ESA Climate Detectives 2019-2020

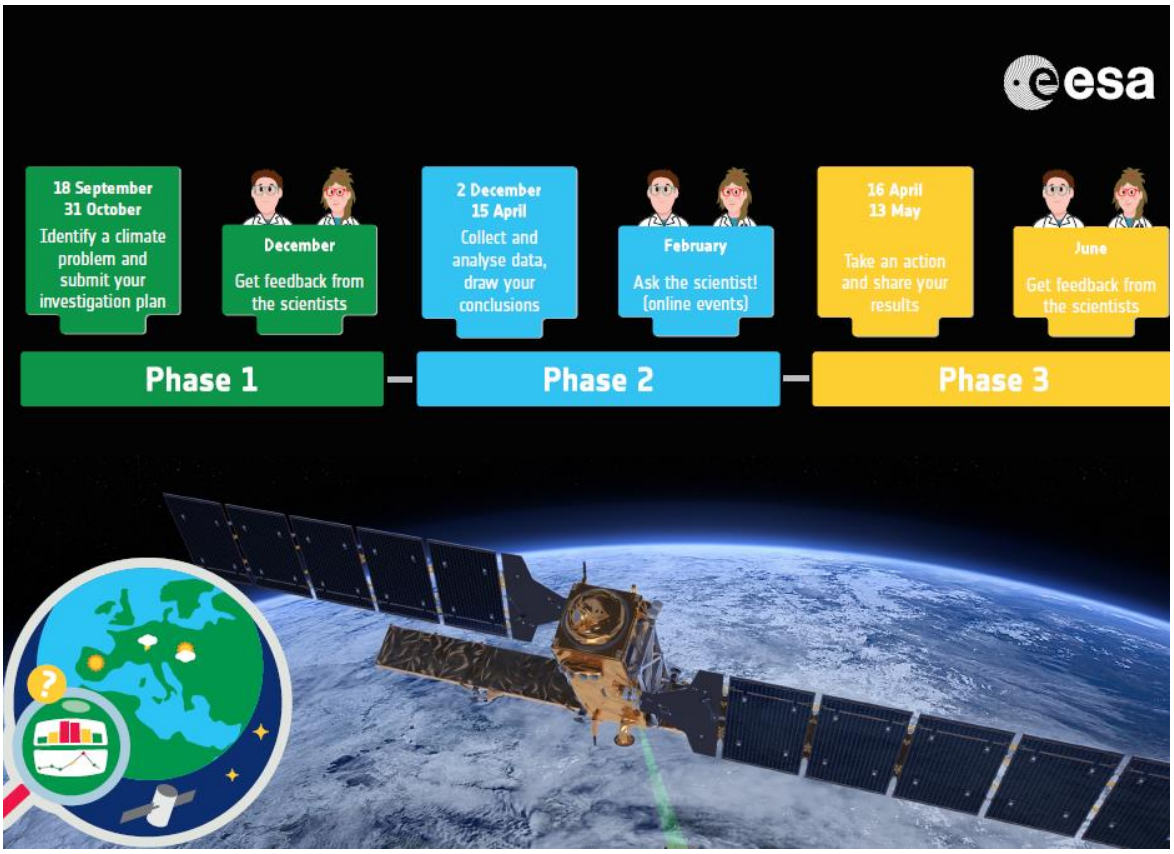
Guidelines

1. Introduction

ESA invites school teachers and students between the ages of 8 and 15 to team up and join the ESA Climate Detectives school project, kicking off in September 2019 and running throughout the school year. Teams of students, supported by their teacher, are called to 'make a difference': identify a climate problem by observing their local environment, investigate it by using available Earth Observation data or taking measurements on the ground, and then propose a way to help reduce the problem.

The students will learn about climate on Earth as a complex and changing system and the importance of respecting our environment. At key phases of the project, scientists in the field of Earth observation and climate will support the teams. They will give feedback on teams' investigation plan and during an online 'ask the scientist' event. At the end, all participating teams will share their research findings on the project sharing platform .

2. ESA Climate Detectives overview



Phase 1 – Identify a climate problem (18 September 2019 – 31 October 2019)

In this phase, students will be asked to identify a climate problem that they would like to investigate as 'Climate Detectives'. Students should define the problem based on questions that arise from their school studies and from observations in their local environment and that has a connection to the global climate.

Teams have until 31 October 2019 to identify a climate problem and submit their investigation plan online (maximum 450 words) (see section 2, 'How to enter the project'). In their investigation plan, the teams must give the following information:

1. **Project title** (max. 20 words)

2. **What is your research question?** (Max. 30 words?)

    - *What is a research question?*

    The first step of the scientific method is to develop a research question. Your investigation is centred around this question. It should be clear, concise and focused. A research question should be about an issue that students are curious about.

3. **Describe the local climate problem/issue you want to investigate.** (max. 150 words)

    - *What is a local climate problem?*

    Teams can explore different problems or their causes/effects but they have to make sure the relation with climate is worked out as well as the relation with their local environment. Examples of climate problems could be "how might increased rainfall in the last years affect flooding in my area?" or "due to the low precipitation, our local river has less water; what are the consequences for the biodiversity and for the local community?". Do you need some inspiration? Find out what some teams have investigated in the past edition by visiting the project sharing platform (https://climatedetectives.esa.int/)

4. **What kind of Earth observation data will you use?** (Checkboxes)

    - Ground measurements
    - Satellite images
    - Other data

    - *What is Earth observation data?*

    Earth observation (EO) is the collection, analysis and presentation of data to better understand our planet. EO data is mostly acquired from remote sensing platforms such as satellites and supplemented by ground measurements. Earth observations may include:

- *a birdwatcher's notes on bird sightings;*
- *measurements taken by a thermometer, wind gauge, ocean buoy, altimeter or seismometer;*
- *photographs taken on the ground or from airplanes;*
- *radar or sonar images from land- or ocean-based instruments;*
- *images taken from remote-sensing satellites;*
- *processed information such as maps or weather forecasts*

5. **Describe how you plan to investigate the climate problem and which data you plan to analyse. Also, describe how you plan to access/collect the data.** (max. 250 words)

    - *How to access EO satellite data?*

    In section 7 'Supporting resources and tools', you can find examples of online tools which will give you access to Earth observation satellite imagery and data.

Scientists in the field of Earth observation and climate will review the investigation plans from all teams participating in the project. Teams will receive feedback and recommendations about their investigation plan in December 2019.

Phase 2 – Investigate the climate problem (2 December 2019 – 15 April 2020)

In this phase, students will collect, analyse and compare data to draw a conclusion about the problem they are investigating. **The use of data is mandatory to enter the project**. Such data can be either satellite or ground-based data retrieved from professional sources, or data obtained from measurements by the students, or a combination of them. For example, teams can make weather observations and compare them with historical climate data.

During Phase 2, ESA or, where applicable, the national coordinator will organize online events in which teams can "ask a scientist" questions related with their investigations.

Phase 3 – Make a difference (16 April 2020 – 13 May 2020)

We can all make a difference! Based on the results of their investigations, students should decide on the actions they want to take - as individuals and as citizens – to help reduce the problem. Actions do not need to be limited to the school time; for example, students could take home ideas and involve their families to put them into practice in their everyday lives, or could run a presentation campaign to their school or local community to raise awareness.

Teams should record and provide evidence of their actions, and will share them with the ESA Climate Detectives community. **Teams will be able to share their main results and actions from 16 April 2020 until 13 May 2020** on the project sharing platform . By the end of the project (June 2020) teams who shared their projects will receive a final written feedback provided by scientists. All teams who share their project will receive a certificate of participation by email in June 2020.

3. How to enter the project?

In Phase 1, teams have to register online and submit their investigation plan. **The deadline is 31 October 2019**.

In the cases where ESA has identified a national coordinator, teams shall register to Phase 1 through their national coordinator, and they can choose to submit their investigation plan either in English or in their national language:

- If you are a team from Austria, you should register through ESERO Austria. Find more information on www.aec.at/esero/
- If you are a team from Belgium, you should register through ESERO Belgium. Find more information on www.esero.be
- If you are a team from Czech Republic, you should register through ESERO Czech Republic. Find more information on www.esero.sciencein.cz/detective
- If you are a team from Denmark, you should register through ESERO Denmark. Find more information on www.esero.dk
- If you are a team from Luxembourg, you should register through ESERO Luxembourg. Find more information on www.esero.lu
- If you are a team from Finland, Norway and Sweden, you should register through Nordic ESERO. Find more information on https://www.esero.no/prosjekter/klimadetektiv/
- If you are a team from Portugal, you should register through ESERO Portugal. Find more information on www.esero.pt
- If you are a team from Spain, you should register through ESERO Spain. Find more information on www.esero.es. For questions contact esaclimatedetectives@esero.es
- If you are a team from United Kingdom, you should register through ESERO UK. www.stem.org.uk/esero

In all other cases, that is for teams from Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Romania, Switzerland, Canada, Slovenia and Malta, registration shall be done through the ESA Education office and **the entries must be submitted in English.** Find more information on esa.int/ClimateDetectives

4. Who can participate?

All the following eligibility conditions have to be fulfilled to participate in the ESA Climate Detectives project:

- Participation is open to teams from 8 up to (and including) 15 years old.
- Each student team must consist of a minimum of six students up to the whole class.
- One teacher can sign up maximum three student teams.

- At least 50% of the team members must have the nationality of an ESA Member State[1]Further to the 22 Member States, also Canada and Slovenia, based on their agreements with ESA, qualify to fully participate in the programmes of the ESA Education Office. In the framework of the current collaboration agreement between ESA and the Republic of Malta, teams from Malta can also participate in the Climate Detectives project.
- Team members must meet one of the following requirements:
    - Be enrolled full-time in a primary or secondary school located in an ESA Member State, Canada, Malta and Slovenia; ESA will also accept entries from primary or secondary schools located outside an ESA Member State, Canada, Malta and Slovenia only if such schools are officially authorised and/or certified by the official Education authorities of an ESA Member State, Canada, Malta and Slovenia (for instance, French school outside Europe officially recognised by French Ministry of Education or delegated authority).
    - Be home schooled (certified by the National Ministry of Education or delegated authority in an ESA Member State, Canada, Malta and Slovenia).
    - Be a member of a science or environment club, enrolled full-time in a primary or secondary school in an ESA Member State, Canada, Malta and Slovenia.
- Each team must be supervised by a teacher or mentor acting as the team's point of contact with ESA's Education Office and, where applicable, with the respective National Coordinator.
- Each team can submit one entry only and each student can only be a member of one team.

Teams not respecting the conditions above will be rejected.

5. Project requirements and constraints

When planning their investigation, teams shall have in consideration:

- Each team has to register and submit their investigation plan online (in total a maximum of 450 words).
- The project must include the use of data (from Earth Observation satellites or ground measurements) and be related to the topic 'climate'.

Entries not respecting the requirements above will be rejected.

By entering the Climate Detectives project, teams agree and certify that their submission is their original work, and that they have full legal right to use any portion that is not their original work. ESA bears no responsibility for verifying the authenticity of the proposals.

The interaction with scientists from the European climate and Earth observation community is a key element for the students to connect to real science research, and to reinforce their motivation and

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[1] **ESA Member States:** Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom.

knowledge. In order for the organizers to be able to manage and provide scientific feedback for all the teams, the number of teams per country that can participate in the project may be limited. ESA Education and the national coordinators will do any possible efforts to give formal feedback to all entries. However, in the event of exceeding participation, ESA and the national coordinators reserve the right to close the application process earlier or to run a selection of the entries that can be admitted based on quality.

6. Supporting resources and tools

ESA provides a set of resources for primary and secondary school teachers.

- **Classroom Resources -** These cover the topics weather and climate, seasons, Earth and atmosphere as well as natural and human-made disasters. ESA suggests the use of these resources to encourage student's participation and motivation and to improve their understanding of Earth's climate as a complex and changing system.
  http://www.esa.int/Education/Climate_detectives/Classroom_resources_for_Climate_Detectives

- **What is Climate (Change)?** - Learn more about Earth's climate in this engaging webinar by Dr Natalie Douglas who explains in simple terms the basics of Earth's climate. She discusses the difference between weather and climate as well as between global warming and climate change. She tells about how scientists investigate climate change and gives some impressive ideas about what we can all do to protect our planet's climate!
  http://www.esa.int/Education/Climate_detectives/Watch_the_Climate_Detectives_webinar

Students can access Earth Observation satellite data making use of the suggested tools:

- **Sentinel Playground** – This online tool provides easy access to satellite images and is updated every day. Since 2015, Sentinel-2 satelllite data is available, to see images from before that date, you can choose NASA's Landsat-8 as data source.
  apps.sentinel-hub.com/sentinel-playground/

- **EO Browser** – EO Browser combines an archive of different Earth observation satellites that is updated every day. The EO Browser can be used to research satellite images covering any area of interest. It is also possible to download the images in different formats. Changes on Earth that took place in the past 30 years can be analysed with the 'compare' function and students can also create their own time-lapse. ESA has developed a quick start guide to explore EO Browser: http://esamultimedia.esa.int/docs/edu/EO_Browser_guide.pdf
  apps.sentinel-hub.com/eo-browser/

- **Climate from Space -** This app, developed by the ESA Climate Office, shows more than 30 years of global satellite observations on climate. Background information on different climate

variables such as ocean temperature, sea level, carbon dioxide, is provided. With the interactive data viewer, students can analyse and compare different phenomena related to climate and investigate how they change over time.
http://cci.esa.int/content/tablet-app

7. Questions

For any questions, consult the ESA Climate Detectives website esa.int/Education/ClimateDetectives and the national coordinators websites, or send an email to climate.detectives@esa.int.

8. Useful links

ESA Climate Detectives
esa.int/Education/ClimateDetectives

Climate Detectives sharing platform
https://climatedetectives.esa.int/

ESA's Climate Change Initiative
http://cci.esa.int/

ESA's Earth Observation missions
https://www.esa.int/Our_Activities/Observing_the_Earth/ESA_for_Earth

ESA Earth Observation Image of the Week
http://www.esa.int/spaceinimages/Sets/Earth_observation_image_of_the_week

Sentinel hub Education page
https://www.sentinel-hub.com/explore/education

Virtual platform to view satellite observations interactively
https://ovl.oceandatalab.com/

Online platform to access satellite information about surface water levels of waterbodies
https://www.blue-dot-observatory.com/