

Title:
Extreme natural phenomena

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Metadata



Age and language of the students: 10 -12

Number of Lessons– Duration (per lesson): 2 x 60 min

Subjects: Earth Science, Geography, Physics, Physical Geography, Math

Curriculum and country: Geography,

Country: Romania

Class: Secondary School Grade: 5,6

Topic: Geography, Physics, Mathematics, environment

Objectives :

- To adapt vocabulary related to weather and natural disasters / define “natural disaster”, identify different types of natural disasters / the “cartographic” dimension of learning and daily existence
- To differentiate between natural and man-made disasters
- To develop skills to describe the processes that produce the phenomena /
- Using the tools and techniques necessary for spatial thinking in order to develop geographical skills

Materials and Tools :

- A video clip of a TV emergency alert, Satellite images, EO Browser
- Video clips of a tornado, a hurricane, a tsunami, and an earthquake, two note cards (natural hazard, geographic location)
- computer with Internet access

<https://www.theguardian.com/world/natural-disasters>, <https://www.nationalgeographic.com/environment/topic/natural-disasters-weather>

Metadata



Spatial concepts, skills and abilities:

Map Projection, Location, Time processes

Spatial skills:

Creating written texts with geographic content starting from a cartographic representation; transfer of information from cartographic language to oral or written language.

Performing simple mathematical operations with elements represented on the map; the use of mathematical operations in the analysis and interpretation of the results / effects of some extreme phenomena from the surrounding reality;

Comparing the elements represented in the plan with elements from reality, Calculating some distances represented on the map with the help of the scale of proportion, Explaining the time sequences of the extreme phenomena from the last 10 years.



SPATIAL ABILITIES

Identification of conventional signs in legends associated with maps at different scales, Identification of common elements of different representations by conventional signs,

Constructing a coherent text based on the information represented on a cartographic support, Identifying the cartographic representation (plan, sketch or map) as a specific form in relation to other ways of rendering reality (text, photography, oral narration)

- spatial use of different tools.
- Critically analyzes the identified information in order to better manage the problems in the world we live in related to extreme phenomena.

Skills

Understanding the need for cartographic representation of the surrounding reality as a basic skill in lifelong learning.

Identify map-like representations (eg satellite imagery)

Comparison of extreme phenomena in the country with phenomena produced in other countries / continents based on information from maps

Recognizes an extreme phenomenon in images

Explain extreme phenomena and propose solutions to reduce the occurrence of these phenomena

Description of the activity in detail



Short Description :

In the implementation of this learning scenario we will start from brainstorming, where students will be asked to specify what extreme phenomena they know, the causes and effects that produce them.

They describe the dangerous characteristics of each extreme phenomenon in Romania and compare them with those identified worldwide. Avalanches, earthquakes, fires, floods or droughts, hurricanes, tornadoes, volcanoes, hail.

This lesson scenario aims at learning based on different ways of thinking and reasoning correlated with the recognition of some models, the description of some extreme phenomena, identification through images of some phenomena produced in Romania and comparison with other phenomena from other countries.

During this activity students will be familiar with theoretical notions about the extreme phenomena that have occurred in recent years more and more often, what are the causes that triggered these phenomena. Identifying the areas where most of the specified phenomena occurred, comparing them with the phenomena produced in the country. For more explanations and technical support students will learn to use the online application EO Browser, where they will search for satellite images from this application



What will they do?

The students will search for information on the Internet about the extreme phenomena presented, will download images and compare them with those in the application, where they will look for details about the intensity of their production, affected areas and will make comparisons with other periods when such phenomena have occurred. .
Realization by drawing of some extreme phenomena using one of the 2D, 3D graphic editing applications.

Keywords :

Satellite images, Environmental Monitoring, remote Sensing, Risk impact Assessment, Multi-criteria analysis,

1. QUESTIONS ELICITING ACTIVITIES



PROVOKE CURIOSITY

WATCH THE VIDEO CAREFULLY FROM BELOW :

[HTTPS://YOUTU.BE/ZMM0YU8Z37M](https://youtu.be/zmm0yu8z37m) - **MONITORING EXTREME PHENOMENA**

Propose preliminary explanations or hypotheses

What extreme phenomena have occurred in the country lately?

But on the globe, what extreme phenomena have you heard about?

What natural disasters did you identify in the video you watched?

What negative effects have they produced on the population, the economy?

What spatial data is needed to record and monitoring the data of extreme phenomena?

Could you dynamically analyze these phenomena?



2. ACTIVE INVESTIGATION



PLAN AND CONDUCT SIMPLE INVESTIGATION

During this stage students will collect information about the extreme phenomena produced in recent years and will work in the EO Browser application.

Topic selection: you can focus on one of the extreme phenomena, such as. Tornadoes or hail, describe the phenomenon (How do tornadoes occur? What effects can they produce?

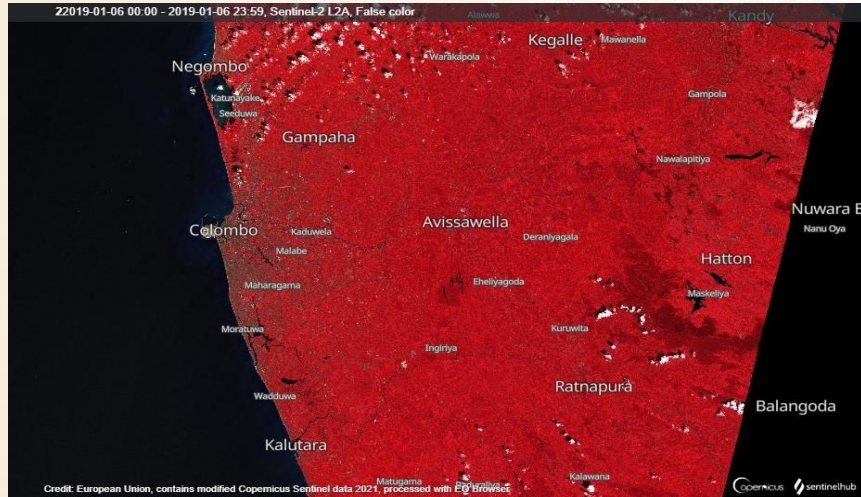
Explain how to avoid triggering them.

Perception of produced phenomena - What can be seen? What's that sound? How does it feel? - Do you know the difference between natural phenomena and natural disasters?

What type of data is needed? How can we analyze this data? What tools are used during spatial analysis procedures?



ANALYZE - THE MOST RELEVANT INFORMATION ABOUT EXTREME PHENOMENA READING AND INTERPRETING MAPS AND IMAGES USING THE GOOGLE EARTH APPLICATION



CAN A TORNADO BE A NATURAL PHENOMENON? HOW DO TORNADOES OCCUR?

WHAT CHANGES IN MAN-MADE ENVIRONMENT CAN INCREASE TORNADO PRODUCTION?

ARE THERE OTHER PHENOMENA THAT CONSTITUTE REAL DANGERS?

WHY? WHAT CAN YOU DO TO PREPARE IF YOU LIVE IN AN AREA WHERE SUCH PHENOMENA
OCCUR FREQUENTLY?



2. ACTIVE INVESTIGATION



DISCUSSION BEGINS:

Available data:

For documentation:

<https://www.pbslearningmedia.org/resource/ess05.sci.ess.watcyc.do wndraft/how-do-tornadoes-form/>
<https://vimeo.com/139451771>
<https://www.geography.org.uk/teaching-resources/flooding-case-studies>

[10 Free GIS Data Sources: Best Global Raster and Vector Datasets - GIS Geography](#)

Need to Learn:

<https://apps.sentinel-hub.com/eo-browser/?zoom=10&lat=6.90734&lng=79.8761&themeld=HISTORICAL>
<https://earthobservatory.nasa.gov/topic/natural-event>
<https://maps.ngdc.noaa.gov/viewers/hazards/>

Available tools :

<https://apps.sentinel-hub.com/eo-browser/>
<https://maps.ngdc.noaa.gov/viewers/hazards/>
<https://www.google.com/earth/>
["How Much Bigger...?" Calculator \(usgs.gov\)](#)

Think of other extreme phenomena and how dangerous they are for the population, the economy.

Create a list of these phenomena and group them according to the severity of their occurrence,

Specify the similarities and differences between natural phenomena and natural disasters

If you have ever thought that in triggering phenomena, people can influence whether or not a natural phenomenon becomes a natural disaster.





COMPARE NATURAL PHENOMENA WITH NATURAL DISASTERS

[HTTPS://EARTHOBSERVATORY.NASA.GOV/TOPIC/NATURAL-EVENT](https://earthobservatory.nasa.gov/topic/natural-event)

[HTTPS://WWW.GEOGRAPHY.ORG.UK/TEACHING-RESOURCES/EARTHQUAKES-TSUNAMIS](https://www.geography.org.uk/teaching-resources/earthquakes-tsunamis)

Explore the relevant resources recommended above:

Each team of students will record information about the following: the type of extreme phenomenon / natural disaster, the threat posed by the phenomenon, the damage they can cause, their cost, the most common time of year to trigger them, the efforts made by people to reduce the impact of the hazard,

Calculate using Google Earth the distance between two areas where a phenomenon occurred.



Describe after the effects produced the extreme phenomena that you have identified in the recommended online applications, or that you have found on the internet - discover similarities and differences between some extreme phenomena taking into account: intensity produced, causes that triggered the phenomenon, distance on which spread (using the google earth application), the effects produced, measures to prevent them.



Application - draw on a drawing sheet one of the desired extreme phenomena



After completing the investigations, one member of each team will present their findings to the class.



In a google document, the results of their investigation will be recorded, they will exchange information.

Debate: they will evaluate which are the most expensive phenomena and which are the least expensive from an economic point of view.

Which areas of our country are most prone to extreme phenomena?

Comment and make a report

<https://www.visme.co/report-maker/>

To help visitors better understand these dangers so they can take precautions to minimize risk.



3. CREATION



GATHER EVIDENCE FROM OBSERVATION

Activity planning

Before starting the activity, the students are divided into teams of 2 each. One of the students will be responsible for the collection and organization chart of the implemented tasks, the acquisition of relevant data and the corresponding steps to be followed during the activity.

The second member is responsible for validating and communicating the results, including the preparation of the final report.





CREATION –PART 1 (OPEN EO BROWSER)

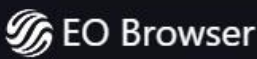
A key concept that students need to understand is how to graphically represent spatial information obtained from this application.

1. CREATING ACCOUNT ON:

[HTTPS://APPS.SENTINEL-HUB.COM/EO-BROWSER/?ZOOM=10&LAT=41.9&LNG=12.5&THEMEID=DEFAULT-THEME&TOTIME=2021-07-08T06%3A01%3A24.208Z](https://apps.sentinel-hub.com/EO-BROWSER/?ZOOM=10&LAT=41.9&LNG=12.5&THEMEID=DEFAULT-THEME&TOTIME=2021-07-08T06%3A01%3A24.208Z)



apps.sentinel-hub.com/eo-browser/?zoom=10&lat=41.9&lng=12.5&themeld=DEFAULT-THEME&toTime=2021-07-08T06%3A01%3A24.208Z



ENGLISH

Login

Discover

Visualize

Compare

Pins

Theme

Login to use custom configuration instances.

Default

Search

Highlights


Data sources

☐ Sentinel-1
 ☒ Sentinel-2
 ☐ Sentinel-3
 ☐ Sentinel-5P
 ☐ Landsat 4-5 TM
 ☐ Landsat 8

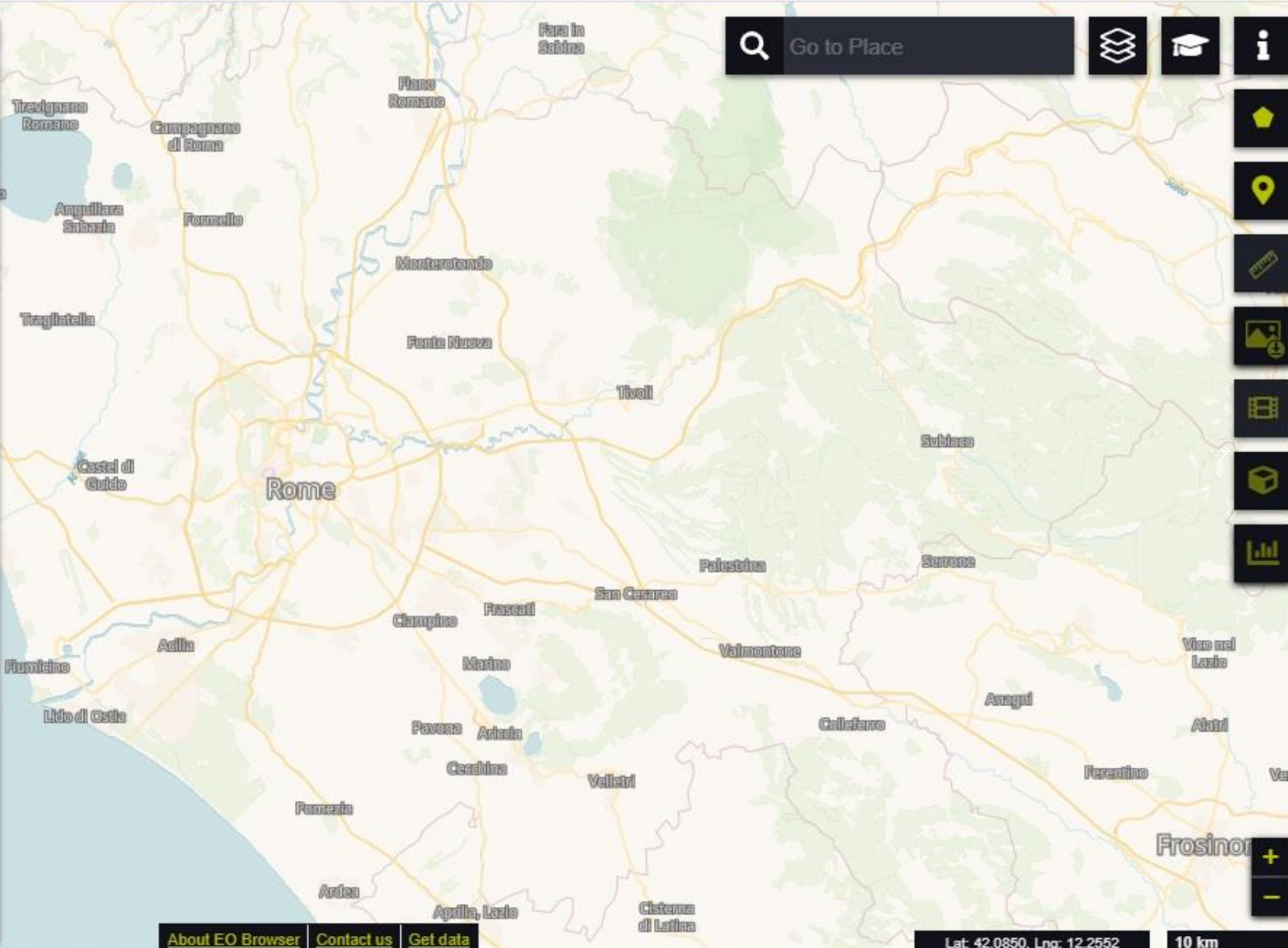
Advanced search: ☐

Free sign up for all features

Powered by Sentinel Hub with contributions by ESA v3.4.5



Go to Place



About EO Browser

Contact us

Get data

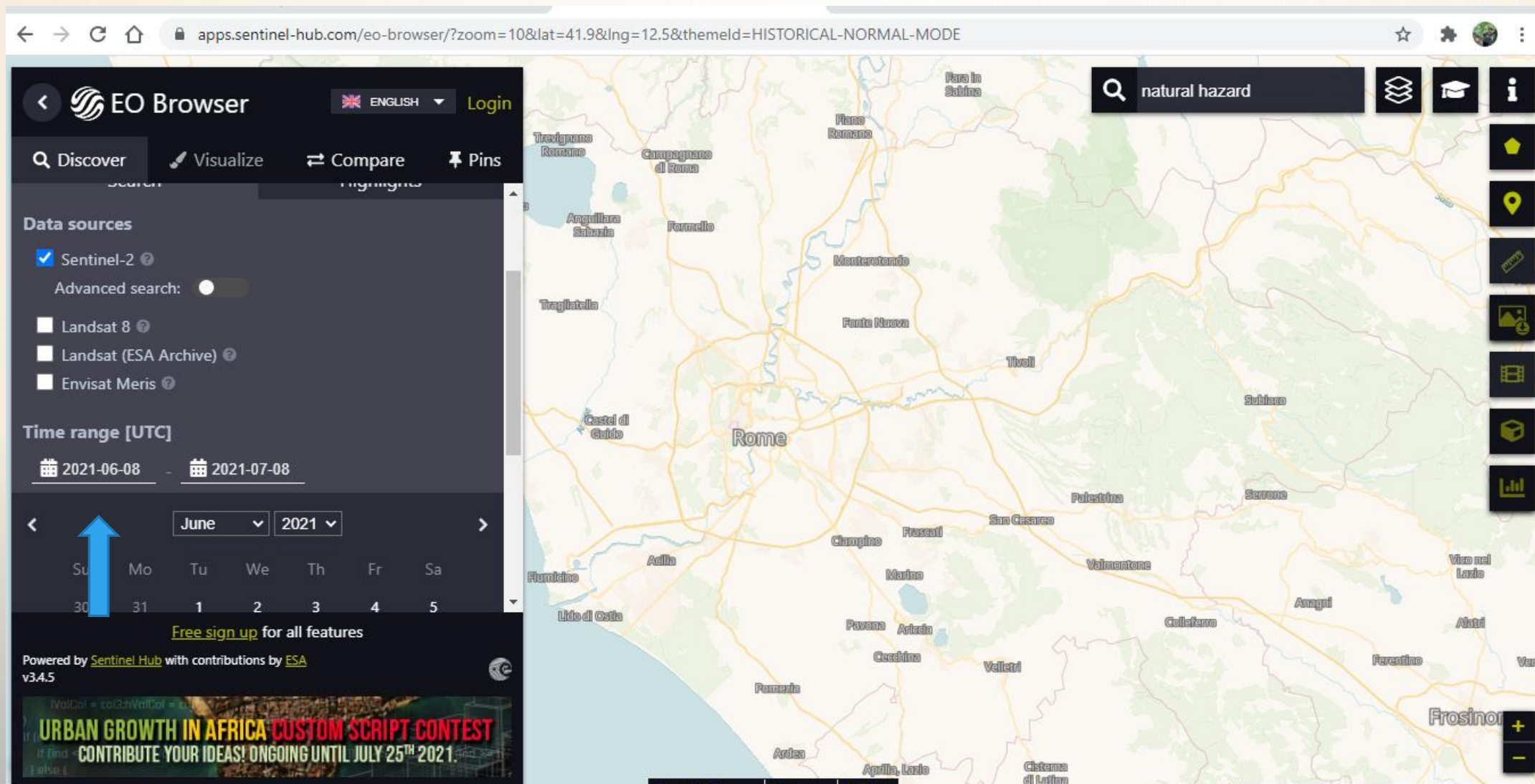
Lat: 42.0850, Lng: 12.2552

10 km

09:02



SELECT “THE TIME RANGE “



The screenshot displays the EO Browser web application interface. The browser's address bar shows the URL: `apps.sentinel-hub.com/eo-browser/?zoom=10&lat=41.9&lng=12.5&themelId=HISTORICAL-NORMAL-MODE`. The application header includes the "EO Browser" logo, a language selector set to "ENGLISH", and a "Login" button. Below the header, there are tabs for "Discover", "Visualize", "Compare", and "Pins".

The left sidebar contains the "Data sources" section, where "Sentinel-2" is selected with a blue checkmark. Other options include "Landsat 8", "Landsat (ESA Archive)", and "Envisat Meris". Below this is the "Time range [UTC]" section, which shows a date range from "2021-06-08" to "2021-07-08". A calendar view is visible, with a blue arrow pointing to the date "30" in the "Su" column of June 2021.

The main area of the interface is a map of Rome and its surrounding regions, including Lazio and Umbria. The map is overlaid with a grid and shows various geographical features like rivers, roads, and urban areas. On the right side of the map, there is a search bar containing the text "natural hazard" and a vertical toolbar with icons for different map layers and tools.

At the bottom of the interface, there is a banner for the "URBAN GROWTH IN AFRICA CUSTOM SCRIPT CONTEST" with the text "CONTRIBUTE YOUR IDEAS! ONGOING UNTIL JULY 25TH 2021".



CREATION –PART 2

SELECT FROM THE LIST “THEME”, FIND A NATURAL PHENOMENA OR DISASTER.

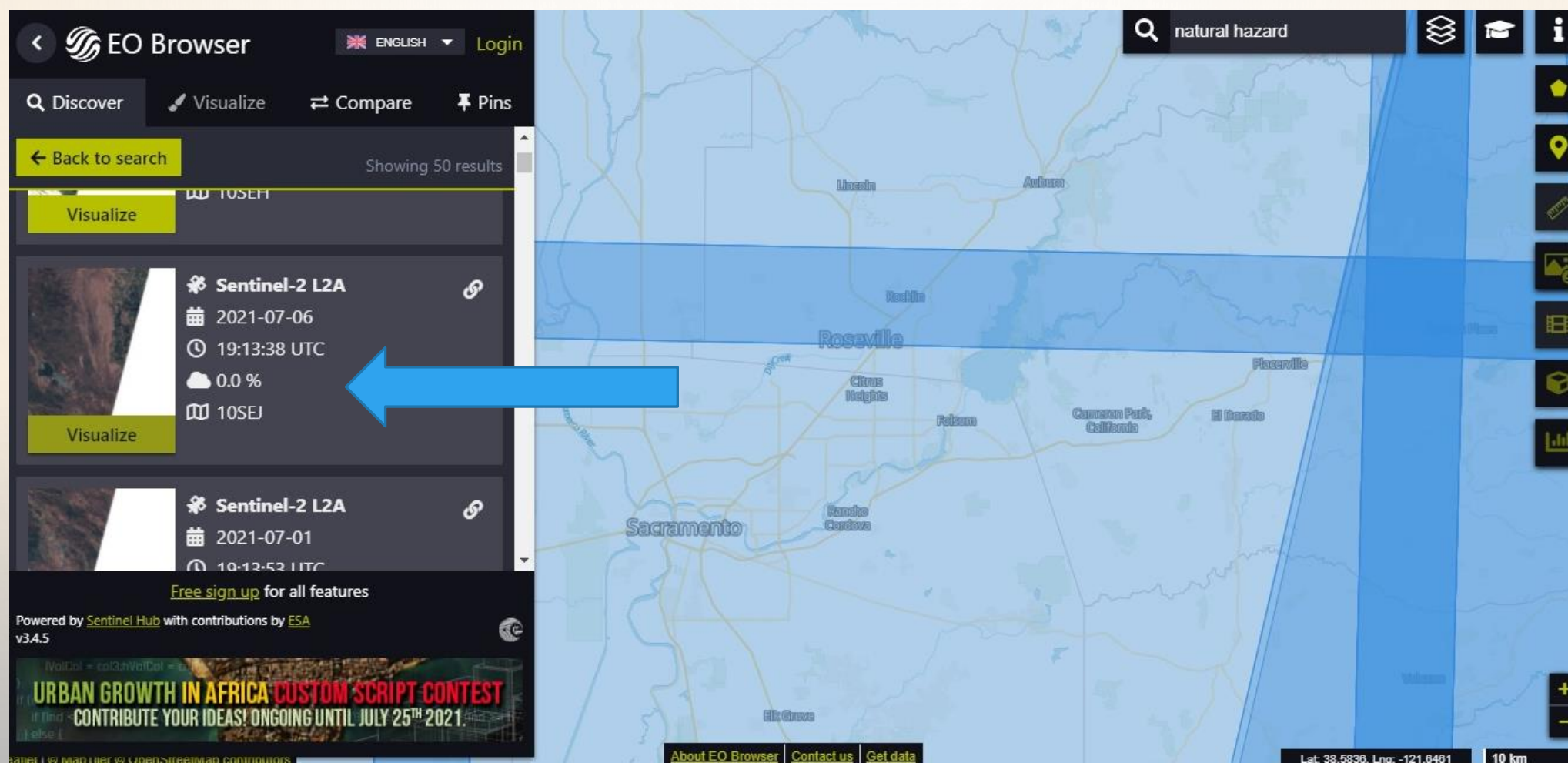


A screenshot of the Sentinel Hub EO Browser web application. The browser window shows the URL 'apps.sentinel-hub.com/eo-browser/?zoom=10&lat=41.9&lng=12.5&themeld=HISTORICAL-NORMAL-MODE'. The interface includes a left sidebar with a search bar, a 'Theme' dropdown, and a 'Data sources' section with checkboxes for Sentinel-2, Landsat 8, Landsat (ESA Archive), and Envisat Meris. The main area displays a map of Rome, Italy, with a search results list on the right. The search results list is titled 'natural hazard' and contains several entries, including 'Natural Hazard Disclosure Report, LLC, Walerga Road, Antelope, California, Statele Unite ale Americii' and 'Center for Natural Hazards Research, East 10th Street, Greenville, Carolina de Nord, Statele Unite ale Americii'. The bottom of the interface shows a status bar with coordinates (Lat: 42.1308, Lng: 13.0820) and a scale bar (10 km).



CREATION –PART 3

For details , click on the “ Vizualize”



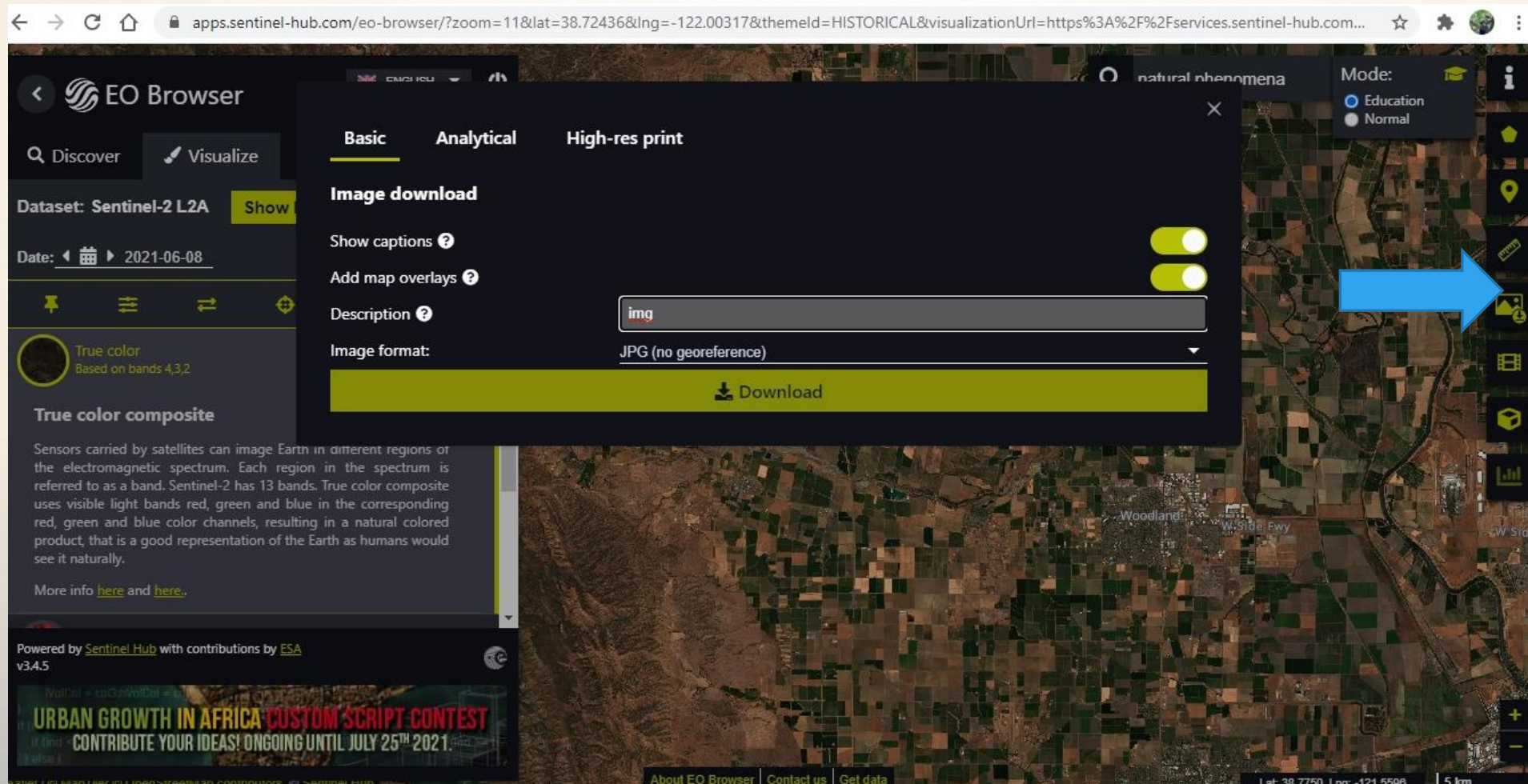
The screenshot displays the EO Browser interface. On the left, a sidebar shows search results for 'Sentinel-2 L2A' images. The top result is dated 2021-07-06 at 19:13:38 UTC, with a cloud cover of 0.0% and a 10SEJ value. A blue arrow points from the 'Visualize' button next to this result to the map area. The map shows a region in California, including Sacramento, Roseville, and Placerville. The search bar at the top right contains the text 'natural hazard'. The interface includes various navigation and tool icons on the right side, such as a search icon, a map icon, a location pin, and a scale bar at the bottom right.



CREATION –PART 4



From the right download the image



The screenshot displays the EO Browser web application. On the left, the 'Dataset: Sentinel-2 L2A' is selected, and the date is set to '2021-06-08'. The 'True color composite' section provides information about the image's spectral bands. The main panel shows the 'Image download' tab, which includes options for 'Show captions', 'Add map overlays', and 'Description'. The 'Image format' is set to 'JPG (no georeference)', and a large green 'Download' button is visible. A blue arrow points to the download button. The background shows a satellite map of a rural area with labels like 'Woodland' and 'W. Side Fwy'.



4. DISCUSSION



EXPLANATION BASED ON EVIDENCE

CONSIDER OTHER EXPLANATIONS

Can you identify other extreme phenomena, which you can incorporate in the list created depending on the severity of the effects produced? why do you think it is important to study and analyze these extreme phenomena? could the proposed solutions to prevent some of these phenomena be put into practice?

how can we be sure that the proposed solutions are good?

[HTTPS://MAPS.NGDC.NOAA.GOV/VIEWERS/HAZARDS/](https://maps.ngdc.noaa.gov/viewers/hazards/)

[HTTPS://TASKS.HOTOSM.ORG/LEARN](https://tasks.hotosm.org/learn)

[EXTREME NATURAL EVENTS | NATIONAL GEOGRAPHIC SOCIETY](#)



Layers

☐ Tsunami Events ?

Show as:

- ☒ Symbols for Cause/Fatalities
☐ Green Squares

Search

☒ Tsunami Observations ?

Show as:

- ☒ Vertical Bars for Water Height
☐ Color-Coded by Measurement Type

Search

☐ Significant Earthquakes ?

Search

☐ Significant Volcanic Eruptions ?

Search

☐ Volcanoes ?

Search

☐ DART® Deployments ?

Search

☐ Tsunami Capable Tide Stations ?

Search

Tsunami Events Search

Tsunami Source Criteria:

Source Year (-2000 to present):

Min: Max:

Source Location Name includes:

Source Region Name:

Source Country:

Event Validity:

Min: Max:

Number of Deaths:

Min: Max:

Damage in Millions of Dollars:

Min: Max:

Cause of Tsunami:

- ☐ Unknown Cause
☐ Earthquake
☒ Questionable Earthquake
☐ Earthquake and Landslide
☐ Volcano and Earthquake
☐ Volcano, Earthquake, and Landslide

Earthquake Magnitude:

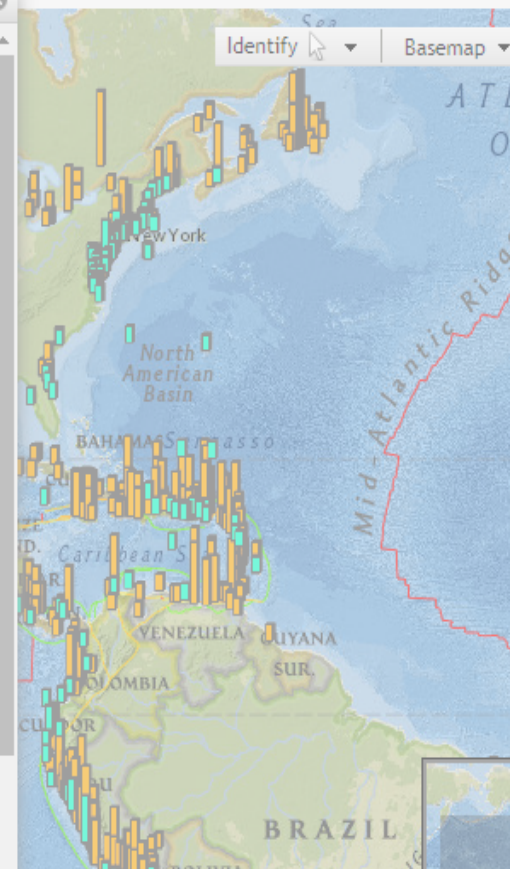
Min: Max:

Tsunamis that Generated Observations with these Criteria:

Observation Region Name:

Observation Country:

Observation Area (state, province, prefecture, etc.):



5. REFLECTION



COMMUNICATE EXPLANATION

Verification of knowledge understanding

Answer the following questions:

What is a natural phenomenon? What is a natural disaster?

Give specific examples for each.

Is there a difference between natural phenomena and natural disasters? Which will be?
What measures can be taken to reduce the impact of these phenomena?





REFLECTION

Students will prepare a journal / report where they will present the sequence of stages of the lesson, will discuss the problems identified and analyzed and will participate in discussions.

regarding the solutions and the obtained results.

Students will receive instructions regarding the preparation of the activity report which will have to include:

A brief introduction about the sequence of stages of the activity,

Diversity of studied phenomena and data representation

The results obtained and their commentary,

The final conclusions





THEMES FOR REFLECTION

<http://www.bom.gov.au/tsunami/index.shtml?ref=dropdown>

<https://www.geography.org.uk/teaching-resources/flooding-case-studies>





Useful links :

<https://maps.ngdc.noaa.gov/viewers/hazards/>

<https://quizizz.com/admin/quiz/5de40e597a60f0001ef41bbe/atmospheric-phenomena>

[Hazards \(usgs.gov\)](https://hazards.usgs.gov/)

[Maps | Worldmapper](#)

<https://www.funtrivia.com/html5/index.cfm?qid=50603>



Thank you for your attention!



Useful icons

TI

