coastal filtration wells.

Coastal filtration wells

Coastal filtration wells located on gravel terraces close to river beds account for nearly 30% of drinking water production in Hungary. The water passes through a layer of gravel and sand of a few dozen metres thick as it undergoes physical, chemical and microbiological changes and filtration until it reaches the well. The filtration process changes the proportion of organic matter and microscopic organisms in the water, thus improving water quality. The raw water obtained can be used for drinking water after further purification.



Renewable energy source

Water is mostly available to us continuously and is therefore considered a renewable energy source. The movement of water is essentially powered by the sun. Solar radiation causes surface water to evaporate, turn into water vapour and form clouds. The water that condenses in the clouds later falls back to the surface as precipitation, replenishing surface and groundwater supplies. So it is because of the water cycle driven by the sun's energy that we see water as a renewable energy source.

Energy is derived from the movement of water and harnessed in hydroelectric power plants.

Advantages

A relatively stable, more or less predictable performance over the operating period. An additional advantage is that there are no emissions associated with the production of the energy (except for those emitted during the investment and when constructing the power plants).

IMAGINE!

IMAGINE!

The Kisköre hydroelectric power plant was built to control flooding in the Tisza river and supply water to the Great Plain. The project was completed in 1990, and the reservoir is now called Lake Tisza. Today the artificial lake has its own ecological lifecycle, including a bird reserve. As part of the Hortobágy National Park it has been a UNESCO World Heritage Site since 1999.

Disadvantages

Weather conditions affect operation, for example, if rivers freeze in winter in high mountains, the power plants built on them cannot operate.

The ecosystem can be damaged if large areas are flooded, either because of a barrage or by splitting the river habitat upstream and downstream (for example, fish cannot swim up the river to their spawning grounds). With changes in the river flow and water levels in riparian areas, the whole ecosystem and its functioning can be affected, and the lack of gravel supply from the mountains can lead to a thinning of the filter layer and thus impair the river's ability to purify water.

The example of Lake Tisza shows, however, that hydropower plants built and operated with proper planning and attention can also benefit the ecosystem.

IMAGINE!

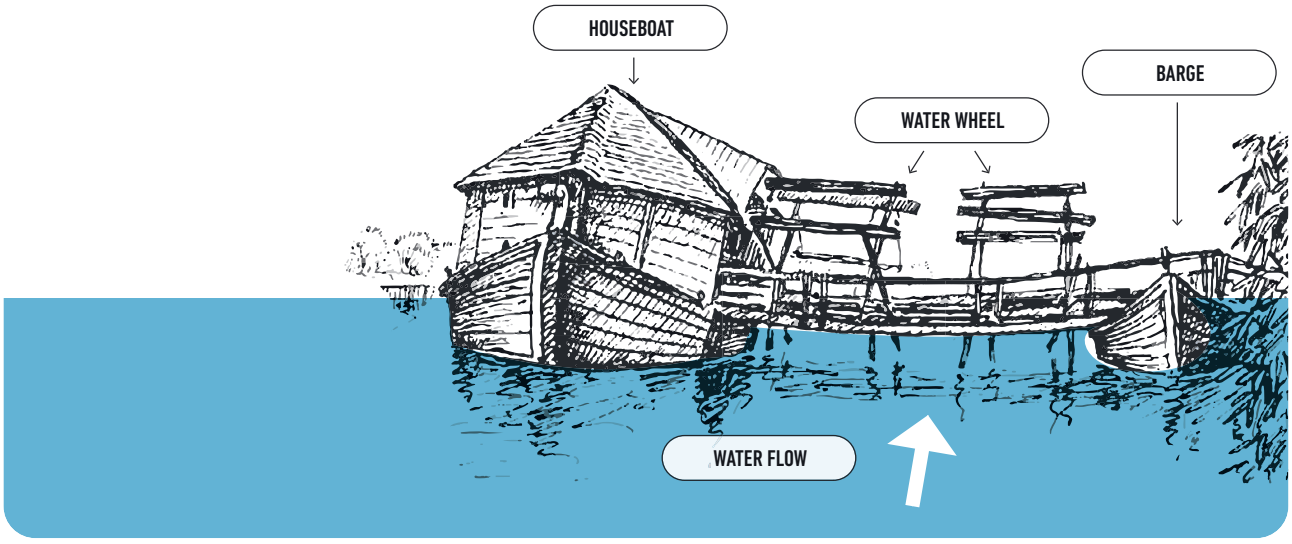
IMAGINE!

What is the difference between a dam and a pumped storage plant?

- If the water of a stream or river is impounded by a dam, potential energy is harnessed from the reservoir when it is drained (hydroelectric dam).
- If the water is pumped upstream, the stored potential energy is converted back into electricity when it is drained (pumped storage plant).

Using the movement of rivers directly

In Hungary, waterwheels were mainly used as mills, and we can still see some of them today.



Ship mill

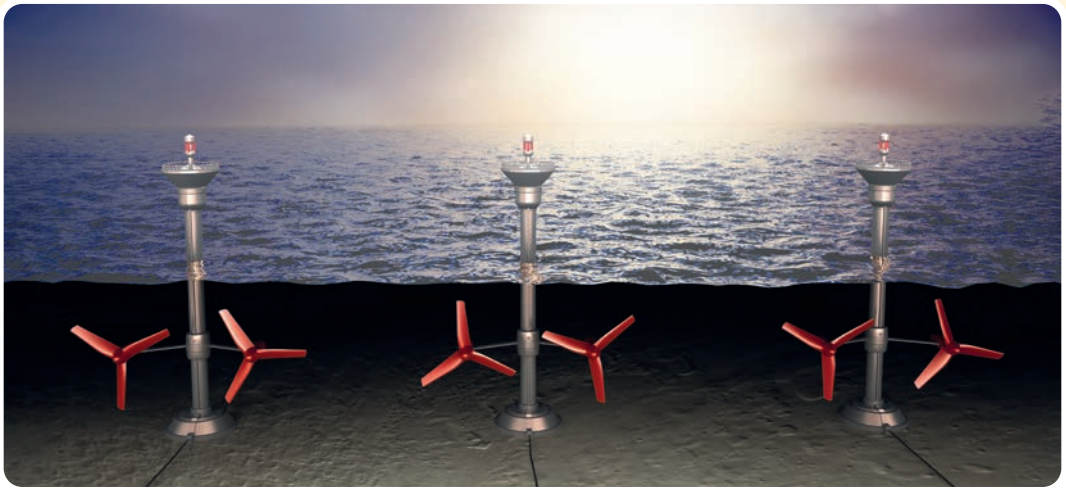
Tidal power plants

It is becoming more and more common to hear of power plants being built on beaches to harness the energy from tides or waves. They use the energy generated by the movement of the water to drive turbines, and also harness the potential energy produced by the difference in height of the water in dams. The flowing water is released through turbines and converted into electricity by a generator.

IMAGINE!

IMAGINE!

The largest tidal power plant on Earth is located in Sihwa Bay, South Korea. Its annual electricity production capacity is roughly 550 GWh (gigawatt hours), or 550,000,000 KWh (kilowatt hours). Approximately 1 KWh can fully charge an average smart-phone 100 times, and the same amount is enough to power an energy-saving light bulb for 50 hours.

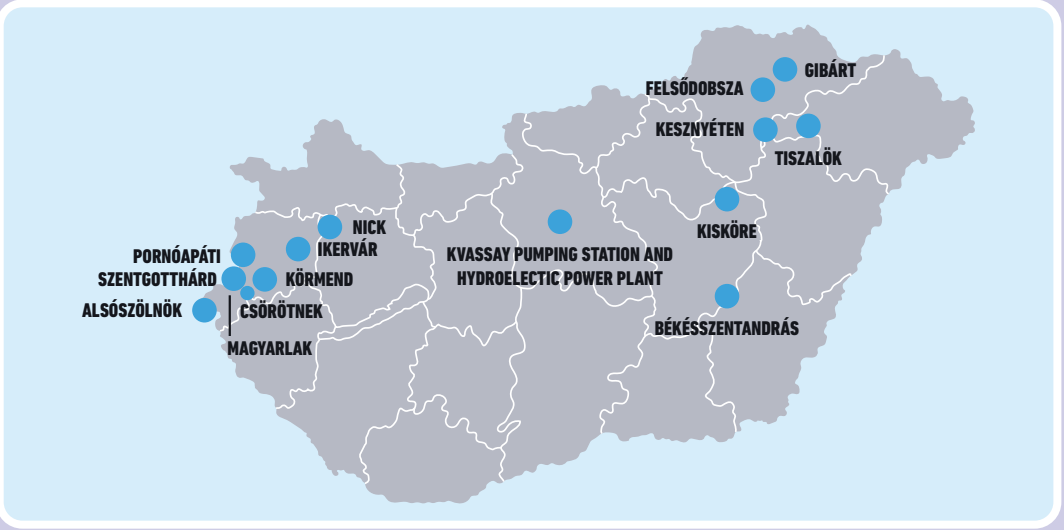


Operation of a tidal power plant

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Find out what opportunities exist in Hungary to harness the energy of water.
2. The map below shows the hydroelectric power plants in Hungary. Which ones are they? Look for photos of them on the internet. Find examples of the economic, social and ecological aspects that might have been, have been and are being taken into account in the design and operation of the plants.



MEDICINAL WATERS

Deep aquifers can be significantly warmer (thermal waters) or contain various dissolved minerals (mineral waters). Hungary has significant thermal water reserves. How could these be used for energy production?

Types of thermal and medicinal waters	Main features	Applications	Geographical location
Thermal waters	20–25°C, average salinity	- - -	Esztergom, Visegrád, Szeged, Miskolc, etc.
Carbonated, acidic waters	Low salt content	Heart complaints	Balatonfüred, Csopak, Kékkút, etc.
Alkaline-bicarbonate waters	Salt content above 1000 mg	Helps with digestion	Zalakaros, Gyula, Nagyatád, Szolnok, Debrecen, Bükkszék
Calcium-magnesium-bicarbonate waters	Rich in salt, carbonic acid	Circulatory disorders	Eger, Balatonfüred, Bük
Chloride waters	Rich in salt	Rheumatic, gynaecological diseases	Sárvár, Nyíregyháza, Győr, Kalocsa
Sulphate, bitter waters	Rich in sodium, magnesium, sulphates	Promotes digestion	Nagyigmánd, Tiszajenő, Alag, etc.
Iron-rich waters	Sodium and sulphate ions	Gynaecological diseases	Parád, etc.
Sulphurous waters	S, Ca, Mg, H, Cl, CO_3 ions	Rheumatic, gynaecological and skin diseases	Balf, Parád, Harkány, Parádsasvár, Mezőkövesd, Erdőbénye
Iodine-bromine waters	Mainly rich in iodine	Musculoskeletal disorders, gynaecological disorders, respiratory and circulatory problems	Hajdúszoboszló, Debrecen, Karcag-Berekfürdő, Kecskemét, Cegléd, Eger, Bükkszék, Mosonmagyaróvár
Radioactive waters	Low in radiotoxicity, do not cause harm	Musculoskeletal disorders, neuritis, after-treatment of injuries, glandular disorders	Hévíz, Eger, Miskolctapolca, etc.

WHAT COULD THREATEN THE HYDROSPHERE?

The effects of climate change – extreme water-related weather events (large amounts of precipitation falling in one area over a short period), storms, flash floods, floods, extreme drought in other places/at another time – have the greatest impact on the hydrosphere.

IF THE OCEANS' CAPACITY TO STORE CARBON DIOXIDE IS REDUCED

If the oceans' ability to sequester carbon dioxide continues to decline due to the warming of waters, this could contribute to an increase in atmospheric carbon dioxide levels, which could further amplify the greenhouse effect and accelerate global climate change.

Why is this?

This is because large amounts of carbon dioxide emitted during the combustion of energy sources are released back into the atmosphere by humans much faster than they were produced or could be re-stored, thereby increasing the greenhouse effect and warming.

IF OCEANS SEQUESTER TOO MUCH CARBON DIOXIDE

There is a risk that the carbon dioxide absorbed will form carbonic acid. The process leads to a shift in the pH of seawater, to acidification, which has a major impact on marine ecosystems. For example, it reduces the photosynthetic capacity of aquatic plants and thereby the quality and quantity of carbon dioxide fixation. Acidification also affects the excretion of calcium carbonate in animals with calcified shells making them more vulnerable due to the weaker, more fragile skeletal material.

DRINKING WATER: THE SCARCE TREASURE

If we use more water than we have available, we talk about water scarcity. The depletion of freshwater resources, namely water scarcity and poorer water quality, causes social, economic and political conflicts. Agricultural irrigation may also be reduced leading to a decline in food production and famines.

IMAGINE!

IMAGINE!

The UN predicts that with the current poor water management standards and population growth projections, access to clean drinking water will be a problem for 3 billion people by 2025, and it could affect up to 5 billion people by 2050.
The average Hungarian citizen uses 200–300 litres of clean drinking water per day, while a North American citizen uses up to twice that amount.

WATER POLLUTION

Water pollution occurs when the water quality is affected to such an extent that the balance of natural processes that maintain the functions of
- surface water or
- groundwater is disrupted or destroyed.

What are the consequences of water pollution? It reduces
- the self-sustainability of aquatic ecosystems and
- the biodiversity of the biocenosis.

IMAGINE!

IMAGINE!

Scientists have studied what threatens the biosphere, i.e. where the consequences of human intervention can no longer be managed safely.

As a result of their research, they identified the disruption of the Earth's natural nitrogen cycle and the nitrate enrichment of water bodies as a critical process, alongside biodiversity loss and climate change.
This is mainly due to two activities:
- **large-scale agriculture, and**
- **the release of human-generated wastewater.**

In agriculture nitrogen fertilisers are often used in excessive amounts in the hope of increasing yields, and the excess is not absorbed by the plants – so it does not contribute to improving yields – it ends up in flowing waters, in groundwater. The other major source of pollution is inadequate wastewater treatment, which results in excess nitrogen from human metabolic waste being released into natural waters, into groundwater.

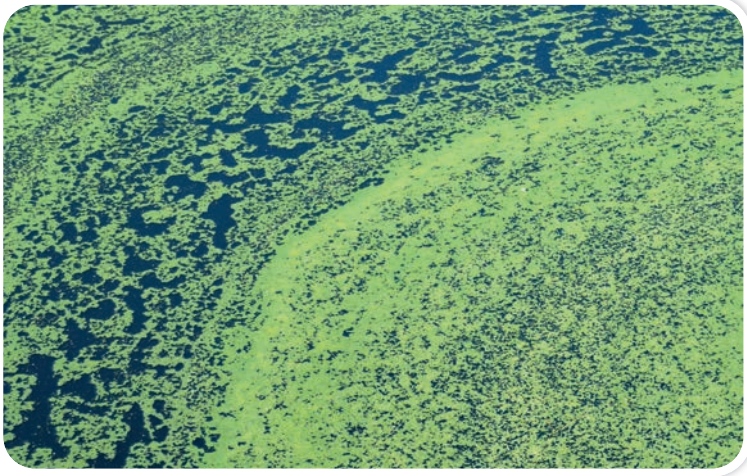
FIND OUT!

FIND OUT!

1. How does smart technology help reduce water pollution?
2. Why is biodiversity the basis of the ecosystem?

WHAT CAUSES NATURAL WATER QUALITY TO DETERIORATE?

The imbalance in the flow of substances in the water is caused by a number of factors, including intensive agricultural activity.



- Changes in natural vegetation cover, for example, due to soil erosion caused by logging or clearing of grasslands.

The nutrient-holding capacity of soils declines, resulting in a leaching of mobile nutrients from plants.
- After entering the food chain, **agrochemicals** (pesticides, herbicides, insecticides) can accumulate in living organisms and damage wildlife.
- Excessive **use of organic and chemical fertilisers** can lead to an accumulation of phosphates and nitrates in natural waters causing an overabundance of nutrients and algal blooms.

Detergents

Detergents used in the household contain large amounts of phosphorus-containing ingredients. The natural environment has a normal level of phosphorus. If this level rises, it can upset the ecological balance, therefore, discharging effluents into natural waters also contributes to the increase in algal blooms.

IMAGINE!

IMAGINE!

We talk a lot about the importance of phosphorus. Why do we need it? And where do living organisms get it?
Phosphorus is needed for bones, it is part of the hereditary material in cells, and it is necessary for plants to flourish.

How do organisms get this important building material?
Animals get it from water and plants. Phosphates are released from the remains of dead organisms by bacteria, which settle in the water. They pass through the food chain into the bodies of fish, then birds and back onto land.

Thermal pollution

Factories most often use water from rivers, then return the industrial water with pollutants to natural waters. Industrial cooling water results in a change in natural water temperature. This is called thermal pollution of water.
What happens as a result of thermal pollution?

- When water gets warmer, dissolved oxygen levels decrease leading to intensified anaerobic processes, which cause the accumulation of toxic substances.
- Decreasing water temperature results in a slowdown in the life processes of living organisms and has a major impact on fish populations.
- The concentration of suspended solids (various water-insoluble particles such as clay minerals, bacteria, plankton) increases. They affect the life activities of photosynthetic organisms, and therefore interfere with self-cleaning processes. When deposited on the substrate, these suspended solids disturb the life of microbes living there and can even damage fish gills.
- The warming of the seas is caused by carbon dioxide being released into the atmosphere during combustion much faster than it was produced or could be re-stored, thereby amplifying the greenhouse effect and warming. If the oceans' ability to sequester carbon dioxide continues to decline due to the warming of waters, this could also contribute to an increase in atmospheric carbon dioxide levels, which could further amplify the greenhouse effect and accelerate global climate change.
- The impact of seas and oceans on climate change is also significant. The water's high heat capacity cools the coastal areas in summer and warms them in winter, while the high humidity of the air contributes to the frequent and abundant rainfall. The warming of the seas, however, alters the Earth's water cycle and increases the amount of water vapour in the atmosphere.

What does too much water vapour in the atmosphere cause?

Water vapour in the atmosphere that is **too high** leads to intense thunderstorms in some areas, while severe droughts are a problem towards the centre of continents. The warming also raises the average temperature of rivers and lakes.

Less precipitation and lower water yields deteriorate water quality, which can disrupt freshwater ecosystems.

Radioactive pollution

Radioactive pollution is mostly caused by the release of isotopes into water from nuclear power plants, research or medical laboratories. Radioactivity makes living organisms sick or dead.

Oil pollution

The contamination mainly involves the release of petroleum and its derivatives into the water, most often from ship or rig accidents. Due to its physical and chemical properties, the oil floats on the water surface and blocks the path of light and oxygen.
Pollution can cause

- oxygen depletion in aquatic organisms;
- bacteria to contaminate water with toxic substances during their anaerobic processes;
- an imbalance in the aquatic ecosystem resulting in the destruction of the biocenosis.
- Oil pollution is harmful not only to aquatic animals, but also to birds that feed on water. By forming a coating on their plumage, it adversely affects their ability to fly.

Plastic waste pollution

Society's awareness of the vast amount of marine plastic waste has been raised by whales washing ashore with plastic bottles in their bellies, turtles entangled in plastic packaging and marine life suffering from various single-use plastics.
The problem is not only about visible pollution, but also about the spread of *microplastic* particles from plastics through physical and chemical decomposition. These tiny particles enter the groundwater, but also the natural material cycle, and even affect animal and human organisms. Microplastics in the body reduce reproductive capacity and can even cause disease by being incorporated into the genetic make-up. Recent research has shown that microplastics are often harmful not only on their own, but also due to other toxic substances that easily associate with them.

Air pollution causes water pollution too

When energy sources and fuels are burned, carbon dioxide and other harmful combustion products are released into the air, polluting not only the atmosphere but also rainwater.

- Nitrous oxide and sulphur dioxide molecules react with the water content of the air forming various toxic acids, which fall to the ground by precipitation.
- Acid rain damages the roots and leaves of plants.
- Acidic precipitation leaches into the soil where it stimulates the leaching of certain heavy metal compounds from the soil, which damage biodiversity as they enter groundwater and eventually rivers and seas.

FIND OUT!

FIND OUT!

Using the data in the table, compare the water requirements of each industry. Which industries require the most water?
Water consumption of Hungarian industry:

Industry	Cooling water demand	Technological water demand	Industrial drinking water, bathing water and other non-industrial water demand
	1000 m^3/day		
Electricity	8,700	290	210
Organic and inorganic chemistry	830	79	22
Metallurgy	610	68	50
Paper industry	7	262	3
Sugar industry	107	254	9
Coal mining	10	75	34
Petrochemical industry	92	20	3
Other industries	564	412	289
Industry total	10,920	1,460	620

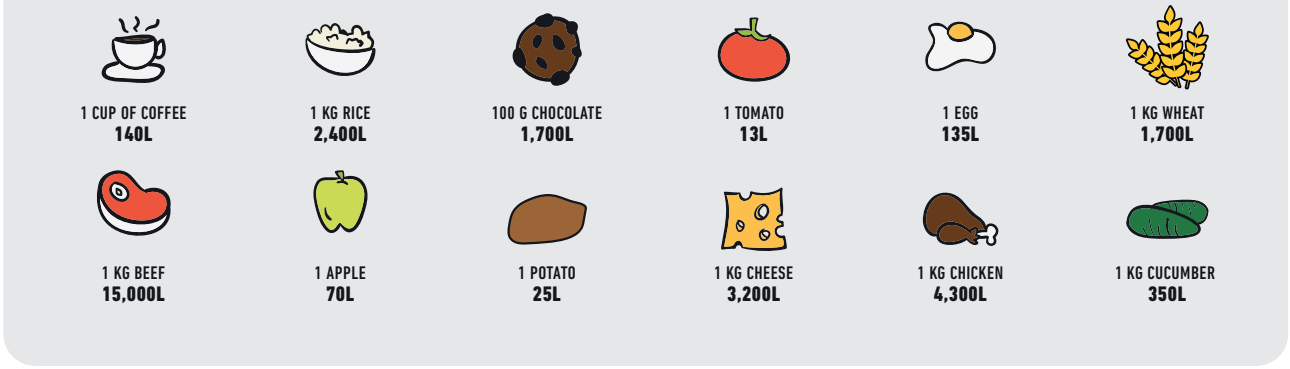
WATER USAGE METRIC: WATER FOOTPRINT

The ecological metric for expressing water use is termed water footprint. This refers to the total volume of water used and polluted over a given period. It can be calculated for a person, a household, a city, an industry or an entire country. But a water footprint is not just about direct water consumption, it also includes all the goods and services that require water to be produced and used. This means that while the direct daily water consumption of a user considered frugal is between 100 and 120 litres, the indirect water consumption can be many times higher, up to several thousand litres per day.

FIND OUT!

FIND OUT!

Germany is considered frugal as regards water consumption. The average direct water consumption there is 120 litres per person per day, but total water consumption reaches 5,000 litres due to indirect consumption.

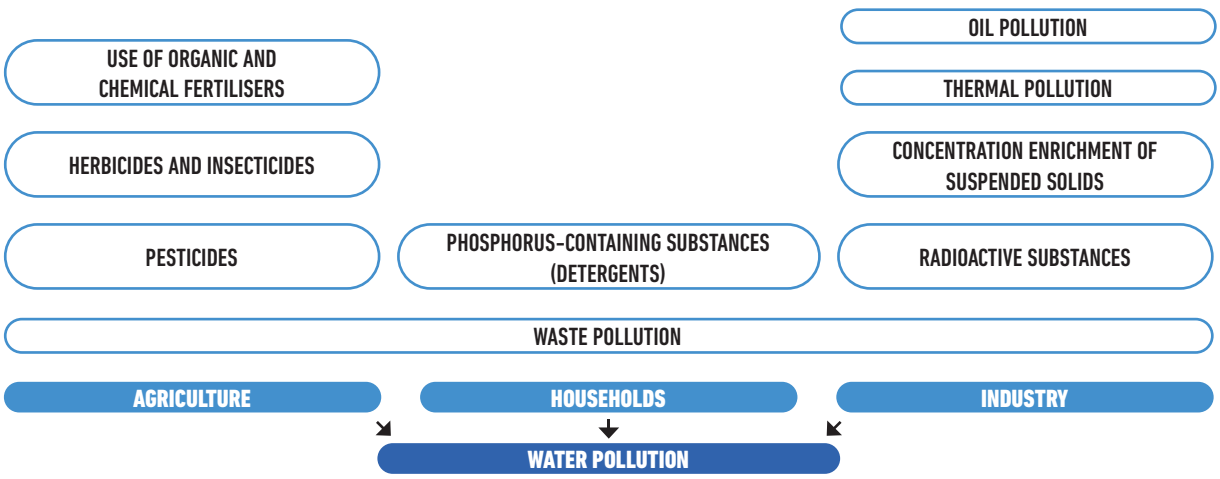


Water footprint of food

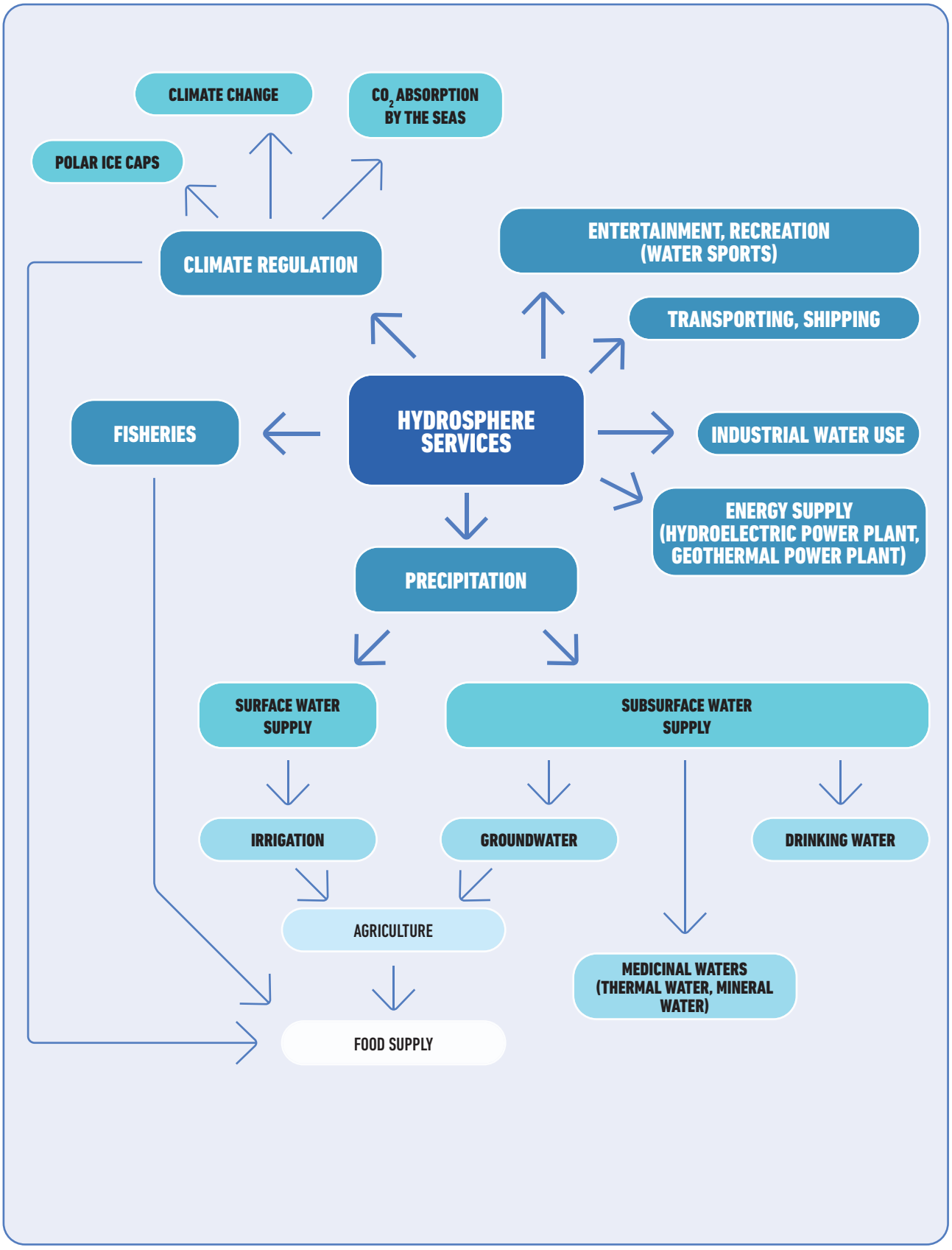
A water footprint consists of green, blue and grey water.

- **Green water** refers to the amount of rainwater stored in the soil.
- **Blue water** represents the amount of fresh water used to produce certain goods and services, while
- **Grey water** refers to the polluted water used to produce certain goods and services.

TYPES OF POLLUTANTS



OVERVIEW


CLIMATE CHANGE
CO_2 ABSORPTION BY THE SEAS
POLAR ICE CAPS
CLIMATE REGULATION
ENTERTAINMENT, RECREATION (WATER SPORTS)
TRANSPORTING, SHIPPING
FISHERIES
HYDROSPHERE SERVICES
INDUSTRIAL WATER USE
ENERGY SUPPLY (HYDROELECTRIC POWER PLANT, GEOTHERMAL POWER PLANT)
PRECIPITATION
SURFACE WATER SUPPLY
SUBSURFACE WATER SUPPLY
IRRIGATION
GROUNDWATER
DRINKING WATER
AGRICULTURE
MEDICINAL WATERS (THERMAL WATER, MINERAL WATER)
FOOD SUPPLY

HOW DO ECOSYSTEMS WORK?

As already discussed, a system is a group of different units whose elements interact with one another. The elements of a system are connected by certain rules, with different dependencies between them. This means that any external effect on one element will also affect the other elements of the system.

IMAGINE!

IMAGINE!

What's wrong with Dave moving away?

Jack runs a family farm. Each member of the family has different tasks. Jack gets the customers and delivers the produce himself. Dave runs the machinery, and Margaret looks after the plants and manages the workers. Michael does the sales and bookkeeping, Mary takes care of the family, cooks, does the washing and the shopping. One day Dave announces that he will get married and move away.

Why is it a problem if one element of a biocenosis disappears?

Just like Dave's departure disrupts the family farm – or even makes its operation impossible if there is no solution – so an ecological community breaks down as a result of an external influence for example.

Ecological community (biocenosis) as a system

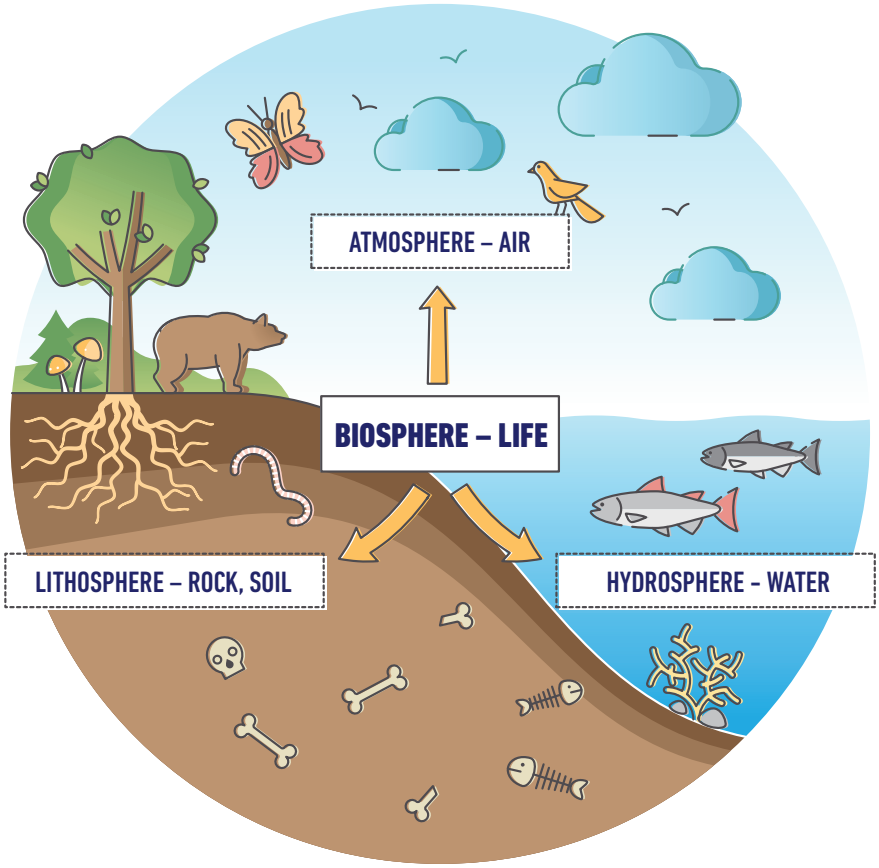
Dave's family is also a small system as all the elements (family members) interact with each other. The work of one family member depends on the other, and each of them has their own tasks. The moment one element (Dave) leaves this system, the system either breaks down or adapts to the new situation. For example, a new employee is hired, or Dave's tasks are divided among the family members.

THE BIOSPHERE IS THE THEATRE OF LIFE ON EARTH

Life on Earth is thought to have begun more than 3.5 billion years ago. From this time onwards, evolutionary processes gave rise to living organisms on the ground, in the air and in the water, i.e. in the biosphere.

The *biosphere* is described as all the environments in which plants, animals, fungi or even single-celled organisms, i.e. living things, exist. Over millions of years, living organisms and their environment have become closely interconnected and function as one complex system.

Parts of larger systems act as smaller systems, and vice versa, smaller systems themselves make up parts of larger systems. The interaction between different systems results in dynamic material and energy flows, which are the basis and condition for our life on Earth.



Biosphere – theatre of life on Earth

Unity of living organisms and their environment

Living organisms depend on each other and their environment because they are in constant interaction with their habitat. An ecosystem includes all the living and non-living factors that make up living organisms and their immediate environment, as well as the system of relationships between them.

They function through

- the food web of living organisms, and
- *biogeochemical* cycles, the material and energy flows between living organisms and their non-living environment.

An ecosystem works well when multiple organisms are involved in the cycles. In other words, *biodiversity* is the basis for the functioning and stability of ecosystems. Biodiversity describes not only the variety of species, but also includes genetic diversity, the diversity of ecosystems and the interactions between the organisms living in them.

Biodiversity takes many different forms such as deep-sea, steppe, forest, desert, savannah or high mountain ecosystems. This diversity includes everything from blue whales to the Great Tit, red pines, poppies, corals and the Rosalia longicorn, and even the smallest micro-organisms. The more diverse the organisms are in an ecosystem, the more secure the ecosystem's functioning is.

All the organisms involved are important for food chains and dynamic material and energy flows because they keep ecosystems alive. However, it is not only species diversity but also the number of individual species that are important in maintaining this. This is why the decline in population numbers over recent decades is a cause for concern. Biodiversity provides us with clean air, drinking water, good quality soil and many other conditions for life. Ecosystems ensure the interaction of living organisms with each other, so the loss of any species has a serious impact on the food chain.

Examples of diverse Earth-based ecosystems

Deciduous forest

Saline steppe

Mediterranean

Desert

Deep-sea marine life

What does hippo wallowing have to do with bushmen starvation?

The ecosystem of the Okavango region in southwest Africa is sustained by the periodic flooding of the Okavango River.

The river is unique in that it does not flow into water, but into the Kalahari Desert. The river delta is home to seven national parks. The Kalahari Desert absorbs an estimated 11 billion m3 of water per year, which is transported by the Okavango.

Okavango Delta

Hippos, buffaloes and elephants live there and play an important role in maintaining the river delta's ecosystem.

How do hippos preserve the ecosystem?
Hippos migrate and wallow in flooded areas
- forming channels that
- turn into swamps and lagoons.

Lagoons are home to an abundant and diverse fish fauna, which is the basis for feeding the local population. The habitats of hippos, however, are under serious threat. The area has been affected by increasingly severe droughts for years, and the water from the delta is used to irrigate local farms and supply water to villages.

FIND OUT!

FIND OUT!

1. Describe the Okavango Delta as a system (elements and their interactions).
2. If we consider hippos as an element of the system, how does the destruction of their habitat affect the other elements of the system?

SERVICES OF THE ECOSYSTEM

Well-functioning ecosystems are essential for life on Earth, as they play an important role
- in the vital carbon and water cycles,
- in the cycling of elements such as nitrogen, phosphorus and sulphur,
- in regulating atmospheric oxygen and carbon dioxide levels, and thus
- helping to control the climate.

Balanced ecosystems provide social and economic conditions for our lives, collectively known as ecosystem services.

Types of ecosystem service:

Provisioning services:
- water,
- food,
- raw materials and other resources.

Regulatory services that maintain the interactions between the spheres:
- water cycle,
- air quality regulation,
- global climate regulation,
- pollination of plants.

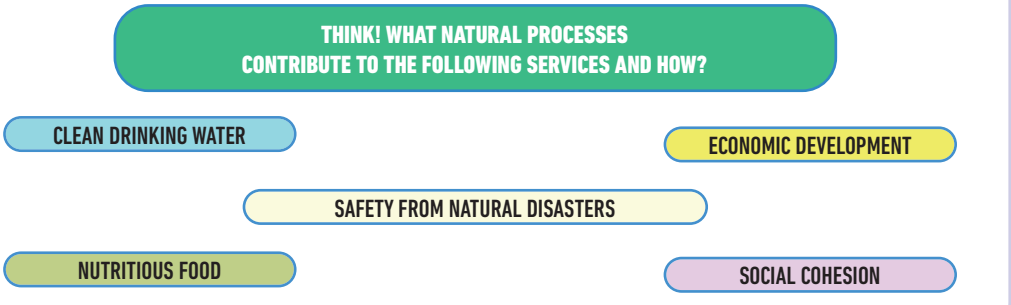
Supporting services:
- maintaining the continuity of material and energy flow, for example by photosynthesis or the cycling of various organic and inorganic substances.

Cultural services:
- offering possibilities for relaxation and recreation, which contribute to our mental and physical health.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Give specific examples of each type of service.



IMAGINE!

IMAGINE!

How was the concept of ecosystem services born?

Until it became clear that environmental degradation could have serious socio-economic consequences, politicians and businessmen paid little attention to the issue. Ecosystem services, however, can be described and measured in economic terms. The importance of protecting natural resources has thus become understandable even for sceptics. With the introduction of ecosystem services the economic benefits of ecosystems and biodiversity can now be measured, and the use of natural resources can be included in economic calculations. This has enabled ecological considerations to be taken into account in economic decision-making.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. How tangible are ecosystem services in your daily life?
2. Make a flow chart of the impact on our daily lives if bees, our main pollinating insects, were to disappear.

ECOSYSTEM ACTORS

An ecosystem is a system of relationships between living organisms and the inanimate creatures that surround them.

Ecosystem components

- inanimate environmental factors (abiotic components) and
- living organisms (biotic factors).

All living organisms have a specific role to play in maintaining ecosystems; there are no redundant species.

Adaptation and survival

Since the emergence of life, ecosystem actors have varied over time – species have appeared and disappeared. Despite these changes, ecosystems have remained dynamic for millions of years thanks to the *ability of organisms to adapt* to their living and non-living environments.

"Who" are ecosystem engineers?

Species constantly influence ecosystems, and affect their functioning to varying degrees. Some species can have a wider impact on the lives of many other organisms in their environment, so they are called ecosystem engineers. They can maintain or modify their environment through their activities, and some can even change ecological communities to the extent of destroying habitats or even creating new ones. Examples of such ecosystem engineers include beavers, giant armadillos, steppe marmots, elephants and red swamp crayfish.

IMAGINE!

IMAGINE!

Learn about the work of ecosystem engineers.

Beavers influence the flow of rivers and modify riparian areas by building lodges and dams. Their activities help increase the oxygen supply to bodies of water.

The burrows dug by giant armadillos provide feeding, resting or hiding places, and even temporary homes for many animals.

Steppe marmots, also known as bobak marmots, build colonies and forts with large burrow systems. They build flat or mounded burrows covered with a variety of steppe vegetation.

Each species of grass is also linked to the built burrow and the eating habits of the group.

Elephants keep the vegetation of savannah grasslands in check by clearing smaller trees and bushes, which plays an important role in maintaining the food chain.

They also help to spread plants by scattering fruit seeds in their droppings.

The red swamp crayfish digs burrows in the swamp, loosening its structure, improving its oxygen supply, and thereby contributing to the efficient use of nutrients by the mangrove.

IMAGINE!

IMAGINE!

Awesome animals!

In Yellowstone, North America, the grey wolf population declined dramatically in the late 1990s as a result of hunting. In 1995 an attempt to reintroduce wolves yielded a much more interesting result than expected. Elk, the primary prey of wolves started to decrease in numbers.

The surviving elk became more vigilant, and avoided areas where they could easily fall prey to wolves. In the past, meadows were a good hunting ground for wolves as they had a good view of the area and most of their prey was taken there.

The absence of grazing herds of elk gave vegetation in these meadows a chance to grow rapidly, with the emergence of many species of herbaceous and woody plants and a blooming biodiversity. This nourished insects, which reproduced rapidly, feeding birds that appeared in the area. Mammals such as beavers, of which only a few have been seen by biologists for years, were also thought to be back in the park. Beavers are known to engineer wetlands, and the beaver dams they build have led to the introduction of otters, muskrat species and many reptiles.

Wolves are able to live in a wide range of habitats, and their presence has a major impact on biocenoses. In the absence of natural predators in the forests of the Carpathian Basin, they function as apex predators along with bears, influencing the populations of their prey animals through hunting.

Wolves prey mainly on large herbivores, especially deer, roe deer and wild boar. When hunting, sick and weak prey animals are at a disadvantage compared to healthy, agile specimens. Thus they have a major impact on herbivore populations by amplifying natural selection.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Why is a wolf an ecosystem engineer?
2. Find more articles and videos about the Yellowstone wolves. What impact has the reintroduction of the wolf pack had on the environment?
   a) How have wetlands changed?
   b) What impact have they had on vegetation?
   c) Has the extent of soil erosion in the area changed?
   d) How has the resurgence of the grey wolf affected different animal populations?
3. A few years ago the grey wolf reappeared in Bükk, Hungary. How does the spread of the wolf in Hungary's forests affect the functioning of the ecological community?

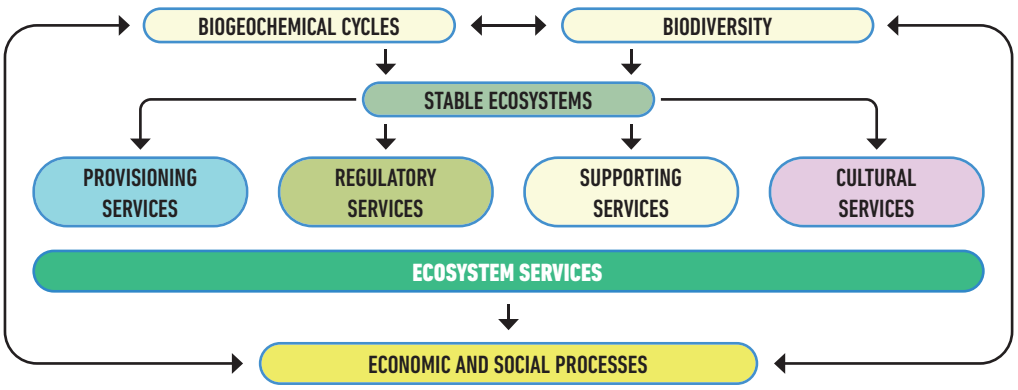
- Research in Slovakia has shown that wolf colonisation is associated with a reduction in the spread of swine fever. Wolves usually hunt sick, injured animals, thereby contributing to the health of the wild population.
- Due to long, dry summers caused by climate change, Spain is being increasingly hit by forest fires, with tens of thousands of hectares of forest being consumed by fire every year. Forest fires are forecast to become an ever greater threat to the country every year. According to Greenpeace's wildfire prevention campaign, the growing population of European bison could be the solution to the problem.

European bison

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Explain the illustrated processes.



Palm oil and rainforests

IMAGINE!

There are several campaigns underway to encourage traders to sell more palm oil-free products. However, it has also been found that palm oil alternatives can also be environmentally harmful. This also shows that you cannot look at a system element on its own, you also have to see what will take its place.

FIND OUT!

1. What is wrong with palm oil?
2. Check your fridge and pantry at home. Collect products that contain palm oil.

COPING, ADAPTING: Resilience

The stability of ecosystems not only means balanced functioning, but also adaptation to external influences, durability, and the capacity to renew. This capacity is called **resilience**.

Loss of biodiversity leads to changes in the networks and relationships between living organisms, which in turn reduces the resilience of ecosystems. In this case, ecosystem services are also likely to change.

The decline in species and numbers affects not only animals but also plants. The more diverse and species-rich a grassland is, the more stable its ability is to store carbon dioxide and produce oxygen. Research proves that degraded areas, damaged plant communities and grasslands disturbed by introduced species cannot provide the same services on a stable basis. It is also worth knowing that the living world and the Earth would change anyway without humans, but at a slower pace. Ecosystems function well by being able to respond to varying degrees of disruption in the harmony, which constantly characterises their operation.

IMAGINE!

Convention on Biological Diversity
In 1992, the United Nations Conference in Rio de Janeiro adopted the Convention on Biological Diversity, which is currently the highest global policy statement on the relationship between humans and nature. The Convention aims to promote the conservation of biodiversity by safeguarding species and genetic diversity. Each member state has made commitments to implement species and habitat conservation measures, reduce adverse impacts, launch research and training programmes and introduce technological innovations. The countries have also developed individual plans tailored to local conditions and circumstances, which are summarised in National Biodiversity Strategies.

NOW IT'S YOUR TURN.

1. What does biodiversity give us?
2. What is the impact of deforestation on us?
3. We often try to balance deforestation with artificial reforestation. In many cases, this involves disturbing natural biocenoses such as ancient grasslands with stable carbon sequestration capacity or species-rich wetlands. Consider the pros and cons of afforesting ancient grasslands or wetlands.
4. What can we do to reduce the area needed for livestock farming?

Little doc in my small garden

Of course, there is much we can do ourselves. For example, try to plant native species in your garden and choose plants that support each other, preferably as many as possible, to increase the diversity of your garden. When tending the garden, make sure it doesn't turn out sterile. Protect flowering plants by pruning around them.

Regular weeding of invasive species should also be part of the maintenance routine. Since the seeds of these invasive species stay viable in the soil for a long time, they become difficult to eradicate and therefore need continuous weed control. For more on organic farming, see the next lesson.

Red List

The **IUCN** (*International Union for Conservation of Nature*) was established in 1948 to protect natural values and biodiversity. The international organisation's Red List is a very important indicator of the world's biodiversity.

The list is compiled on the basis of careful observations, data collection and analyses by thousands of researchers, and is an excellent example of professional cooperation and collaboration in the natural sciences.

There are many success stories thanks to *conservation* and *habitat restoration* actions.

Giant pandas

Giant pandas, leopards, tigers and elephants

Thanks to years of efforts, energy and resources, the giant panda has been removed from the IUCN Red List of Threatened Species, and, although it remains vulnerable with nearly 1,800 animals, the result is of immense value.

The conservation programme has contributed not only to the population growth of giant pandas in China, but has led to an increase in the number of Amur leopards, Siberian tigers and Asian elephants too.

Iberian lynx

Iberian lynx

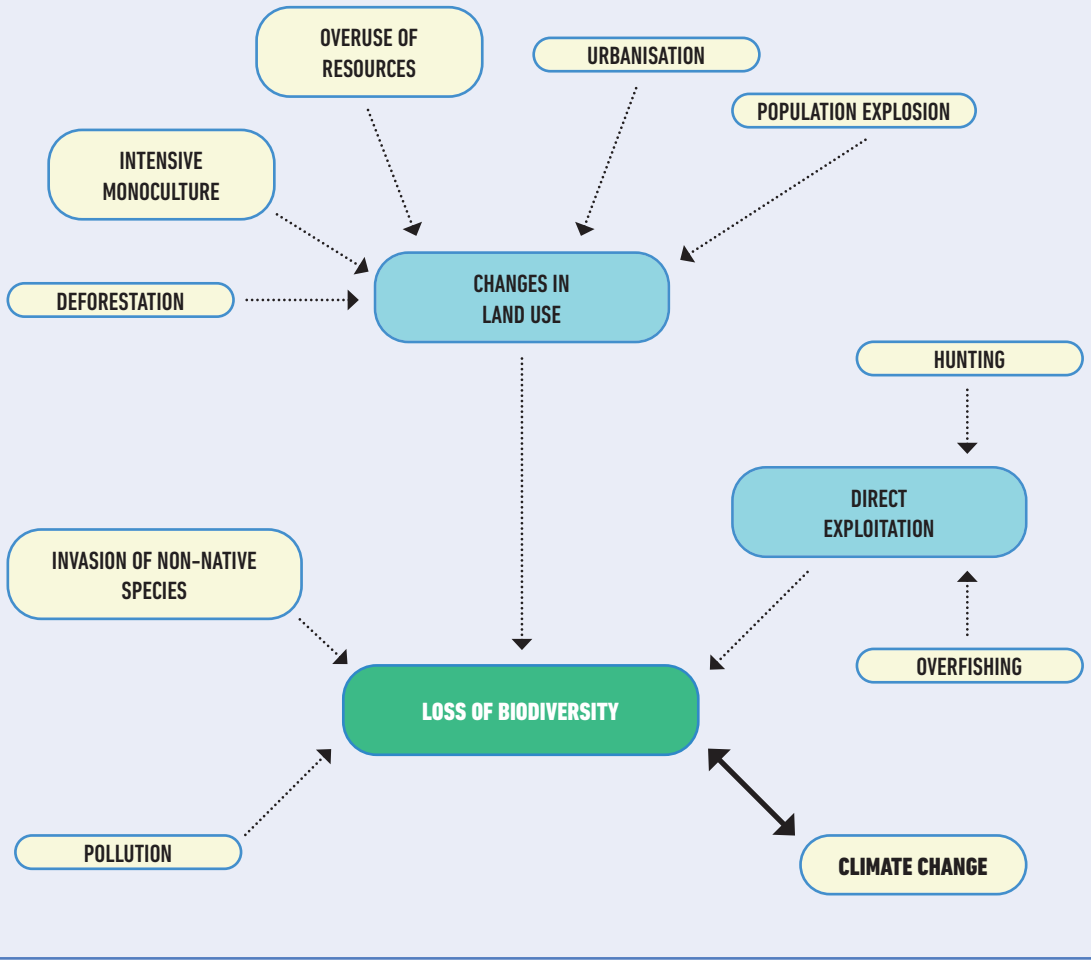
The wild population of the Iberian lynx almost became extinct about 20 years ago as a result of habitat conversion, the decline of their prey animals, an increasingly intensive human presence and large-scale hunting.

The population numbers decreased significantly, so the Iberian lynx was added to the Red List of Threatened Species. As a result of conservation programmes, reintroduction campaigns and international cooperation, surveys today paint a very optimistic picture of the species' future. In Spain, there were only 94 animals in 2002, but by 2019 the number had increased to 855, and the population growth is still encouraging according to researchers. If this trend continues in the future, the Iberian lynx could be removed from the Red list.

OVERVIEW

A SPECIES IS CONSIDERED THREATENED WITH EXTINCTION IF AT LEAST ONE OF THE FOLLOWING STATEMENTS IS TRUE.

- ITS HABITAT IS LIKELY TO BE SEVERELY DEGRADED
- TOTAL POPULATION SIZE IS LESS THAN 250
- NUMBER OF BREEDING ANIMALS IS LESS THAN 50
- THE SPECIES IS UNDER COMMERCIAL EXPLOITATION
- DECLINE IN NUMBER OF SPECIES OVER THE LAST 10 YEARS IS MORE THAN 80%
- ESTIMATED DECLINE IN NUMBERS OVER THE NEXT 3 YEARS OF MORE THAN 25%
- HAS A SINGLE HABITAT OF LESS THAN 100 KM²



ON THE TRAIL OF LOCAL ECOSYSTEMS

IMAGINE!

IMAGINE!

Pizarro – with potatoes under his arm

In the 15th century, great exploration ships set sail from the ports of Europe under Spanish, Portuguese, English and Dutch flags. Amid the great power rivalry, a Spanish conquistador named Pizarro was the first to land in the Inca Empire. In his travel diary he made interesting notes on the dietary habits of the Inca village communities. The indigenous people dug up and consumed the underground tubers of a hitherto unknown plant, the potato.

It transpired that the plant had been grown and consumed by indigenous peoples in Peru and Chile for thousands of years. No wonder, since the underground tuber was rich in starch and provided an excellent source of nutrients. The captain really liked the new plant, so Pizarro didn't hesitate to grab a big sack of potatoes before setting off, and brought them back to Europe. So it was that by the 1600s potatoes were already being consumed and grown in many European countries.

NATIVE OR ALIEN?

In the Age of Discovery, European travellers brought many new species from newly discovered lands, and introduced them to Europe. These included not only crops but also those that altered natural plant communities. Examples in Hungary include the Carolina water-shield, American pokeweed, giant knotweed, ash-leaved maple, Russian olive, silkweed, Canadian goldenrod and the common lilac.

American pokeweed

Endemic and invasive species

Plants that are native to a habitat are called indigenous or endemic species. They have adopted their lifestyle and dispersal strategies in competition or cooperation with many animal and plant species, successfully adapting to the constantly and slowly changing conditions. However, they are less able to cope with sudden changes in their immediate environment, such as the presence of a new invasive plant.

What makes invasive species invade?

In the absence of natural enemies in the new habitat, the invasive species spread fast because, unlike indigenous species, they tend to adapt easily and quickly to changing environmental conditions, although not always and under all circumstances. For example, some invasive species spread in wetlands, while others prefer drier areas. They display rapid adaptation and also have an aggressive dispersal strategy. Without natural enemies in the case of animals, or natural pests for plants, they can reproduce rapidly and therefore invade a habitat over a relatively short period.

This is why they are called invasive or invading species. By rapidly conquering a new ecosystem, they often displace native, indigenous species. However, while a species may be considered native in some habitats, it may also act as an invasive species when introduced into other ecological communities. For example, the common starling and the carp, which are indigenous in Hungary, are invasive in the Americas and in Australia respectively, displacing native species.

So not all invasive species can be considered evil aliens, but each species is most useful in the environment in which it has lived for millions of years, taking on an irreplaceable ecological role. Human activity has a major role to play with introducing species into new areas, so we have a great responsibility.

IMAGINE!

IMAGINE!

A textbook example of invasive plants is ragweed. Spreading intensively and transforming ecological communities, ragweed not only reduces biodiversity, but also has economic and social impacts.

It leads to a reduction in crop yields on arable land, as it outcompetes crops for nutrients and water, causing significant economic damage to agriculture. It also has significant human health and social implications: its pollen causes allergic reactions. Allergic diseases, increased health costs or less efficient work have serious economic consequences, not to mention that eradication is also costly for society. Ragweed, however, is an exception in some ways because it mainly spreads in areas disturbed by humans. Once human encroachment ends, it will decline over time. This is not true of all the invasive species.

FIND OUT!

FIND OUT!

What domestic measures have been successful in reducing the spread of ragweed?

ALIEN SPECIES

Not only plants have been introduced by humans, but animals too. There are many alien animal species in Hungary.

IMAGINE!

IMAGINE!

Here are some examples of non-native species:
Invertebrates: The signal crayfish, the harlequin ladybird, the Colorado beetle, the western corn rootworm, the fall webworm, the Japanese silk moth, the Spanish slug and the zebra mussel are not typical Carpathian Basin species.
Vertebrates: Fish such as grass carp, brown bullhead and rainbow trout, birds such as pheasant and mandarin duck, while mammals such as fallow deer and European mouflon are all invasive alien species.

IMAGINE!

IMAGINE!

The oak lace bug that has recently appeared is attacking hundreds of hectares of oak forest native to Hungary. The insect reduces the evaporation of plants and hinders the functioning of oak ecosystems. As an invasive species it has no natural enemies in Hungary, so it is free to breed and destroy our oak forests.

Oak lace bug

The spread of alien species can also affect the quality of our food. In Hungary, new pests and diseases are typically introduced by species from Mediterranean areas, to which the native plants are vulnerable.

One solution adopted by many farmers is to use insecticides and poisons, but these species can also be controlled without chemicals. By eradicating, frequently cutting back and mowing invasive plants, we can prevent the formation of crops and seeds and thus hinder their further reproduction. Insect pests can be controlled by planting plants that act as a deterrent (e.g. onions, marigolds). There are also eco-friendly pesticides such as nettle juice or baking soda solution, which can help to control newly emerging pests, such as various heteroptera species.

FIND OUT!

FIND OUT!

1. What does the term controlled organic farming mean?
2. Why is it important to buy local food?

IMAGINE!

IMAGINE!

What makes an organic product organic?

What is a real organic product?

- it has been produced under controlled conditions,
- free from fertilisers and synthetic, toxic substances,
- its nutrient supply is organic,
- crop pests are also killed mechanically,
- it has been sprayed with products of natural origin and authorised for organic farming, which are easily washed off with water.

The volume of products produced in this way is lower (due to lower yields) than their chemical-treated counterparts, and their production is more expensive. Fortunately, the yield gap between organic and conventional farming is steadily narrowing both because the size and efficiency of organic farms is increasing and organic farming technology is also improving rapidly. We can therefore hope that prices for organic products will fall in the near future.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Do you remember the adverse effects on soil quality of using too much fertiliser?
2. What happens to the inorganic nutrients that get washed away from the soil?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. What protected plants and animals live near where you live?
2. Check out your neighbourhood.

IMAGINE!

IMAGINE!

Nature is also a great source of ideas. An idea adapted from nature is called biomimicry. Examples of imitating nature are sailing boats using shark skin technology or Velcro designed like a thistle that sticks to clothes.

The lotus and the aeroplane

One of the finalist teams in the Climate Launchpad start-up competition was inspired by the water-repellent properties of the lotus flower. This led them to invent a material that prevents water from sticking to aircraft, thus preventing ice formation.

This is a great idea because it reduces the weight of the aircraft significantly, which not only lowers the CO_2 emissions of the aircraft, but also makes flying more cost-effective. Biomimicry, the inspiration of nature, can therefore be of environmental, social and economic importance. Why not apply practices widely that have been successfully proven in nature?

The gecko and glues

Geckos have millions of microscopic hair-like setae arranged in lamellae on their toe pads. An adhesive force occurs between the setae and the surface, which in effect sticks the animal to the surface. The force is so strong that the gecko can only lift its feet little by little, gradually separating its pads from the surface by curling its toes.

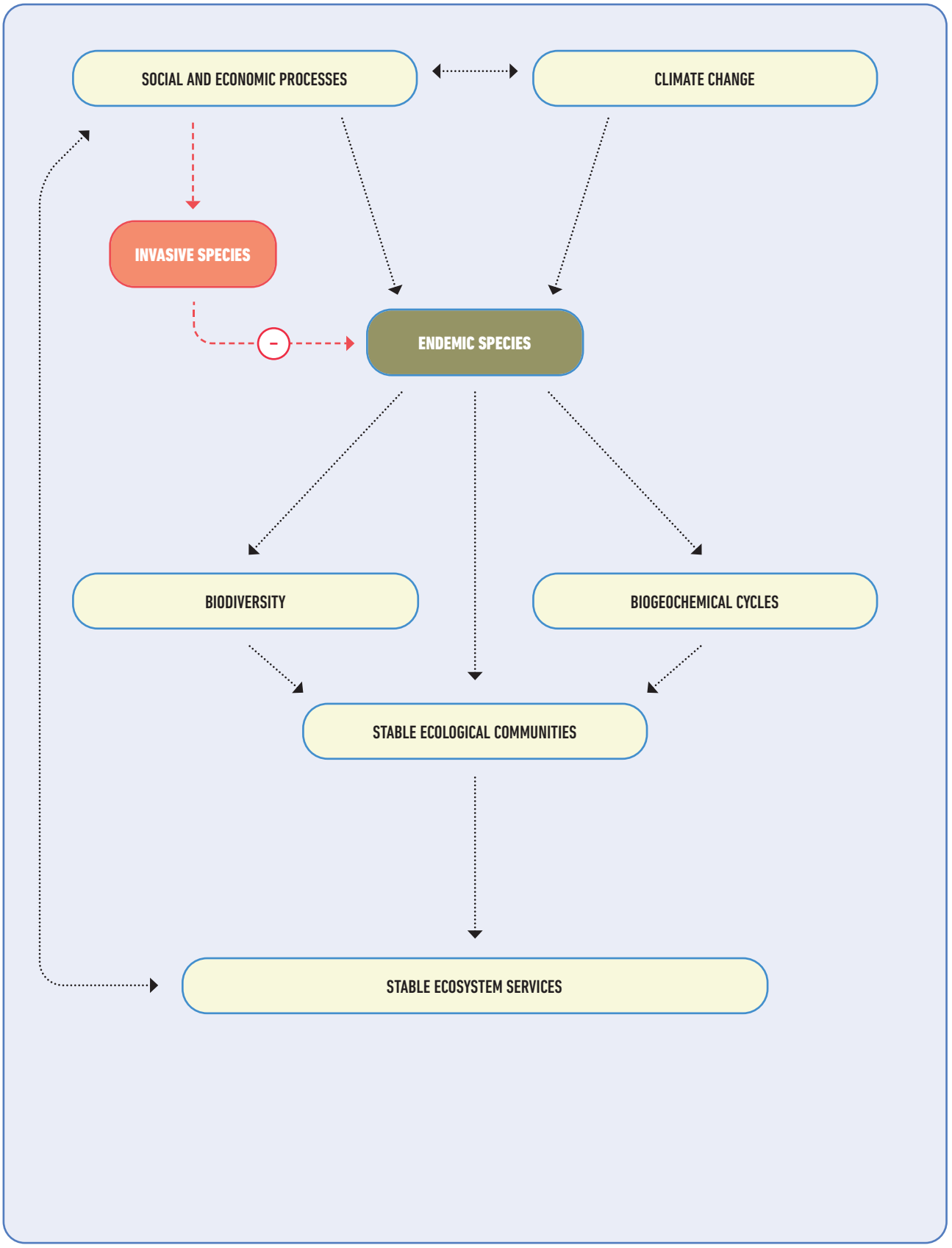
Researchers at MIT (Massachusetts Institute of Technology) have used this property to develop a reusable super-strong adhesive that can hold more than 300 kg.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Split into groups and create an innovative business plan inspired by nature. The ideas are endless, get creative!
2. What does the term start-up mean?

OVERVIEW


SOCIAL AND ECONOMIC PROCESSES
CLIMATE CHANGE
INVASIVE SPECIES
ENDEMIC SPECIES
BIODIVERSITY
BIOGEOCHEMICAL CYCLES
STABLE ECOLOGICAL COMMUNITIES
STABLE ECOSYSTEM SERVICES

THE CARPATHIAN BASIN, WHERE WE LIVE

The flora and fauna of the Carpathian Basin are unique in the world, both in their richness and diversity. Due to its location and microclimate, it is one of the most vulnerable ecological communities in the region, which is also threatened by climate change and anthropogenic environmental changes.

IMAGINE!

IMAGINE!

Why not let your pond slider go free?

We could have said why not release your goldfish into the pond, or why not bring home from holiday a plant that is not native to Hungary. The reasons are similar. The pond slider, for example, is an invasive, non-native species that can have a negative impact on the endangered native population of the European pond turtle. The European pond turtle is part of the native ecosystem, a useful animal that feeds on arthropods, amphibians, molluscs, carrion and diseased fish.

What interventions have affected the ecological communities of the Carpathian Basin?

- Forests have become victims of logging.
- Wetlands have been transformed by river regulation and pollution.
- In addition to habitat loss, the spread of alien species,
- inappropriate land use, and
- various forms of pollution are also affecting ecological communities.
- Climate change is having a noticeable impact on ecosystems too.

In addition to the natural ecosystems remaining, climate change and pollution also have an effect on the efficiency of agricultural production and food supply. Our forests are being adversely affected, with many of our tree species, pines, oaks and herbaceous plants in decline.
Changes in vegetation also entail alterations to the fauna that live in this habitat.

IMAGINE!

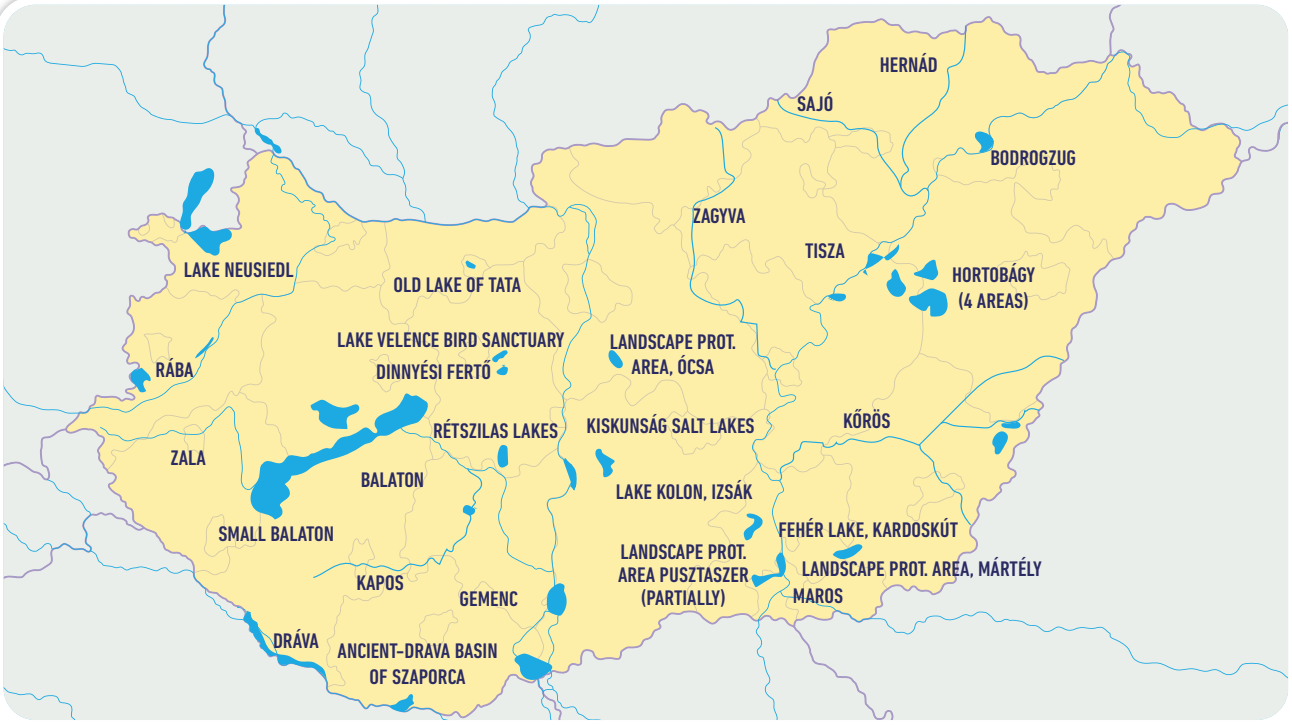
IMAGINE!

The mass death of fish in Lake Velence in June 2021 was one of the worst disasters of the year. One in every 100 fish in the lake – mostly asps, common bream and pike – died. It happened because of severe oxygen deprivation. This mass death of fish, however, created an opportunity for unprecedented cooperation. In total nearly 6 tonnes of fish carcasses were collected in cooperation between civilians, local government and water experts. Thanks to the swift action, the oxygen level in the lake was prevented from falling further due to the decomposition of decaying carcasses.

In the future, it will be necessary to invest in the maintenance and restoration of natural habitats to preserve the ecosystem of Lake Velence.

Although Lake Velence has dried up several times in its history, we now have the tools to prevent this from happening and save the aquatic ecosystem.

Several Hungarian wetlands are protected because they are extremely rich in species and provide nesting sites for many birds. Wetlands protection is supported by the Ramsar Convention of 1971, which aims to maintain and protect waterbird habitats from ecological degradation.

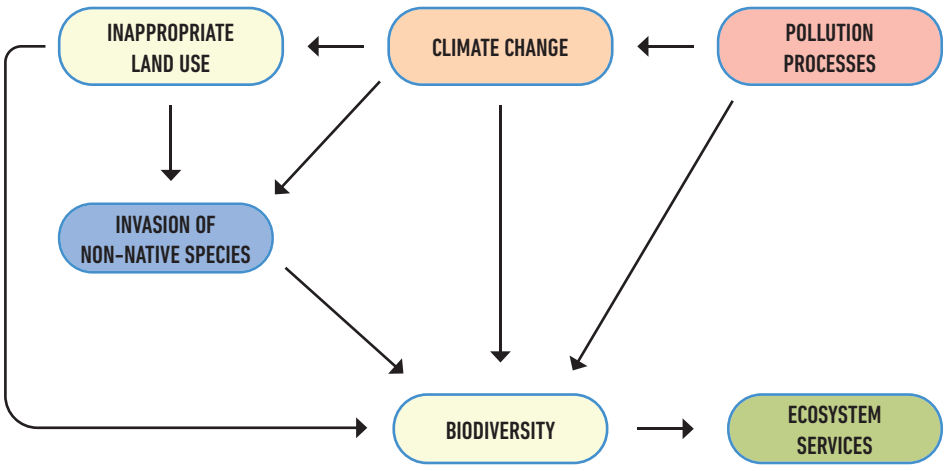


Wetlands of international importance in Hungary

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Which protected areas are close to where you live?
2. Interpret the diagram. How do the depicted system elements interact?



3. Discuss. How is the habitat of domestic waters being changed by intensive agricultural practices and inappropriate land use?

NOW IT'S YOUR TURN.

1. Opinion poll

Create a poll (possibly with your classmates) to see *What people know about sustainability?* The target group could be your family, school, or "people on the street".

The purpose of the survey should be to assess the knowledge and awareness of the respondents. Report back on the results in your class.

Make suggestions on how to ensure that
- people are well informed about the issue;
- and are aware of what they can do in their everyday lives to promote sustainability.

2. Everything is connected

Form small groups of 3-4 people.
a) Create a mind map of the links between environmental and social problems.
b) Make a funny flowchart of the development and spread of an everyday problem.

Aspects: Which process affects which other process? Mark the positive and negative feedback in different colours. Compare and discuss the completed mind maps.

3. Energy or clean air?

As you have seen in the lessons about problems in the atmosphere, energy production is largely responsible for air pollution.

Split into two groups. One group should collect arguments for fossil fuels, and the other for renewable energy sources. Discuss the different views with the help of a moderator.
Make suggestions for a compromise on resolving the differences on the above question.

4. Present it!

a) Write a report on the *Montreal Protocol (1989)* and ozone-friendly CFCs. Describe the objectives of the agreement and the problems implementing it.
b) Prepare a report on "25 years after *Kyoto*". Describe the objectives of the agreement and the international controversies surrounding it. What is the situation now? Make a proposal for a compromise-based solution to the conflicts.
c) The EU Biodiversity Strategy for 2030 document contains the following lines: "The biodiversity crisis and the climate crisis are intrinsically linked. Climate change accelerates the destruction of the natural world through droughts, flooding and wildfires, while the loss and unsustainable use of nature are in turn key drivers of climate change. But just as the crises are linked, so are the solutions. Nature is a vital ally in the fight against climate change." Show why biodiversity is important in the fight against climate change.

5. Carbon dioxide underground

Find out how carbon dioxide can be stored in rocks deep underground? What are the pros and cons of this method?

6. Plan to reduce water demand

List all the household activities that require water in your home. Make a plan to reduce your family's water demand and consumption. Collect arguments to convince your family members of the importance of reducing water use.

7. Types of water pollution

Make an awareness poster about the problems of water pollution. What types of pollution affect the seas, oceans, rivers, standing waters and groundwater? Describe the impact of water pollution on social and economic processes.

8. Domestic water protection

Find out what projects have been implemented in Hungary to protect water bodies and wetlands. Which objectives have been achieved and which projects have not been implemented?

9. The living world in the Carpathian Basin

Make a digital photo collection of the specific creatures of the Carpathian Basin and prove that we live in a unique place rich in living organisms. Don't leave out distinctive species such as the Hungarian meadow viper, the European snake-eyed skink, the fire salamander, the saker falcon or the European mudminnow. Describe the impacts that threaten the species richness of the Carpathian Basin.

10. Board game project

Create a paper-based or digital board game based on *Monopoly*, calling it *Manage sustainably!* Design the squares and stations on the board, and don't forget the chance cards! The only limit to the rules of the game is your imagination. Once you've created the game, give it a try.

NOW YOU KNOW!

TERM	DEFINITION
Types of minerals	• Solid (ore, coal, silicates) • Liquid (oil, water) • Gaseous (natural gas) • Geothermal energy Solid minerals are extracted by surface or deep mining, and gaseous and liquid minerals by deep drilling.
Hazards in mines	• Firedamp • Gas explosion • Dust hazard • Coal dust explosion • Water hazards • Radiation hazards
Cave	Caves are naturally formed cavities in the lithosphere that are at least 2 metres long and passable by humans.
Biosphere	All the environments in which plants, animals, fungi or even single-celled organisms, i.e. living things, exist.
Endemic (or indigenous) species	Plants and animals that are native to a habitat.
Eutrophication	A process whereby the amount of nutrients (mainly nitrogen and phosphorus) increases in the water.
Earth's boundary	The atmosphere is the Earth's outermost envelope. The Earth's boundary is determined by the part of the atmosphere that moves with the Earth due to gravity. It extends about 10,000 km from the Earth's surface.
Earth as a closed system	The Earth exchanges energy with its surroundings, but exchanges matter only to a negligible extent.
Geospheres as open systems	Geospheres can be considered open systems as each sphere can exchange matter and energy with all other spheres through complex biogeochemical processes.
Disaster	An accident, damage or emergency caused by natural disasters or other human activities.
Hydrosphere	The part of the Earth containing water. Water is the only substance in nature that exists in all three states simultaneously. As liquid water (oceans, lakes, seas, rivers), as ice in solid form (glaciers, high mountain and polar ice caps) and as a gas (vapour, clouds).
Thermal pollution	Harmful temperature rise of natural waters caused by human intervention, such as thermal power plants and factories. As a result of warming, the oxygen content of water decreases and aerobic organisms are damaged.
Invasive species	Species that are not native to a particular ecosystem. Species that upset the ecological balance include those that: • reproduce rapidly, • are viable under given environmental conditions, and • have no natural enemies in their new habitat.
Surface mining	In surface mining, the material to be extracted is found at or near the surface, so only the overburden needs to be removed to start extraction.
Lithosphere	The rocky shell of the Earth.

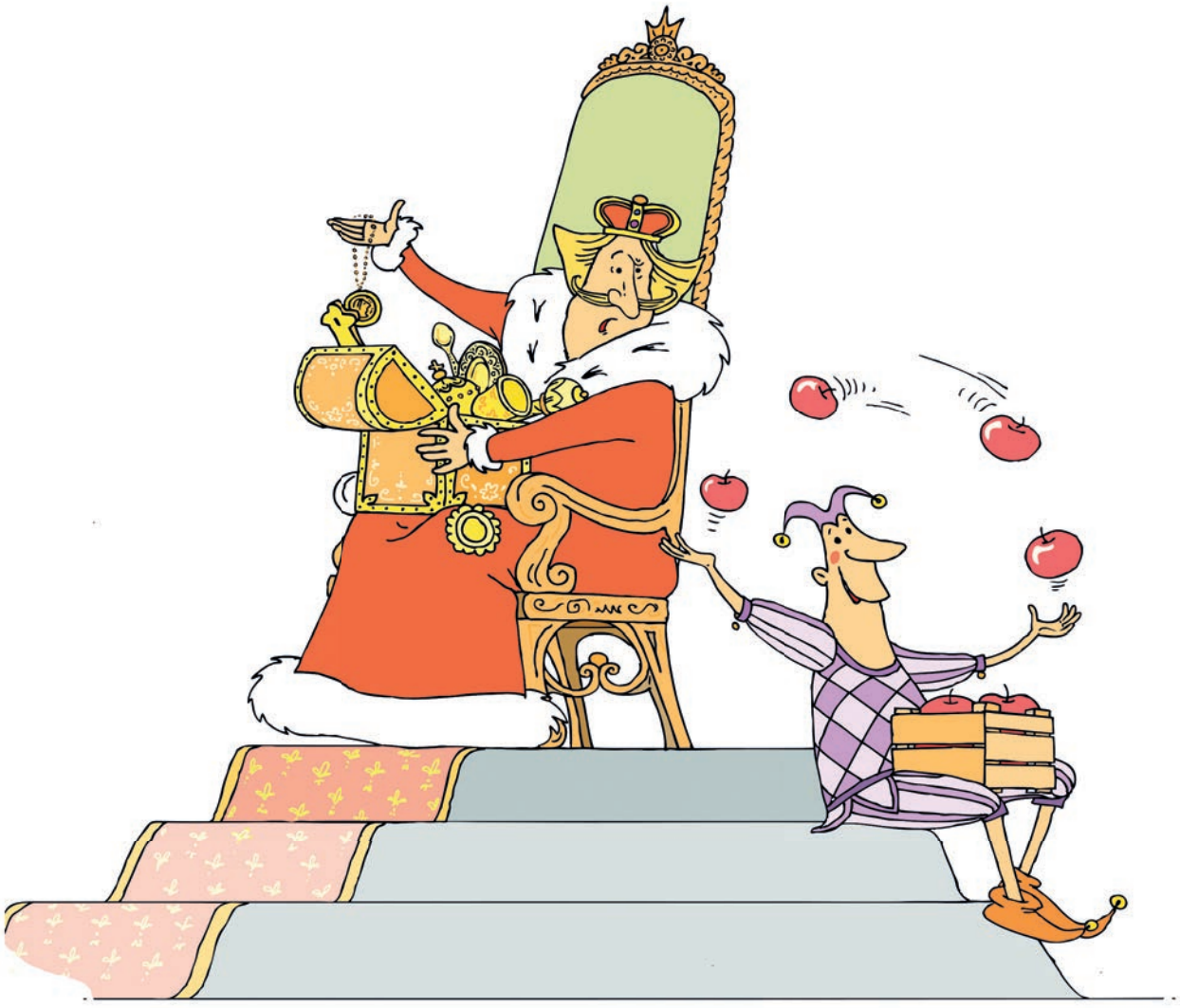
NOW YOU KNOW!

TERM	DEFINITION
Deep mining	Mining of mineral resources below the Earth's surface. The mineral resources are accessed through tunnels and deep mine shafts.
Ecosystem	A system of relationships between living organisms and the inanimate creatures that surround them.
Ecosystem services	Involved in the following regulatory processes: • carbon and water cycles, • cycling of elements such as nitrogen, phosphorus or sulphur, • regulation of atmospheric oxygen and carbon dioxide levels, and thus • climate control. **Types of ecosystem services:** *Provisioning services* • water, • food, • raw materials and other resources. *Regulatory services that maintain the interactions between the spheres* • water cycle, • air quality regulation, • global climate regulation, • pollination of plants. *Supporting services* • maintaining the continuity of material and energy flow, for example by photosynthesis or the cycling of various organic and inorganic substances. *Cultural services* • possibilities for relaxation and recreation that contribute to our mental and physical health.
Recultivation	Reclamation of abandoned mine land with the intention to restore the degraded land to a condition similar to its original state.
System	Groups of elements that interact with each other. The elements of a system are connected by certain rules, with different dependencies and hierarchical relationships between them. The properties and behaviour of a system cannot be derived directly from the characteristics of the individual system components. Other general features of a system: • it has boundaries, • it changes over time and its current situation is called a state, • its functioning is characterised by reinforcing (positive) and weakening (negative) feedback. • Systems are examined in terms of time and causality. • In a **closed system** there is no free mass flow between the system and its environment, but energy flow is possible. • In an **open system**, there is a free mass and energy flow between the system and its environment.
System dynamics	It deals with the behaviour of systems, examining things, processes and elements as they change over time.
Resilience	Adaptability to external influences, resilience and capacity to renew.

NOW YOU KNOW!

TERM	DEFINITION
Soil	The upper, fertile part of the lithosphere. • Soil loss – soil degradation. • Deterioration in the quality of soil is called soil depletion, i.e. the loss of nutrients.
Misconception	A belief that has no scientific basis. Its subject has not been proven and there is no data to support its existence. Therefore, misconceptions are actually mistakes that arise from our everyday thinking. For example: • overgeneralisation, • selective memory or • inaccurate observation.
Water footprint Components of water footprints	Total volume of water used and polluted over a given period. • **Green water** refers to the amount of rainwater stored in the soil. • **Blue water** represents the amount of fresh water used to produce certain goods and services, while • **Grey water** refers to the polluted water used to produce certain goods and services.

ECONOMY AND SUSTAINABILITY



PROSPERITY – WELL-BEING

WHAT'S THAT GOT TO DO WITH IT?

We use the expression in the title when we see or hear things that don't fit together. Economic development often brings to mind smokestacks, child labour, deforestation, water pollution, false advertising, in short, phenomena that ignore sustainability. How do economy and the pursuit of profit fit in with environmental protection, health and sustainable development in general?

Can sustainability and economy be reconciled? As a genuine systems thinker, we will now take a look at what the world, a region, a country or an individual can do to harmonise the efforts of the different sectors of the economy and sustainability.

IMAGINE!

IMAGINE!

This contradiction is often found in everyday life. Whose interests matter? What should we take into account when making decisions?

Let's look at an example.

Imagine a large city located in a longitudinal valley, where a main road leads from the city centre to the outskirts. This route carries a lot of traffic every day, with buses, cars, lorries and even trams. Traffic jams are particularly frequent in the morning and afternoon, and sometimes accidents make travelling difficult.

IMAGINE!

IMAGINE!

There is huge demand for a cycle lane in the city, many would choose to cycle to work or school. Widening the main road is not feasible, and marking a cycle lane would narrow the road further and make the situation even more difficult. There is only one road parallel to the main road that could be considered for a bypass. It passes through a family housing area, and is currently used mainly by residents.

The local government is looking for a solution to the traffic situation. The following ideas have been put forward:

1. A high-speed railway with car parks at the stations in the outer suburbs.
2. Restricting the access of lorries to the city.
3. Converting the road passing through the residential area into a cycle lane.
4. Significantly increasing the number of trams.
5. Making driving into the city centre subject to a permit.

FIND OUT!

FIND OUT!

How can the interests associated with the different solutions be harmonised?
What can be in the interests of:

- residents in the city centre,
- businesses in the city centre,
- people living in the family housing area,
- cyclists,
- transport companies?
- What do you think a civil society organisation or even an individual can do to help solve a problem like this?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Which idea would you support? Discuss!

a) Compile whose interests the local government has to take into account.
b) Where are there conflicts of interest that should be resolved? How?
c) Analyse the economic implications of the different solutions.
d) Which solution would be the most environmentally beneficial?
e) Come up with some more ideas.
f) How could you use marketing tools to convince stakeholders of the effectiveness of your proposals?

FAILURES AND RISKS

As you have seen above, many aspects have to be taken into account "even on a small scale" to harmonise economic-environmental-social areas and not let them grow at the expense of each other. Let's look at how this can be tested for large systems.

LEVEL	EMERGING PROBLEM	WHAT IS THE ECONOMIC RISK OF NOT SEEKING A SOLUTION?
Global	The globalisation of production and trade implies that • transport distances and demands are increasing, thus so does their carbon footprint and contribution to climate change; • the environmental impact is felt in less developed countries, those that are more vulnerable socially and in terms of health care.	Transportation from multiple locations is vulnerable. For example, a pandemic can cause disruptions to production and trade. Adapting to the impacts of climate change places a heavy burden on both states and business organisations.
National level	Heavy air pollution due to inadequate heating and traffic.	A high level of air pollution means, among other things, that • people's health declines, with illnesses leading to sick leave; • health care costs increase; • people who can afford it move to places with better air quality, which further increases the gap between wealthier and poorer social groups.
Individual people	People learn about environmental disasters from the news, but are not aware of the options for action.	A feeling of being vulnerable makes people lose their motivation to learn, work and shape their future.

ECO-SAVVY – OBJECTIVES FOR WELL-BEING

Prosperity and well-being. The two terms are similar, but in fact they cover different content. While prosperity means material wealth, well-being, for example, includes

- life expectancy, years of good health
- state of health, wellness, stress levels,
- public security,
- economic security, and
- legal security
- social relations, opportunities for social renewal, or
- the quality of the living and natural environment.

In 2015, UN member states signed an agreement committing to achieving, by 2030, the 17 Sustainable Development Goals (SDGs) and 169 targets detailing them.

The UN measures progress towards the SDGs through annual and biennial reports against a set of indicators. The report ranks countries according to the extent to which they achieved the goals. The closer a country is to the goal, the higher its score on a 0–100 point scale.

In the 2020 ranking, Hungary was ranked 29th out of 166 countries with a score of 77.3. Among the Visegrad countries, the Czech Republic ranked 8th, Poland 23rd and Slovakia 27th in the global ranking.

How can these goals be achieved?

- By helping countries in need.
- By promoting sustainability aspects in national policies and international cooperation.
- Designing and implementing action plans to achieve the goals.

Which are the least developed countries?

Most of the tasks detailed in the SDGs include support for the least developed countries. Let's look at what criteria the UN uses to classify a country in this category.

Criteria for classification as a least developed country:

1. low income,
2. serious problems in nutrition, health, education and adult literacy,
3. the country is economically vulnerable, with no stable production and services, the economy is small and vulnerable, and natural disasters are frequent.

These countries have few skilled human resources and are the most vulnerable to economic and environmental shocks. There are currently 47 countries on the list, which is reviewed every three years. This is why international cooperation and support for lagging countries is essential to achieve sustainable development globally.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Fuhajoma is an imaginary country lagging behind. How can a country with such serious problems be encouraged to achieve sustainable development goals?

Main features:

- A significant proportion of the country's population lives in extreme poverty with per capita income of less than 2 US dollars a day.
- The economic situation varies considerably across the country.
- Climate change is causing serious problems (drought, soil erosion) for agricultural production, which means that many people do not have access to sufficient food.
- There is a lack of medical and social infrastructure.
- The education system is inadequate and children have no vision for the future.
- Equal opportunities are not respected, gender equality, for example, is seriously undermined.
- There are no skilled workers.
- Innovative, high-tech industries have not expanded, exports are limited to a few products, and the country is becoming increasingly disadvantaged.
- Public security is poor.
- Existing production has high emissions.
- There is no recycling in the country.
- Several developed countries ship their waste there, which is sorted, then recycled into marketable raw materials in a way that is harmful to health.

1. How do you think a change of attitude can be achieved within the government and the population of a country with such serious problems?
   a) Explain why a change of attitude is needed.
   b) What further difficulties arise if there is no change in this area?

2. Come up with arguments and discuss why environmental awareness is necessary for countries at different levels of development. (Consider economically developed, less developed and severely underdeveloped countries too.)

3. Make a summary, for example a presentation, an infographic or a video on the social, national and global risks of not taking timely and appropriate collective action, supported by developed countries, to solve the problems of Fuhajoma or other underdeveloped countries.

WHY SHOULD I SUPPORT THEM? THEY DO IT ALL THEMSELVES.

Two settlements are 20 kilometres apart. One of them is called WEHAVEEVERYTHING and the other is called: WEHAVENOTHING.

Actors:
1. Mayor of WEHAVEEVERYTHING
2. Mike Graham, local resident
3. – SYSTEMS THINKER –

The sentence in the title was uttered in the mayor's office by the wealthy and angry local resident, Mike Graham. This was because the town administration has prepared a support plan to help the neighbouring municipality, and to do so, the citizens of WEHAVEEVERYTHING will have to make some sacrifices.

CIRCUMSTANCES	WEHAVEEVERYTHING	WEHAVENOTHING
	A large car factory has been set up in the city and provides jobs for the population.	The metallurgy industry that provided jobs for WEHAVENOTHING's inhabitants was closed down 20 years ago. Anyone who can, and has a bicycle, takes casual work in WEHAVEEVERYTHING. Many live on benefits.
	People even from the capital have come to work in the car factory, and new residents have settled in the city, renovating abandoned houses.	Many people have had no idea for two decades what it means to regularly go into work. There is no pattern for children.
	A major information campaign by the local government has led to the installation of solar panels, heating modernisation and separate waste collection. Funding has been raised partly through tenders and partly through donations from local entrepreneurs.	The houses are in poor condition, but there are no resources to renovate them. They can't apply for other improvements because they don't meet the conditions of the call for proposals.
	Public security is ensured by local neighbourhood watch personnel with police officers from the neighbouring town coming in when necessary.	Due to poor public security, tourists avoid the village. If necessary, police officers come over from the neighbouring town.
	A school has been set up with the help of parents, so that children do not have to travel. This required the cooperation of local entrepreneurs.	Since there are only grades 1-8 in the local school, many children do not even pass the 8th grade to avoid travelling. Illiteracy has reappeared.
	Several local families have opened restaurants, rent out old but renovated houses and earn their living from tourism.	Even though the area is beautiful and hilly, with only one grocery store and one pub, no one wants to spend their holidays there.

SUSTAINABILITY FEATURES	WEHAVEEVERYTHING	WEHAVENOTHING
	Since the majority of the population comes from affluent families, young people from the age of 18 also drive.	Only one family in the village has a car, but they don't use it because of the high petrol prices. Most of them do not even have bikes.
	Water consumption is high, as they use drinking water to water their gardens and prefer baths for washing.	There is no running water in the houses, water is supplied by jerry cans from public wells.
	Everyone shops online, and the vast amounts of packaging end up in the bin.	They shop at the local grocery store once a month. If they have no money, they borrow from loan sharks who threaten them physically.
	Food waste is also huge, although some of it is recycled.	A weak immune system caused by a poor diet and poor sanitation leaves residents suffering from a wide range of infectious diseases.
	They always wear the latest fashion. Young people in particular buy new clothes and shoes every month.	They get their clothing from charity shops or inherit it from each other.
	Most houses have energy-efficient gas boilers.	The houses are heated by iron stoves. For this, they use waste from the surrounding area.

PROBLEM ANALYSIS

Appearances and false conclusions

1. Life in WEHAVENOTHING is more sustainable, with environmentally friendly transport, low energy and water waste, and very low consumption.
2. In WEHAVEEVERYTHING cars pollute the environment and the consumption of both energy and consumer goods is high.

Graham: – So WEHAVENOTHING is leading by example, and if we helped them, we would only increase their ecological footprint.
Is Graham right?

What do we do when we support them?

- We fulfil **humanitarian** objectives so the residents of WEHAVENOTHING do not suffer from food shortages, diseases, and from those exploiting their vulnerability, such as loan sharks. Some of them have fallen on hard times through their own fault, but many more, especially children, through no fault of their own.

- **We share common goals and interests.** Problems and solutions know no borders.
  - The casual workers from WEHAVENOTHING bring infectious diseases into WEHAVEEVERYTHING because of the poor health and hygiene conditions.
  - The shortage of money and food has often prompted thieves to commit burglaries in affluent WEHAVEEVERYTHING and, as a result, real estate values in WEHAVEEVERYTHING have started to fall, with many residents moving out.
  - The poor people in WEHAVENOTHING heat their homes with whatever they find because they can't afford fuel, which leaves the neighbourhoods thick with smoke all winter, and many people suffer from coughs and allergies in both cities.
  - The waste collection in WEHAVENOTHING is slow, so many people dump their rubbish in the nearby woods or stream. The stream also flows through WEHAVEEVERYTHING.
  - If they help them, public security will increase, skilled labour will be needed and property values will rise.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

a) Present further arguments.
b) Describe with your classmates:
- In what ways could WEHAVEEVERYTHING be more sustainable, and
- how could the two municipalities work together to increase the prosperity and well-being of the residents of both settlements?

DID YOU KNOW?

DID YOU KNOW?

What is the CAP?
The CAP (Common Agricultural Policy) is a common policy of the EU Member States.

Agriculture is affected by a number of unpredictable factors. For example, extreme weather conditions (drought, floods, hailstorms, cloudbursts, extreme cold). All of these lead to lower yields in the long term with further serious consequences such as higher prices.

The CAP aims to ensure the long-term economic viability of agriculture. This should be harmonised with the short-term interests of farmers, who need to make a living and make improvements, i.e. remain economically viable in the short term. Agriculture also plays an important role in carbon neutrality by providing biomass to farms. Moreover, the maintenance or loss of biodiversity and ecological services depends to a large extent on agricultural practices.

Therefore, the CAP
- supports farmers' livelihoods,
- introduces incentives and subsidies for greener farming,
- provides rural development support to ensure that agricultural investments are sustainable and
- supports research, technological development and digitalisation.

However, as a systems thinker, we can see that poorly thought-out support can cause problems in other areas. For instance, it can lead to higher prices for certain foods, or to a decline of natural habitat through cultivation of more land. This is why the CAP's objectives and interventions should be subject to broad consultation.

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING

Economic interests often override social and environmental concerns.

Countries with varying levels of economic development have different responsibilities and priorities for moving towards sustainable development.

Globally coordinated action is needed to achieve sustainable development.

Without intervening, the world's resources will be depleted and won't be available for future generations.

TARGET SETTING

Appropriate economic measures to help achieve the SDGs also require a clear understanding of the country's characteristics and how they relate to each other and to the global situation.

International cooperation is needed to help lagging countries.

ALTERNATIVES TO INTERVENTION

In international organisations, the member states define the targeted goals and interventions on the basis of professional guidelines.

Each country also harmonises the legal environment regulating its economic activities with international objectives.

Socio-economic processes are assessed in light of sustainability, and new objectives are defined and actions planned at national, local and company level.

They set goals based on the need and potential for individual responsibility.

HOW BIG, HOW MUCH, HOW MANY?
ECONOMIC CALCULATIONS, ANALYSES FOR SUSTAINABILITY

Determining the *"state"* of a country in economic, legal, health and environmental, etc. terms is not so easy. You would think that developed countries are more sustainable, as they have had environmental policies in place for decades and have a range of incentives to encourage companies and citizens to operate more sustainably.

However, UN data shows that while the richer a country is the more it takes sustainability into account in its policies and decision-making, the economically more developed countries still have a larger ecological footprint: their citizens consume more, travel more, use more energy, and therefore the responsibility of developed countries increases correspondingly.

GDP OR GPI

How are *prosperity* and *well-being* measured?

One of the most commonly used metrics of a society's level of economic development is its gross domestic product (GDP) per capita. However, GDP alone does not reveal a country's social and environmental sustainability.

Why is GDP not enough?

GDP does not treat natural resources as capital. Therefore it does not calculate their destruction and depreciation. The components of GDP are: consumption + investment + exports – imports.

Another indicator has also been introduced, namely, the Genuine Progress Indicator (GPI). The key feature of the *GPI* is that it does not rely on short-term outcomes. GDP only applies to a given year, while GPI also takes the possibility of depleting natural and social capital into account, and therefore provides an early indication of sustainability data.

GPI deducts the following expense items from the value of goods and services consumed in an economy:

1. compensation (e.g. health, recovery costs),
2. social costs (e.g. education, aid items) and
3. depreciation of the environment and natural resources.

IMAGINE!

IMAGINE!

THERE IS A HOME FOR GROSS NATIONAL HAPPINESS

Bhutan is a country half the size of Hungary and located between Tibet and India. Bhutan's leaders decided to strike a balance between industrial development, nature, economic growth and sustainability. To achieve this, they created the concept of Gross National Happiness (GNH) in addition to financial considerations, to use it as a measurement of progress and a guide to growth.

Bhutan

The four pillars of GNH are:

1. sustainable development,
2. environmental protection,
3. preserving culture and
4. good governance.

In Bhutan, all provisions comply with these four principles. The country's environmental policy is based on a constitutional decree stating that at least 60 percent of the country's land should never be deforested. This ensures that Bhutan is able to preserve the diversity of its ecosystem, makes the country a stronghold of biodiversity, and ensures it remains carbon neutral.

"The developed world has a lot to learn from this small country, which is mainly populated by subsistence farmers and where TV and internet were unknown until 1999."

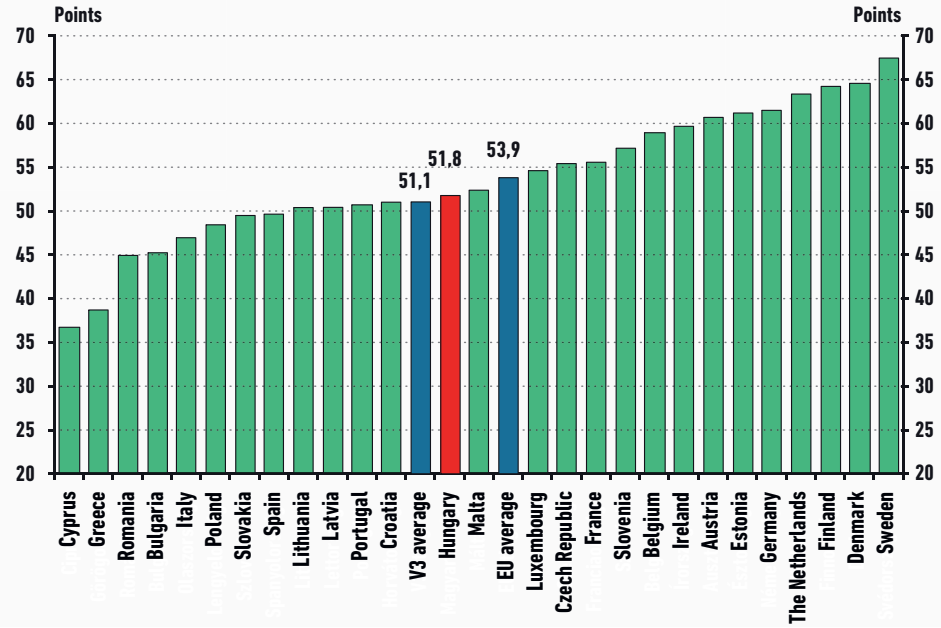
Sustainability index

The Magyar Nemzeti Bank (MNB, Hungarian National Bank) has also assessed Hungary's sustainability performance. MNB uses a sustainability index based on indicators developed in four main areas. These are:

1. environment,
2. society,
3. finance and
4. real economy.

The graph below shows Hungary's position in relation to the EU Member States.

Hungary's position in European Union according to the Sustainability Index 2021



Note: The scale is 0–100 points, where 100 is the best value.

Source: MNB

FIND OUT!

FIND OUT!

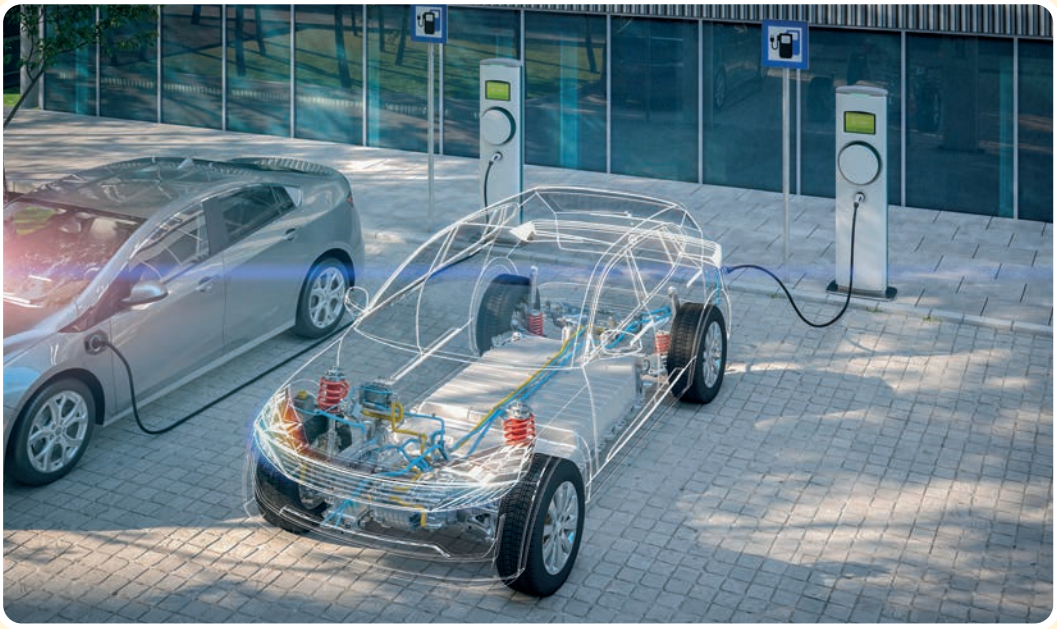
Do research online. Find out how each Member State scores in the sustainability index rankings in terms of GDP per capita in the previous year.

SUSTAINABLE BUSINESSES

IMAGINE!

IMAGINE!

Cars are responsible for 12% of all carbon dioxide emissions in the European Union. EU countries have therefore set a target to reduce carbon dioxide emissions from transport to 60 percent by 2050 compared to 1990 levels. According to the legislation, which came into force in April 2019, manufacturers should endeavour to cut emissions from new cars by around a third by 2030. These regulations place a considerable burden on car manufacturers, as they have to adapt and expand technology, train their staff in new solutions, etc., while also taking the new needs and habits of car users into account. This shows that targets need to be tailored to the current situation and constantly adjusted.



NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Check if EU countries have set new targets to cut carbon dioxide emissions since 2015.

Electric cars have been welcomed by the world as they are more environmentally friendly than petrol or diesel cars due to their low direct emissions.

BUT!

Changing one element of a system will affect the others – we have said this many times before.

What happens in the case of electric cars?

Considering all the conditions and impacts related to producing, maintaining and operating electric cars, the world is facing exciting new challenges. Let's look at some of them.

- Today, there are 80-90 million new cars on the road every year, and this number is steadily increasing. Producing and running this growing number of cars requires more and more raw materials and energy. Manufacturing an electric car needs far more minerals than a conventional car. Continuous research and innovation is required to ensure that the raw materials can be used in production as much as possible, and that less waste is generated.
- Gradually replacing the car fleet with electric cars will help reduce energy consumption and emissions per car. With more charging opportunities and battery capacity, electric car drivers can travel longer distances, which makes the use of electric cars more attractive.
- Although running electric cars is cheaper thanks to the lower energy needs, free parking and subsidised charging, the cost of producing and purchasing them is still high.
- Production, for example, declined dramatically in 2020-2021, first due to the pandemic and then, despite a surge in demand, chips – one of the key components – were in short supply, causing disruptions in car manufacturing. Extensive corporate research and cooperation frameworks have been set up to address this and prevent it in the future.

However, the most environmentally friendly solution for transport is to use and buy fewer cars:

DID YOU KNOW?

DID YOU KNOW?

Car-sharing means that the person who wants to travel does not use their own car, but rather that of a specialist company or individual in exchange for a rental fee. As with shared bikes or scooters, they pay for and access the car via an app, more easily than if they rented it from a car rental company. If car-sharing is growing in popularity, it also means that the number of people buying their own car is falling somewhat. At the same time, a car is used by many different drivers and is subject to more stress, so it needs to be more robust – but this is a challenge for manufacturers.

The way in which resources and technology are used is also very important from an environmental and sustainability point of view. For example, a small shop uses only environmentally friendly packaging materials, or a workshop mostly carbon-neutral energy sources.

FIND OUT!

1. Do some research online and collect further environmental arguments for and against electric cars and combustion engine cars.
2. Find out who are the people whose needs will likely be met by public transport, and who – although being environmentally conscious – will not give up their car.

MARKET AND PROFIT

An entrepreneur is a person who – at their own risk – wants to satisfy an assumed market need, and supplies goods or services to do so, while seeking to make a profit.

To start a business, you need to have different resources:

- capital,
- labour,
- expertise,
- different natural resources such as land, water, energy, and
- solvency, i.e. able to pay expenses such as wages.

Entrepreneurial goals

- The primary goal of **profit-oriented** businesses is to maximise profits in the long run. The profits belong to the owners of the business, who can develop a profit-sharing scheme under which employees or managers can share in the profits.
- **Non-profit** enterprises can use profits for public purposes, as defined in their constitutional documents, rather than for their own purposes. In addition to its entrepreneurial activities, the income of a non-profit enterprise may also come from donations and grants, as is the case with other non-profit organisations.

NOW IT'S YOUR TURN.

List the risks an entrepreneur faces. What happens, for example, if they misjudge market needs and opportunities when launching a product, the costs of introducing and promoting it, their competitors and other stakeholders, and they don't take changing consumer trends into account. Find examples.

DID YOU KNOW?

WHAT WAS THE DOTCOM CRISIS?

With the emergence of e-commerce, anyone could set up a webshop, and many companies took advantage of this opportunity. The investors also saw big profit in these new formats, so they supported these "dotcom companies". ("dotcom" refers to ".com", the domain used by many of these new firms.) However, there were many who went into business without the necessary expertise and experience and later went bankrupt. But not all companies failed in the crisis, as Google, the largest search engine today, was founded at the same time. Google designed algorithms to identify users' interests, activities and habits based on their searches, and then target ads to them. So, in theory, everyone is satisfied, because Google earns revenue by delivering information to potential customers, the customers are happy to be quickly informed, and advertisers generate revenue by being rapidly connected to their customers. In principle, everyone is happy.
Yet when considering satisfaction, a systems thinker, however, also takes into account the environmental consequences of unnecessary consumption, or even overconsumption due to unsolicited advertisements.

THE SECRET TO EFFICIENT OPERATION IS STAKEHOLDER SATISFACTION

As the Google example shows, the secret to success is mutual satisfaction among stakeholders.

But who are the stakeholders?

• *Internal stakeholders*
Owners, managers, executives and employees. Their interests are linked to the assets of the business in some way. They either want to maximise the return on their investment, or have higher wages and job security. These interests often do not coincide. It is the owner's responsibility to develop the right incentives for managers and employees.

• *External stakeholders*
Actors outside the enterprise who are influenced by the enterprise's activities: customers, suppliers, partners, competitors and production plants. People living in the vicinity of the business premises also have an impact on the company. If the inhabitants of a municipality feel that a company operating there cares about protecting the environment, about the health and well-being of people, and is careful with resources, they will be more supportive, and will be able to cooperate in many areas of common interest.

What happens when business interests clash with sustainability concerns?

It is in the interest of all stakeholders that the business operates in a predictable way, produces the right quality, provides jobs, creates healthy working conditions, and does not pollute the environment, etc. These interests often clash with the short-term economic interests of the business. Environmental solutions can cost more money, for example switching from an existing technology to a more environmentally friendly one may require developments and investments. Planning for recyclability throughout the life cycle as well as organising and implementing recycling requires highly coordinated professional work and investment.

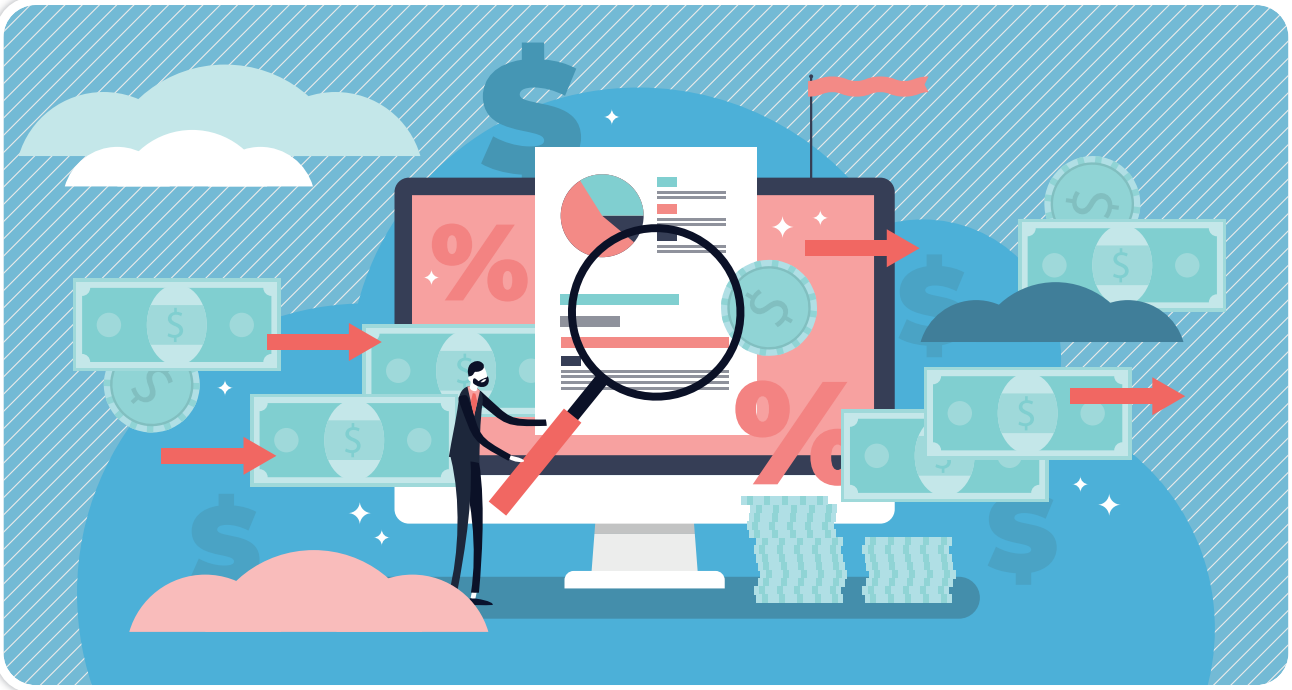
It is the responsibility of the state to encourage economic actors, including entrepreneurs, to protect environmental values and promote social justice by means of legislation, incentives and penalties, such as subsidies, special taxation of polluters, and by shaping social and entrepreneurial culture and consumer demands.

FIND OUT!

FIND OUT!

1. Find out who might be the stakeholders of a car manufacturer or a related business.
2. Describe how the stakeholders depend on the company and how they can influence its environmental performance.
3. Discuss what action the company is likely to take in the situations listed. How could the company be encouraged or influenced in these circumstances?
   a) The company is awarded a contract to carry out a major environmental investment in the municipality. Fulfilling the order generates very low profits, but it is likely to attract national media attention.
   b) The company's wastewater treatment plants are outdated, they need to be replaced. The owners are willing to replace them, but the current financial situation does not allow for the purchase of new equipment.

A business will be successful if its managers take into account the results of (national and international) studies, measurements and trends beyond the company to make informed decisions. For example, in considering whether to use recycled raw materials or make environmental investments, they actually think in terms of longer-term profit and survival, because investing in energy- and material-efficient technologies pays off. The transition to a circular economy, employee empowerment or the use of environmentally friendly solutions can also bring gains.



Main aspects to be considered for preparing decisions:

Costs and revenues

A company earns revenue from the sale of its products and services. To supply goods or services, it has to purchase various raw materials and energy, set up or rent premises, operate them, transport and store goods, and employ workers. The company may also have expenditure related to marketing, social benefits or, for example, to environmental product fees. This expenditure is termed costs. A business makes a profit if its revenues are greater than its expenditure.

Real usable data

A company keeps continuous records, aggregates its data, prepares an annual business plan, then draws up an annual report on its assets and results. This is necessary for the company to be able to carry out analyses.

DID YOU KNOW?

DID YOU KNOW?

Not just "small scale", but "large scale" as well.
Not only companies aggregate their economic data, but national economies too – though it is not easy. This is because it has to be taken into account that products are often used by other enterprises, so their value is repeated in the national aggregates. Another important issue is how to include, for example, the values produced by foreign companies in the country, or by domestic producers abroad.

Analysis of efficiency, economic efficiency

The operation of a business can be considered efficient in two respects:

EFFICIENT OPERATION

technically efficient

If all resources have been used in the production process, **no excess capacity remains.**

economically efficient

If the **maximum possible revenue** is achieved for a given expense
or
If the **least possible expense** is used to achieve a certain revenue.

MARKET INSTRUMENTS FOR SUSTAINABILITY

The market must be familiar with the company's products before it buys them, and the entrepreneur should be aware of market needs. That's what marketing is for.

What is marketing?

Marketing is an activity whereby a business carries out market analyses, product development, product promotion, pricing, sales and sales promotion to meet the needs of customers.

What role does marketing play in sustainability?

Marketing research results and methodology can also be used for social and environmental purposes. For example, marketing tools are also needed to create demand for environmentally friendly products and services, and to generate public support for such measures. These tools can be used not only by companies, but also by the state or professional civil society organisations.
Since market research shows that customers are increasingly receptive to natural, organic, environmentally friendly and animal welfare products, manufacturers and retailers tend to use these terms and visual representations more often. Fortunately, there is increasingly more information available to make an informed choice, and it is difficult to deceive a growing proportion of consumers with a few eye-catching promotions and half-truths.

Packaging-free shop advert

ECONOMICS OF POLLUTION

From where to where?

Rapidly improving living standards in developed countries and the exploding populations in the developing world have led to a surge in consumption from the mid-20th century. For supply to keep pace with the rapid growth in demand, the exploitation of natural resources and energy production had to be increased. It was then that use of the planet's natural resources multiplied. At that time, the prevailing view was that resources were available in unlimited (or at least abundant) quantities, while waste and pollutants could be handled and processed by the Earth's system. No attention was paid to the environmental impact, including emissions reduction and energy efficiency.

By the 1970s, however, the negative effects on the state of the environment became clear. These included loss of biodiversity, polluted air, water and soil, which led to changes in the economy too. This was when the economics of pollution was born, which take the changes in natural resources as well as the extent and consequences of pollution into account in the profitability calculations for businesses.

To implement this approach, it would be necessary to "price" natural resources. This is not a simple task. While we can calculate some of the values produced directly, for example in the case of forests, where timber becomes a commodity on the market, it is difficult to calculate, for example, the value of neutralising carbon dioxide emissions and preserving the balance of the atmosphere, or other ecological services that are provided by biodiversity.

Fortunately, it is no longer just international conventions and national legislation that drive sustainable development, but also increasingly conscious consumer expectations. The companies that develop a sustainability strategy and set business policy objectives to reduce their emissions, ensure the recycling of their products, streamline their production processes and demonstrate sustainable use of scarce natural resources will be able to compete in the long term. And they make these goals and actions clear to both their employees and consumers.

FIND OUT!

FIND OUT!

- **Why do you think the economics of pollution needs to be addressed?**
- **Briefly summarise how economic growth affects the quality of the environment.**

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Find the 25 countries with the lowest and highest GDP in 2020. Choose one country from each group.
a) Use the internet to collect data on your own regarding the relationships between economic development and environmental impact in the given countries.
b) Interpret the data and draw your conclusions.

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING	Demographic growth and the rise in individual needs have resulted in increased consumption. Increasing production can lead to a depletion of resources. Pursuit of profit alone does not move us towards sustainable development. The economics of pollution contributes to achieving sustainable development. On entering the market, consumers are increasingly environmentally aware and responsible consumers. Economic indicators can be used to measure a country's economic development (GDP) and its genuine progress (GPI), also taking environmental and social aspects into account.
TARGET SETTING	The economy should grow in a way that does not damage but improves the quality of the environment. Environmental and social costs should be included in economic and management calculations. In addition to economic interests, sustainable development goals should be taken into account.
ALTERNATIVES TO INTERVENTION	The costs of economic efficiency should include the price of ecosystem services used. Production options should be introduced that reduce the impact on the environment. Calculating long-term return rather than seeking "immediate" return. Using responsible environmental marketing.

RESPONSES OF WELFARE SOCIETIES TO ENVIRONMENTAL CHANGES

Natural resources, in particular arable land, forests and water resources, biodiversity, especially native plant and animal species, as well as cultural values are the common heritage of the nation, which the state and all of us have a duty to protect, maintain and preserve for future generations.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Look for further details in the Fundamental Law of Hungary that refer to sustainability considerations.
2. Based on the extract from the Fundamental Law, summarise the areas in which Hungary has taken responsibility for sustainable development.
3. What else do you suggest should be included in the Fundamental Law in relation to sustainability?

Split into small groups and argue for your proposals.

CIRCULAR MANAGEMENT IS THE FUTURE

For a long time, the functioning of developed economies was based on the assumption that ever-increasing demand can be met with unlimited resources.

This is called linear management, which has four pillars to implement the management steps:

1. extraction of raw materials,
2. manufacturing of products,
3. consumption,
4. disposal of waste.

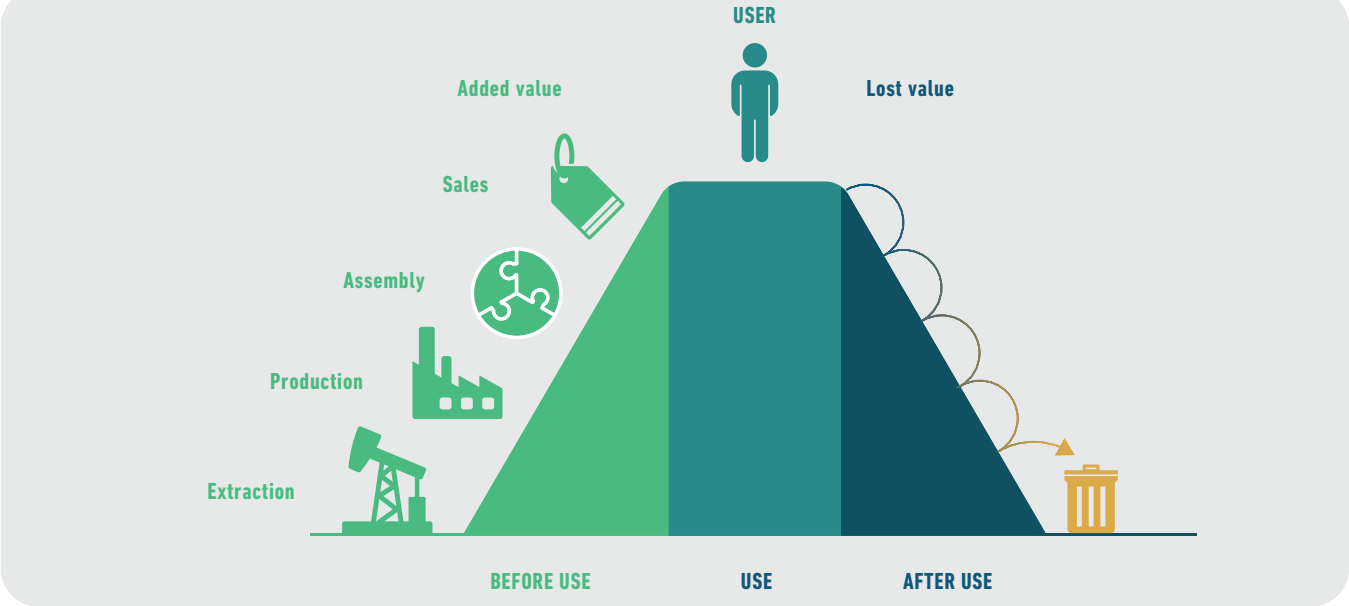
The system did not address two critical points: scarcity of resources and management of the increasing amount of waste.

Functioning of the linear economy

(Source: Get into circulation! A guide for SMEs. Budapest, 2019.)

The linear economy treats products delivered to consumers as waste at the end of their useful life. Thus all the material, labour and energy invested in making the product are completely lost for the economy at the end of the product use. However, the natural resources were used up, and the amount of waste increases.

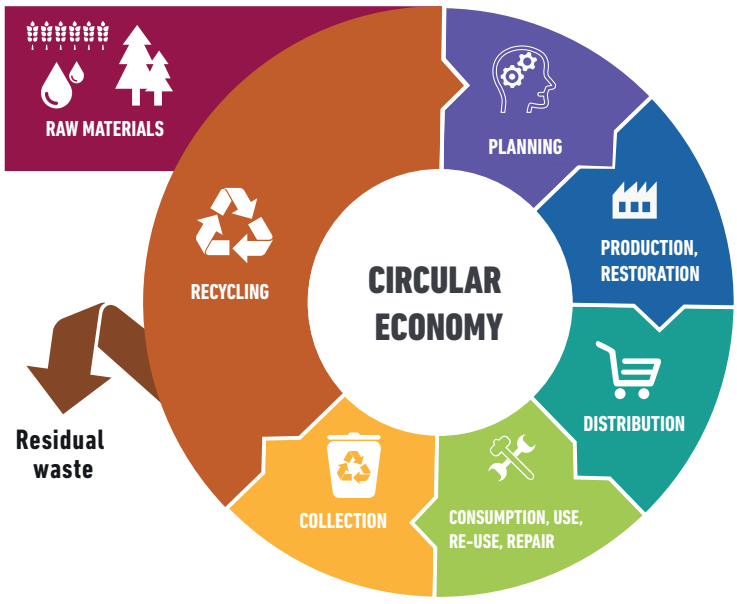
As a consequence, the depletion of natural resources, changes in the environment and uncertainty with purchasing raw materials lead to price rises and uncertainty in the supply market.



Value pyramid in a linear economy

(Source: Get into circulation! A guide for SMEs. Budapest, 2019.)

The circular economy is about keeping the materials and other resources used to produce goods in the production-consumption cycle for as long as possible.



(Source: Get into circulation! A guide for SMEs. Budapest, 2019.)

It requires a change of approach in management processes that implements the strategy of "making more from less, and more efficiently". So circular product management seeks to achieve economic growth by

- reducing the amount of resources used,
- minimising the environmental impact,
- even completely eliminating waste,
- reducing emissions,
- recycling at as many stages of the production chain as possible.

FEATURES AND BENEFITS OF THE CIRCULAR ECONOMY

Introducing new material management and business models	The model based on a full life-cycle analysis reduces the demand for resources in the economy while allowing businesses to remain profitable
Conscious design	The product is carefully designed to ensure that it can be used for as long as possible, repaired, as well as recycled at the end of its life. This means that no or much less raw material has to be extracted. Waste is reduced or eliminated
Identifying substances that are harmful to health and the environment	Reducing then eliminating emissions and materials that cannot be recycled back into the economy
Reducing the use of primary raw materials, encouraging the use of secondary raw materials	Protecting natural systems Promoting regeneration
Promoting innovation, environmentally friendly technology, repair and maintenance	Increased production of environmentally friendly products Increase in useful life of products Preserving the resources invested in products for as long as possible
Encouraging and supporting new consumer attitudes and behaviour	For example, the aim is not to acquire property, but to access services. The product remains the property of the manufacturer and is rented or leased by the user.
Extended product liability	**Manufacturers are becoming more interested in making products that can be used for longer, taking back end-of-life products and recycling them.**

Classification of circular economy solutions:

1. **Slowing down process of products becoming waste:** designing products that have a long lifespan and can be reused.
2. **Closing the raw material production and landfilling loop:** recycling and reusing usable materials.
3. **Increasing resource efficiency,** reducing waste: curbing material and energy use, increasing efficiency, reducing energy use indicators.

Reducing greenhouse gas emitting and low-efficiency energy uses (e.g. natural gas, coal and firewood based combustion systems).

Making renewable energy sources (e.g. solar, geothermal, wind energy) widely available.

BENEFITS AND LIMITATIONS OF RECYCLING

DID YOU KNOW?

DID YOU KNOW?

Did you know that one billion mobile phones are sold every year and an average mobile phone user replaces their phone every 18–24 months? The medals for the 2021 Tokyo Olympics were made from recycled materials. The raw materials were metals (32 kg of gold, 3,500 kg of silver, 2,200 kg of bronze) extracted from nearly 80,000 tonnes of electronic equipment collected during a public campaign from 2017 to spring 2019. The ribbons holding the medals were also produced from recycled polyester fibres.

To ensure the long-term sustainability of resources, generated waste should be used as a resource. Since the manufactured products are transformed into raw materials at the end of their useful life, they cover part of the raw material supply for the production process.

There are two main areas of *recycling*:

1. **reuse:** the product is used for the same purpose without transformation, for example second-hand clothes or used machinery;
2. **reprocessing:** the product is transformed at the end of its useful life and becomes the raw material for a new product. For example, ragged T-shirts are turned into yarn for weaving, or recyclable plastics are recycled into plastic raw material.

Benefits of recycling:

- As a result of reprocessing, fewer resources are needed to produce one unit of product, i.e. the principle of "making more from less, and more efficiently" is achieved.
- The amount of generated waste is reduced, so the environmental impact can be minimised through recycling.
- By recycling, we protect the ecosystem, reduce landfill and emissions.

The following conditions are necessary for the circular economy to work effectively and for recycling to spread:

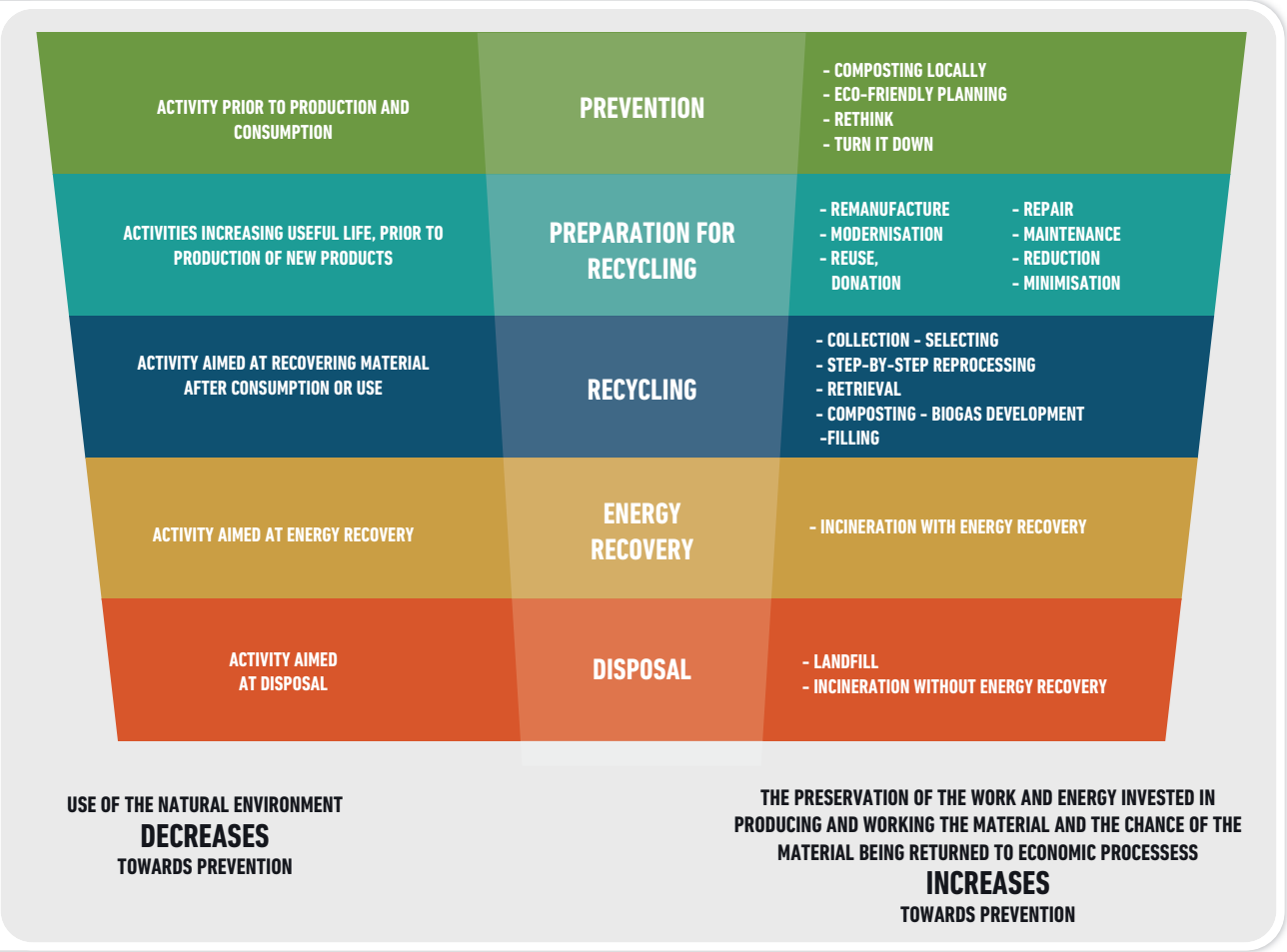
- A general change in attitude
- Programmes on the benefits of recycling to encourage separate waste collection
- Separate waste treatment schemes need to be developed that are capable of sorting waste, not just collecting it.
- The responsibility of those involved in production is particularly important, e.g. using raw materials from ethical extraction with the lowest possible environmental impact, payment of environmental costs.
- Products should be designed from the outset so they can be repaired, dismantled and recycled. This is often not the case today. It used to be possible to repair most products, often even at home (e.g. cars). Recognising this, a movement called *"Right to repair"* has been launched to make products repairable, and the European Parliament has taken a stand on repairability, which is now being incorporated into EU consumer and product policy.

Of course, it is best if no waste is produced in the making of a product, and no product or packaging becomes waste. This is called waste prevention.

If waste is still generated that cannot be recycled, waste management can face the following additional tasks:

1. energy recovery of waste,
2. or, as a last resort, the disposal of waste, for example by incineration without energy recovery, or via safe, controlled landfilling, while minimising the impact on the ecosystem.

Waste management summary from a sustainability perspective



NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Give specific examples of the positive effects that circular product management can have on the environment.
2. Write a short essay about the characteristics of energy management in the 21st century.
3. Collect arguments and discuss why corporate social responsibility plays a key role in ensuring sustainability.

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING	Developed economies have recognised the fact that resources are finite and waste needs to be reduced, so a shift towards the circular economy is emerging.
TARGET SETTING	The amount of waste generated throughout the entire life cycle of products – production, distribution, use and obsolescence – should be reduced. Circular product management should be introduced in all areas. If the product is recycled at the end of its life cycle, waste and emissions will be reduced. A change of attitude should be promoted to ensure a positive shift in economic processes and protect the environment.
ALTERNATIVES TO INTERVENTION	Waste should be managed in the least environmentally damaging way possible. Management should continuously become circular.

IMPACT OF SOCIO-ECONOMIC PROBLEMS ON THE ENVIRONMENT

The Aral Sea became a victim of human carelessness, flawed agricultural policy decisions and the pursuit of performance at all costs. Read The destruction of the Aral Sea article, and find out what wrong decisions have led to the current situation.

FIND OUT!

FIND OUT!

Describe the economic interests behind the decisions.

DID YOU KNOW?

DID YOU KNOW?

DESTRUCTION OF THE ARAL SEA

Fifty years ago, the Aral Sea was the fourth largest lake in the world. The lake has been drying up since 1960. Leaving professional arguments aside, the main reason is that the then Soviet leadership decided to grow cotton and rice in this area. Considering that both crops are water-intensive and the area was semi-desert, the water resources of the rivers feeding the lake were used for irrigation.

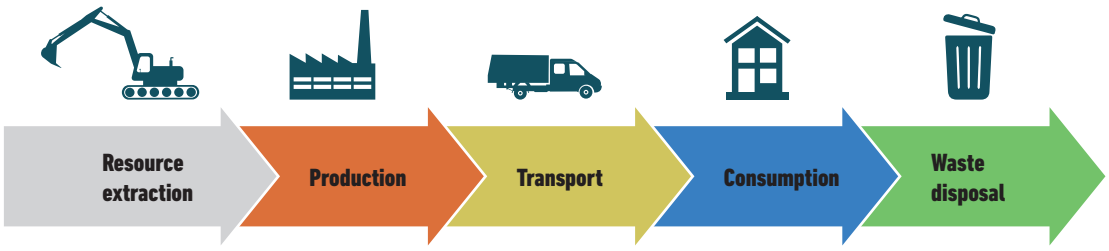
Not only did the lake dry up and its water resources were lost, but agricultural chemicals were also discharged into the rivers, contributing to the deterioration in the health of the local population. There was a marked increase in the incidence of cancer, as harmful substances entered the drinking water too. Devastating salt and sand storms led to an increase not only in gastrointestinal, but also in respiratory diseases.

What other natural and social disasters occurred as a result of inappropriate intervention? The living world in the area was wiped out and the fisheries that provided a livelihood for the locals collapsed, leading to migration.

ENVIRONMENTAL TRAPS OF LINEAR MANAGEMENT

The main problem with linear management is not simply that it fails to manage the recycling of waste at the end of the product's life. In this process, the inputs (raw materials, energy, labour) used to make the product are lost at the end of the product's useful life, and the product becomes waste polluting the environment. In other words, during production no attention is paid to protecting the environment, reducing the environmental impact and rationalising the use of resources, thereby ensuring long-term sustainable development.

The linear management model can be illustrated as follows:



Traps of linear economic model:

- management based on one-off consumption,
- no conscious choice of raw materials and technology to reuse the product as a secondary raw material,
- there is an end to the product life cycle,
- waste is not reused or recycled,
- environmentally harmful and polluting management,
- balance of ecosystems is upset,
- resources used to make the products are permanently lost.

By contrast, circular product management takes the selection and processing of raw materials into account to minimise, preferably eliminate, the waste generated by the use of the product, as well as reuse or recycle the product as a raw material at the end of its life cycle.

CHALLENGES TO SUSTAINABLE ENERGY MANAGEMENT

Developing sustainable energy management is a key element of sustainable development. Increasing energy efficiency, phasing out greenhouse gas-emitting energy production and replacing it with renewable energy sources are important steps in this process.

As with everything else, this requires a number of factors to be considered at individual, economic and national levels.

Fluctuations in production and consumption, energy storage
The amount of energy produced by renewable energy sources such as solar, hydropower and wind, depends on weather conditions, i.e. the yield changes, fluctuates, and this fluctuation does not usually coincide with changes in household energy demand. For this reason, it is necessary to stabilise the energy supply and find a solution for storing energy from renewable sources with variable yields.

Since finding the least environmentally damaging solution for storage is the biggest challenge facing the energy industry, researchers and developers are working on this with huge capacities. For example, there are giant concrete-lifting energy storage systems, which are much simpler and less polluting than battery storage. In several countries, modern, smaller-capacity nuclear power plants are thought to be the way to compensate for fluctuations in renewable energy production.

Transport, measurement

The primary purpose of the former electricity grids was to transport the energy generated by power plants to consumers, where energy consumption was measured and the electricity bill was paid. The example of active houses has shown – but it is also clear from the growing number of solar parks at institutions and businesses – that more and more consumers are today becoming producers themselves. Grid operators can prepare for this new decentralised energy supply by using smart technologies and by upgrading and expanding the electricity grid and the metering systems.

Regulation, decision-making

Given the complexity of the system, the conditions for energy production and consumption at micro, macro and global levels need to be regulated to coordinate the activities of various actors. Accordingly, the European Union has set itself the objective of becoming fully climate neutral by 2050, i.e. emitting no greenhouse gases through EU economic activity. To achieve this, Member States develop individual policies and action plans. In line with this, the Second National Climate Change Strategy of Hungary for 2018-2030, which also looks ahead to 2050, accepted – among its plans to reduce carbon dioxide emissions – the need to increase the use of renewable energy sources and energy efficiency, reduce energy demand and maintain nuclear power in the long term to achieve the goals.

Although the European Union is committed to reducing greenhouse gas emissions, there are unfortunately some countries that are blocking the establishment of a sustainable energy management system.

LIMITS TO GREEN THINKING

We would assume that impoverished societies are primarily responsible for high environmental impacts. However, this has not been fully proven in practice.

Where GDP is higher, consumption is likely to increase and may even be more wasteful, leading to higher environmental impacts. For example, broken or damaged products are thrown away rather than repaired, leftover food also ends up in the bin, and so on.

IMAGINE!

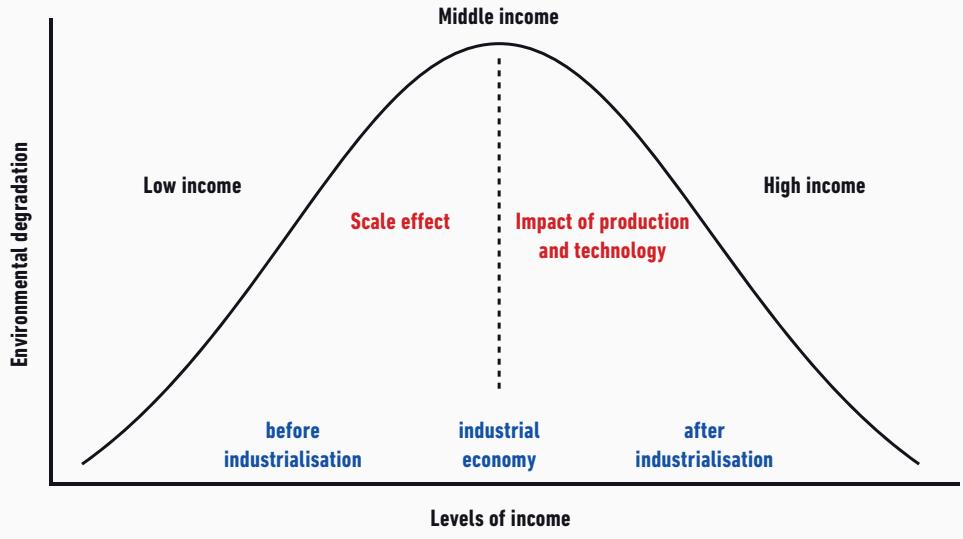
IMAGINE!

American economist Simon Kuznets argues that in societies in the early stages of economic growth, increased wealth and production are associated with higher levels of pollution. Later, however, with a certain level of income and a further increase in economic growth, pollution begins to decline. This is illustrated by the Kuznets curve. This turning point is reached at higher economic growth in developed countries, and with much lower GDP and carbon dioxide levels in developing countries. Research has shown that the Kuznetz curve is not clearly valid in most cases, as financial development, urbanisation, institutional and trade development also play a role in shaping the environmental impacts.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Choose a country of your choice. Do some research online and show how the socio-economic problems of the given country affect its environmental policies. Where would you place the chosen country on the Kuznetz curve? The scale effect in the graph means that 1% economic growth is associated with a 1% increase in the environmental impact.



The environmental Kuznets curve

FIND OUT!

FIND OUT!

1. How does linear management limit the achievement of the objectives of environmental sustainability?
2. Identify limiting factors that constrain sustainable energy management.
3. Describe and argue in favour of the energy management improvements you think are justified in terms of environmental sustainability in an underdeveloped country.

Use the following concepts when arguing and defining the direction of development.

wind energy, hydropower, solar energy, environmental impact, emissions, sustainable energy, modern energy, affordable energy, clean energy, energy for all, grid development, limiting factors, supporting factors

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

As experts from the United Nations Environment Programme (UNEP), you are asked to develop a proposal together with the evaluation criteria on the following topic:

The leaders of a less developed country, Girgindia, have recognised the importance of sustainability. They would like to have a situation assessment and a set of recommendations that will be the basis for their decisions to promote sustainability in the future.

Draft the call for proposals. The evaluation criteria should include the target group, the product description (study, research, etc.) in terms of

- what areas should be covered by the situation assessment,
- based on which characteristics does the evaluation committee consider an application appropriate.

You face the following challenges when issuing the call for tender:

- The country's leaders stated that because the country's GDP is low, they cannot provide resources for environmental management.
- The country does not monitor the environmental impact of management processes.
- The country has a linear management structure.
- The concept of sustainable energy management is familiar to them, but no action has been taken to implement it.
- Recycling is not part of the socio-economic approach.
- The strategic objectives of the country's leaders do not include the promotion of an environmentally conscious approach in society.

Make applicants aware that most of the time there are no clearly right or wrong solutions. The assessor should aim to propose the best possible solution supported by data and arguments.

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING	Wrong economic decisions can cause irreversible damage to the biosphere. Restricting economic growth perpetuates poverty and underdevelopment in lagging countries. Linear management has a severe impact on the environment. Economic growth goes hand in hand with increased energy consumption. As economic development progresses, the environmental status of a given country increases, but only up to a certain point, before it starts to decline.
TARGET SETTING	Environmental policy objectives must be integrated into the systemic regulation of countries. A shift from linear to circular product management is needed. The potential of renewable energy should be exploited, and the right infrastructure should be put in place. It is necessary to reduce the dependence of lagging countries on donors.
ALTERNATIVES TO INTERVENTION	Preliminary environmental studies should be carried out to assess the likely environmental impact of certain economic interventions. Processes that ensure economic development should be adapted in the context of sustainable development. Greater emphasis should be placed on conscious production, consumption and recycling. With economic growth, a shift in social attitudes towards the environment is needed.

CONTRADICTIONS BETWEEN GLOBALISATION AND SUSTAINABILITY

What is good and what is bad about globalisation?
The basic idea behind globalisation is to make rational use of each country's resources to achieve the greatest benefit. So there is division of labour – specialisation – between countries, each supplying the products or services that transnational companies outsource to them and in which they have a comparative advantage over other countries.

For example, cheaper labour, raw materials nearby, less stringent environmental regulations. It would be difficult to say, for example, what "nationality" a Mercedes is, because there are eight factories in Europe outside its home country, in France, Spain and Hungary, and they import parts and raw materials from many other countries.

One of the main features of globalisation is that national economies become more open, foreign trade plays an increasing role, international capital flows appear, and national economies are integrated into the world economy. The environmental culture of international firms, their expectations of sites and suppliers may contribute to a stronger environmental focus. However, there are disadvantages in terms of economic dependence on foreign countries, transnational corporations, and the vulnerability of a more open economy. So in a globalising world it is important to increase the capacity of nation states to act, e.g. to take joint action against the ambitions of certain giant corporations.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Debate whether economic globalisation processes support or hinder the achievement of sustainable development. Support your opinion with arguments.

Benefits and risks
Looking at the relationship between globalisation processes and sustainability, a number of benefits and risks can be identified. The impacts of globalisation processes on the environment should always be considered on an individual basis. Often, the benefits of globalisation accrue to one country, while others only suffer its negative effects. National economies opening up and cooperating, usually encouraged by large transnational corporations, can bring a number of benefits, for example:
- globalisation ensures that the results of technological developments are shared;
- countries transfer innovation and good practice;
- resources are used in the most efficient way;
- reduced environmental impact with efficiency gains;
- specialisation reduces environmental impact;
- improved national welfare;
- free trade between countries contributes to strengthening environmental policy and consumer protection;
- creates a basis for long-term economic cooperation.

However, a number of questions arise in relation to the above theory.
- Does the process of globalisation really deliver all these benefits in practice?
- Did the conditions for sustainable development also improve in countries that benefited from globalisation?
- Does the rise in incomes really guarantee environmentally responsible management?

Both Neverland and Tiberstan produced excellent sour cherry jam. The weather in Neverland is more unpredictable, and there were periods when much of the crop froze. By contrast, the climatic conditions in Tiberstan are always optimal for sour cherries, but the glass factory uses outdated technology to produce jars at a high cost. So they agreed to produce the sour cherry jam together in the future, with the fruit coming from one place and the jars from the other.

Theoretically, this specialisation also supports environmentally friendly farming, but the reality is often different.

Staying with the example above, reasonable cooperation will result in a high quality jar of sour cherry jam. But in Neverland, much of the sour cherry growing was stopped, and the agricultural workers were made redundant. Similar processes ensued in Tiberstan, where the jar factory closed down. This had the advantage of eliminating pollution from the outdated technology, but the number of unemployed increased. Moreover, cooperation between the two countries may lead to an increase in transport costs.

IMAGINE!

IMAGINE!

With globalisation, not only transport needs but also the number of tourist and business trips has increased, which has led to a surge in air traffic.

Fly or fall?

Aviation accounts for around 3–5% of total annual carbon dioxide emissions and 12% of emissions from transport. Although aviation has suffered a setback as a result of the coronavirus pandemic, experts predict that by 2035 up to 7.2 billion people could be travelling by air.

Noise pollution

Noise pollution is also extremely harmful to the environment. Since most airports are located in the immediate vicinity of cities, or even in the heart of cities, noise seriously affects people's quality of life. In addition, the negative impact on wildlife is not negligible either.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Discuss how to reduce these negative impacts in the interests of sustainable development.

A SMALL PROBLEM BECOMES A BIG PROBLEM

Failure to address sustainability issues at the local level, be it emissions, unemployment, water pollution or others, will have an impact on regional and global processes.

Let's look at some examples.
A lorry carries a number of products that need to be transported to different countries in Europe. Lorries generate considerable emissions and are the most resource intensive, so they have a significant environmental impact, which does not stop at the borders of the destination countries. Rail or river transport are less polluting, so if their use were to increase, it would alleviate this problem.

Or think of buying a tablet made in the Far East – much cheaper than those available in Hungary – from an online store. There is no requirement to recycle the packaging, even though there is quite a lot of it. It may also be more difficult to enforce the warranty, and if you need to repair it, you often have to send it back to the country of manufacture at your own expense, or there is no warranty at all because EU regulations do not apply there. This is loaded on a ship with thousands of other items. Unfortunately, there have been a number of accidents recently where damage to a container ship led to an ecological disaster. When you think about it, is this really the cheapest option?

Transport is expensive. For the manufacturer, it is worth considering whether to set up a subsidiary in the target market, or to increase the price of the goods with transport and other costs. Today, making a quick profit is often more important than sustainable development, but at global level, more and more companies are realising the importance of protecting the environment. Globalisation can even help to solve problems together through cross-border cooperation, but it requires a change of attitude of course.

What happens when a product is made by a manufacturer in a deprived region, using child labour, for starvation wages? Customers in developed countries enjoy the benefits of globalisation, cheaper goods, a cleaner environment, while the less developed country manufacturing the product has to suffer the negative effects, the consequences of social and economic problems.

FIND OUT!

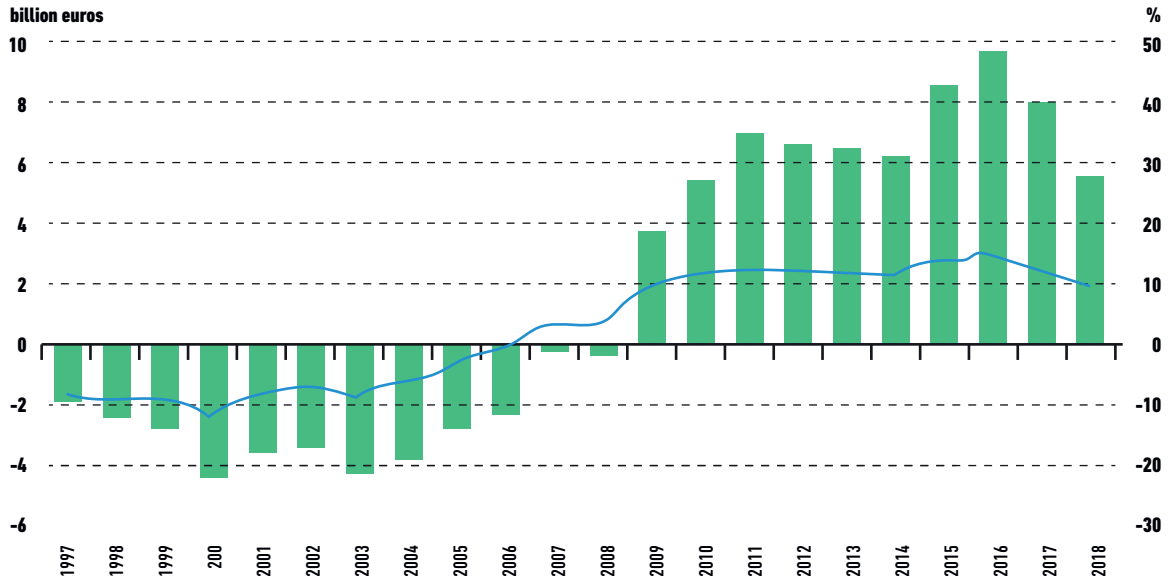
FIND OUT!

1. What contradictions are there between globalisation and the pursuit of sustainability?
2. What is the reason for this? How would you address them?
3. The problems related to sustainability at different levels show logical connections. What are these?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Identify a problem in the area where you live that is likely to emerge in regional and global socio-economic processes too. What intervention would be needed to solve the local problem?
2. Hungary joined the European Union on 1 May 2004. Analyse the chart to see how Hungary's trade in goods developed. Based on the indicators, describe the globalisation processes in the country's economy.



Goods turnover in Hungarian foreign trade, 1997–2018 (source: CSO)

EXTERNALITIES

We should always take unintended consequences into account in our decisions and actions. A lovingly baked birthday cake with nuts might trigger an allergic reaction in the person celebrating, or an inconsiderate joke can ruin a friendship, or a business partner might be delighted to discover that we are related through our great-grandmother and are already on the road to success.

DID YOU KNOW?

DID YOU KNOW?

Externalities are unintended external effects experienced by a third party. They can be beneficial or harmful, positive or negative.

One of the aims of economics of pollution is to incorporate the cost of negative externalities caused by environmental impacts into profitability calculations and record them as costs.

Electric cars from a different perspective

Let's look at the familiar example. One advantage of electric cars is that they eliminate direct greenhouse gases and emissions. This has a positive impact on air quality, with reduced health expenditure for treating respiratory illnesses in city dwellers, less time off work due to illness, etc. This is a positive external effect of the production of electric cars experienced by different actors.

However, electric vehicles also need energy. The surge in the number of electric vehicles leads to a significant increase in electricity consumption. The electricity grids were not designed for this, so a significant increase in load can cause grid disturbances and blackouts. This is considered a negative externality arising from the use of electric cars.

Externalities in everyday life

The Smiths' next-door neighbour is a family of five who take turns smoking on the balcony. The Smiths' home is filled with tobacco smoke even when they keep the windows closed. Since the grandmother has asthma, this exacerbates her symptoms. The deterioration in the grandmother's health is a negative externality of the neighbours' behaviour.

The adjacent flat to the Smiths has been empty for a long time. This was reflected in their heating bills, as the cold came through the common wall. When the family moved in, this problem was solved as the flat was heated continuously during the winter months. This cost reduction is a positive externality of the neighbours moving in.

Let's look at a gardening example.

Uncle John is a beekeeper, and the hives are next to Michael's orchard. The bees collect a large amount of honeydew from the trees in the orchard, pollinating the flowers of the fruit trees in the meantime. This amplifies the yield for the orchard owner. This is a positive externality, since like it or not the beekeeper produces a benefit for the orchard owner. The orchard owner considers filing a complaint because he was stung by bees and is allergic to bee stings. This is a negative external effect of beekeeping.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Read the press release below. What do you think were the positive and negative externalities affecting the investment?

THE GREEN SPLISH SPLASH

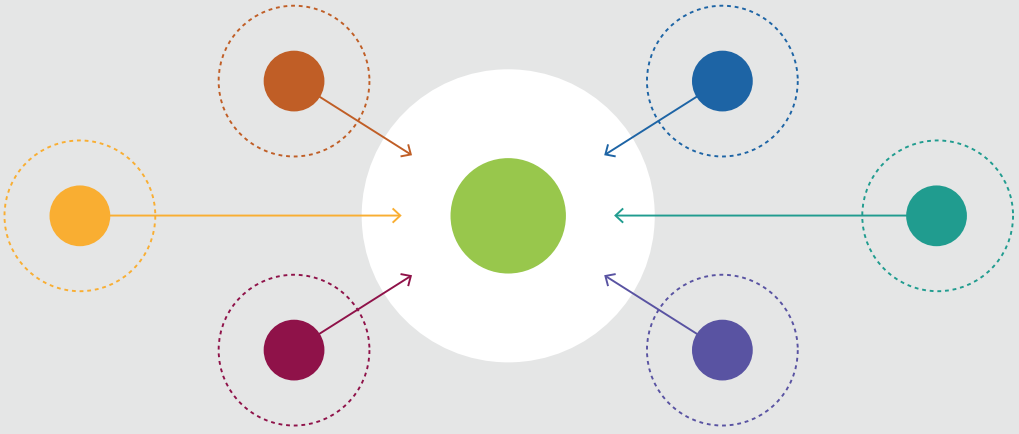
Sustainability was an important consideration in the design of the Splish Splash (SS) Bathing Complex project. In line with the green city solutions of Apple Village, we opted for environmentally friendly district heating. So, we use thermal energy from geothermal plants in the area to heat the buildings and the water recirculated in the pools of the SS Adventure Spa.

Unfortunately, the heat supplier's annual summer maintenance also affects Splish Splash. Hence we would like to inform our visitors that the pools' water temperature will be lower from 23 to 25 June due to the break in the district heating supply. Thank you for your understanding.

2. Gather positive and negative externalities from your own life. Share your "collection" with your classmates.

Why is it important to deal with externalities?

So we can see that our behaviour and actions have intended and unintended effects. Unintended ones can be both beneficial and harmful. They should always be considered when solving a problem or intervening in a system. Even if not all of them are foreseeable and cannot be planned for, or are uncertain to occur, they can usually be anticipated. This should be a part of risk management.



GLOBAL TRADE AND ENVIRONMENTAL POLICY

The process of globalisation has also highlighted a number of other issues. Some critics argue that it is the very process of globalisation that hinders sustainable development. In fact, for international trade in goods to take place, many countries had to lower their environmental standards. At international level, instead of a green finance approach, the objectives and interests of some multi-national and transnational companies have become dominant. They can even indebt individual countries, and the scale of production does not take account of the fact that the world's resources are finite.

The main issues include:

Widening gap between rich and poor countries	**Indebtedness of economically underdeveloped countries**	**Global depletion of raw material resources**	**Globalisation of economic crises**

Experts have developed business models to secure the set of goals for green development. These models put sustainability at their core, taking different interests into account. They are also well suited to globalisation processes.

REORGANISATION OF PROCESSES	EXTENSION OF LIFE CYCLE	SERVICES
Circular value chain Using recyclable or degradable materials that can be used in successive life cycles.	**Durability, products made of repairable components or modular products** Increasing the lifetime of products through maintenance and refurbishment. The products are made from assembled, reusable components.	**Providing a service instead of a product** The product doesn't become the property of the consumer, it remains with the manufacturer. The consumer rents it from the manufacturer, or the manufacturer gives access to use it.
Recovery and recollection Recovering waste and by-products, promoting recycling.	**Tailoring, made-to-order** Personalised contact with customers to reduce stock, minimal loss due to unsaleable stock.	**Sharing products** Using an internet-based system through which products can be shared, e.g. vehicles, bicycles.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

- Look for active businesses that work based on the business models you have learned.

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING

The economic interests of globalisation and sustainable development goals are often not in line.

The development of the world economy is significantly influenced by globalisation.

Globalisation aims to rationalise the use of resources, then achieve international integration.

Globalisation has advantages and positive impacts on sustainable development, but it also brings with it disadvantages and risks.

TARGET SETTING

In addition to the rational use of resources, emphasis should be placed on promoting sustainable development.

In distributing the socio-economic benefits of globalisation processes, attention should also be paid to supporting societies that are lagging behind.

The risk of economic crises should be minimised.

The indebtedness of countries should be eliminated.

ALTERNATIVES TO INTERVENTION

The basic elements of circular product management should be introduced into globalisation management processes.

A recovery and recollection system should be developed that operates at global level too.

The life cycle of products should be increased and their reparability ensured.

Purchasing products should be replaced by renting products. In this way, we use a product only as long as we need it, then it doesn't become waste, but can be used again as needed.

WHAT CAN PUBLIC ADMINISTRATION DO TO ENSURE THAT BUSINESS OPERATIONS AND CITIZENS' BEHAVIOUR PROMOTE SUSTAINABILITY?

Planning
It develops a long-term strategy for sustainability that is in line with national and international interests and guidelines.

Legislation and enforcement
It makes laws and punishes violations of laws. Examples include legislation on the burning of dry leaves or waste management.

Levying taxes
This includes product fees on polluting products and services, and penalties imposed on polluting companies and compensation for damages in the event of environmental pollution.

Economic incentives
For example, when the state gives tax breaks for desirable green products, or encourages companies to supply such products and services by means of subsidised tenders, loans or grants.

Product labelling, product information
National verified certifications can be mandatory, such as the energy labelling of products, or voluntary, such as the European or Hungarian eco-label. This can give certified products and services a market advantage. Mandatory information on products facilitates consumer choice and also contributes to a more responsible use of raw materials and packaging.

Communication
Many are uninformed, so the greatest persuasive force is information, knowledge transfer, campaigning, etc. Communication and education are particularly important because lasting results are achieved when people choose environmentally friendly and socially responsible products and services of their own free will, with the right information and a sense of responsibility. Responsible consumer expectations and a culture focusing on sustainability also have an impact on the functioning of business organisations.

Promoting Corporate Social Responsibility
The social responsibility of companies and market actors can also be encouraged through state and local government resources and strategic cooperation.

FIND OUT!

FIND OUT!

Determine which of the administrative tasks listed above are performed successfully, and those performed unsuccessfully, in or around your area.

WHAT CAN ENVIRONMENTAL POLICY DO?

In general, environmental policy is about making and enforcing environmental rules.

The European Union's environmental policy is based on the following principles:

- precaution and prevention,
- rectifying environmental damage at source,
- applying the "polluter pays" principle.

DID YOU KNOW?

DID YOU KNOW?

For example, EU rules require companies that transport dangerous substances to take preventive measures against imminent damage to the environment. If damage occurs, they must take remedial action and cover the restoration costs.

Integrating environmental protection into other EU policy areas has become an important element of European policy, and significant progress has been made in this area in recent years. The integration of environmental policy is reflected in energy policy, in the parallel development of the EU climate change and energy package or in the Roadmap for moving to a competitive low carbon economy in 2050.

The European Parliament plays an important role in shaping EU environmental legislation. The Parliament has been involved in action plans on the circular economy (on waste, batteries, end-of-life vehicles, landfill, etc.), climate change issues and other legislation based on these.

What is legislation for?
According to legislation, indirect negative effects on the environment are considered externalities as long as intentionality cannot be established. Evidence of the intentional destruction of the environment can be punished with financial and other penalties.

However, to establish intentionality, a clear framework should be laid down in legislation. Of course, legislation should be reviewed and amended from time to time based on new knowledge, research findings and changing environmental conditions.

DID YOU KNOW?

DID YOU KNOW?

While fewer people lived in cities, fewer people had cars and less was known about the health risks of air pollution, measuring and regulating the composition of exhaust gas emitted by vehicles were less important. Even this is not enough today in some large cities, and a change of vehicle type is required. To this end, representing the interests of other actors in society as well as the role of the state in protecting environmental values are important and necessary, as it is not in the manufacturer's short-term interests to change the technology or use other solutions that increase their costs.

To ensure accountability and enforcement, the principles of a country's environmental policy should always be incorporated into its legal system. A state has the power to enforce environmental protection in a number of ways.

Let's look at some of them.
- **Taxes:** It levies taxes on products whose consumption pollutes the environment or has other sustainability disadvantages. This leads to an increase in the price of the product, a decrease in its consumption, and thus an expected reduction in its environmental impact (e.g. fuel, tobacco).
- **Quantitative limits:** In this case, a regulation caps the amount of pollution. (For example, a local government may prescribe that a household can deposit a maximum of 250 kg of waste per quarter at a rubbish tip free of charge, but more than that is charged.)

- **Quality restrictions:** Quality standards regulate the given area. (For example, in the case of chemical companies, incinerators or coal-fired power plants, standards regulate the installation of filters with strict parameters in the production system to ensure that as few harmful substances as possible are released into the air.)
- **Introduction of official prices:** The price of a service or product is set centrally. (For example, public transport fares. One cause of air pollution is emissions from cars. The change of attitude to transport – i.e. not one person in a car, but using public transport to reduce emissions – is helped by the legislator by setting official fares for state-owned public transport companies, regardless of whether or not they cover the company's costs. The lost revenue is replaced by subsidies, preferably covered by a product fee imposed on the use of less environmentally friendly means of transport.)
- **Product fee:** The commercial distribution of a given product is subject to payment of a separate fee. The product fee is normally used to mitigate the damage caused by the product, process or dispose the product after use, or promote a more environmentally friendly solution, and often to raise awareness. (For example, until the EU's regulation banned the use of single-use plastic bags by supermarket chains, the state limited the quantities sold by charging an increased product fee.)
- **Permit processes:** A direct regulatory system to influence economic processes. An environmental permit is required, for example, to establish an irrigation or livestock facility.
- **Subsidies:** The state can provide more favourable conditions by subsidising certain areas (e.g. Green Lending Programme to support sustainable construction).

IMAGINE!

IMAGINE!

Direct public intervention can also have positive spill-over effects. For example, let us assume that enterprises can expect to be heavily fined for illegally discharged pollutants or landfilled waste, or even forced to close down the polluting plant.

So they facilitate appropriate waste management at company level, ensure the proper and compulsory disposal of waste and promote recycling processes. Thus, by creating a law on penalties, the state has encouraged businesses to carry out more environmentally aware operations.

It is therefore important to carefully consider the impacts of every possible public intervention, and to place the greatest emphasis on what is most likely to achieve the desired outcome. And if this is accompanied by information, education and the involvement of stakeholders in the decision-making process, it contributes to changing the attitudes of the business sector and consumers, as well as production and consumption patterns.

FIND OUT!

FIND OUT!

1. Explain why state involvement is important to achieve and ensure long-term sustainability.
2. What other tools can the state use apart from penalties?
3. Find out and write a short essay on what tools the state uses in Hungary to achieve sustainable development?
4. Read and interpret the extract from the article below.

"Designing and implementing environmental policy, including climate policy, is not only an intergovernmental and governmental task, but also involves the direct participation of others at their level and with their means, such as representatives of various disciplines, businesses, regional and local authorities and civil society organisations. The international organisations of these specialised, stakeholder groups facilitate the cooperation between their members, but they also work together effectively in connection with international negotiations and the implementation of agreements, and this will continue to play a major role in solving environmental problems."

- How can the state influence the economy through its environmental policy to achieve long-term sustainability?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Debate which environmental actions you think are the most important for a country. How can a country influence other sectors through its environmental policy actions?

OVERVIEW

SITUATIONAL ANALYSIS, FACT-FINDING	States intervene to reduce environmental risks. In addition to international legal instruments (agreements), national legal instruments (legislation) are also available. States develop an international cooperation strategy to guide national environmental policy decisions. The environmental policy pursued by the state interacts with the regulated area in a self-improving or self-limiting way. Sustainable development is affected by both positive and negative externalities.
TARGET SETTING	Most environmental problems need to be addressed effectively in a comprehensive way, rather than in isolation. The state needs to formulate its own comprehensive environmental policy guidelines and develop a strategy for managing the problems. Public intervention should exploit the national comparative advantages. Priority areas of Hungary's environmental policy: agriculture, healthcare, education, information technology and environmental protection.
ALTERNATIVES TO INTERVENTION	Laying the foundations for international development cooperation. International humanitarian responsibility and assistance. Counteracting the effects of negative externalities through legal sanctions. Using environmental policy instruments (imposing taxes, quantitative restrictions, qualitative restrictions, official prices, product fee).

PROBLEMS AND CURES

The level of commitment to sustainable development, responsibility and environmental awareness depends on the country.

To address this:

- Strategic tasks for sustainable development need to be defined at international level, and implementation steps should be continuously analysed and updated.
- Cooperation is needed between developed and less developed countries. Best practices and financing opportunities should be shared.
- Economic, business and consumer interests should be identified and stakeholders involved in decisions.
- Programmes to encourage sustainable consumption and behaviour are needed, and information campaigns should be undertaken building on NGOs and activists.
- A shift in social attitudes is needed through education and lifelong learning on the subject, from nursery school to professional training.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Ecodesign means environmentally conscious product design. In addition to following the product's life cycle, designers take the environmental impact of the raw materials needed to supply the product or service, as well as other environmental aspects into account. Ecodesign focuses on prevention.

Look for businesses and products that were made with an ecodesign approach.
Make a presentation about them and show it to your classmates.

VALUES, MANKIND AND PROFIT

Let's return to the example of the three-legged table. We said that if any leg of the chair is much longer than the other two, it loses its stability. If human factors are not given due consideration alongside economic goals, it can lead to social inequalities that have an impact on job performance and attitudes, and thus could cause economic damage.

Help each other, you can get in trouble too!

Solidarity means reciprocity, a duty to help, social cohesion, a shared purpose and common interests. Solidarity is a fundamental principle of the European Union.

DID YOU KNOW?

DID YOU KNOW?

In the event of a natural disaster, the European Union Solidarity Fund provides assistance to the affected Member State or the country negotiating for accession. The EU countries most affected by the coronavirus pandemic received epidemiological support from this fund.

COMMITTED BUSINESSES

We have all experienced the feeling of support and compassion in times of need. But is there a monetary value to solidarity and help in the market?

Human-friendly workplaces

People's well-being, comfort and social environment also have a positive impact on job performance. Recognising this, successful and responsible companies try to create a working environment where employees feel comfortable and which is not only healthy and aesthetically pleasing, but also provides an opportunity for shared activities and retreat.

Increasingly, there are also workplaces that make sure that furniture is made from environmentally friendly materials, paper use is kept to a minimum, green surfaces are provided and canteens offer a choice of healthy food.

What is CSR and why is it worth it?

CSR is an acronym for *corporate social responsibility,* which means that, in addition to making a profit, companies go beyond their legal obligations to pay attention to the well-being of their employees, support environmental protection and, beyond their community involvement, they also contribute to the development of the local economy.

Since 2005, medium-sized and large companies in the EU have been required to include in their financial statements what they do in the context of CSR. This can be an advantage, for example, when bidding for certain tenders.

Corporate social responsibility builds confidence in partners. A fair person in the market will presumably be fair in economic cooperation too. It is also appealing to customers if a company respects the environment and the people and communities around it. It is increasingly important for employees as well to know what their employer does for the environment and society.

ISO, one of the most widely used quality assurance standards for companies, certifies a company's operations in various areas. So there are ISO standards for environmental protection and CSR activities too. In the context of corporate social responsibility, companies provide financial, material and service benefits, employee volunteering options and discounted services to support community causes, such as the purchase of medical equipment, cultural events and nature conservation. Corporate social responsibility is now intertwined with committed actions to sustainable development, and in many cases companies are ahead of the law, for example in meeting climate objectives and implementing environmental management systems.

IMAGINE!

IMAGINE!

A major UK supermarket chain saved £1,000,000 in advertising time by launching a programme to help homeless people into work. How? The campaign received a lot of media coverage, which was worth more than any advertisement.

FIND OUT!

FIND OUT!

Eco-labels

Customers are also increasingly making choices based on ecological criteria. Eco-labels can therefore have not only an informative but also an advertising function. However, in addition to genuine certification verified by independent organisations based on transparent criteria, labels for marketing purposes have also appeared that seem environmentally friendly, but do not carry any important information. So it's worth paying close attention when choosing the product you want to buy.
Check out what the following labels stand for, which are real certificates? What other eco-labels do you know?

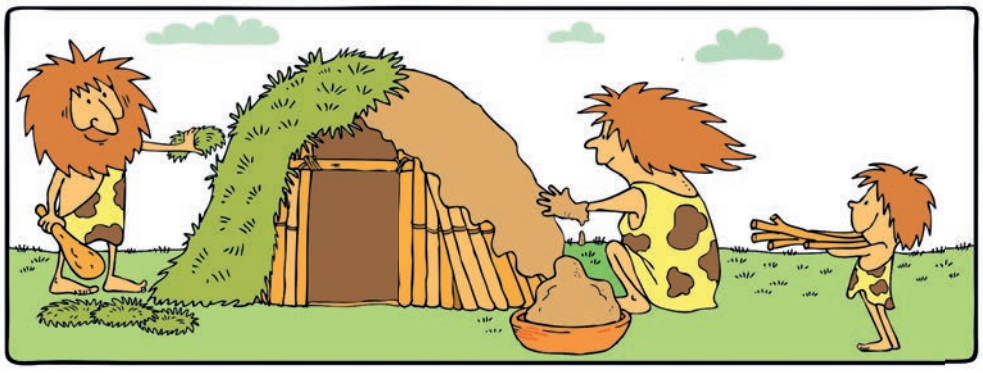
NOW YOU KNOW!

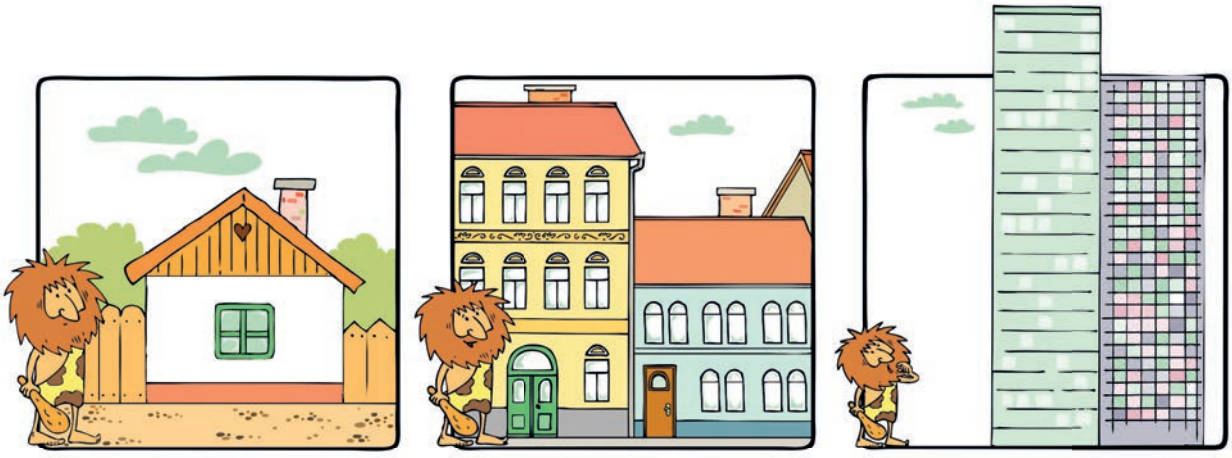
TERM	DEFINITION
Car-sharing	In exchange for a rental fee, a specialised company or an individual allows use of the cars they own, which can be paid for via an app. The car can be "picked up" from stations in the city and parked at the destination.
GNH	Gross National Happiness (GNH). The concept is used to measure progress and serve as a guide for growth. The four pillars of GNH: 1. sustainable development, 2. environmental protection, 3. preserving culture and 4. good governance.
CSR	This is the abbreviation for Corporate Social Responsibility. It means that, in addition to maximising profits, a company/corporation supports various noble causes, events and developments.
Externality	Unintended external effects. They can be beneficial or harmful, positive or negative.
Globalisation	The origin of the term is the Latin word globus (globe). It means becoming global. The basic idea behind globalisation is the systematic use and exploitation of the resources of individual countries to achieve the greatest benefit. Globalisation has both positive and negative aspects for the economy. Its impact varies from country to country.
GPI	Genuine Progress Indicator. In contrast to GDP, GPI also takes the possibility of natural and social capital depletion into account, therefore providing an early indication of sustainability data. GPI deducts the following expenditure items from the value of goods and services consumed in the economy: 1. compensation (e.g. health, recovery costs), 2. social costs (e.g. education, aid items) and depreciation of the environment and natural resources.
Prosperity	Material wealth.
Well-being	This refers to quality of life, which includes not only material, but also other indicators. These include: • life expectancy, • health, stress levels, • public security, • economic security, and • legal certainty.
CAP	The CAP (Common Agricultural Policy) is a common policy of the EU Member States.
Circular product management	The **circular economy** model aims to achieve economic growth by • reducing the amount of resources used, • minimising environmental impacts, • even completely eliminating waste, • reducing emissions, • recycling at as many stages of the production chain as possible.
Environment policy	In general, this is about making and enforcing rules about the environment.

NOW YOU KNOW!

TERM	DEFINITION
Linear management	**Linear economic model:** • management is based on one-off consumption; • there is no conscious selection of raw materials to become a secondary raw material in the future; • there is an end to the product life cycle, • waste is not reused or recycled, • environmentally harmful and polluting management; • protection of ecosystems is compromised; • resources used to make the product are permanently lost.
Marketing	An activity whereby a business carries out market analyses, product development, product promotion, pricing, sales and sales promotion to meet the needs of customers.
Non-profit company	**Non-profit** companies can use profits for public purposes, as defined in their constitutional documents, rather than for their own purposes. In addition to its entrepreneurial activities, the income of a non-profit enterprise may also come from donations and grants, as is the case with other non-profit organisations.
Ecodesign	Eco-friendly product design.
Profit-oriented	The primary goal of profit-oriented businesses is to maximise profits in the long run. The profits belong to the owners of the business, who can develop a profit-sharing scheme under which employees or managers can also share in the profits.
Recycling	One way to prevent waste. This can mean: 1. **reuse**: the product is used for the same purpose without modification, for example second-hand clothes or used machinery; 2. **reprocessing**: the product is transformed at the end of its useful life, and becomes the raw material for a new product. For example, ragged T-shirts are turned into yarn for weaving.
Stakeholders of an enterprise	Actors linked to the enterprise in some way. • *Internal stakeholders* Their interests are linked to the assets of the enterprise in some way: owners, managers, executives and employees. • *External stakeholders* Actors outside the enterprise who are influenced by the enterprise's activity, but they are also the customers, suppliers, partners, competitors and production plants. People living in the vicinity of the business premises also have an impact on the enterprise.

WHY DID WE SETTLE, AND HOW?





Throughout history, people have realised that a settled way of life is simpler and more predictable than a nomadic one. Agricultural activity made people reside in the same area for at least one crop cycle, and if the land was good, it was worth settling there. Providing various services along trade routes, such as getting food and water, shelter, meals, forging, trade, etc., was also profitable. If a place was favourable for settling, it grew and flourished, but if conditions changed for the worse, it became deserted. With an increasing population – along with the number and size of settlements – and administrative boundaries (empire, city) being established, the possibilities for migration became more limited.

In this part, we review what has been learned in geography, but the main focus of our analysis will remain sustainability.

WHY IS IT GOOD TO LIVE IN A SETTLEMENT OR MUNICIPALITY?

Put simply, a municipality is a geographically well-defined area where people live and/or work for a lengthy period, and satisfy their basic individual needs at the level of the community. The latter means, for example, that community rules and enforcing them, access to resources, health protection, knowledge acquisition and sharing as well as related infrastructure organise the daily life of the community as a whole, while making the lives of individuals safer and more balanced.

The following factors play an important role in the development of municipalities:
- natural environment,
- socio-economic factors, and
- infrastructure necessary for their functioning.

Municipal planning ensures the living conditions of the people living in the given area. The tasks depend on the number of inhabitants and their expectations with regard to living conditions. The expectations of a person who has to walk miles for drinking water are not the same as those of a person who has problems because the metro runs less frequently than they would like.

Municipalities can be assessed according to different criteria:
- **type** : farm, smallholding, village, town, city, metropolis, etc.;
- **size**: size of the area, number of inhabitants;
- **geographical environment**, location: plain, hilly, mountainous;
- **history**, age;
- **structure**: layout (regular, irregular, mixed);
- **composition of population**: ethnic, gender, age distribution, occupations, main activities (agriculture, industry, tourism, etc.);
- **role in the wider geographical environment**, its possible central function, its administrative, economic or cultural role, and the services it provides to surrounding municipalities: e.g. capital, county seat, industrial or cultural centre, etc.
- variety and quality of **services available** in the municipality.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Make a presentation for interested tourists about the place you live in. Structure your presentation based on the above criteria. Include pictures, but you can also add a short video.

FIND OUT!

FIND OUT!

- Which settlement criteria might have been decisive in the development of the places shown in the following pictures?
- What do the following towns have in common in their formation, structure and development? Use the map.

Alexandria (Africa)

Athens (Europe)

THE ONLY CONSTANT IN LIFE IS CHANGE

If the environmental conditions in a place were favourable, rapid growth in the population began, the area expanded, and if the conditions became unfavourable, migration and depopulation took place.

As Herodotus, considered by historians to be "The Father of History", wrote in his work The Histories around 440 BC:
"For most of those which were great once are small today; And those that used to be small were great in my own time. Knowing, therefore, that human prosperity never abides long in the same place, I shall pay attention to both alike."

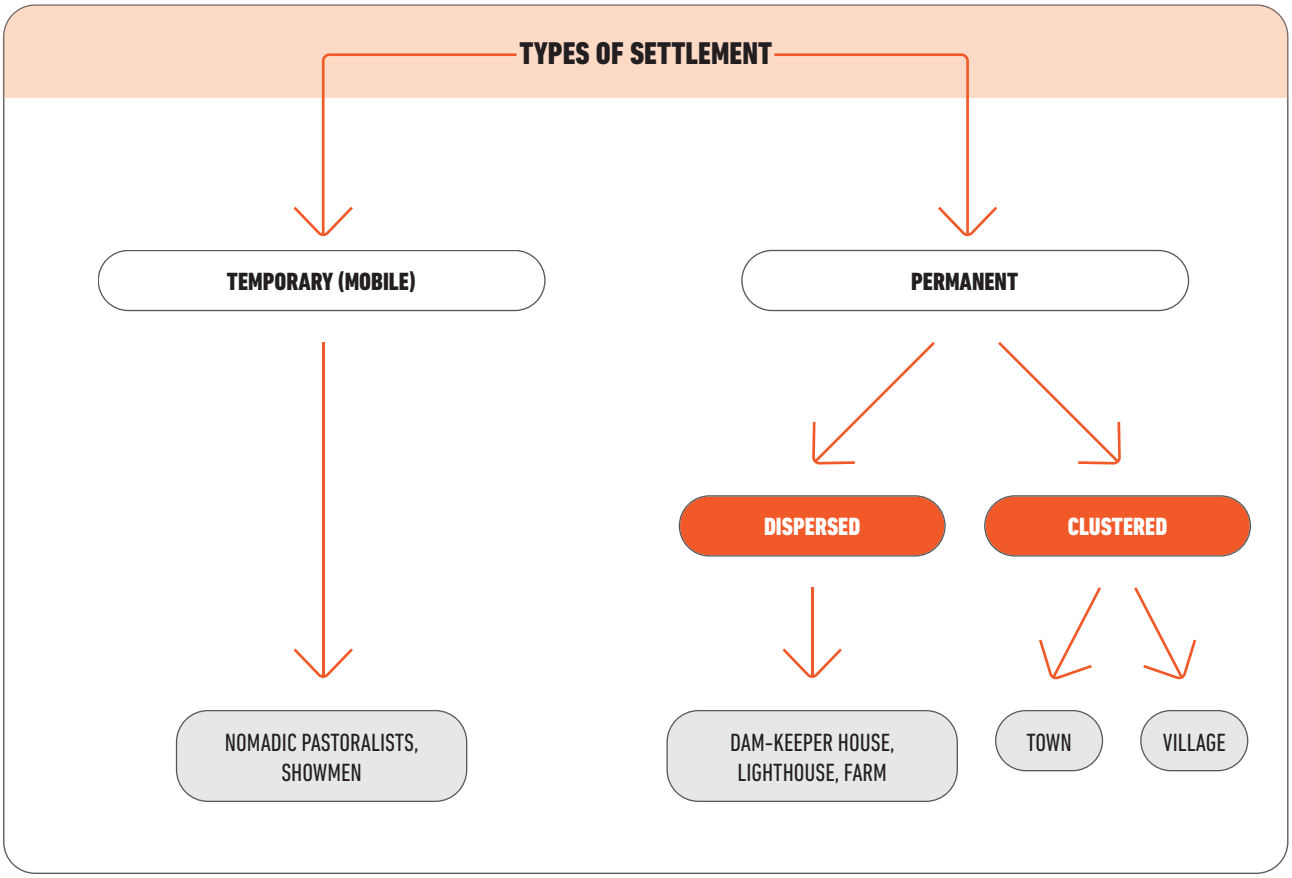
New situation, new problems, changing tasks

Population growth of a municipality constantly creates new challenges. What is not a problem for a population of 100-200 people is an issue for a population of 1000 or 200,000. Population size also determines the (public) tasks needed to serve the community. For example, with a few hundred people, organic waste can easily be recycled in gardens or on land around the municipality. However, if the population of a municipality increases in size and density, the inappropriate management and disposal of organic waste from as many as 100,000 people can lead to diseases and epidemics.

Therefore, the collection and disposal of waste requires organisation, a separate service. The growing volume of non-organic, i.e. non-degradable waste has presented municipalities with new challenges. In view of the rapid saturation of landfill sites and illegal dumping, the main tasks of waste management now include preventing the generation of waste and organising separate collections and recycling.

TYPES OF SETTLEMENTS

Types of settlements were influenced, among other things, by the socio-economic characteristics of the given period and the geographical features of the environment.
We can distinguish the following types based on their characteristics.



MOBILE OR TEMPORARY SETTLEMENT

Mobile settlements are characterised by only serving the housing and work of the people living there for a certain period, so they can also be called temporary settlements. Examples include mobile research stations, tent cities, shows travelling the world and temporary dwellings for nomadic pastoralists.

Those living in temporary settlements had to find ways to make their dwellings easy to build and move around, and to create a liveable environment in their new locations as quickly as possible.

Bedouin mobile tent village

FIND OUT!

FIND OUT!

1. From a sustainability perspective, what are the advantages and disadvantages of a mobile lifestyle?
2. How does the interior and exterior design of the dwelling relate to lifestyle?
3. The typical dwelling of nomadic pastoralists is the yurt. What are the advantages of this type of dwelling?
   a) Find pictures and descriptions of yurts built and inhabited nowadays!
   b) If you were to build on a lakeside in a sustainable way, what features of building a yurt would you use?

Mongolian yurts

Interior of a Mongolian yurt

Life of Mongolian nomadic herders and sustainability

Changes in the political, economic, climatic and land ownership conditions of past decades have had an impact on the way of life of Mongolian nomads too. For example, they travel much shorter distances, having moved closer to big cities. Interestingly, researchers conclude that the decline in mobility is also due to the proliferation of objects, such as ornaments, that are not used for daily activities.

What will be the ecological consequences of reduced mobility?
Shorter migrations lead to overgrazing and overhunting around settlements, while more distant pastures are less used than before, i.e. undergrazed. Studies of domestic grasslands show that both undergrazing and overgrazing result in a loss of diversity and conservation value of grasslands. Overgrazing and climate change together contribute to the gradual shrinking of the Mongolian steppe, which also carries a high conservation value, and the expansion of the Gobi Desert.

The livelihoods of nomadic herders depend to a large extent on the weather, prompting them to monitor it closely. They say in recent times the rain has been getting scarcer and has become patchy, with more frequent droughts and sand storms. The herders' observations are supported by research.

FIND OUT!

FIND OUT!

What are the social and cultural consequences of nomads moving closer to towns?

DISPERSED SETTLEMENTS

It is also important for the inhabitants of dispersed or scattered settlements to have adequate living conditions. They themselves have an important role to play in this too, for example by producing food and recycling waste, but they also have access to community services such as public transport (bus, train) or electricity.

Mongolia

FIND OUT!

FIND OUT!

1. How is proper care provided for people living on farms?

Farm

2. And for those living in a lighthouse?

Lighthouse

3. What does a dam-keeper do?

A dam-keeper house in Ópusztaszer

Source: Csanády

IMAGINE!

IMAGINE!

Ida Lewis was one of the best-known lighthouse keepers in Rhode Island. Originally, her father was given the job, she inherited it after her parents died. She lived on the coast, but the lighthouse could only be reached from the shore by boat or by swimming. Lewis became an excellent swimmer, rescuing nearly two dozen people from the water from the age of 12. One of her most important tasks was to light the oil lamp at sunset, refill the oil at night and extinguish the flame in the morning. She gained fame for rescuing two soldiers who had fallen into the icy stormy sea in 1869.

FIND OUT!

Does a farm always consist of a single house? Find out what types of farms there are in your country. How different might life be for people living on different types of farms?

CLUSTERED SETTLEMENTS: WHAT MAKES A TOWN, WHAT MAKES A VILLAGE?

The two basic types of settlement are the village (rural municipality) and the town. In everyday language, the terms rural municipality and village are used synonymously. The difference between the two concepts is that while a rural municipality is an administrative (legal, political) category, a village is a geographic concept. The two settlement types are distinguished by characteristics such as the number of inhabitants, the type of built-up area (houses with gardens, adjacent multi-storey buildings) or the number of people employed in agriculture.

One of the most common ways of classifying settlements is by their number of inhabitants. (However, there can be significant differences between countries. For example, in Denmark, towns and villages are defined according to different criteria, so a place of 250 inhabitants can be a town, but in Hungary there are also villages with large populations.)

According to UN categories:

1. metropolis – over 1 million inhabitants,
2. city – over 100,000 inhabitants,
3. medium-sized city – between 20 and 100,000 inhabitants,
4. small city – between 5-20,000 inhabitants,
5. village (rural municipality) – under 5,000 inhabitants, small town – over 5,000 inhabitants.

The past

The first settlements – villages – were established as a result of agricultural production around 9,000 years ago. The natural environment provided people with:

- the conditions they needed to build shelter, and
- to produce food, such as land, soil, water, building materials (wood, reeds, building stone) and a suitable climate.

The initially small settlements saw an increase in population and area due to their favourable geographical location, for example, because they were situated at the mouth of a river, on a coast suitable for harbours or at the junction of trade routes.

From these growing settlements, those that took on a central role and increasingly diverged in many of their characteristics from agricultural villages became cities. Cities are characterised by their close links with their immediate surroundings, providing services not only to the people in the city but also to the inhabitants of the smaller municipalities in the surrounding area, for example, by running public administration offices, hospitals, banks, schools and universities. Of course, the surrounding areas also provide the city with services such as food, recreation, or sites for power plants and landfills.

IMAGINE!

IMAGINE!

From village to town, and vice versa

However, the characteristics that distinguish a village from a town are changing. Despite the rural character of the environment, those moving from the city to the agglomeration may no longer engage in agricultural activities, while many villages have been industrialised and tourism has emerged as a service function. However, this type of change is only typical of developed economic regions. In regions lagging behind economically, we see a depopulation of villages and migration for employment, along with the emergence of slums and shantytowns in cities.

FIND OUT!

FIND OUT!

Shantytowns have emerged in many cities of the developing world.
How does this relate to outward migration from rural areas?

Slums in a big city: Mumbai

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

There is a settlement somewhere in Africa called Tulbuha. (Don't look for it on a map, it's an imaginary place.) Not so long ago, the population was only 180. They fished, hunted, bathed and washed in the fast local stream, and drank its water. Diseases were rare, mainly from accidents and injuries. There was no school, knowledge was passed from father to son. Thanks to an ethnographer passing by or an aid organisation, one or two children a year went to school in a big city 1,500 kilometres away.

Tulbuha has been discovered by investors in the last 50 years. Partly because of its mineral resources and partly because of its location, which has also favoured the development of tourism. The population grew rapidly, industrial plants and travel agencies appeared, and hotels were built.

What do you think?

1. How did this benefit the indigenous people of Tulbuha?
2. What disadvantages did they suffer?
3. What village planning tasks was the local government given?

IS SUSTAINABILITY AN OPTION OR A DREAM?

In municipalities of increasing population and size, sustainability problems have grown in proportion to convenience and easy access to services. Nowadays, in addition to the quality of life of inhabitants, the main concern when designing sustainable places to live is to ensure the smallest possible ecological footprint per settlement and per inhabitant.

Such efforts include:

- low energy consumption of the urban community through the development of an appropriate spatial structure (in simple terms: spatial structure means the location and interconnection of economic, social and environmental elements);
- creating harmony and a balance between green surfaces and the built environment;
- enforcement of environmental considerations such as rainwater management, waste recycling, use of green energy;
- creating clean and aesthetic public and community spaces;
- promoting environmentally friendly transport;
- establishment of environmentally friendly infrastructure to ensure the provision of essential services to the population.

FIND OUT!

FIND OUT!

In addition to traditional farmers' markets, packaging-free shops offer a more conscious and sustainable alternative to consumption. Less packaging, less waste. Why are packaging-free shops called "garabolyos" in Hungary? What is a garaboly (wicker hand basket)?

WHAT IS WRONG WITH THE GROWTH OF BIG CITIES?

What are the most common problems and challenges we face when a city grows? Let's look at some examples.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Work in groups.

1. Continue the list below, then make a problem grid showing how each problem or task is related to the others.

NATURAL	SOCIAL	ECONOMIC
Increasing demand for new land, resulting in the loss of surrounding natural areas and internal green surfaces.	Increasingly serious damage to health (due to noise pollution, air pollution, divorce from nature, less exercise).	Growing utility costs: water, wastewater, waste treatment.

NOW IT'S YOUR TURN

2. We value it and turn it into value.
Make an outline map of your neighbourhood. Mark the areas and objects that you think are of value, and/or need to be renovated or protected. Also indicate if there is anything you would demolish or remove. Give reasons why.

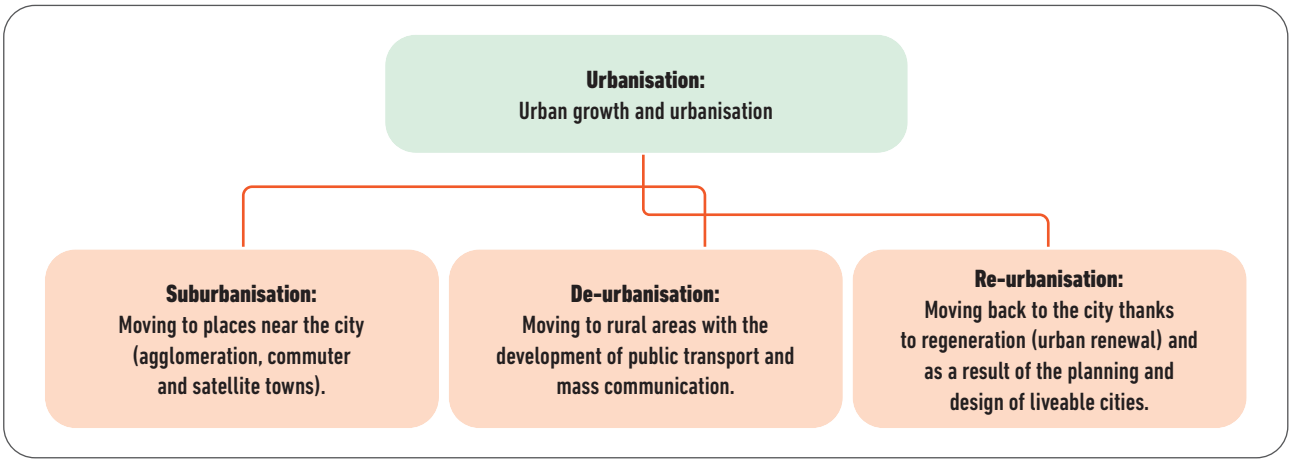
3. Our neighbourhood in space and time
How has your neighbourhood changed over the last 100 years? Look for old photos and old, publicly available maps of your town and its surroundings, buildings, streets and roads. Make a photomontage of them.

Compare them with the current situation. Mark the changes.

ENVIRONMENTAL ISSUES OF URBAN DEVELOPMENT

With the development of technology, people have increasingly been able to separate themselves from the primary factors of settlement provided by nature. Today, more than half of the world's population lives in cities. The growth in the number and population of cities and the spread of the urban lifestyle are collectively known as urbanisation.

You have already dealt with the process in detail in geography class, so let's just recall what you have learnt:



During the industrial revolution, urban migration involved the development of larger, formerly fertile areas and cultivated lands, the formation of agglomerations linked to the cities and the production of waste on a massive scale as a by-product of technological and industrial development.

Liveable city

As the needs of people change, so does the concept of a liveable city. The meaning of a liveable city is not the same in Paris, Vienna, Budapest, or in regions lagging behind. Creating parks and green areas, running environmentally friendly and high quality services are the main goals of a liveable city, in poorer areas drinking water supply and waste management are the main concerns. And although living standards have also improved a lot in the developing world over the last two decades, this has not only brought benefits, but also had a serious impact on the environment. Just look at the air pollution data for the rapidly growing cities of South and East Asia. This is due not only to industrial pollution but also, for example, to the rapid increase in car traffic associated with rising living standards.

The new industrial revolution we are seeing, known as Industry 4.0, and digitalisation are transforming production and occupational structures, affecting incomes, prosperity, not least our environment, and even our personal relationships.

FIND OUT!

FIND OUT!

1. Interview "people on the street". Ask questions like these: Do you know your neighbour? Did you help each other during the pandemic? Who has given you support and who have you given support to recently?

Share your experiences with each other.

2. Discuss what can be done to bring local people closer together.

ENVIRONMENTAL ISSUES OF RURAL DEVELOPMENT

But what are rural areas?

Put very simply, this includes everything that is not a city. In everyday language, it refers to any area outside the capital or the larger cities and their surrounding areas.

Village

More technical response?

A rural area is an area in which villages and smaller towns (with less than 10,000 inhabitants) form an economic and social unit. It has a lower population density, varying degrees of built-up area, a more fragmented infrastructure, fewer economic actors, and the services available are also different from those in large cities. Although the distinction between rural and urban life is increasingly blurred in Hungary today, with many people commuting from villages to work in cities and a variety of economic activities emerging in the countryside, in general it can be said that part of the population in rural areas is employed locally in agriculture or related activities, with the majority of land used for agriculture, forestry, nature conservation and recreation.

– SYSTEMS THINKER –

Part of the urban population is moving to nearby villages if they can, while keeping their jobs in the city. Commuting, however, is leading to increased traffic with frequent congestion on the roads in and out of the city, which is accompanied by noise pollution and bad air caused by pollutant emissions. For people living alongside roads, it is important to reduce noise and air pollution, but for commuters, what matters is getting to their workplace in the city as quickly as possible. Constructing bypasses and ring roads may seem like a good solution, but by doing so, it takes more land away from natural habitats, fragmenting them and also leading to a loss of biodiversity and reduced viability of the natural areas remaining.

Since the bypass is initially quicker to get into the city, the number of commuters using cars increases, thereby slowing traffic down on the bypass, and increasing the frequency of accidents and congestion. So after a while, the traffic slowly moves back to the original route with reduced traffic, and this continues until the time needed to reach the city is the same on both roads. The real solution is to improve and modernise public transport, thereby reducing journey times, making travel convenient and cheap, and to increase the opportunities for cycling shorter distances.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Read the story and suggest a solution.

A group of 50 friends decides to move to a depopulated village near a city. They don't want to give up the facilities and amenities of the city, but at the same time they want to keep sustainability in mind. As members of the expert group, you are given the task of planning the structure and functioning of the village to ensure sustainability. Prepare a map and an explanation to present your proposals.

Features

1. Forest, adjacent lake
2. Concrete roads connecting the village with two other more populated settlements
3. Dirt roads within the village
4. Good quality soil
5. Church
6. 20 adobe houses in a good structural condition, consisting on average of 4 rooms
7. The grocery store in the village centre, currently closed
8. A closed drink store next to the grocery store

NOW IT'S YOUR TURN

What should be installed and built

1. Post office
2. Internet access
3. ATM
4. Community centre
5. One member of the group would move their business to the village, which would provide jobs for the residents of the area, but there is a need to solve the problems of wastewater disposal and prevent air pollution, while at the same time it is important that workers can easily get to their workplace

Aspects

1. Three of the future residents work from home, three are retired and one is at home with her baby.
2. Five of them are men aged 20–40, and five are women aged 20–40. The members of the group want to work locally in organic farming and sell their products.
3. They want to ensure that they have access to everything they need for their livelihood in the village.

FIND OUT!

FIND OUT!

1. What are the processes of environmental degradation associated with urbanisation?
2. What environmentally harmful factors may be present in villages or dispersed settlements?
3. What were the causes of the depopulation of rural areas in your country?
4. Why has the village become appealing again?
5. What are the greatest values of urban life?
6. What are the advantages and disadvantages of farm life?

THERE AND BACK: city to village, village to city

Urban and rural settlements are interconnected:

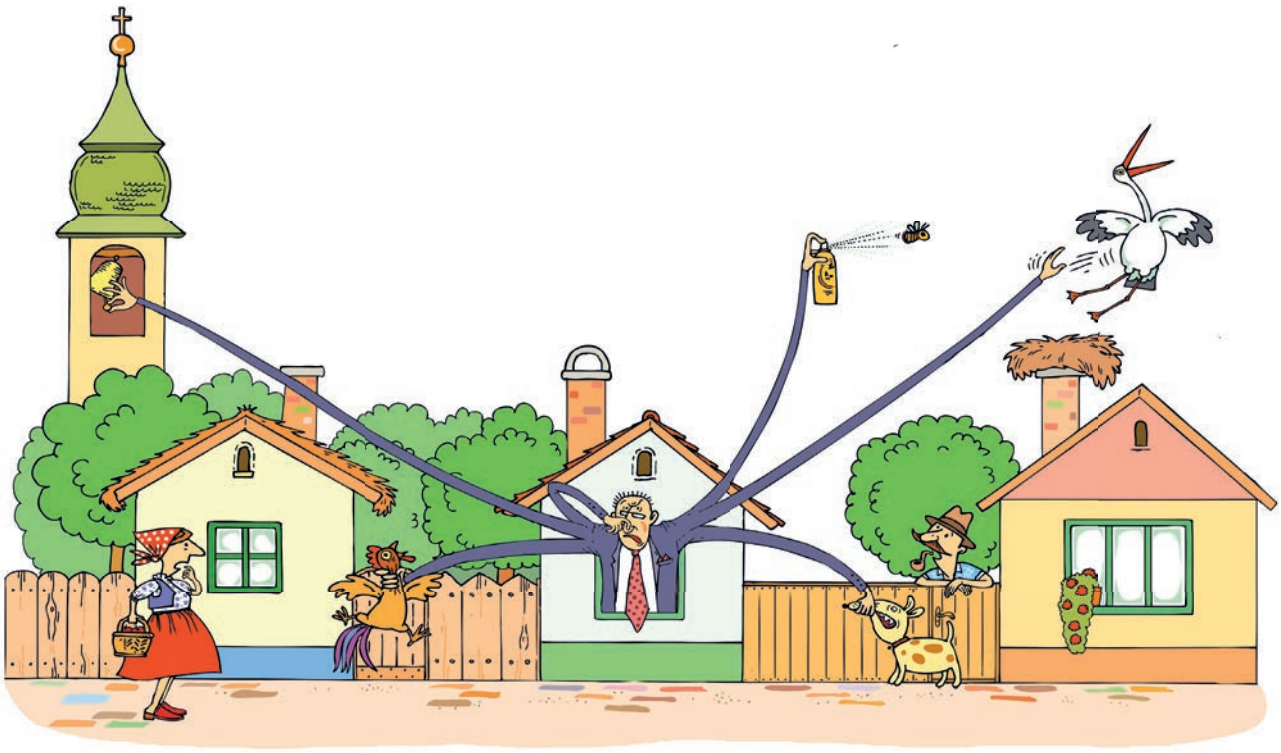
- cities are home to institutions that also serve the surrounding settlements, such as government offices, courts, secondary schools, clinics and hospitals;
- a large proportion of people living in rural areas work in the city, producing goods;
- people living in cities seek recreation in the countryside;
- the countryside has always played an important role in supplying food to the city.

IMAGINE!

IMAGINE!

Head for the village!

You know when a city dweller decides they have had enough of the hustle and bustle, moves out to the quiet, natural, idyllic countryside, then starts to develop the usual urban lifestyle? The hitherto peaceful pond is disturbed by the noise of their motorboat, they cut down trees because of the falling leaves, they pave the yard for their cars, they urge action to kill mosquitoes on the lakeside, which results not only in the disappearance of swallows due to lack of food, but also of other insects, and the entire food chain is impaired. In France, fed up with the urban dwellers in the countryside constantly complaining to their neighbours about pigs grunting, cockerels crowing or the smell of manure, a law was passed to specify the sounds and smells associated with village life, so no one could complain about them.



Head for the city!

Not only urban dwellers are heading for the countryside, but at the same time, people living further away from cities are moving there with its better infrastructure and with, or with the prospect of, job opportunities. This process leads to a depopulation of some villages. The main reasons for migration are problems in making ends meet or the lack of basic services. (Reasons in Hungary include the distance of health facilities from villages or the lack of access to primary education, but in many countries, access to drinking water is also a factor. However, those coming to the city in the hope of finding work or better infrastructure often end up in worse conditions than they could have had in their village. For example, because of their lack of education or information they are not employed or are paid very low wages, and due to the high cost of housing, they are unable to maintain even low-rent homes on their own, thereby increasing the number of slum dwellers.

– ECO-SAVVY –

The stakes are huge in rural development: if the young population of the countryside migrates, its settlements age, become depopulated, then disappear. It is important for places to maintain institutions that provide basic services to the population (medical care, nursery and primary education, cultural institutions preserving traditions), so as to reduce migration. This is because it is easier for young people of working age to stay in places with better infrastructure.

Recognising their own potential, some villages have embarked on development projects to prevent migration and improve living conditions. In such cases, the local government's concept of urban development as well as involving people in planning and implementation are always decisive.

In villages where people are involved in shaping the local life, they will be more motivated and committed. Rural development is now a separate discipline, and there is a special rural development training programme in higher education.

Key features of local economic development:

- *created by:* local initiative,
- *actors:* local stakeholders (local government, businesses, civil society organisations and citizens),
- *method:* cooperation and participation of local people,
- *basis:* taking stock of and using local assets and internal resources, external assets and resources (e.g. tenders) are only temporary incentives,
- *control:* processes, decisions and actions are controlled by the local community,
- *utilisation:* economic benefits are mainly local.

Making plans a reality, together

Today, there are many examples where entrepreneurs and suppliers of different services or products work together – building on local values – and develop joint marketing. Some offer accommodation, meals and services together, such as bicycle hire; they buy jam, cheese and smoked goods from local producers, and recommend each other's services, such as visiting producers, or wine, honey or apple tasting as a leisure activity. Local guides are available to show cultural or natural values on a guided tour. A best practice is to develop local consumer markets or short supply chains to nearby towns.

Local produce offered locally

FIND OUT!

FIND OUT!

1. How does the Hungarian Living Village Network work?
2. What was the importance of the Ant Consumer Cooperative established in the late 19th century?
3. What characterises a Hungarian eco-village?
4. Find out where there is a local farmers' market in or around your area. Create a report (video, photos) to present the market.

RESPONSIBLE CITIES, SURVIVING NATURE

Although we associate cities with hustle and bustle, noise, asphalt jungles and polluted air, the proportion of city dwellers is steadily increasing. By 2030, around 60% of the world's population, some 5 billion people, will be urban dwellers. With the emergence of cities, the habitat of the original living world is shrinking, the proportion of natural green surfaces is decreasing and being replaced by gardens and parks, more houses are being built, and the built environment is slowly becoming dominant.

– SYSTEMS THINKER –

Although green energy policy, low-energy buildings, improved public transport, separate waste collection and responsible water management can nowadays prevent and alleviate the problems of big cities, 50 years ago, when blocks of flats were built, this was not a consideration.

It did not occur to us that, with the increase in the number of hot days, life in these homes would often become almost unbearable. Nor did the builders then think that the time would come when people would be encouraged to save energy and water, which means the engineering installations would not be able to measure water and heat consumption per apartment, and the heating systems and the pipe network would become obsolete. So solutions have to be found afterwards, for example with insulation, shading and often air conditioning, which in turn leads to additional energy consumption.

During renovations, replacing old radiators and taps with new ones with meters can help. Although solutions are often costly, there is a growing trend to modernise blocks of flats. However, a steady flow of grants is needed to achieve results.

Block of flats

City within the city

The city and its surrounding area are closely linked by the employment, leisure, commercial and economic activities of the population, and by transport routes. The outskirts are constantly changing and being reassessed as part of urbanisation processes. Since the growing population needs more and more housing, the green areas are increasingly being populated. Blocks of flats were initially built, but today housing estates are being constructed, expanding the city's boundaries.

Modern housing estate

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Explain the difference between a block of flats and a housing estate.
2. Find an example of a block of flats or a housing estate. Where are they located, when were they built, what environmental problems do they face and what are stakeholders (residents, local government, etc.) doing to mitigate them?
3. Compare a block of flats built in the 1970s with a modern housing estate built in the 2010s. Show their advantages, disadvantages, common and different features. Include the implementation of environmental and sustainability aspects too.

SUSTAINABLE URBAN PLANNING

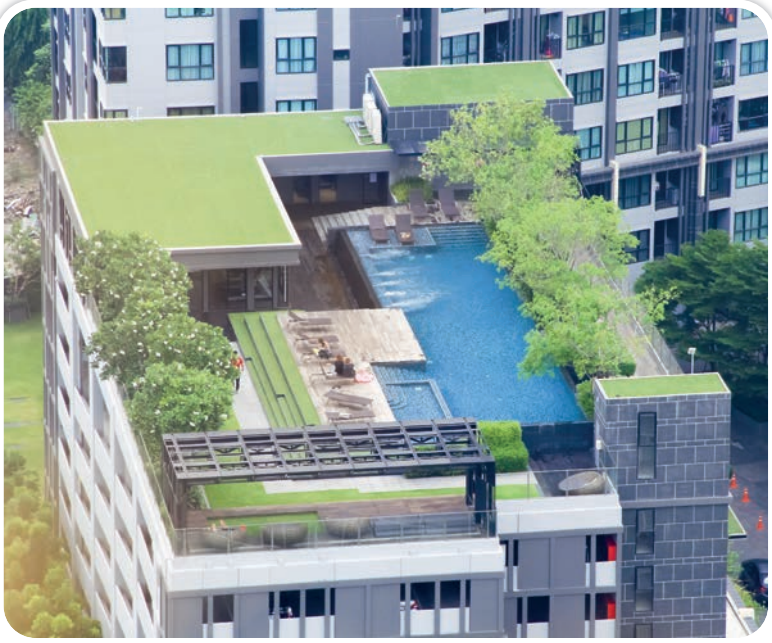
Sustainable urban planning should also take social, economic and environmental aspects into account when planning and implementing urban life and infrastructure. What should we aim for?

In the city
- there should be an optimal population density;
- existing buildings, roads, squares, public spaces, utilities and energy grids should be used as economically as possible;
- environmentally friendly transport should dominate;
- adequate amount and quality of green space, parks and promenades should promote healthy lifestyles and recreation for the people living there,
- direct and indirect environmental impacts should be reduced;
- waste management should be modern, waste should be reduced;
- there should be a strategy for the separation and proper management of wastewater and rainwater;
- the role of renewable energy sources in energy supply should rise.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Form small groups of 4–5 people. Look for examples of sustainable solutions in the area around your school or place of residence. Document them, take photos and make a mini exhibition.



Roof garden

– ECO-SAVVY –

Green spaces in cities – parks, gardens and courtyards of public institutions (schools, hospitals) – usually have plants that withstand the harmful environmental impacts of the city, air pollution or low rainfall.

Urban greening is welcome, but often involves the introduction of alien species. Unfortunately, construction is fragmenting natural habitats, also leading to a loss of biodiversity.

Efforts are being made to compensate for the reduction in green surfaces, for example with greater use of green roofing, or roof gardens on larger roofs.

IMAGINE!

IMAGINE!

Housing estates on the outskirts of a town can also cause damage to nature, as can the urban dwellers choosing to live in a village, whom we spoke about earlier. They also want to live close to nature, but this is often not done in a very environmentally friendly way. Sometimes, the plants that used to flourish in a newly built residential area are completely eradicated, often to facilitate construction, and then replanted with new species. They build fences to protect their private property and pave the roads – thereby transforming and destroying the original habitats.

Habitat corridor, permaculture, forest garden

In cities, recent efforts have been made to connect green spaces through habitat corridors (along rivers, around lakes, on roof gardens, alleys), thereby contributing to the conservation of biodiversity. In several European cities, the permaculture or forest garden approach (designing gardens and habitats to mimic ecological processes in nature) has already emerged.

EVERYTHING IN A DIFFERENT WAY, EVERYTHING IN A DIFFERENT PLACE.

Making a big city sustainable is a complex task. Many economic, community and individual interests have to be reconciled, and the financial situation, existing buildings, roads, streets and infrastructure also determine the opportunities. However, with the recognition of sustainable and unsustainable processes, the establishment of long-term goals and the emergence of sustainability in public thinking, more and more initiatives are being taken.

CITTA SLOW

The Citta Slow movement takes its name from the Italian word 'city' (città) and the English word 'slow'. The idea is to create a quality of life for city dwellers that promotes a healthy lifestyle and rejects rush. Citta Slow cities prioritise eco-friendly operations, support for local producers and community action. Municipalities not only from Italy but also from other countries around the world joined the movement, and the Slow City Charter was published. They also agreed to promote sustainable energy production. Their slogan is: "Network of cities where living is good." Over time, Citta Slow has become a trademark, and only cities that meet the 55 criteria set out in the Charter can claim this title.

IMAGINE!

IMAGINE!

The greenest city in the world

Vienna, the capital of Austria, is the greenest city in the world. The criteria for the assessment included parks, public green surfaces, use of renewable energy, air quality, public transport and markets offering regional products.
Interestingly, Vienna has 800 village farms. Cucumber, aubergine, tomato and pepperoni (spicy) pepper yields are also outstanding on a national scale. 73% of people in Vienna travel to work mainly by public transport.

A park in Vienna

Kitchen garden on the rails

Anne Hidalgo, the first female mayor of Paris, launched a project in 2014 to make Paris a model city for sustainable food production.

Today, in Paris, people not only grow crops on rooftops, but also in a garden of 1,000 square metres in a former railway station building for example. The crops of more than 150 species are used in cafés. They also keep poultry and bees.

FIND OUT!

FIND OUT!

There are community gardens in Hungary too. Describe one of them.

Kitchen garden on the rooftop

SIGHT AND FUNCTION: LANDSCAPES AND SCENERY

Landscape is the part of the Earth's surface that is spatially definable, visibly distinguishable, and has a distinctive character. Depending on the type and degree of human intervention, we can talk about:

- natural,
- cultural and
- historical cultural landscapes.

Natural landscape is defined as the original state of a landscape before human intervention. Today, there are less and less of them on our planet.
A cultural landscape is a partially built-up area that is significant from a historical, monumental, artistic, scientific, technical, etc. point of view, and which is the result of a collaboration of man and nature (in Hungary, it is defined in Article 38 of Act LXIV of 2001 on the Protection of Cultural Heritage).
Historical cultural landscape: a landscape that is associated with a momentous, memorable event (e.g. a historical event, a legend) or is the subject of a work of art (e.g. a famous painting). One example is the painting of Taormina in Sicily by Tivadar Kosztka Csontváry.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Collect national and international examples of each type of landscape and find pictures of them on the internet. Make a presentation using the pictures, adding explanatory text to the pictures. Show the presentations.

FIND OUT!

FIND OUT!

Find out and explain what floodplain farming is. Interpret the following text.
Rehabilitation of the floodplain system
The primary reason for the rehabilitation of the floodplain system is to "bring back" a form of farming in harmony with nature, adapted to the natural flow of the rivers.

IN HARMONY WITH THE LANDSCAPE, OR NOT?

In your geography studies, you will have heard about how climate affects the structure, style and shape of buildings.

ENVIRONMENTALLY FRIENDLY BUILDING MATERIALS

The materials used to build houses also vary from zone to zone. Early civilisations used building materials available locally. The natural materials and technological options available influenced the materials and methods used for construction, even in later times. In the Great Plain, for example, farm buildings were built by digging pits from where the material for adobe was extracted. The pit was later used as a duck pond, for example. Reeds covered round the duck pond, which were used to repair the thatched roofs of the houses.

Adobe house

FIND OUT!

FIND OUT!

1. What aspects could have been taken into account by the builders of "hobbit houses" and the Icelandic residents?

"Hobbit houses"

Grass roof in Iceland

2. What do you think determined the choice of building material for the following houses?

House made of wood: United States, along the Mississippi River

House made of mud: Africa, Cameroon

House with brick walls: Great Britain

Straw bale house

Rock house: the Swiss Alps

LET'S LEARN! WHAT DOES CREATIVE NATURE DO?

Nature has an effective and good response to every sustainability problem. Nature strives for minimum use of materials and energy. Earlier you could read that applying solutions adapted from nature is called biomimicry. These are therefore technologies that are based on materials and solutions developed by living organisms during evolution. If we want to promote sustainability, we should study these solutions.

IMAGINE!

IMAGINE!

Termites

Inside the termite mounds, the extensive tunnels and ducts serve as ventilation and air conditioning, helping to regulate heat, humidity and airflow. Australian mounds are 3 metres high and are all positioned in the same way, with the narrower sides facing north and south and the wider sides facing east and west.

Termite mounds in Australia

Nest of sociable weavers

Weaver ants

Sociable weaver

These little birds build their nests together and close to each other, like building a twin house with your neighbour.

This type of nest protects sociable weavers from predators. They move from the top down, so they create a "dwelling" of many small nests, where they let other bird species in as "lodgers". The completed nests always form a roof over the newly built ones.

Weaver ant

Weaver ants are perfect master tailors because they sew leaves together to make their nests. And instead of a sewing machine, they use their own larvae as a tool. Their nest is waterproof, protecting them not only from their enemies but also from the elements. They form "working brigades" to join the leaves together, using their hind legs to grip the edge of one leaf with their mandibles and front legs grasping and pulling in the other leaf. Many of them work together, and that's how the two leaves end up together. Then comes the sewing process.

WHAT MAKES A BUILDING SUSTAINABLE?

- Minimising negative impacts on the landscape during construction and operation.
- Low waste and pollution during construction.
- It operates in an energy- and material-efficient way, for example, using a water-saving solution for flushing toilets, heating is adjustable, it is well-insulated, correctly orientated and uses renewable energy.
- It is built with local materials that are not harmful to health.

The building should be adapted to its surroundings, and its style should be in keeping with the traditions and design of its environment.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

A client comes to your construction company saying that they have bought a plot of land on the north shore of Lake Balaton, in a picturesque village, and they want to build this very house on their 1,000 square metre plot. Convince them why their idea is wrong.
Play out the scene.

1. **Look for buildings in your area that fit in well with their surroundings. Take a photo of them and show why you liked this building.**

THIS IS NO LONGER THE FUTURE!

Active house – the electricity meter can also spin backwards

The main feature of an active house is that its energy needs are covered by renewable sources, and, in addition, it usually produces more energy than it uses. This construction method requires extra costs, and investments that are recouped only slowly.

Interestingly, active building is also the term for a building that is used by many people, such as an office building or an educational institution, and is designed to encourage its users to move around more to protect their health, for example by placing lifts in less congested areas, or having to walk between flights of stairs.

Passive house

A passive house signifies compliance with a strict German certification system, which means that the temperature is maintained mainly by solar radiation and waste heat generated inside the building. The building pays for itself in roughly 10-15 years.

For the time being, passive and active houses are more expensive to build than conventional solutions because of the more complex mechanical equipment, but the low running costs mean that they pay for themselves relatively quickly, and many developers are working on cost-reducing technologies. In accordance with the European Union directive, from 2021 only nearly zero-energy buildings can be built.

Autonomous house

An autonomous house, as its name implies, operates independently. It is not connected to the utility network, waste treatment remains "in-house", hot water and heating are provided by geothermal energy or solar panels. Water is supplied from boreholes, and rainwater and toilets are flushed with grey water.

Ecohouse

A house is considered an eco-house if it was built using only natural materials, taking local environmental conditions into account and using renewable energy sources to meet energy needs.

Eco-friendly houses with green roofs, Dordrecht, Netherlands

IMAGINE!

IMAGINE!

Why is a thatched roof good?

- It can be individually shaped.
- Excellent thermal insulation.
- Excellent sound insulation.
- Maintenance need: every 8–10 years, with a lifespan of 35–40 years.
- No need for a roof structure underneath.
- Nature-friendly, aesthetically pleasing.
- Withstands the weather.

For these reasons, many people in Hungary chose it as a sustainable solution in the past, but nowadays more and more people are opting for an alternative.

What is the disadvantage of a thatched roof nowadays?

- Thatch has become very expensive in Hungary.
- With old craftsmen dying out, fewer and fewer people know how to renew it, so you have to wait a long time for a renovation, which is becoming more and more expensive.
- Liquid glass spraying and flame retardants can be used to protect it from the risk of fire.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

On behalf of Ökodu Design Office, you welcome a client George Ambitious. Ambitious explains that he would like to move to the village in the picture with his large family, and would like to have a two-storey house built there with column capitals, a gate with lions, a breath-taking view and all amenities. The balcony and terrace railings would be decorated with transparent yellow plastic inserts. He also wants to minimise energy costs. To plan your work, ask Ambitious about their lifestyle and habits carefully. Prepare a memo for the imaginary conversation, i.e. the questions and answers.

The client shows up at the office at the appointed time. Then...

After the first meeting, the office workers gather to discuss how to convince the client why his expectations are unrealistic, and what alternative proposal to come up with. Make your plans and proposal in light of the memo.

Play out the scenes.

SMART PEOPLE WITH ECOHOUSES

WHEN EVERY HOUSE IS ECO

Eco-communities can also be established by transforming new and old towns or parts of them. In Western Europe, in the Ruhr area, former industrial districts have been used not only for artistic but also for housing purposes. One good example is Duisburg or Essen, also in Germany, where the aim again was sustainable architecture.

Duisburg

Some principles of eco-communities:

- The development and operational principles and directions that influence the life of eco-communities are developed jointly by the inhabitants.
- Anyone who accepts the principles established by the community can be a member of it, regardless of their beliefs (religious, political, ideological).
- They develop a way of life that doesn't interfere with that of others. "Live and let live."
- Residents engage in organic farming and use a composter.
- They carry out ecological wastewater treatment.
- They use renewable energy.
- They seek to be independent of utilities.
- They live a self-sufficient lifestyle and engage in farming, not driven by profit and market principles.
- They build in an environmentally responsible way, respecting the environment and the community.
- They use natural resources more slowly than their regeneration rate.
- They strive to make the least possible impact on the ecosystem.

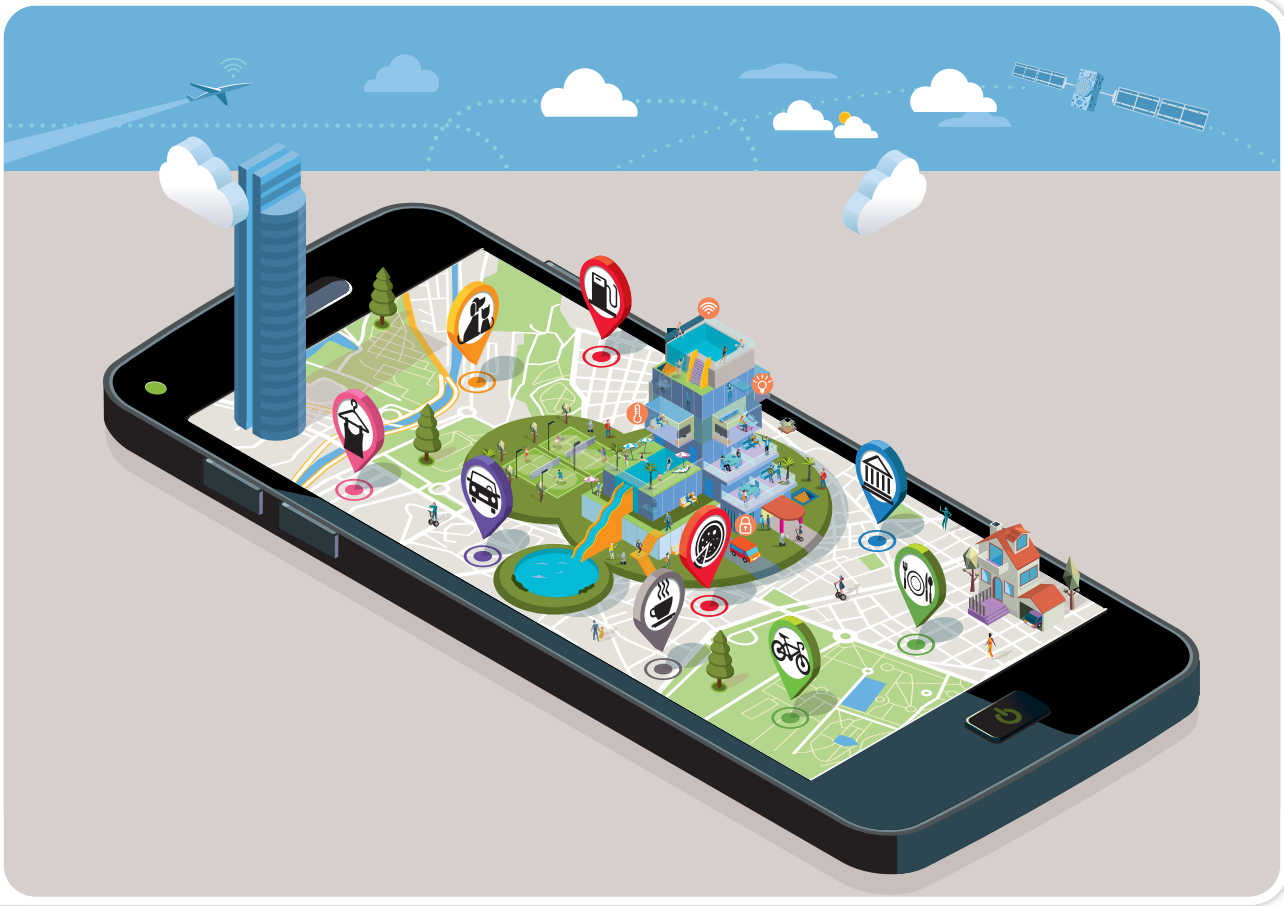
NO...

- large-scale livestock farming and crop production as well as use of machinery with internal combustion engines to avoid atmospheric, soil, water and noise pollution.
- burning of green waste and dry leaves, it is recommended to compost them, thereby replacing the use of fertilisers with organic matter. (Burning green waste and dry leaves is also prohibited by law in Hungary.)

For example, there are eco-villages where they collectively adopt a way of life, such as eating meat-free or building with the help of the family and relatives. Community and self-sufficiency, however, allows for houses not necessarily to be built close to each other, unlike what was previously prescribed for the municipality for example. There is also an international network of eco-villages, the *Global Ecovillage Network*, which helps municipalities become eco-villages by organising events, providing technical materials and exchanging experience and information.

SMART CITY

Many people generally understand smart city to mean a village or town where digital technologies are widely used in developments and in the operation of different systems (utilities, transport, services, decision-making, regulation, etc.). Yet the concept is more complex than that: digital technology is a tool for "smart" data processing, process planning, control and optimisation. *A smart city puts digital technology at the service of sustainable urban development.*



Key development aspects and areas of a smart city:

- ensuring the sustainability of the natural environment;
- achieving sustainability of the built environment;
- continuous development of digital infrastructure;
- developing smart governance, access to public data, online administration, etc;
- increasing the diversity and quality of services, ensuring equal access;
- involving local people in planning and decision-making;
- using clean and efficient energy with a focus on renewable energy sources;
- creating economic efficiency.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Make a report about the place you live. Which of the aspects listed can you find in it? If there are none, why? What should be done to turn it into a smart village or city?

WHAT'S NEW AT HOME? – SMART SOLUTIONS IN HUNGARY

Since 2017, legislation has set out in Hungary what we call a smart city.

According to this:
A smart city is a place or a cluster of places that develops its natural and built environment, its digital infrastructure as well as the quality and economic efficiency of the services available in its area using modern and innovative information technologies, in a sustainable way and with the increased involvement of its inhabitants.

The initiatives of our cities include developments in the fields of transport, economy, environment, living conditions, urban governance or developments for the benefit of society (e.g. education, health). The first model programmes were launched at the end of 2020, so it's worth following them.

Creating an eco-village

The idea of an eco-village became popular in Hungary in the 1980s, when the first initiatives were launched. Two young people from Budapest decided to create a village and community based on sustainable principles. They chose the village of Gyűrűfű, which had been completely depopulated by 1970. So began one of the first eco-villages. And at the same time, young families in Visnyeszéplak started a life on their own in similar conditions.

Another example of sustainable villages and cities is when a committed resident or leader of an existing place initiates the change, or when non-local researchers and experts gradually make the place more liveable, more environmentally friendly and sustainable with the involvement of local residents, their continuous attention and support.

There are also eco-farms, model farms, that are smaller than a village, and besides farming they have been established for educational, tourist or religious purposes.

So we can see that 'eco-settlements' can take on many forms. Sometimes young people and families from cities move into an abandoned village and create a self-sustaining, more balanced life in harmony with nature. They develop their own principles of management and cooperation, and only let others live there who agree with these conditions.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Introduce one of the eco-villages in your country. Describe its history, what made the inhabitants choose this way of life? How do they organise their community?

EASIER TOGETHER

In Hungary, in addition to governmental measures, a number of campaigns, initiatives and civil society organisations help to promote sustainable lifestyles. One of these is the Hungarian Living Village Network, which helps its members to work, learn from experience and disseminate the values of eco-villages widely through newsletters and meetings. But we can also mention the "Gyüttment" Festival, which brings together non-local farmers – known as "gyüttment" (newcomer), expressed slightly pejoratively – who originally moved out of the city, to swap experiences.

Today the festival has grown into a major rural development event, where sustainable agriculture, food production, traditional medicine, or even rural architecture and village planning can be explored.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Here is a little taste of the achievements of Hungarian researchers, developers and inventors. Form small groups of 4–5 people. Each group should choose at least 3 products and present to the class what problem they solve and how. Using the internet, name and introduce the inventors and the companies that developed them. Show how the smart use of inventions contributes to making municipalities more sustainable and greener.

Hungarian inventors...

- **...have created a bacterial cocktail that breaks down plastic in such a way that the resulting organic matter can reintegrate into the ecological cycle.**
- **...have created a smart greenhouse that uses sensors and scales to help farmers make decisions about what crops grown in aquaculture need, based on a continuous stream of data. This way, it optimises water, nutrient use, heat control or work organisation. The development is hugely significant because it works in a wide range of environmental conditions.**
- **...have developed a hydroponic cultivation technology that has the advantage it does not require soil, only nutrient-rich, oxygen-rich water. The Hungarian company's development, for example, saves 90% of the water used in garden sprinkling and uses exactly as much nutrient as the plants can absorb.**

NOW IT'S YOUR TURN

- ...have created the world's first closed-loop geothermal power plant. They discovered that thermal energy can be generated from deep unused boreholes without extracting aquifers. For instance, this way, any building can be heated without polluting the environment, whether it is a dwelling, a factory or a greenhouse.

- ...have developed a system whereby microcapsules are mixed into plaster or thermal insulation material, the content of which melts when heated and solidifies when cooled, absorbing and releasing the absorbed heat to the internal environment, thereby ensuring a constant internal temperature for the building.

- ...have developed a bio-wastewater purifier to prevent untreated wastewater from entering flowing waters. The system uses plants to purify the water.

- ...have created a material from reeds that, when built on a concrete foundation, simplifies and makes construction cost-effective. As well as being cheap, the building material is sustainable, has excellent thermal and acoustic insulation properties and, last but not least, is earthquake resistant.

- ...have produced methanol from municipal waste, winning the World Competition of Green Inventions in Nuremberg.

1. If you want to do something for the sustainability of where you live, it's worth volunteering with an organisation so you can see for yourself what you are good at and what you can contribute to the community.

OVERVIEW

Building on what was previously learned, in this chapter we looked at the sustainability of municipalities. We hope it has become clear to you that an eco-friendly lifestyle and urban development require a series of conscious decisions. Making the transition requires a sustained effort, but a sustainable village or town is better to live in, with cleaner air, a healthier environment, people looking out for each other more, and there is the added joy of knowing that it is a matter of survival for humanity.

Do you remember?

1. What are the criteria for assessing municipalities?
2. What are the changes – in a more developed economy – in the lifestyle of rural and urban dwellers?
3. How has digitalisation changed the life of a city dweller?
4. What are the advantages and disadvantages of living in an autonomous house?

FIND OUT!

How much has digitalisation changed the lives of people living in dispersed settlements?

NOW YOU KNOW!

TERM	DEFINITION
active house	A building whose main feature is that its energy needs are covered by renewable sources, and, in addition, it usually produces more energy than it uses.
mobile or temporary settlement	A settlement that serves the housing and work of the people living there only for a certain period. Examples include mobile tent cities and temporary dwellings for nomadic pastoralists.
autonomous house	An autonomous house, as its name implies, operates independently. It is not connected to the utility network, waste treatment remains "in-house", hot water and heating are provided by geothermal energy or solar panels. Water is supplied from boreholes, and rainwater and toilets are flushed with grey water.
de-urbanisation	Moving to the countryside.
passive house	A passive house signifies compliance with a strict certification system, which means that the temperature is maintained mainly by solar radiation and waste heat generated inside the building. The building pays for itself in roughly 10-15 years.
re-urbanisation	Renovation and rehabilitation of cities and districts, making it appealing to move (back) to the city.
sustainable building	• Minimising negative impacts on the landscape during construction and operation. • Low waste and pollution during construction. • It operates in an energy- and material-efficient way, for example, using a water-saving solution for flushing toilets, heating is adjustable, it is well-insulated, correctly orientated and uses renewable energy. • It is built with local materials that are not harmful to health.
local economic development	Key features of local economic development: • *created by:* local initiative, • *actors:* local stakeholders (local government, businesses, civil society organisations and citizens), • *method:* cooperation and participation of local people, • *basis:* taking stock of and using local assets and internal resources, external assets and resources (e.g. tenders) are only temporary incentives, • *control:* processes, decisions and actions are controlled by the local community, • *utilisation:* economic benefits are mainly local.
sustainable urban planning	The aim of sustainable urban planning is to: • ensure an optimal population density in the city; • make the most economical use of existing buildings, roads, squares, public spaces, utilities and energy grids; • have a dominance of environmentally friendly transport; • ensure that an adequate amount and quality of green spaces, parks and promenades support healthy lifestyles and recreation for the people living there, • reduce direct and indirect environmental impacts in the city; • modernise waste management, reduce waste; • have a strategy for the separation and proper management of wastewater and rainwater; • increase the role of renewable energy sources in energy supply.

NOW YOU KNOW!

TERM	DEFINITION
dispersed or scattered settlement	A settlement where dwellings are located far apart or in small groups. In Hungary, scattered settlements are the farms of the Great Plain.
eco-house	A house is considered an eco-house if it was built using only natural materials, taking local environmental conditions into account and using renewable energy sources to meet energy needs.
smart city	A smart city is a place or a cluster of places that develop(s) its natural and built environment, its digital infrastructure as well as the quality and economic efficiency of the services available in the area using modern and innovative information technologies, in a sustainable way and with the increased involvement of its inhabitants (Government Decree 56/2017 (III.20). **Development aspects and areas of a smart city:** • ensuring the sustainability of the natural environment, • the built environment is sustainable, and • continuous development of digital infrastructure; • smart governance, access to public data, online administration, etc, • increasing the diversity and quality of services, ensuring equal access, • involving local people in planning and decision-making, • using clean and efficient energy with a focus on renewable energy sources, • creating economic efficiency.
suburbanisation	Moving to places near the city (establishing agglomeration, commuter and satellite towns).
landscape	Landscape is the part of the Earth's surface that is spatially definable, visibly distinguishable, and has a distinctive character. Depending on the type and degree of human intervention, we can talk about: • natural, • cultural and • historical cultural landscapes.
municipality	A geographically well-defined area where people live and/or work for a lengthy period, and satisfy their basic individual needs at the level of the community.
urbanisation	Urban growth and urbanisation together, i.e. the growth in the number of cities and the spread of urban conditions.
rural area	A rural area is where villages and smaller towns (with less than 10,000 inhabitants) form an economic and social unit. It has a lower population density, varying degrees of built-up area, a more fragmented infrastructure, fewer economic actors, and the services available are also different from those in large cities.

CONNECTING AND SEPARATING
SOCIETY AND SUSTAINABILITY

NEEDS

WHAT IS CONSIDERED A HUMAN SOCIETY?

The term society is a translation of the Latin word societas, meaning an organised social grouping of people. The term is used in a wide range of meanings, for people living in a state as well as for other communities of humans – "rural society" – or for an era, "ancient societies". Society or a community are what make us human. Without this, we would not have emerged from the animal world, we would not even be able to speak.

Societies have undergone continuous transformation throughout history, and these changes are still taking place today, depending on the impact of economic forces, ecological processes and cultural-intellectual-identity characteristics.

SOME ASPECTS OF STUDYING SOCIETY

We can look at the functioning of a society from many different perspectives.

NOW IT'S YOUR TURN

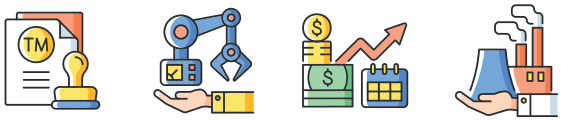
NOW IT'S YOUR TURN.

1. List what characteristics you would use to examine your school's society.
2. Create a mind map of the result. Analyse the correlations.

A few examples

- **Means of subsistence:** What kind of lifestyle do they lead? Nomadic pastoral? Perhaps farming? Is it industrial or post-industrial? etc.

•**Social structures:** What economic policies do they pursue? What is its legal system and standards like? What is its education and health system like? What is its political system like? What is its culture like, what are its traditions, its network of relationships on different grounds, its occupational structure? etc.



• **Ownership and distribution:** What is the proportion of public and private sector ownership? How does the state operate certain structures, such as local governments? What natural resources does it have, and are they predominantly domestic or foreign, state-owned or privately owned? What is the pension system like, the employment/unemployment ratio, the social safety net? etc.

• **Education:** What is the ratio of the educated to the uneducated in the population, and how is it distributed by gender? What is the drop-out rate from primary education, what percentage of the population completes tertiary education? etc.

• **By age structure:** What is the ratio of the elderly to young people? How many children are born in a year? What is the life expectancy? etc.

WHAT MAKES A SOCIETY SUSTAINABLE?

Why do we need to look at how society works?

As you have already learned, there is no single element of a system that – if altered – does not affect the functioning of the system as a whole. Human society is also part of our planet's big systems. As we have seen so far, the problems that threaten sustainability are mainly the result of human activity. If we want to leave behind a liveable planet for our grandchildren, we need to look at the functioning of society as a whole – with a complex system of natural and economic processes – and shape it according to the results.

Building on what we have learned so far, we will now explore how political decisions, human behaviour and life situations, the environment and environmental impact interact on the wealth-poverty scale and ultimately affect our future. And while looking at the "big systems", we also examine how the "small element" of the big systems – i.e. individual people – can influence processes.
So let's see!

CONFUSING CONCEPTS

Development

You would think that development – in simple terms – means growth. Really?

IMAGINE!

IMAGINE!

Consider the two small subsystems of the universe: Mary and John.

When we talk about the development of Mary and John, it's not only about their "quantitative" growth. When Mary stands up for the first time, everyone claps, saying how clever she is, how much she has grown. When six-year-old John can touch his left ear with his right hand, people say he has developed in line with his age. When Mary achieves great results as a leader, it is said that her leadership skills have improved. If all that Mary could say about herself as a leader is that she has grown to 170 cm and weighs 75 kilos, this would not be interpreted as progress.

SUSTAINABILITY OR SUSTAINABLE DEVELOPMENT

We can't have infinite growth on a finite planet. For example, if an iron ore mine is opened, sooner or later the raw material will run out... Then a new one is opened, then another. But after a while, it is no longer possible to open more mines, because the iron ore that was formed over many hundreds of million years has been extracted in a few hundred years.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

How much would Queen Victoria's fortune be today if her father had deposited one pound a year in the bank from her birth until his death bearing 1% interest?

Development or growth?

First of all, the concept of development should be defined. Given the contradiction between the concept of development, identified as growth, and the term "sustainable", some experts do not talk about sustainable development, but about sustainability. This is because it is by no means certain that what we consider to be development also meets the requirements of sustainability. Economic development is typically seen as a continuous increase in wealth and value over time, with GDP as the indicator at national level, and "prosperity" at individual level.

How does the process termed economic development relate to sustainability?

Economic development almost always refers to economic growth, so when we talk about the economy, the two terms are often used synonymously. However, economic development often goes against sustainability, as it frequently stems from overuse of the environment, and does not take the price to be paid for growth into account. Moreover, GDP only considers the level of expenses and revenues, regardless of their moral, health, cultural, etc. content. Paradoxically, even a natural or humanitarian disaster can contribute – temporarily – to economic growth, for example during the recovery from a typhoon.

We have already discussed in previous chapters that genuine progress (GPI) or well-being depends not only on material wealth.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Find examples where short-term economic interests and sustainability considerations contradict each other.
2. Find examples and solutions where economic interests and sustainability considerations are compatible and do not contradict each other.

THE ONLY CONSTANT IN LIFE IS CHANGE

There is no constancy in nature, in society, or in the life of a company or person. A broken machine, a family feud, a happy event, the departure of a colleague or the arrival of a new manager can all upset stability. If something moves, evolves, is replaced, born or dies, it will affect the functioning of the whole.

ADAPTING TO CHANGING CIRCUMSTANCES

Sustainability does not mean the perpetuation and maintenance of a given ideal state, which lasts forever, unchanged, but the creation of a state in which economic activity meets the needs of society while preserving the life-supporting processes of the geo-biosphere and ensuring its renewal.

It also means understanding and adapting to change in a flexible way to maintain balance. Throughout evolution and human history, our body, our way of life and our social organisations have adapted to many things in many ways. With fossil fuels involved in production and rapid technological progress, we are able to transform our environment very quickly.

According to Mihály Csíkszentmihályi, a happiness researcher, our greatest challenge is to enable our mind to adapt, understand these changes and their consequences, and plan and manage interventions to promote sustainability.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Interpret the following statement and find examples. You can also use examples from your own life.

Statement:
If constraints dictate that the adaptation has to be faster than the adaptive capacity would allow, the result will be different from what is desired.

IMAGINE!

IMAGINE!

ADAPTING TO NATURAL CONDITIONS
When hair was still in fashion
Our distant ancestors once survived a climate change. Nearly 3 million years ago, drier weather in East and Central Africa wiped out the forests – the habitat of our ancestors – so they had to adapt to a savannah lifestyle. In their new environment, they became much more vulnerable to the sunlight. Those who did not become overheated from running in the heat and travelling long distances, i.e. from the physical exertion, managed to survive and were able to find food. According to a very likely theory, one way of doing this was to get rid of most of their hair.

So why aren't all savanna animals bare?
The explanation lies in the fact that humans – in addition to being hairless – have the ability to optimise their heat balance, by sweating, which is also very rare in the animal world. This makes them capable of exerting force (such as running) for much longer periods than most animals.

But strangely, we have not lost our hair everywhere, it remains around the genitals, in the armpits, and as hair on our head. What is the function of the hair on these areas of the body? The role of hair is to insulate. And armpit and genital hair amplifies the effects of odorants, so it has a function in reproduction, in selecting mates. It may surprise you, but the truth is that the hair loss is only partial: humans actually have the same number of hairs as a chimpanzee, but they are less noticeable because of the shortness of the hairs.

DEPENDENCE: ENVIRONMENT, SOCIETY, ECONOMY

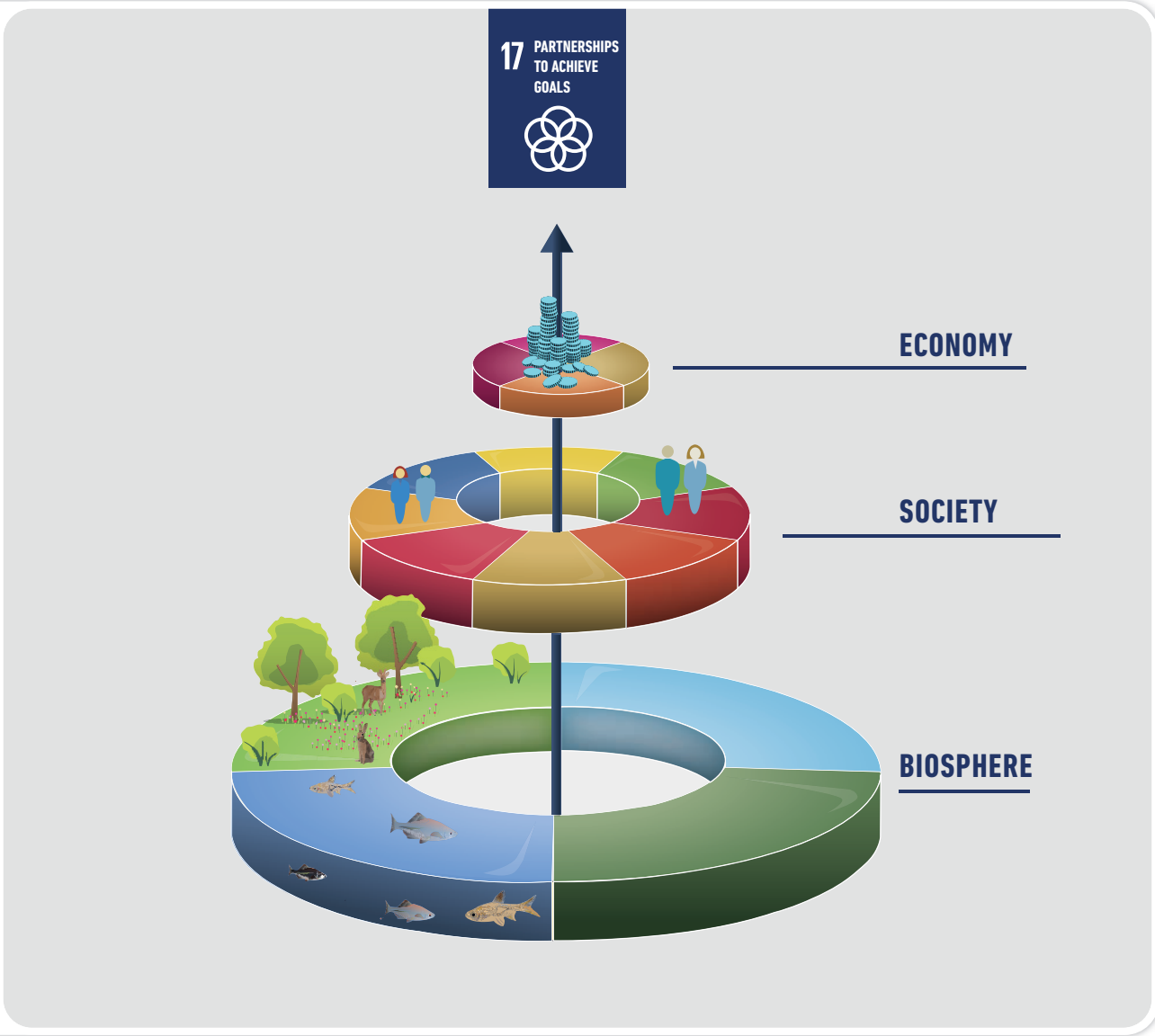
The state of the natural environment is a crucial factor in determining the state of society, and the state of society has an impact on the functioning of the economy. So it is clear that we are fundamentally dependent on nature.

AT THE EXPENSE OF EACH OTHER OR IN SUPPORT OF EACH OTHER?

Maintaining sustainability depends on human intervention in the living and non-living environment. While we are dependent on the natural environment, the ecosystem can provide services depending on the type and extent of human intervention.

If the sub-systems that rely on the ecosystem (e.g. agriculture, industry, culture, education, health, water) do not use it to the detriment of each other, then it is possible to renew environmental resources and maintain the necessary living conditions for humanity.

Society also provides the framework for a sustainable economy through other means, such as public administration (regional development, coordination of land use, economic regulations, subsidies, taxes, raising awareness), shaping consumption patterns, needs and desires, education and research.



Some eco-savvy environmental and economic (industrial, agricultural, service) conditions:

- adapting to environmental changes,
- taking the regenerative capacity of natural resources into account and ensuring their conditions,
- protecting soil, water resources and biodiversity,
- economic growth that does not overload the environment, and that supports the regenerative capacity of the environment.

What does it mean that the three areas of sustainability – natural environment, society and the economy – are growing at the expense of each other?

For example:

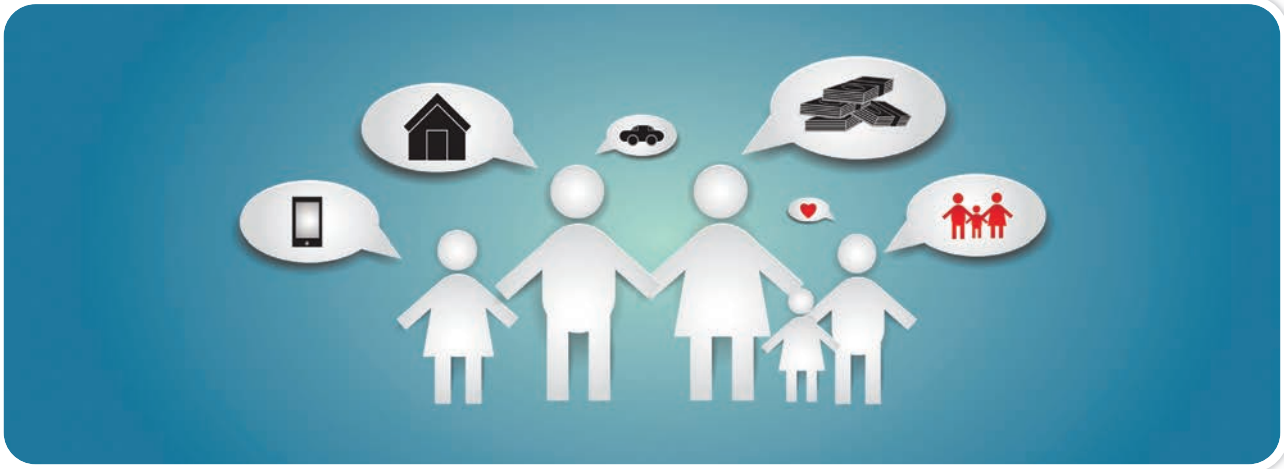
- Short-term economic interests mean that economic actors do not factor environment use into their production costs, and do not pay the price for using the environment.
- To reduce investment costs, they do not buy and install environmentally friendly solutions and new technologies that minimise environmental impact.
- Using existing infrastructure and technology is generally more cost-effective and predictable in the short term than introducing a new product or technology with a much lower environmental impact. But often the opposite is true. To use a car example: if I frequently replace my car with a new one that uses less fuel, my overall consumption will be higher than if I used my old car for several years.
- Legal regulations as well as support and lending schemes are not based on up-to-date information and do not follow sustainability goals, so they hinder the economic transition.
- In agriculture, the demand for increased yields leads to the use of practices that result in soil degradation and destruction.

PROSPERITY, WELL-BEING, NEED AND WANT

As previously mentioned, prosperity is more economic while well-being is the satisfaction of human needs and wants beyond material goods, such as love, honesty, human relationships, solidarity, the joy of work, freedom, the assumption of our identity, daily life without abuse, spiritual pleasures – and there are many more examples. In short, well-being comes into play when we are "comfortable in our own skin".

Money and well-being

Of course, well-being depends on material opportunities, but we can see that some people sacrifice well-being to gain wealth, i.e. they do not pay attention to their own and their families' social, cultural and human needs. If material gain is not a means of creating well-being, it becomes an end in itself.



The truth of this is shown by the results of 75 years of happiness research.

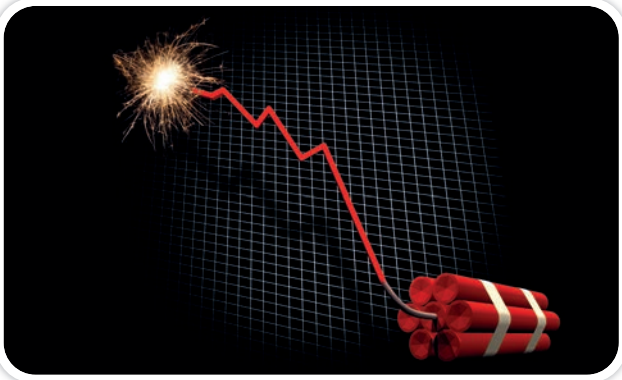
IMAGINE!

IMAGINE!

Researchers at Harvard, one of the most prestigious American universities in the world, have spent 75 years – i.e. generations – studying what makes a person happy. This has involved analysing the health, career and wealth of the participants – in fact, it covered every important detail of their lives.

Professor Robert Waldinger, psychiatrist and fourth director of the project, summarised the results in a discussion: Many people believed and still believe that genetics, money and professional success are key to a happy and fulfilled life. However, the results of the research were surprising even to the scientists. It turned out that lifestyle was only one of the conditions for staying healthy and avoiding a mental decline. The healthiest people at age 80 were those who were most satisfied with their relationships at the time of the first survey (at age 50). The results also showed that good relationships not only protect our bodies, but also our brains. Since ageing starts at birth, researchers say people need to look after themselves at all stages of life. When the research began, no one had yet looked at empathy or attachment. "The key to healthy ageing is relationships, relationships, relationships," said George Vaillant, one of the researchers on the project. Waldinger added that it is not the number of relationships that counts, but the level of engagement and the quality of belonging.

In conclusion, lifestyle is one of the conditions for health, but material goods are also necessary for health and happiness. However, if someone spends most of their time accumulating material wealth whilst neglecting human relationships, their personal life, health, friendships and environment will suffer in the long run. So short-term interests make long-term well-being impossible. This has clearly been demonstrated by various crises.



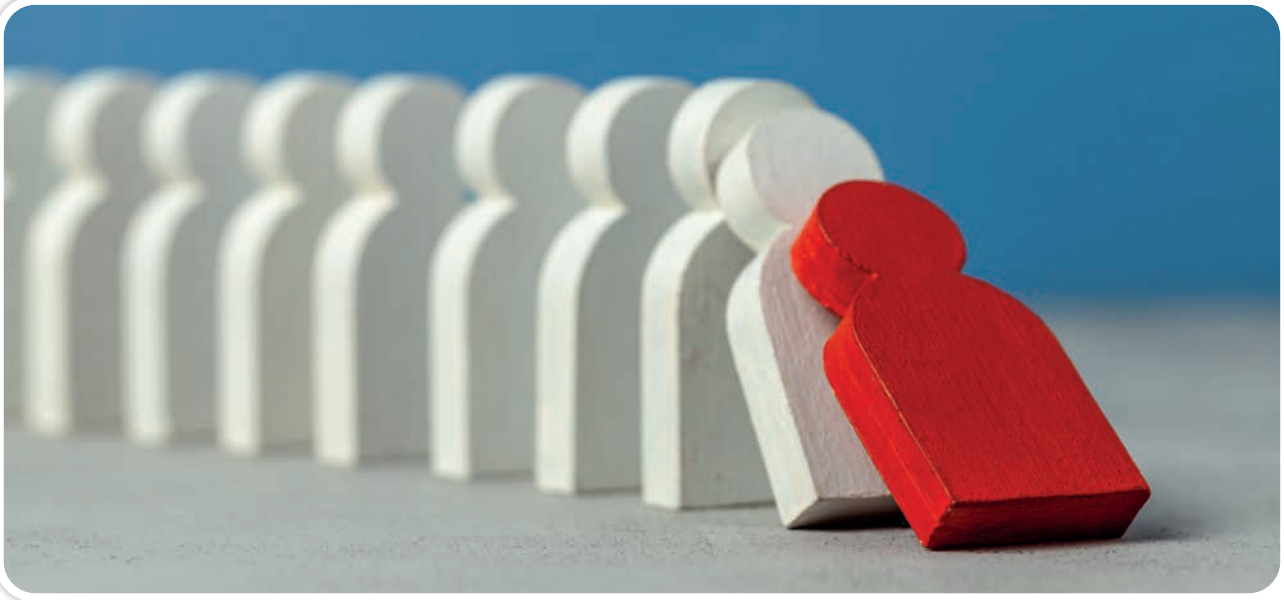
The 2008 crisis

The main reason for the onset of the crisis was that banks in the United States provided mortgage loans to individuals who were inherently risky borrowers, without any thorough credit assessment or proper disclosure.

They did so because house prices had been increasing steadily and the US Federal Reserve kept the base rate low. (Loans are priced according to the base rate. If the base rate rises, borrowing from banks is more expensive, and deposit rates will also be higher.)

The bank also benefited if the debtor could not repay the loan in face of the higher property prices, because the bank took possession of the high-value property and sold it at a large profit. Solutions were offered for risky loans where the risks were passed on to investors, making the market increasingly unregulated and opaque.

GDP boomed in the first phase, but by 2006 more and more lenders had given up, leading to a fall in house prices. This led to a domino effect, as more and more homes were put up for sale, more and more real estate agents then lending institutions went bust, and a large number of investors lost their money, etc. This resulted in people cutting back on their consumption due to a lack of credit, for example buying fewer household appliances, so manufacturers also started to cut production; this reduced production brought job losses, increased unemployment, and the list goes on. Ecologically this was beneficial, since reducing consumption is one of the key factors in mitigating the climate crisis.



For these reasons, some experts consider the 2008 crisis not even a crisis but a welcome event from a (natural) sustainability perspective. It slightly reduced our ecological footprint. They argue the very reason we have an ecological crisis is that we consider a slowdown in economic growth to be a crisis.

HOW MUCH DO WE NEED, OR HOW MUCH DO WE WANT?

IMAGINE!

IMAGINE!

- **Charles is lost and has been looking for a way out of the desert since the morning. If he doesn't get water by the evening, it could cost him his life. Charles' goal is obviously to stay alive.**
- **Grandma wants to bake a cake, but she forgot to buy flour. And without flour, you can't bake a cake.**
- **There is a power cut in the town. Mr Taylor is annoyed because he can't read his official letters without the internet, and this could have serious consequences.**
- **Rob is staying up late because of his job. He wants to change his job because the constant sleeplessness has caused him serious health problems.**

The actors above need something to achieve their goals. Charles wants to stay alive, Grandma wants to bake a cake, Mr Taylor wants to do his job, and Rob needs to stay healthy. All of them have a goal, for which their needs have to be met.

But what do we mean by need?

Need is a "mobilising" state of deficiency. It prompts action to eliminate the state of deficiency. Basic needs are related to self-preservation and reproduction:

- Physiological (hunger, thirst, sleep, etc.)
- Security (housing, protection, transparency, order, stability, etc.)
- Social (belonging, love, compassion, identification, etc.)
- Self-assessment (self-confidence, efficiency, competence, esteem, etc.)
- Personal fulfilment (self-awareness, wish fulfilment, career building, etc.)

Needs are not necessarily put in order, i.e. our needs related to self-assessment do not only appear, for example, when physiological needs are satisfied, they can also appear simultaneously, in a sequence depending on the individual, historical or social circumstances. Just think of the people who sacrifice their lives for an ideal, who go on hunger strikes, or for whom building a career overrides all other needs.

I don't necessarily need it, but I want it

Wants are the degree to which a need is satisfied, the way in which a state of deficiency is overcome. It is also a kind of need, but satisfying it is less essential. For example, washing is a basic hygiene need, but the amount of water used, the washing conditions, the type of detergent used and the brand of detergent chosen are all classified as wants.

At the same time, we are often faced with the fact that the question of needs and wants is a cultural and individual issue. Basic needs such as sleep are essential. But is it a need or a want if we would like to sleep in a bed and not in the open air on the ground?

Or no one doubts that hygiene and washing are an important part of staying healthy, and are therefore a need. But if William has eczema for example, and can only use a specific shower gel, is that a need or a want?

With these examples, we wanted to show there is no rigid boundary between the two categories; what is more, today we can even witness in our own lives how a need becomes a want.

- Peter was advised by his dentist to use an electric toothbrush because it was good for his periodontitis. A tool that was once unknown or inaccessible suddenly became a need.

As living standards rise, we are seeing more and more wants becoming needs. However, what is considered a need that someone suffers a lack of, and what is a want the lack of which would be bad but not a major problem for them, depends, as already mentioned, on a number of factors.

Advertising to persuade consumers creates needs, which is a well-known effect.

- I used to vacuum up my dog's shedding hair, but now there's a grooming glove, without which Buddy and I just don't feel right...
- If you don't buy a certain brand of nappy, you're a bad parent...
- If you don't take out life insurance for your grandchildren, you're an irresponsible grandparent...
- If you don't use *Wowlambeautiful* face cream, you'll be ugly and nobody will want you.

These messages imply – subliminally – that to be appreciated, you need to have certain types (or perhaps specific brands) of things. Possessing them becomes a need because they promise a more effective fulfilment of one of our basic needs: belonging.

Need and want are nothing more than motives or motivations for action. The motives that bring about a state of deficiency and trigger the process of eliminating it depend, among other things, on the individual's knowledge, values, interests, health, desires, living conditions, and the culture and expectations of the environment.

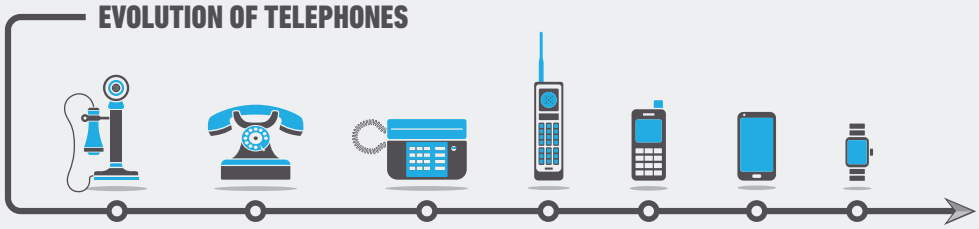
NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Below you can see the "evolution" of different tools. Discuss with your classmates the needs and wants that gave rise to the newer and newer versions.

a)

b)



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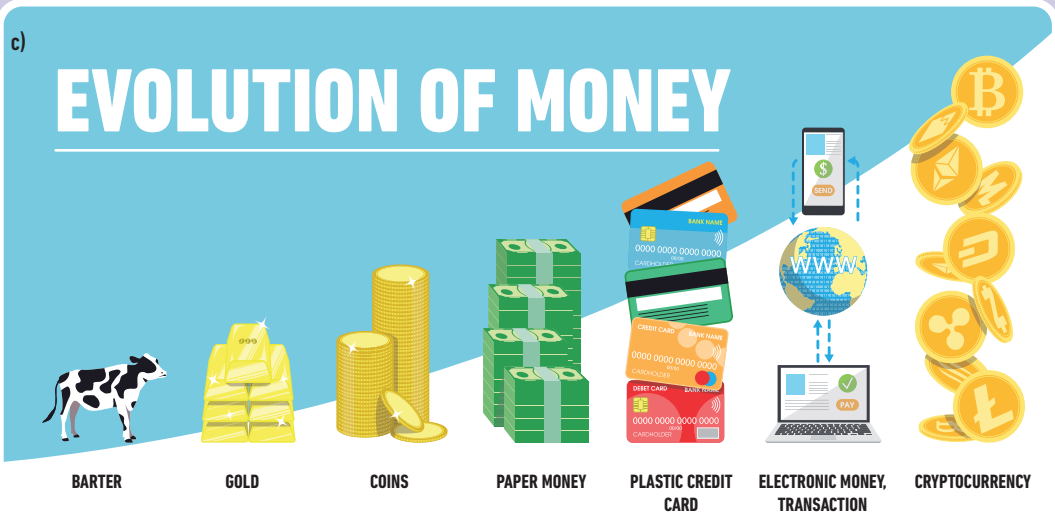


FIND OUT!

FIND OUT!

1. What's wrong with cryptocurrency:
   - from an environmental perspective,
   - from the lack of central regulation?

2. Look for needs or wants in your own life that you could do without, temporarily or forever.

THE PRICE OF WANTS

Article 25 of the Universal Declaration of Human Rights states: *"Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services..."*

Does this right apply in all cases? How and why can situations arise where few have much and many have little, and how does this affect the environment, and us?

DEMOGRAPHIC TRENDS AND SUSTAINABILITY

CONSEQUENCES OF POPULATION GROWTH IN ECONOMICALLY UNDERDEVELOPED AREAS

The high population growth in underdeveloped countries is threatening the supply of populations. Possible reasons for this:

- the lack of infrastructure makes it difficult to supply the growing population;
- underdeveloped agriculture and/or exposure to the weather – for example as a result of a drought, or a monsoon season with excessive rainfall – can lead to famine;
- the country has no resources to buy more food on the world market;
- the conflict of interest between feeding the domestic population and exporting food and energy raw materials that can be sold more expensively abroad often impacts adversely on food production – crucial for the domestic supply – and thereby also jeopardising the supply of a growing population.
- the rising demand for land in agriculture leads to soil degradation and loss of biodiversity;
- although they create jobs, factories established in such regions can often pose serious environmental and health risks due to the lack of legal regulation;
- unemployment is on the rise; one reason, for example, is the declining demand for labour on mechanised plantations, and the unskilled labour;
- there is also huge internal migration – people moving to cities in the hope of a better life, but more and more people are trying to earn a living in other countries.

However, migration does not solve the problems of those remaining, just as aid from abroad is only temporary relief. However, initiatives such as the Economic Partnership Programmes, which the European Union is implementing with the help of private and public investors in African countries among others, are aimed at providing long-term relief to the problems. The programme is designed to promote job creation and fair employment conditions through the development of infrastructure, digitalisation and education.

What is the impact of such programmes?

If efforts to inject impetus into the economy are successful, leading to higher living standards and better access to health care and education, growth in the population will slow. However, the question remains about how to reconcile the economic recovery with sustainability.

The rate of population growth in the world has been slowing since 1965. In 2019, the global fertility rate (average number of children born to each woman) was only 2.4, just slightly higher than the 2.1 needed to reproduce the population. The issue of population growth is perhaps less of a threat than previously thought, and we increasingly need to prepare for the challenges posed by ageing societies.

However, it is also true that the rate of population growth in the poorer regions of the world is not slowing down, or only very slowly. Africa's population continues to grow rapidly. A slowdown in population growth would ease the pressure on food production and allow more resources to be devoted to education, which could contribute to better education and thus employment, as well as creating local jobs. Education and health education could also help to raise awareness about the importance of environmental and social sustainability, as well as the associated economic development.

IMAGINE!

IMAGINE!

China has followed a particular path in shaping demographic processes. The socio-economic problems arising from rapid population growth came to the fore in the 1970s. In 1979, a "one-child policy" was introduced, with the aim of rapidly reducing population growth and stabilising the population by 2050. Often quite drastic steps were taken to achieve the one-child family model, but it turned out quite successful, with even a population decline becoming a real threat, posing a serious socio-economic risk. In 2016, the model was therefore replaced by a "two-child policy".

"According to official figures, the population of the Far Eastern country grew by 5.38% from 2010 to 2020, to around 1.41 billion people. Previously, the growth rate was 5.84%, and before that it was in double digits."

By some estimates, the country's population could start to decline as early as 2021. Sociologists predict that this decline could continue until 2030. The target of the changed model for the population to reach 1.42 billion people by 2020 has not been met. Another – in many respects adverse – effect of the one-child family model was a shift in the gender ratio, with a significant surplus of boys – especially in the younger age groups. This was because, under the one-child model, many traditional families, especially in rural areas, preferred to terminate pregnancies when the sex of the foetus turned out to be a girl.

The sharp reduction in the number of births is therefore slowly becoming a thing of the past because of the economic difficulties that may result from a fall in the proportion of working-age people. The country must face the threat of ageing and labour shortages, which would greatly slow down economic growth while making China more sustainable.

CONSEQUENCES OF POPULATION DECLINE IN ECONOMICALLY DEVELOPED REGIONS

Why is population decline a problem?

- The lack of labour has to be replaced by technology or foreign workers.
- The number of tax-paying workers financing the care of the elderly, health care and education is decreasing, thereby placing an increasing burden on public finances.
- Due to the decline in the working-age population, the retirement age is gradually rising...

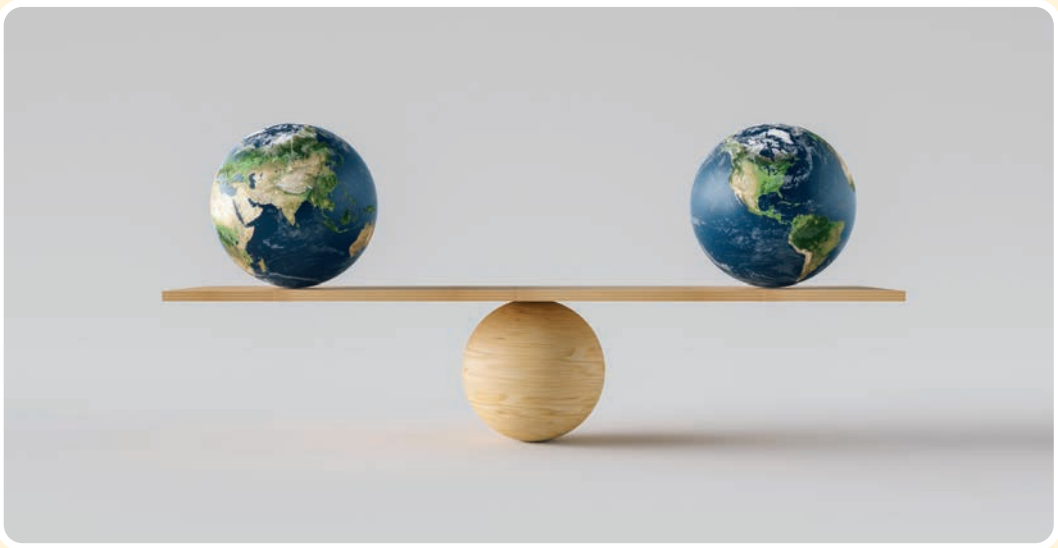
- ... with the possible consequence that grandparents are less able to help young people with children.
- There is a need to rethink how to care for older people, for example, so that they can feel useful and pass on their experience, which is also important for preserving cultures and traditions. The rise in the retirement age partly addresses this problem. This is why an issue needs to be looked at from several angles.
- The changing age structure of society also has an impact on consumption and demand for services.

DEMOGRAPHY AND EQUAL OPPORTUNITIES

IMAGINE!

IMAGINE!

If all the people in the world were to live the way those in developed countries today, we would need two Earths to survive.



FIND OUT!

FIND OUT!

- **Find out what the term Anthropocene means.**
- **Discuss whether the impact of human activity is really so significant that we can talk about a new era.**

The world has exceeded the Earth's current carrying capacity. This means that ecosystem services and resources are not able to renew at the rate we are using them globally.

FIND OUT!

FIND OUT!

Figure out which days were marked in the last 5 years as the Earth and the European Overshoot (i.e. overconsumption) Days. Find the countries that are able to live the longest on their annual resources. What can you conclude from this?

The Earth's carrying capacity depends on the population, the quantity, composition and quality of consumption, and the technologies used to produce the goods and services consumed. So it is also crucial from the perspective of sustainable development to look at how the populations of economically developed countries and those lagging behind are changing.

Monitoring population change

The economic and social situation of a country and the state of the environment can be assessed by means of surveys and data collections exploring many different angles. (Population censuses existed as early as ancient times at the request of powerful rulers, but reliable data has only been collected systematically since the second half of the 19th century.)

Comprehensive censuses, usually conducted every 5-10 years, record the state of a country at a given point in time. It's like taking a snapshot with a drone, and then zooming in to reveal the smallest detail. By juxtaposing the surveys, trends and correlations emerge in time and space. In Hungary, the last census was in 2011 followed by a microcensus in 2016. The latter is based on a sample typically selected for the composition of the population, and the data collected is used to draw conclusions for the population as a whole. The next census, due in 2021, was postponed due to the coronavirus pandemic.

NOW IT'S YOUR TURN

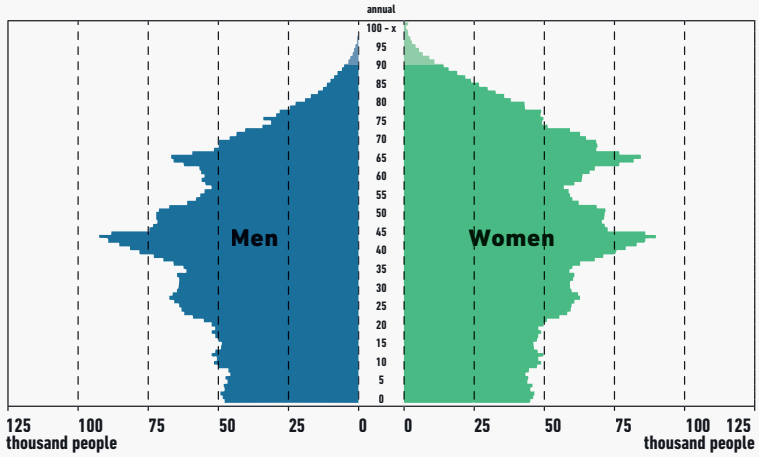
NOW IT'S YOUR TURN.

1. Visit the World Population History website **(https://worldpopulationhistory.org)**. (The site is in English, but easy to understand. If it is not, you can click to translate it into your language.)
   - Drag the slider along the time line. Which regions of the world have had high populations over time?
   - In which century was there a population explosion?
   - How many people live on Earth today, and how many are expected to be here by 2050?
   - In each of the topics, click on the little diamonds to see 2 events that have shaped human life.
   - What did you find interesting?
   - Write a short news summary based on the information you found.

2. Use your 9th grade geography textbook to help you:
   - What is a population pyramid?
   - What are the 3 types of population pyramid?
   - What characterises ageing societies and rejuvenating societies?

3. The interactive population pyramid available on the Hungarian Central Statistical Office website tells us a lot about Hungary through population trends.
   - Find 3 states with a timestamp where the 3 types of population pyramid are displayed.
   - What is the population pyramid of Hungarian society today?
   - How many people are expected to live in Hungary in 2050?

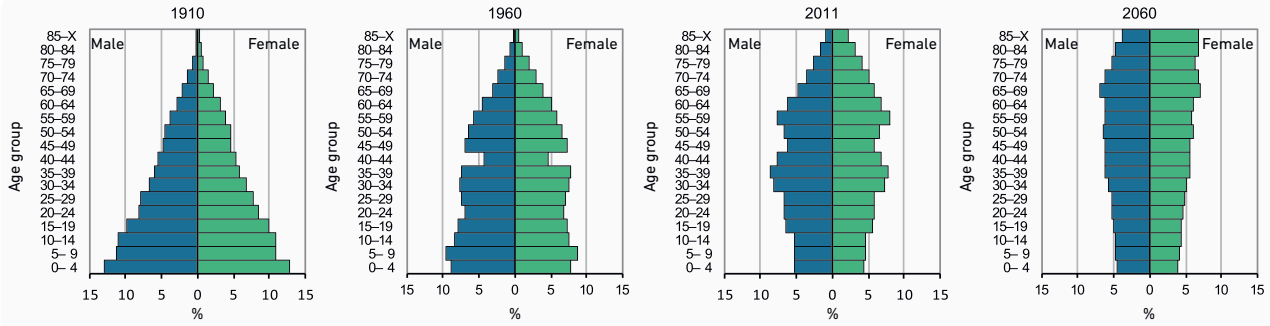
What conclusions can you draw from the following population pyramid?



Population of Hungary by gender and age, 1 January 2020

Some data:
According to the aggregated demographic data, there were about 7.7 billion people on our planet in 2020, and by 2050 there will be more than 9 billion.

Graphically depicting the distribution of the population by age group in a given year gives us a diagram of different shapes, a population pyramid. The **population pyramid** is the most visible tool for presenting population size by age and gender.



Changes in the age composition of the population of Hungary, 1910–2060

The figure shows the changes in the age composition of Hungary's population based on data from 1910, 1960, 2011 and the population projection for 2060.

Economically developed countries generally have an ageing society model. For less developed or lagging societies, the number of births significantly exceeds the number of deaths; in this case we talk about a booming population.

FIND OUT!

FIND OUT!

Based on the previous diagram, which process do you think was typical for Hungary during different periods?

In the last 35 years the Earth's population has doubled; in the past this used to take 200 years. Today, half of all people who have ever lived on Earth are our contemporaries. By upsetting the balance between birth and death rates, the rate of population growth at the global level has skyrocketed, resulting in a demographic explosion. The reasons for overpopulation can be traced back to improving living conditions and developments in technology and healthcare. These have led to falling mortality rates, while birth rates have remained high. Meanwhile, life expectancy has also increased thanks to improved healthcare.

In Hungary, the Statistical Office expects a slow population decline. Based on current trends there will be around 7.9 million Hungarians by 2060.

ECO-SAVVY

In the developed world, including Hungary and many countries in Europe as well as far-off Japan, declining populations and ageing societies are causing serious social and even economic tensions.

Governments are taking various measures to encourage families to have children. In Hungary, for example, these include tax allowances, financial support and credit subsidies for families, which help not only parents but often also grandparents to participate in bringing children up.

GOOD HEALTH AND WELL-BEING

Who is healthy?

We tend to answer this question by saying that everyone is healthy if they have no physical, mental or spiritual problems. In other words, anyone who isn't sick, is healthy.

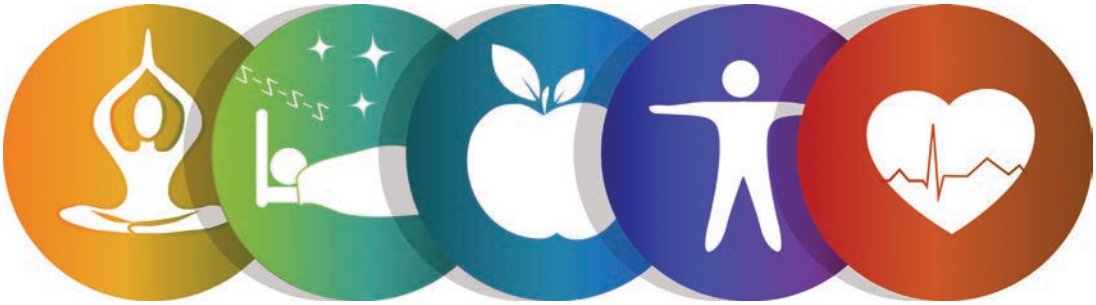
– SYSTEMS THINKER –

However, as a systems thinker, you have often been confronted with the fact that things are not black and white. If someone can meet biological, psychological, social and environmental demands without any particular difficulty, and usually has no problems with themselves and the world, has good self-esteem, self-respect and has relationships, they are considered healthy, or consider themselves healthy.

According to the World Health Organisation (WHO): "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

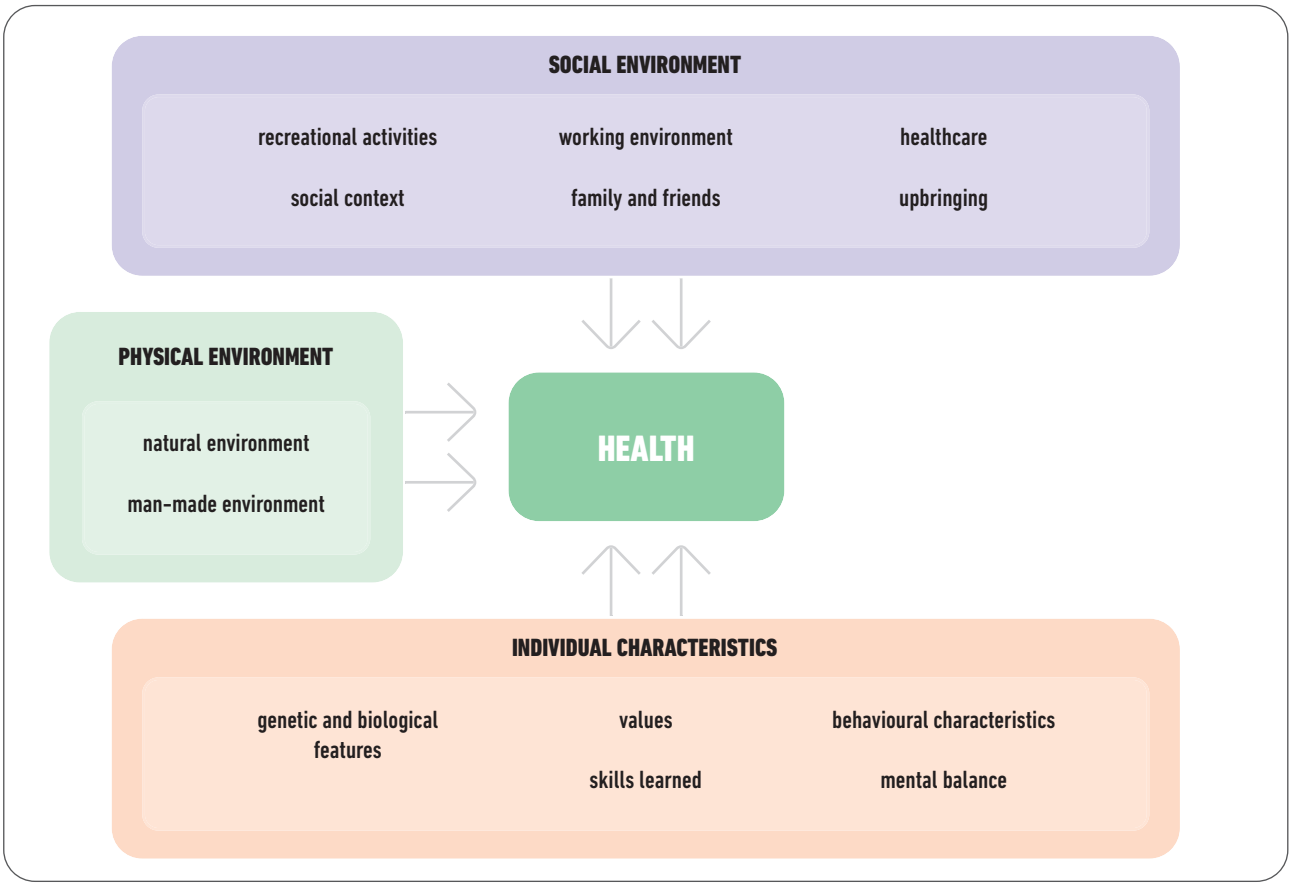
In simple terms, a person is healthy if they consider their own functioning to be appropriate. In practice, there is no such thing as perfect health; an individual's health depends on the extent to which they are satisfied with their physical, mental and social well-being, and their functioning in general. It is also partly a question of attitude. Some people may not feel comfortable despite enjoying relatively good physical health, for example because they are overwhelmed by problems in making ends meet or have relationship difficulties that make them feel unhappy and lacking energy.

The complexity of the concept of health means there are many definitions of health in literature.



The following are generally considered to be the main criteria for health:

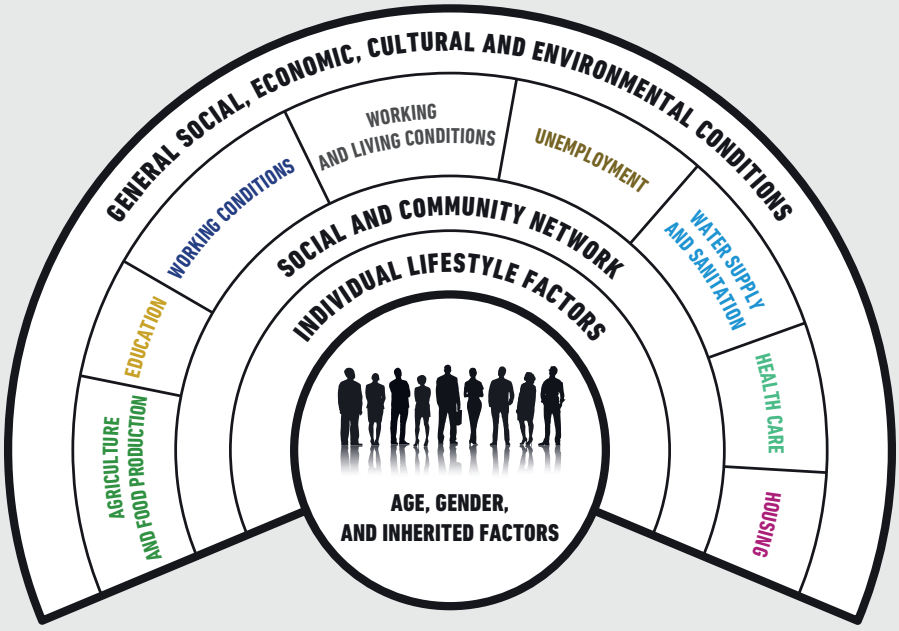
- the body's ability to function properly,
- fulfilling social roles – family, friends, work – successfully.
- resilience, the ability to cope with different – physical, biological, social – stress situations,
- well-being awareness,
- avoiding the risk of illnesses and premature death, preventive behaviour.



Factors influencing health

Health is determined by:

1. hereditary factors,
2. conditions for healthy development in childhood,
3. lifestyle,
4. income, prosperity,
5. social care system,
6. education,
7. economic situation of society, working conditions of individuals,
8. natural and physical or man-made environment,
9. availability and quality of health services,
10. cultural characteristics.



Factors determining health (based on Dahlgreen and Whitehead)

IMAGINE!

IMAGINE!

Life expectancy

One indicator of a population's state of health is life expectancy. In 2020, life expectancy in Hungary was 72 for men and 78 for women.

FIND OUT!

FIND OUT!

Which country in the world has the lowest and which has the highest life expectancy?

At what age do we start getting sick?

Surveys show that the lower a person's socio-economic position, the fewer years they spend in good health. In other words, they start to have health problems significantly earlier than their peers in better economic and social positions.

Inequalities have a major impact on the chances of a healthy (healthier) life. Due to social and economic disparities and inequalities, there will always be people who have easy and rapid access to good quality health care and those who do not. (Covid-19 vaccines were also available first in the most developed countries.) These health inequalities exist within single societies, but also between regions and continents. According to the WHO, 90% of healthy living conditions cannot be guaranteed because of financial insecurity, poor housing, social exclusion and poor working conditions.

HEALTH CARE SERVICES

MATERIAL SECURITY AND SOCIAL SAFETY NET

HOUSING CONDITIONS

COOPERATION

EMPLOYMENT AND WORKPLACE CONDITIONS

The pictograms show the areas where the WHO believes action is needed to protect health.

NOW IT'S YOUR TURN.

1. What kind of health problems must slum dwellers face? How can their problems be tackled?
2. Find aid organisations in your country that work to heal or improve the social situation of marginalised people in your country or abroad. Present them.
3. Why do you think doctors work in the programme in even the most developed countries?

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Discuss:

1. What can you do to protect your health?
2. How can advertising affect health? What do you think about advertisements promoting painkillers or slimming products that promise miraculous effects?
3. How are the beauty and pharmaceutical industries linked to sustainable development? Make a presentation on this topic.

Health and illness as an economic issue

How is education related to health?

In Hungary, everyone has access to healthcare. However, if someone – unwittingly – ignores certain symptoms and fails to go for check-ups, small untreated problems can turn into big issues. That's why it's important to be informed, so that people know when to seek treatment and not to settle for instant solutions that appear to work, such as using painkillers to mask the cause of their problems.

The declining health of members of a society also has social and economic consequences. Sick people are off work, leading to economic damage and reduced tax revenues, while the health sector incurs costs because of tests and possibly lengthy treatments. Research and calculations have shown that money spent on screenings, promoting healthy lifestyles and preventing disease pays for itself many times over for a state.

Good health and well-being is one of the UN's Sustainable Development Goals. The targets under this goal give high priority to maternal and child health, a reduction of major infectious diseases (HIV/AIDS, malaria, tuberculosis, hepatitis B), non-infectious and environmental diseases, the provision of universal health coverage and access for all to safe, affordable, quality and effective medicines and vaccines. To this end, the UN supports research and development, increased spending on health, and strengthens countries' capacity to manage and reduce health risks.

IMAGINE!

IMAGINE!

- Infant mortality in the world fell from 5 million in 1990 to 2.4 million in 2019.
- The risk of infant death is highest in the first 28 days of a newborn's life.
- The main cause of death in the first 28 days is the lack of an adequate professional healthcare system at birth.

Monitoring the achievement of goals

Many organisations monitor the achievement of the SDGs from different perspectives. The United Nations has developed a single set of indicators for which countries provide data. Where such data is not available, international assistance and support is sought to organise data collection. In Hungary, the UN's partner is the Central Statistical Office. Their website contains the UN indicators used to measure each of the targets (or substitute indicators if not available in Hungary).

Human development indicator

The United Nations Development Programme (UNDP) uses several composite indicators to assess the state of societies. One of the oldest is the Human Development Index (HDI), which has been used since 1990 and is calculated from a range of statistics.

IMAGINE!

IMAGINE!

When is a society considered developed?
According to the HDI, the development of a society is influenced by the estimated life expectancy, the number of years spent in good health, the level of education and the standard of living of its members. The HDI ranges from 0 to 1, the higher the value, the more advanced a society is considered to be in terms of well-being.

FIND OUT!

FIND OUT!

1. What does the HDI measure, and what not?
2. If the HDI increases, which Sustainable Development Goals (SDGs) will experience progress?

Social Progress Index

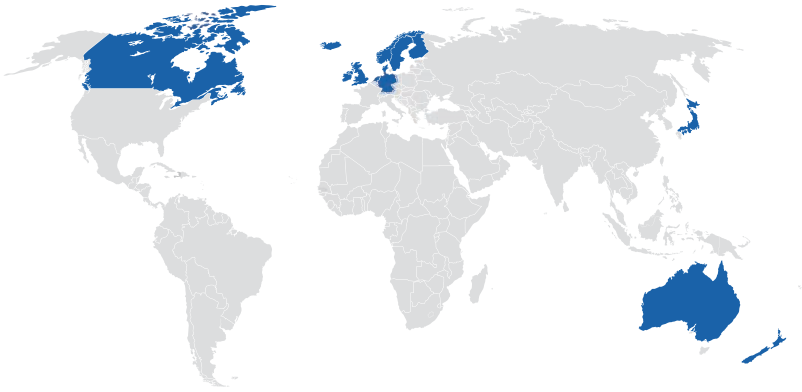
Another indicator of the development of society is the Social Progress Index (SPI). This composite indicator is calculated using data in three areas:

1. basic human needs,
2. foundations of wellbeing, and
3. opportunity.

So the index includes both social and environmental indicators. The higher the SPI value, the better the social progress of a country.

TOP 15 COUNTRIES ACCORDING TO SOCIAL PROGRESS INDEX

RANK	COUNTRY	SOCIAL PROGRESS INDEX
1	Norway	90.26
2	Iceland	90.24
3	Switzerland	89.97
4	Denmark	89.96
5	Finland	89.77
6	Japan	89.74
7	The Netherlands	89.34
8	Luxembourg	89.27
9	Germany	89.21
10	New Zealand	89.12
11	Sweden	88.99
12	Ireland	88.82
13	United Kingdom	88.74
14	Canada	88.62
15	Australia	88.32



Source: https://hu.history-hub.com/mi-az-tarsadalmi-fejlodes-indexe

Experts agree that the SDGs can be achieved through common will, social cooperation and a new form of economic/business behaviour. To achieve a paradigm shift (i.e. a systemic and radical change in prevailing, mainstream thinking and attitudes), we need to be aware of a number of key factors for ensuring sustainable development.

We need to know about:

1. world population trends,
2. the causes and components of social inequalities, and
3. their economic and environmental consequences, and
4. we need to know the social, economic and environmental impacts of our consumption habits so we can make the right choices.

These are the first steps to change our own behaviour, and eventually, through collective action, to reverse the negative trends.

WHAT MAKES SOME PEOPLE "MORE EQUAL" THAN OTHERS?

The title, of course, is ironic. What we really want to know is how social inequalities arise. How can it be that one person cannot even afford basic necessities, while another can have luxury items.

GROUPING ASPECTS

The stratification or grouping of a society can be mapped by assessing several factors, such as occupation, income, housing, education or health conditions. (Subjective factors can also be taken into account, such as language, clothing, musical taste, which are all considered subculture.)

Throughout history there have been many different social structures. There are societies with rigid structures, such as the caste system, and those that allow for mobility and stratification, in which – in addition to opportunities acquired at birth – knowledge and skills are the main determinants of social mobility.

IMAGINE!

IMAGINE!

The caste system, still a major obstacle to India's socio-economic development, is a rigid social structure based on the fact that people are born unequal and have to live their entire lives in a closed group, a caste of birth, from which they cannot break free. What is more, the system discriminates against those considered impure from birth. They are not free to choose a career and could do the same job all their lives.
This does not depend on wealth, because a person could not cross the boundaries of their caste even if they had gained financial wealth. The Indian government and international organisations are working to break down this rigid structure, but changing and preserving traditions is a complex task.

STRATIFICATION OF MODERN SOCIETIES

One possible principle for group formation in modern societies depends on access to resources. On this basis, we can talk about

- access to political capital (power),
- economic capital (material goods),
- knowledge and information capital (education, information), and
- social capital (relationships, recognition).

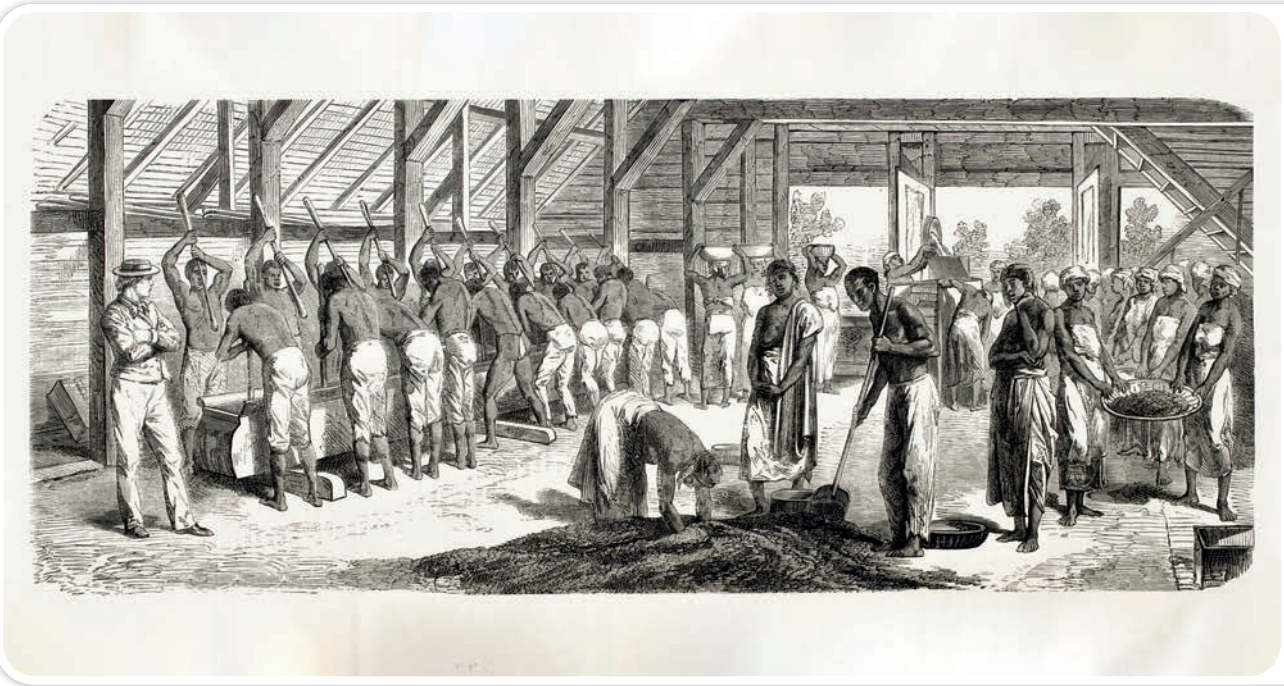
Traditional social structures, such as kingdoms, may continue to exist in both developed and developing countries.

Are social inequalities necessary?

Inequalities exist in every society. We do not start life from the same physical, mental, wealth, family, etc. situations. Our success is also greatly influenced by external circumstances, the opportunities that help us achieve our desires.

However, the viability of a society and economy largely depends on the level of inequalities: the proportion of the population made up of very rich and very poor groups, as well as the middle class with an average standard of living, their lifestyles and how they "behave" with other groups of society.

Here is an example of the development of inequalities on a historical scale:
During colonialism, the conquering Europeans subjugated and exploited the indigenous peoples of the conquered territories, subverting their previously secure beliefs and culture. This had a long-term socio-economic impact. The descendants of indigenous peoples were often disadvantaged for centuries in terms of rights, education and income-earning opportunities.



IMAGINE!

IMAGINE!

Between 1492 and 1888, 12 million Africans were brought to the Americas as slaves because of the need for labourers in agriculture. From the 17th century onwards, the English colonies in the south practised plantation agriculture, which required mass slave labour. In the north, the French practised farming and it was here that industrial development began, which did not require mass slave labour. The Civil War between the North and the South was partly the result of President Abraham Lincoln's fight to abolish slavery. Yet although the abolition of slavery was a huge step forward, the lives of the descendants of slaves continued to be strictly regulated and discriminated against for many years. They had separate schools, doctors' surgeries, shops, could only travel in the back on public transport and had to give way to white people.

– SYSTEMS THINKER –

Although the negative consequences of colonisation continue to have an impact to this day, it must also be acknowledged that in many cases it led to improvements in public health and often to the control of ongoing local conflicts, whilst also integrating the territory, albeit unequally, into the world economy, which could become the basis for subsequent development.

FIND OUT!

FIND OUT!

What is the 1955 Montgomery bus boycott famous for? Discuss it with your classmates.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Below you can read about different destinies. We have included photos of the main characters' grandparents in each story.
a) Guess how their lives might have turned out.

b) Discuss
- What the grandparents who didn't get their wish because they were born in the "wrong place" would have needed.
- Figure out happy or unhappy endings to the stories, and explain how much the fate of the stories was down to personal choice and how much to luck.

VICTORIA'S AND DANIEL'S STORY

The man on the left is an ancestor of the brothers.

Victoria and Daniel are siblings living in Harlem. Victoria was always interested in biology, and Daniel was a talented dancer. Unfortunately, the family could not afford to send them to school because their father died early and they needed their earnings too. Daniel is now a labourer, and Victoria works in a sewing factory.

The boy in the striped jersey in front is Jacob's grandfather.

JACOB'S STORY

Jacob lives in a small village where most of the inhabitants have moved to the city. There is only a primary school here. As the lower secondary school is in the city, where it would be difficult to go every day, Jacob became a boarding pupil and only comes home at weekends. One of his teachers discovered his talent for poetry, and entered him in the county poetry competition, which he won. It was then that he had the idea of becoming either a teacher of Hungarian, or an actor.

The picture shows Megan's great-grandparents. The baby is Megan's grandmother.

MEGAN'S STORY

Megan lives in the capital, in a nice area of detached houses. Her parents drive her to a sports school on the other side of town. But Megan is not only good at sport, she also loves languages, so she takes Spanish lessons alongside English and German.

Her parents want her to continue her studies and do something she enjoys and has a talent for, so they have organised help for her in subjects where her grades are not very good.

We can see that the path to inequality has similar and quite individual causes. These paths involve many forks, fortunes or misfortunes, and decisions to make. They have to be followed very consciously, so that each one makes the most of their potential to fulfil their desires and talents.

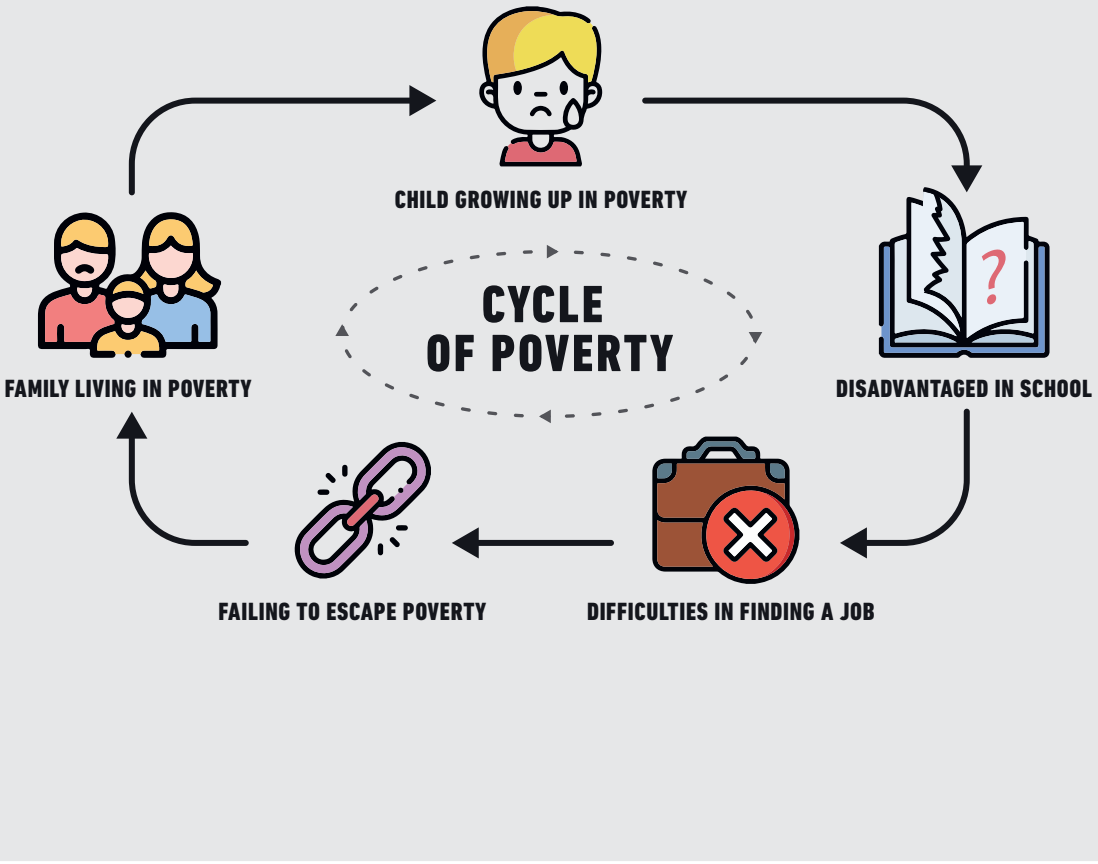
While there are no single, welcoming solutions, a democratic state should strive to create the legal, social, educational and health conditions that enable everyone to make a living, regardless of their family background, skin colour or gender.

Cultural and religious barriers to equal opportunities

In many cultures, there were and still are barriers to access to education, intellectual property or civil rights. Examples include restrictions on women's access to education and voting rights, or income disparities between women and men.

POSITIVE FEEDBACK. EDUCATION AND INCOME

To manage your own life consciously and wisely, you must also have the right knowledge. They need to learn a profession, take part in secondary or higher education, educate themselves, and so on. Those entering the labour market with lower qualifications, without professional skills or work experience can be expected to find jobs with lower earnings. Low-income families can give their children far fewer opportunities, so income inequality can be a barrier to equal opportunity. This triggers a positive, reinforcing feedback loop, and upsets the equilibrium.



IMAGINE!

IMAGINE!

We would expect technological progress to have a positive impact on the economy as a whole and on the labour market. The truth is that it mainly benefits the highly skilled, especially in sectors based on information and communications technology. Robots and automation replace the jobs of low-skilled workers, increasing unemployment among the unskilled.

If you remember...

In a reinforcing causal loop consisting of a series of positive feedbacks, actors mutually accelerate the processes induced by each other. In a balancing causal loop with negative feedbacks, self-regulating mechanisms of the system are triggered. This is the case for many processes in nature. For example, in very simple terms, if the number of foxes increases, more rabbits will be caught, thereby reducing the rabbit population, which will eventually lead to a decline in the fox population due to a decrease in food. This results in an increase in rabbits, followed by a rise in the fox population, and so on.

There may also be a situation where we want to control a process, but instead of the expected balancing or stabilising effect, an unexpected rebound effect causes the original problem to escalate. This is the case when, in the interests of sustainability, the price of environmentally friendly cars is lowered, hoping that this reduces pollution from cars. But instead, the price reduction allows more people to buy cars, and although individual emissions are lower, the combined environmental impact starts to increase due to heavier traffic.

Large income disparities also have other consequences. If people can see that neither their ambitions nor their efforts are yielding the expected results, they are not getting a decent income and they cannot help their children to better their situation, then growing discontent and disillusionment does much damage to the sense of belonging, solidarity and ultimately national identity.

IMAGINE!

IMAGINE!

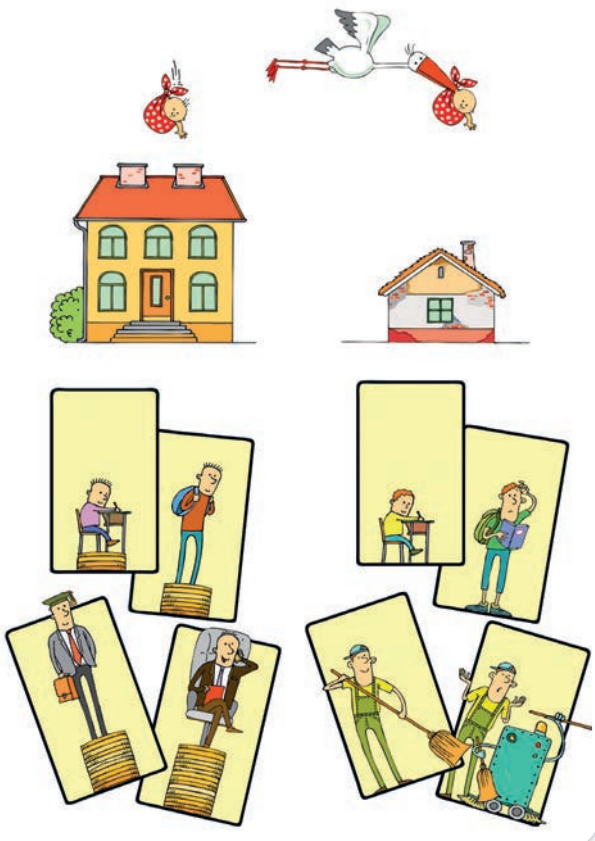
What is the GINI index?

The Gini index measures inequality in the distribution of income and wealth. The indicator shows the distribution of goods acquired among different groups in society. The indicator ranges between 0 and 100, and if it is 0, then income is distributed completely equally among people in the country. If it is 100, the situation is that all income is concentrated in the hands of one person, which is impossible in reality.

Opportunity monitor

When measuring opportunities, the focus is on young people. This is because a person who reaches adulthood has already made a number of good and bad decisions in their life, and has had their life path shaped by a number of random situations, whereas a young person is only influenced by their life chances when they start out. Thus child poverty and the risk of exclusion become important indicators of inequality of opportunity.

INDIVIDUAL LIVES, SYSTEMIC SOLUTIONS



It's their fault. I have nothing to do with it. Why didn't they learn? Why did they start drinking? Why did they let themselves go? Well, it was hard for me too, and yet...

Earlier we tried to open your eyes to the fact we all have our own lives, where we were born, what qualities we inherited, whether we are fragile or strong, were hurt or loved, and whether our childhood was fortunate or not. Some of us are to blame for getting into trouble, some less so. Whatever the case, these individual life events, troubles and problems add up and can cause systemic problems, so systemic solutions are needed.

Maybe Mary or Stephen became homeless for some reason and fell into drug abuse, but many similar cases still accumulate problems that cannot (only) be dealt with individually, they require systemic solutions.

The EU provides expertise and funding for reforms to support social inclusion and the extension of the social safety net. Of course, solutions need to be tailored to the local features of the given country, since unemployment rates, social and educational institutions, etc. vary across the EU.

Let's look at the areas covered by efforts to promote equal opportunities:

- Investing in knowledge acquisition and skills development is a key policy tool for reducing inequalities. For example, training low-skilled workers for higher wages and to create jobs.
- Making the school system work to create opportunities, eliminating segregation and promoting access to quality education.
- Developing incentives in the tax and social care system to reduce income inequalities.
- Provide economic incentives to help unemployed and inactive people re-enter the labour market.
- Taxation of wealth, capital, high-value properties and inheritance.
- To break the cycle of disadvantage:
  - provide quality and accessible childcare;
  - state and municipal benefits: education, health care, housing assistance;
  - promote greater female labour force participation;
  - invest in transport, road networks and digital access.

FIND OUT!

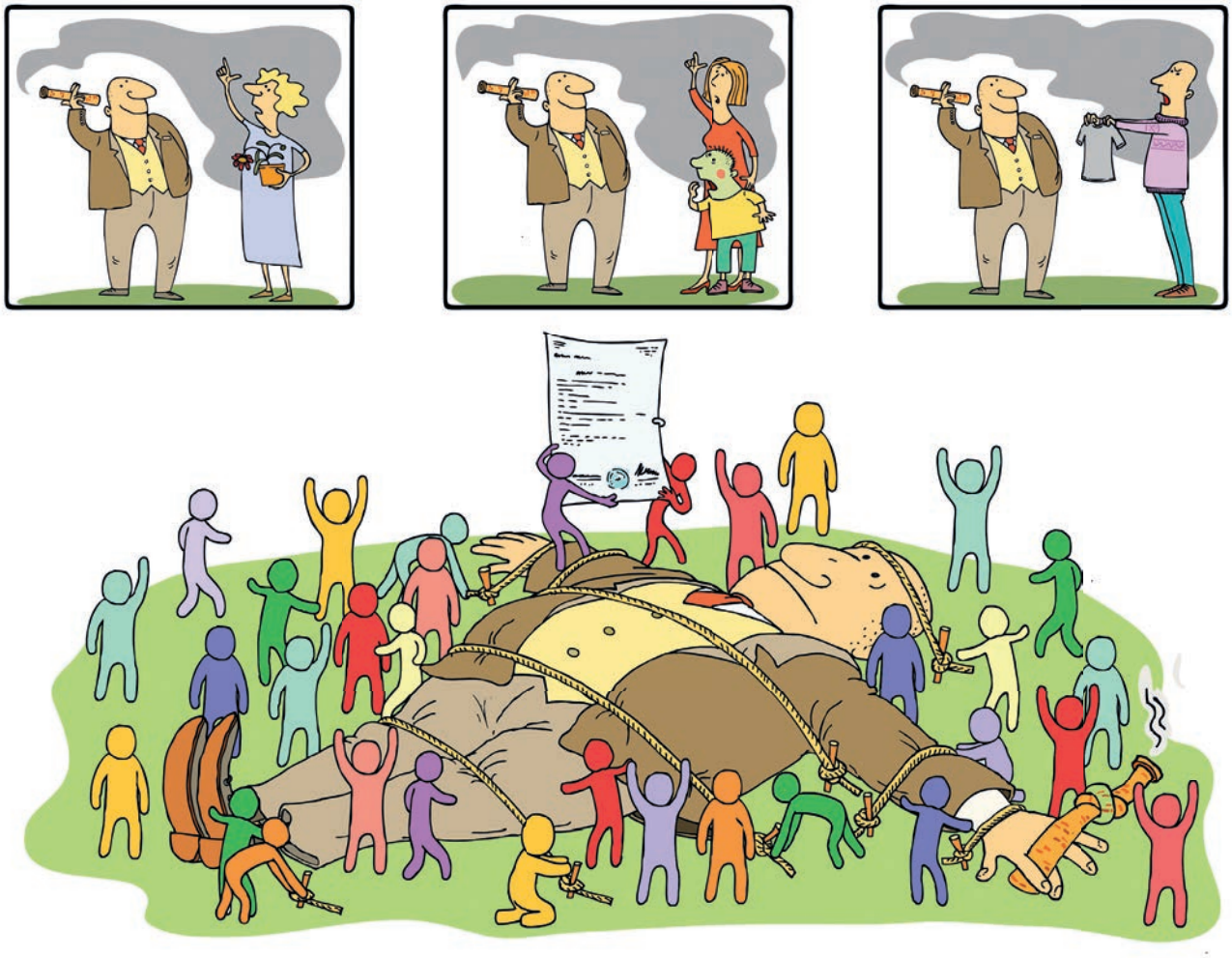
FIND OUT!

Find out what measures support the functioning of the social safety net in your country.

NOW YOU KNOW!

TERM	DEFINITION
Census	Population census
Determinants of health	1. income, prosperity 2. social care system 3. education 4. economic situation of society, working conditions of the individual 5. natural, and physical or man-made environment 6. lifestyle 7. conditions for healthy development in childhood 8. availability and quality of health services 9. hereditary factors 10. cultural characteristics
Access to resources	Access to • political capital (power), • economic capital (material goods), • knowledge and information capital (education, information), • social capital (relationships, recognition).
GINI index	Indicator of the ratio of income to wealth distribution.
Want	A want is a kind of need, but satisfying it is less essential.
Need	Need is a "mobilising" state of deficiency. It prompts action to eliminate the state of deficiency. Basic needs (drives) are related to self-preservation and reproduction: These are • physiological (hunger, thirst, sleep, etc.), • security (transparency, order, stability, housing, protection, etc.), • social (belonging, love, compassion, identification, etc.), • self-assessment (efficiency, competence, esteem, self-confidence, etc.), • personal fulfilment (self-awareness, wish fulfilment, career-building, etc.).
Society	This is a translation of the Latin 'societas', meaning an organised social grouping of people.

COOPERATION FOR A SUSTAINABLE FUTURE



WE HAVE TO ACT!

We interviewed students during Sustainability Week:
I have been dealing with climate change for almost two years. It is good that there are youth organisations to join. Together we can do more. My attitude has changed a lot over the last few years. We only have the Earth on loan, we are only temporary users. We must appreciate what we have. Everyone must act to avoid disaster.

I am often surprised to learn how much of a difference I can make with one small step... I also have many ideas for the future. My parents and I want to get into composting, and in the spring we're going to try to start a vegetable garden. I try to shop waste-free. As an adult, I would also choose to cycle or use public transport, because it releases less carbon dioxide into the air.

Where I volunteer, I have also made friends. I believe what I am doing is useful, I have fun while doing it, and I don't miss out on parties either. Politicians can have the biggest impact on people, without this you can't expect anything to happen. They have to be persuaded.

It's good here. Every weekend we get together, plan things and chat. Sometimes we make posters, paint and take photos. While we hunt for waste, we end up taking long treks. Volunteers are everyday heroes. They are members of a community who don't just talk the talk, but want to do something meaningful to create a liveable world for themselves and future generations. Some can devote a few hours of their lives to doing this work, others more. There are many ways to do this, both in person and online.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

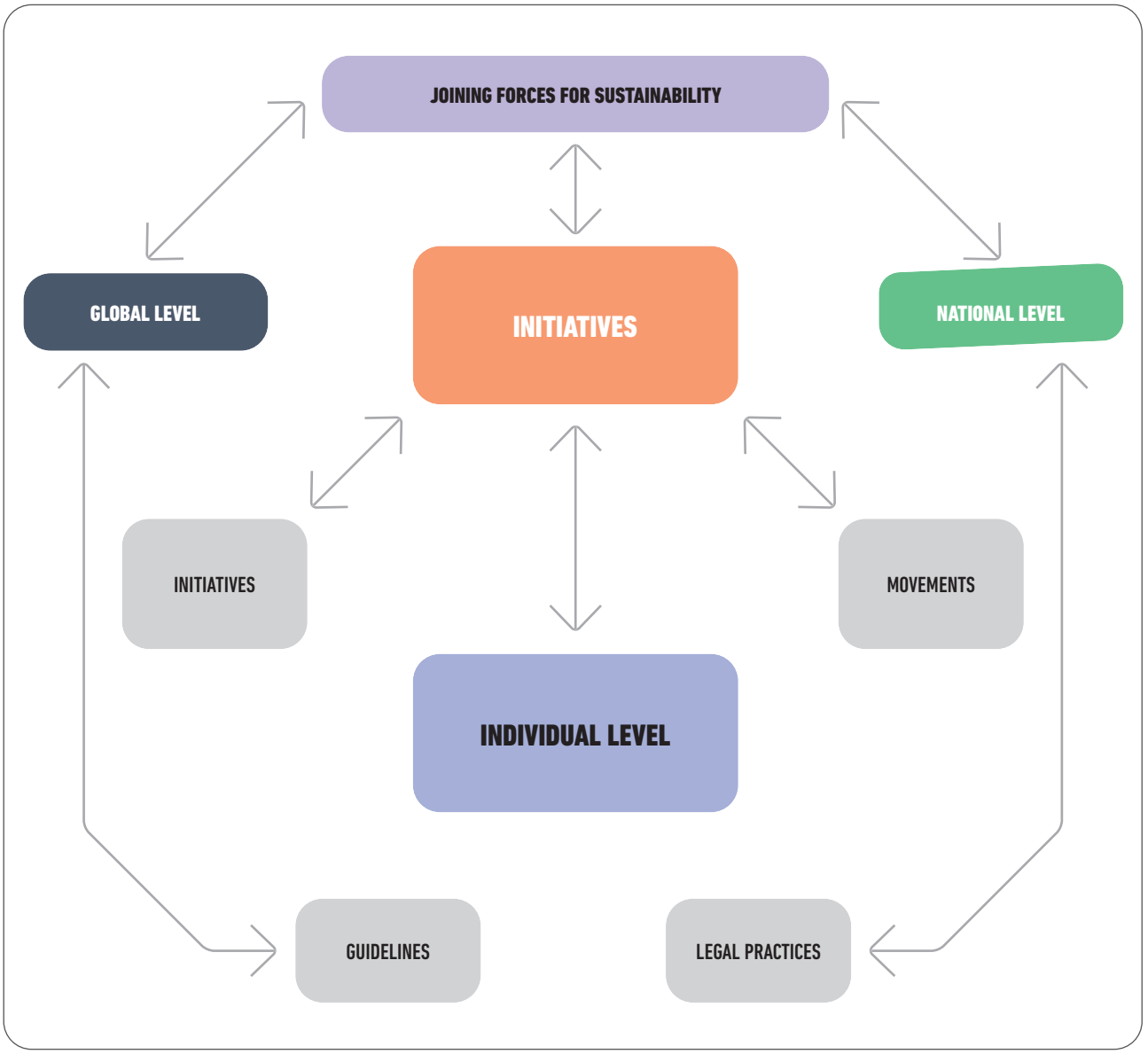
Mark the student's thoughts that you are interested in.

FIND OUT!

FIND OUT!

Look for ways in which students are trying to do something about sustainability and the problems they have identified. Which do you agree or disagree with, and which would you happily join? Why?

In this chapter, you can read and learn about the different forms and levels of working together for our planet. You will also see how you can take action to make a difference, because you are not alone.



ECO-SAVVY: SETTING THE RIGHT TARGETS

To develop effective strategies for sustainability problems that lead to solutions, we need to explore the situation through international cooperation and networks of experts. Points of intervention need to be identified, objectives set, then the means should be devised to achieve these objectives. It sounds very simple, because you do the same thing when your bike breaks down. You check what's wrong, what parts are needed to fix it, and who to take it to for servicing.

In this case, setting objectives and achieving them is an extremely difficult and complex task, because often barely reconcilable economic interests clash with measures that affect everyone's health and future. The willingness to cooperate and compromise varies greatly at international level, and even at the level of citizens. Many do not even recognise the need to act, or to advocate the long-term health, safety, environmental protection and equal opportunity interests – usually in the face of short-term, immediate welfare and economic gains.

For example

- It is in the interests of the major oil-producing countries and oil-processing giants to keep conventional (petrol and diesel) vehicles in operation as long as possible, but at the same time, everyone is aware that burning fossil fuels contributes significantly to climate change. And disasters during oil production and transportation cause serious damage to marine ecosystems.
- A country that builds its economy on sea fishing has a short-term interest in catching as much as possible, as efficiently as possible, because it needs income to feed its population now. However, protecting marine ecosystems is a global interest, not only to mitigate climate change and secure food supplies, but also to ensure the long-term livelihoods of the country's inhabitants.
- The huge demand for and the revenue from palm oil is appealing to a tropical country with a less developed economy, but it leads to the loss of rainforests and the extinction of orangutans, while transporting it to another part of the world is polluting. So is it really a good alternative to the oils and fats we have been using so far? Or can it be produced in a sustainable way, will it be more expensive, and who suffers the economic disadvantage, the producer or the consumer?
- Child labour is indeed deserving of condemnation, but what if it is the only source of income for a family? And are we willing to give up the latest fashionable shoes and mobile phones when others already have them? Do we choose to travel by train, bus, metro and tram making several changes instead of a more comfortable car journey?

This is why it was hugely important to have the Sustainable Development Goals (SDGs) framework, which was developed and adopted by UN Member States and consists of 17 goals and 168 targets. The goals set out a grand scheme of tasks for the world and all its actors, taking these contradictions into account and setting directions and pathways for change.

The SDGs are an international framework and compass for sustainability, universal goals and targets that affect the whole world. They are integrated, inseparable and strike a balance between three dimensions: environment, society and economy. The last few targets under each of the goals set out tasks for developed countries to reduce global inequalities of opportunity and level the playing field. Goal 17 aims to strengthen partnership in global cooperation for sustainable development. These goals cover financial, technological, educational and trade-related measures, and include a reconciliation of national policies and institutions, broad stakeholder involvement as well as the development of tools to measure the sustainability of development and the coordination of data collection.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Think about and discuss what tasks each goal might mean in your environment. What do you think are the most pressing issues? Which sustainability goals would you achieve in the next 10 years?
2. Why is an international framework for sustainability needed?
3. Why is it important that the goals were set within the UN framework?

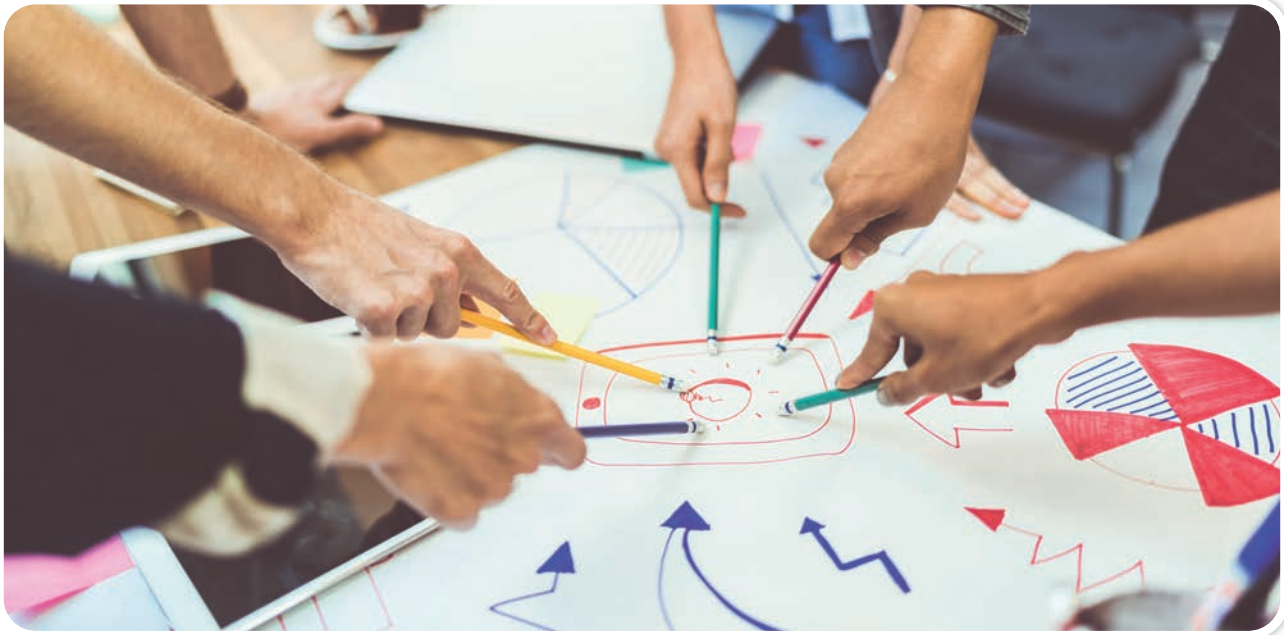
IMAGINE!

IMAGINE!

The initiative was the brainchild of two countries – Colombia and Guatemala – but has grown into the UN's most comprehensive and most important "agenda" (to-do list) ever. The set of goals is the result of a truly global cooperation. The representatives of the Member States had the final say, but there was a lot of support and pressure from academia, civil society, young people and the corporate sector. The UN Secretariat and its institutions also provided considerable support. Never before have world leaders pledged to work together and make a concerted effort on such a broad and universal policy agenda. They have set out concrete goals that can only be achieved through collective action.

Expectations for defining goals

Setting the goals was a very complex task. They were expected to be
- specific,
- limited in number,
- quantifiable,
- easy to communicate, and
- relevant to all countries.



The latter meant they should be valid and applicable both globally and for individual countries. There was also a need for the unmet objectives of the Millennium Development Goals (MDGs), which underpinned UN development policy from 2000–2015, to be reflected in the new goals. Everyone had a different focus, a different goal, and a different approach. That is why it is such a great achievement that it was finally possible to establish a set of goals that was accepted by all 193 Member States.

GOALS

IMAGINE!

IMAGINE!

Hungary played an important role in setting the goals. The Ambassador of Hungary to the United Nations, Csaba Kőrösi, co-chaired the process of setting the goals with his Kenyan counterpart. The Co-Chairs were responsible for developing the working procedures, setting the agenda, chairing the meetings, learning about all the positions, making proposals, drafting the goals and objectives and getting member states to reach a consensus.

Each country faces specific challenges in its efforts to achieve sustainable development. According to these common guidelines, based on the ambitious and global goals, and taking national circumstances into account, each government
- sets its own national targets, and
- decides how these targets should be incorporated into national planning processes, policies and strategies.

Although the implementation takes place at national level, the efforts will collectively lead to the achievement of the global goals. In Hungary, the National Framework Strategy on Sustainable Development was prepared in 2013, before the adoption of the SDGs, and its role in achieving the SDGs was assessed in the biennial review in 2018.

A BIT OF HISTORY

Rio Conference
The United Nations Conference on Environment and Development, best known as the Earth Summit, was held in Rio de Janeiro from 3–14 June 1992. This intergovernmental conference is significant from the perspective of sustainable development because it highlighted that different social, economic and environmental factors are interdependent and evolve together. So what happens in one sector will, over time, have an impact on other sectors too. The outcome document of the conference was the Rio Declaration. Important conventions were adopted that protect the Earth's climate and biodiversity, such as the Framework Convention on Climate Change and the Convention on Biological Diversity.

Another major achievement of the conference was that, in the spirit of international solidarity, developed countries pledged to contribute 0.7% of their GNP to support developing countries with environmental protection, economic development or aid. This pledge was also included as a separate target in Sustainable Development Goal 17.

The UN Millennium Development Goals (MDGs)

were adopted at the Millennium Summit in September 2000. The MDGs set out 8 goals to be achieved over the period 2000–2015.

The goals:
- eradicate extreme poverty and hunger;
- achieve universal primary education;
- promote gender equality and empower women;
- reduce child mortality;
- improve maternal health;
- combat HIV/AIDS, malaria, and other diseases;
- ensure environmental sustainability;
- develop a global partnership for development.

Rio+20 Conference

Fifty thousand participants attended the United Nations Conference on Sustainable Development, also held in Rio de Janeiro, Brazil, from 20–22 June 2012, to mark the 20th anniversary of the Earth Summit. World leaders were joined by representatives from major social groups, the business sector and the academic sphere. The Sustainable Development Goals were included in the conference's outcome document, "The Future We Want". It was in the context of this document, negotiated by UN Member States, that the Open Working Group, co-chaired by Hungary and Kenya, established a set of proposals for the SDGs.

Thanks to the Millennium Development Goals – among other things – the number of people living in extreme poverty in the world and the global under-five mortality rate have declined by more than half. And the global maternal mortality ratio has fallen by 45 percent.

More than 6.2 million malaria-related deaths have been averted. An estimated 37 million more lives have been saved through the prevention, diagnosis and treatment of tuberculosis. However, there are still plenty of tasks to be incorporated into the newly defined development goals (SDGs) – especially on gender inequalities, inequalities between the poorest and the richest, as well as rural and urban areas, poverty and hunger.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Study the pictograms. Look up the description of each goal. Choose a goal and make a poster for it.
2. Choose two of the goals and see the progress made by the place where you live.
3. Choose a few goals and make a plan on what you could do in your school to achieve them.

MEANWHILE IN HUNGARY

Let's take a broad overview of the steps taken in Hungary parallel to the international events leading to the establishment of the SDGs and their implementation.

SUSTAINABILITY CALENDAR

- 1992 – The Commission on Sustainable Development was set up, to which civil society and scientific organisations were also invited. The Commission remained active until 2002.
- In 1993, on the initiative of citizens and under the leadership of a civil society organisation, advisory and consultation work on environmental legislation was launched, involving actors from scientific, civil and economic sectors.
- In 1995, the Hungarian Parliament adopted the Environmental Protection Act, one of the most progressive and powerful pieces of legislation in Europe. Among other things, the National Environmental Protection Council was established in the manner prescribed by the Act, operating with equal participation of scientific, economic and civil society organisations.
- In 2007, based on studies and feedback from researchers and civil society, and under a ministerial framework, the first National Sustainable Development Strategy was prepared.
- In 2008, the National Assembly passed a resolution establishing the National Council for Sustainable Development (NCSD).
- Since 2007, the Hungarian Central Statistical Office has prepared a biannual publication entitled *Indicators of Sustainable Development for Hungary*.
- In 2013, the National Assembly adopted the National Framework Strategy on Sustainable Development

NATIONAL COUNCIL FOR SUSTAINABLE DEVELOPMENT

NFFT
National Council for Sustainable Development

What does the National Council for Sustainable Development do?

The Council contributes to planning, revising and implementing the strategy and, last but not least, to raising public awareness and social participation as well as involving civil society.

The Council brings together the parliamentary groups of political parties, the Government, the Hungarian Academy of Sciences, the Hungarian Rectors' Conference on behalf of universities, economic chambers, employers and employees (trade unions), the association of local governments, churches and national civil society organisations. It includes representatives of social, health, cultural, educational, environmental and nature conservation organisations.

The National Framework Strategy on Sustainable Development bearing the title of National Concept for the Transition to Sustainability was adopted by the Parliament in 2013 on the proposal of the National Council for Sustainable Development (NCSD).

What does the strategy contain?

"According to the approach of the Framework Strategy the goal of the sustainability transition is to ensure permanent public well-being. The sustaining of resources in the long term, which is the basis for the possibility of a good life, requires governance, legislation and management that can balance that with the short-term interests. Sustainability policy must be centred around individuals and communities, as opposed to the previous approach concentrating on policy areas." (Extract, p. 34)

"The overall objective of the national sustainability policy is to ensure the conditions of adaptability to the ever evolving social-human-economic-natural external environment and the quality improvement of the cultural adaptation required. The system of objectives regarding the four fundamental national resources is as follows.

Human resources

The objective is a society with a stable population of healthy individuals, possessing knowledge and skills required to tackle the challenges of current times, gradually reducing social exclusion.

Social resources

The objective is the creation of a culture supportive of sustainability and the enhancement of positive values, norms and attitudes with regard to sustainable society. Since the environment of every society is continuously changing, we need to adapt to these changes while keeping our identity. Therefore we need to maintain knowledge related to the existence and cohesion of the community.

Natural resources

The environment's carrying capacity must be applied as a limit to economic management.

Economic (physical) resources

It is essential to maintain an appropriate level of sovereignty in economic decisions. ... Strengthening the entrepreneur class, a gradual increase of domestic capital investments and reducing their foreign exposure are high priorities. It is essential to establish a rational balance between the utilisation of localisation and international economic relations, and to enhance local economic relations (e.g. city and its rural areas)." (Extract, pp. 41–44)

Monitoring the achievement of goals

The NCSD measures the goals set out in the National Framework Strategy on Sustainable Development in biennial progress reports. The Framework Strategy's second progress report for 2015–2016 already assesses the contribution to the 17 global goals set by the UN. Since 2007, the Hungarian Central Statistical Office has presented a report every two years on Hungary's sustainable development indicators. The indicators are updated annually in line with international and national targets. The reports since 2016 have drawn on the National Framework Strategy on Sustainable Development when compiling indicators.

The Framework Strategy also builds on the EU requirements adopted by Hungary

- "The Union shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment.
- It shall promote scientific and technological advance.
- It shall combat social exclusion and discrimination, and shall promote social justice and protection, equality between women and men, solidarity between generations and protection of the rights of the child.

- It shall promote economic, social and territorial cohesion, and solidarity among Member States.
- It shall respect its rich cultural and linguistic diversity, and shall ensure that Europe's cultural heritage is safeguarded and enhanced. (...) In its relations with the wider world, the Union shall uphold and promote its values and interests and contribute to the protection of its citizens.

- It shall contribute to peace, security, the sustainable development of the Earth, solidarity and mutual respect among peoples, free and fair trade, eradication of poverty and the protection of human rights, in particular the rights of the child..." Extract, p. 36

FIND OUT!

FIND OUT!

1. Find the full text of the framework strategy and see what issues are highlighted in the document within each resource.
2. Find out who are the current members of the National Sustainable Council for Sustainable Development (NFFT).
3. Check out the latest progress report. How is the achievement of the domestic goals progressing?
4. Find out how the National Framework Strategy on Sustainable Development adopted in 2013 contributes to the achievement of the Sustainable Development Goals adopted in 2015, according to the NFFT report.

SUSTAINABILITY IS A COMMON CONCERN OF HUMANKIND

THE BEGINNINGS

Earth Day

Launched more than 50 years ago, Earth Day has grown into one of the largest movements in the world. It started as an educational programme within a university. A US state senator from Wisconsin, Gaylord Nelson, was concerned about the country's deteriorating environmental situation. The oil spill off the coast of Santa Barbara in 1969 was the last straw.

Nelson wanted the fight for environmental protection to match the intensity of youth anti-war protests. So he asked American university student Denis Hayes to organise a course on the subject. But Hayes thought this was not enough, he wanted a national event, so instead of a university course, it turned into Earth Day.

Earth Day was first organised on 22 April 1970. Across America, 20 million people participated in the first demonstration. As a result of this pressure, by the end of the year Congress authorised the establishment of a federal-level agency specialising in environmental issues, the US Environmental Protection Agency. This led to the first environmental laws in America (regarding environmental education, worker protection, clean air and endangered species).

Denis Hayes and his friends set up the International News Centre for Earth Day in California in 1989, and sent monthly newsletters to countries around the world in the hope of a joint celebration. As a result, the 1990 Earth Day celebrations took place in 141 countries with 200 million participants. Many Hungarian civil society organisations and municipalities also joined the movement. The Earth Day event probably also played an important role in organising the Earth Summit in Rio de Janeiro in 1992.

Earth Day has become a symbol. Many events and initiatives have been and are carried out on Earth Day. For example, the signing of the Paris Agreement or Critical Mass events promoting cycling.

Critical mass in Germany

IMAGINE!

IMAGINE!

Sustainability Week, the largest sustainability programme in education, has been held in Hungary since 2016 in connection with Earth Day, with 400,000 students from more than 1,800 schools taking part every year.

FENNTARTHATÓSÁGI Témahét

FIND OUT!

FIND OUT!

1. Take a look at the recent Earth Day events and announcements made by civil society organisations, companies and the government in your country.
2. What and how long did it take for an idea to become a global movement? Make a flowchart from the idea to the implementation.

A BIT OF HISTORY

1968	Foundation of the Club of Rome
1972	**UN World Conference on the Human Environment in Stockholm.** The first UN-level summit on the environment, focusing on the human impact on the environment. As a result, the United Nations Environment Programme (UNEP) was established. Its opening day, **5 June** was declared **World Environment Day**.
1972	**The famous Club of Rome report is published**: The Limits to Growth.
1987	**The Brundtland Report is published** – A report by the United Nations World Commission on Environment and Development entitled Our Common Future, which calls for a sustainable economy. The best-known definition of sustainable development is also set out in this report.
1992	**UN Conference on Environment and Development, UNCED** in Rio de Janeiro, which adopted Agenda 21: an international action plan for sustainable development, the Framework Convention on Climate Change and the Convention on Biological Diversity.
1992	The UN General Assembly sets up the Commission on Sustainable Development to oversee the implementation of Agenda 21 in the programmes and processes of the UN system.
2000	**The Millennium Development Goals (MDGs),** which form the basis of UN development policy for the period 2000–2015, are put into effect with the aim of reducing poverty and hunger.
2002	**UN World Summit on Sustainable Development (WSSD)**, Johannesburg, where the interaction of environmental, economic and social problems and the possibility of solving them together were clearly discussed.
2005	**The Kyoto Protocol comes into force**, legally binding developed countries to meet greenhouse gas emission reduction targets.
2012	**Rio+20** The United Nations Conference on Sustainable Development, which decided to set common sustainable development goals and initiated the establishment of a working group to define the goals.
2013	The first meeting of the **High-level Political Forum** (HLPF), set up to monitor progress on the implementation of the Agenda for Sustainable Development, took place.
2015	The **UN adopts the 2030 Agenda**, which is based on the **Sustainable Development Goals (SDGs)**.
2015	**The Paris Agreement** is the first universal, legally binding global agreement under the UN Framework Convention on Climate Change.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Find out what the Club of Rome is, why it was founded, and how.
2. Choose a "turning point" in the timeline, study the details of the event, then make a poster about it.
3. Make a montage about sustainability becoming a global issue.
4. Create a similar timescale of events in your country. Add to the events in the textbook some events found on the internet. Find out what happened in your environment.

ORGANISATIONS FOR SUSTAINABILITY

An organisation is a group with its own purpose and function. It has a formal structure and a management. It can be a company, institution, association, foundation, etc. Organisations can be classified according to a number of criteria, such as the area of operation, organisational structure, founder, circumstances of establishment, scope, form of management, etc. Organisations can be set up by countries, other organisations and private individuals too.

Here are a few examples of organisations and associations that have been set up and are working towards sustainable development goals.

INTERNATIONAL ORGANISATIONS

The United Nations (UN) was established in 1945 by its 51 founding member states in the aftermath of the Second World War, recognising the need for much more concerted cooperation between nations to establish and maintain peace and security. Hungary joined in 1959, and there are more than 190 members today. Its highest body is the General Assembly, and comprises representatives of the member countries. Specialised agencies are set up to coordinate and harmonise global activities in specific fields. A few examples:

SPECIALISED AGENCIES OF THE UNITED NATIONS

UNEP: The UN Environmental Program defines the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the UN, and serves as a credible advocate for the global environment.

UNESCO: United Nations Educational, Scientific and Cultural Organization: "The main objective of UNESCO is to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture and communication in order to foster universal respect for justice, the rule of law and the human rights and fundamental freedoms that are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations".

UNESCO's mission is to coordinate international cooperation in education, science, culture and communication. UNESCO's tasks include the preservation of the world's natural and cultural heritage and the operation of the World Heritage Program.

WHO: The World Health Organization (WHO) is the UN's specialised agency responsible for public health and acting as a directing and coordinating authority.

WHO is responsible for
- providing leadership on global health matters,
- shaping the health research agenda,
- setting norms and standards,
- providing technical support to developing, lagging countries and
- monitoring and assessing health trends,
- performing humanitarian tasks in disasters and wars.

The WHO's main objective is to ensure the highest attainable standard of health for all people, which means a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

FAO: Food and Agricultural Organisation (FAO) of the United Nations. It plays an important role in sharing knowledge and information to help developing countries and countries in transition modernise and improve their agriculture, as well as pursue efficient and sustainable forestry and fisheries. Its priority is to help reduce hunger so that everyone has access to adequate food.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Which other UN specialised agencies are working on sustainability?
2. There is currently no specialised UN agency for water, but almost 30 UN agencies do focus on water in their work. The activities are carried out by an inter-agency coordinating body called UN Water. Do you think there is a need for a specialised UN agency "on water"? Support your opinion with arguments.
3. What new institution would you propose to establish?
4. Find out which UN organisations have a representative office or organisation in your country.
5. Check which organisation is involved in safeguarding intangible cultural heritage and discuss how this contributes to sustainability.
6. Study the World Heritage Sites of your country and discuss why each one is important for sustainability. Find out what you can do to safeguard them.

ORGANISATIONS, ASSOCIATIONS, ACTIONS

In describing the history of Earth Day, we have seen that a well-organised demonstration or action at the right time can have a big impact. In this case, for example, it led to the introduction of environmental regulation and the establishment of institutions in the United States.

There are many legal and other options for influencing the actions of countries, international organisations and even businesses as citizens. We call it social participation when we exercise our rights as a citizen to support or influence public or intergovernmental decisions. When we take part in public hearings and express our views on an urban development plan or an investment that requires a permit, we exercise these rights under the law.

We also have other tools to draw the attention of authorities and institutions to a problem or a task. We can collect signatures, organise spectacular actions, demonstrations, campaigns – after obtaining the necessary permits, of course. These events are usually not without conflict and are often divisive. It is difficult to decide whether it is just a matter of a few people's personal agenda or a real social and environmental problem that needs to be solved. Often it is only years later that the impact they have had on improving the world becomes clear. But one thing is certain: events can help people become aware of the problem, talk about it, and consider it when making social and economic decisions.

IMAGINE!

IMAGINE!

In the early 1990s, events preparing for the Hungarian Environmental Protection Act gathered pace when a social organisation, the Göncöl Foundation, in collaboration with the mayor, convened in Vác the leaders of the twelve most polluted cities for a meeting called the "Dirty Dozen", borrowing the title from the well-known cult film. The mayors made a joint declaration to Parliament saying that they could only clean up their cities if there was harmonised environmental legislation.

Civil or social organisations are established in response to a common need of citizens. These needs may include pursuing a common hobby, community building, supporting marginalised groups, people in need, protecting nature and the environment, etc.

GLOBAL ORGANISATIONS

IUCN – Founded in 1948, the IUCN – International Union for Conservation of Nature – is the world's first and largest nature conservation organisation. It is one of the few international institutions that both governmental and non-governmental organisations can join. The IUCN has more than 1,400 members and 18,000 experts working together in its technical committees. Their programmes support cooperation between governments and environmental organisations to preserve the integrity and diversity of nature and ensure the equitable and economically sustainable use of natural resources.

The IUCN is the only environmental organisation with observer status at the UN, and it provides scientific information and advice on global nature conservation policy through a number of international fora. It also has independent projects and research. It is also responsible for the compilation of the Red List, summarising the research on extinct and endangered species, and the categorisation of national parks. The organisation is committed to supporting young people to participate and express their views in organisational and international decision-making.

WWF – The Morges Manifesto was signed in 1961 by 16 of the world's leading conservationists, establishing the WWF World Wildlife Fund. The Fund was set up to support the work of existing conservation groups, including the IUCN, by raising funds. Over time, activities to provide funds for other organisations were expanded, and began working independently on habitat conservation as well as the conservation of endangered species.
In the second half of the 1980s, they changed their name to the World Wide Fund for Nature.

Objectives of their activities:

1. biodiversity conservation,
2. reducing environmental pollution, and
3. promoting the long-term sustainable use of natural resources.

In more than 100 countries, they work for the protection of natural assets and a sustainable future, with more than 6,000 colleagues. The WWF has been a member of the IUCN since 2012. Their biannual Living Planet Report provides a comprehensive picture of the health of the planet in an easy-to-understand format and helps people make responsible decisions.

IPCC: In 1988, the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) established the Intergovernmental Panel on Climate Change (IPCC). The IPCC prepares its assessment of climate change and its potential environmental, social and economic impacts every 5-7 years. Thousands of eminent researchers share their research on a voluntary basis, and the IPCC synthesises the findings of these prestigious peer-reviewed publications following international consultations at various levels. In recognition of its work, the IPCC was awarded the Nobel Peace Prize in 2007.

Global Youth for Biodiversity Network

Global Youth Biodiversity Network

An international network of youth organisations and individuals. Their mission is to change the world into a place where biodiversity does not decline because of human activity, and people live in harmony with nature. They have members from over 172 countries and reach more than 1 million young people.

They coordinate and collectively make young people's voices heard, including as official partners of the Convention on Biological Diversity. In spring 2021, they co-organised the online Global Youth Summit with the IUCN, welcoming over 14,000 participants. Their position paper was presented at the IUCN General Assembly and was included in the IUCN programme.

FIND OUT!

FIND OUT!

1. See how organisations and experts in your country are involved in the activities of the IUCN, WWF and IPCC.
2. Find out what the Red List is, and why is it important.
3. Find and check out WWF's Living Planet Report 2020. What shocked you the most, what made you think the most, and what will make you change your lifestyle?
4. When was the latest IPCC report published and what were its main messages?
5. Search for international youth organisations and see if they have members in your country.
6. Do you know of any youth-led initiatives that have grown beyond a school, a municipality or a country?
7. Does it ring a bell, if not, check out what the terms Overshoot Day, #YOUTH4CLIMATE and #ForNature mean?
8. Do you know who they are and what their activities have to do with sustainable development and international organisations?
   - David Attenborough,
   - Jane Goodall,
   - Diana Ürge-Vorsatz,
   - Greta Thunberg,
   - Malala Juszafza?

IMAGINE!

IMAGINE!

- Former US Vice-President Al Gore runs a non-profit organisation called The Climate Reality Project to fight climate change.
- Would you have guessed that Erin Brockovich – played by Julia Roberts in the film of the same name – is still an environmental activist today?

HUNGARIAN ORGANISATIONS

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

If there is an environmental organisation where you live, find out about its work and join it. If there isn't one, get some enthusiastic environmentalists together and form one.

MME: The Hungarian Ornithological Society (MME) was founded on 6 January 1974 with 200 members, and over the decades it has become the largest nature conservation society in Central and Eastern Europe. Today, it has 10,000 members, and thousands of volunteers help the MME, which has contributed significantly to the strengthening of nature conservation in Hungary over the last 40 years. The MME formed its Youth Branch (MME IFI), with the aim of involving young people interested in nature and especially birds in the activities of the Society.

HUMUSZ: The Humusz Alliance was originally founded by five Hungarian environmental organisations in 1995. Together with their members who have joined since then, their aim is to promote the everyday practice of sustainable production and consumption through ideas, educational programmes and proposals. With their message "Complete Life – Zero Waste", they try to encourage the population and companies to adopt a circular approach.

Association of Conscious Consumers
Founded in 2002, the organisation aims to discover, test and evaluate ethical and environmentally friendly ways of living, enabling everyone to be informed, make informed choices, and support sustainability through their purchases. In this way, by promoting conscious consumption, it also influences companies to move towards sustainable production.

FIND OUT!

FIND OUT!

1. Find out what it means to be a volunteer or a member of a civil society organisation.
2. Who would you choose to help you start and run an organisation or project, and why?
3. Find out what organisations and programmes are involved in sustainability issues where you live.
4. Write down the most urgent sustainability tasks in your area.
   - Find out which organisation you could ask for help to find a solution.
   - What can you initiate yourself?
   - What do you consider your strengths that you can contribute?

V4SDG

In 2018, 30 young professionals initiated a partnership, which has now become a non-profit organisation, aiming to strengthen cooperation and exchanges between the Visegrad countries in the field of sustainability. They want to achieve this through joint projects, helping each other and sharing knowledge. They are trying to extend their activities to other countries in Central and Eastern Europe. Their president was Hungary's first youth delegate to the UN.

PET KUPA [PLASTIC CUP].

In 2013, the first PET fleet of 4 vessels was launched. These were essentially rafts made from PET bottles. The aim was twofold: to clean the Tisza river of rubbish, most of which was PET bottles, and to make a film about the work to raise awareness about the river's pollution. Since then, PET rafts have been launched every year, declaring war on rubbish.

Source: petkupa.hu, Enikő Kubinyi

LOCAL COOPERATION, NATIONAL NETWORKS

People perceive the problems of a municipality or residential community locally, and they can seek solutions to them there, plan together, share tasks and mobilise for the benefit of the municipality.

As a result of enhanced online communication, social media groups have been formed in many municipalities to share information (lectures, books, websites) and household practices on environmentally conscious living, offer products (chemical-free food, packaging-free products, herbal remedies), organise clubs, lectures, joint clean-up events, tree planting, donations for people in need, or joint relief work (tree cutting, house renovation), free exchanges, and raise awareness of a particular problem in the municipality.

Local councillors are often members of these forums and are able to respond quickly to the issues and problems raised.

Establishing a local civil society organisation is a higher level of organisation. The purpose here is to formalise the operation, support activities through membership fees, donations and tenders, or even provide official partner or client status in local affairs. Civil society organisations can be set up for any public purpose or on the basis of individual interests or hobbies.

Public purposes can also take on many forms: for example, organising the work of volunteer firefighters and neighbourhood watch personnel, covering their costs, community development, achieving local environmental goals, helping disadvantaged residents, children and the elderly, protesting against the activities of an investment that are harmful to the environment and human health, or supporting and working with local people to ensure agreed conditions are complied with during the investment and its operation.

The efforts of local organisations are often more effective if they are organised in a national network to learn about each other's problems and achievements, help each other with their experience, or even work together to get support, create or change legislation or launch joint projects to address common problems. Such associations include the National Society of Conservationists, the Hungarian Ornithological Society, the Association of Large Families and the Hungarian Hikers' Association, which also have several local organisations.

On a regional basis, the Tree of Life Environmental Association brings together environmental groups and organisations in Heves County and beyond. To achieve their goals, they cooperate with local and county governments, and share their experience with other civil society organisations. In addition to environmental protection and nature conservation, social organisations working to help disadvantaged people and areas, and supporting international development also play a very important role in terms of sustainability.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Describe in more detail the organisations and movements mentioned or those similar to them. Make a presentation, poster or photomontage to present them. Use their websites to better understand their aims and activities.
2. Interview your school friends and acquaintances about why they think young people should be active in these movements.
3. The movements presented here are all initiated by young people. What do you think will happen when they are older?
4. Find out what the job of a UN Youth Delegate is.

OVERVIEW

SOME SPECIAL DAYS FOR SUSTAINABILITY

World days, or international days, are anniversaries linked to a calendar day that aim to draw attention to an issue that affects all of humanity. It was not the UN that invented such days, as International Women's Day dates back to the late 19th century, for example. However, the UN can use them as a powerful advocacy tool to raise awareness of an issue that may not be part of people's everyday thinking. Beyond raising awareness, it seeks to promote international awareness and action on these issues. But there are also special days, such as the Birds and Trees Day celebrated on 10 May, which was initiated by ornithologist István Chernel, and became an official event with the help of naturalist Ottó Herman.

We looked at a selection of special days related to the environment and sustainability. The list is not complete.

every Monday	MEAT FREE MONDAY (since 2013)
2 February	WORLD WETLANDS DAY (since 1979)
6 March	WORLD ENERGY EFFICIENCY DAY (since 1998)
18 March	GLOBAL RECYCLING DAY (since 2018)
20 March	HUNGARIAN FISH DAY (since 2017)
21 March	INTERNATIONAL DAY OF FORESTS (since 2013)
22 March	WORLD WATER DAY (since 1993)
23 March	WORLD METEOROLOGICAL DAY (since 1961) HMS/WMO
3rd–4th Saturday of March	EARTH HOUR (since 2006) WWF
18 April	INTERNATIONAL DAY FOR MONUMENTS AND SITES
22 April	EARTH DAY in Hungary too since 1990
last Wednesday of April	INTERNATIONAL NOISE AWARENESS DAY - INAD (since 1996)
2nd Saturday of May	WORLD FAIR TRADE DAY – FAIR TRADE
10 May	BIRDS AND TREES DAY – In Hungary
15 May	WORLD CLIMATE CHANGE DAY
20 May	WORLD BEE DAY (since 2018)
3rd Saturday of May	EUROPEAN OBESITY DAY (EOD) (2010)
31 May	WORLD NO TOBACCO DAY
5 June	WORLD ENVIRONMENT DAY (since 1972)
8 June	WORLD OCEANS DAY (1992/2008)
9 June	EMPTY CLASSROOM DAY – since 2012, Hungary
17 June	WORLD DAY TO COMBAT DESERTIFICATION AND DROUGHT – WDCD
3 July	INTERNATIONAL PLASTIC BAG FREE DAY
8 September	WORLD READING DAY (since 1965)
3rd Saturday of September	CLEAN UP DAY
22 September	WORLD CAR FREE DAY
29 September	INTERNATIONAL DAY OF AWARENESS OF FOOD LOSS AND WASTE – IDAFLW (since 2020)
30 September	PACKAGING FREE DAY
4 October	WORLD ANIMAL DAY (since 1931)
24 October	INTERNATIONAL DAY OF CLIMATE ACTION – 350.org
end of October	TV TURN-OFF WEEK
last Friday of November	BUY NOTHING DAY
last week of November	EUROPEAN WEEK FOR WASTE REDUCTION
5 December	INTERNATIONAL VOLUNTEER DAY
29 December	WORLD BIODIVERSITY DAY (until 2000)

Each international day offers an opportunity for anyone and any organisation to organise activities related to the theme of the day. The United Nations and its offices and, most importantly, governments, civil society, the public and private sectors, schools, universities and citizens themselves, bring the international day and its theme to the fore through their awareness-raising activities. Their activities encourage collective action and responsibility.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. What are the special days that you also commemorate?
2. Pick a special day, find out why it's on the list, and make a poster for it.
3. Pick a special day and organise a school event around it.

IMAGINE!

IMAGINE!

How does a World Day come about at the UN?
International days are usually proposed to the UN General Assembly by Member States. The General Assembly then decides by consensus whether or not to adopt a resolution establishing the day. Member States have to lobby other countries to support the day. More and more objections are being raised against the many international days because they take up a lot of time, energy and money (and often represent arbitrary national objectives).

Most of the World Days were established by resolutions of the UN General Assembly, although some were designated by specialised UN agencies. If a civil society organisation or even an individual wants to initiate a World Day for example, they must first convince their government or foreign ministry of the importance of the goal, then the country's representative office presents the initiative to the UN. In addition to official World Days, many individual or civil society group initiatives are launched online.

FIND OUT!

FIND OUT!

1. There are international days initiated by Hungary. Check out the history of World Statistics Day (20 October) and the International Day of Charity (5 September).
2. It was mentioned that there were some special days that were not on the UN list, but are "green holidays". Choose one of them and present it.
3. What would you celebrate? Plan a year that focuses on a theme related to sustainability.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

Discuss the most effective ways to raise awareness of a problem. Also make clear what you mean by raising awareness.

CORPORATE PARTNERSHIPS FOR SUSTAINABILITY

FIND OUT!

FIND OUT!

Why should economic actors not be left out of the cooperation?

IMAGINE!

IMAGINE!

The oil company story

Friends of the Earth Netherlands (Milieudefensie), together with more than 17,000 co-plaintiffs and six other civil society organisations, filed a lawsuit in The Hague against a major oil company for its polluting activities. On 26 May 2021, the court in The Hague ruled that the company must drastically reduce its carbon dioxide emissions by 45 percent within 10 years. This is a huge victory because it is the first time in history that the responsibility of an economic operator has been so clearly established. The judgment is a historic step because it sets a precedent at global level for curbing the activities of other major polluters.

The message sent by the judgment – among other things – is that responsibility cannot be reduced to marketing a few spectacular actions. Planting a few trees and "greenwashing" does not compensate for the damage. It is assumed that this decision will trigger dozens of lawsuits against big polluters.

IMAGINE!

IMAGINE!

International Court of Justice in The Hague: The primary judicial branch of the United Nations. It was established under Chapter XIV of the Charter of the United Nations. Its seat is in The Hague, at the heart of public administration in the Netherlands. The court has 15 members and the judges are elected for nine years. The primary task of the International Court of Justice is to settle disputes between states by judicial process through the law. The elected judges take part in the judging process in their personal capacity, i.e. they do not represent their country, they must make decisions on a legal basis. Decisions are taken by majority, but any judge has the right to give a separate or parallel opinion. (In the history of the court, there has been one Hungarian member between 1993 and 2003, Géza Herczegh (1928–2010), international lawyer, university professor and a member of the Hungarian Academy of Sciences.) Hungary has also appealed to the Court, e.g. in 1992 Hungary and the then Czechoslovakia asked the Court to rule on the Gabčíkovo–Nagymaros dams.

Paris Climate Agreement: the Paris Agreement for short, was signed on 12 December 2015 by 194 countries. The landmark agreement put international climate change cooperation on a new footing. Concluded by the members of the United Nations Framework Convention on Climate Change (UNFCCC), the agreement addresses the mitigation of greenhouse gas emissions, adaptation to global warming and its financial consequences from 2020 onwards. The Paris Agreement has been signed by all UN member states and has now been ratified by the majority.

FIND OUT!

FIND OUT!

1. Think about it: why is the oil company lawsuit a big deal, what lessons does it teach us?
2. Find out which company is involved, where the verdict stands. Did the company appeal? Why do you think it acted like this? What has it done since the judgment?
3. Take a look at the Gabčíkovo-Nagymaros decision, and to what extent ecological considerations were taken into account during the negotiations.
4. Identify further litigation and decisions. Discuss who found what interesting, and why.
5. Draw a timeline from the Paris Agreement to the present.

Corporate partnerships in the spirit of sustainability

Of course, economic actors are also looking for solutions and partnerships that can help their own companies, or the whole economic and social sector, to become more sustainable.

World Business Council for Sustainable Development (WBCSD)

The World Council is made up of top executives from more than 200 major companies. The Hungarian member organisation (BCSDH) has more than 100 members. In a consultative process, the international organisation has set out a vision for the business sector up to 2050, entitled Time to Transform. To achieve the vision and the SDGs, the national organisation supports its members and the business sector as a whole with action plans, guides, research and consultations on a selected goal.

"We now have a unique but rapidly closing window of opportunity for action, to transform the systems that govern our businesses and societies in order to change the world for the better. Business can lead this change, but it cannot – and should not – do it alone. Transformation requires an unprecedented level of leadership – rejecting a "business as usual" mindset, and acknowledging that business can only achieve transformation if it sees itself as part of a larger whole. We must recognize that a liveable planet, an equitable society, genuinely free and fair markets, and strong public institutions are in our individual and collective self-interest." (Vision 2050)

Hungarian Association of Environmental Enterprises (KSZGYSZ)

Környezetvédelmi Szolgáltatók és Gyártók Szövetsége

Founded in 1992, this public organisation with more than 250 members, and comprising representatives of the Hungarian environmental industry, provides professional representation of its members' interests, organises meetings, opportunities to exchange information, and contributes to the implementation and dissemination of sustainability through projects to change attitudes. The KSZGYSZ launched the GreenJobPortal in 2021, an online platform aiming to connect green jobs, experts and job seekers.

Leading brands have a strong impact on environmental, social and economic issues through their market position. Surveys also show that both European and Hungarian consumers are increasingly interested in how environmentally friendly the products they buy are. Sustainable Development Goal 12 sets out actions in the area of responsible production and consumption, which is why an increasing number of companies engage in Corporate Social Responsibility (CSR) activities on a voluntary basis. Typical examples of corporate social responsibility include charity, environmental protection, diversity, labour practices and volunteering.

An even higher level of CSR is when partnerships are formed between different industries and sectors. Partners work together on issues, business problems and technical implementation that also produce results that benefit society.

HUNGARIAN EXAMPLES OF CORPORATE SOCIAL RESPONSIBILITY

- Businesses support the work of the Hungarian Ornithological Society in many ways. Some of them offer discounts on the price of their services and products for the membership card, or transfer a few percent of the price of certain products to the Society.

- The tripartite partnership between the General Directorate of Water Management, PET Cup and a major soft drinks company responsible for a significant percentage of PET bottles on the market enables the ongoing work on the Tisza river, recycling of a huge amount of waste and the larger-scale clean-up events.

- One of the Hungarian-owned energy companies is active in energy production, energy trading and industrial energy management services. The drive for sustainability permeates the entire organisation. The measure of the company's success is the effectiveness of efforts to achieve sustainability. This is reflected both in the way it embeds sustainability into its core business – by continuously increasing the share of renewable energy – and through transparency and fair business conduct.

- The manager of an earth-moving company calculated how much CO_2 their machines and vehicles emit when working, and how much forest area is needed to compensate for these emissions. They contacted the local government and asked them to designate an area where they could plant the required amount of trees. He also set up and regularly supports a foundation for environmental protection and education.

FIND OUT!

FIND OUT!

1. Find out and present your favourite brand's responsibility and action for sustainability.
2. What makes a fairphone "fair"? Check out the company.
3. Make a poster for the following thought: As a shopper, you vote with your wallet. (The decision to buy is also a message, a form of voting – if you buy it, you vote yes, if you don't buy it, you vote no.)

SOCIAL ENTERPRISES

Perhaps less well known, but all the more important, is the concept of social enterprise. Social enterprises are important players in the social economy, i.e. they operate in a sector that occupies an intermediate position between the state and the market. Their primary objective is to achieve a particular social impact, and not to generate a profit for the owners or shareholders. With their activities they complete both an economic and a social mission, essentially serving the public interest. In other words, the driving force behind these companies and at the heart of their operation is a social, environmental or broad ethical mission, not profit.

Social enterprises cover a very wide range of activities, each with a different purpose. They seek to provide long-term sustainable solutions to the most pressing social problems. They want to start making social and economic changes. They can vary greatly in number, size, legal form, sources of income, field of activity and experience.

Areas of activity are mainly related to labour market integration, improving the situation of disadvantaged groups, local developments and environmental protection. They provide alternative solutions for local communities and farmers through various – mainly local and grassroot – environmentally conscious initiatives. Examples include farmers' markets, shopping communities, running community gardens, eco-villages, community-supported agriculture, support for social farms, local money (substitutes for money and initiatives) and the launch of micro-credit schemes.

NOW IT'S YOUR TURN

NOW IT'S YOUR TURN.

1. Explain the concept of social enterprise.
2. Make a poster to raise awareness about the importance of social enterprises.
3. Find examples of social enterprises (global, national and local). Choose some of them and describe their activities and impact. Organise a school exhibition about them or arrange for them to present their activities in your school.

THOUGHTS

We hope that by the time you've got this far, you've realised that we have to do something, doing so is a good thing. The fact that not only on a large scale – at national and international levels – but also on a small scale we can also make a difference to sustainability through the way we live and act every day. To do so, "we need to be up to speed". We need to be informed and look behind the scenes as real systems thinkers, consumers, travellers and civilians in our chosen professions or as corporate and public decision-makers.

You may want to keep or save this textbook so you can come back later to examples, exercises, concepts and diagrams that can help you and give you ideas for your future studies or to better understand a situation, prepare a meeting, plan a project or even just to make a personal decision.

The future we build depends on you!

LIST OF IMAGES

Illustrations:
András Berecz: 4, 6-1-2, 7, 8-1, 9-1, 9-3, 12, 17-2, 22-1, 23-1-2, 26-1, 30, 51, 59, 62, 64-1, 65, 71, 76-1, 99-1, 102, 104, 107-2, 111-1, 121-1-2, 122-1-2, 128, 130, 136, 149-1-2, 153, 197, 209-1-2, 213-1, 216, 221, 223, 235-1

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