Choose <u>one</u> of the 3 case studies on the following page for your assignment!

Please document your workflow with screenshots. You <u>do not</u> need to download any imagery.

Part 1: High Resolution, Free Imagery *(5 Points)*

- Use an online portal of your choice (EO-Browser, Google Earth Engine, USGS Earth Explorer, …) to find Sentinel-2 or Landsat-8 imagery fitting for your case study.
    - Provide an overview and quality assessment of the datasets you found *(2 pts)*
    - Briefly describe how you solved this task. What criteria did you apply? *(2 pts)*
    - In your opinion, how is satellite imagery is useful in this context? *(1 pt)*

Part 2: Commercial Very High Resolution Imagery *(5 Points)*

- Very high resolution (VHR) imagery lets us get into the details of what's happening on the ground. It's most useful when we study small regions where we are interested in the details on the ground. As such, we often use VHR data to look at human settlements. Recommended online portal: Maxar/Digital Globe.
    - Choose one image per settlement and list the sensor type, resolution, and acquisition date *(2 pts)*
    - For which settlement was the most imagery available? *(2 pts)*
    - Compare your result with available imagery on Google Earth Pro *(1 pt)*

Some useful resources:

A short "how-to" video for EO-browser: https://www.youtube.com/embed/m3pron0C0kE

"How-to" documentation for USGS: https://gisgeography.com/usgs-earth-explorer-download-free-landsat-imagery/

Google Earth Engine Guides: https://developers.google.com/earth-engine/guides

Prepared Codes for Google Earth Engine:

Sentinel-2 generic code: https://code.earthengine.google.com/c7f69fe0c0762673843b913a3bcb7d04?noload=true

Landsat 8 generic code: https://code.earthengine.google.com/2c7e7b39bafc4201d83a6b9acf65aaf5?noload=true

Deforestation around Altamira, Brazil

Context: You are invited to attend a meeting to assess deforestation activities in the last decade around the city of Altamira in the state of Para, Brazil. You will be joining as a remote sensing expert and are expected to bring along some insightful satellite imagery as a discussion starter and information source.

You should bring along high-resolution imagery from 2016 or earlier and from 2021 for comparison. Use an online portal to query Sentinel-2 or Landsat 8 imagery for your area of interest (AOI). For your search, either download your AOI from here or create your own in the portal. Keep in mind: good comparisons over the span of several years consist of images from the same seasons!

Since this area is so remote, very high resolution (VHR) data of the settlements Anapu and Medicilandia would be helpful to get an idea of the local population sizes. Use an online portal to find fitting VHR imagery. Only one image per settlement is needed, it should be as recent as possible and cloud-free.

Wildfire Monitoring in NSW, Australia

Context: You receive an urgent call to attend a meeting to evaluate the damage extent and possible emergency responses to the wildfires that are spreading in New South Wales, western Australia in October and November 2019.

Your job as remote sensing expert is to prepare some high-resolution satellite imagery that will help others understand the situation. To find useful imagery, query online portals for Sentinel-2 or Landsat 8 images before and during the fires. For your search, either download your AOI from here or create your own in the portal.

To assess potential at-risk populations, very high resolution (VHR) imagery can help us figure out how many people and what kind of houses there are. Find one VHR image each for the settlements Grafton and Bellbrook as near to the time of the fires as possible.

Glacier Melt Watch in Alaska, USA

Context: You are part of an expert group whose purpose is to document the melting of Alaskan glaciers throughout the last five to ten years. An important piece of evidence will be satellite imagery. Your job is to find some useful high-resolution imagery for comparisons from 2017 or earlier and from 2021.

To find these images, use online portals to search for Sentinel-2 or Landsat 8 imagery. For your search, either download your AOI from here or create your own in the portal. Keep in mind: good comparisons over the span of several years consist of images from the same seasons!

Alongside the glacier melt, your team wants to assess the nearby population sizes. Very high resolution (VHR) imagery is the best option to get a detailed overview of settlements. Find one recent VHR image each for the settlements Cordova and Valdez. Visibility should be good and there should be no snow cover.

Detecting Algae Blooms in the Baltic Sea

Context: You've just joined a marine monitoring team in that is keeping an eye on the blooming of harmful cyanobacteria during summer months (esp. July) in the Baltic Sea. Satellite imagery has recently been proven very useful in the detection of these blooms, since such large-scale phenomena are harder to spot from the ground.

Your task within the team is to collect historic imagery on these blooms, within the last 5 years though, which will be used as education and communication material in meetings with local authorities. Use an online portal to query Sentinel-2 or Landsat 8 imagery for your area of interest (AOI). For your search, either download your AOI from here or create your own in the portal.

The team is also interested in finding out more about the coastal settlements where communities may be directly or indirectly affected. To gain a first insight, find one very high resolution (VHR) image for each of the settlements Hanko and Kärdla as recently as possible.

Deforestation

Global Forest Watch – online map showing global deforestation
Nusantara Atlas – online map showing deforestation in South East Asia
Satellite shows Extent of Destruction to the Planet (Video) – BBC short video
How Satellite Imagery is Helping the Fight Against Deforestation

Wildfires

Copernicus EMS – real information on this case study's wildfires as analysed by experts
NASA's FIRMS – NASA's online map on fires around the world (or rather thermal anomalies)

Glacier Melt

Ice in Motion (Video) – article and timelapse video on how satellite images capture change
Observing Glacier Change from Space – article on diverse remote sensing applications

Detecting Algae Blooms

How NASA Satellites Track Algal Blooms
The Good, the Bad, the Algae (Video) – NASA's plans and explanation on algae monitoring