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Module 1

What Is Climate Change?



Rise Up Against Climate Change!
A school-centered educational initiative
of the Inter-American Development Bank



Rise Up

Against Climate Change

A school-centered educational initiative of the Inter-American Development Bank

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Have you thought about what your life will be like in 10 or 15 years? Surely you have imagined yourself being happy, moving around your favorite spaces, working on what you like, and enjoying beautiful plants and clean and fresh air. How is your lifestyle today affecting your chances of enjoying such a future?



How committed am I to my environment?

We invite you to make a short assessment of your environmental behavior. A few moments' reflection will surely serve you well for the future. Then invite your colleagues—both teachers and students—to do so as well. You will most certainly discover that, although everyone wishes for a promising and happy future, few of us are doing anything to ensure it. Perhaps even small efforts, such as the creation of this manual, will help us adopt new attitudes and rethink how we teach, learn, and transform the world.

In table 1, write an X under the option that best describes your current practices. Do the exercise just for your own sake, and answer with total honesty. Score your answers as follows: An X in the first column (never or nothing) earns no points. For every X in the second column (sometimes or half the time), give yourself 2 points. For every X in the third column (always or a lot), give yourself 4 points. The maximum possible score is 112.

Between 0 and 28. Carefully review those areas you have paid little attention to. Haste often prevents us from looking at the impact of our actions on the environment. We are confident that the recommendations provided in this kit will help strengthen your ability to improve the environment.

Between 29 and 56. You are on the right track; pay more attention to your weaknesses. The planet needs you. Look for information and shift into a higher gear so that you soon become a promoter of environmentalism.

Between 57 and 85. You are on the right track toward learning and becoming a committed, environmentally respectful person. Get informed and pay more attention to areas where you need to reinforce your commitment to the environment.

Between 86 and 112. You have great potential to lead initiatives for making your school an environmentally friendly space. Use your commitment to the environment as an engine that drives your school community into a better future. Congratulations!

Beware! You need to pay attention to your _____

- Subtotal 1: consumption
- Subtotal 2: transportation
- Subtotal 3: way of caring for energy
- Subtotal 4: way of caring for water
- Subtotal 5: waste management
- Subtotal 6: approach to nature
- Subtotal 7: school's vulnerability

Table 1. How environmentally friendly is my life?

Question	Levels		
	Never	Sometimes or half the time	Always or a lot
On the consumption of goods			
I choose the products I use depending on which cause the least possible damage to the environment. (For example, are they produced with pesticides? Do they involve the reuse of other materials in their manufacturing process?)			
I repair worn-out or defective goods instead of buying new ones.			
I use rechargeable batteries.			
I avoid replacing appliances or goods I am using when a new model is available.			
Subtotal 1			
On mobility			
I use public transportation when I need to travel considerable distances.			
I walk or ride a bike when I need to travel short distances.			
I share a car with people traveling to the same destination.			
I take care of my vehicle so as to optimize emissions.			
Subtotal 2			
On energy			
I use energy-saving lamps or bulbs.			
I turn lights off when not in use.			
I disconnect appliances when they are off, or I use a multipurpose power switch to turn them off when not in use.			
I clean bulbs and lamps to make sure they provide optimum lighting.			
Subtotal 3			
On water			
I take a maximum of five minutes to shower.			
The plants in my garden are from the region where I live, so they need little water.			

Table 1. How environmentally friendly is my life?, continued

I turn off running water while I wash my hands or brush my teeth.			
I have water-saving systems installed in my faucets and toilet.			
Subtotal 4			
On waste management			
I separate waste into at least two categories.			
I reuse disposable containers as much as possible.			
I prepare compost with my organic waste.			
I recycle or drop off inorganic waste for recycling.			
Subtotal 5			
On contact with nature			
I visit natural areas close to my town.			
I adopt street animals instead of buying animals.			
I try to obtain the natural products I consume (wood, land, plants, animals) from agricultural production/breeding sites or sustainably managed sites.			
I consume organic products (that is, those produced without agrochemicals).			
Subtotal 6			
On the vulnerability of your school			
I participate in or promote the inclusion of healthy foods in the cafeteria of my school, considering the nutritional needs of students.			
I design or promote health or environmental care campaigns in my school community.			
I prepare my school community to address environmental risks (floods, drought, heat waves, mudslides, earthquakes).			
I participate in public health campaigns to prevent epidemics generated by vectors and mosquitoes (malaria, dengue fever).			
Subtotal 7			
TOTAL			
Maximum value of each column	0	56	112

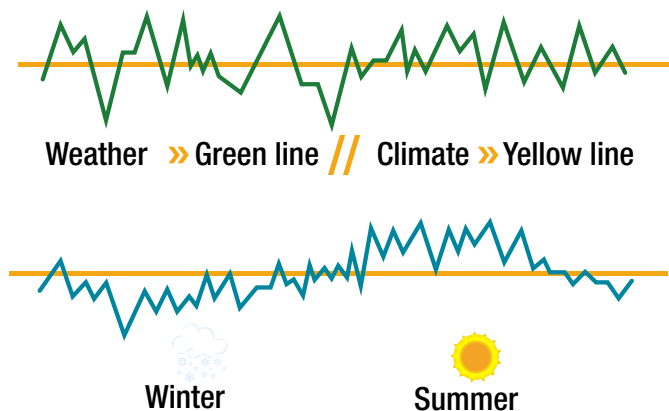
The difference between climate and weather

To understand the topic of climate change and the changes that you can undertake in your school, it is helpful to review some key points that are often misunderstood. For example, you've probably heard that the world's climate is changing. You might answer, "But of course, the weather changes every day." Such short-term changes are not what's being referred to. What, then, is climate change?

To understand this, we first need to distinguish between:

- What we often refer to as the *climate* (though the term is not technically correct) are the weather conditions that fluctuate from day to day. In other words, if it is hot or cold, if it is raining or not, if the sky is cloudy or clear, if it is windy or calm, and so on. This is the *weather*.
- What specialists refer to as the *climate* encompasses how climatic conditions vary over at least 30-year periods.

Figure 1. Variability of weather conditions



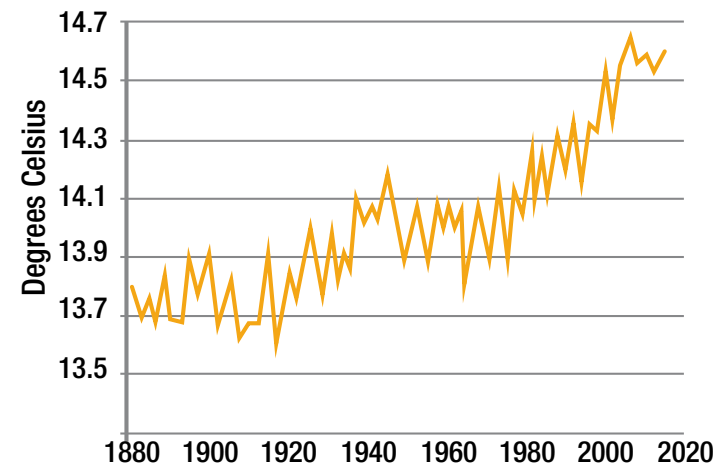
Source: Informe GEO 5, <http://www.unep.org>.

In figure 1 the green and blue lines refer to the *weather*, and the yellow line—which appears to remain still—refers to the *climate* in a given region.

To analyze the behavior of the green and blue lines, you could say that the weather is highly variable—it changes from one day to the next and even within the same day. You'll agree that, although some days are hotter than others in the summer, in general, the summers are hot and winters cold. That is, within the great day-to-day variability, the weather throughout the year is relatively stable or predictable in its spring, summer, autumn, and winter cycles (which are represented by a fluctuating blue line in the figure).

But you will see in figure 2 that the climate has also changed over the past 200 years, showing a gradual increase in temperature. What is the reason for this? The available evidence seems to indicate that this is due to the excessive use of fossil fuels, or hydrocarbons. Let's analyze this in more detail.

Figure 2. Changes in the climate over time
Average global temperature, 1880-2009

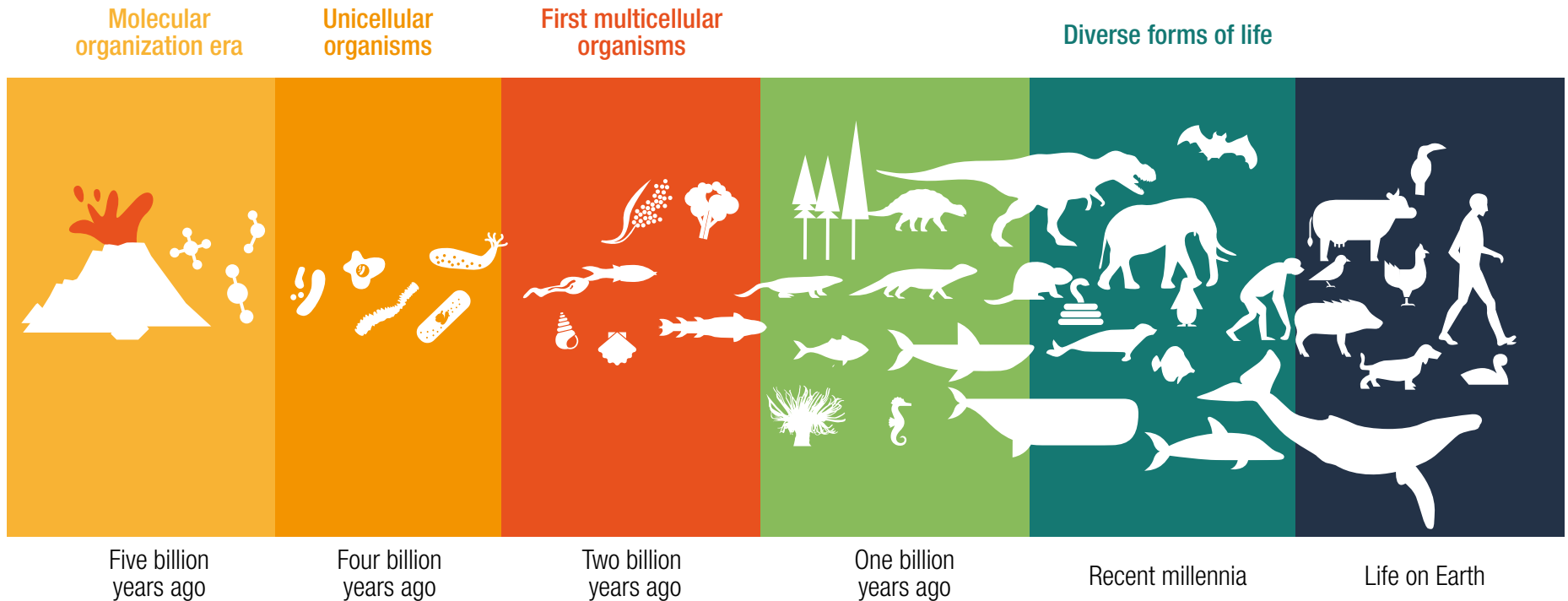


Source: Earth Policy Institute - www.earthpolicy.org

The *climate* is the product of the interaction of factors such as location, temperature, atmospheric pressure, wind, humidity, rainfall, latitude, altitude, proximity to bodies of water or mountains, types of vegetation, and topography. All the regions of the earth have different types of climate that have remained relatively stable, at least throughout human history. But the climate and conditions on the planet have not always

been as we know them today. Over millions of years and up to 2 billion years ago, the earth was an inhospitable place for living beings, without oxygen or an ozone layer. The plants and animals that evolved gradually from simple forms of life have progressively transformed it into the planet we know today (figure 3).

Figure 3. The evolution of life on earth



Why is the climate changing?

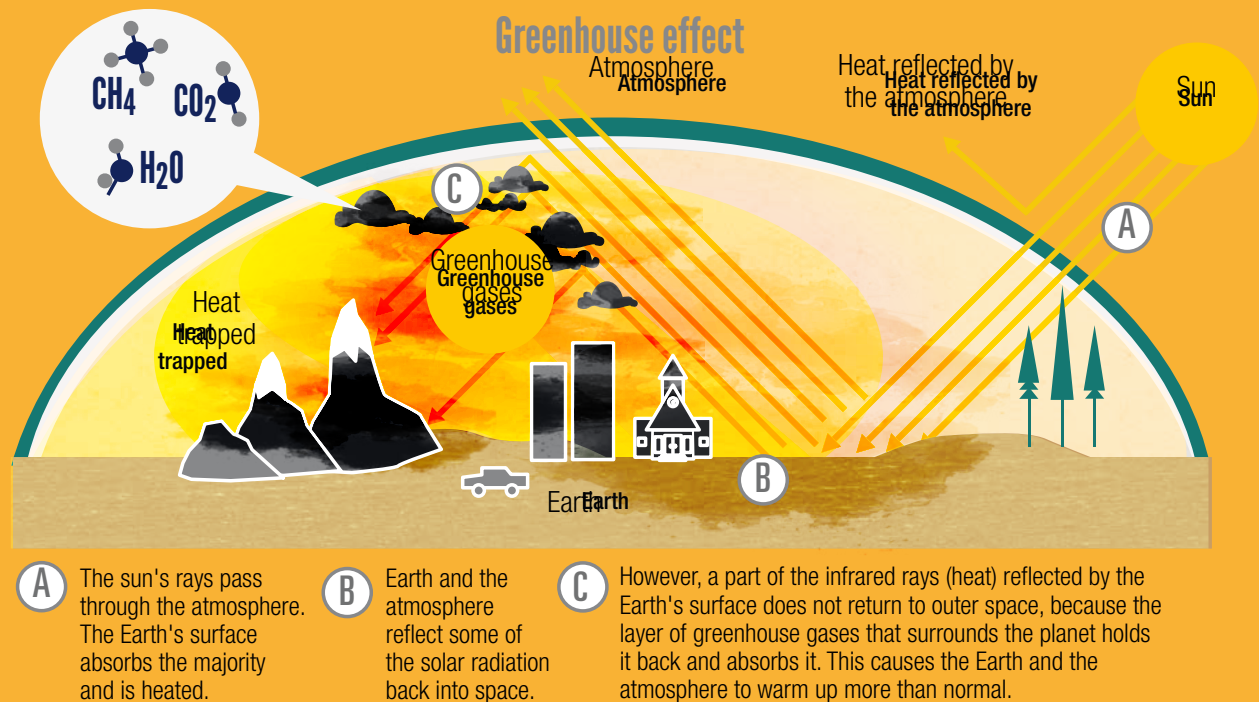
Our planet's climate is stable because of the presence of "greenhouse gases," commonly known as GHGs. These gases are primarily water vapor, carbon dioxide (CO₂), methane, nitrogen oxides, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (UN, 2012).

Most of these GHGs have been present in the earth's atmosphere for millennia. In fact, the existence of life is possible thanks to them, as they prevent the sun's heat that reaches the earth from fully dispersing. If these gases did not "catch" the heat, the earth would have an average temperature of minus 15° C (5° F).

So why have GHGs been considered a problem only in recent years? Because it has only been in the past century or so that we have seen increasing emissions of GHGs, which have now reached dangerous levels. To understand the origin of this increase, we need to review a bit of history, beginning with the Industrial Revolution that started roughly 200 years ago.

Box 1. The greenhouse effect

Greenhouse gases (GHGs) are so called because they generate conditions similar to those found in greenhouses. You've probably noticed that it is warmer inside a greenhouse than outside. This is because the plastic or glass walls and roof let the sunlight in, and also trap the heat inside. On earth a similar phenomenon occurs due to GHGs, which act as a cover that retains some of the heat from the sun. If it weren't for this effect, temperatures would be very high during the day and very low in the evening, making life impossible.



How do we know that the earth's climate is changing?

Various institutions worldwide have been systematically monitoring the earth's climate for many years. One among them, the World Meteorological Organization, devised an observation system 60 years ago that currently consists of over 11,000 terrestrial and 1,300 atmospheric observation stations, 4,000 ships, and 1,200 buoys that record climate-related atmospheric and oceanic data. Many countries also have meteorological and hydrological services monitoring the weather.

Table 1.
The difference between climate change and the hole in the ozone layer

Some people confuse the phenomenon of climate change with the hole in the ozone layer, probably because both phenomena occur in the atmosphere and are caused by gases. The following table depicts the differences:

	Climate change	Hole in the ozone layer
The gases that cause it	GHGs such as CO ₂ and methane, mainly as a result of emissions from burning fossil fuels	Chlorofluorocarbons (CFCs) used as refrigerants, among other uses
The changes it is causing in the atmosphere	Increased concentration of gases, causing the earth to retain more heat	Destruction of the ozone layer in certain parts of the atmosphere, allowing greater penetration of ultraviolet rays
The areas where its effects are observed	All over the planet.	In certain places on earth, mainly Antarctica
The actions that have been taken and results achieved	Creation of the United Nations Framework Convention on Climate Change (UNFCCC). Signing of the Kyoto Protocol by many countries of the world, with the exception of China and the United States—two of the planet's largest polluters	Signing of the Montreal Protocol with a general agreement among the major CFC producers to replace CFCs with hydrochlorofluorocarbons (HCFCs), which do not damage the ozone layer but increase the greenhouse effect.

Research reports using data from these and other sources, now led chiefly by the Intergovernmental Panel on Climate Change (IPCC),¹ have confirmed increased CO₂ concentrations in the atmosphere and rising average global temperatures.

In addition to records of changes in temperature and gas volumes, there are other indicators of change. Many glaciers have decreased in size and some have even disappeared. There are changes in the latitudinal distribution of certain species, which are now found in areas where low temperatures had not allowed them to reproduce before. Sea levels are rising, due to both the melting of the polar ice

caps and thermal expansion (the higher the temperature, the more water increases in volume). In addition, the frequency and intensity of heat waves and fires caused by droughts is on the rise.

It should be noted that not all changes are attributable to global climate change. Some are expressions of climate variability and of areas that have lost their resilience—that is, the ability to withstand the effects of normal changes that take place in ecosystems.

1 In 1988 the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) formed a group of experts known as the Intergovernmental Panel on Climate Change (IPCC), which is open to all members of the UN and WMO. The aim was to build an international group of impartial experts who analyze scientific, technical, and socioeconomic information in a comprehensive, objective, open, and transparent manner to understand the scientific elements of the risk posed by climate change. IPCC members do not conduct investigations or controls related to climate data or other relevant parameters, but it bases its assessment mainly on scientific and technical literature reviewed and published by their colleagues (<http://www.ipcc.ch>).



The story of hydrocarbon production

The Industrial Revolution was spurred by the invention of machines whose operations depended on the burning of fossil fuels: first coal, then oil. In hindsight, we see that this was one of the most important milestones of human history and enabled extraordinary development. To support the increased production and transportation made possible by such machines, people also started extracting huge quantities of natural resources from the earth.

Most of the negative impacts of such extraction were until recently, localized, including pollution from the burning of coal or oil, accidental explosions, and oil spills. Such incidents seemed small compared to mankind's giant steps forward: important technological advances, increased knowledge about space and the underwater world, and better health outcomes worldwide. It was a long time before people

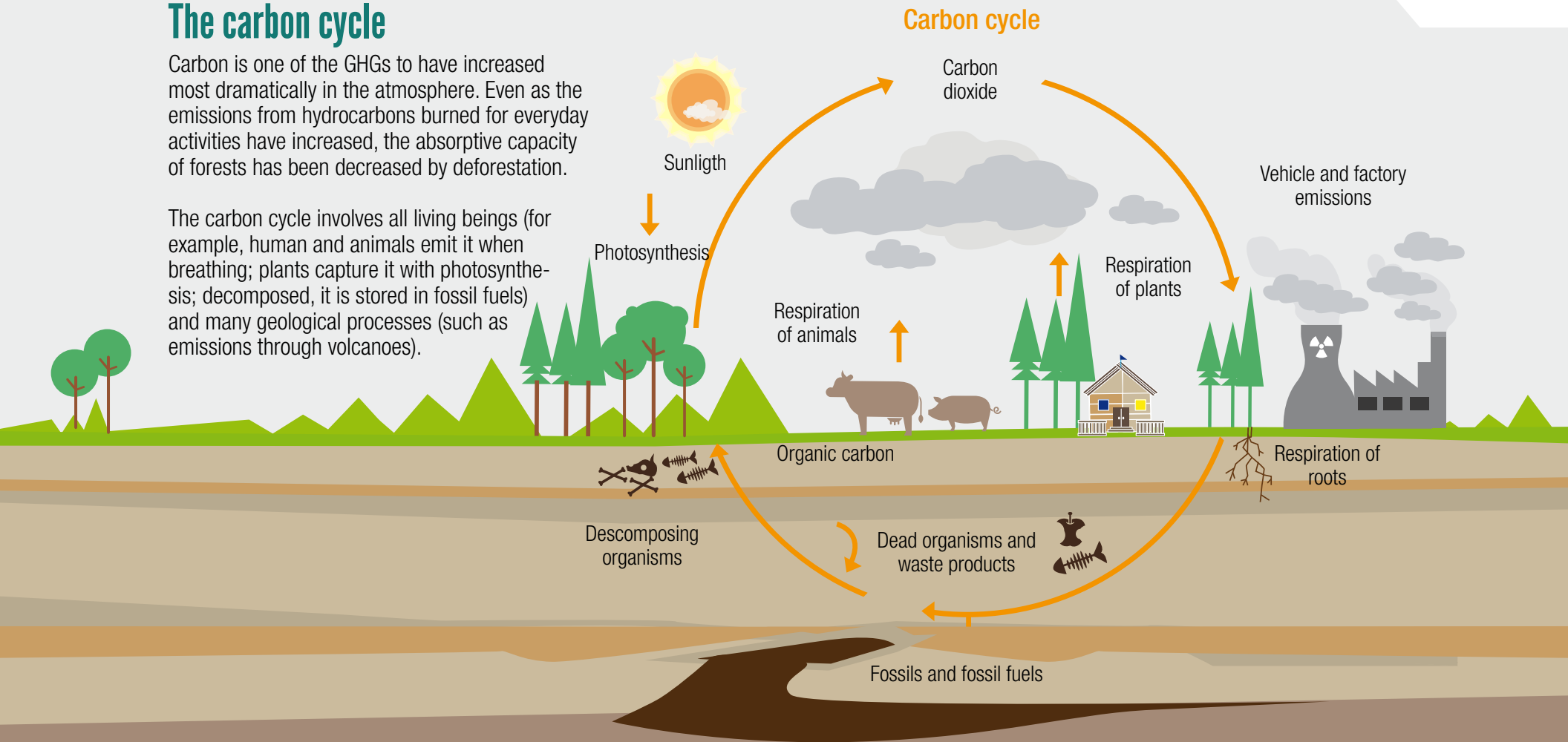
realized that using fossil fuels was leaving a serious mark on the atmosphere and the planet's ecosystems.

Over the past 200 years, humans have steadily increased their consumption of oil, coal, and natural gas, releasing large amounts of CO₂ in the process.

Box 2. The carbon cycle

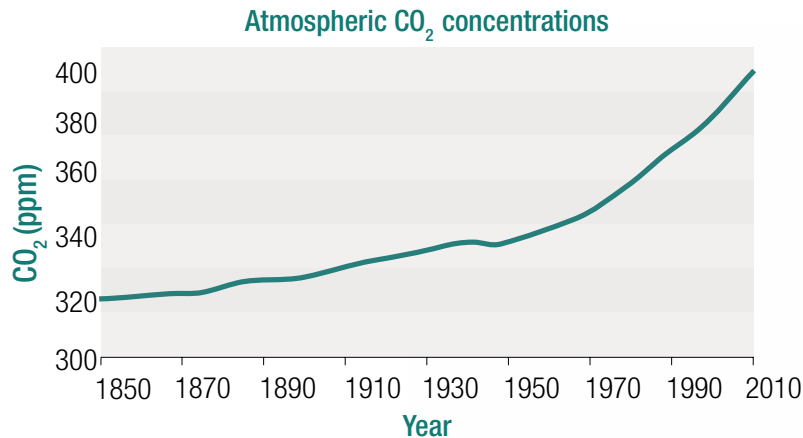
Carbon is one of the GHGs to have increased most dramatically in the atmosphere. Even as the emissions from hydrocarbons burned for everyday activities have increased, the absorptive capacity of forests has been decreased by deforestation.

The carbon cycle involves all living beings (for example, human and animals emit it when breathing; plants capture it with photosynthesis; decomposed, it is stored in fossil fuels) and many geological processes (such as emissions through volcanoes).



As if that were not enough, the forests and jungles of the planet have been dwindling at the same speed as CO₂ emissions have been increasing, yielding an unfortunate result for life on earth—the planet’s atmosphere is retaining more heat. Thus, the average temperature of the earth has increased slightly more than 0.7°C over the past 150 years (IPCC, 2007), and this has disrupted the balance of the planet’s climate.

Figure 4. CO₂ concentration in atmosphere over the past 150 years



Source: GEO 5 Report

For a long time, we believed climatic impacts were limited to areas of industrial activity. Today, we know that the atmosphere distributes them all over the planet, causing global effects. Climate change occurs in a cumulative fashion, that is, depending on the sum of all emissions of the world, large and small. All emissions count, and this is why we urgently need to take action to reduce emissions and keep the rise in the earth’s temperature to a minimum.

We also need to prepare for the climatic changes that will inevitably occur. Our cities and towns, our homes and schools, and our economic activities are not necessarily prepared for the effects—for example, the intensification of droughts and heat waves in some areas, or of rain and floods in others.



Climate change and schools

Schools are pivotal in initiating change. This is because schools are places where values, habits, and customs that transcend the school area are taught and learned par excellence. In a school environment it is possible to test different ways of mitigating climate change, such as through alternative technologies, intelligent building construction, gardens, lighting systems, water management, and so on.

As a school community participates in the identification of opportunities to reduce GHG emissions, members learn to identify all the daily actions that contribute to global climate change. As they become acquainted with new behaviors, habits, and patterns of resource use, these may be extended to individual homes and larger communities.

While climate change is our most pressing environmental problem, all the seemingly small environmental problems arising at the community level also adversely affect our quality of life (contamination of local water sources, deterioration of the quality of air because of the use of motor vehicles and the lack of control of industrial emissions, the contamination of the soil with pesticides, the degradation and deforestation of forests and jungles, and so on). Even though the contributions of a particular area or educational center may seem insignificant compared to the overall global problem, individual actions are necessary to maintain and improve communities' quality of life.

Box 3. Green schools

More schools are incorporating environmental topics into everyday school life, both in their curriculum and in school operations. Some take small actions, mainly related to the handling of waste, while others transform or build their facilities according to principles of sustainability applied from the outset.

It is interesting to note that these developments have emerged from very different sources: some from students, others from teachers, and yet others from school coordinators or administrators.



Throughout this kit, we provide examples of these experiences. Some are documented online and can be found using keywords such as green schools, ecological schools, or sustainable schools. Establish contact with school role models so they can share their experiences.

Improving the environmental performance of schools requires thinking about at least two issues:

- Consumption methods and how we manage each of the goods or services we use
- Technological conditions of school infrastructure that provide us with energy, water, or green areas, among others

In this set of materials you will find recommendations to optimally transform your school, from its facilities to its values, habits, and customs to members' homes and communities. You will find ideas that can be easily incorporated into daily activities at a low cost.

A first step toward transforming your educational space is to assess how it operates and how the school community perceives its operation. Under each topic addressed in this manual you will find tools that can help you conduct a diagnostic evaluation in a timely manner.

You will find that, for all the options we present, it is most important to identify and locate bad habits, acknowledge them, and understand and transform them. You will recognize the value of research as a daily activity, and the importance of developing monitoring and troubleshooting capabilities.

You will discover how satisfying and effective collaborative work is. It is essential for you to stay organized and improve your means of communication. As you accomplish the goal of transforming your school into an environmentally friendly space that abides by the rules of greater energy efficiency and lower environmental impact, you will also notice that you are preparing a different type of student, one who is more engaged with the school community, his or her immediate environment, and his or her global environment. In the end, the aim is for all who participate in these activities to become people with greater resources and capabilities to meet the challenges posed by the world today.

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