

**PROGRAMME OF ACTIVITIES FOR THE TREATMENT OF EXTREME EVENTS
AND THEIR LINK WITH CLIMATE CHANGE AND THE GLOBAL CRISIS
IN COMPULSORY SECONDARY EDUCATION**

(Teacher Version)

In recent decades, the world's population has become progressively more vulnerable to the effects of natural disasters, which have increased in frequency and power due to climate change, creating an uncertain scenario for predicting their effects on humanity. In the period from 2005 to 2015 alone, more than 6,000 disasters were recorded worldwide, the devastating consequences of which were the balance of more than 700,000 lives, more than 1.4 million injured and economic losses of around 2 trillion dollars. Many of the personal, material and economic losses have been aggravated due to the anthropic alteration of nature, such as the increase in the greenhouse effect, urbanization in areas at risk of flooding or in environments susceptible to heat waves and forest fires, which result in a greater destructive impact of these extreme weather phenomena (Aghaei et al., 2018¹; United Nations Office for Disaster Risk Reduction [UNDRR], 2015²; Olcina, 2008³).



¹ Aghaei, N., Seyedin, H., y Sanaeinasab, H. (2018). Strategies for disaster risk reduction education: A systematic review. *Journal of Education and Health Promotion*, 7(1), 98. https://doi.org/10.4103/jehp.jehp_31_18

² United Nations Office for Disaster Risk Reduction (2015). *Marco de Sendai para la Reducción del Riesgo de Desastres 2015-2030*. <https://www.undrr.org/quick/11409>

³ Olcina, J. (2008). Cambios en la consideración territorial, conceptual y de método de los riesgos naturales. *Scripta Nova. Revista Electrónica de Geografía y Ciencias Sociales*, 12(270).



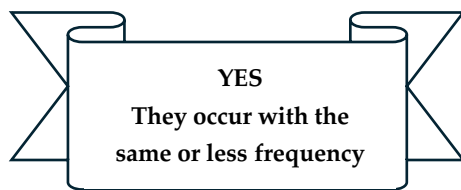
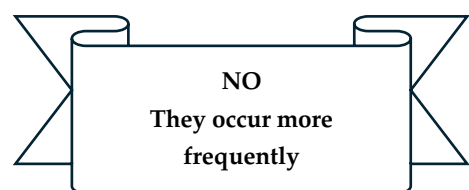
A.0. Let's share what we know... You may have heard about extreme phenomena in the news, on social networks, in movies, series, etc.

a) What extreme phenomena do you know? Name as many as you can think of.

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b) Have any of these phenomena occurred in Spain? Where? Share recent examples and write them down next to the corresponding extreme phenomenon in the previous question.

c) From your point of view, do these phenomena occur with the same frequency as in past decades? Why? Mark your individual votes with an X and try to justify the vote.

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Comments A.0. The first activity, designed to activate prior knowledge, introduces the topic of extreme events. By sharing examples of extreme phenomena that they have heard about in everyday life, a first verbal definition of what they are begins, to which students usually give simplistic answers or based on examples such as: "they are catastrophes", "they are natural disasters such as earthquakes" or "things of bad weather such as the DANA".



To help in contextualization, students are asked to name extreme phenomena that they know and that have occurred in Spain. Next, a key distinction is made: extreme geological/geophysical phenomena, linked to the internal and external processes of the geosphere and unpredictable; and extreme weather events (EWEs), related to the atmosphere, the water cycle and climate, and predictable thanks to meteorology. Finally, there is a debate on whether the frequency of the EWEs has increased in recent decades, and the students must justify their arguments.

A.1. You are going to watch a video that explains what extreme events are and mentions some that have occurred during recent history. Comment and write down the answers as a group.

a) What is an extreme phenomenon?

b) What factor is mainly responsible for them occurring with greater intensity and frequency? It lists and justifies very briefly other contributing factors.

Principal factor:

Other factors:

c) Make a list of all the phenomena mentioned in the video and write down the year and place where they occurred. If you know of other cases in other places, they can be added

- Extreme phenomenon, place, year

Comments A.1. This activity is based on the projection of an explanatory video that defines what an EWE is, presents examples and states the causes of the increase in its frequency, highlighting climate change as the main one (<https://www.youtube.com/watch?v=YKuzwMNUcMw>). It also contextualizes the information with some of the most outstanding events during the 21st century.

After watching the video, their understanding is verified with a sharing of key ideas and concepts. Subsequently, it discusses how climate change is the result of global warming. Other factors that aggravate the damage of EWEs are also exposed, such as deforestation, urbanization in vulnerable areas and the lack of protection infrastructures and warning systems.

A.2. You've seen some digital headlines about extreme events around the world. Shade on the world map the geographical areas affected by these phenomena (fires in red, floods in blue, hurricanes in green, heat waves in orange, droughts in purple...).

At first glance with the shaded map, do you consider it to be a global problem?



Así le contamos sobre los incendios en California en enero de 2025

El número de muertos confirmados fue de 25 al cierre de nuestro directo, con más de 16.000 hectáreas afectadas, y más de 12.300 estructuras destruidas

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Actualizado: 17 ENE 2025 - 04:40 CET



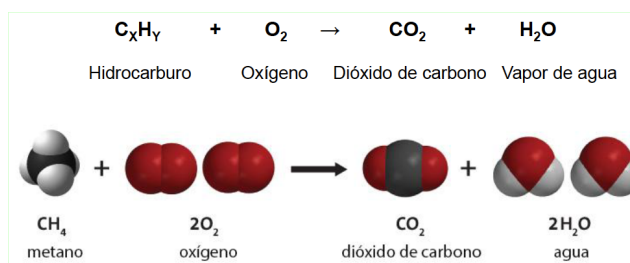
La sequía en el sur de África lleva a 21 millones de personas al hambre

- Namibia, Zimbabue, Malawi y Zambia han decretado estado de emergencia nacional por la sequía extrema
- El 20% de la población de Malawi vive en situación de inseguridad alimentaria extrema

03/02/2025 | 15:17 horas Por SARA ALONSO ESPARZA, enviada especial a Blattyre (Malawi)

Comments A.2. This activity aims to raise awareness of the global scale of the EWE problem. To this end, digital press headlines are presented about different EWE in the world: hurricanes, floods, heat waves, forest fires and droughts. Students must colour or shade the geographical areas affected by a given EWE, assigning a colour for the type of phenomenon. At the end, the students can show with the map the scope of the EWE in the world and, therefore, conclude that it is a global problem. During the presentation, it is worth emphasizing how many headlines mention record data, pointing to an upward trend in the intensity of EWEs. The map on page 11 can be used for this activity.

A.3. We have seen that one type of chemical reaction is combustion reactions:



a) Write the general chemical equation that represents them and name the characteristic reactants and products.

b) Write down examples of daily activities in which these types of reactions occur.

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c) What role do these activities play in climate change?

d) After reflecting on the cloud-in-a-bottle experiment and learning how a DANA is formed, describe how climate change affects this extreme phenomenon.



Comments A.3. The second session begins by contextualizing the chemical reactions of combustion with daily life. First, the combustion of methane is reviewed symbolically represented by spheres: students must extract the reaction with chemical formulas, identify and name reactants and products, with emphasis on CO₂ and water vapor, and express the general chemical equation for this type of reaction. Thus, previous knowledge of stoichiometry is reinforced. This basic knowledge is then linked to activities that produce CO₂, explaining its influence on global warming and climate change. It is crucial to detail what a greenhouse gas (GHG) is and how its increase aggravates the greenhouse effect, emphasizing that the problem lies in the increase, not the effect itself. Finally, a relevant problem is addressed, such as the DANA of Valencia in 2024. The students, based on their knowledge of the water cycle, are asked to try to explain the formation of a DANA. Subsequently, the practical experience "cloud in a bottle" is carried out to recreate the formation of a cloud on a small scale, relating it to the influence of temperature on its rapid formation (<https://medina.aemet.es/experimentos/nube-dentro-de-una-botella>). This experience explains how global warming increases sea temperatures, increasing evaporation and humidity. When warm, moist air meets a cold front, in upper layers of the atmosphere, massive condensation occurs that generates torrential rains. Thus, the formation of a DANA is clarified and reflection on the role of climate change in the generation of this EWE is promoted.



A.4. We are going to calculate the carbon footprint with an online simulator. Each group must come to an agreement on the consumption that a fictitious person makes, and we will obtain how many planets would be needed if the world population consumes the same as this person.

a) This person, after receiving a sustainability education course, wants to take action to help mitigate climate change. Do you think it is important that he has made this decision?

Propose actions or measures that you can do as individuals to address this global problem.

b) The individual actions of citizens are really important to solve this problem, but what other types of solutions are necessary for this? Briefly justify its importance.

Comments A.4. This activity aims to raise awareness among students about the importance of individual actions in mitigating climate change. First, the concept of carbon footprint is introduced and then a fictitious person is created who has certain consumption habits, which are entered into a web simulator to calculate the carbon footprint (<https://www.footprintcalculator.org/home/en>). Many of these habits are based on an approach to the daily activities of students or their environment, allowing them to become aware of the measures they can apply individually to mitigate climate change. In addition, the idea that a collective reduction in the carbon footprint can generate significant results is reinforced.

A.5. a) As a group, assess the importance of the SDGs (Sustainable Development Goals) for the future.

b) Round out which of the SDGs you think have a greater link to extreme events.



Source: <https://unodsd.un.org/content/sustainable-development-goals-sdgs>

c) Make an individual poster about the SDG that you have been given. It should include the goals of this SDG, its link with extreme phenomena and other indications that you must write down in class to complete the task.

Comments A.5. This activity introduces the SDGs of the 2030 Agenda to students. The United Nations website (<https://unodsd.un.org/content/sustainable-development-goals-sdgs>) explains the origin and purpose of the 17 SDGs, highlighting their importance in achieving a more just and equitable world for all. Next, students are asked to cite any of the SDGs that may have a more direct relationship with the EWEs and information and guides are presented to make an individual poster on an SDG.



A.6. a) What do you think "COP" means? Assess its importance for the future of the planet and indicate when and where the last one was held.

b) If you were a world leader, what measures would you propose to be more prepared against an extreme event and to mitigate its frequency? Propose at least two.

c) In the poster of the previous activity, you must include a proposal or measure that has been recognized in a COP of previous years that is closely related to the SDG that concerns you. Write in two or three sentences what the measure consists of and what COP it was proposed.

Example → (COP28, Azerbaijan 2024, Proposal)

Comments A.6. This activity aims to raise awareness of the importance of global policies to meet the SDGs and their role in adapting to and mitigating extreme events. To this end, the role of the Conference of the Parties (COP) in achieving the objectives is presented and it reflects on what policy measures are essential to adapt to this problem, with special emphasis on measures for its mitigation. In addition, students are asked to complement the poster of the previous activity with an agreement or measure of a COP that is closely linked to the assigned SDG.

