Anna Sperotto

LET'S UNRAVEL THIS KNOT!

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A guide for kids (and whoever wants) to dig deeper into the links between water, food and energy

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GETTING STARTED

An introduction to the book

If I say **water**, what is the first thing that comes to mind? Probably **oceans, seas, rivers**, or perhaps the transparent liquid that flows out from the kitchen.
Well, in this book we will discover another type of water: the one hidden in the objects we use every day, in our food, in our trips and in our work.
By leafing through the pages you will learn **how to track the invisible links connecting water to energy, food and ecosystems, and how they affect your daily life and that of other humans in other regions of the globe**.
You will learn to look at the data and graphs as scientists do to interpret the planet and the human influence on it.
You will get answers to urgent questions like.... Are cows' farts really dangerous? Where do spaghetti meatballs come from? (No, unfortunately they are not raining from the sky like in the famous cartoon "Cloudy with a Chance of Meatballs"). **How can we predict the climate of the future without a crystal ball?**
Finally, you will discover how, despite being just a kid, **there is a lot that you can do to try to protect our beautiful planet** and to leave it in good shape also for the kids of the future.
Are you ready to embark on this journey? Let's go.

HOW TO READ THIS BOOK

Before you start, here's a piece of advice on how to read this book

Through the pages you might stumble on some words that you don't know. Don't worry!
The most difficult words are in **black and underlined**.

You can read about their meaning in the **GLOSSARY OF CHALLENGING WORDS** section, at the end of the book.

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Has a topic tickled your curiosity and you want to know more? There you go. Look for this symbol and go to the **DID YOU KNOW?** section for funny facts and anecdotes.

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01

NATURAL RESOURCES

All living things, from tiny bacteria to giant mammals, need some basic resources to survive, including water, energy and food. Such resources are provided by nature. Since the beginning of our history, humans have derived benefits from **ecosystems** making life possible and more enjoyable. **Unfortunately, not all humans have equal access to natural resources**. In some parts of the world, limited resource availability affects the health and well-being of people, limits their development and, in some cases, can even lead to conflicts, migration and war. To ensure that the planet remains a good place for all to live in, **ecosystems** should be protected and preserved. Only in this way, they will be able to maintain the important services they provide, those needed to sustain human life and prosperity.

WATER. THE LIQUID TREASURE

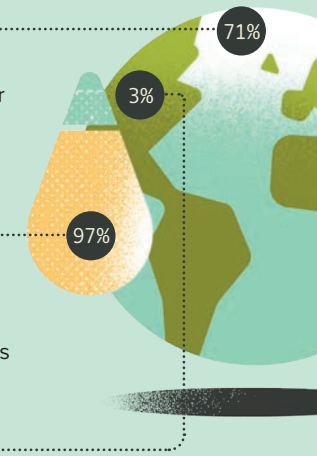
Water is the most important liquid on Earth. Without water, life as we know it would not exist. Besides drinking, humans use water in many different ways. They use it for washing and cooking, irrigating crops and lawns, cleaning streets, operating air-conditioning units and heating systems. As our population grows, more and more people are using up the same resource. Therefore, it is important that we use our water wisely and that we do not waste it.

THE WATER CYCLE

Take a glass and enjoy some fresh water.
Did you know that the water you just swallowed is the same water that woolly mammoths and the first humans used to drink? That is because Earth has been recycling water for over 4.5 billion years through an ongoing cycle called the water cycle.

WATER SOURCES & FACTS

Imagine taking a photo from space. We can see that **our planet has more water than land**, however, only a small percentage of that water is freshwater, and even less of that is easily accessible to humans and other organisms.



About 71% of the Earth's surface is water in the form of oceans, rivers, and lakes.

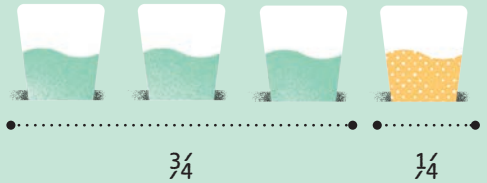
97% of the Earth's water is found in the oceans - too salty for drinking, growing crops and most industrial uses.

3% of the Earth's water is fresh and among this, only 1% is accessible. The rest is either locked up in glaciers, polar ice caps, atmosphere, and soil, highly polluted or lies too far under the Earth's surface to be extracted at an affordable cost.

ACCESS TO DRINKING WATER

Unfortunately, **the available surface freshwater is not equally distributed** across the world. In fact, many human populations do not have access to clean, safe drinking water.

- In 2020, almost **three-quarters (74%)** of the world population had access to a safely managed water source.
- **1/4 people** do not have access to safe drinking water.



ENERGY. WHAT IS IT?

Energy is also essential to human life as it causes all the changes that occur around us. Energy is everything that has the capacity to produce a change in matter. Energy is everywhere you look. It is used for powering, lighting and moving things.

ENERGY TRANSFER & TRANSFORMATION

Do you know that energy can neither be created or destroyed? It can only be transferred from one object to the other.

It can be transformed: For example, energy from wind can be transformed into electricity that can be, in turn, transformed into thermal energy to heat up a room by means of a radiator.
It can be moved: Energy can be moved from where it is produced to the power station. From there, long power lines bring electricity to your house.
It can be stored: Modern mobile batteries or power banks can be used to store energy.

WHAT DO WE USE ENERGY FOR?

At the global level most energy is used by industries for operating motors and machineries in production chains.

Residential use includes the use each one of us make of energy at home when watching television, washing clothes, heating and lighting the rooms.

In the **commercial and service sector** energy is used for heating, cooling and lighting of commercial buildings like restaurants, shops and museums.

Energy is needed in the **transport sector** to make all vehicles move, from personal cars to public transportation.

A small amount of energy is also used in agriculture to operate machinery and equipment and for lighting the farm.

NATURAL RESOURCES

WHERE DOES ALL THIS ENERGY COME FROM?

The majority of the energy we use today comes from non-renewable resources including fossil fuels: coal, oil, and natural gas. Fossil fuels, when burned, release **greenhouse gases** that are responsible for **global warming**. In addition, **there's the possibility that we could run out of fossil fuels in the future**, so it is a good idea to start using more and more alternative renewable energy sources - the so-called "clean energy" - as it doesn't pollute the air or water.

Renewable resources

Renewable resources use natural sources that are replenished in nature at a higher rate than they are consumed. **Renewable energy resources are plentiful and all over the place!**

Wind energy harnesses the energy of air to move large wind turbines located on land (onshore) or in the middle of the sea (offshore). Wind energy has been used for millennia, do you remember windmills?

Wave energy is caused by the wind blowing over open water and creating waves. We can capture waves energy through special buoys that by floating up and down move a hydraulic pump converting the movement into electricity.

Geothermal energy extracts the natural heat from the Earth's interior by using wells. Examples of geothermal energy are the hot steam coming from a geyser or the hot lava ejected by a volcano.

Solar energy is radiant light and heat from the sun that is harnessed using solar and photovoltaic panels to generate hot water and electricity.

Hydropower energy is one of the oldest and largest sources of renewable energy, which uses water to store energy. We can produce electricity by making water fall down from big dams or lakes through turbines.

Bioenergy uses a variety of organic materials and residues as wood, agricultural crops, dung and other manures to produce heat, electricity and for liquid biofuels.

Non-renewable resources

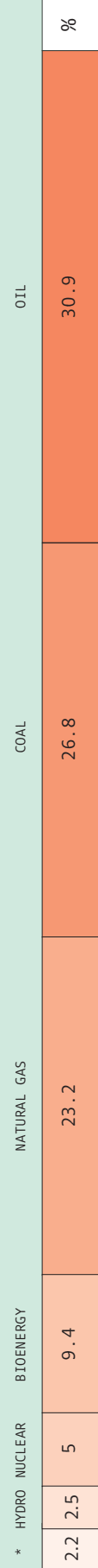
Non-renewable resources use natural sources that cannot be replaced after they are consumed. In short, they only come in a fixed amount on Earth and once they are used up they are gone forever.

Coal is a solid material that is burned to generate heat in homes, or used in power plants to produce electricity.

Oil is a liquid fuel used to produce gasoline. It originates from the remains of dead plants and animals that got trapped under pressure at high temperatures in mud and rock, deep down the Earth.

Natural gas can be extracted from subsurface rock formations via drilling. It is used for cooking, heating, or generating electricity.

Nuclear power exploits the energy found in the nucleus of atoms of specific chemical substances like uranium to produce electricity. Such a process generates radioactive waste that can be harmful.



Percentage of the type of energy sources currently used at the global level. Others* (2.2%) include geothermal, solar, wind and wave energy.

FOOD. "FROM FARM TO PLATE"

Every day we need to eat. Our food comes from plants or animals. Nature and food depend upon each other. The way food is produced has important impacts on the environment. With the rising of populations, the demand for food will rise, and so will the land needs for its production, and also the effects on the environment. Choosing which type of food to eat, its provenance and reducing food waste can make a difference in enhancing the sustainability of the food production system, while ensuring access to proper food to each human being on the planet.

WHERE DOES YOUR FOOD COME FROM?

Take your favourite meal. Before reaching your plate, every ingredient needs to be produced, processed and distributed. Every step in the food chain production makes use of **natural resources** like water, land and energy and can generate waste and pollution going into the environment.

Air *Soil* *Water*

Output Natural resources are **affected**

Input Natural resources are **used**

Phase 1
PRODUCTION

At the farm, farmers grow the wheat and tomatoes from which flour and sauces are then produced. They can also raise cows to obtain meat and milk to produce cheese with.

Phase 2
PROCESSING

Once the product has been harvested, it reaches the processing plants where it is washed and prepared. Here, both animal products and those obtained from plants coming from the farm are processed into pasta, sauce, cheese, mincemeat and so on.

Phase 3
DISTRIBUTION

After being properly packed in boxes and plastic wraps, food travels to supermarkets and restaurants. Nowadays, the food that is being transported covers longer distances, including crossing continents, either by truck or by ship. Some products are even transported by air.

Phase 4
CONSUMPTION

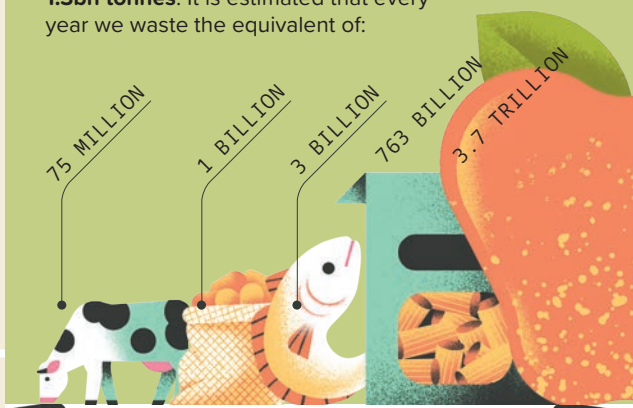
Now, you have all the ingredients at home. After being properly cooked by following grandma's secret recipe... The dish is served and ready to be enjoyed.

Phase 5
WASTE MANAGEMENT

You are not quite done yet! All the envelopes and boxes where food was transported and preserved, together with the organic remains of your dinner, must be disposed of and transported to the landfill.

FOOD WASTE NUMBERS

Each year roughly **one-third of the food produced globally for human consumption goes to waste**, which equates to around **1.3bn tonnes**. It is estimated that every year we waste the equivalent of:



FACTS ABOUT FOOD CONSUMPTION

There is more than enough food produced in the world to feed everyone on the planet. However, while someone is eating too much, someone else is starving.
1 out of 10 people go to bed on an empty stomach every night.
4 out of 10 people are unable to afford a healthy diet, thus suffering from malnutrition.
2 out of 10 people eat way more than what they need; in short, they overeat.
1 out of 10 people is obese.

ECOSYSTEM SERVICES

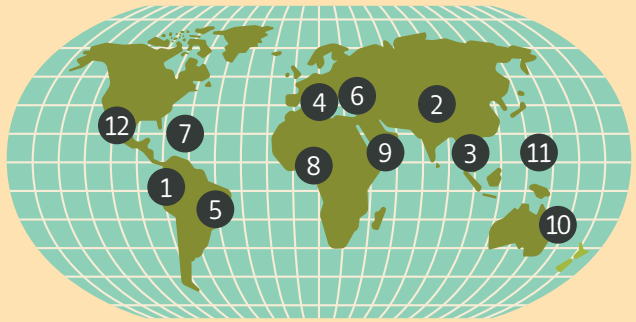
Ecosystems are fundamental to our society as they provide resources like water, food, raw materials from which humans derive benefits making life possible and more enjoyable. Such functions are called **Ecosystem Services**. As they are often invisible to the naked eye, for a long time we took them for granted and **we underestimated the negative impacts that our activities can have on nature.** Degraded **ecosystems** are in fact no longer capable of providing services as opposed to what the healthy ones would do. We need to act in order to keep **ecosystems** in good shape: **if nature suffers, so do humans**.

THREE TYPES OF ECOSYSTEM SERVICES

Although some are more visible than others, all **ecosystem services** are fundamental for ensuring human well-being:
Provisioning services are those that we humans can directly use and need in order to survive, such as food and water, timber, wood fuel, natural gas, oils, plants that can be made into clothes and other materials, as well as medicinal benefits.
Regulating and maintenance services are those helping other processes in nature work and protect them from changes. For example, the capacity of healthy **ecosystems** to provide clean air and to protect from landslides and avalanches.
Cultural services are those which make us glad and happy humans, and give meaning to life, including the sense of beauty, culture and leisure. Think of a nice landscape inspiring artists and poets or green areas where you can practice your favourite sports.

BIODIVERSITY HOTSPOTS

There are regions on Earth called Biodiversity hotspots as they are exceptionally rich in species. They are ecologically unique and can only be found in those specific geographical areas. They are thus priority targets for nature conservation: **if we lose them, we also lose the important services they provide**. Check out the map for some examples.



1. TROPICAL ANDES / 2. HIMALAYA / 3. INDO-BURMA / 4. MEDITERRANEAN BASIN / 5. CERRADO / 6. CAUCASUS / 7. CARIBBEAN ISLANDS / 8. GUINEAN FORESTS OF WEST AFRICA / 9. HORN OF AFRICA / 10. FORESTS OF EAST AUSTRALIA / 11. POLYNESIA–MICRONESIA / 12. CALIFORNIA FLORISTIC PROVINCE

DIFFERENT ECOSYSTEMS PROVIDE MULTIPLE TYPES OF SERVICES

A. Seas and oceans are home to a huge variety of marine animals and plants that can be used as a source of food. They attract tourists coming to enjoy the beauty of nature.

B. Mountains capture and store freshwaters and are important destinations for practicing winter sports like skiing and snowboarding.

C. Agro-ecosystems support agricultural production and represent unique cultural and traditional values for many societies worldwide.

D. As **forests** grow, they store carbon by removing it from the atmosphere, thus helping control the climate.

E. Wetlands act as giant sponges soaking up water during floods and slowing down the flow, making inundations less likely to occur.

F. River vegetation acts as a natural filter removing pollutants and sediment from water and improving its quality.

G. Parks provide opportunities for some of the best recreation activities like walking, running, biking or skating.

H. Green urban areas lower down air temperature through shade and help reduce noise pollution.

I. Shrubs and bushes represent important floral resources for pollinators like bees. They are essential for fruit and vegetable production.

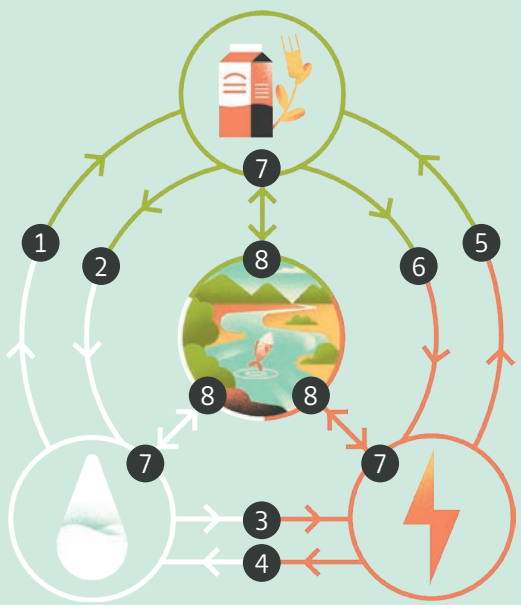
02

THE PROBLEM

Right now, **there are about 8 billion of us on Earth**. Each one of us uses **natural resources** every day for our activities, just like you do with water, energy, and food. This has important consequences on the planet. The burning of fossil fuels to produce the energy we use daily is polluting the atmosphere and causing irreversible changes in climate. We are consuming too many resources, too fast. **The Earth is struggling to recover** in time in order to provide for all of our needs. As the global human population increases, so do people's demands for better living conditions. Resources considered readily available in the past, such as land for agriculture or drinkable water, could become scarce and more valued. At the current state, **the human footprint is too big for the planet**.
Let's see what our future could look like if we don't change our lifestyle.

A MESSY KNOT CALLED NEXUS

Water, energy, food and **ecosystems** are all needed for human life and are all interconnected. By **nexus** we mean the invisible and complex interaction among water-energy-food **ecosystems**. You should picture the **nexus** as a messy jumble of wires keeping all the sectors together. By pulling one wire, all the others are affected. We need to think carefully about our actions. We don't want our decisions to do **knots** that are very difficult to unravel.



Water-Food
1 - It takes water to grow crops, to feed livestock, to sustain aquaculture fishery, to clean and process food.
2 - The use of fertilisers and livestock slurry in agriculture can seriously pollute waters.

Water-Energy
3 - Water is needed to run power plants safely and to produce oil, gas and coal. It can be used directly to produce energy as hydropower.
4 - It takes energy to depurate water for drinking and other uses, to pump and transport it wherever is needed.

Energy-Food
5 - Energy is needed to till and harvest crops. It is used to process, store and distribute food.
6 - Some food crops and their residues can be turned into fuel for vehicles or used to heat and produce electricity.

Ecosystems Food-Water-Energy
7 - Healthy ecosystems provide services supporting the provisioning and regulation of food, water, and energy.
8 - Human activities related to water, energy and food production if not properly managed can affect the status and health of ecosystems.

BONN CONFERENCE

In 2011, ecosystem services experts met in Bonn, Germany, to study all this mess of interconnections and called it **NEXUS**. It comes from the Latin word nectĕre, which means **connections**.

AN INCREASING MESS

By 2050, the population will increase by 9 billion. That's a lot of people to feed, which means more food, a lot more water. But don't worry, there are lots of smart solutions for unravelling such a knot.

OUR FOOTPRINT ON THE NEXUS

Have you ever noticed your footprints in the sand? When you take a step, you leave a mark which can last a long time after you have left. In a similar way, your passage on Earth has an **impact** on the environment. Scientists came up with the idea of measuring this "footprint" to understand how much of the **Earth's resources** people use for their everyday activities like eating, cleaning, playing, and travelling.

SIZE MATTERS

The size of your footprint depends on how many **natural resources** you require to live your life. If you are careful about the amount of water and energy you use, the types of food you eat and the amount of **waste** you produce, you could have quite a small footprint. But if we all live by consuming too many of the Earth's resources, the Earth won't be able to recover in time, nor to support future generations.

At the current state, **one Earth** is not enough to sustain our lifestyle as we are consuming the equivalent of **1.7 Earths**.

THE WATER - ENERGY - FOOD FOOTPRINT OF A HAMBURGER

The choice of the food we eat has an important impact on our ecological footprint. Let's calculate together the footprint of a hamburger:

TOTAL ENERGY: 19.23834 MEGAJOULE (MJ)
TOTAL WATER: 2513.453 LITERS (L)

Cheese
0.899 MJ / 72.5 L

Cucumber
0.05624 MJ / 2.6122 L

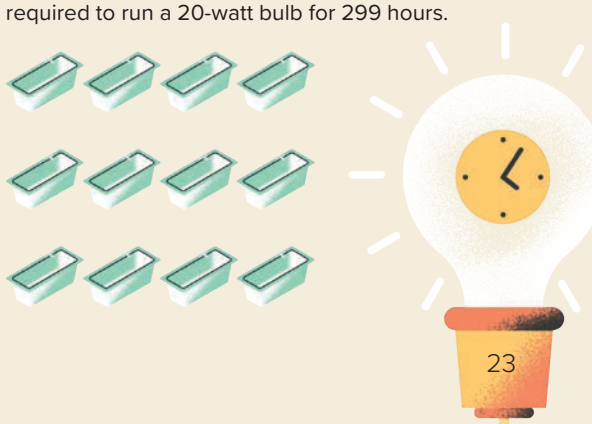
Onions
0.1071 MJ / 0.4624 L

Burger
10.44 MJ / 2312.25 L

Lettuce
4.48 MJ / 6.636 L

Bread
3.256 MJ / 118.992 L

Summing up, to produce a hamburger, we need approximately:
2513 litres of water - that's like the amount needed to fill up 12 bathtubs.
19.23834 Megajoule (MJ) - that's like the power required to run a 20-watt bulb for 299 hours.

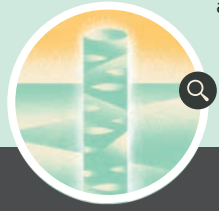


A CHANGING CLIMATE

Earth is a comfortable place. It has the perfect temperatures for plants and animals, including humans, to live in. But why is it so special? And what happens if such **temperatures** change drastically?

WHEN ICE CAN SPEAK

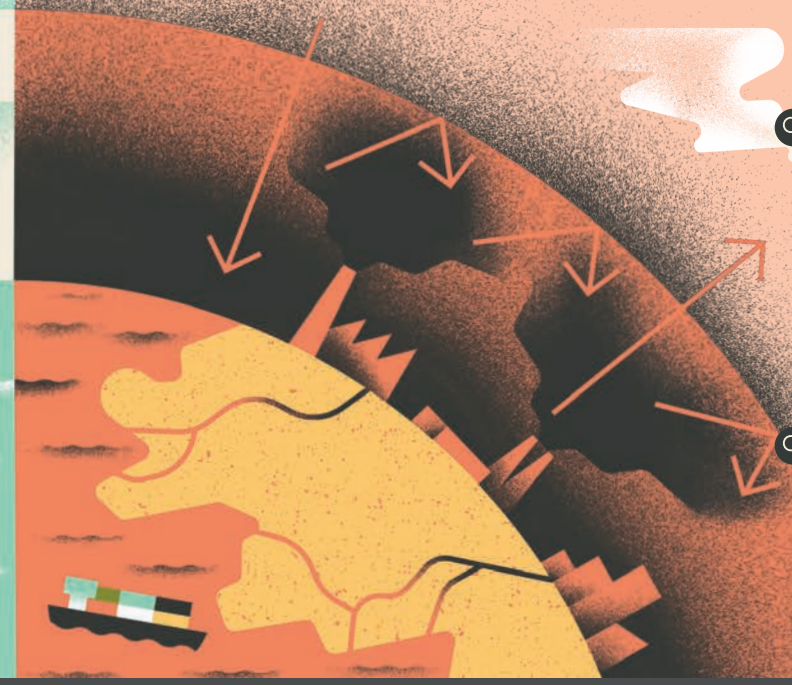
Climate scientists can reconstruct the CO_2 concentration of the past by studying the small bubbles of the atmosphere that remained trapped in the ice. They do so by looking into **"ice carrots"** - big ice samples taken in Antarctica and Groenlandia. Today, CO_2 concentration has never been this high - 410 **parts per million (PPM)**. C02 concentration started to rise faster after the **industrial revolution** (1750) when humans started to use more and more coal and oil to operate machinery and vehicles.

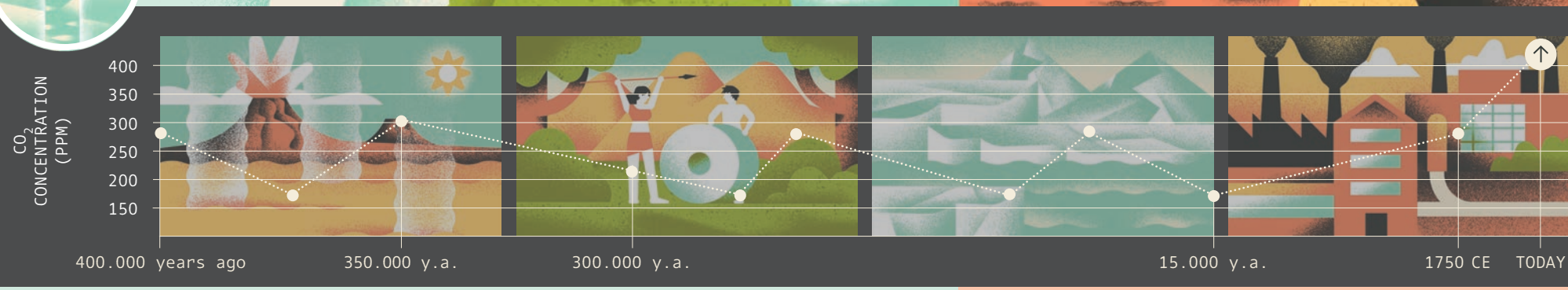


1 - Find out more

THE GREENHOUSE EFFECT

Have you ever heard of the **greenhouse** effect? As the name suggests, it works like a giant **greenhouse**. A **greenhouse** is a building protected by glass walls and a glass roof. In the same way, **the Earth is protected by the atmosphere** - a tiny layer which contains gases called "**greenhouse gases**" like the carbon dioxide, methane and water vapour. This tiny gaseous layer allows part of the energy sent from the sun to penetrate and warm up the Earth but then it traps the heat reemitted by the Earth's surface. That's what keeps our Earth at a warm and cosy temperature (more or less 14 degrees Celsius). Without it, the temperature would be around -18 degree Celsius, basically as if living in a giant freezer.

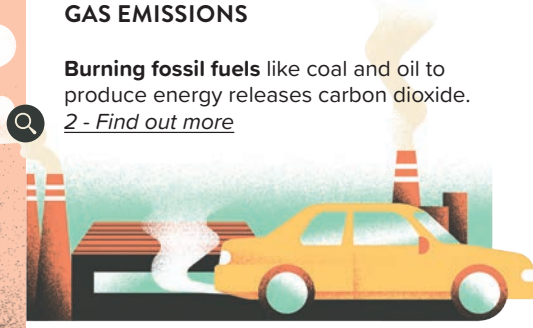




The **greenhouse** effect is a natural phenomenon which makes life possible on Earth. So why is everybody so scared of it? In the last century, human activities have changed the Earth's natural **greenhouse** effect, by releasing more **carbon dioxide** into our atmosphere. A ticker **greenhouse** gaseous layer means that Earth's atmosphere can trap more heat. This causes the Earth surface to warm up way too much in a process called "**Global warming**".

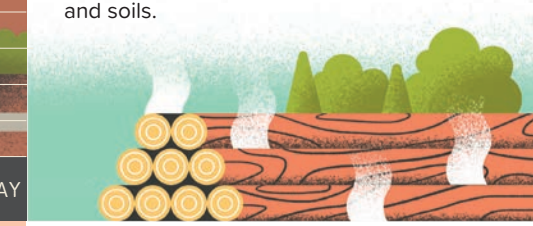
CAUSES OF GREENHOUSE GAS EMISSIONS

Burning fossil fuels like coal and oil to produce energy releases carbon dioxide.
2 - Find out more



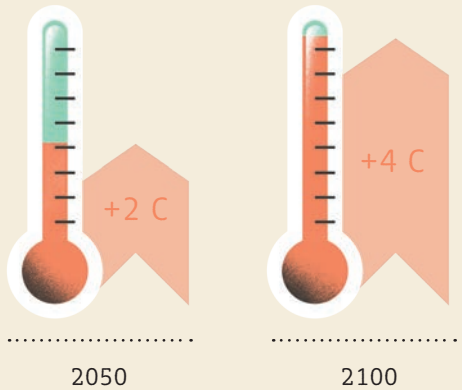
Agricultural practices - Livestock produce a big quantity of methane during digestion.
3 - Find out more

Deforestation - In some places, like the Amazon Rainforest, trees are cut down to clear lands for farming. It releases large amounts of carbon stored in wood and soils.



CLIMATE CHANGE & RESOURCE SCARCITY

Our planet is warming faster by the day. The effects of **climate change** vary across countries and regions, but it is touching all of us by affecting our food, our behaviour and health. The more serious the consequences, the more difficult and expensive it will be to solve them. The best option is to **act quickly** to avoid the worst and irreversible effects.



CLIMATE OF THE FUTURE - CLIMATE MODELS

To predict future climate, scientists use computer programs called climate models. Let's assume that a scientist wants to know what would happen if the atmosphere doubled the amount of **greenhouse gases** it has now. **We don't have a spare Earth** to use for experiments. Instead, scientists have created a digital copy of the Earth on a computer. It is made by a computer atmosphere, a computer ocean and a computer land - all interacting with one another. Like in a video game, **climate models** allow scientists to safely simulate the changes concerning different factors and figure out how lots of other things would change consequently.
Climate models help scientists predict the Earth's climate in 10 years or even 100 years from now.

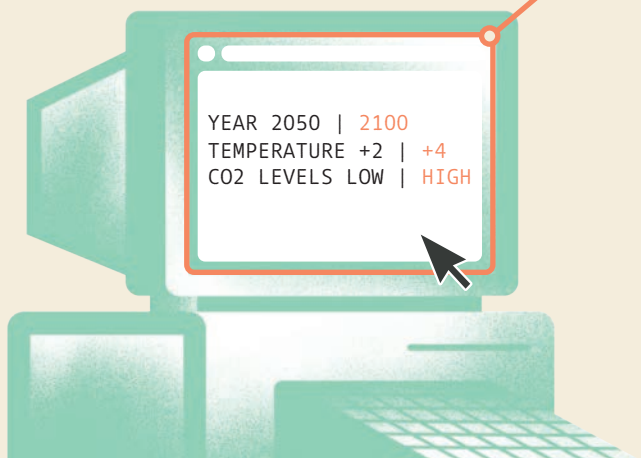
HOT FUTURES

Scientists say that if we continue to pollute like we are doing now, the temperature could become **awfully hot**.

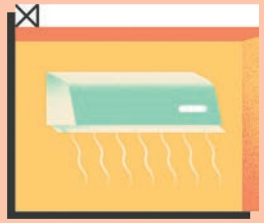
By 2050
The temperature could increase by +2 C.

By 2100
The temperature could increase by +4 C.

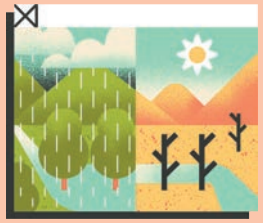
Let's simulate what the consequences would be for the planet:



It's hot!
The number of days with extremely high temperatures will increase. **It could be fatal** to older and vulnerable people.



Energy demand
To face the high temperatures the use of air conditioning and cooling systems will increase and so will the **demand for energy**.

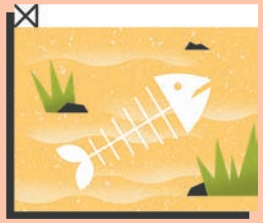


Changing rainfalls
Some places will receive excessive rainfall, which could lead to **flooding**, while other places will get less of it, which means drought.

On fire!
Wildfires will become more frequent and even more dangerous due to the extreme **heat and drought**.

Rising seas
Due to ice melting, the **sea level will rise** resulting in the flooding of many coastal communities, cities and small islands.

Tropical Cyclones
Tropical cyclones like hurricanes and tropical storms will be **stronger** and happen more often.



Biodiversity losses
Many terrestrial and marine species will suffer the **loss of their habitats**. Some will even face extinction.

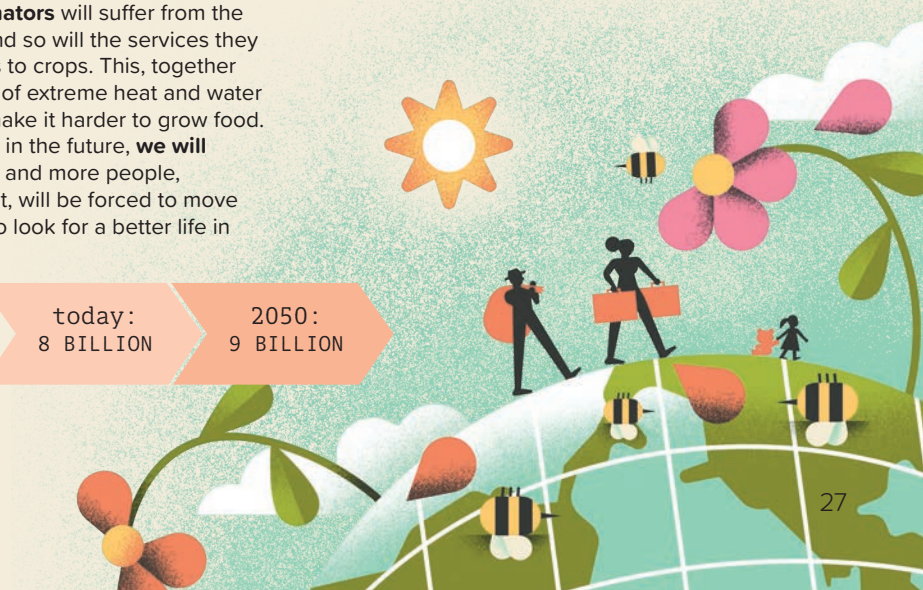
Acid oceans
Oceans will get **hotter** and more **acidic** by absorbing carbon dioxide from the air. It will hurt some marine organisms like corals and fish stocks.

LESS FOOD FOR EVERYONE

4 - Find out more

Bees and other **pollinators** will suffer from the changes in climate and so will the services they provide as pollinators to crops. This, together with the combination of extreme heat and water shortages, will only make it harder to grow food. What it means is that, in the future, **we will have less food**. More and more people, especially the poorest, will be forced to move from their countries to look for a better life in other regions.

Climate migrants | today: 8 BILLION | 2050: 9 BILLION



03

SOLUTIONS

It looks like we're only dealing with bad news here, doesn't it? It doesn't have to be this way, though. If only governments, companies and all of us as humans were to **work together**, we could cut **greenhouse** emissions over the next few decades and prevent the worst effects of **climate change** from happening. To do so, we have to stop burning fossil fuels and increase the use of cleaner and renewable energy sources.
At the same time, we should do our best to use **natural resources** less intensively and reduce the footprint we leave on the planet.
Here is the good news. We already know how to make that happen - at least most of it.
We just have to take action. Let's find out what the solutions are in our hands to build a different and **sustainable** future!

LEARNING FROM NATURE

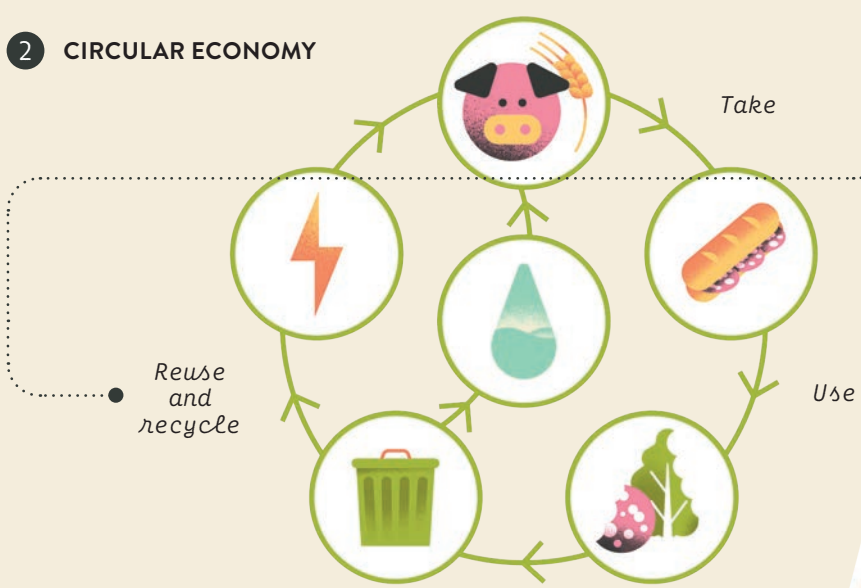
We have to make smarter use of the scarce **natural resources** we have. How? That's easy! By taking inspiration from nature. **There is no waste in nature.** Energy is provided by the sun; one organism's waste is another's food and when things die, their nutrients return to the soil. Everything, even after its lifetime, becomes a source for something else.

CLOSE THE LOOP

Humans naturally tend to do things in a **linear way (1)**. But to guarantee a **sustainable** future, we have to move towards a **circular economy (2)**, where everything is reused or recycled - just like nature does.

1 LINEAR ECONOMY

2 CIRCULAR ECONOMY



SOLUTIONS

WASTE: A HIDDEN TREASURE

Algae treatment - Green microalgae have the ability to remove nutrients and CO_2 from wastewater returning clean water and biomass, which can then be used as biofuels, fertilisers as well as in packaging materials.

Fuels from crops - Residues from crops can be burned to produce energy to heat homes or generate electricity. Corn and sugarcane can be converted into biofuel that can be used in place of gasoline with cars.

Coffee-addicted fungi - Some kinds of mushrooms have the potential to use the nutrients in coffee as their food source. So, coffee ground waste has been used as substrate to grow edible mushrooms for gourmets' recipes.

5 - Find out more

NATURE-BASED SOLUTIONS

6 - Find out more

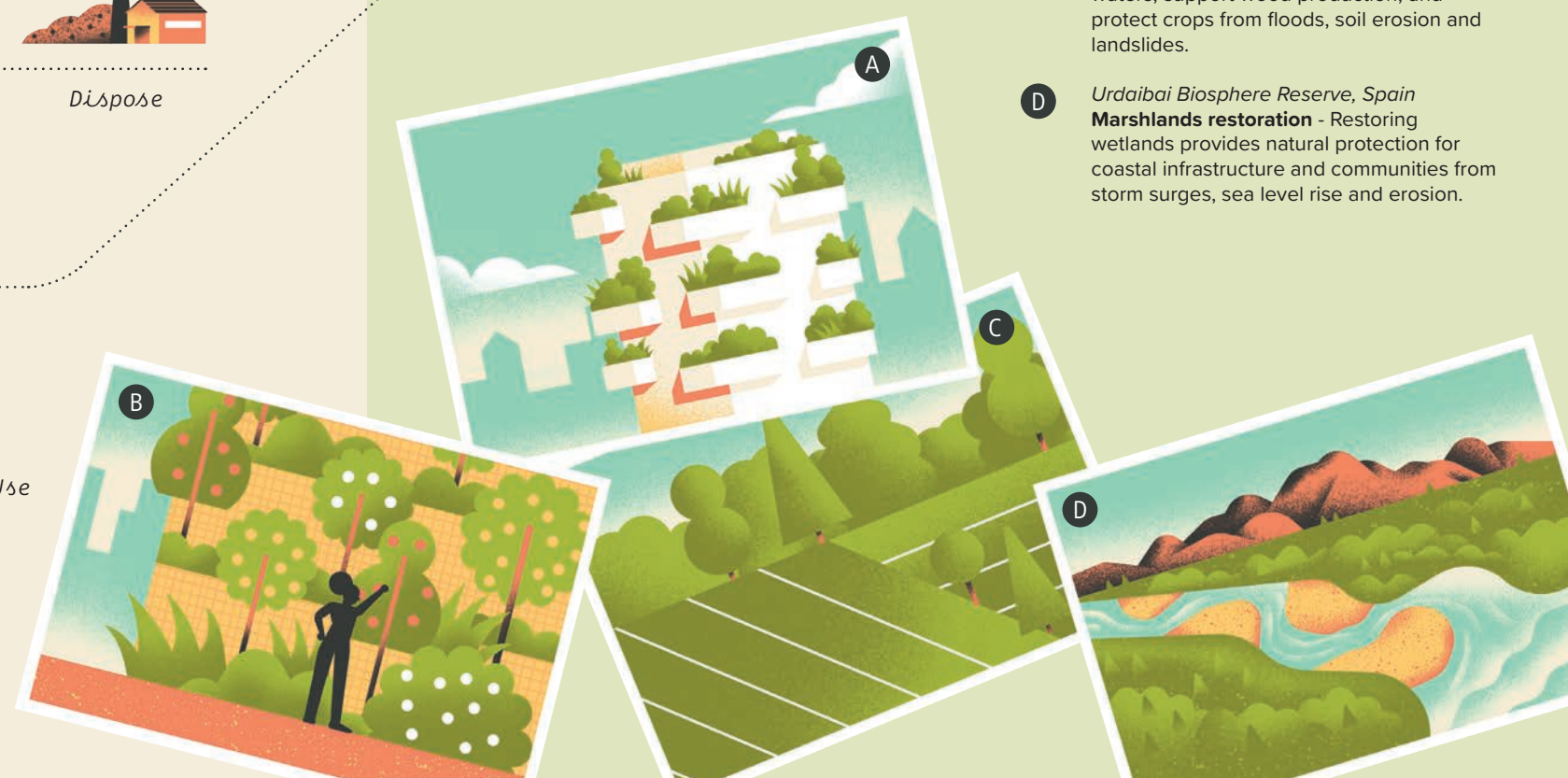
The power of nature doesn't stop here. We can even use the services **ecosystems** provide to build solutions that help cities and productive systems mitigate and adapt to the effects of **climate change**, while providing us with **natural resources**. It is already a reality in many parts of the world.

A *Bosco Verticale, Milano, Italy*
Green roofs - Planting trees on the roofs in cities helps keep buildings cool during heat waves, capture water during storms, clean air from pollution and adsorb carbon. It is not only useful, but also beautiful to look at.

B *BiodiverCity Malmo, Sweden*
Yummy walls - Growing vegetables or small fruits in specific compartments on communal gardens' walls allows for the supply of fresh veggies and for reuse of water that would otherwise be routed to the sewer.

C *Bosco Limite, Italy*
Forested infiltration areas - Planting trees in agricultural areas can secure water supplies through infiltration, purify waters, support wood production, and protect crops from floods, soil erosion and landslides.

D *Urdaibai Biosphere Reserve, Spain*
Marshlands restoration - Restoring wetlands provides natural protection for coastal infrastructure and communities from storm surges, sea level rise and erosion.



OUR EARTH, OUR FUTURE

World leaders have the great responsibility for making good decisions to preserve the health of the Earth and, at the same time, the well-being of its inhabitants.
The good news is that countries are already cooperating for a better future but there is still a lot to do.

THE SUSTAINABLE DEVELOPMENT TIMELINE

This table will walk you through some of the most important achievements toward a **sustainable development**.

1987

Brundtland Report
For the first time, world leaders recognized the need for a more **sustainable economic development**. They were finally concerned with the environment when making economic decisions.

1992

Earth Summit
The global fight against **climate change** started here. Countries around the world signed an international treaty: the **United Nations** Framework Convention on **Climate Change** (UNFCCC).

1997

Kyoto Protocol
UNFCCC adopted the Kyoto protocol: the first global agreement to reduce **greenhouse gas** emissions to control **climate change**.

2015

Agenda 2030
The 2030 Agenda for **Sustainable Development** is adopted. It is an urgent call for action by all countries to solve major global challenges together.

7 - Find out more

Paris Agreement
195 countries committed to reduce **greenhouse gas** emissions to limit global temperature rise to well below 2°C above pre-industrial levels, by adopting more renewable energy sources and new technologies.

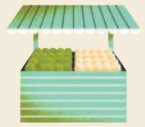
NOW IT'S YOUR TURN

Tips for saving water

World leaders have to get serious about addressing **sustainable development**, but the rest of us need to lend a hand. And you can do a whole lot to help out! It's simple to make a difference. So be cool and do your best to keep the Earth healthy and...well, cool.
Try with some of these tips to save natural resources in your daily life.
Reducing your water-energy-food footprint is easy.

Recycle and reuse
Don't throw everything in the bin and reuse things as much as possible. Reuse shopping bags and envelopes.

Less packaging
Buying fresh fruit and vegetables rather than pre-packaged ones can cut down on packaging waste.



Eat local
Food grown in your country or near your home tastes better than food shipped from thousands of kilometres.

Save water!
Turn the tap off when brushing your teeth or rinsing dishes and food. Taking a shower uses much less water than filling up a bathtub.

Go public
Instead of travelling by car, use public transportation, walk or ride your bike whenever you can. It is much more fun also, don't you think?

Switch it off
Electronics use energy even when they're turned off, so make sure you unplug them when you're not using them.

Layer up!
In wintertime, at home, wear a warm sweater, fluffy jumpers and thick socks instead of turning up the heat.

Go unplugged
Try entertaining yourself without electricity. Read a book, draw, play sports or board games with friends.

SMALL IDEAS CAN CHANGE THE WORLD

Propose these activities to your parents or at school.
Who said that changing the world cannot be fun?
1 - Grow a vegetable garden - Growing your own can save you money and reduce emissions from transporting products.
2 - Build a water storage system - With a little bit of invention, and a lot of recipients, you can store rainwater and reuse it for gardening and toilet use.
3 - Engage your friends in a competition - Collect imaginative ideas to save resources and the planet. The best one wins!

GLOSSARY OF CHALLENGING WORDS

Here you can find the meaning
of the most complex words in the book

A

ADAPTATION

The process of adjusting human systems to the expected climate change and its impacts. Adaptation aims to reduce damages or take advantage of the change.

C

CLIMATE CHANGE

A change in the state of the climate that persists for a prolonged period of time.

E

ECOSYSTEMS

Units made up of plants, animals, other living organisms and the interactions among them. A forest is an example of an ecosystem.

ECOSYSTEM SERVICES

All the processes or functions provided by ecosystems that benefit humans or societies. Food provisioning is an example of an ecosystem service.

G

GLOBAL WARMING

An increase in temperature near the surface of the Earth. Global warming has occurred in the distant past as the result of natural causes. Today, we mostly use the term to refer to recent and ongoing warming caused by human activities.

GREENHOUSE GASES

Those gases that can trap heat in the atmosphere and warm our planet. The main greenhouse gases are: Water vapour, Carbon dioxide, Methane, Ozone, Nitrous oxide, Chlorofluorocarbons.

M

MITIGATION

Human actions taken to reduce greenhouse gas emissions - for example limiting the burning of fossil fuels - or to enhance sinks of greenhouse gases by conserving forest ecosystems.

MEGAJOULE (MJ)

A unit of measurement used to describe energy. It is equal to one million joules.

N

NATURAL RESOURCES

Everything provided by nature that can be used directly or indirectly by living organisms for their needs. Examples of natural resources are water, forests, minerals, wood, oil.

NEXUS

The very close links connecting water, energy, food and ecosystems and the ways in which changes in one sector have an impact on the others.

P

PARTS PER MILLION (PPM)

A unit of measurement that can be used to describe the concentration of a particular substance within air, water or soil. For example, if the concentration of carbon dioxide in the Earth's atmosphere is almost 400 parts per million, it means that 1 million litres of air contain about 400 litres of carbon dioxide.

S

SUSTAINABLE DEVELOPMENT

"Sustainable" is something that can go on forever. Sustainable development is the practice of using natural resources responsibly today, so that they are available for future generations tomorrow.

U

UNITED NATIONS (UN)

An association of countries that agreed to work together to prevent and end war, improve social conditions, public health, environmental conservation, and human rights.

DID YOU KNOW?

Interesting facts to amaze your parents and friends

1

AN ICE CORE "LIBRARY"

Glaciers around the world could disappear due to **global warming** and, with them, the precious information they hold about the climate of the past. In the Ice Memory project, an international group of scientists is creating a big database of ice carrots collected on different glaciers around the world. This peculiar library will allow future generations of scientists to have access to information - otherwise no longer available - and to analyse them with more advanced technologies.

www.ice-memory.org/

2

FOSSIL SOURCE OF ENERGY

What do fossils have to do with energy? Millions of years ago, remains of dead plants and animals got trapped in mud and rock deep down the earth. The pressure from the ground above, combined with the Earth's heat, converted this matter into substances that today can be pumped out of the Earth by humans to be used as energy.

3

DANGEROUS BURPS AND FARTS

Cows are ruminants, that is, they have four stomachs. It means that they produce a lot of methane during digestion, one of the gases that causes **global warming**. One single cow can produce up to 120 kg of methane per year. Most of it is released as burps, but some certainly escapes the rear end, too!

4

TIRELESS BEES

The Food and Agriculture Organization (FAO) of the **United Nations** estimates that as many as 71 out of the approximately 100 types of crops that supply 90% of the world's food are pollinated by bees.

5

NO WASTE BUT TASTE

Do you want to start your fungi cultivation using dad's coffee ground waste? An Italian startup invented a kit to do it easily.

Get your kit here:
www.funghiespresso.com/?lang=en

6

SMART SOLUTIONS

I bet you are dying to discover more of the nature-based solutions implemented around the world. At this link you can find the most ingenious and original ideas using nature to adapt to **climate change**:

https://climate-adapt.eea.europa.eu/en/knowledge/tools/case-study-explorer

7

THE AGENDA FOR THE FUTURE

The Agenda 2030 is like a to-do list made up of 17 points called **Sustainable Development** Goals (SDGs). All countries around the world agreed to achieve all points by 2030. They will ensure better ways of life for everyone on the planet without destroying the environment and resources for the future.

Learn more here:
https://sdgs.un.org/goals

RESOURCES AND DATA TO EXPLORE

Do you want more information on the data and figures? You've come to the right place

01 NATURAL RESOURCES

Access to drinking water around the world: Our World in Data (2022) https://ourworldindata.org/clean-water-sanitation;

Global energy uses and sources: Our World in Data (2022) https://ourworldindata.org/energy;

People hungry and undernourished: UN's Food and Agriculture Organization (2019) https://ourworldindata.org/hunger-and-undernourishment;

Food loss and waste: UN's Food and Agriculture Organization (2021) https://www.fao.org/platform-food-loss-waste/flw-data/en/;

Global biodiversity hotspots: Conservation International (2022) https://www.conservation.org/priorities/biodiversity-hotspots;

02 THE PROBLEM

Ecological footprint calculator: Global Footprint Network (2022) https://www.footprintcalculator.org/home/en;

Carbon Dioxide levels in human history: Luthi D. et al. (2008); Etheridge D.M. et al. (2010) https://climate.nasa.gov/evidence/

Climate change impacts on natural resources: Intergovernmental Panel on Climate Change (2022) https://www.ipcc.ch/assessment-report/ar6/

03 SOLUTIONS

Database of climate change adaptation initiatives: European Climate Adaptation Platform Climate-ADAPT (2022) https://climate-adapt.eea.europa.eu/;

Sustainable development goals: United Nations (2015) https://sdgs.un.org/goals

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Finally, I would like to thank some of my colleagues, who, before being amazing climate-change scientists, are very good friends. **Francesca Larosa** and **Nicolò Maffezzoli** whose advice have helped me with the development of sections related to energy and ice cores data, respectively.

To conclude, I would like to thank all of yesterday, today and tomorrow's kids for their pure enthusiasm and curiosity towards things. **The future is yours**, so try to leave this planet a little better than you found it.

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www.bc3research.org

A guide for kids (and whoever wants) to dig deeper into the links between water, food and energy

Natural resources such as **food**, **energy** and **water**, are necessary for the **survival of all living organisms**. People like you and me also need them.
Sadly, as important as they are for everyone's life, they are not accessible to the whole world. This not only puts **people's health** in danger, but it can also trigger worldwide conflicts. Now that you understand the **vital role of nature in our lives**, let's see how we can protect it from **climate change**.