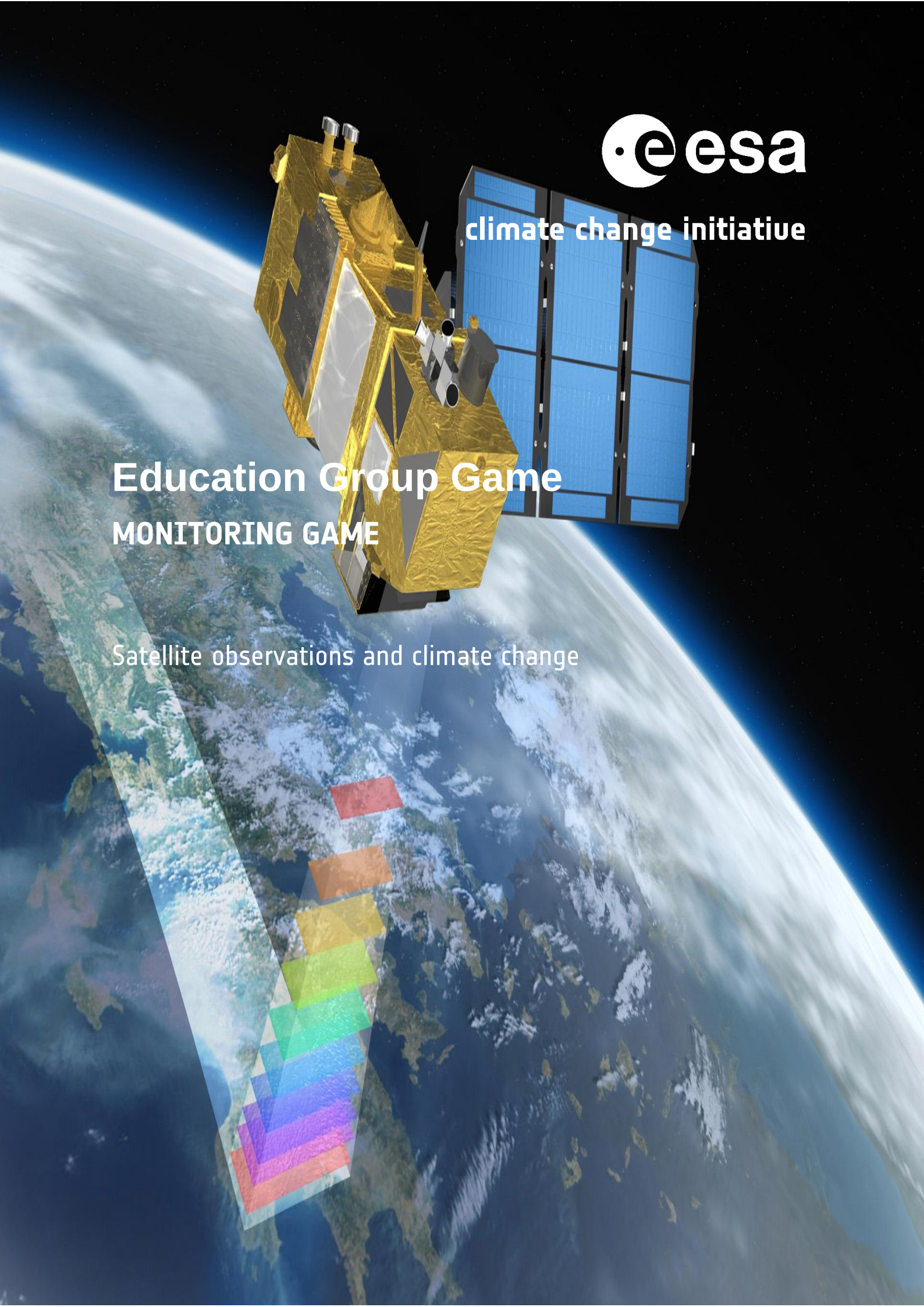

Education Group Game

MONITORING GAME

Satellite observations and climate change

Contents

climate change initiative education group games– MONITORING GAME
https://climate.esa.int/educate/climate-for-the-public/

Activity concepts developed by University of Twente (NL)

The ESA Climate Office welcomes feedback and comments
https://climate.esa.int/helpdesk/

Produced by the ESA Climate office

MONITORING GAME: Overview

Satellite observations and climate change

Fast facts

Subjects: satellite observations and climate change

Age range: all

Type: group game

Number of players: 5+ players

Time required: 20-40 minutes

Cost: Low (0–20 euros)

Location: indoor/outdoor

Includes the use of: Timer/stopwatch

Keywords: electromagnetic spectrum, radiation, sensor, pixel, satellite

Brief description

This game simulates how satellite sensors monitor the climate. The participants will face emerging difficulties with monitoring different attributes simultaneously in a playful way. We also monitor the world around us. Our eyes, ears, nose, tongue and skin give us the capability to observe our surroundings. Using their senses to observe, the participants will be confronted with the limitations satellite sensors have when 'looking' at Earth from such a great distance. This game can be used as supporting material for the '*Taking the Pulse of the Planet*'.

Intended learning outcomes

Having worked through this game, participants will be able to:

understand and experience how satellite sensors monitor different attributes of the climate.

Game's goal

To be able to describe as many attributes as one can memorise from looking at a group of participants for 30 seconds**.** The winner is the individual or group with the maximum number of observed attributes.

Health and safety

In all activities, we have assumed you will continue to follow your usual procedures relating to the use of common equipment (including electrical devices such as computers), movement within the learning environment, trips and spills, first aid, and so on. Since the need for these is universal but the details of their implementation vary considerably, we have not itemised them every time. Instead, we have highlighted hazards particular to a given practical activity to inform your risk assessment.

Some of these activities use the Climate from Space online resource. It is possible to navigate from here to other parts of the ESA Climate Change Initiative site and thence to external websites. If you are not able – or do not wish – to limit the pages participants can view, do remind them of your local Internet safety rules.

Facilitator Guide

Background information

The effects of climate change on our planet are observed through measuring variables that are essential to characterise the Earth's climate, such as sea level, the mass of glaciers and ice sheets, the temperature of land and ocean, the concentration of carbon dioxide in the atmosphere, and many others. Scientists have been monitoring the changes in these variables for a long time and, based on continuous monitoring programmes, they could establish that the climate is changing. Measuring all these variables all together gives us a better picture of the current climate and helps us work out how the climate is likely to change in the future. Satellites can take frequent measurements across the whole world rather than periodic measurements in a few selected places. However, instruments on buoys, research ships, and aircraft are still needed – scientists use readings from those to calibrate the observations made by satellites and check the reliability of the data. With such synoptic and continuous observations made by satellite, scientists can improve the prediction of how the climate is likely to change, and better prepare us for the hazards and risks resulting from climate change. More information on this subject can be found in the educational resource pack *Taking the Pulse of the Planet*.

Overview

In the Monitoring Game, participants will experience the complexity of monitoring many attributes simultaneously and, thereby, develop an understanding of how satellites monitor different climate variables. This game shows how satellite sensors monitor the climate and the relevance of using different satellite sensors.

Everyone has physical attributes (height, shape, facial expressions, colour, *etc*.) that are inherent and could, therefore, be used to characterise the general state of the person (e.g., healthy, happy, tired, *etc*.). By combining different attributes, we develop a complete picture of how somebody is looking and doing. In case someone is ill, looking at the colour of the eyes does not provide sufficient information to see if someone may be ill. By combining this information with the general outlook, the responsiveness of the person, temperature, and the presence of a runny nose, one becomes more confident telling if the person is likely to be ill. Sensors mounted on satellites measure the attributes of Earth to form a complete picture of its climate in a similar fashion. By combining the long record of satellite observations scientists can establish a full picture of the climate.

The participants will be divided into two groups:

1) Earth group: 4 to 8 participants standing in a circle who are (somewhat) comfortable to be closely analysed by the sensor group.
2) Sensor group: 1-3 participants who are going to analyse the attributes of the Earth group.

Materials needed

- Some space in the room
- Timer/stopwatch

Setup

1. Make some space in the room (or outdoors if the situation allows), sufficient for a group of *circa* four participants to make a circle and for a second group to walk around them at 1 m distance.
2. Choose the Earth group (*circa* 4 persons) and ask them to stand in the middle of the room in a circle looking outwards. They will be thoroughly analysed by the sensor group, so make sure they are somewhat comfortable with this.
3. Choose the sensor group, *circa* 1-3 persons, with the task to observe the 'Earth' group from a one-metre distance and for 30 seconds.

Steps

Part I

1. From the sensor group, ask one participant to make one round around the Earth group trying to capture as many attributes as possible. After this round, the 'Sensor' may not look back at 'Earth'. Say this:
   In the middle of the room, we have made the Earth. [Participant] is a satellite sensor and is given the task to capture as many attributes of the Earth. The sensor can walk around Earth and in 30 seconds the sensor must memorise what is observed. You are tasked to memorise how many glasses you saw, the colour of clothing, hair, eyes, and the general shape of the body (length and weight). Are you ready? Time starts now.
2. When the 30 seconds are over or the sensor is done with the round, say this:
   Time is up. Stop monitoring.
3. Repeat steps 1-2 for all participants in the sensor group.
4. Swap the roles of participants: participants in the Earth Group become the sensor and vice versa.
5. Repeat steps 1-3.
6. Finalise the first part of the game by asking each participant to list the memorised attributes. And explain that a satellite has many different instruments that each monitor a part of these attributes. A satellite sensor looks at, for example, the thickness and extent of ice sheets, the temperature of the ocean surface, or the sea level. Every instrument looks at a single attribute to make sure it is right.

7. Identify the winning participant which is the one who can remember the highest number of observed attributes.

Part II

8. Now invite the sensor group and ask them to organise their observations of the Earth group, so each participant gets assigned a single thing to monitor. Say this:
   A satellite carries multiple sensors that all look at a particular attribute. Now we have two new sensors that will look at a specific attribute. After making one round, the sensor group must write down their findings.
9. Ask them to make a second round and see if they could improve their observations.
   Explain that:
   The frequency of the visit is how often the satellite measures some attributes. The frequency of looking can make a significant difference in what we see. Some attributes may only change very slowly, like the colour of your hair, while others, like the clothes you have on, change more frequently.
10. Ask them to make the third round from a larger distance (depending on the room size, try for a distance greater than 2 m) and write down which attribute was difficult to detect.
    Explain that:
    A satellite orbits the Earth from a great distance, some of the attributes will become harder to identify correctly from a larger distance. For this, some measurements need to be done 'on the ground'. Scientists have instruments on land, ocean, and the atmosphere to see from close by and check if what the satellite sees from far away is a 'true' measurement.
11. Ask if the participants can identify how 'Earth' smells (from a distance), then explain that some attributes cannot be measured by satellites (like the smell), but they can 'see' quite well.
    Explain that:
    Sensors that retrieve visual information see like our eyes, and they have a certain resolution. From nearby, you can identify quite some attributes of people, but when looking out of the window, it gets harder to identify what colour are the eyes of the person walking by outside. Satellite sensors also have such a finite resolution. Other sensors can observe outside the capability of the human eye. For example, in the microwave region, similar to radar detecting airplanes, or thermal sensors detecting temperature.
12. Swap the role between the sensor and Earth groups and repeat steps 8-11.
13. Identify the winning group as the one with the maximum number of observed attributes.

Game's goal

To be able to describe as many attributes as one can memorise from looking at a group of participants for 30 seconds. The winner is the individual or group with the maximum number of observed attributes.

Debriefing

In the debriefing, participants reflect on the game. Example questions are:

- How did you feel? What did you experience? What made you feel good? What made you feel uncomfortable?
- Why is it beneficial to have multiple satellite sensors concentrate on one particular attribute?
- How did what you experienced relate to your context?
- Is there anything from this game that you would like to take forward?

Variations

- ‘Earth’ can be increased to eight persons.
- The attributes of ‘Earth ’to monitor can be changed to earrings, jewellery, watches, or other attributes that suit the group.