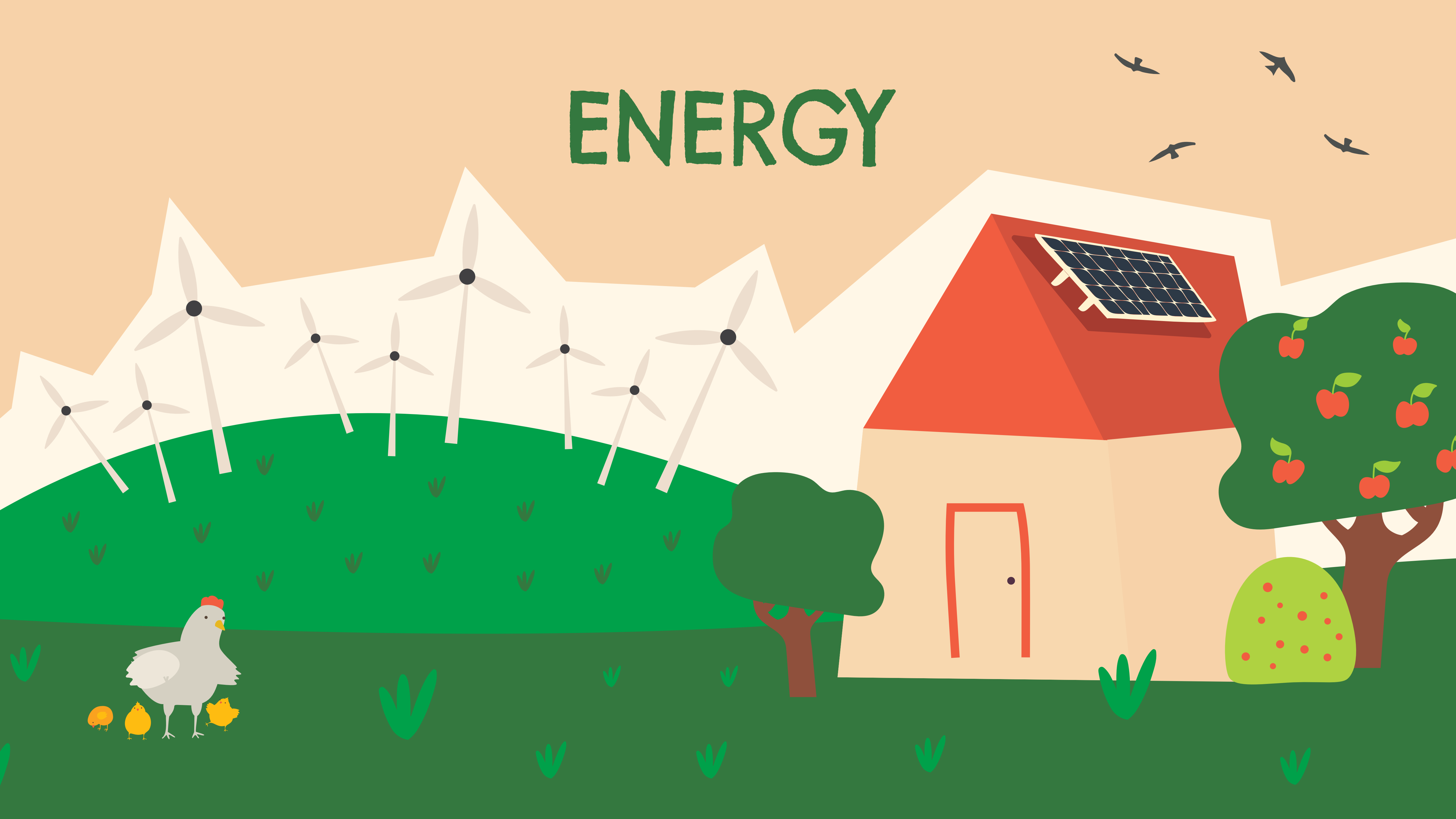


ENERGY



ENERGY

Objectives

- Establish the fundamental elements related to energy in its connection with sustainable development processes.
- Propose actions to teach people about all these aspects and achieve greater awareness of the issues.



ENERGY

the inherent capacity of all physical systems to carry out movements and certain tasks, generating transformations or changes. In the field of technology and socio-economic requirements, energy refers to the use of specific natural or other resources to achieve social or industrial results.

RENEWABLE ENERGIES

Power generated by converting natural sources of energy, for example, solar energy (from the sun), hydro energy (from water), eolic energy (from the wind), tidal energy (from the movement of currents), geothermal energy (from the heat of the earth), bioenergy or biomass energy (related to the capitalisation of organic and industrial matter).

Basic concepts:

NON-RENEWABLE ENERGIES

diminish as they are consumed - reserves of these energies are limited. These include energy derived from oil, coal or natural gas, as well as nuclear energy. Currently, we are undertaking excessive extraction and use of non-renewable energies, which is not sustainable and generates socio-environmental impacts. Oil, coal and natural gas are known as fossil fuels, and contribute to our carbon footprint, polluting the atmosphere by generating greenhouse gas emissions.

NUCLEAR ENERGY

Energy that comes from nuclear reactions or the radioactive decay of unstable atoms. There are serious concerns about the use of nuclear energy, as its various phases produce significant levels of radioactivity, ionising radiation that can affect living beings.

According to 2021 statistics, **over 1 billion people globally live without electricity, and another 3 billion use polluting fuels such as wood or other biomass to cook or heat their homes.**¹³⁴

Renewable energy is increasingly important to allow countries to develop modern, secure and clean energy systems. The transition to green and clean energy also has enormous potential to foster economic development and increase GDP.¹³⁵

According to UNEP,¹³⁶ and in the framework of the Sustainable Development Goals, particularly SDG 7 Affordable and Clean Energy, the number of people with access to electricity increased from 78% to 87%, and the number of people without energy fell to just under one billion between 2000 and 2016. The **energy sector is known to be a major contributor to climate change, accounting for around 60% of global greenhouse gas emissions.** To achieve SDG 7 by 2030, we need to invest in clean energy sources, such as solar, wind and thermal power, and to improve energy productivity. There is also a need to expand infrastructure and improve clean energy technology in all countries.

It is also crucial to stimulate energy savings, moving towards energy efficiency with more efficient production processes. We must try to reduce the amount of energy used and choose better technologies. For example, light-emitting diodes (LEDs) consume less energy than traditional light bulbs, as does the use of fluorescent lamps, or natural light. And, of course, we also need to act carefully and reduce unnecessary energy use in various social and economic activities.

¹³⁴ The World Bank. (2021). Energy. <https://www.worldbank.org/en/topic/energy/overview>

¹³⁵ UNEP. (2021). Accelerating the energy transition would benefit the environment and the economy in Panama <https://www.unep.org/news-and-stories/press-release/accelerating-energy-transition-would-benefit-environment-and-economy>

¹³⁶ United Nations Development Programme. (2021). Objective 7: Affordable and Clean Energy. <https://www.undp.org/sustainable-development-goals#affordable-and-clean-energy>



Our connections with energy

The human body requires energy for all its activities: for walking, moving, staying healthy and achieving a good balance (known as the “energy balance”). Food is the basic source of energy for all living beings, which is why care and a harmonious relationship with what we consume are essential to enhancing our natural connection with energy and to allow us to be always able to carry out all the necessary and daily actions of life itself. In this sense, organic, uncontaminated food can really become a good source of energy for everyone.

Social and economic relations with energy involve the use of various energy sources in order to obtain necessary resources, such as: lighting, home appliances (refrigerators, cookers, fans) and entertainment (radios, televisions, internet). Energy is also needed for industry to carry out all production processes. Access to energy transforms the lives of families in various areas including: education, access to information, mobility for greater connectivity, food, more efficient production systems, etc.





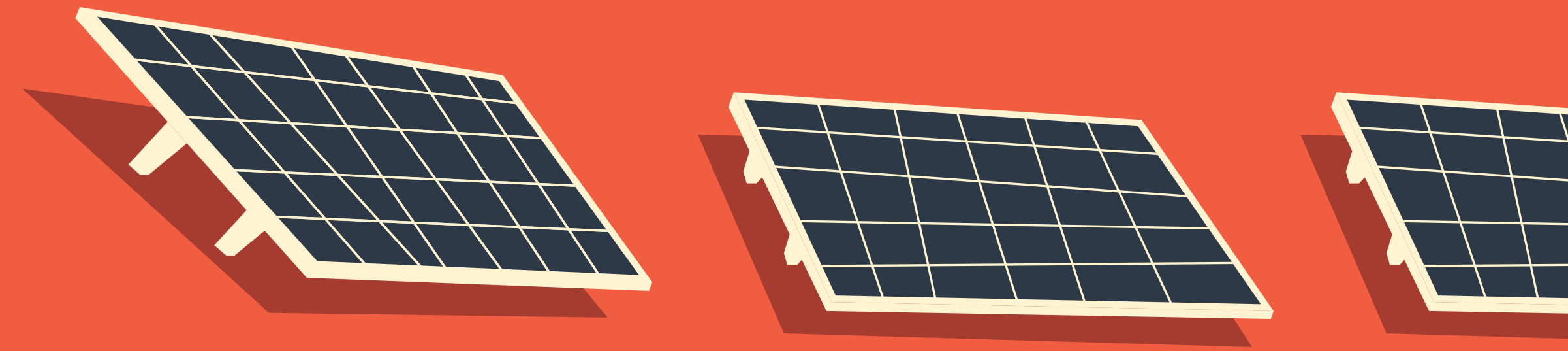
Energy can be seen through two lenses in the socio-economic fields: on the one hand, society, every individual, all social groups have to use energy properly to save energy and not waste it. On the other hand, industrial and extractive processes have to take the necessary measures to ensure that their actions do not pollute, affect water sources, forests, contaminate the air or lead to serious problems like climate change, soil deterioration, damage to biodiversity, noise generation and even the production of visual impacts, as in the case of some energy facilities. Similarly, **the state must play a fundamental role in creating the right conditions for a just and affordable energy transition.**



There are numerous cultural links to energy. Native or traditional communities perform various rituals to show their respect and gratitude for the sun, our energetic source of life, as well as to water, fire and the cosmos. The energy of Pachamama, of Mother Earth, is revered and cared for.

Cleansing and healing ceremonies are performed to allow people to balance their energies and recover their health. Sessions are held to articulate and share the energies of human groups, in a supportive and harmonious expression of solidarity. Support and accompaniment, for example, as part of the concept of Ayni used by Quechua and Aymara peoples, is expressed as a form of mutual aid, reciprocity and energy exchange.

Context in Latin America and the Caribbean:



A document by the Latin American Energy Organisation (OLADE)¹³⁷, entitled Energy Outlook of Latin America and the Caribbean 2018, **states that the region's energy sector is undergoing profound and continuous change, marked primarily by new technology trends in the sources and uses of energy.** One of these changes is the incorporation and gradual consolidation of non-conventional renewable energy sources into the regional energy matrix, with major advances in this direction occurring in some of the region's main economies.

The outlook found progress in electricity access: the number of people without access to electricity decreased from 20 million in 2016 to 19 million in 2017. It is worth noting that natural gas rose from 29% of the

primary energy matrix in 2012 to 34% in 2017. Energy security, which the International Energy Agency (IEA)¹³⁸ defines as: reliable, affordable access to all fuels and energy sources is an important issue.

An OAS document entitled Seguridad Energética para el Desarrollo Sostenible en las Américas (Energy Security for Sustainable Development in the Americas)¹³⁹ notes that **the region requires an ever-increasing energy supply to sustain economic growth and development, and therefore energy resources are under great pressure.** Current patterns of energy generation and consumption pose a threat to the environment, particularly with regard to CO2 emissions, and they add that governments in the Americas are increasingly aware that energy paradigms need an overhaul to be able to respond adequately to the challenge of providing secure energy.

¹³⁷ Organización Latinoamericana de Energía - OLADE (Latin American Energy Organisation). (2018). Energy Outlook of Latin America and the Caribbean. <https://biblioteca.olade.org/opac-tmpl/Documentos/old0424a.pdf>

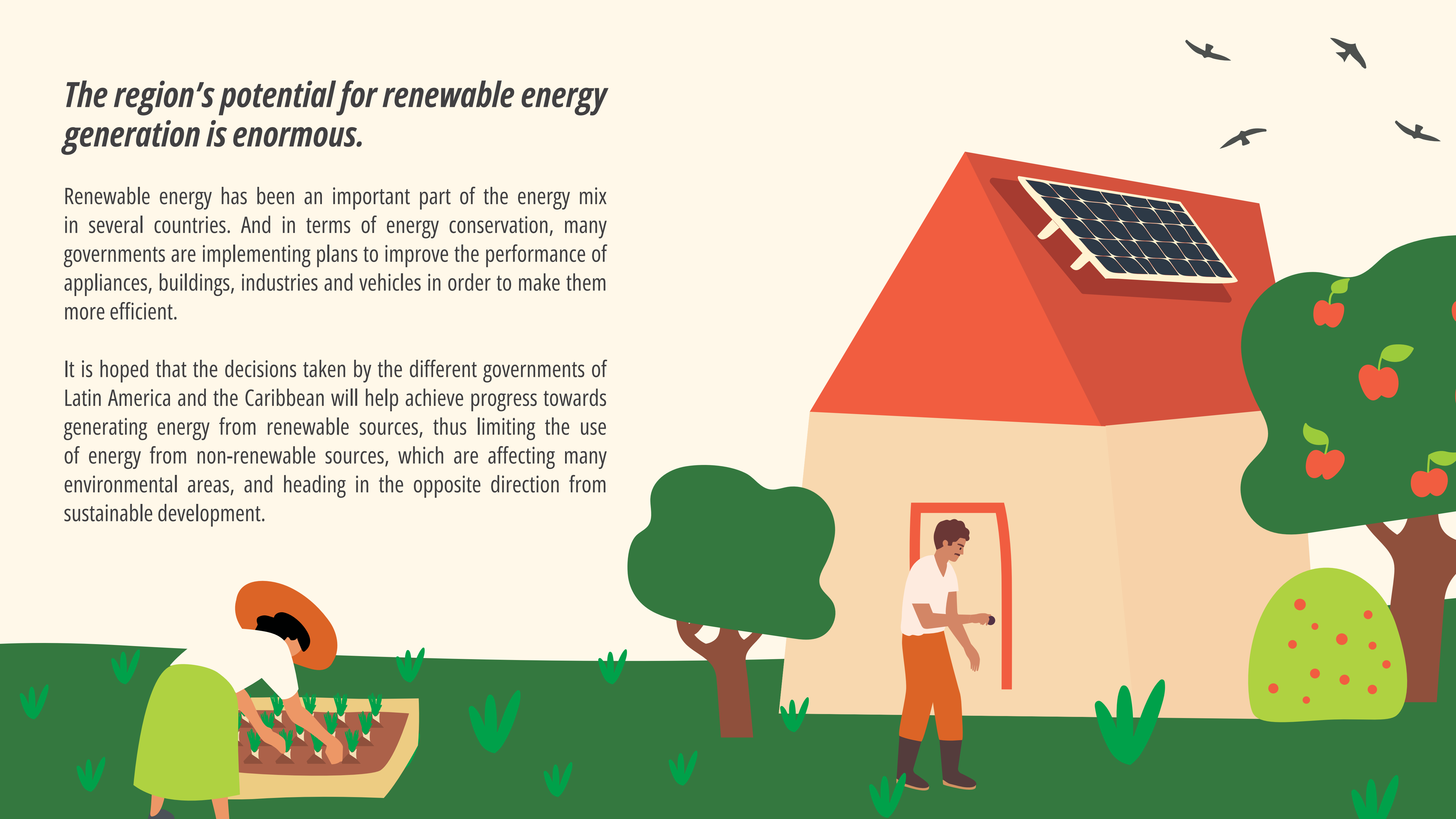
¹³⁸ International Energy Agency. (2021). Energy security - Topics. IEA. <https://www.iea.org/topics/energy-security>

¹³⁹ Organization of American States. (2018). (Seguridad Energética para el Desarrollo Sostenible en las Américas) Energy Security for Sustainable Development in the Americas. https://www.oas.org/dsd/publications/Documents/EnergySecurity_SPA.pdf

The region's potential for renewable energy generation is enormous.

Renewable energy has been an important part of the energy mix in several countries. And in terms of energy conservation, many governments are implementing plans to improve the performance of appliances, buildings, industries and vehicles in order to make them more efficient.

It is hoped that the decisions taken by the different governments of Latin America and the Caribbean will help achieve progress towards generating energy from renewable sources, thus limiting the use of energy from non-renewable sources, which are affecting many environmental areas, and heading in the opposite direction from sustainable development.

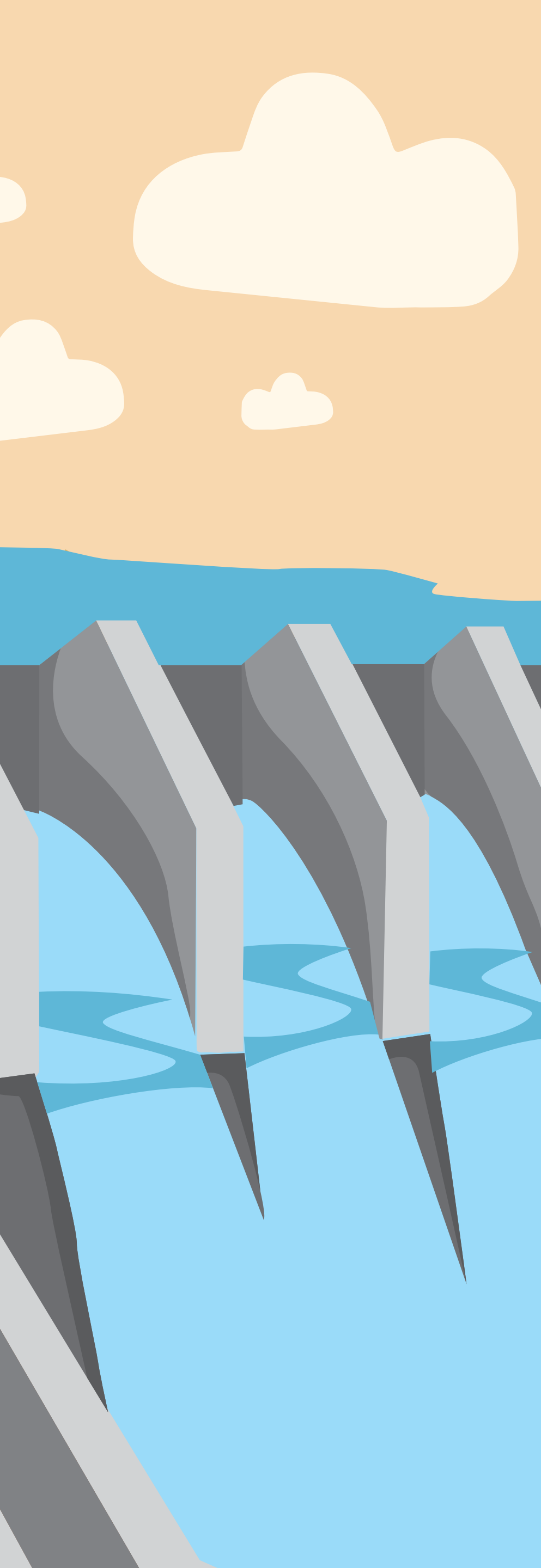


Context in Ecuador



The Implementation Plan for Ecuador's First Nationally Determined Contribution 2020-2025 (IP-NDC) states that, according to the Tercera Comunicación Nacional - TCN (Third National Communication) on Climate Change, the energy sector is the largest GHG contributor in the country. This sector's emissions are mainly caused by burning fossil fuels for energy production¹⁴⁰.

¹⁴⁰ Ministry of Environment and Water, Ecuador. (2017) Third National Communication



The current energy matrix produces electricity using a mix of hydropower, and the combustion of oil and its derivatives and natural gas; which produces GHG emissions. Transport is responsible for almost half of the emissions in this sector. As a result, the definition of and actions in this sector and sub-sector are very important for fighting climate change.

The Instituto de Investigación Geológica y Energética del Ecuador - IIGE (Institute for Geological and Energy Research of Ecuador)¹⁴¹ has the following main research topics: the generation and production of knowledge, the promotion of scientific and technological research, scientific innovation and training, energy efficiency, diversification of the national energy matrix, as well as promoting a greater participation of sustainable renewable energies, the development and use of diversified, non-polluting, low-impact technological practices that do not jeopardise food sovereignty, the ecological balance of ecosystems or the right to water. It is important to know their research in order to gain a vision of the future in this field.

¹⁴¹ Government of the Republic of Ecuador. (2021). Instituto de Investigación Geológico y Energético - Ecuador (Institute for Geological and Energy Research of Ecuador). Government of the meeting, Instituto de Investigación Geológico y Energético. <https://www.geoenergia.gob.ec/>

¹⁴² Gomelsky, R., Inter-American Development Bank (IDB), & United Nations Development Programme (UNDP). (2013). Rapid Assessment Gap Analysis - Ecuador. https://www.seforall.org/sites/default/files/Ecuador_RAGA_ES_Released.pdf

¹⁴³ United Nations. (2012). Sustainable Energy for All: A Global Action Agenda. <https://www.seforall.org/system/files/gather-content/SEFA-Action-Agenda-Final.pdf>

A study of the energy situation in Ecuador¹⁴² prepared by the former Ministry of Electricity and Renewable Energy shows that **Ecuador is an oil exporter, which plays an important role in the national economy and also dominates the energy matrix.** Oil is the country's largest export. The study also describes the main aspects that need to be considered.

The United Nations Sustainable Energy for All: A Global Programme of Action, known as SE4ALL¹⁴³, sets out three main goals: energy access, energy efficiency and renewable energy. All of them tend towards changing to an environmentally, socially and economically sustainable energy matrix, while supporting the improvement of the living conditions of the poorest people, which coincides with Ecuador's major objectives. Achieving these objectives will therefore have a major impact on the social and economic transformation of the country.

Ecuador is home to extensive development of renewable energies for electricity generation based on existing and new hydroelectric projects, as well as open spaces in the current regulations for private generation with non-conventional renewable energies and hydroelectric plants. There are also programmes and projects towards energy efficiency and the use of renewable resources, which are in demand in the productive sectors, and in order to drive progress on these issues.

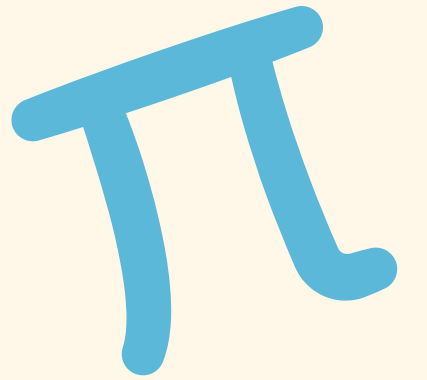
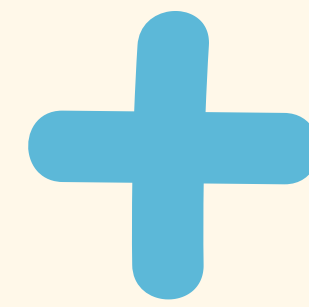
One conclusion states that one of the areas that requires more attention in Ecuador and may require additional technical cooperation support or funding is: thermal energy for cooking, efficiency and the use of renewable energies in the productive sectors, and access to electricity for isolated localities or dwellings.

Ecuador's Nationally Determined Contribution, which sets out its efforts and commitments to reduce national emissions and adapt to the impacts of climate change, includes the following projects in the energy sector: the development of hydroelectric power plants, improving energy efficiency by reducing gas flaring and using gas associated with oil for electricity generation and to produce Liquefied Petroleum Gas (LPG), reinforcing wind power, solar power and landfill biogas, promoting efficient public transport and efficient cooking by replacing LPG cookers with induction cookers.¹⁴⁴

¹⁴⁴ Ministry of Environment and Water Ecuador. (2019) Nationally Determined Contribution

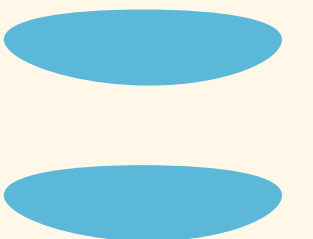
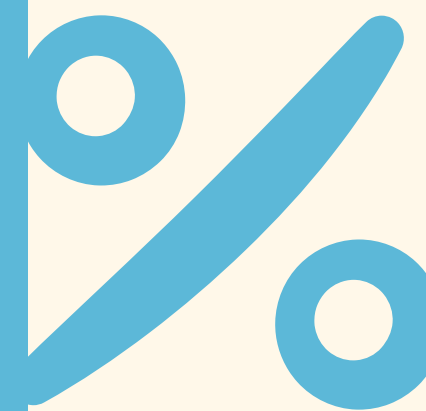


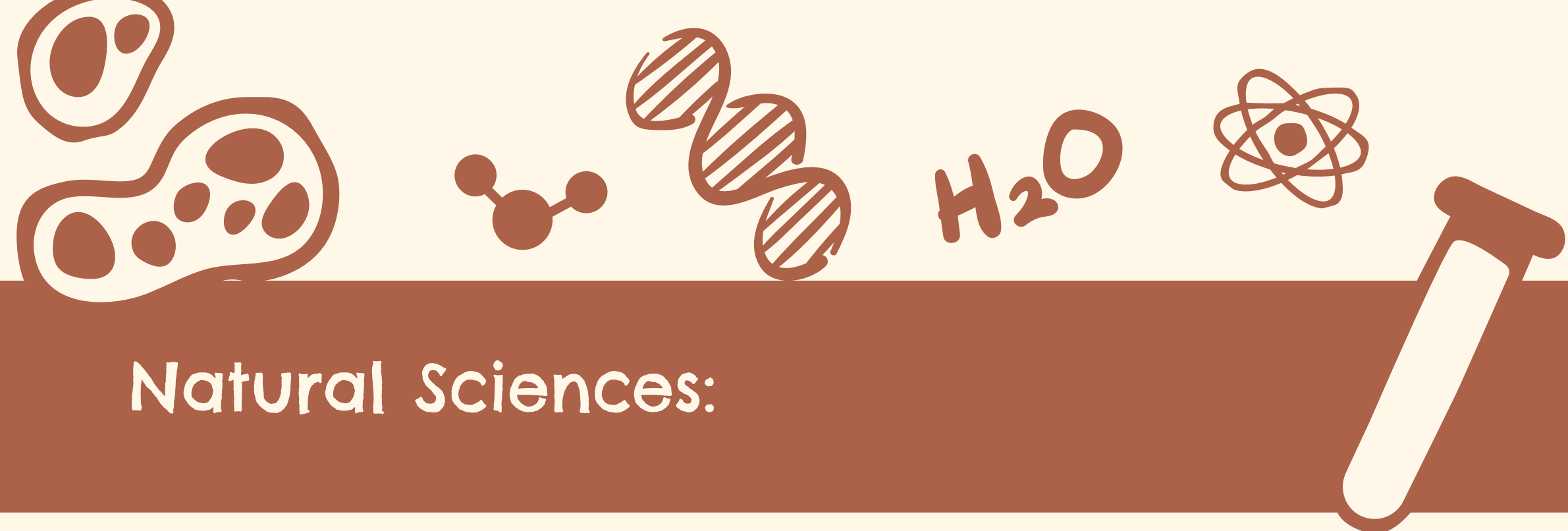
Thematic contributions



Mathematics:

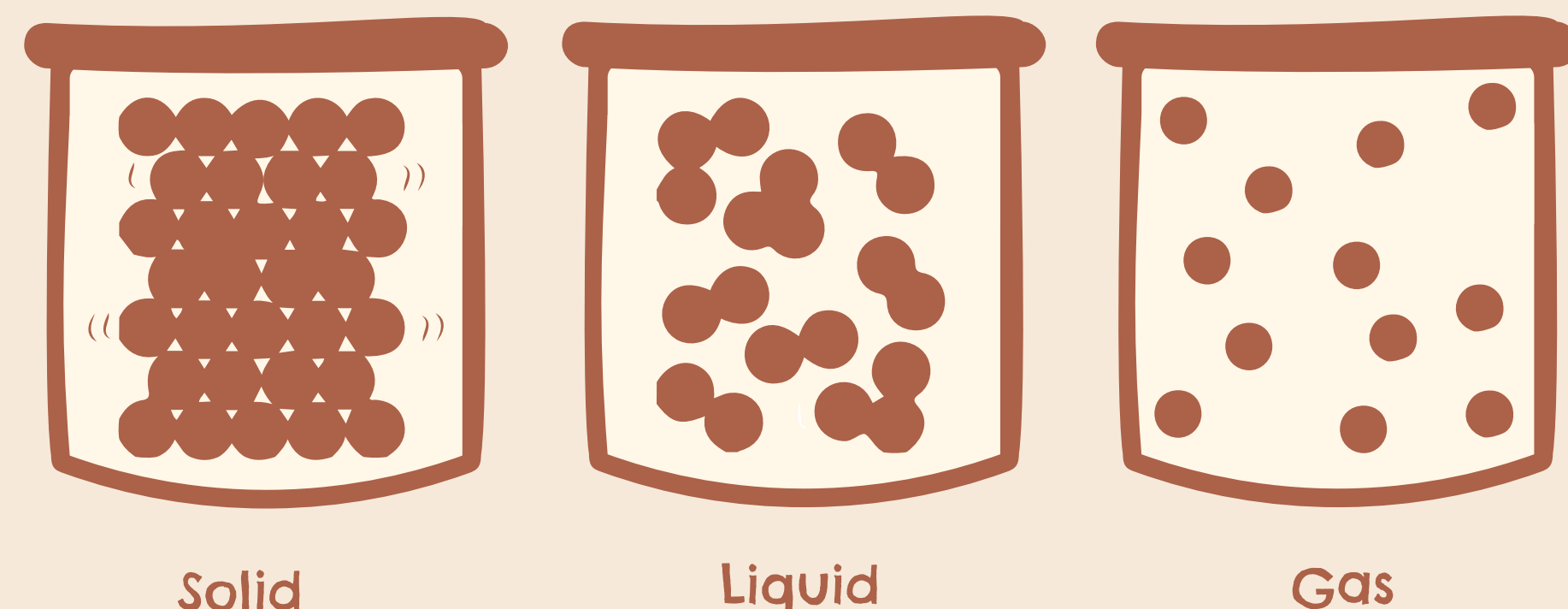
- Establish the main parameters involved in calculating energy consumption in an average household, regarding the use of a few common appliances.
- Propose an analysis of ways to make energy savings that can be carried out in each household, and calculate the financial savings that the reduced energy consumption would entail based on the basic official cost of electricity.





Natural Sciences:

- Start from the subject of matter as related to volume and mass; and its solid, gaseous and liquid states; or to relate matter to energy and energy sources, by explaining how these make matter move or change.
- Explain the differences between energy types: renewable or non-renewable, their current use and the most important consequences to consider.



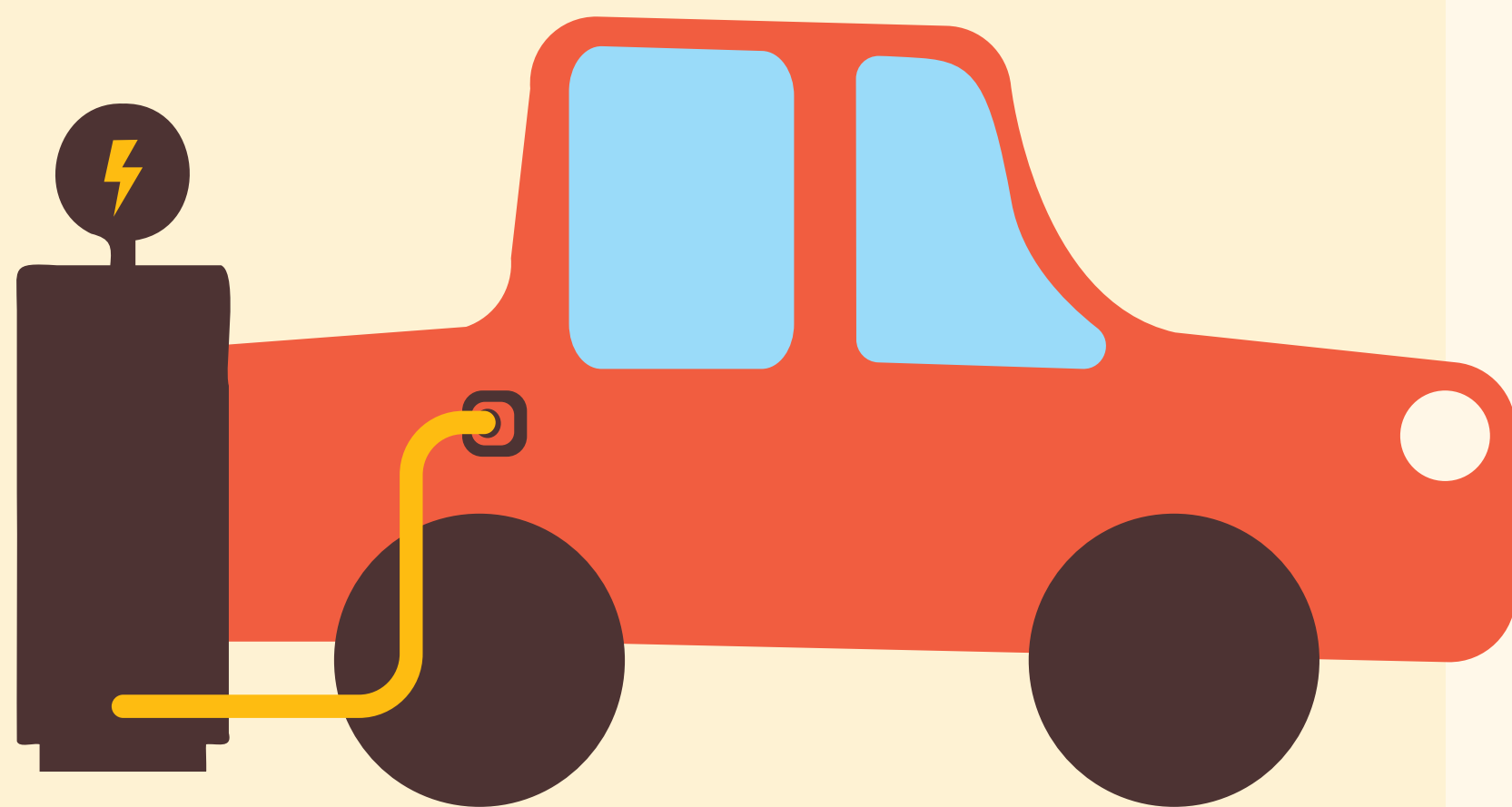
Language and Literature:

- Invite the group to write and discuss a story about our use of energy from non-renewable sources, which will one day run out, and that are currently polluting our environment.
- Define and highlight some of the main contemporary expressions related to energy, such as: energy security, energy efficiency, unsustainable consumption, etc.



Social Sciences:

- Identify historical processes of social and economic change in relation to energy use and how this relates to climate change. Emphasise the importance of social responsibility for good energy use.
- **Analyse the main approaches involved in our need to use non-renewable energies that progress towards sustainable development.**

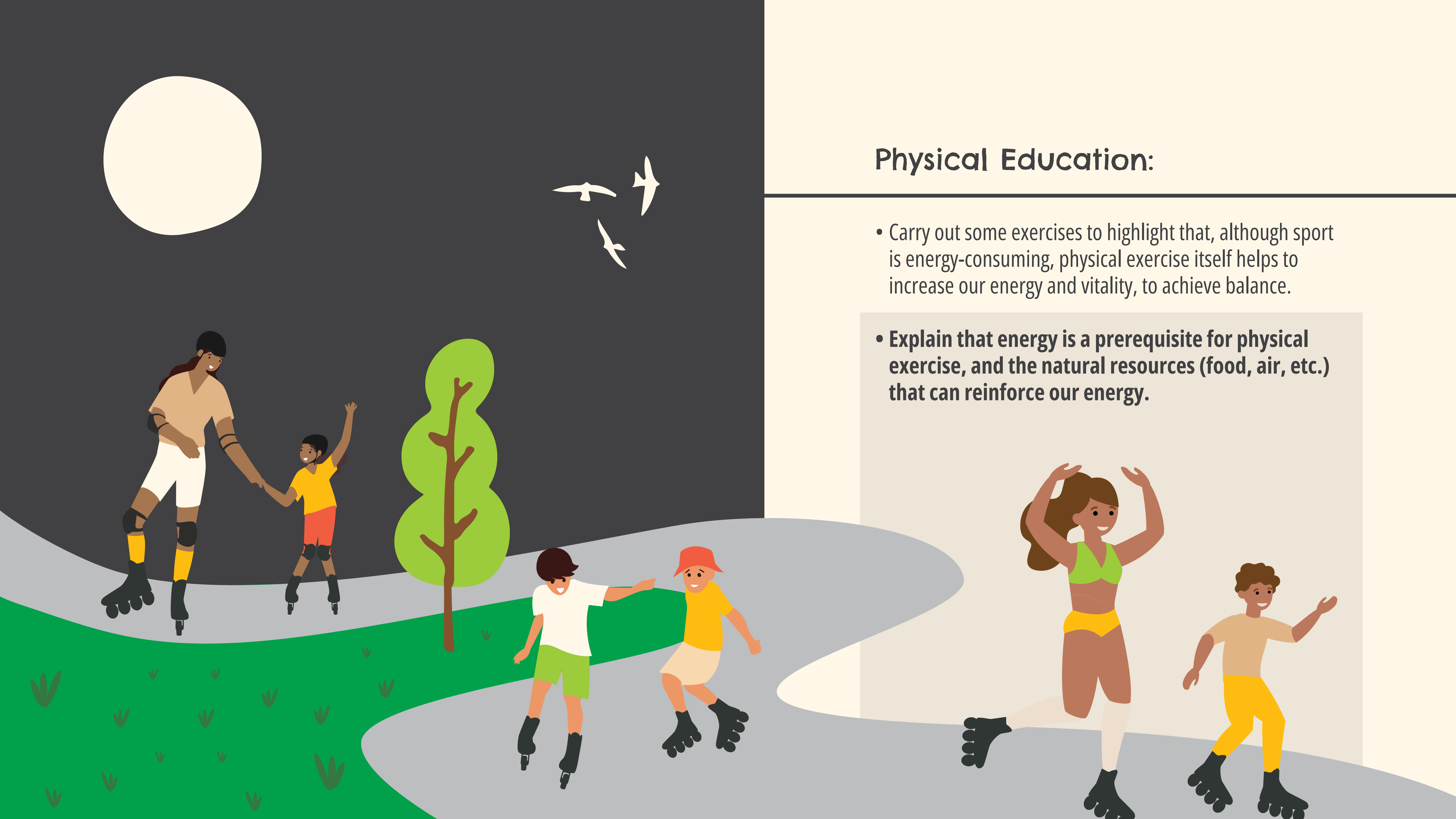


The Arts:

- Invite students to make drawings or posters illustrating the main renewable energies (solar, wind), as a way of presenting them in an artistic way to interest people.
- Produce a model or drawing of a sustainable city that includes energy principles.
- **As a group, produce cartoons to show the ways and importance of saving energy in a funny and attractive way.**

Por ejemplo: For example: boys and girls turning off lights, cycling, changing light bulbs for LEDs, unplugging equipment, etc.





Physical Education:

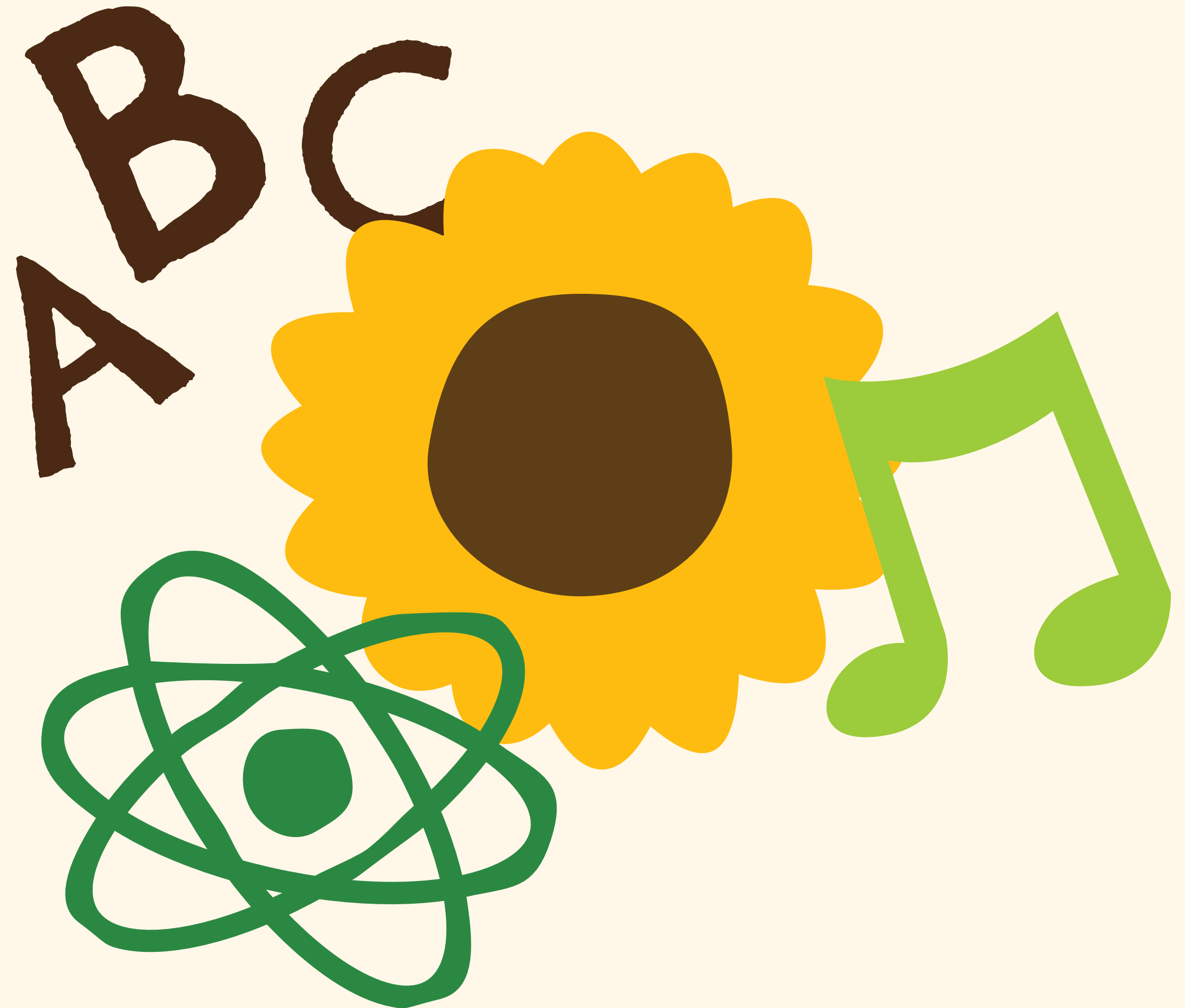
- Carry out some exercises to highlight that, although sport is energy-consuming, physical exercise itself helps to increase our energy and vitality, to achieve balance.
- **Explain that energy is a prerequisite for physical exercise, and the natural resources (food, air, etc.) that can reinforce our energy.**

Potential interdisciplinary activities

Once teachers have made their subject contributions for classroom use, the Interdisciplinary Committee meets to design and agree on a common Desirable Scenario. For example:

"Students are actively involved in the design and development of a travelling exhibition to raise local community awareness of the importance of energy and energy saving."

Once some of the details, approaches and scopes of the Scenario have been drafted and specified, organise interdisciplinary activities to celebrate and educate people in this subject at the educational centre and/or with the community.



“THE SUNFLOWER” TRAVELLING EXHIBITION ON ENERGY

1. Example of an interdisciplinary activity on energy

Main theme and focus: Preparation of a series of thematic panels by the students, with the help of teachers and possibly volunteers, parents, to express the importance of energy and saving energy, and to create a travelling exhibition to raise awareness in the community surrounding the school.

What is a travelling exhibition? A thematic exhibition that can be presented and moved to different spaces (public squares, cultural centres, etc). Therefore, it should be easily adaptable, easily transportable and able to be placed in different locations. This is achieved using folding or free-standing panels.

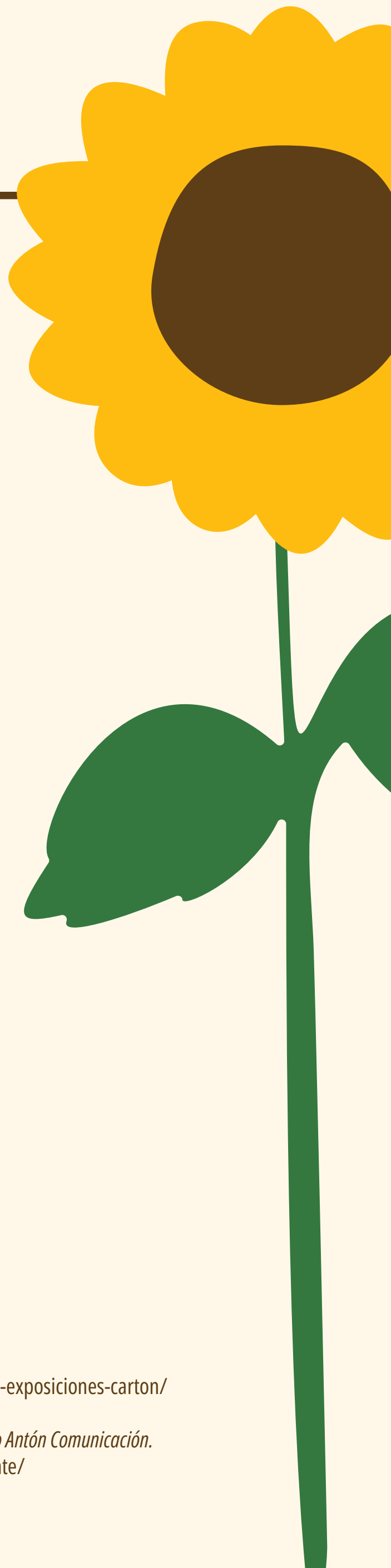
The focus will be on the students’ contribution to the wider community, expanding their knowledge and understanding of the main issues in this field. The travelling exhibition could be called Sunflower, as this plant symbolises energy and the sun, both because it follows the sun and because of its many uses. It has now become a symbol of energy and solar panels.

Preparatory activities

The advantages and possible results of this exhibition are analysed in previous meetings involving the teachers and educational centre management. These sessions are complemented with a few conversations with the local authorities, people linked to community and neighbourhood organisations, non-governmental organisations, companies, etc. All this is to raise the idea of the exhibition and gain support for its implementation and subsequent presentations in public places. All consultations emphasise that the exhibition is a student and school contribution to the general public’s awareness of energy issues.

The type of panels to be constructed and the materials that can be used and are readily available will be defined on this basis. There are many interesting experiences and models, especially with cardboard. Other materials such as cork, newspaper, wooden frames, etc. can also be used.

¹⁴⁴ Ver por ejemplo, estos 3 modelos y propuestas:
CartonLab. (2021). *Consejos para diseñar una exposición con soportes de cartón*. <https://cartonlab.com/blog/diseño-de-exposiciones-carton/>
Rubio, S. M. (2013). *Exposiciones de cartón*. Museo, Go Green! <https://museogogreen.com/2013/01/17/325/>
Grupo Antón Comunicación. (2015). *El cartón que envuelve nuestras ilusiones, el cartón de MADE IN ALICANTE* - Blog Grupo Antón Comunicación. <https://www.grupoanton.es/ntn/2015/12/10/el-carton-que-envuelve-nuestras-ilusiones-el-carton-de-made-alicante/>



2. Contents of the main exhibition panels:

The following are a few suggestions for the content of the main panels, starting from a common style: Each topic should be accompanied by drawings, photos or suggestive and explanatory images, and should also include a brief explanation of the topic, with lettering and wording that makes it easy to read and understand for different types of people. You don't need to include panels explaining every kind of energy, focus on the ones that are more relevant and easier to understand for the target audience.

Panel 1. *What is energy?* Types of renewable and non-renewable energy: A short introductory sentence defining the energy, its symbolic relationship with the Sunflower, and a list of the main types of energy, with a call for interest and participation.

Panel 2. *Electricity:* how it is generated in the country, and locally, its importance.

Panel 3. *How can we save energy?* List of the main actions to save energy in homes, offices, premises, etc. For example:

- *Take advantage of natural light by opening windows as much as possible*
- *Turn electrical appliances off when not in use*
- *Turn lights off when you leave the room*
- *Use energy-saving light bulbs (LED, fluorescent and others)*
- *Only open the refrigerator or cooler only when necessary, and close it quickly.*
- *Only iron essential garments*
- *If you need fans or heaters, use them sparingly and turn them off when the temperature improves.*

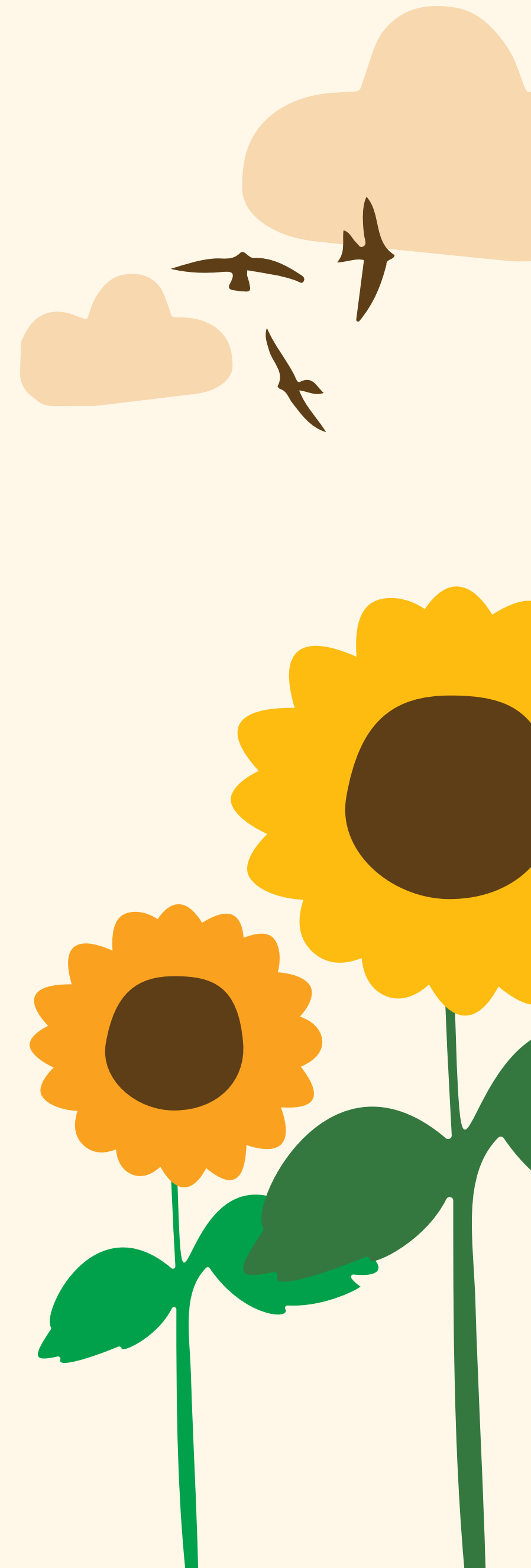
Panel 4. *Wind energy:* Source and use of winds, connection with windmills. Advantages: renewable, non-depleting, clean, no impact on the soil. Difficulties: local wind variations, can affect the natural landscape, sometimes produce noise.

Panel 5. *Hydropower:* Its use in dams, rivers, etc. Advantages: low costs, various applications in industry, low CO2 emissions. Disadvantages: impact on local fauna and flora, terrestrial flooding, impact on rivers and wetlands.

Panel 6. *Solar energy, solar panels:* This form of energy comes from the sun in the form of light, heat and ultraviolet rays. Advantages: the sun does not run out, panels do not pollute and are easy to install in places that are difficult to access, in homes or elsewhere. Disadvantages: there can be changes in the sun's radiation and panels depend on rhythm of day/night, as well as the angle at which the sun is received.

Panel 7. *Biomass energy:* Obtained from organic compounds. Advantages: obtaining them is a natural process, waste can be eliminated and put to a new, non-polluting use. Disadvantages: toxic gases can sometimes be produced during combustion if not carried out properly.

Panel 8. *Conclusions:* Thank exhibition participants and visitors for their interest in energy, and include phrases to encourage everyone to continue caring for and saving energy, with their non-polluting and renewable approaches. A notebook for comments and suggestions is placed nearby. You could promote the idea of putting on a play or travelling event to explain energy dynamics and types.





3. Presentation and tour of the exhibition.

The first presentation takes place at the school. Comments and suggestions about the details and possibilities for future tours are invited. This presentation is attended by participating students, who will act as exhibition guides.

This “première”, and any relevant adjustments launch the tour, which is based on the agreements reached with the authorities, community leaders, young people or those responsible for companies or businesses. This tour could comprise three or four presentations in different locations, depending on the surrounding areas: urban or rural, etc.

4. Final report.

Once the planned tour has been completed, keep the panels for future use or other environmental dissemination purposes. Carry out an initial assessment of the results and thank the students, teachers and other participants for their work.

FOLLOW-UP TO THE EXPERIENCES RELATED TO THE TRAVELLING EXHIBITION

2. Example of an interdisciplinary activity on energy

Main theme, approach and guidelines: The main themes to be studied further at the educational centre are established on the basis of the experience obtained through the travelling exhibition, and in accordance with the suggestions made by the organisers and visitors.

It will be interesting to follow up creatively with input from a variety of people. This monitoring can reflect and take action.

For example:

- The participants identify a need to learn more about some aspects of renewable energies, in which case workshops could be organised to address their main terms.
- There is interest in carrying out a green school diagnosis on the appropriate use of energy (see the example of the green school diagnosis on solid waste). Recommend putting up signs to remind people to turn off all computers and lights when leaving a room.
- A specific idea for a targeted media campaign is raised, in which case the issues that attracted most public attention would be addressed. These and other creative follow-up actions are important, as it is essential that pupils understand that every action taken must be analysed and followed up to ensure sustainable environmental education.



Evaluation of the activities carried out



The Desirable Scenario designed in the Interdisciplinary Roundtable is taken as the main reference for evaluating the activities carried out. In the case of energy, this was: “Students are actively involved in the design and development of a travelling exhibition to raise local community awareness of the importance of energy and energy saving.” For evaluation purposes, two main objectives can therefore be considered to have been pursued:

- Raise community awareness on energy issues and energy saving.
- Provide elements for monitoring this process.

Four general criteria could be used to evaluate the activities carried out. These can be developed into specific indicators at the educational centres, according to the various educational levels/ages, different subjects and based on the established pedagogical approaches.

EVALUATION CRITERIA	MAIN FOCUS	CENTRAL THEME: ENERGY						COMMENTS AND PROPOSALS
		ACTIVITY 1. Travelling exhibition on energy			ACTIVITY 2. Follow-up to lessons learned			
		LEVELS			LEVELS			
KNOWLEDGE <i>Energy, renewable energy, non-renewable energy, nuclear energy.</i>	<i>Extent to which understanding of key issues has been achieved</i>	HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW	
PARTICIPATION, INTEREST <i>Participation in the design of the panels, their preparation and presentation. Public interest.</i>	<i>Level of participatory process, motivation and commitment</i>							
OUTPUTS OBTAINED <i>Exhibition designed, produced and presented. Eight Panels</i>	<i>Achievement of visible, concrete results</i>							
FOLLOW-UP PROPOSALS <i>Proposals for further use and new exhibition spaces</i>	<i>Presence of new ideas, projects and suggestions</i>							

Rationale for the Guidelines

Environmental education is transversal. As an effective and transformative tool, it is key to the fulfillment of the Sustainable Development Goals. The Environmental Education Guide is presented as part of the 2021- 2022 Work Plan and at the request of the member countries. The guide contains ten thematic environmental booklets designed to be reference material for primary school teachers and environmental trainers to support the inclusion of environmental themes and concepts in the formal and informal education sector. They were developed to generate collective reflection that helps people identify ways to solve environmental challenges.

The Environmental Training Network is an intergovernmental platform, coordinated by the United Nations Environment Program (UNEP) and comprising eighteen environmental education focal points within the Ministries of Environment. The network aims to strengthen and share knowledge and experiences in environmental education in the region, and defines itself as a community that promotes action, cooperation, and the exchange of experiences and knowledge in environmental education, both face-to-face and online.

The Network reports to the Forum of Ministers of Environment of Latin America and the Caribbean. The Environmental Education Decision was adopted In Cartagena, Colombia, 2016, consolidating regional commitment to environmental education as a key element to transform values, behaviours and visions. During the XXI Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean (Buenos Aires, Argentina, 2018), in the Declaration of Buenos Aires, the countries agreed: “To strengthen environmental education as a cross-cutting issue and provide more support to the Environmental Training Network of Latin America and the Caribbean to promote cooperation in the exchange of experiences among the countries of the region, generating synergies with other initiatives and Rationale for the Guidelines networks that promote environmental education”. It also responds to the UN Decade on Ecosystem Restoration: Action 3. Take ecosystem restoration into schools with the inclusion of a notebook focused on Ecosystem Restoration in Latin America.

