

AIR



AIR

- Raise awareness of the importance and main characteristics of air, as well as the causes and effects of air pollution.
- Contribute to promoting better air quality locally and in the region



AIR

Air is essential for life, breathing is absolutely vital for the human body, and all other living things. Air is a mixture of gases found in the atmosphere, which are attracted to the surface of our planet due to the force of gravity.

It is composed of approximately 78% Nitrogen (N), 21% Oxygen (O₂) and 1% of other substances, such as water vapour (related to local humidity), Ozone (O₃), Carbon Dioxide (CO₂), Hydrogen (H) and inert gases such as Krypton (Kr) or Argon (Ar).

Basic concepts:

WIND

It is a movement or flow of air in the atmosphere. It is the air, moving naturally, as a result of atmospheric conditions. Wind formation is related to differences in atmospheric pressure, caused by temperature changes. Cold air is denser and therefore moves downwards, and warm air is less dense and moves upwards.

ATMOSPHERIC PRESSURE

The weight of a column of air on any point or place on Earth. The higher the altitude, the lower the atmospheric pressure and vice versa.

BREEZE

A gentle wind. It could be the wind blowing gently from the sea onto the land, known as sea breezes, or valley and mountain breezes, caused by temperature changes at the peaks or valley bottoms.

HURRICANES

If the wind is very strong, especially if it rotates in a circle, it causes hurricanes, cyclones or tornadoes. These are generally stormy weather systems that bring rain and very intense winds, and can cause dangerous situations in the places they cross.

OZONE LAYER

This band of ozone is located approximately 19-23 km above the Earth's surface, in the layer of the atmosphere called the stratosphere. It forms a kind of shield that filters ultraviolet radiation and protects the earth from the sun's rays. Some polluting chemicals known as Ozone Depleting Substances (ODS) destroy the ozone in this protective layer, causing serious consequences..

SHORT-LIVED CLIMATE POLLUTANTS

They are also known as near-term climate forcers and include: methane (CH₄), black carbon (BC), tropospheric ozone (O₃) and some hydrofluorocarbons (HFCs). These pollutants have a significant climate impact as they have a high capacity to absorb the heat in the atmosphere and have estimated lifespans ranging from a few weeks to 15 years, which is shorter than the lifespan of CO₂ (about 100 years). Black carbon is also one of the main components of fine particulate matter (measuring less than 2.5 microns - PM_{2.5}); along with ozone, it is a form of air pollution with serious effects on health and the environment.



Basic concepts:

AIR POLLUTION

It is a serious problem for health and life. Air pollution may have various origins; it is mostly caused by socio-economic activities, such as energy production from combustion, mining, construction, transport, industry, agricultural and livestock activities. Burning fossil fuels (such as coal, oil, natural gas) emits pollutant gases that affect the air, including carbon dioxide (CO₂), sulphur oxides, nitrogen oxides, carbon monoxide (CO) and particulate matter. **These compounds pollute our air and can also cause acid rain, which affects plants, soils and agricultural yields.**

⁸⁴ United Nations. (2021a). Climate Change | United Nations. <https://www.un.org/en/global-issues/climate-change;> <https://www.ipcc.ch/>

GREENHOUSE GASES

These gases can trap heat in the atmosphere and are recognised in the Kyoto Protocol: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and fluorinated gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). After more than a century and a half of industrialisation, deforestation and large scale agriculture, the quantities of greenhouse gases in the atmosphere have risen to record levels not seen in three million years.⁸⁴

GREENHOUSE EFFECT

The emission of gases that can trap heat in the atmosphere, mainly due to **anthropocentric activities, leads to an increase in the earth's temperature that is affecting the climate and exacerbating climate phenomena.** Greenhouse gases prevent the sun's rays from reflecting, causing them to remain partially in the atmosphere, retaining solar energy. In cities, the main sources of greenhouse gases are: **industrial activities, transport, increased energy demand or inadequate waste management.** In rural areas, agricultural burn-offs, poor livestock farming practices, the use of solid fuels such as wood or charcoal for cooking or heating, and forest fires are the main sources of these gases and also pollute the air, causing serious health impacts. All these processes have consequences for health and the planet.



Our connections with air

Air represents life, so our relationship with air symbolises our ability to stay alive, to breathe, to feel, to fill our lungs with every breath and at all times. We sigh when we're feeling emotional. When a fresh breeze comes from the sea or mountains, we feel at peace, as if surrounded by balance and vital freshness. With this air, nature leads us to feel part of her. The scent of the air after a storm or the smell of wet grass is soothing. The fragrance of flowers and aromatic plants contributes to our well-being and mental health.




We have many social connections with the air. If we are chatting to friends in a peaceful environment, words travel through the air, with the aromas of the food or drinks we are about to enjoy, generating pleasant and peaceful moments. Every social, work and home environment is related to the air, from many angles: noise makes us irritable and nervous, any polluting gases affect our health and foul smells make us uncomfortable. But if the air carries relaxing music, our mood improves. In short, we are always vitally connected to the air. This link can be pleasant and stimulating or become a threat to life and tranquillity.

Many LAC traditions are related to music, and especially wind instruments. Ancient sounds are still played on zampoñas, sikuris and all kinds of reed and wood flutes. Similarly, all over the world, native peoples and communities perform ceremonies involving aromas and incense, which contribute to processes of concentration and prayers, as in all religions.



Context in Latin America and the Caribbean



According to the Pan American Health Organisation (PAHO)⁸⁵, **air pollution is the main environmental health risk in the region. It is estimated that globally one in nine deaths are the result of conditions related to air pollution.** In Latin America, 79% of the population lives in towns and cities with more than 20,000 inhabitants, representing a major demand for energy, services, materials and goods production and consumption, freight transport and human mobility. Activities that require high energy consumption and have low efficiency, plus solid waste management, are another important factor as they are a permanent source of polluting emissions.

A series of individual and social actions are being promoted in the various countries in the region. These must be strengthened to improve the quality of the air we breathe. These actions include: **promoting electric vehicles, the use of public transport, reducing private car traffic or promoting intensive use (carpooling),**

encouraging the use of bicycles, reducing the waste we produce, protecting urban wooded areas and green spaces, promoting non-polluting industrial, agricultural and livestock processes, etc.

The XXII Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean held in 2021 asked LAC countries to re-establish the Intergovernmental Air Pollution Network and update its action plan. The Regional Action Plan on Air Quality 2022-2025 was developed in compliance with this Decision to establish a cooperation framework to reinforce integrated air quality management in the Latin American and Caribbean region, at national and sub-national level, and to facilitate and promote actions to reduce air pollution to protect health and the environment, contribute to climate change mitigation and make progress on achieving 2030 Agenda for Sustainable Development objectives⁸⁶. Today, all these regional efforts are vitally important for improving air quality through the fundamental mechanisms of mutual cooperation.

⁸⁵ Pan American Health Organization. (2016). Air Quality. Regional Office for the Americas of the World Health Organization. https://www.paho.org/en/topics/air-quality?option=com_content&view=article&id=12918%3AAmbient-air-pollution&Itemid=72243&lang=en

⁸⁶ Regional Action Plan on Air Quality for Latin America and the Caribbean 2022-2025 [[español](#)] [[english](#)]

Context in Ecuador



The Ecuadorian Norma Ecuatoriana de la Calidad del Aire (Air Quality Standard)⁸⁷ aims to preserve human health, air quality, the well-being of ecosystems and the environment in general. Article 86 of this standard establishes the maximum limits permissible for concentrations of criteria pollutants (which define the air quality alert, alarm and emergency levels) and unconventional pollutants, at ground level in ambient air. It also establishes air quality alert, alarm and emergency plans, as well as specific methods and standards.

The introduction to Ecuador's Plan Nacional de Calidad del Aire (National Air Quality Plan)⁸⁸ **states that the Constitution of the Republic establishes that the State shall protect its people's right to live in a healthy and ecologically balanced environment, which ensures sustainable development.** It shall ensure that this right is not compromised and shall guarantee the conservation of nature.

⁸⁷ Secretaría de Ambiente de Ecuador (Secretariat of the Environment of Ecuador). (2021). Norma Ecuatoriana de la Calidad del Aire (Ecuadorian Air Quality Standard). <http://www.quitoambiente.gob.ec/index.php/norma-ecuatoriana-de-la-calidad-del-aire>

⁸⁸ Ministry of the Environment of the Republic of Ecuador. (2010). Plan Nacional de Calidad del Aire (National Air Quality Plan). <https://www.ambiente.gob.ec/wp-content/uploads/downloads/2012/10/libro-calidad-aire-1-final.pdf>

In Ecuador, air pollution is caused by deficiencies in some aspects related to the territorial planning of human settlements, industries, the use of obsolete production technologies and transport activities, poor fuel quality, open-pit mining and others. The National Air Quality Plan's main objective is to achieve the adequate environmental management of air quality, in order to protect human health, natural resources and cultural heritage, thus contributing to the improvement of the quality of life in Ecuador.

The World Health Organisation (WHO) considers **Ibarra and Ambato as exemplary cities in Latin America in which inhabitants breathe the cleanest air.** It is important to facilitate social support for ongoing processes, and gradually advance air quality improvement programmes, involving various social and economic sectors.

Few studies on the health impacts of air pollution in Ecuador are available (FLACSO/MAE/UNEP, 2008; Ministry of Environment, 2010; Moreira Romero, 2018). However, some evidence has been found; according to the Ecuadorian Ministry of Public Health, around 1,770 people die due to air pollution each year. Of these, approximately 85 are children⁸⁹. Most studies point to causes related to respiratory diseases, while other research has concluded that school-age children are most affected by breathing difficulties due to air pollution.⁹⁰



⁸⁹ Ministry of Public Health (2016)

⁹⁰ UNICEF Ecuador. (2020). El aire que respiramos: Los efectos de la contaminación del aire y del cambio climático en la salud de la niñez en el Ecuador (The air we breathe: The effects of air pollution and climate change on children's health in Ecuador.)

Thematic contributions



Exact sciences

(mathematics, chemistry, physics, computer science):

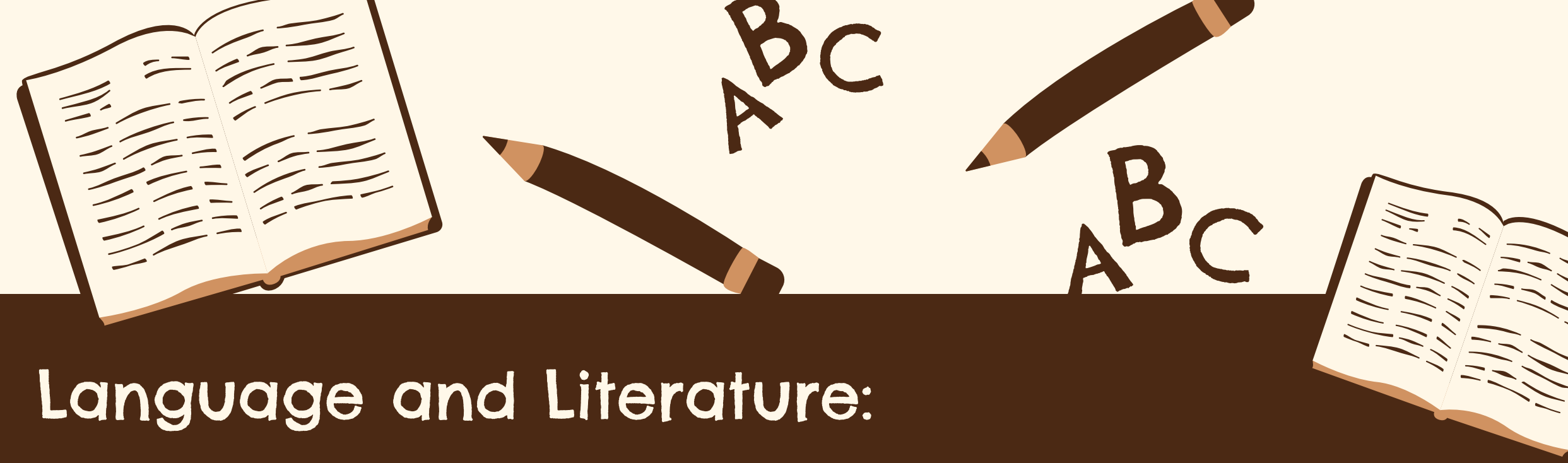
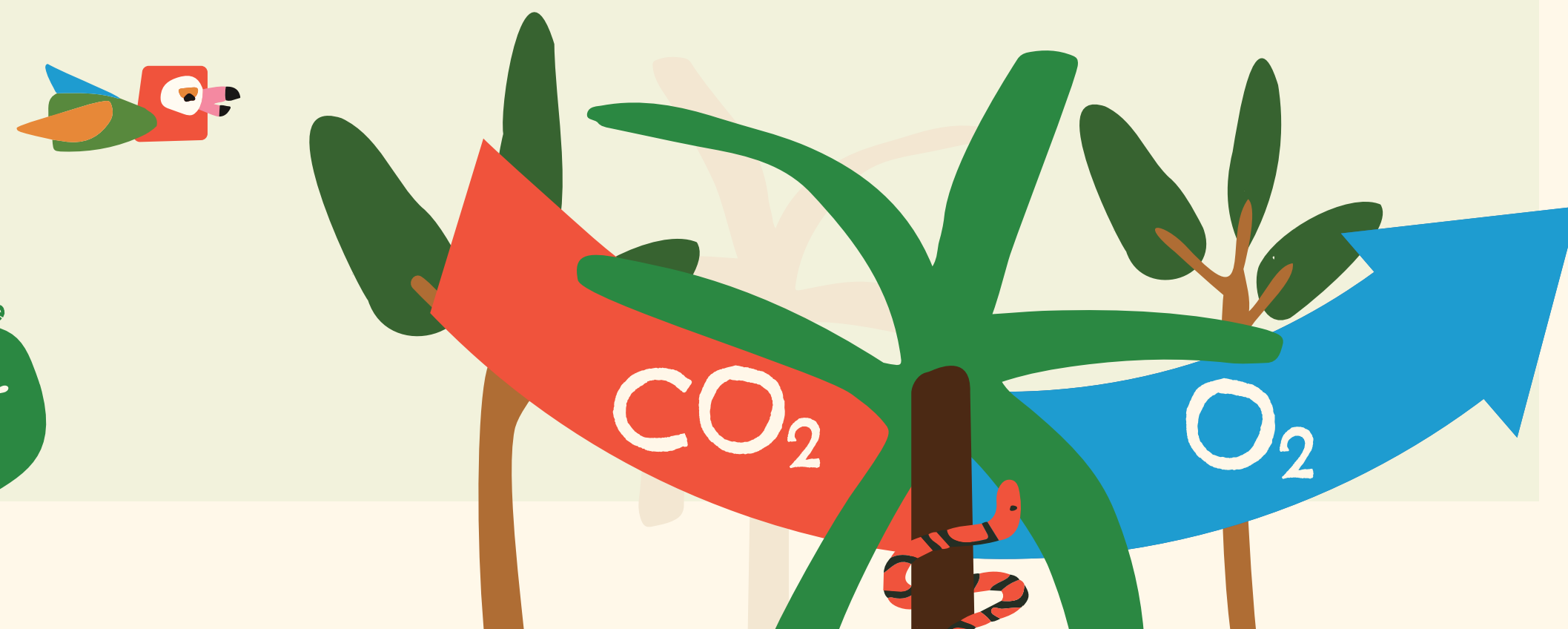
- Estimate the social and economic costs of disasters, contributions and prevention measures for natural disasters.
- Use digital maps and air quality phone apps. Assess the main hours, days and months of air pollution. Find out why this is the case.
- Design homemade air quality meters.
- Propose how to measure local atmospheric pressure, according to the altitude, and using reports.
- Calculate the flight of a paper aeroplane using an experiment.⁹¹ Invite the class to make paper kites and examine how their velocities are influenced by the wind, their shape and launch site.

⁹¹ For example, make several, different, paper aeroplanes with the students. Try to throw them with approximately the same force and speed. Repeat the launch of each paper aeroplane design 5 or 6 times. Record the results on a graph and calculate the mean for each aircraft. Conclude which aircraft flew the furthest, and why, etc. Did wind, direction, force, design, etc. influence the results?



Natural Sciences:

- Explain ocean ecosystems' capacity to absorb CO₂ (blue carbon) and the impact of this process on acidification.
- Examine local wind patterns, and the likelihood of hurricanes or high winds in some known areas.
- Use bio-indicators to detect air pollution (experiment with lichens)
- Explain plant and tree respiration, show how they are affected by pollution and their ability to absorb CO₂.



Language and Literature:

- Analyse a few poems about air and their use of symbolism. For example: Oda al Aire (Ode to the Air), by Pablo Neruda.
- **Study the words for their power, in relation to what they mean, and the volume, force and nuance with which they are expressed when spoken out loud. The role of air, breath and intention in saying each word.**





Social Sciences:

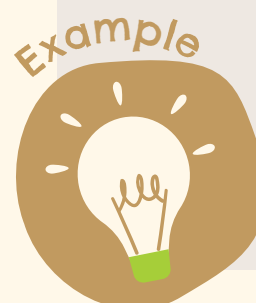
- Analyse the relationship between air pollution and society. How far are we aware of our negative and protective actions?
- Relate air to social sensitivities, for example, by inviting students to consider the various attitudes of people in their social and natural settings: the smells of the countryside, the aromas of meals, family memories of being in the outdoors and surrounded by wind, etc.
- Visit an air quality measurement centre.

- **Analyse what life is like in countries with high levels of pollution. What restrictions or care should their citizens take? How can such levels be prevented?**



Desde las Artes:

- Organise a sequence of local dances, explore the importance of breathing in dance, its relationship to creativity, emotion and inspiration.
- **Explain the role of air in wind instruments, using local songs and instruments. Discuss how singers' voices are related to air and breathing.**



Physical Education:

- Link all physical actions to lung capacity and the quality of the air entering our lungs.
- **Perform breathing exercises, emphasising the importance of breathing clean, healthy air.**



Potential interdisciplinary activities:

Once the teaching team has made its subject contributions for classroom use, a common Desirable Scenario is designed and agreed at the Interdisciplinary Roundtable. For example:

“Students become actively aware of the importance of air quality, investigate the local situation, and generate proposals”.

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.



CREATION AND OPERATION OF A GROUP OF “AIR SENTINELS”

1. Example of an interdisciplinary activity about air

Main theme and focus: Creation and implementation of a youth collective to monitor, alert and follow up on the polluting processes in their environment, in order to improve local air quality near the school. The collective will comprise a group of interested student volunteers who wish to learn and contribute to this task as part of their education. They will be guided by a small group of teachers, who will accompany them at certain times and give them ideas on how to carry out the various stages of the process. Example group name: “Air Sentinels”.

Main phases and activities:

- 1. Preparatory phase:** With the agreement of the education authorities, a small group of teachers will invite (especially final year) students to form the Air Sentinels. This invitation will be issued in an open session explaining the objective of the work of a group of leaders interested in improving air quality, as well as the interest, scope and contributions that such a group can make, underlining that it will be made up of volunteers.
- 2. Organisational phase:** Once the volunteer group has been formed, a meeting is called to announce their possible activities and initial planning details, so that the students can become familiar with and add to the planned actions. All of this is based on the usual form of organisation at the school, as it will be voluntary work and can mainly be carried out in free periods and rooms. A “licence card” showing the group name will be issued for identification purposes.

3. Focus and goal setting phase: A leading environmental protection group is formed based on its interest in improving quality of life for humans and all other living beings on the planet. From this perspective, the project is very useful, as it involves contributions and explanations for other people to help them change their habits to activities with a lower environmental impact. The Air Sentinels will monitor the various human activities in and around the school in order to detect polluting processes so that they can be modified or reduced, to improve local air quality. The group can install bio-indicators, such as lichens, to monitor the air quality in their educational community.

4. Planned observation and monitoring: The group takes steps observe and monitor local polluting processes that they already know about (occasional, mobile, widespread and natural) that pollute the air. For example: public or private transport fumes, smoke from industrial chimneys, people smoking in enclosed spaces, noise pollution from entertainment venues, traffic noise, rubbish dump odours, etc.

5. Development of data collection guides: Taking the main sources of pollution into account, and supported by their teachers, the group draws up a guide to help them note down the events, places, days and times when they can detect pollution. They also agree on dates and deadlines for gathering the data. For example, two weeks are allowed for initial monitoring and another week is given as the deadline to confirm and review their findings.

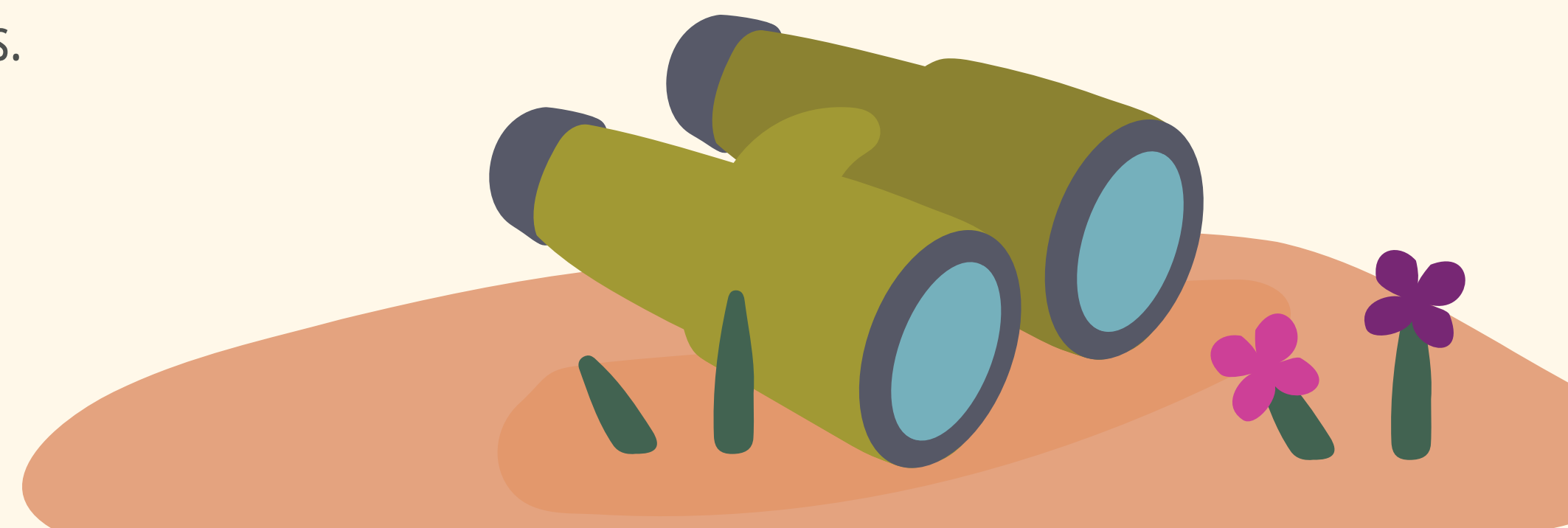
6. Meetings: The Air Sentinels will present the results of their first two weeks' surveillance at a meeting after the first deadline. Together with a group of teachers, they agree on the arrangements for the following week based on these results, in order to confirm their observations.

7. Conclusions: A number of conclusions will be reached at a second, final stocktaking meeting, such as:

- The most significant sources of air pollution detected,
- The places where these were perceived,
- The causes of such contamination,
- Ways to improve the situations observed, etc.

The group presents their observations to the entire educational community to raise awareness and determine whether a campaign to improve local air quality is appropriate. If appropriate, the Air Sentinels receive recognition for their work (diploma or similar).

8. Follow-up stage: Air quality observation processes will continue to be carried out by the Air Sentinels, who will strengthen their observational capacity and will be able to define possible future steps to achieve the goal of improving air quality in the locality.



OUTREACH CAMPAIGN TO IMPROVE LOCAL AIR QUALITY

2. Example of an interdisciplinary activity about air

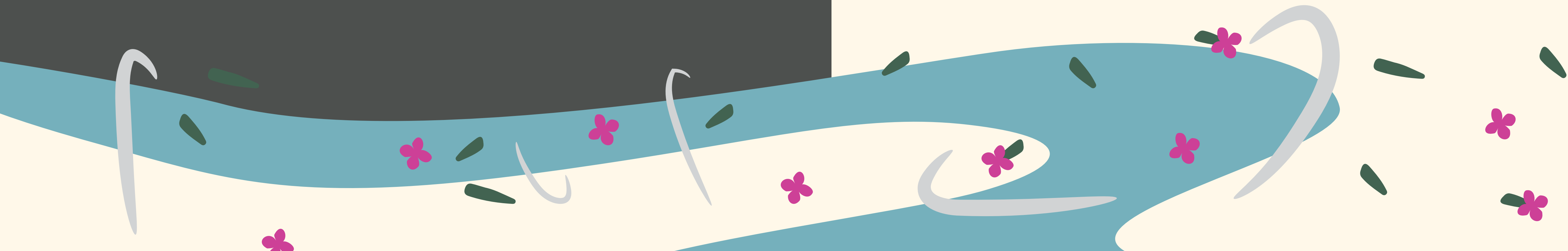
Main theme and focus: The design and implementation of a simple local air quality improvement campaign, emphasising the importance of the health of all inhabitants, as well as the importance of protecting the health of other living beings. The approach will be based on the experience the Air Sentinels gained in the previous activity.

Activity and steps:

Design, implement and evaluate the campaign:

An awareness-raising campaign based on the experiences, balance sheets and findings of the Air Sentinels' work will be designed and implemented as follows:

1. Establish the **main campaign objective**, related to improving air quality, and based on the most important aspects revealed by the Air Sentinels.
2. Define the **target audience** (the educational community, local authorities, community leaders, families, the general public, etc.)
3. Agree on the ways and institutions through which a few **funds** could be raised to support or endorse the campaign with the school. Work with a few media outlets who could be interested in publicising the campaign.



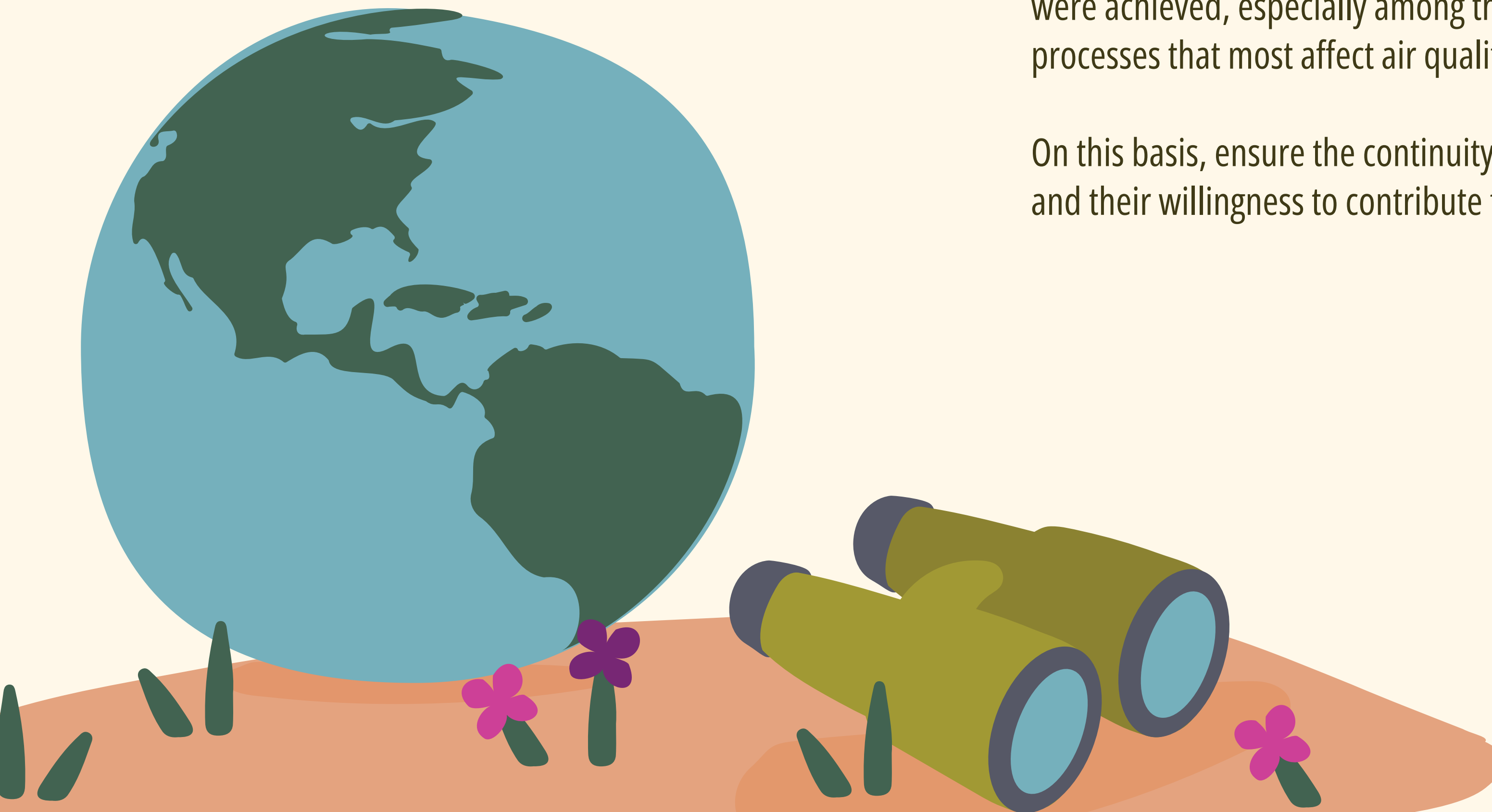
4. Select the **main media** to be used: for example, posters illustrated with photos or drawings on the importance of air for health; catchy messages to be sent to various media (radio stations, local newspapers, etc.); short talks that can be presented to various groups (neighbourhood communities, parent groups, non-governmental organisations, youth leaders, etc); use of social media (Twitter, TikTok, Facebook, Instagram, etc).

5. Design the **main message**: Agree on one or two meaningful phrases and images to warn about the risks of air pollution, and promote responsible behaviour.

6. Launch the campaign: Once these steps have been defined, launch the campaign at a participatory school meeting, to which some local authorities, journalists, social or cultural influencers, etc. can be invited. Involve students in the whole process.

7. Evaluate the results and ensure continuity: Once the campaign has been carried out, the results should be analysed within the defined deadlines. Examine whether any changes in attitude were achieved, especially among the sources of pollution, whether any commitment to improve the processes that most affect air quality was obtained, etc.

On this basis, ensure the continuity of the Air Sentinels' surveillance actions – the value of their work and their willingness to contribute to local well-being is now publicly recognised.



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 this example of an activity on air: students became actively aware of the importance of air quality, investigated the local situation, and came up with proposals. For evaluation purposes, two main purposes can therefore be considered to have been pursued:

- Raise students' awareness of the importance of air quality
- Participatory research on the situation at local level and improvement actions.

In order to evaluate the activities carried out, the group can start from four general criteria, specified through specific indicators developed in the educational centres, according to the different educational levels, ages and subjects, and based on established pedagogical approaches.

EVALUATION CRITERIA	MAIN FOCUS	CENTRAL THEME: THE AIR						COMMENTS AND PROPOSALS
		ACTIVITY 1. Creation and actions of the group of volunteers.			ACTIVITY 2. Campaign to improve local air quality			
KNOWLEDGE <i>Air, wind, pollution, hurricanes, greenhouse effect, ozone layer</i>	<i>Extent to which understanding of key issues has been achieved</i>	LEVELS			LEVELS			
		HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW	
PARTICIPATION, INTEREST <i>Actively involved in forming the group, contributions to participatory and motivational meetings.</i>	<i>Level of participatory process, motivation and commitment</i>							
OUTPUTS OBTAINED <i>Guidelines for data collection Data obtained Campaign design and implementation</i>	<i>Achievement of visible, concrete results</i>							
FOLLOW-UP PROPOSALS <i>Follow-up actions</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.

