Collect Earth – Training Plots

Augmented Visual Interpretation
Learning by example

Before you start

- This presentation complements the Collect Earth survey that is shown the first time Collect Earth is run after installation. This survey is also available HERE

- The examples on the coming slides are shown on the Google Earth interface when Collect Earth is loaded with the survey. Try to visualize them while you read this guide.

- Collect Earth requires the user to have the latest version of **Chrome** installed, please make sure you do! Also, if you don't have **Google Earth** installed you are in the wrong presentation ☺

- It is not easy to understand the mechanism of the interpretation on the first plots, try to connect what you see in the Google Earth Very High Resolution imagery to the False Color imagery to better understand how the land cover is being visualized.

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Table of contents

- Background information:
  - What is the Normalized Difference Vegetation Index (NDVI)?
  - What is a False Color Image?
  - Why do we need the GEE app?
  - Which satellite images and graphics can you find in the GEE app?
  - How to activate historical images in the Google Earth interface?

- Training plots:
  - Examples of land uses based on the IPCC land use categories (Forest, Cropland, Grassland, Wetland, Settlement, Other land) will be presented and discussed.
  - Plots are distributed in BEGINNER and ADVANCED plots depending on their level of difficulty.

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Training plots

➢ **Forest:**
- Broadleaf evergreen - (Corcovado, Costa Rica)
- Broadleaf deciduous - (Sinaloa, Mexico)
- Broadleaf mixed - (Cuvette, Congo)
- Mixed forest (brod-con) - (Hokkaido, Japan)
- Riparian forest - (Alfeiós, Greece)
- Mangrove forest - (Mekong Delta, Vietnam)

➢ **Cropland:**
- Rice paddy - (Biliran, Philippines)
- Permanent crop, Sugarcane - (Corozal, Belize)
- Orchard, Vineyard - (Kakheti, Georgia)
- Permanent crop, Cereal - (Guadalajara, Spain)
- Palm - (West Sepik, PNG)

➢ **Grassland:**
- Grassland with trees and shrubs - (Western Rwanda, Rwanda)
- Grassland - (Southland, New Zealand)
- Grassland with trees - (Serengeti, Tanzania)
- Shrubland - (La Palma, Spain)
- Grassland with trees - (Mato Grosso, Brazil)

➢ **Wetland:**
- Lagoon - (Rio de Janeiro, Brazil)
- Seasonal river - (Ghaggar, India)
- Permanent river - (Nyabarongo, Rwanda)
- Salt extraction - (Qoqek, China)
- Peatland - (Muyaga, Rwanda)

➢ **Settlement:**
- City - (Essaouira, Morocco)
- Infrastructure - (Hamburg, Germany)
- Mining - (North Rhine Westphalia, Germany)
- Village - (Island, Lake Chad)
- Urban Park - (London, UK)

➢ **Otherland:**
- Snow - (Arusha, Tanzania)
- Sand - (Easter Island, Chile)
- Dune - (Mingsha Shan, China)
- Ice - (Graham Land, Antarctica)

The KML (Google Earth file) with all these plots can be found here HERE

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What is the Normalized Difference Vegetation Index (NDVI)?

The NDVI quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs). These bands are present on the imagery collected by the MODIS, Landsat and Sentinel sensors.

NDVI = (NIR – Red) / (NIR + Red)

- Calculations of NDVI for a given pixel always result in a number that ranges from minus one (-1) to plus one (+1)
- No vegetation (trees of grass) gives a value close to zero
- A zero means no vegetation
- Close to +1 (0.8 - 0.9) indicates the highest possible density of green leaves
- A negative value indicates the presence of water, snow or ice

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What is a False Color image?

- Instead of using the human-visible bands (Red-Green-Blue) these images show a composition of Near Infrared, Short Wave Infrared and Red (NIR-SWIR-Red) bands.

- This band combination allows the vegetation to be shown more prominently.

- Using this <u>False Color</u> combination the highly **vegetated areas** (forest) will be shown with different shades of red/orange, the **less vegetated areas** (open forest and grasslands) as shades of orange/yellow and areas of very **little vegetation** as shades of green/blue. **Water** will be represented in black/dark blue.
Areas with **wet terrain** or **snow/ice** will be shown purple/pink

- In the coming slides you will be able to see the different ways that this false color combination behaves depending on the land cover.

Image with human visible bands

Image with false color bands

COLLECT EARTH
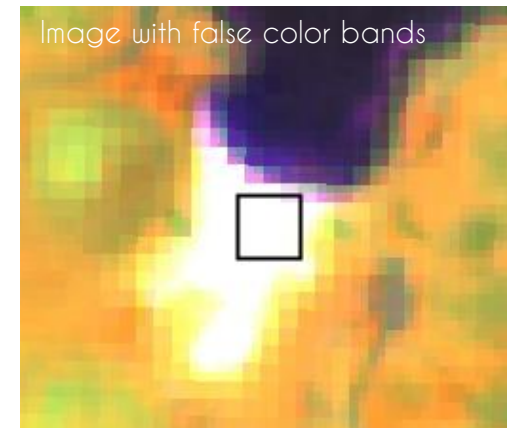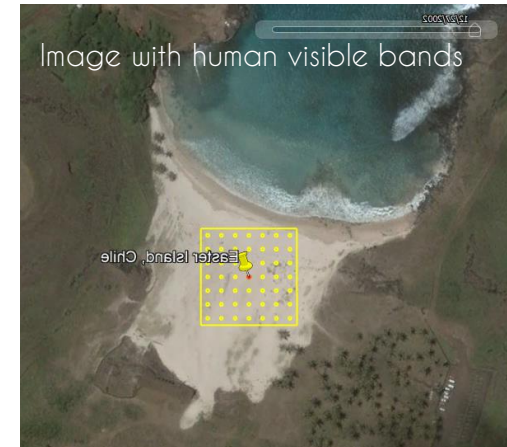
Why do we need the GEE app?

• Google Earth has a historical repository of Very High Resolution (VHR) imagery that usually makes visual interpretation easy.

• But this repository is limited, some areas will have **dozens** of VHR images while others will have **one or none**.

• The GEE App integration allows Collect Earth to give the user a historical perspective of the changes in the landscape as the **MODIS, LANDSAT 7/8** and **Sentinel-2** imagery is collected globally and systematically.

• Being able to access the NDVI graphs and False Color images allows the user to really understand the dynamics of the plot.

Image with human visible bands

Island, Lake Chad

Image with false color bands

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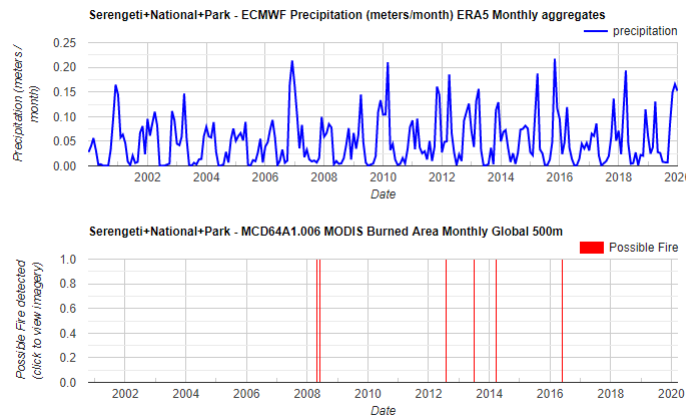# Which satellite images and graphics can you find in the GEE app?
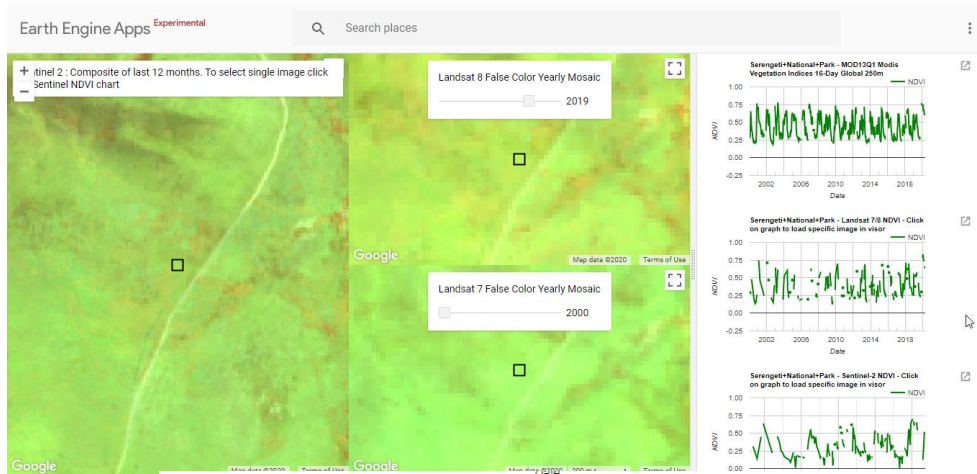
Images: Sentinel 2 and Landsat 7/8 False Color Mosaics (NIR-SWIR-Red)

NDVI graphs: MODIS, Landsat 7/8 and Sentinel-2 NDVI (vegetation index showing the vegetation intensity)

Precipitation graph: Representation of precipitation. ECMWF Precipitation in (meters/month) - ERA5 Monthly aggregates. The precipitation should influence the variation of the NDVI.

Fire graph (MODIS): Representation of possible fires with MODIS Burned Area Monthly Global 500m
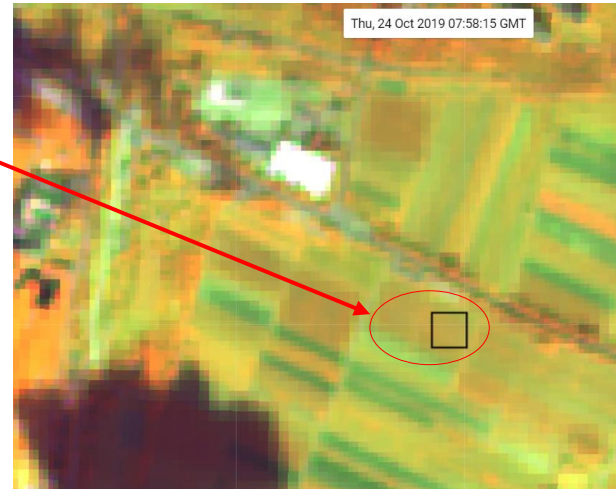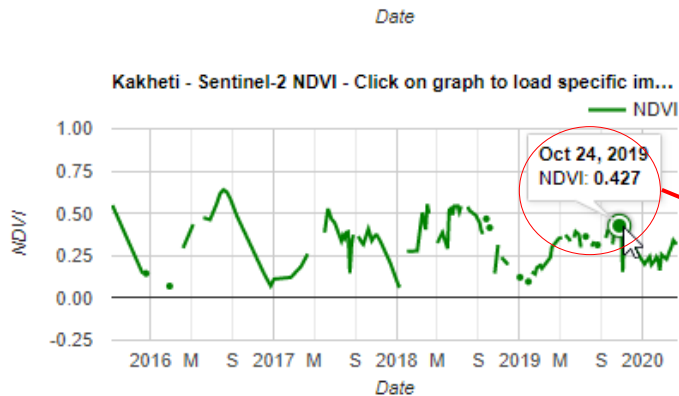
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Which satellite images and graphics can you find in the GEE app?

Spatial and temporal resolution of satellite images:

Satellite	Spatial resolution	Temporal resolution	Imagery available since
MODIS	Low (250 m)	High (daily revisit time, graph shows less-cloudy image during16 days)	2000
Landsat 7/8	High (30m)	Low (16 days revisit time)	2000
Sentinel 2	High (20m)	High (5 days revisit time)	2015

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Which satellite images and graphics can you find in the GEE app?

Date

Kakheti - Sentinel-2 NDVI - Click on graph to load specific im...

— NDVI

Oct 24, 2019
NDVI: 0.427

Thu, 24 Oct 2019 07:58:15 GMT

The graphs and the images are connected. Clicking on a certain date in the graph the image of the same day will appear.
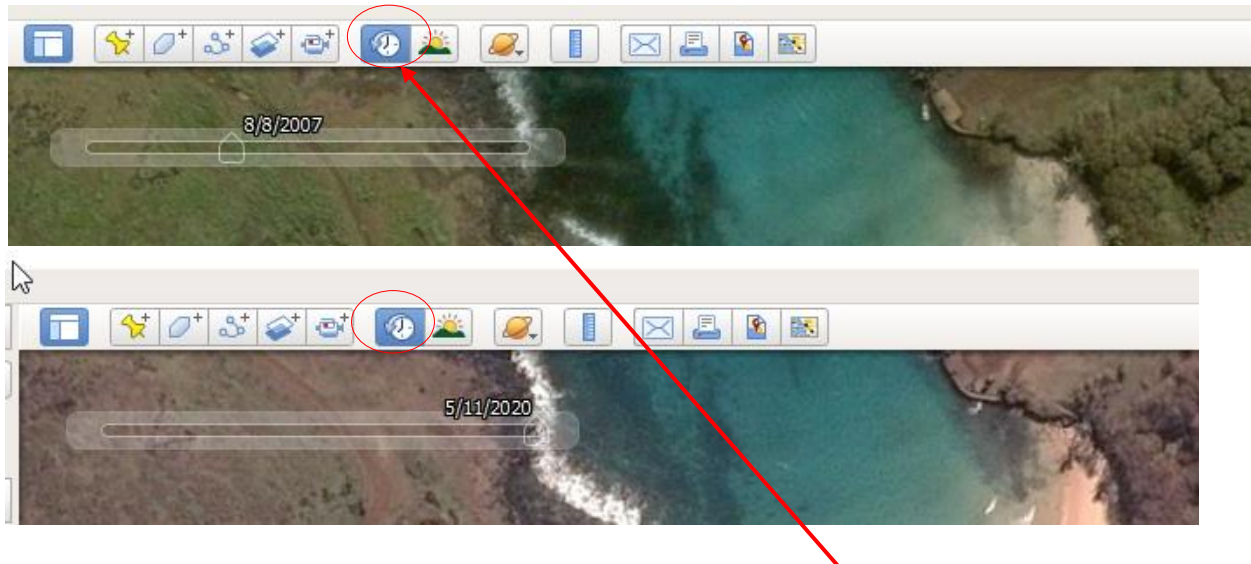
But they are not showing the same information!!
The graphs display NDVI values and the false color mosaics show the vegetation intensity.

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How to activate historical images in Google Earth?

Show historical imagery. Use the time slider to move between acquisition dates.

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Forest – Broadleaf evergreen
 (Corcovado, Costa Rica)

Category: Forest

Subcategory: Broadleaf evergreen

Description: In the plot and surroundings a dense forest can be seen. The plot is in Corcovado, one of the most important and untouched protected areas in Pacific Costa Rica established in 1975.

View in Google Earth

BEGINNER PLOT

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Forest – Broadleaf evergreen
 (Corcovado, Costa Rica)

Land use change: Since1970 no changes perceived in terms of forest area and density.

Forest – Broadleaf evergreen
(Corcovado, Costa Rica)

Corcovado - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m

Corcovado - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphs:
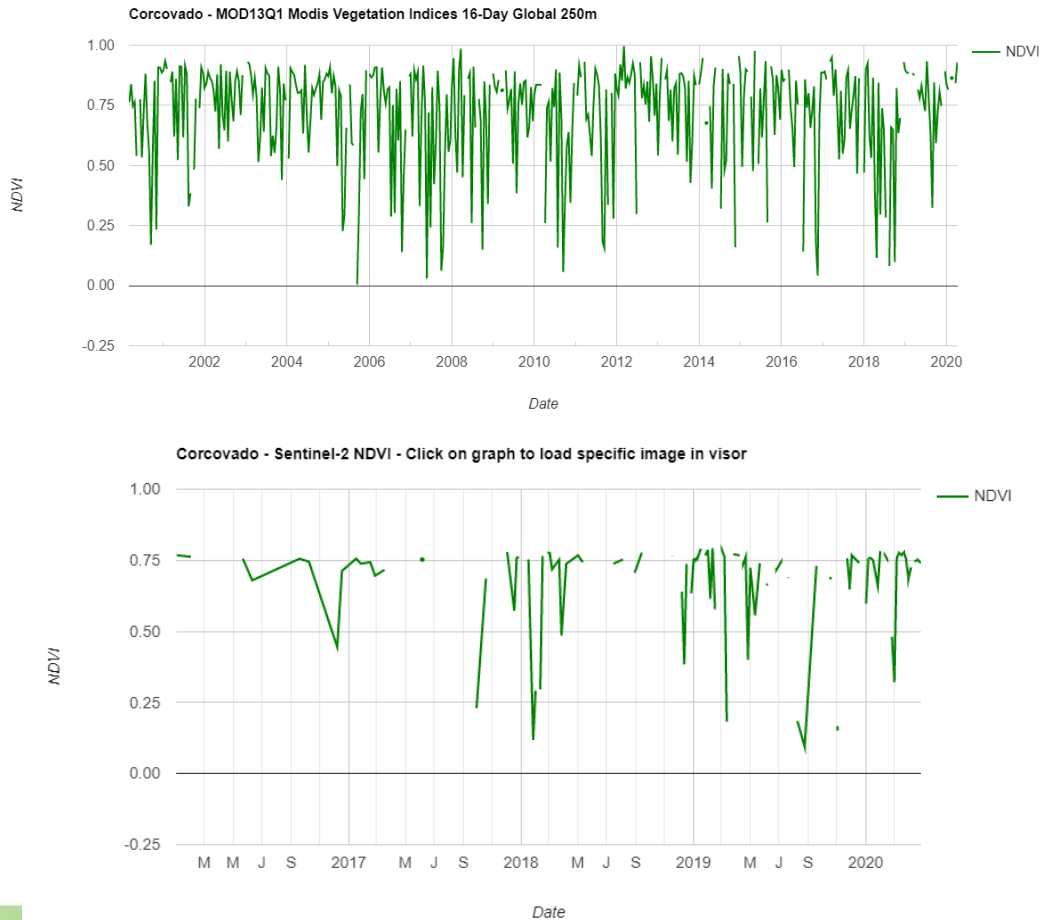
- In both graphs the average is above 0,5 which means presence of healthy vegetation throughout the year.

- The lack of annual fluctuations reflects the evergreen character of the forest.

- The **steep drops** in the graph are a consequence of the **clouds** that cover the forest and satellites do not receive the reflection.

COLLECT EARTH

Forest – Broadleaf deciduous
(Sinaloa, Mexico)

Category: Forest

Subcategory: Broadleaf deciduous

Description: In the plot and surroundings a semi-dense forest can be seen. The plot is in an arid area in the western part of the Sierra Madre Mountains in Mexico.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

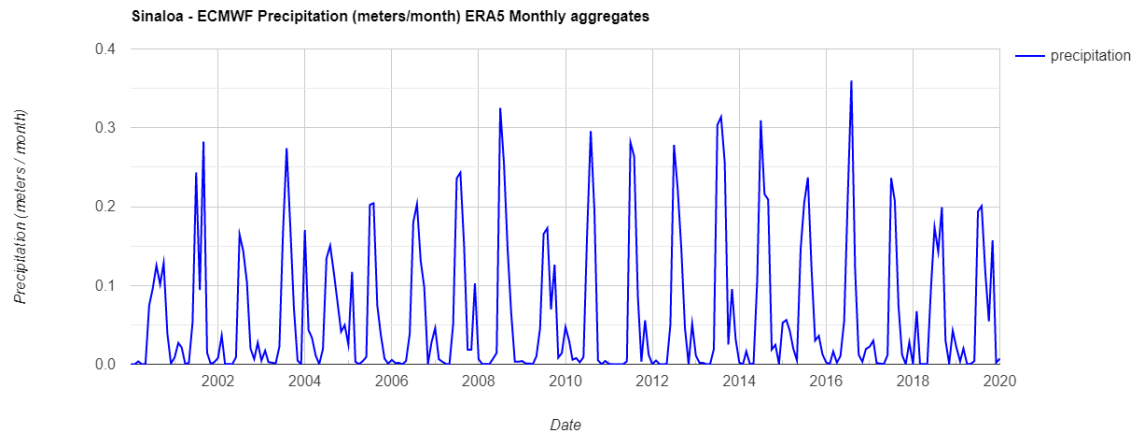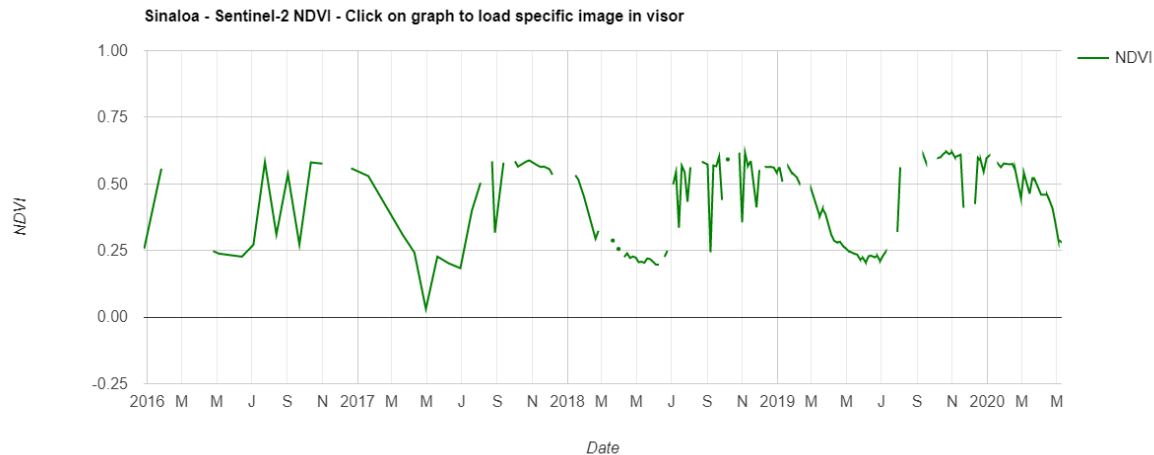# Forest – Broadleaf deciduous
(Sinaloa, Mexico)

Between June and November 2019 the landscape and colors look different due to the fall of the leaves in the deciduous forest.

Forest - Broadleaf deciduous
(Sinaloa, Mexico)

Sinaloa - Sentinel-2 NDVI - Click on graph to load specific image in visor

Sinaloa - ECMWF Precipitation (meters/month) ERA5 Monthly aggregates

Interpretation of NDVI and precipitation graphics:

- The NDVI graph shows that the highest NDVI value is above 0,5 and drops till 0,25 in the dry season.

- The annual pattern reflects the deciduous character of the forest that match with the precipitation graphic.

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Forest – Broadleaf mixed
(Cuvette, Congo)

Year 2019
3/2/2019
Cuvette, Congo

View in Google Earth

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Category: Forest

Subcategory: Broadleaf mixed

Description: The plot is located close to the Congo river.

Nevertheless, it is not a riparian forest because it does not look like a transition zone between the terrestrial and aquatic environment.
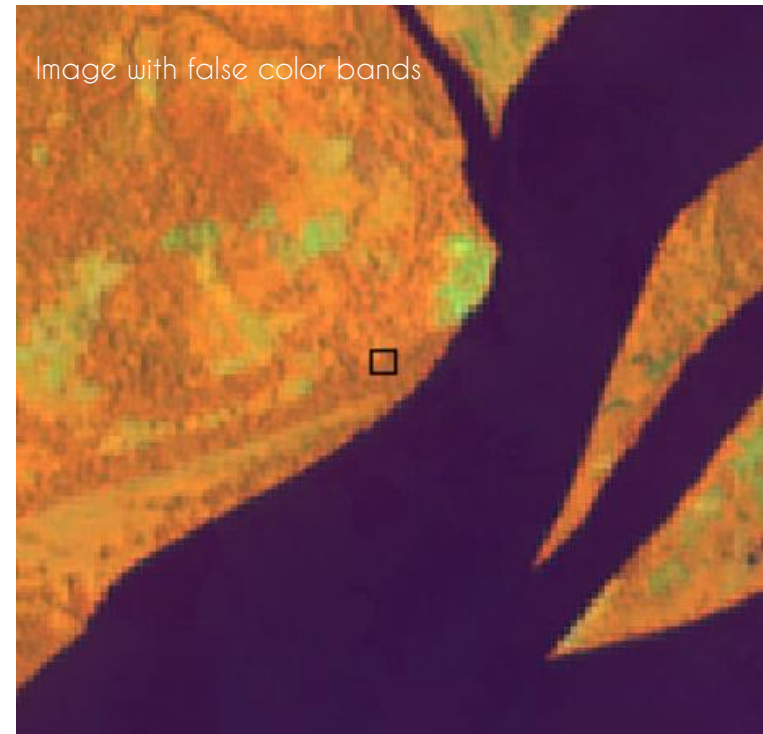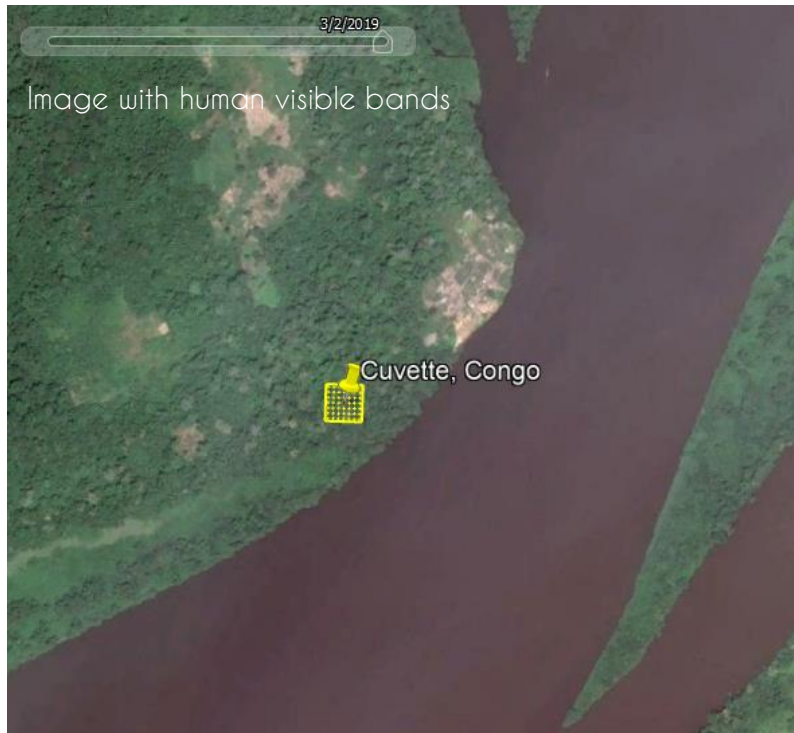
ADVANCED PLOT

Forest – Broadleaf mixed
 (Cuvette, Congo)

Real color image on the left side and false color image (Sentinel 2 composite of last 12 months) on the right side in comparison. In the Sentinel 2 image water is represented in dark blue, vegetation in orange and a village on the sidelines of the river in green.
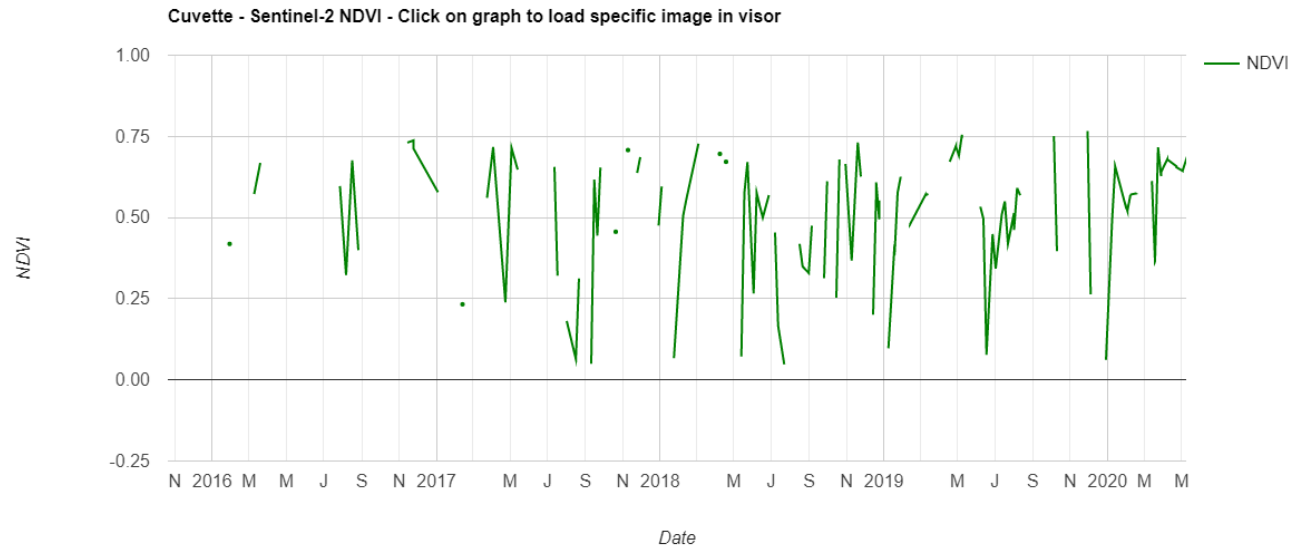
Forest – Broadleaf mixed
(Cuvette, Congo)

Cuvette - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graph:
- The average is above 0,5 which means presence of healthy vegetation throughout the year.
- The slightly recognizable annual pattern reflects the mixed character of the forest.
- Like in the broadleaf evergreen forest, the steep drops in the graph are a consequence of the clouds that cover the forest.

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Forest – Mixed forest (brod-con)
(Hokkaido, Japan)

Category: Forest

Subcategory: Mixed forest (brod-con)

Description: The plot is located in the plains of Hokkaido in Japan. The satellite image suggests the presence of coniferous and broadleaf species in the forest.
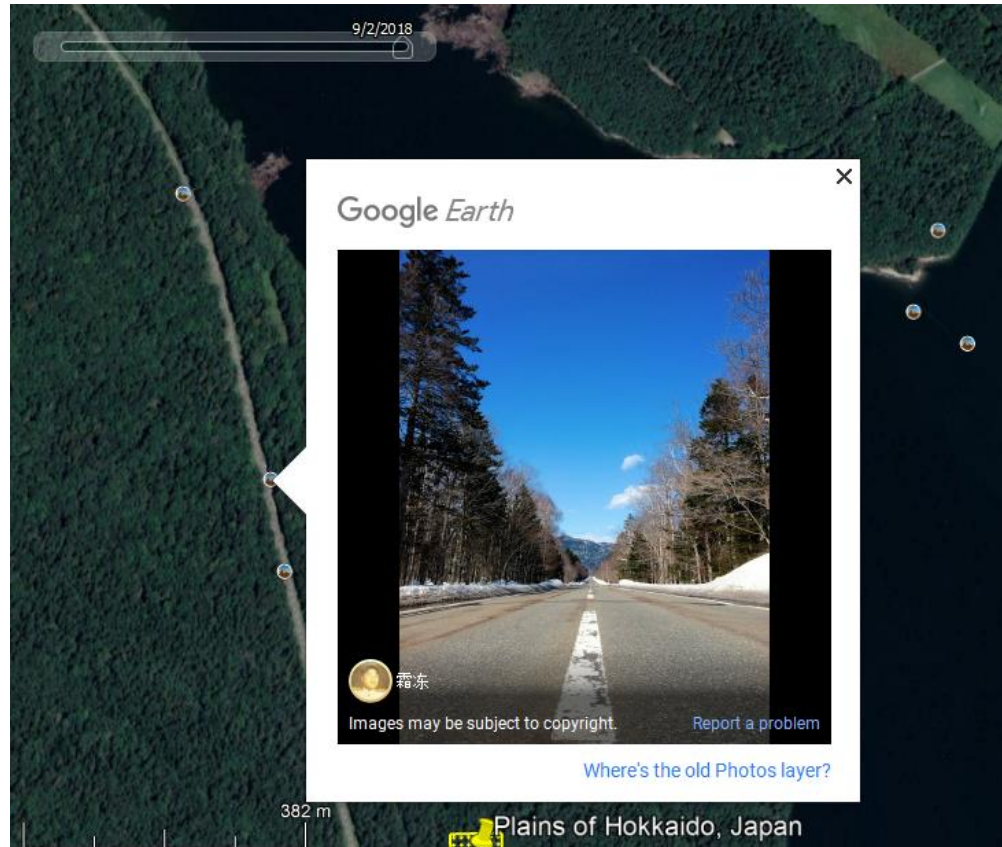
View in Google Earth

ADVANCED PLOT

COLLECT EARTH

Forest – Mixed forest (brod-con)
(Hokkaido, Japan)

The Google Earth pictures can be very helpful for the identification of land use categories and especially subcategories. In this picture the coniferous and deciduous trees that compose the mixed forest can be seen in the winter time.

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Forest – Mixed forest (brod-con)
(Hokkaido, Japan)

Year 2006 — 5/18/2006 — Plains of Hokkaido, Japan

Year 2012 — 6/25/2012 — Plains of Hokkaido, Japan
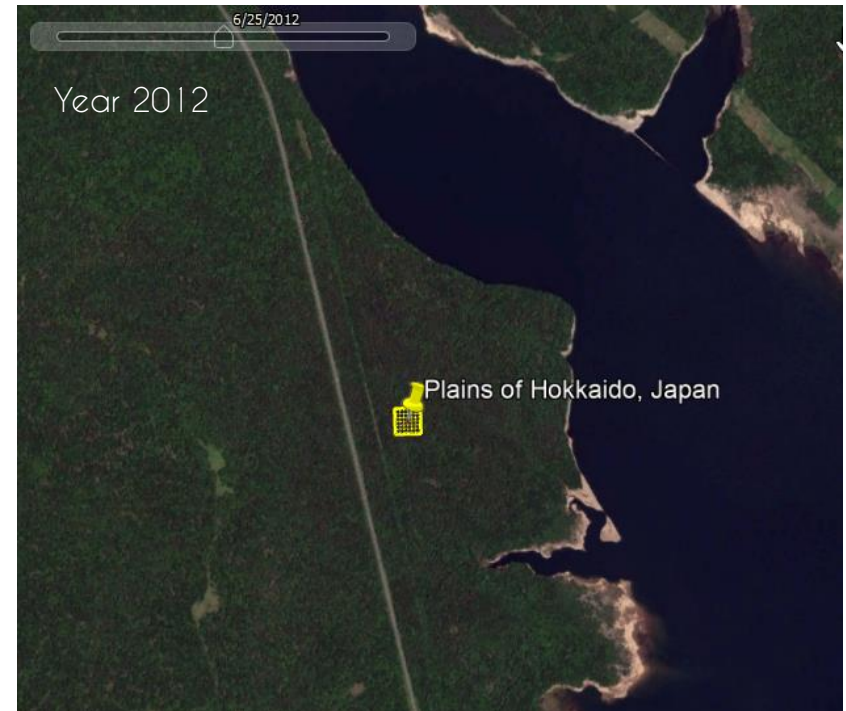
Land use change: Since 2000 (using NDVI graphs) no changes perceived in terms of forest area and density. The image on the right side in June 2012 shows how the color of the leaves start to turn red.
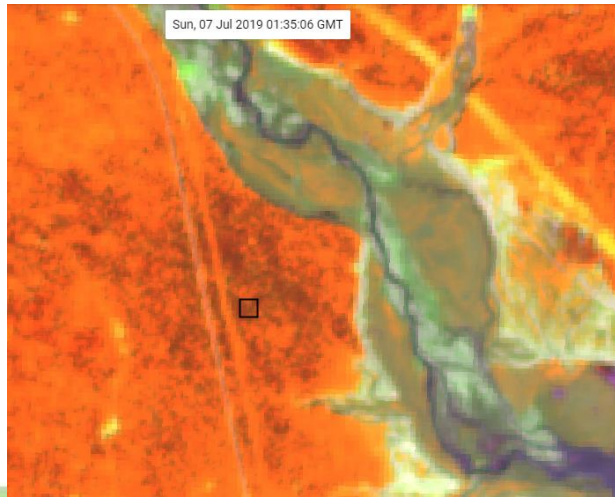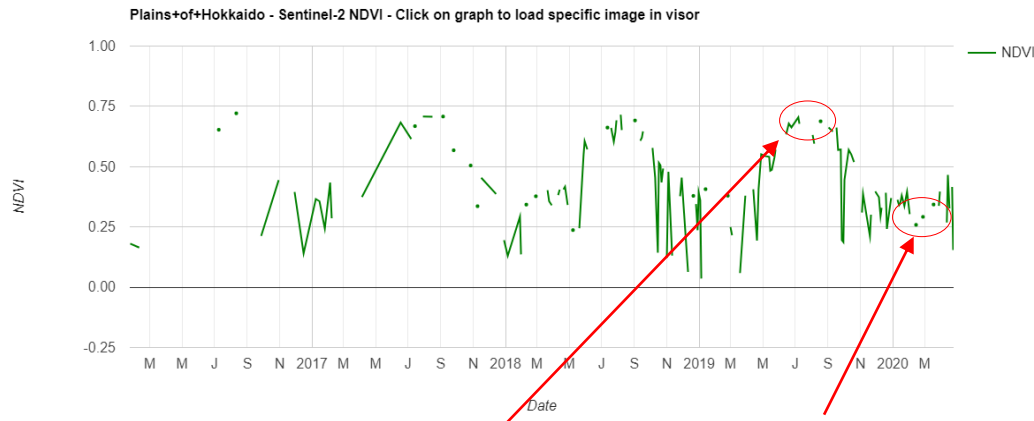
COLLECT EARTH

Forest – Mixed forest (brod-con)
(Hokkaido, Japan)

Plains+of+Hokkaido - Sentinel-2 NDVI - Click on graph to load specific image in visor

Sun, 07 Jul 2019 01:35:06 GMT

Fri, 14 Feb 2020 01:24:59 GMT
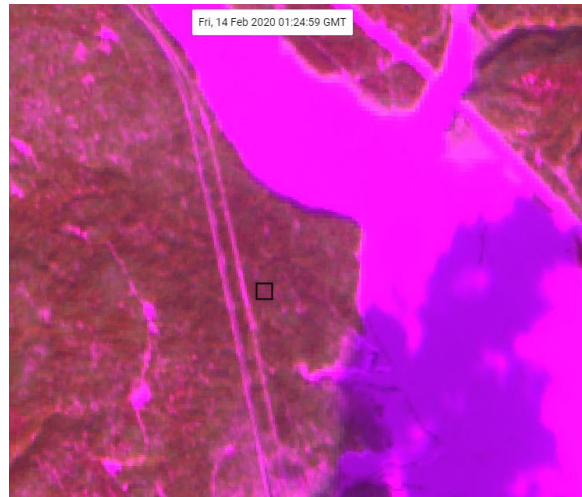
Interpretation of NDVI graphs and images:

- The NDVI graph shows that the highest NDVI value is above 0,5 and drops till 0,25 when a part of the forest loses its leaves or when the forest is covered by snow.

- On the left image in July, the forest is represented in orange as a sign of healthy vegetation.

- On the right image the forest is brownish, and the path and lake are pink/purple because covered with snow.

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Forest – Riparian forest
 (Alfeiós, Greece)

Year 2017
9/8/2017
Alfeios- Greece

Category: Forest

Subcategory: Riparian forest

Description: The plot is located adjacent to the Alfeiós which is the longest river in the Peloponnese, in Greece.

Riparian zones are transition zones between an upland terrestrial environment and an aquatic environment.
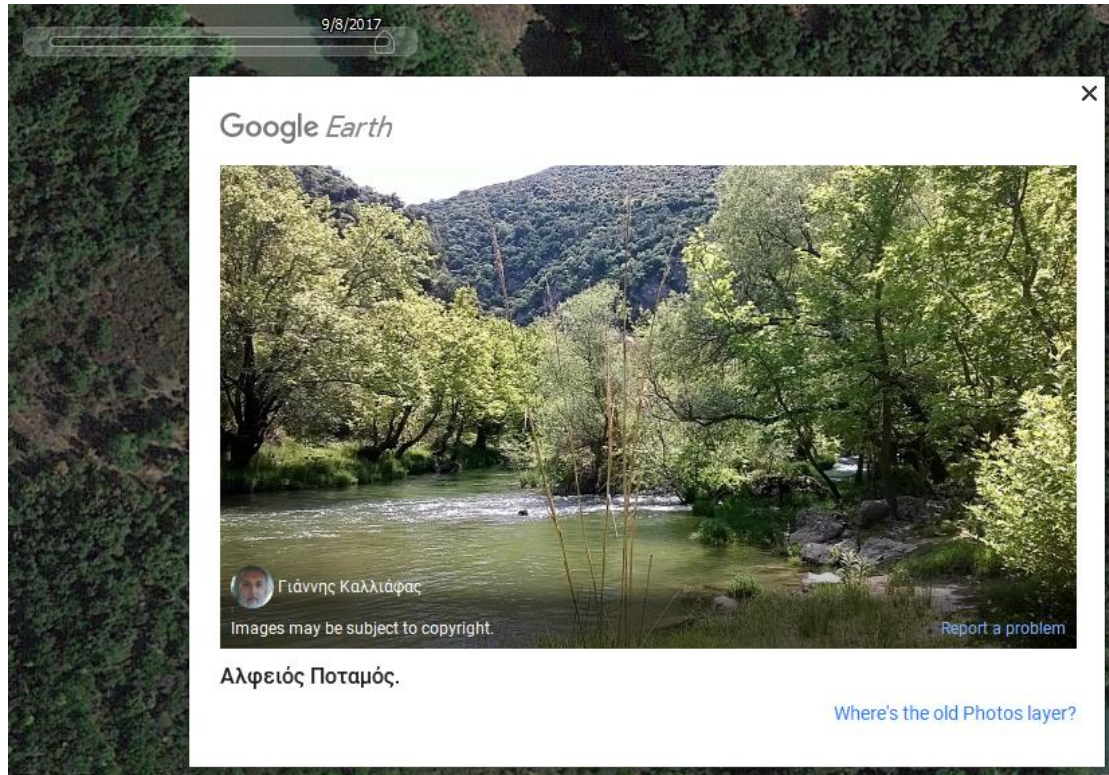
BEGINNER PLOT

COLLECT EARTH
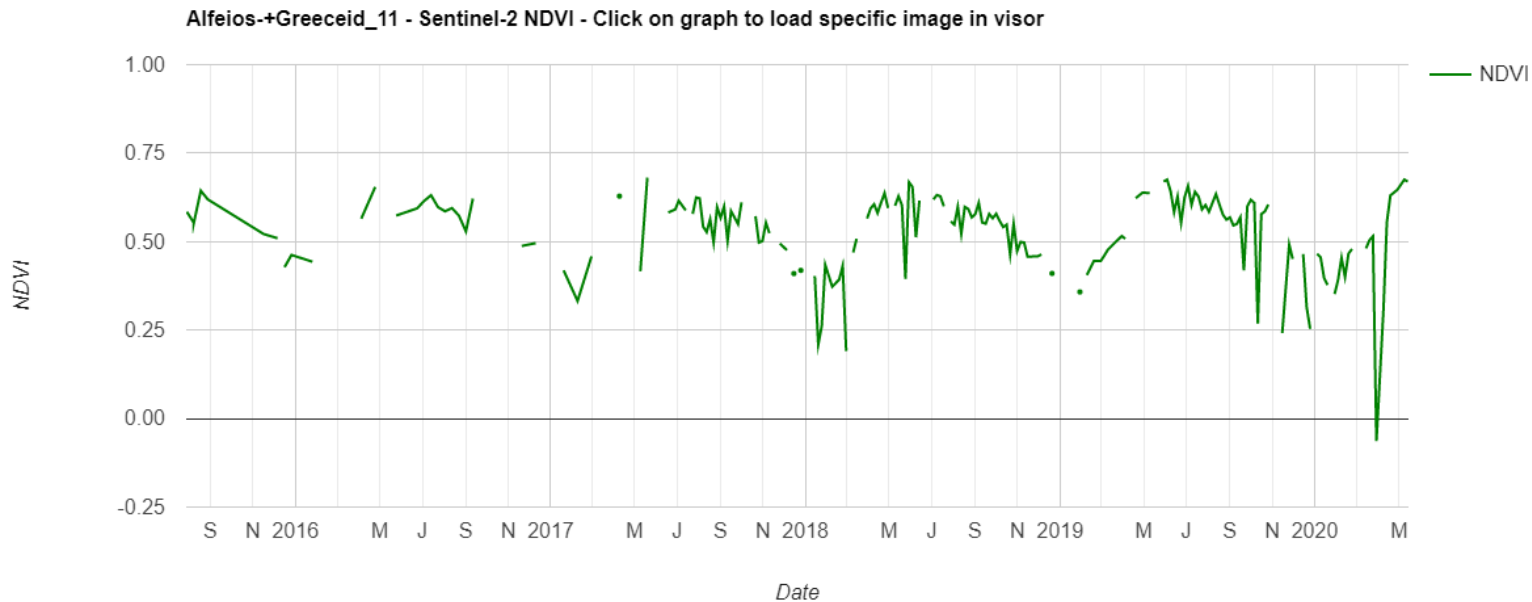
Forest – Riparian forest
 (Alfeiós, Greece)

In this picture riparian forest species (Salix etc.) can be appreciated.

Forest – Riparian forest
 (Alfeiós, Greece)

Alfeios-+Greeceid_11 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graph:
- The average is above 0,5 which means presence of healthy vegetation throughout the year.
- This riparian forest is deciduous that is why it fluctuates as year seasons change.

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Forest – Mangrove forest
 (Mekong Delta, Vietnam)

Category: Forest

Subcategory: Mangrove forest

Description: The plot is located in the Mekong Delta.

Mangrove forests grow on coastal intertidal zones in tropical and subtropical latitudes.
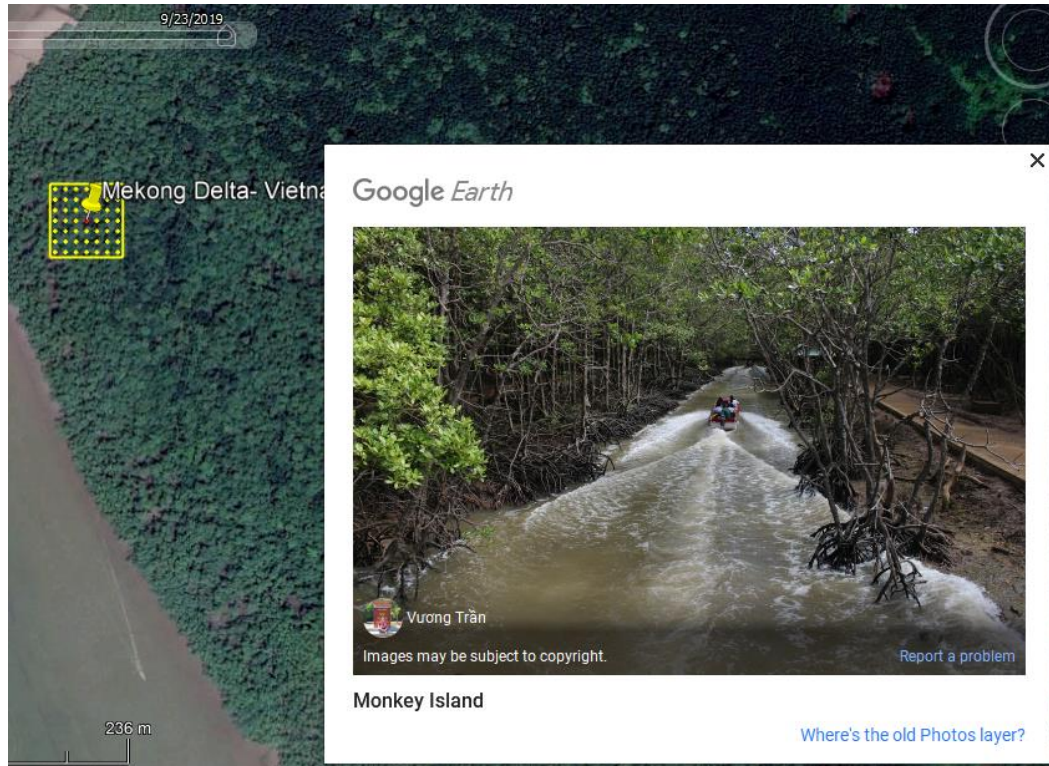
ADVANCED PLOT

View in Google Earth

COLLECT EARTH

Forest – Mangrove forest
(Mekong Delta, Vietnam)

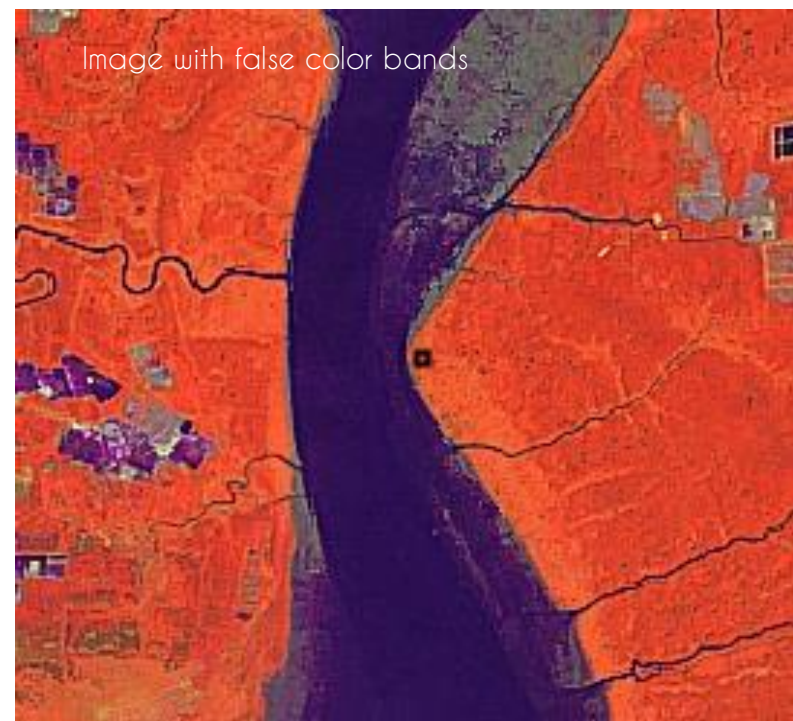In this picture the mangrove species can be appreciated. They are easy to recognize due to their particular roots system.
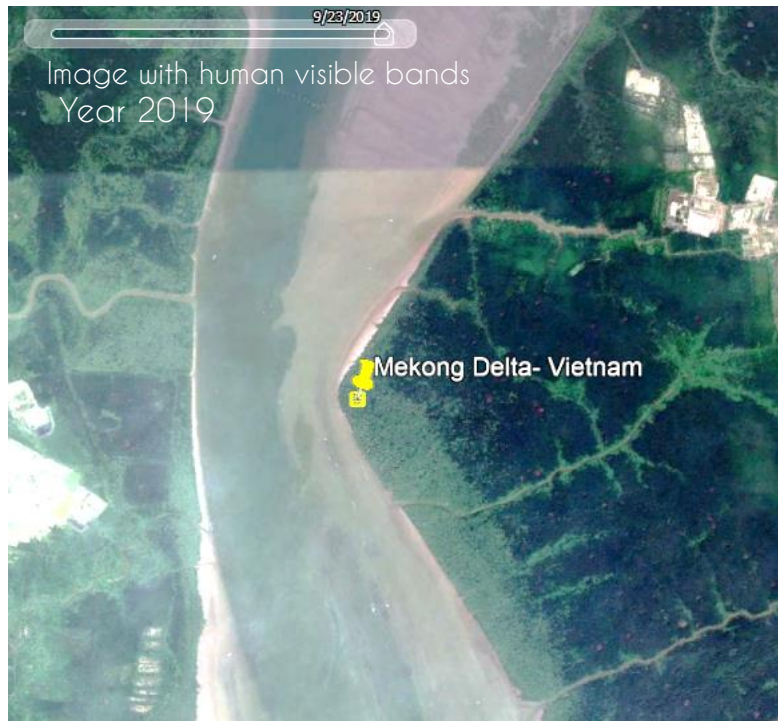
COLLECT EARTH

Forest – Mangrove forest
(Mekong Delta, Vietnam)

Real color image on the left side and false color image (Sentinel 2 composite of last12 months) on the right side in comparison. In the Sentinel 2 image vegetation is represented in orange and **mangroves are easy to spot due to the fact that the orange color is very strong**. Water is represented in dark blue.
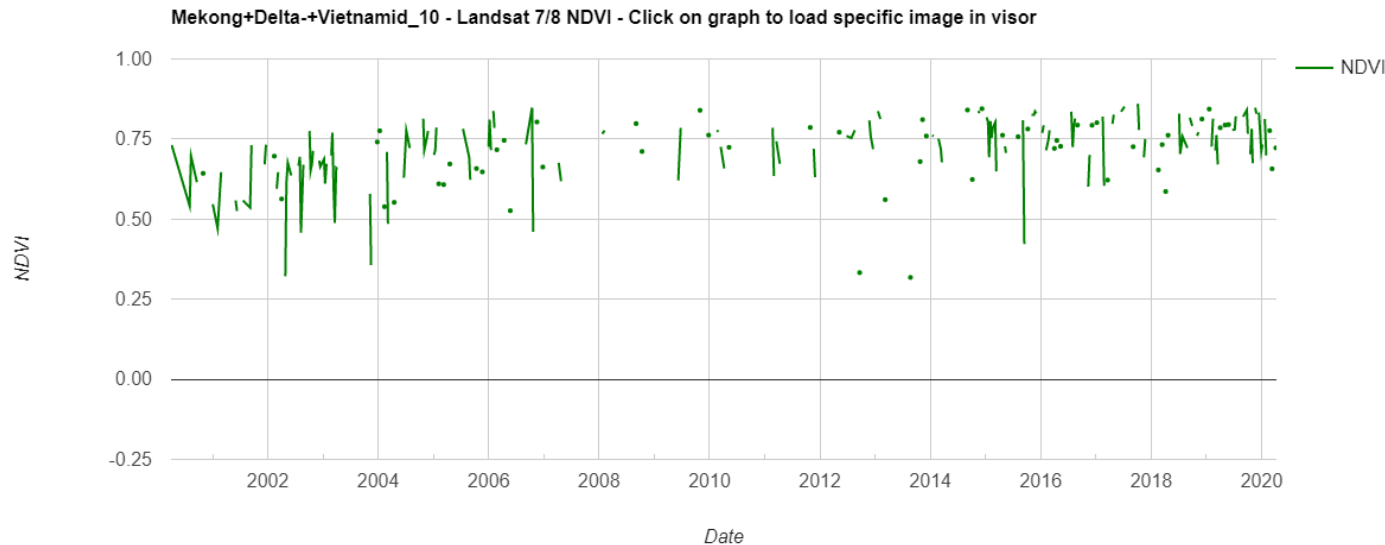
Forest – Mangrove forest
(Mekong Delta, Vietnam)

Mekong+Delta-+Vietnamid_10 - Landsat 7/8 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graph:
- The average is above 0,5 which means presence of healthy vegetation throughout the year. Mangroves are evergreen forests.
- Like in the broadleaf evergreen forest, the steep drops in the graph are a consequence of the clouds that cover the forest.

COLLECT EARTH

Cropland – Rice paddy
(Biliran, Philippines)

Category: Cropland

Subcategory: Rice paddy.
Annual crop

Description: The presence of terraces makes it very easy to identify paddy fields. These rice fields are located in a mountainous region in Biliran Island in the Philippines.
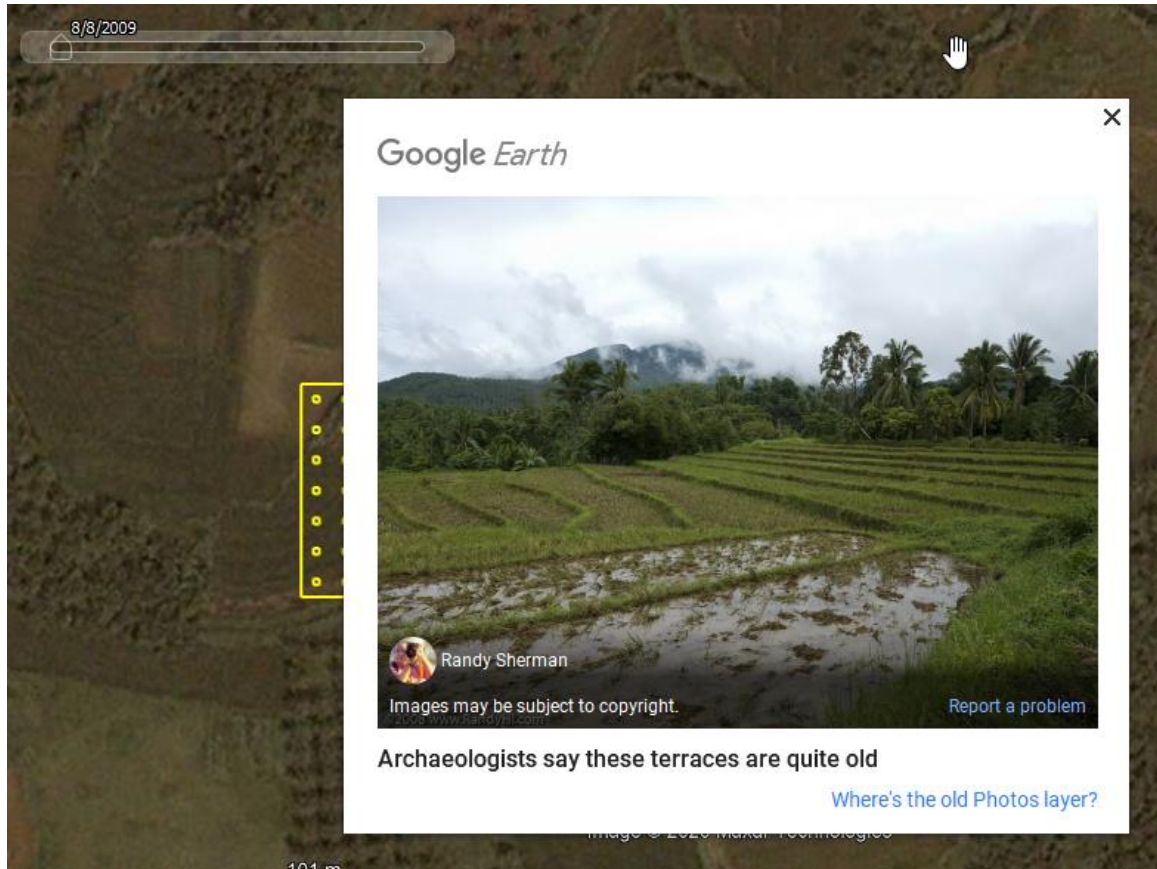
View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Cropland – Rice paddy
(Biliran, Philippines)

The Google Earth pictures can be very helpful for the identification of land use categories and especially subcategories. In this pictures we see the paddy fields and the watered terraces.

Cropland – Permanent crop, Sugarcane
 (Corozal, Belize)

Year 2018

1/2018

Corozal, Belize

Category: Cropland

Subcategory: Land under permanent crop. Annual crop. Sugarcane

Description: In the satellite image we see a cropland surrounded by forest and big roads that reveal the existence of deforestation and extensive farming systems.
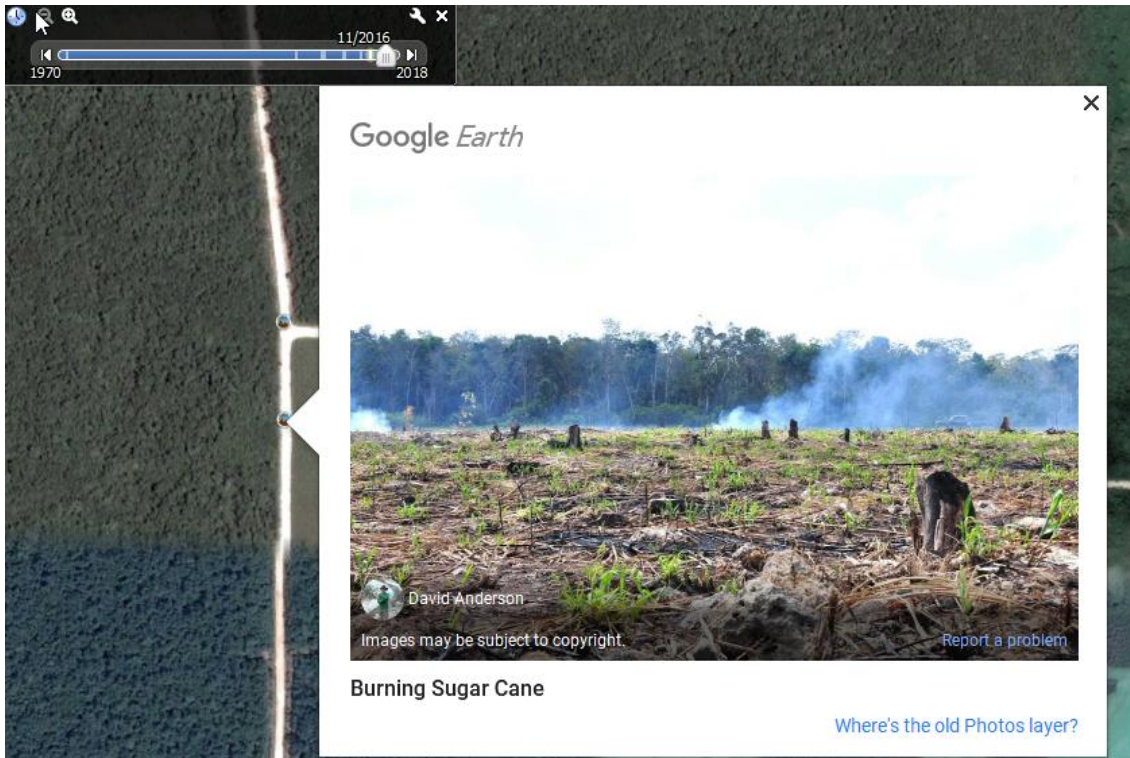
BEGINNER PLOT

COLLECT EARTH

Cropland – Permanent crop, Sugarcane
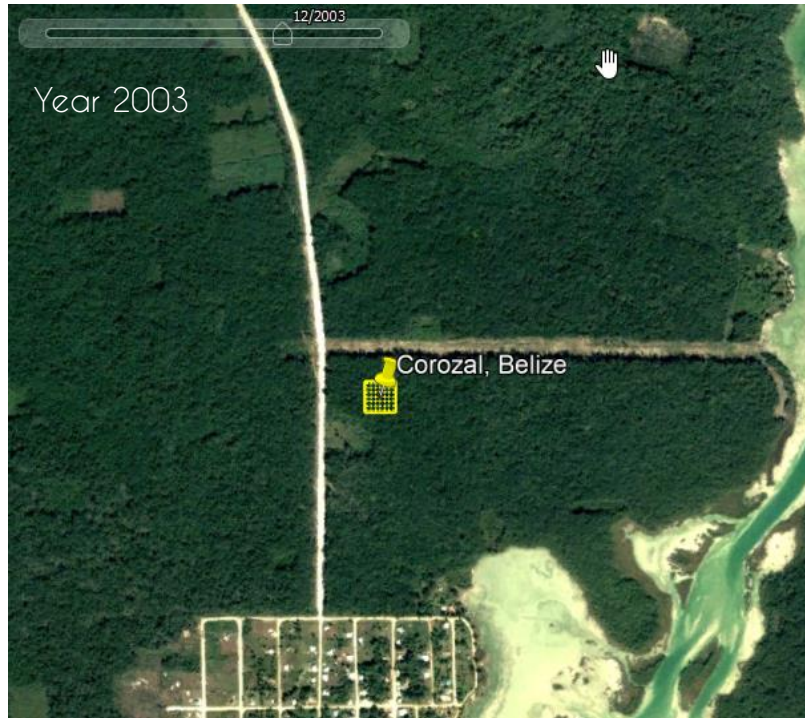## (Corozal, Belize)

The Google Earth pictures can be very helpful for the identification of land use categories and especially subcategories. In this pictures we see a burned sugar cane field.

COLLECT EARTH

Cropland – Permanent crop, Sugarcane
(Corozal, Belize)

Year 2003 — 12/2003 — Corozal, Belize

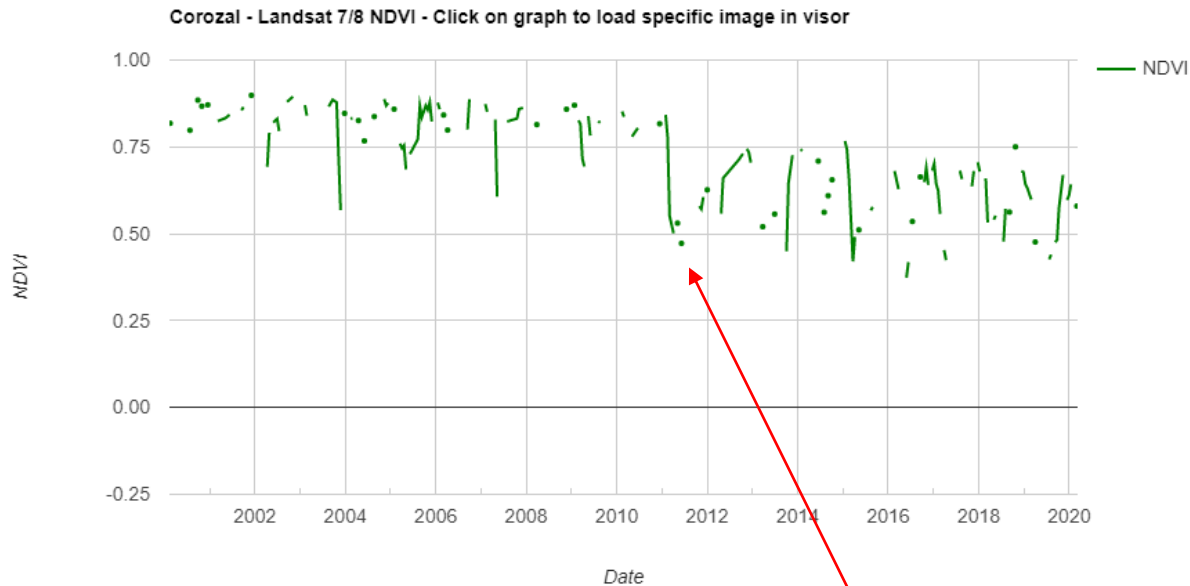

Year 2013 — 8/2013 — Corozal, Belize
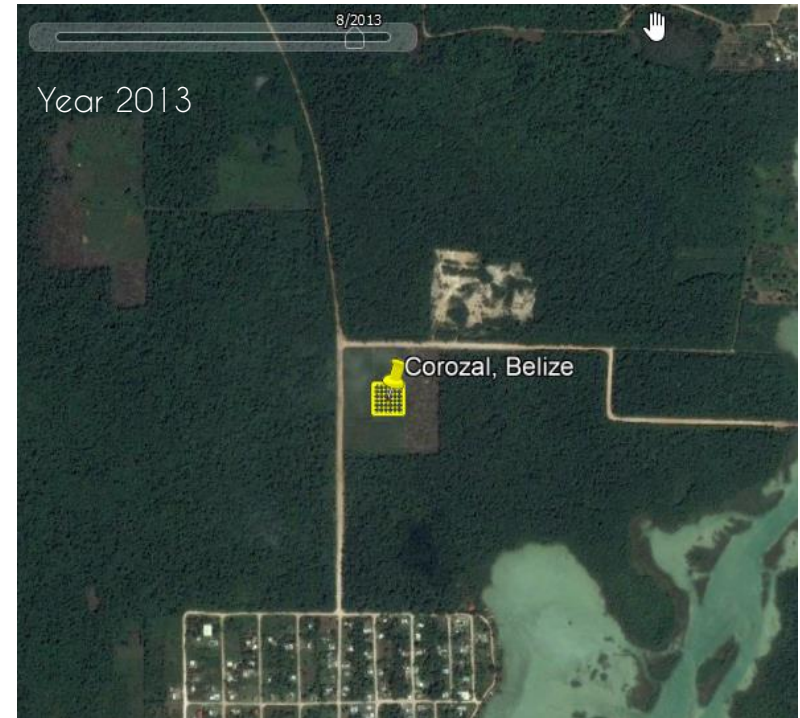
Land use changes in time: Between 2003 and 2013 we see a land use change in our plot. In 2003 the land use was forest. It was converted to cropland in 2011.

COLLECT EARTH

Cropland – Permanent crop, Sugarcane
(Corozal, Belize)

Corozal - Landsat 7/8 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphics:

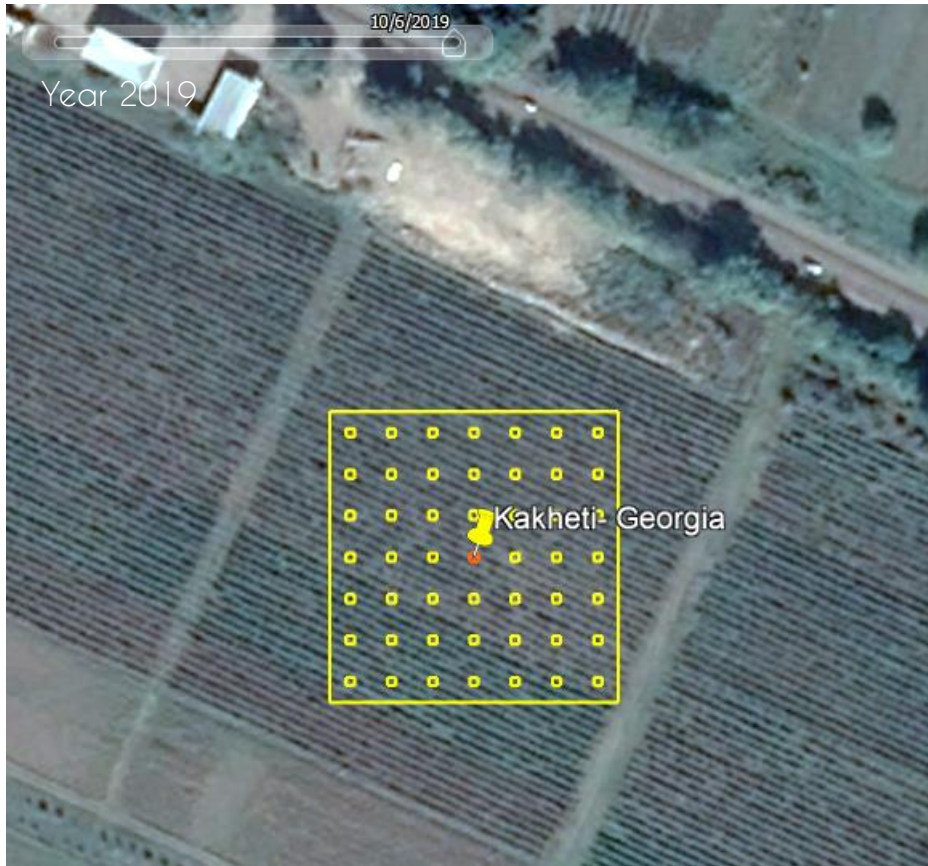Conversion from forest to cropland as seen in imagery. Change occurs in 2011.

COLLECT EARTH

Cropland – Orchard, Vineyard
(Kakheti, Georgia)

10/6/2019

Year 2019

Kakheti Georgia

View in Google Earth

Category: Cropland

Subcategory: Orchard. Perennial crop. Vineyard

Description: In the Google Earth image we see a vineyard that can be identified due to its particular row spacing scheme.

Kakheti is the oldest and most important wine region in Georgia.

BEGINNER PLOT

COLLECT EARTH
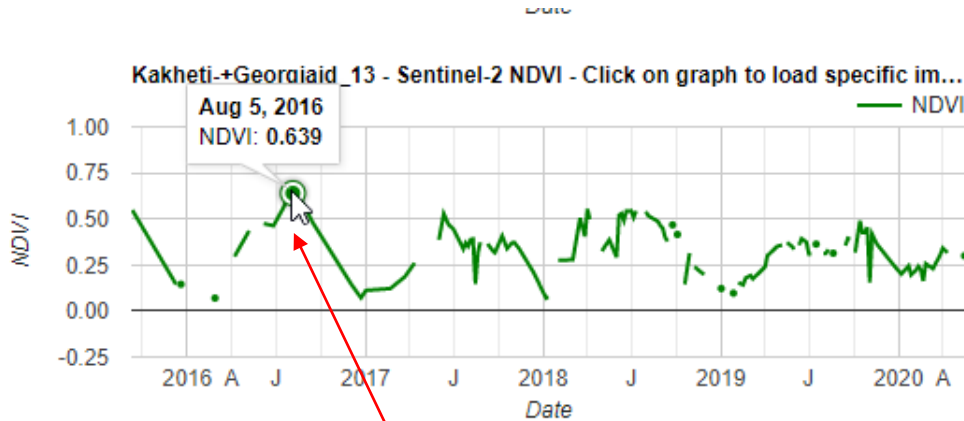
Cropland – Orchard, Vineyard
(Kakheti, Georgia)

Kakheti-+Georgiaid_13 - Sentinel-2 NDVI - Click on graph to load specific im...

Aug 5, 2016
NDVI: 0.639

Fri, 05 Aug 2016 07:51:50 GMT

Interpretation of NDVI graphic:

- Looking at the graphic, we will see that vineyards have a particular growing pattern with its highest peak in the summer months and drops after the grapes harvest.

- The picking and pressing of grapes in Georgia's main wine-producing region, Kakheti, lasts from about 20 September to 20 October. The vegetation intensity can vary according to the yearly climatic conditions.
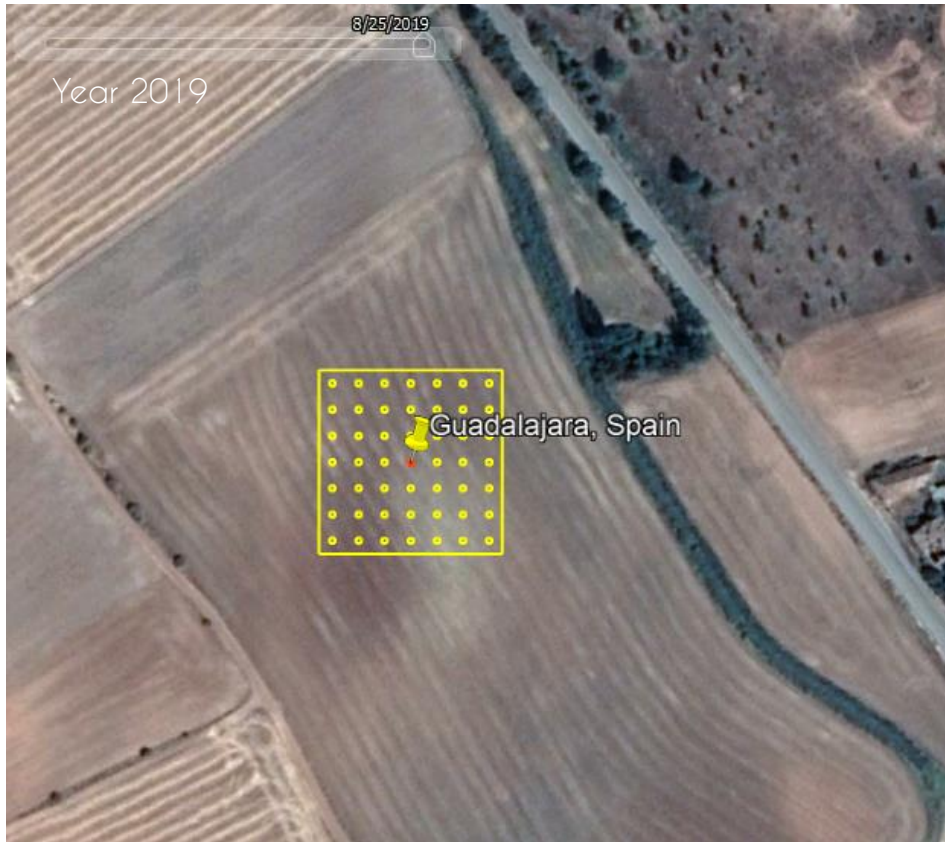
COLLECT EARTH

Cropland – Permanent crop, Cereal
(Guadalajara, Spain)

8/25/2019
Year 2019
Guadalajara, Spain

View in Google Earth

Category: Cropland

Subcategory: Land under permanent crop. Annual crop. Cereal

Description: The bright yellow colors and parallel stripes after the harvest make it easy to identify cereal plantations such as wheat, oat, barley or spelt. These are rainfed plantations.
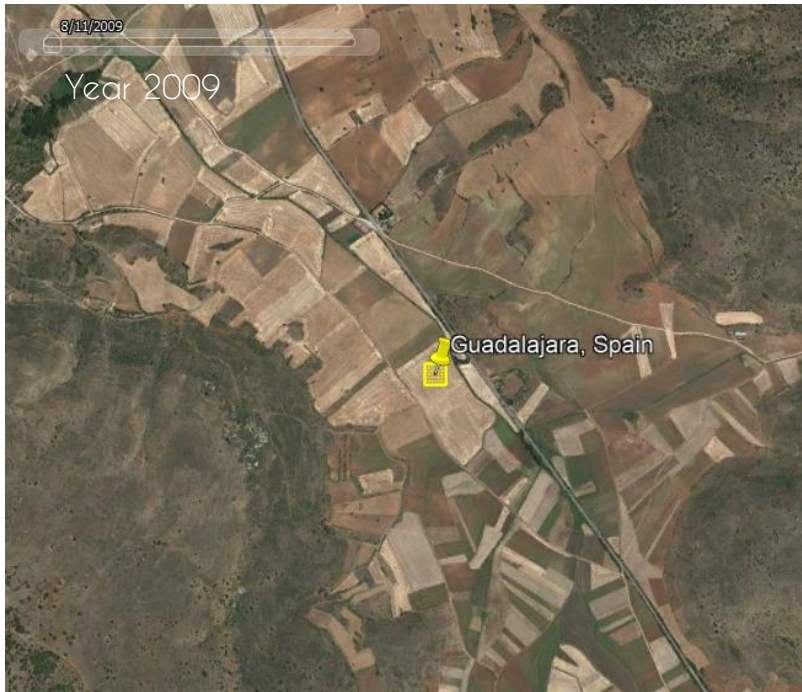
ADVANCED PLOT

COLLECT EARTH

Cropland – Permanent crop, Cereal
(Guadalajara, Spain)

Land use changes in time: In this area farmers rotate crop systems such as cereals, sunflowers and legumes in order to obtain benefits for the soil.
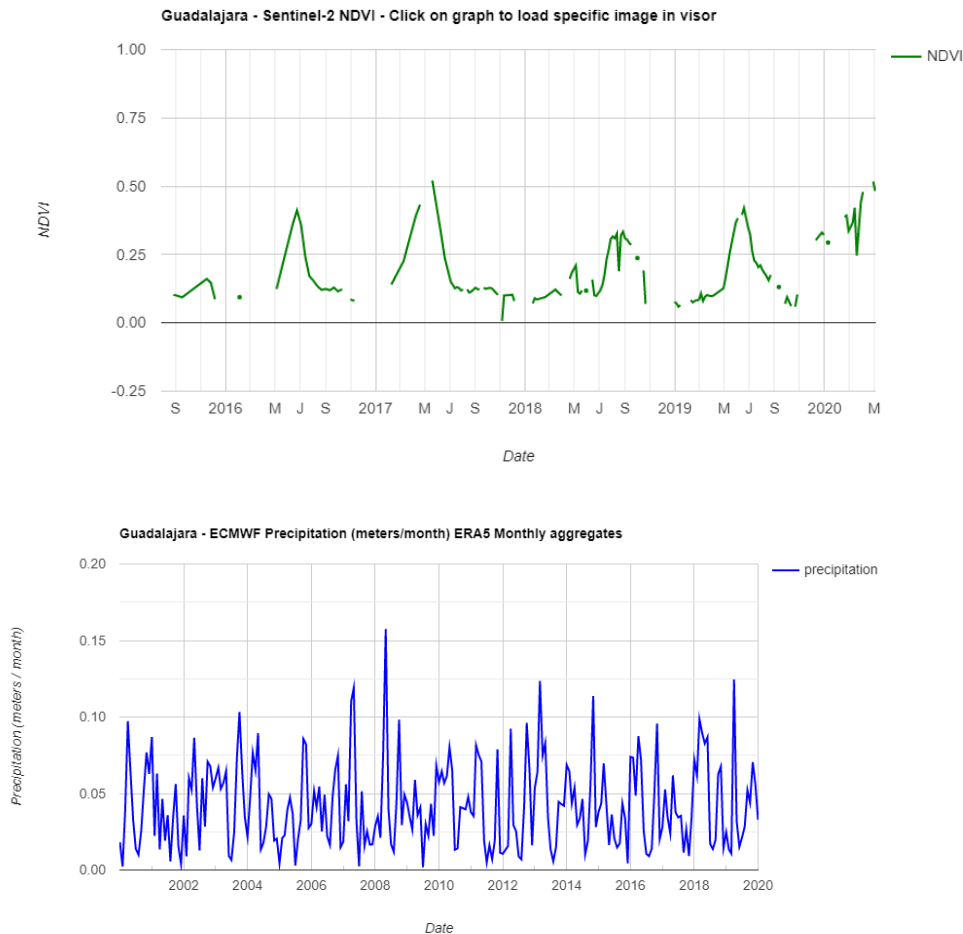
Cropland – Permanent crop, Cereal
(Guadalajara, Spain)

Guadalajara - Sentinel-2 NDVI - Click on graph to load specific image in visor

Guadalajara - ECMWF Precipitation (meters/month) ERA5 Monthly aggregates

Interpretation of NDVI and precipitation graphics:

- NDVI fluctuates reaching 0,5 in the spring when plantations are in its growing phase and drops down in the summer when farmers harvest their land.
- Maximum NDVI value is 0,5 denoting a rainfed crops. Usually irrigated crops will have higher NDVI values
- The graphs shows that the plantation in this particular field might not have been the same in 2017, 2018 and 2019 and 2020, as NDVI curves behave differently.
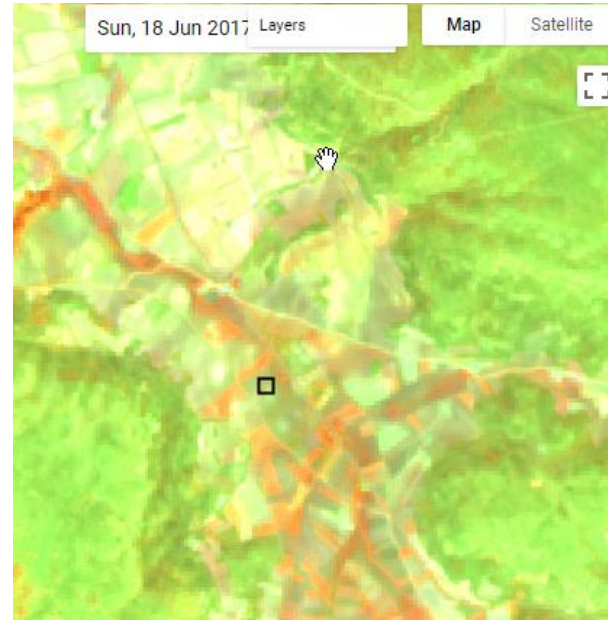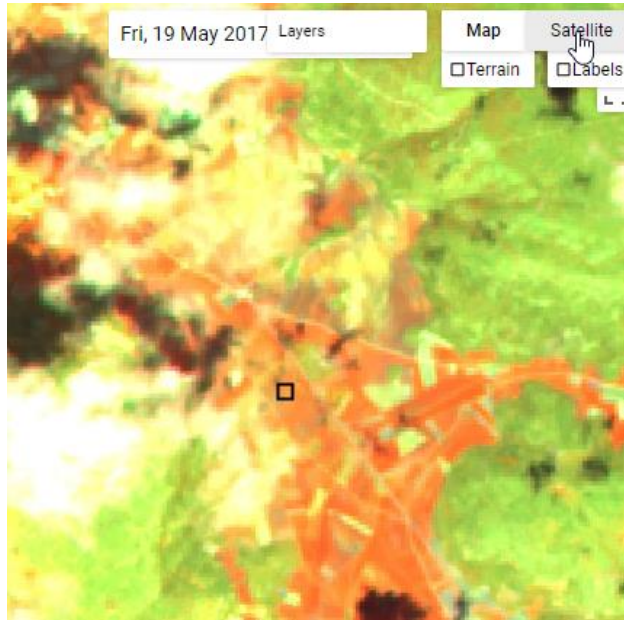- Maximum precipitations fall in the spring months.

COLLECT EARTH

Cropland – Permanent crop, Cereal
 (Guadalajara, Spain)

Interpretation of Sentinel 2 composite images (20 m resolution) showing the vegetation intensity (orange is high vegetation intensity and green is low vegetation intensity): The image in May 2017 shows its vegetation in its maximal intensity. In the image on the right in June 2017 the vegetation intensity is very low after the harvest.
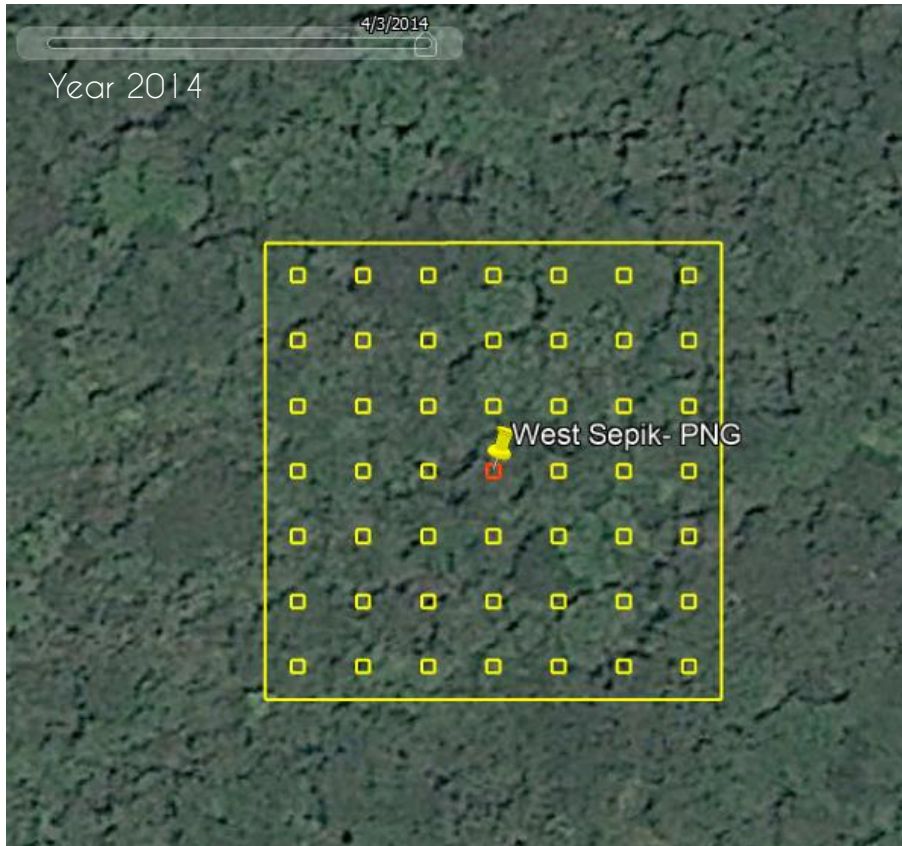
COLLECT EARTH

Cropland – Palm
(West Sepik, PNG)

Year 2014

4/3/2014

West Sepik- PNG

View in Google Earth

COLLECT EARTH

Category: Cropland

Subcategory: Perennial crop. Oil Palm

Description: This forest located in Papua New Guinea looks like a broadleaf evergreen forest.

The **land use change from forest to oil palm plantation** cannot be appreciated with Google Earth images because the last satellite image available in the GE repository is from the year **2014**.

ADVANCED PLOT

Cropland – Palm
(West Sepik, PNG)

Year 2013 — 3/22/2013 — West Sepik- PNG

Year 2014 — 4/3/2014 — West Sepik- PNG

Land use changes in time: Between 2013 and 2014 we can see that big roads were built within the forest.

COLLECT EARTH

Cropland – Palm
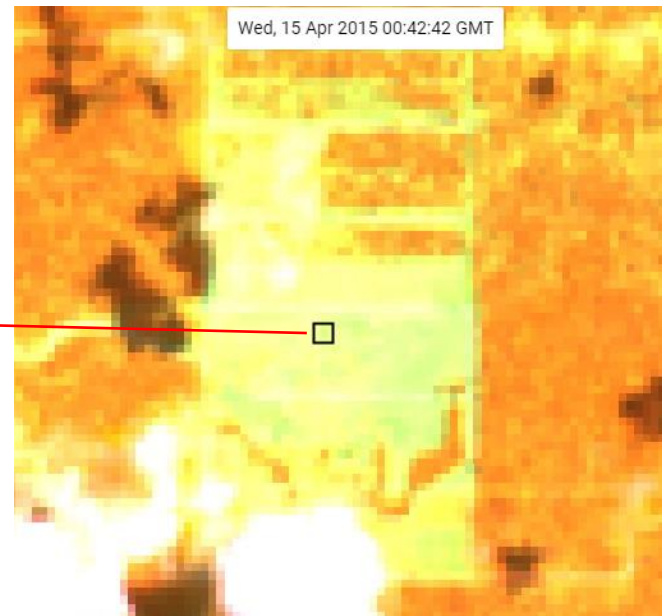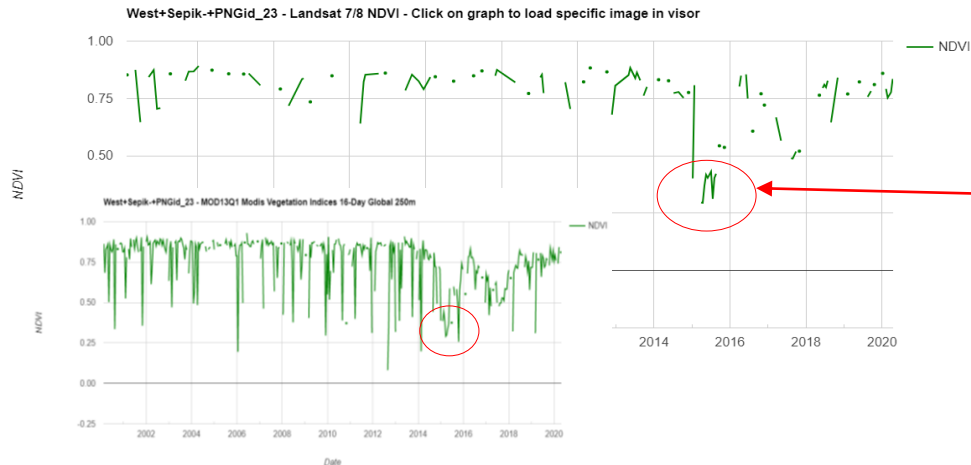## (West Sepik, PNG)

West+Sepik-+PNGid_23 - Landsat 7/8 NDVI - Click on graph to load specific image in visor

West+Sepik-+PNGid_23 - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m

Wed, 15 Apr 2015 00:42:42 GMT

Interpretation of NDVI and precipitation graphics:

- The NDVI values in the Landsat and MODIS graphs reflect the evergreen character of the forest until the year 2015.

- In **2015 a steep vegetation drop** can be read in both graphs. This happened after the fields for the oil palm plantations were cleared down. If we look at Landsat images in April 2015 we can clearly identify the cleared parts of the forest.

COLLECT EARTH

Grassland – Grassland with trees and shrubs
(Western Rwanda, Rwanda)

7/2/2019

Year 2019

Western Rwanda, Rwanda

Category: Grassland

Subcategory: Grassland with trees and shrubs

Description: The plot is located in a hilly region in Western Rwanda at 2660 m altitude. The fences suggest the presence of grazing.

The difference between tree and shrub is very clear in this grassland. The one tree on the left upper side of the plot is very high and the shade can be recognized easily.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Grassland – Grassland with trees and shrubs
(Western Rwanda, Rwanda)

In this case the Google Earth picture shows the hilly nature of the terrain and the healthy grassland vegetation.

COLLECT EARTH

Grassland – Grassland with trees and shrubs
(Western Rwanda, Rwanda)

Year 2006
6/17/2006
Western Rwanda, Rwanda

Year 2019
7/2/2019
Western Rwanda, Rwanda

Land use changes in time: No changes in the land use identified.

COLLECT EARTH

Grassland – Grassland with trees and shrubs
(Western Rwanda, Rwanda)

Western+Rwanda - Sentinel-2 NDVI - Click on graph to load specific image in visor
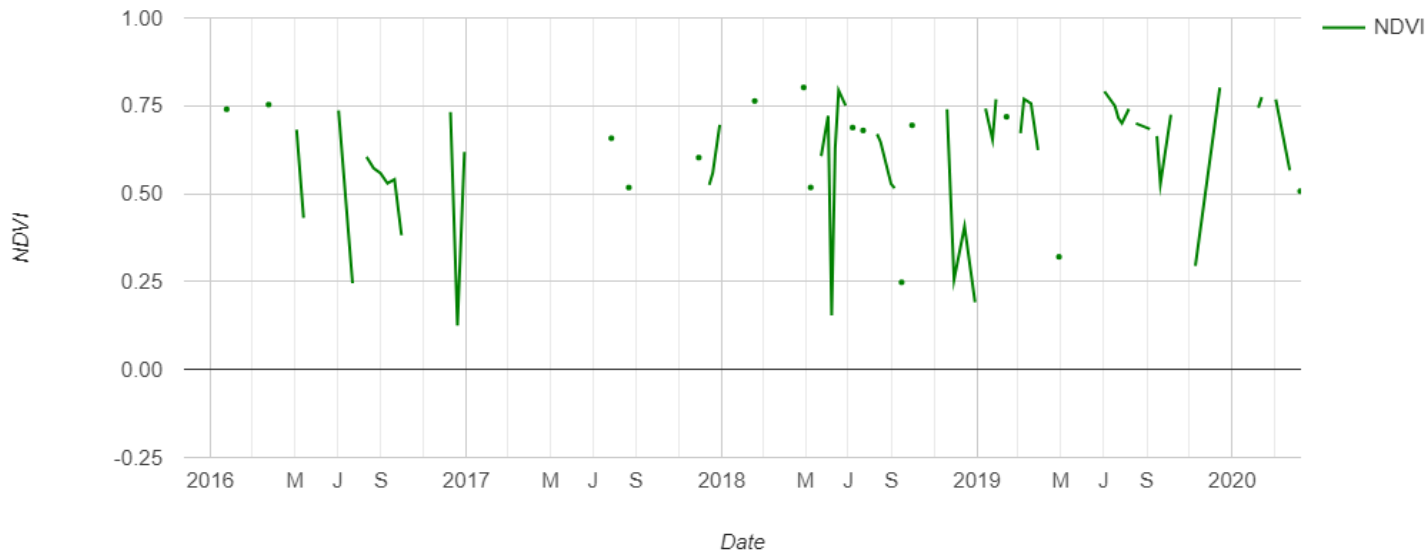
Interpretation of NDVI graphic:
NDVI ranges between 0,75 and 0,5. This is a sign of a grassland with healthy vegetation.

COLLECT EARTH

Grassland – Grassland
(Southland, New Zealand)

2/17/2019

Year 2019

Southland- New Zealand

Category: Grassland

Subcategory: Grassland

Description: The plot is located in the southern part of New Zealand. From the color of the grassland we can see that the vegetation intensity is very high.

View in Google Earth

COLLECT EARTH

BEGINNER PLOT

Grassland – Grassland
(Southland, New Zealand)
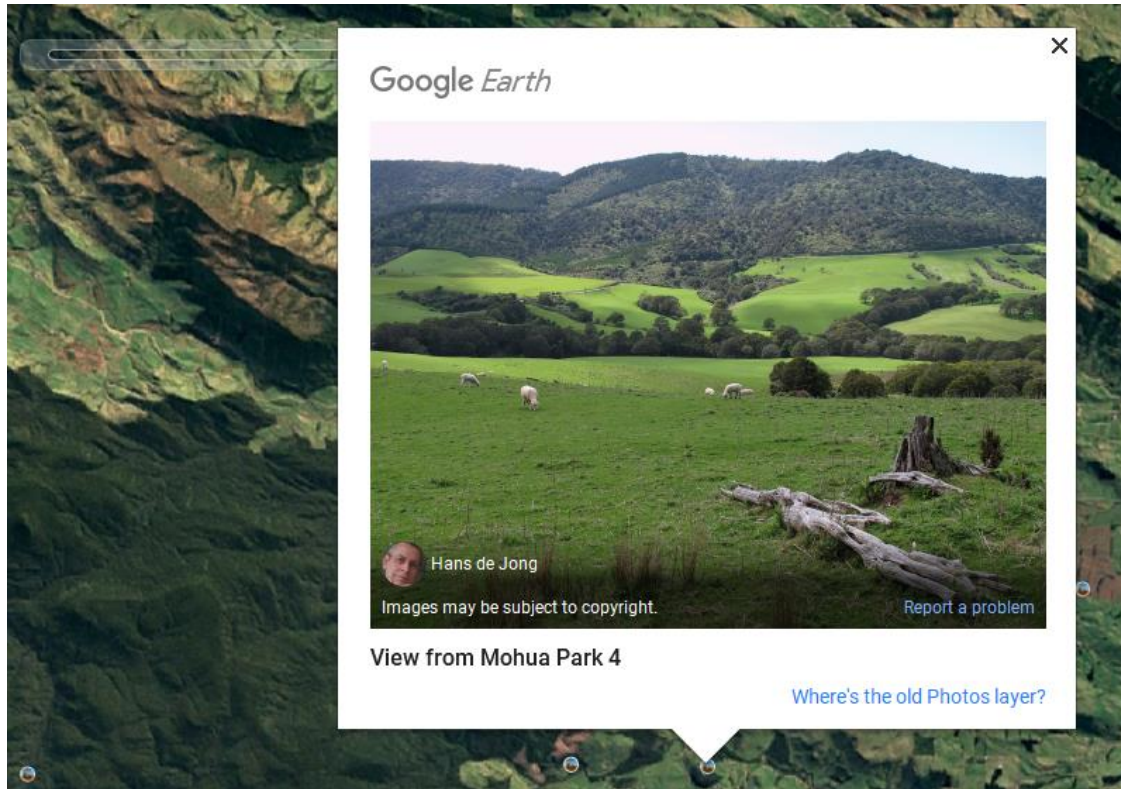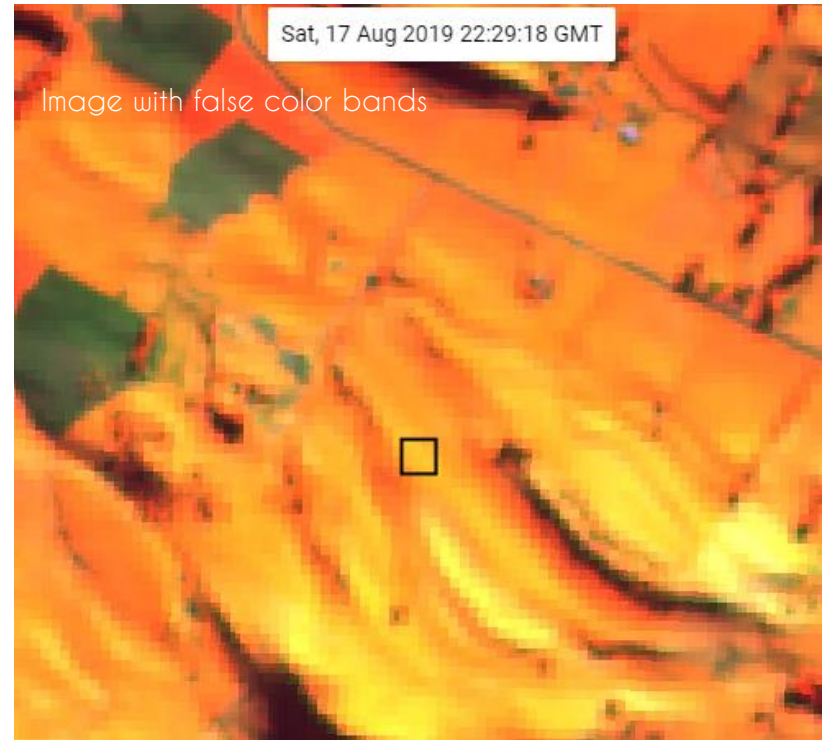

Google Earth pictures nearby show that we are talking about pasturelands for sheep.

COLLECT EARTH

Grassland – Grassland
(Southland, New Zealand)

Natural color image on the left side and false color image (Sentinel 2 composite of last12 months) on the right side in comparison. In the Sentinel 2 image vegetation is represented in orange.
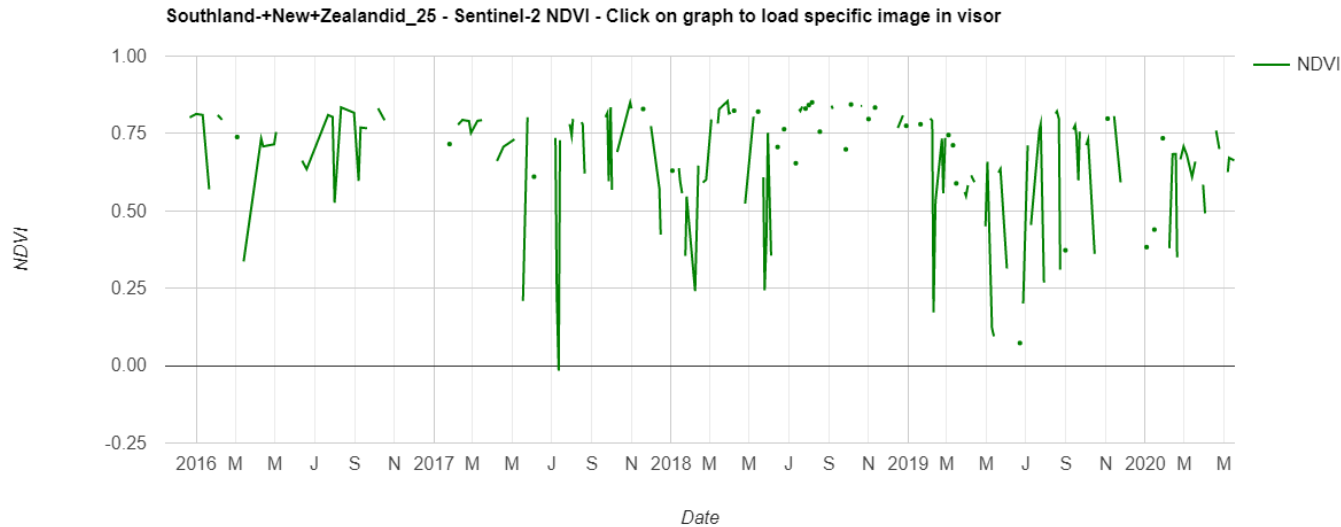
COLLECT EARTH

Grassland – Grassland
(Southland, New Zealand)

Southland-+New+Zealandid_25 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphic:
NDVI ranges between 0,5 and 0,75. This is a sign of a grassland with healthy vegetation.
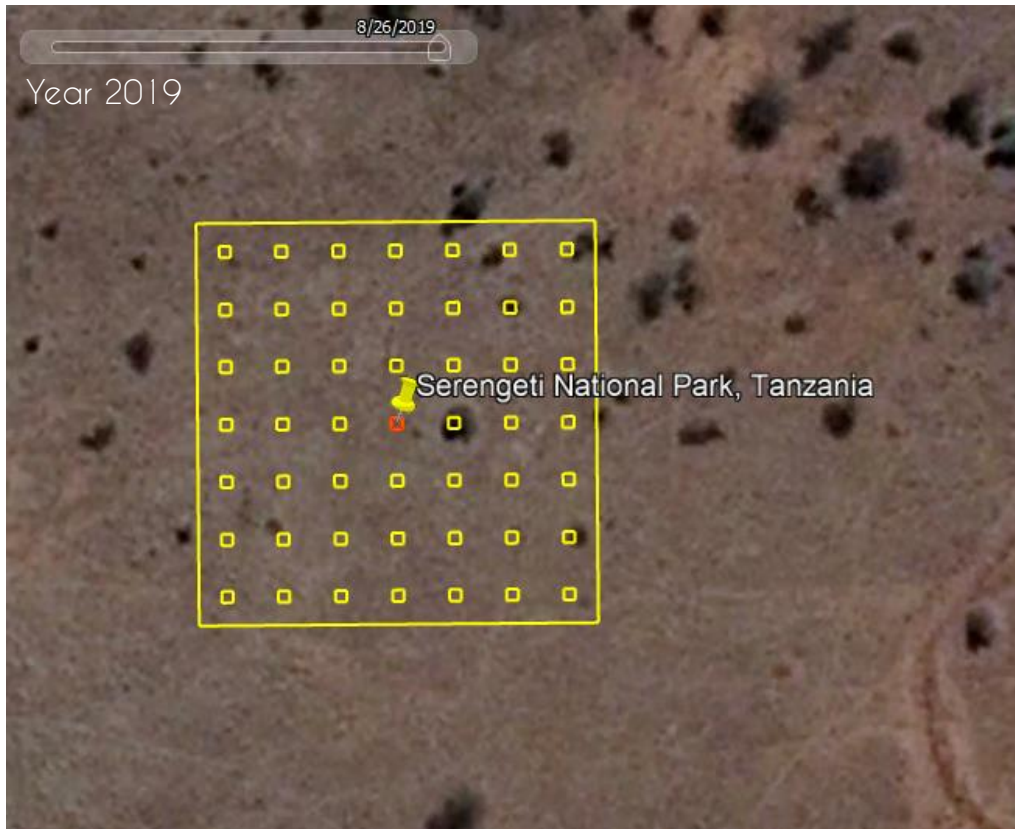The steep drops in the graph are a consequence of the clouds.

COLLECT EARTH

Grassland – Grassland with trees
(Serengeti, Tanzania)

8/26/2019

Year 2019

Serengeti National Park, Tanzania

View in Google Earth

Category: Grassland

Subcategory: Grassland with trees

Description: The plot is located in the Serengeti National Park in Tanzania.

In this case it is easy to differentiate between trees and bushes when zooming out and activating the historical images.
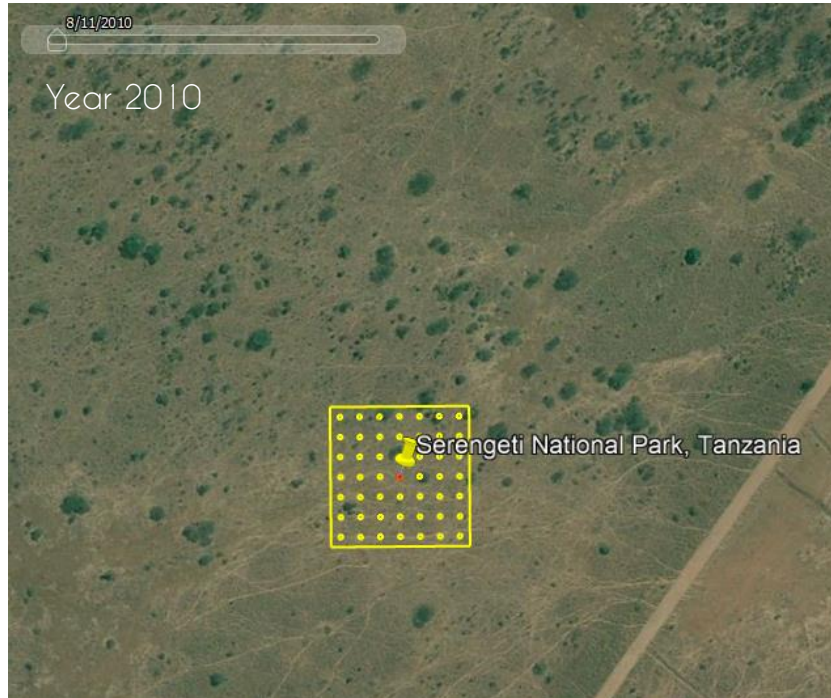
BEGINNER PLOT

COLLECT EARTH

Grassland – Grassland with trees
## (Serengeti, Tanzania)

Land use changes in time: The difference between the image on the left in August 2010 and the one on the right in September 2016 is the vegetation intensity of the grassland. In the images we can see degraded soils due to possible fire events and paths used by wild animals.

COLLECT EARTH

Grassland – Grassland with trees
(Serengeti, Tanzania)

Serengeti+National+Park - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m
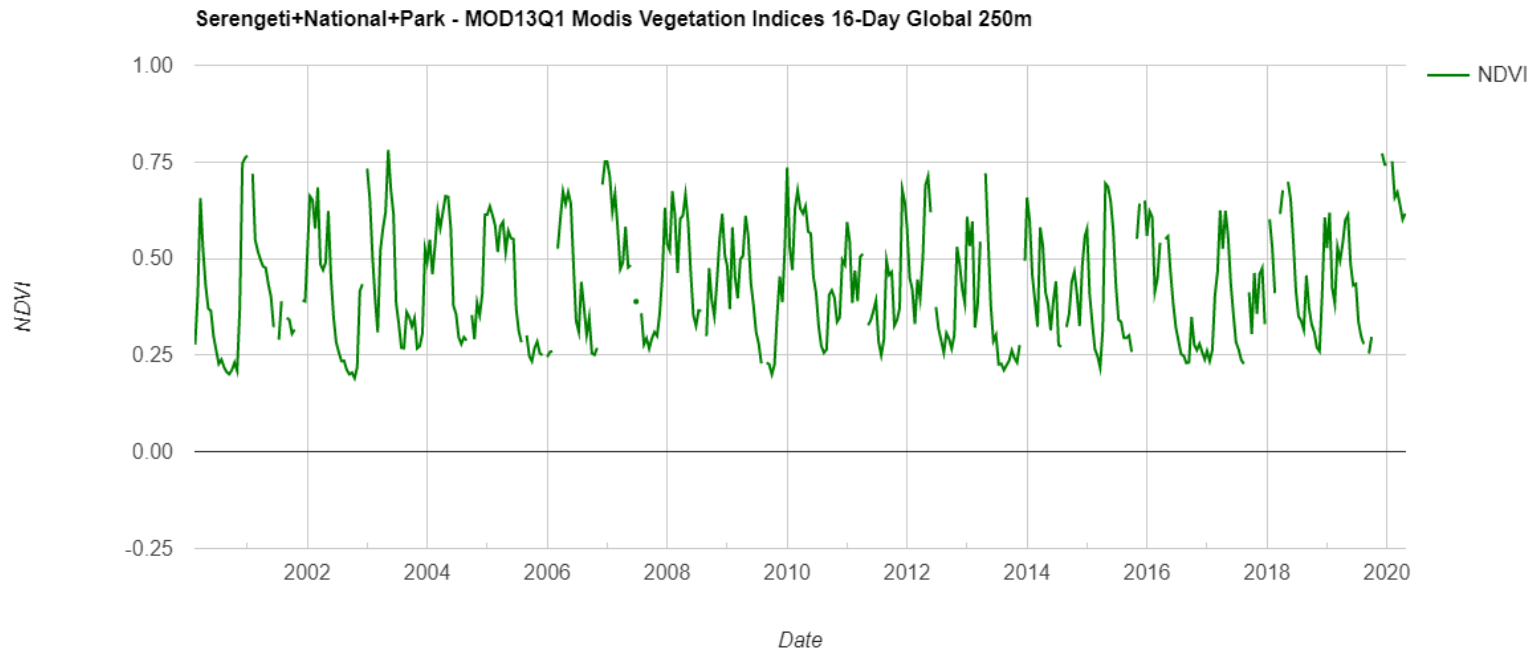
Interpretation of NDVI graphic:
NDVI ranges between 0,25 and 0,75 This is a sign of a grassland with healthy vegetation. NDVI graph shows growing phases of grass that depends on precipitation.

COLLECT EARTH

Grassland – Shrubland
(La Palma, Spain)

7/25/2019
2000   2019
Year 2019

La Palma, Spain

View in Google Earth 🌍

Category: Grassland

Subcategory: Shrubland

Description: This plot is located in the Caldera de Taburiente National Park, a national park on the island of La Palma, Canary Islands in Spain.
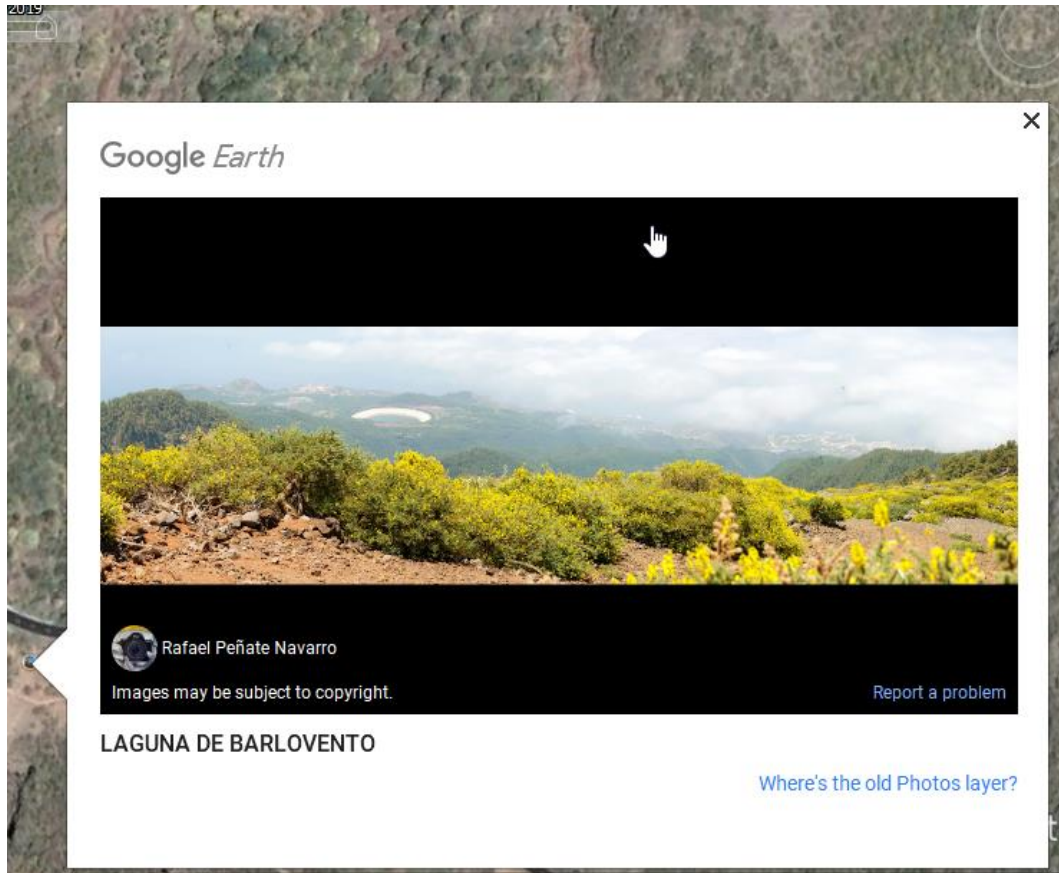
ADVANCED PLOT

COLLECT EARTH

Grassland – Shrubland
(La Palma, Spain)

In this case the Google Earth picture shows the shrubs with the yellow flowers that are typical for this region in the island of La Palma.
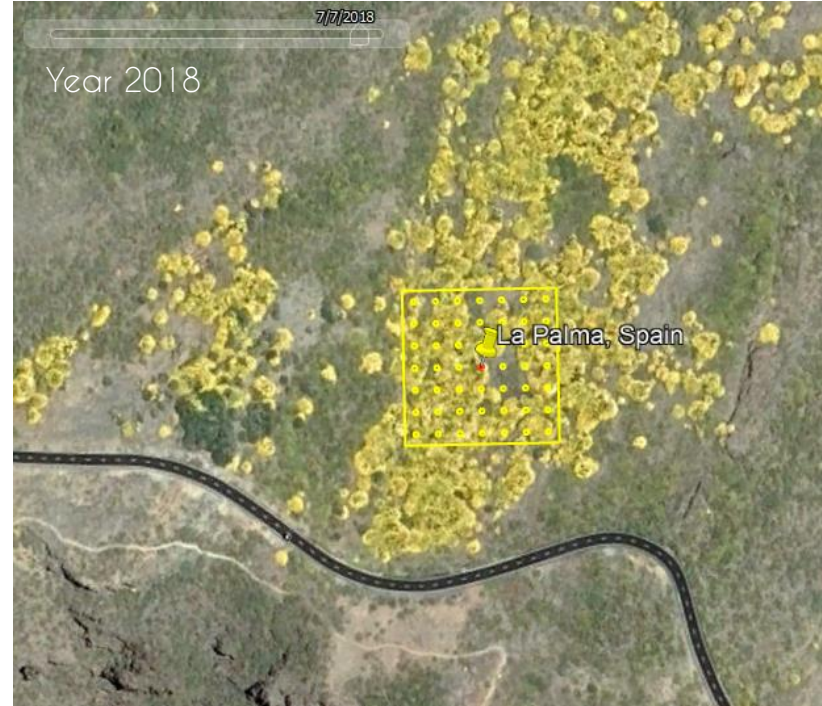
COLLECT EARTH

Grassland – Shrubland
(La Palma, Spain)

Land use changes in time: In the winter months the territory is a lot drier (left image). In July the yellow flowers of the shrub can be seen in the satellite image (right image).
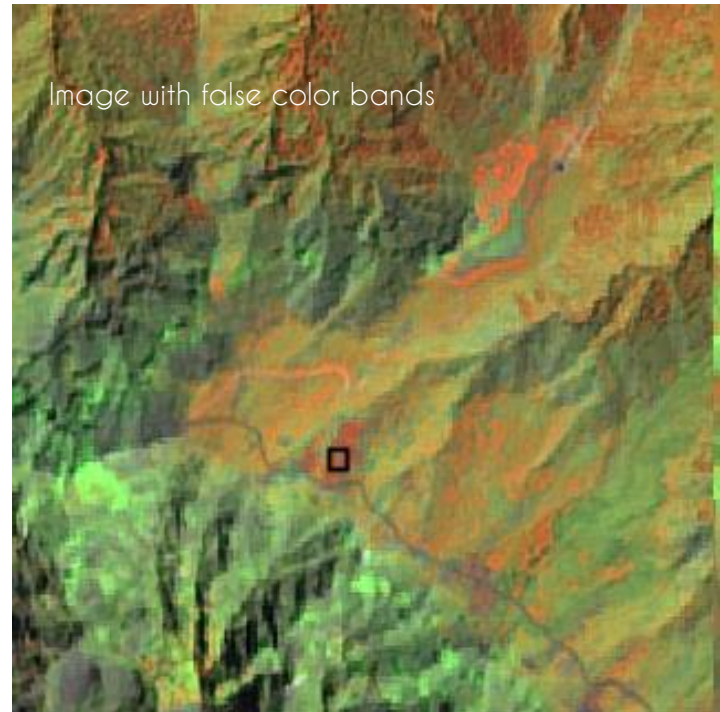
COLLECT EARTH

Grassland – Shrubland
 (La Palma, Spain)

Natural color image on the left side and false color image (Sentinel 2 composite of last 12 months) on the right side in comparison. The images show how vegetation intensity changes in accordance to the altitude.
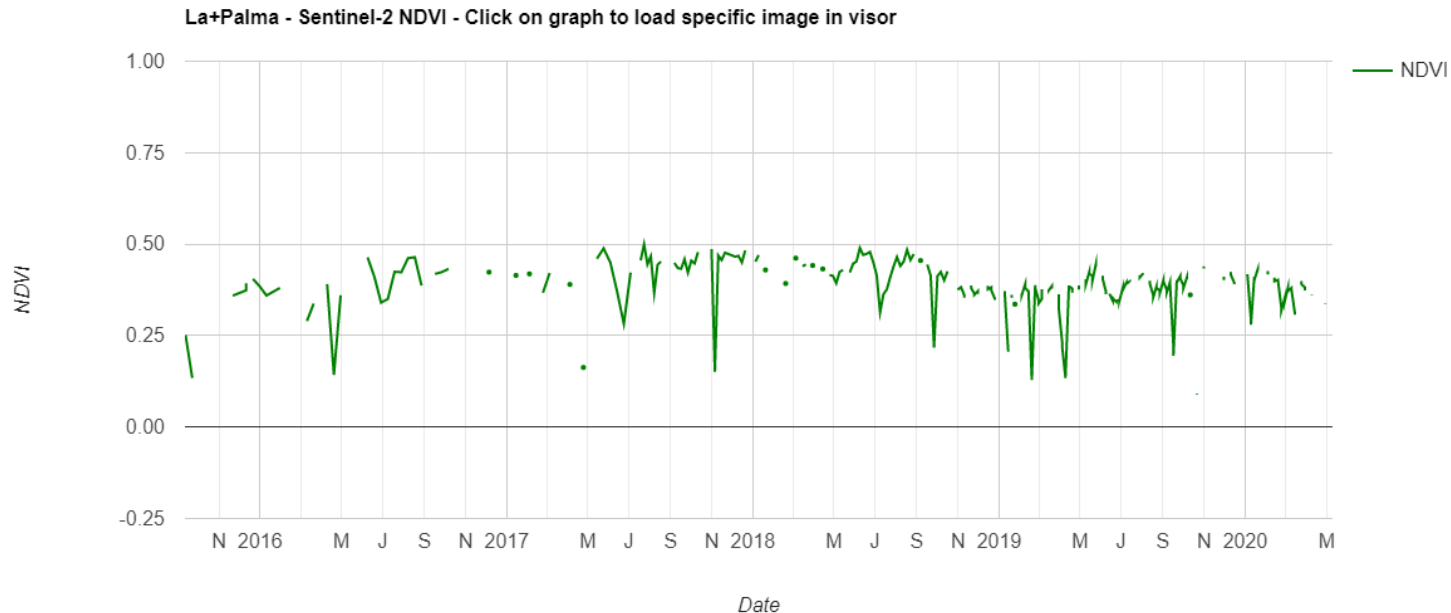
COLLECT EARTH

Grassland – Shrubland
(La Palma, Spain)

La+Palma - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphic:
NDVI values are constant around 0,3 and 0,5. This is a sign of a shrubland with healthy vegetation and little seasonal changes.

COLLECT EARTH

Grassland – Grassland with trees
(Mato Grosso, Brazil)

Year 2019

Mato Grosso- Brazil

5/31/2018

View in Google Earth

Category: Grassland

Subcategory: Grassland with trees

Description: In the plot we can see a grassland with some palm trees.

ADVANCED PLOT

COLLECT EARTH

Grassland – Grassland with trees
(Mato Grosso, Brazil)

FIRST Land use change: Between 2000 and 2001 we see a land use change from forest to cropland. The forest is cleared and the area is used as grassland or cropland. The conversion in the full area is even clearer when looking at the 2004 Landsat 7 yearly mosaic
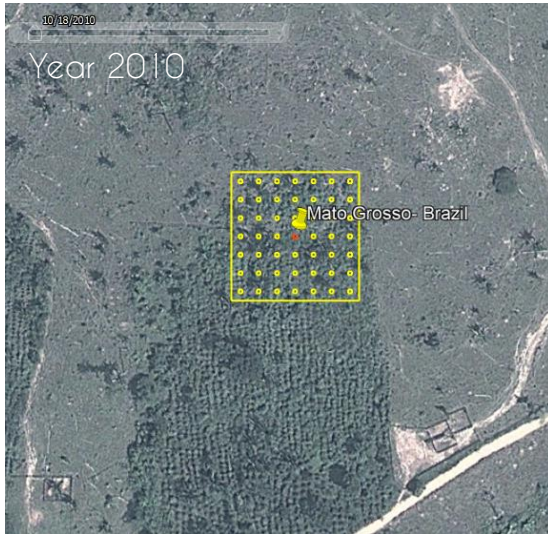
COLLECT EARTH

Grassland – Grassland with trees
 (Mato Grosso, Brazil)

SECOND Land use change: Between 2010 and 2019 we see a land use change from cropland to grassland. Palm tree plantations converted to grassland with trees within 9 years. The area is now used for cattle.
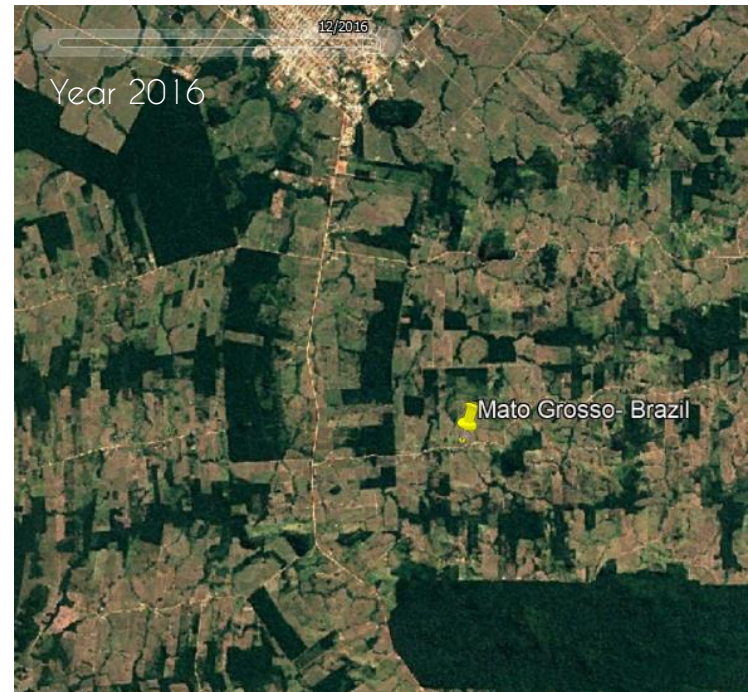
Grassland – Grassland with trees
(Mato Grosso, Brazil)

Year 1985 · 12/1985 · Mato Grosso- Brazil

Year 2016 · 12/2016 · Mato Grosso- Brazil

Land use changes in time: Land use between 1985 and 2016 has changed from forest (through cropland) to grassland within the plot and all around the area where the Amazon forest has been massively deforested.

COLLECT EARTH

Wetland – Lagoon
 (Rio de Janeiro, Brazil)

Category: Wetland

Subcategory: Lagoon

Description: The plot is located in a coastal nature preserve located in neighborhoods of Rio de Janeiro, Brazil.
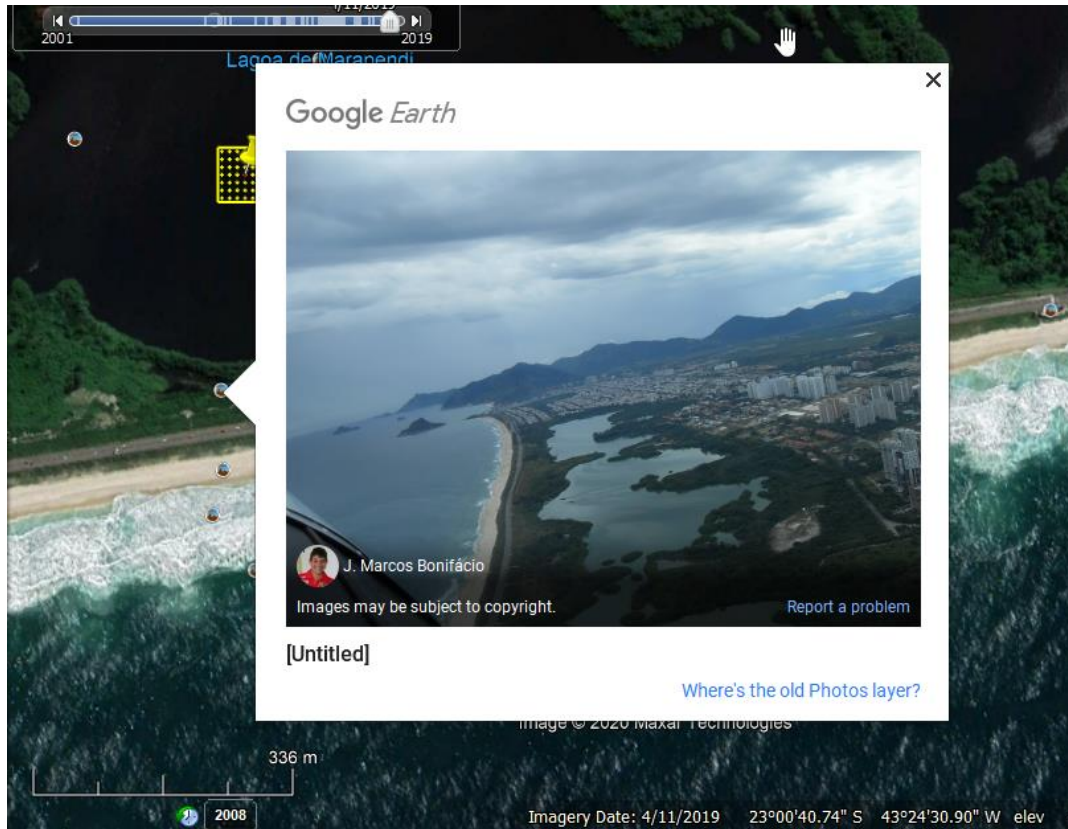
View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Wetland – Lagoon
 (Rio de Janeiro, Brazil)

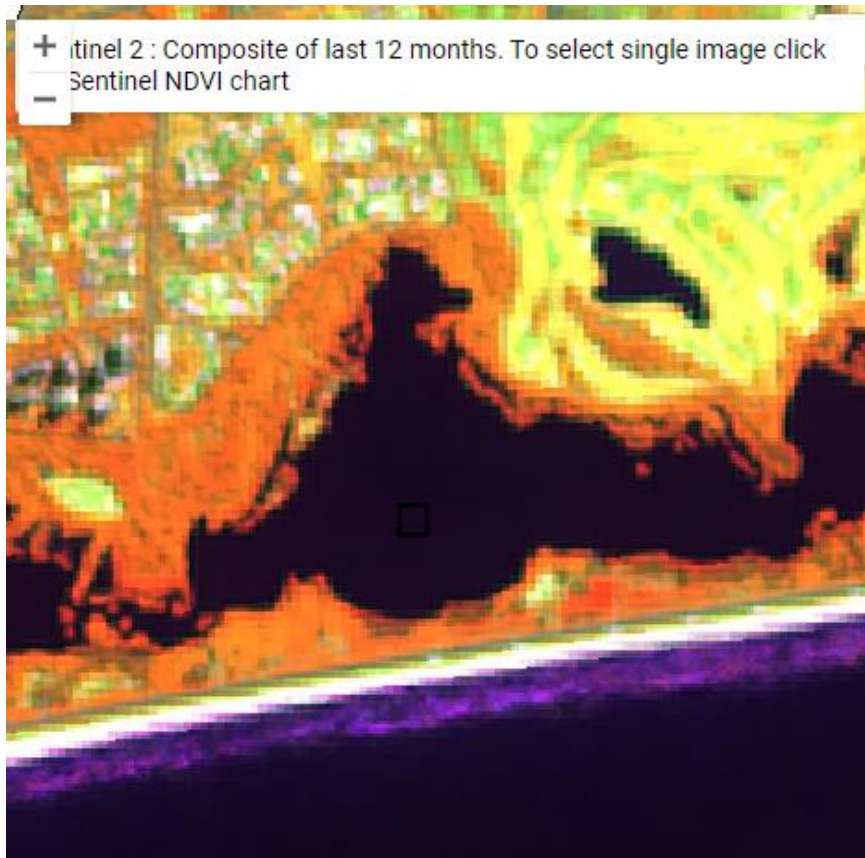In this case the Google Earth picture shows an areal picture of the lagoon.

Wetland – Lagoon
 (Rio de Janeiro, Brazil)

Interpretation of Sentinel 2 composite images (20 m resolution):

- In these Sentinel 2 composite images water is represented in black.

- The plot is located in the lagoon surrounded by areas with healthy vegetation. In the upper part of the image the coastline and the sea can be recognized.
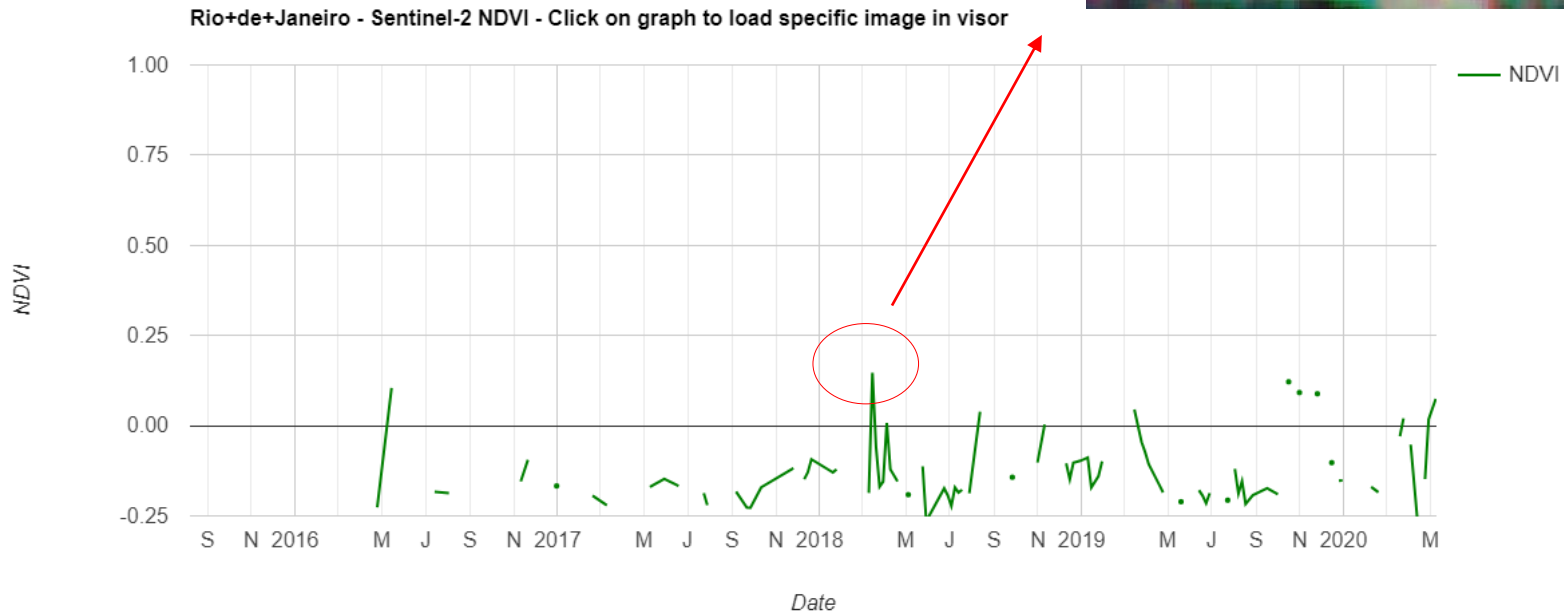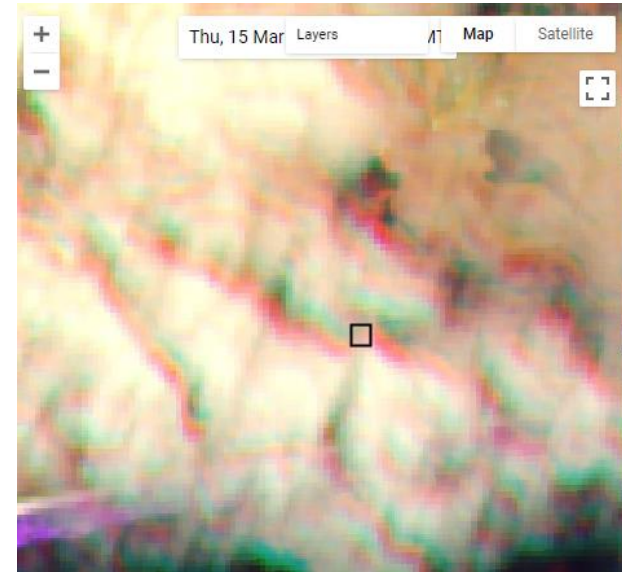
COLLECT EARTH
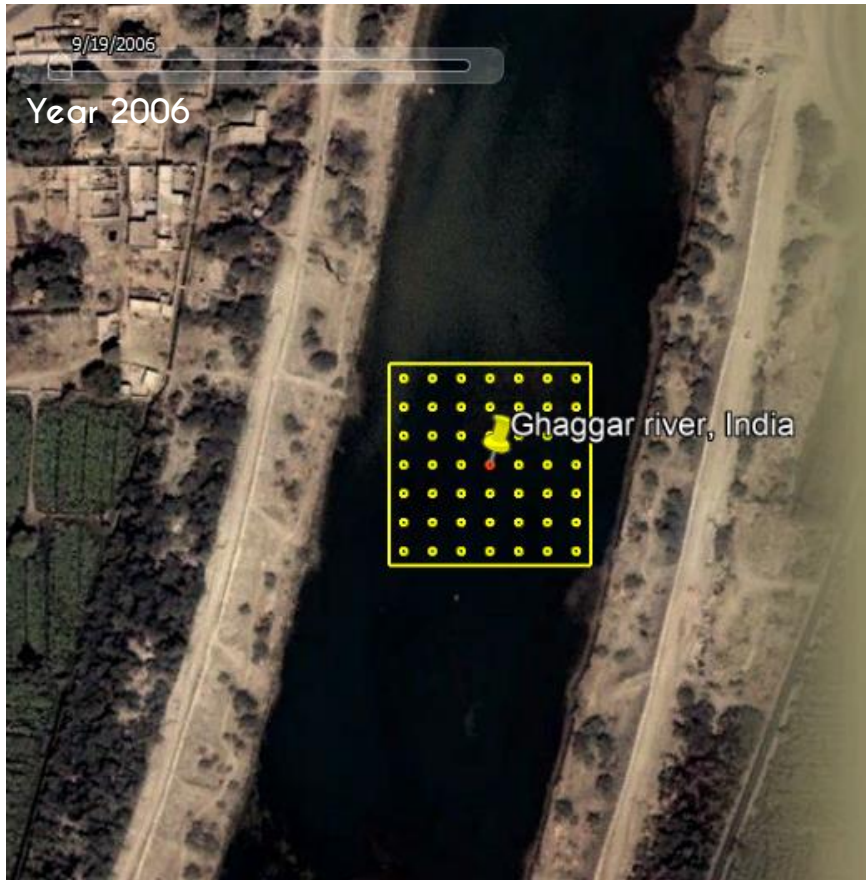
Wetland – Lagoon
 (Rio de Janeiro, Brazil)

Interpretation of NDVI graphic:

Negative values of NDVI (values approaching -1) correspond to water. In this case NDVI values above 1 appear when clouds are covering the area.

Rio+de+Janeiro - Sentinel-2 NDVI - Click on graph to load specific image in visor

Wetland – Seasonal river
 (Ghaggar, India)

9/19/2006

Year 2006

Ghaggar river, India

View in Google Earth

Category: Wetland

Subcategory: Seasonal river

Description: The plot is located in the Ghaggar river which is an intermittent river in India that flows during the monsoon rains.
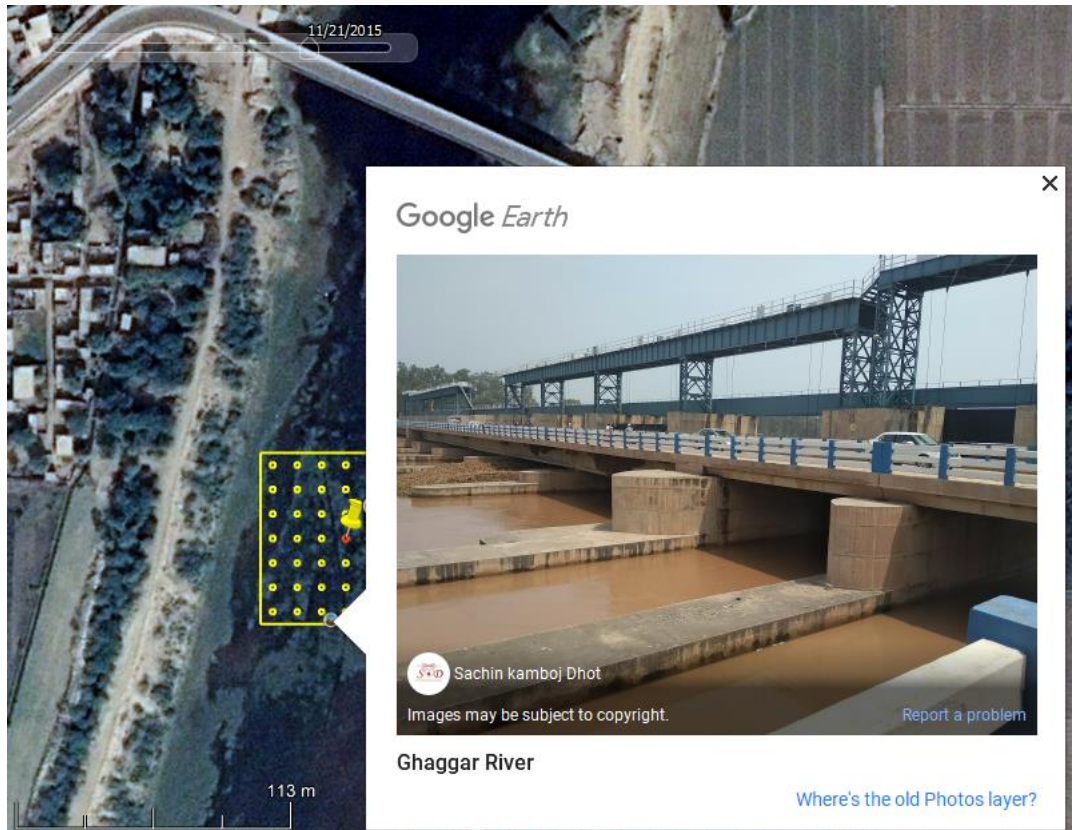
ADVANCED PLOT

COLLECT EARTH

Wetland – Seasonal river
 (Ghaggar, India)

In this case the Google Earth picture shows a bridge that crosses the river in front of the plot and will influence the rivers water regime.
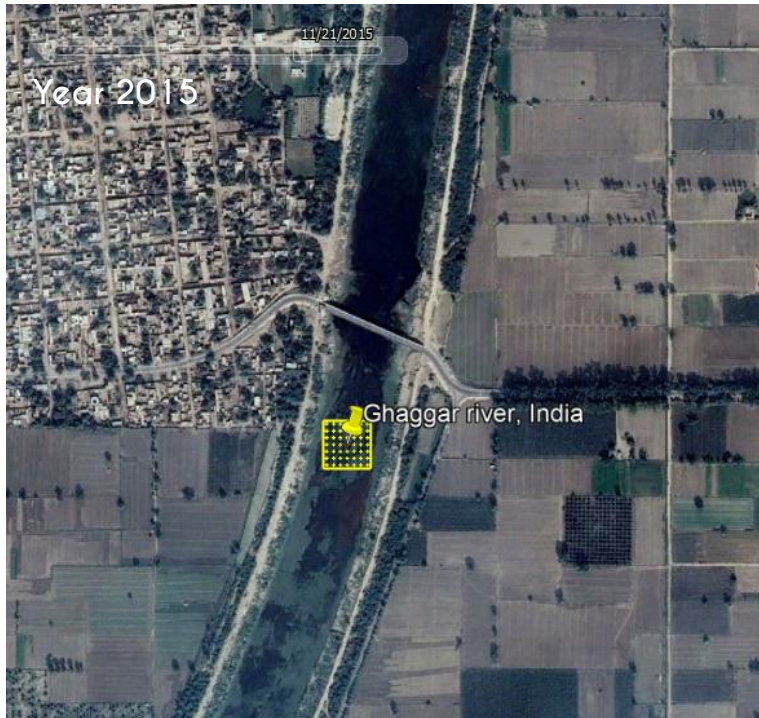
Wetland – Seasonal river
(Ghaggar, India)

Land use changes in time: The river flows with water only in the rainy season as seen in the left side and dries up the rest of the year as seen in the image on the right side.
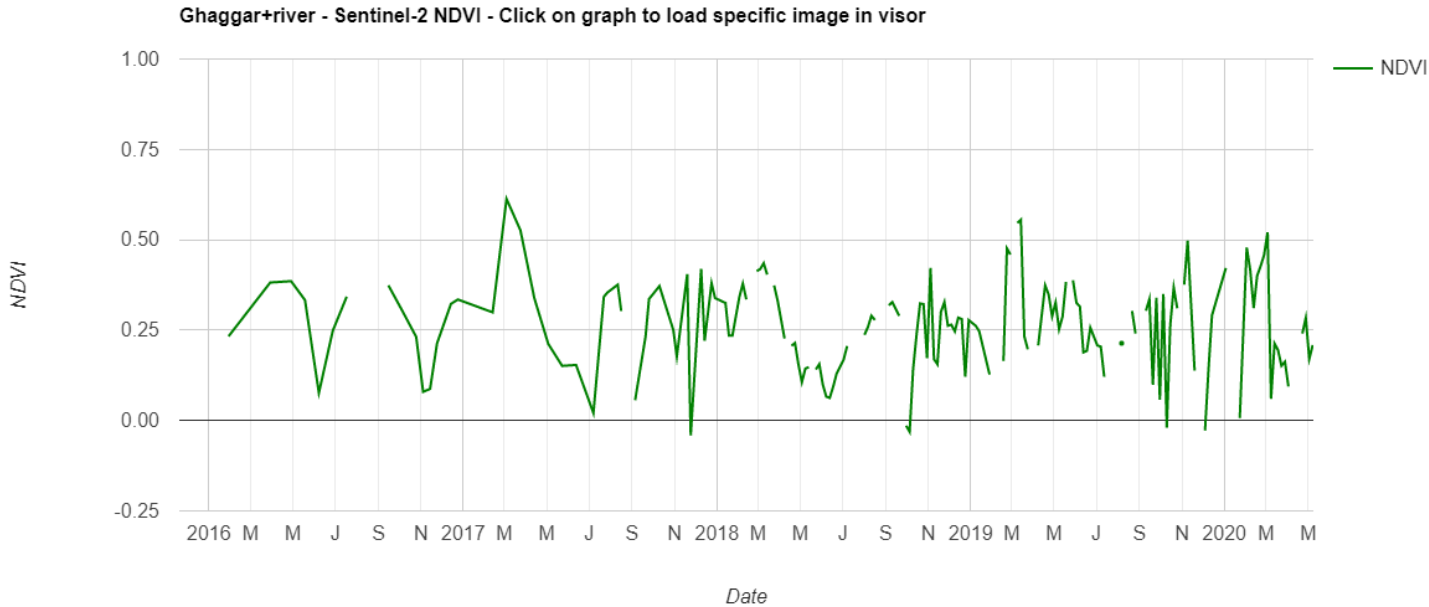
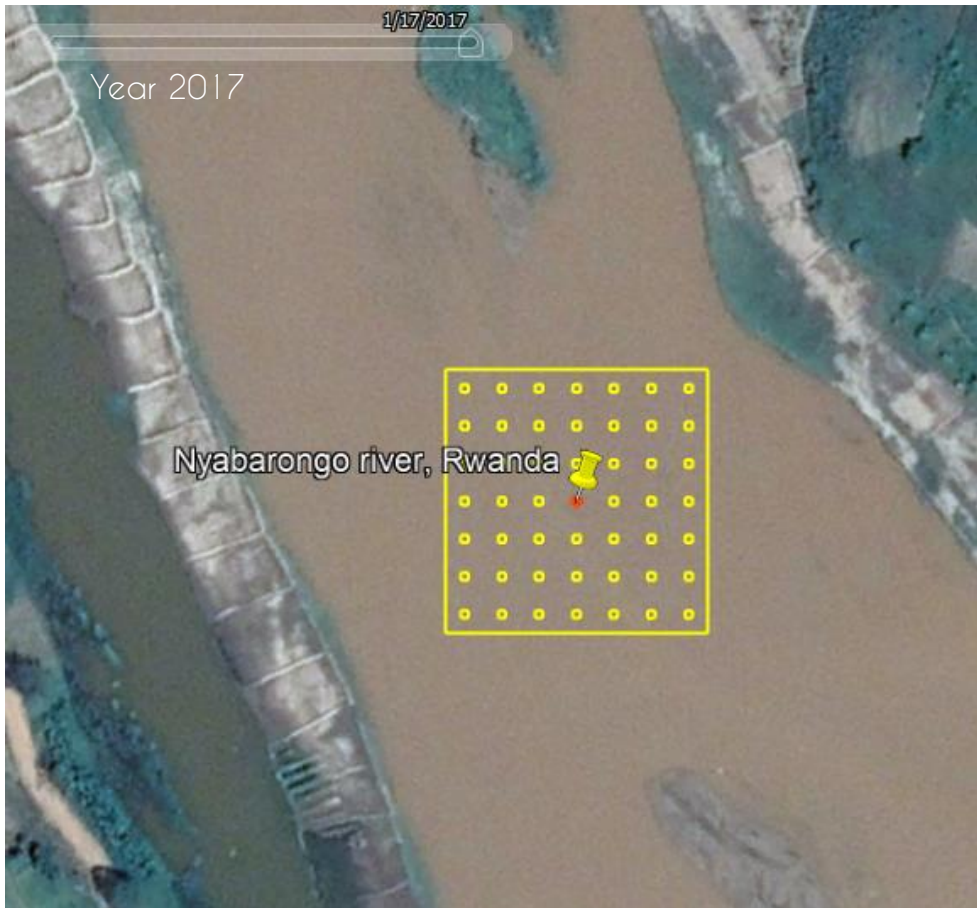COLLECT EARTH

Wetland – Seasonal river
 (Ghaggar, India)

Interpretation of NDVI graphic:
NDVI values are so high because vegetation might cover the river bed when it is not covered by water. Based on the NDVI graph the water does not often flow in the river only in the monsoon period (NDVI values lower than 0).

COLLECT EARTH

Wetland – Permanent river
(Nyabarongo, Rwanda)

Category: Wetland

Subcategory: Permanent river

Description: The plot is located in the Nyabarongo river, the longest river entirely flowing in Rwanda.
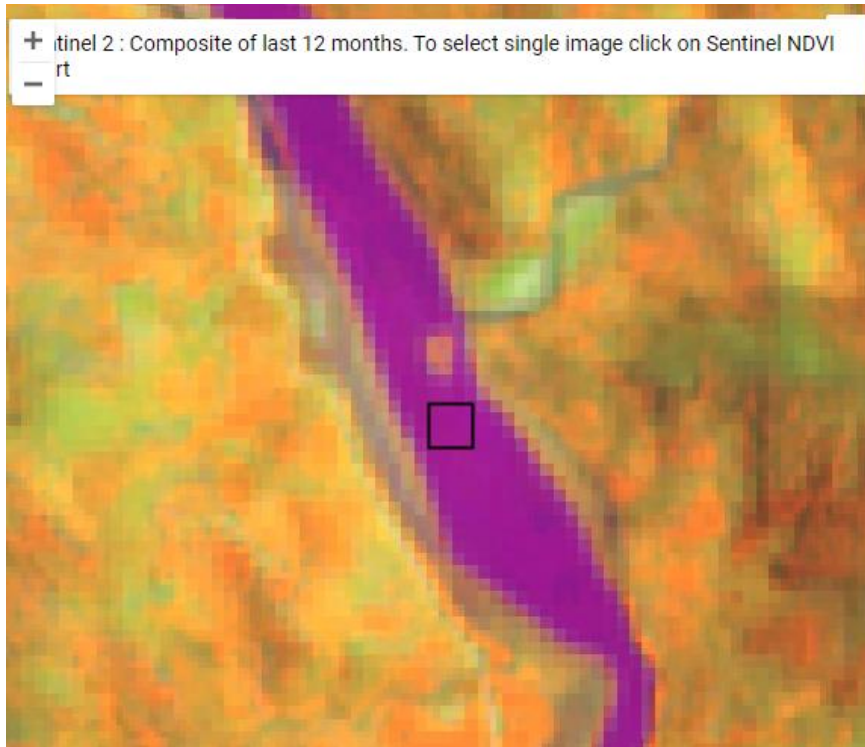
View in Google Earth

ADVANCED PLOT

COLLECT EARTH

Wetland – Permanent river
 (Nyabarongo, Rwanda)

tinel 2 : Composite of last 12 months. To select single image click on Sentinel NDVI
rt

Interpretation of Sentinel 2 NDVI image (20 m resolution):

- In this Sentinel image water is represented in purple. The color of the water is purple and not black/dark blue due to the fact that it is a river with shallow waters.

- The river is surrounded by areas with healthy vegetation that are represented in orange (orange is high vegetation intensity and green is low vegetation intensity).
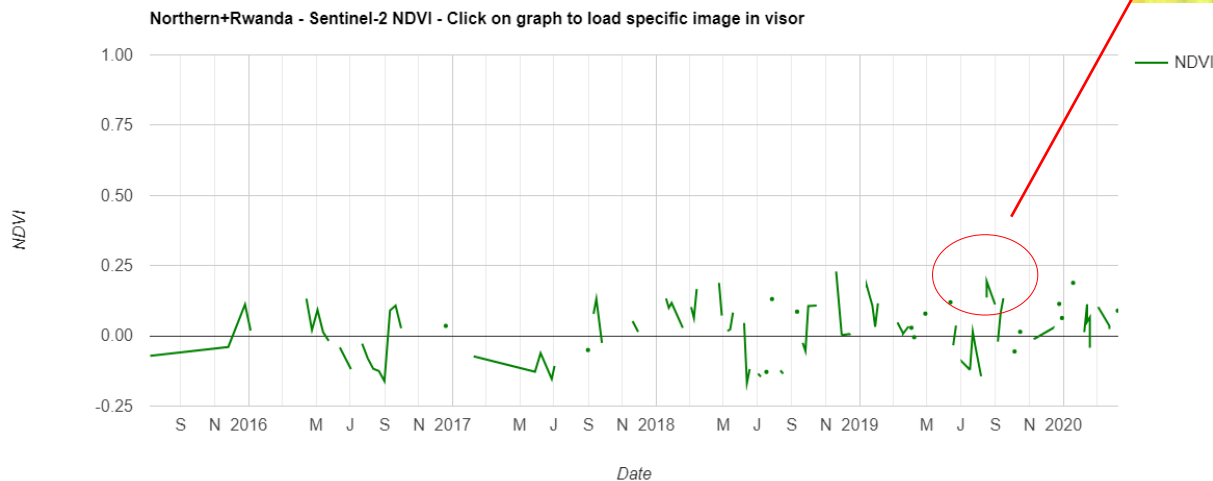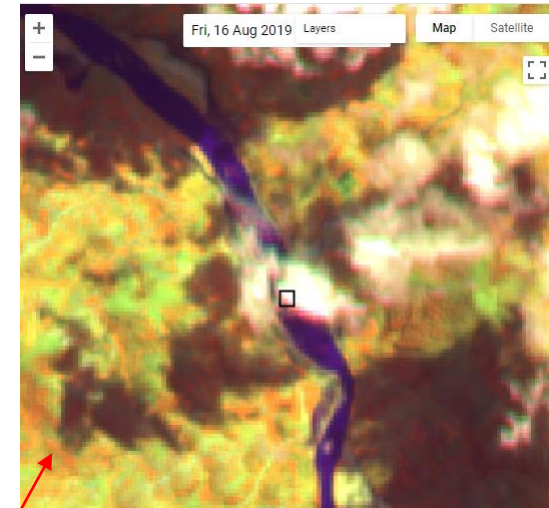
COLLECT EARTH

Wetland – Permanent river
 (Nyabarongo, Rwanda)

Interpretation of NDVI graphic:

Negative values of NDVI correspond to water. In this case NDVI values above 0 appear when clouds are covering the area. Also probably due to the fact that the river is transporting sediment NDVI values are not constantly negative.
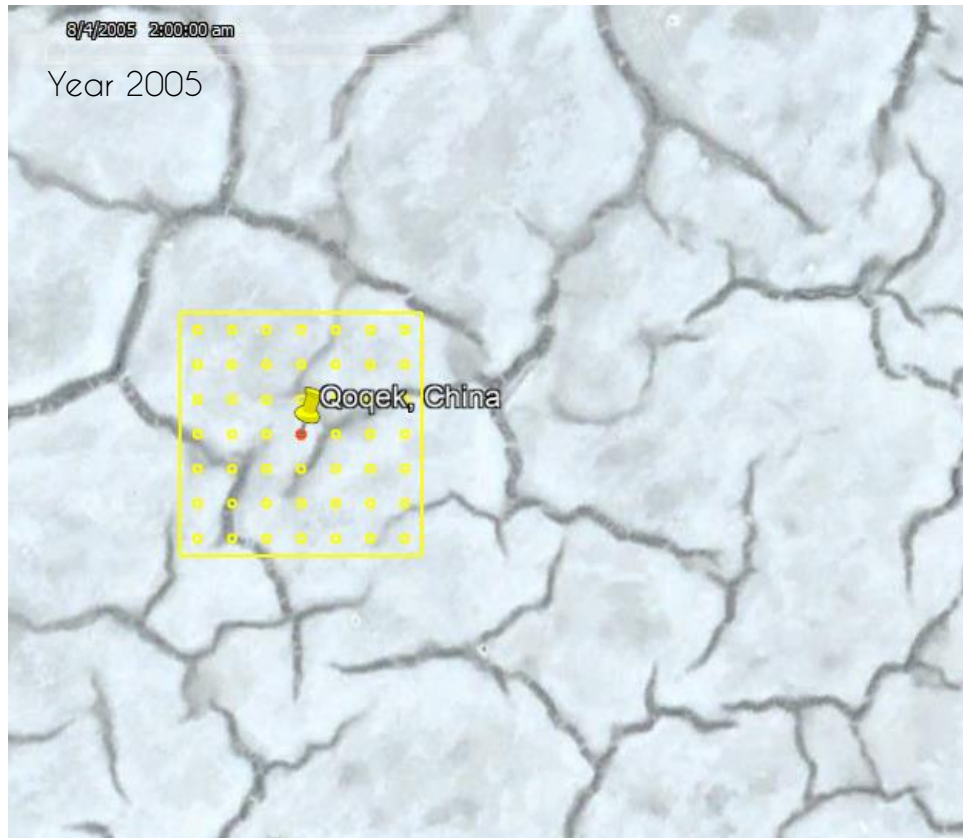

Northern+Rwanda - Sentinel-2 NDVI - Click on graph to load specific image in visor

Wetland – Salt extraction
 (Qoqek, China)

8/4/2005 2:00:00 am

Year 2005

Qoqek, China

Category: Wetland

Subcategory: Salt extraction

Description: The plot is located in an arid area in the northern part of China. Without zooming out the terrain looks like a very dry soil or a salty soil.

View in Google Earth

ADVANCED PLOT

COLLECT EARTH

Wetland – Salt extraction
 (Qoqek, China)

Year 1984

Year 2000

Qoqek, China

Year 2016

Qoqek, China

Land use changes in time:
It used to be a seasonal salt lake. Now it is being used to extract salt as can be seen in the last image in the year 2016.
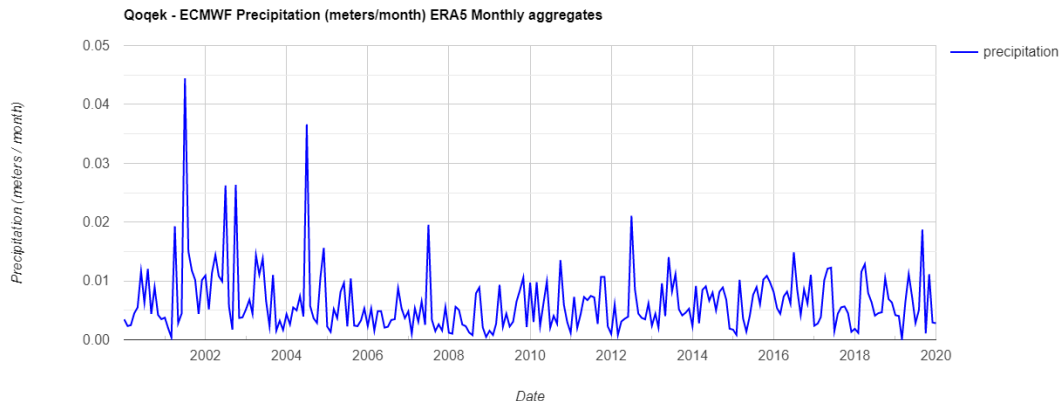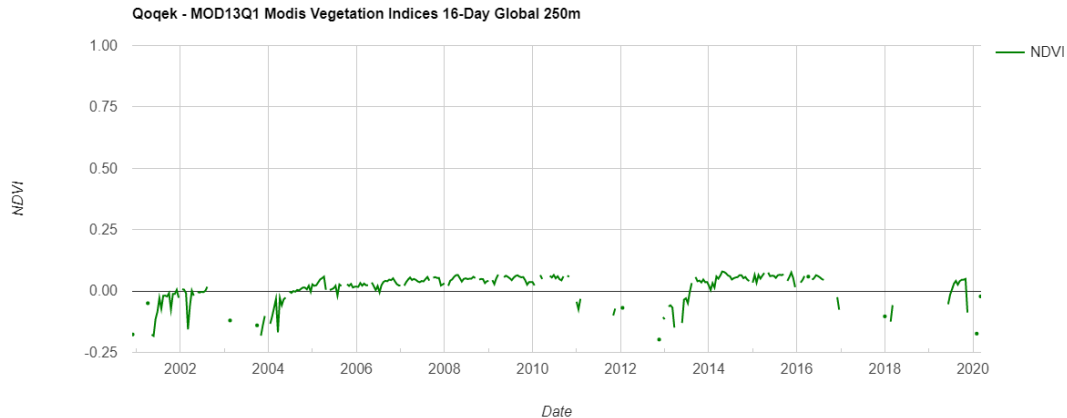
COLLECT EARTH

Wetland – Salt extraction
(Qoqek, China)

Qoqek - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m

Qoqek - ECMWF Precipitation (meters/month) ERA5 Monthly aggregates

Interpretation of NDVI and precipitation graphic:

- Values close to 0 mean no vegetation like in this arid area.

- In this case we are considering the low spatial resolution (250m) MODIS graph because the area around the plot is homogeneous.

- The NDVI values drop to minus 0 when the lake is covered by water.

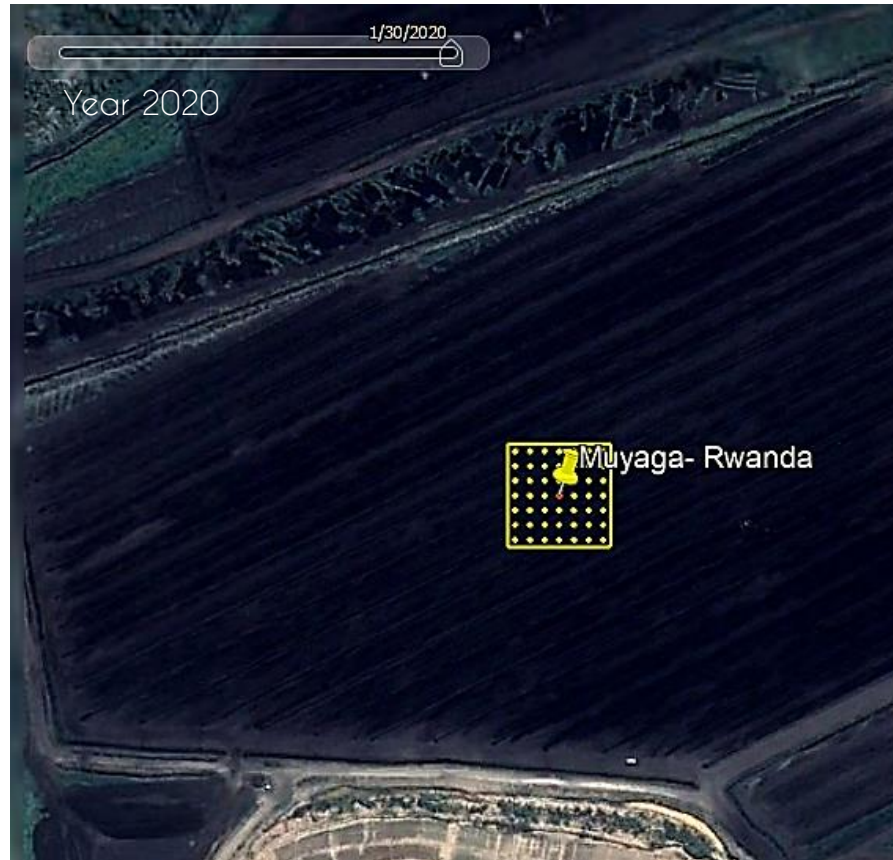- Precipitation is extremely low as the plot is located in an arid area.

COLLECT EARTH

Wetland – Peatland
 (Muyaga, Rwanda)

Year 2020
1/30/2020

Muyaga- Rwanda

View in Google Earth 🌍

**Category:** Wetland

Subcategory: Peatland

Description: This plot in Rwanda is located in a peatland which is basically an area of land with layers of accumulated organic surface material in a state of decay (known as peat).

This area is used for extraction of peat for energy production.

ADVANCED PLOT

COLLECT EARTH

Wetland – Peatland
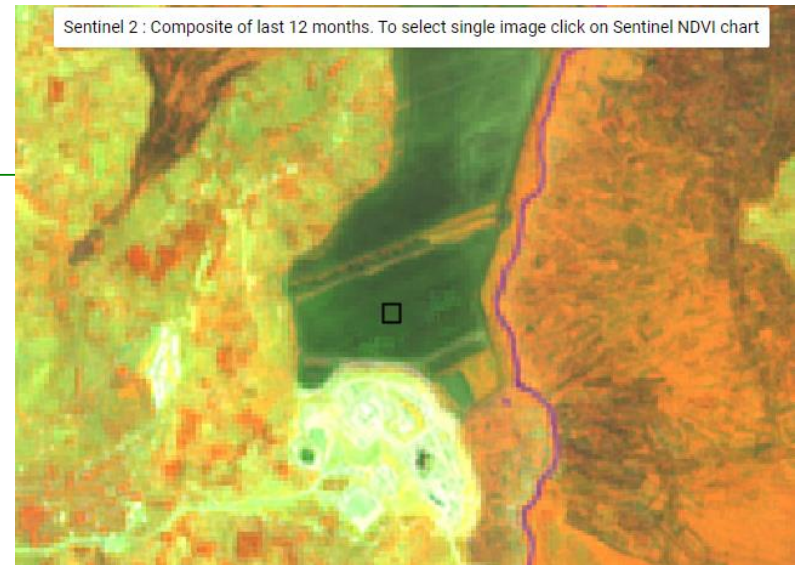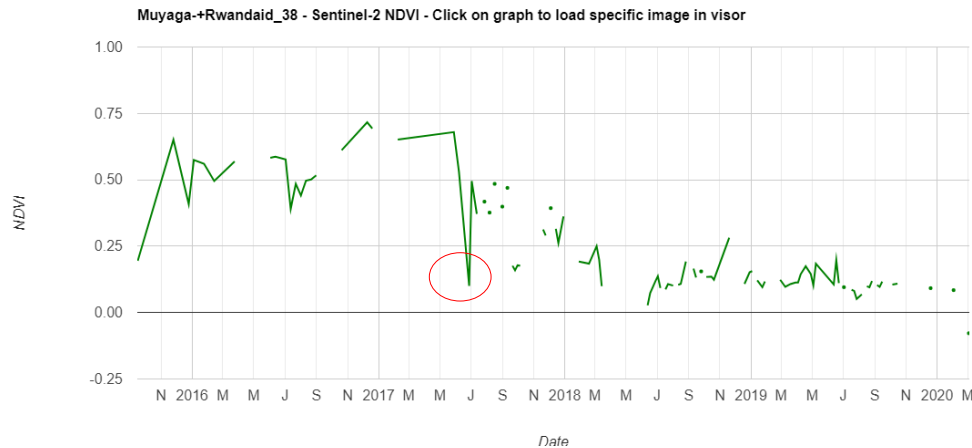 (Muyaga, Rwanda)

Year 2007

Year 2016

Year 2019
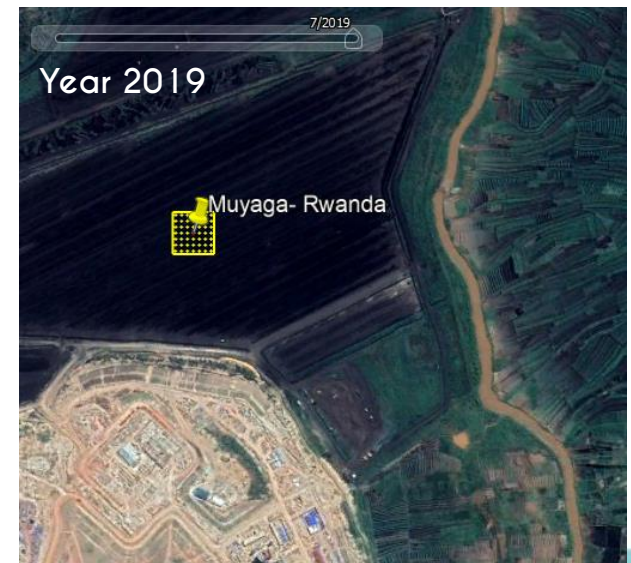
Land use changes in time: Between 2007 and 2019 the area around this plot changed in many aspects. In 2007 it was used for small holder agriculture and between 2016 and 2019 a power plant was built in the southern tip of the bog and the area is used for extraction of peat for electricity generation.

COLLECT EARTH

Wetland – Peatland
(Muyaga, Rwanda)

Muyaga-+Rwandaid_38 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Sentinel 2 : Composite of last 12 months. To select single image click on Sentinel NDVI chart

Interpretation of NDVI graphic and Sentinel 2 NDVI image (20 m resolution):
- The land use conversion can be observed from the NDVI graph. Before 2016 the land use was agriculture (high NDVI values, high vegetation intensity). The peatland extraction commenced as the power plant was build.
- The Sentinel 2 false color mosaic shows the peatland in green (no vegetation) and the power plant in white/yellow. On the right side the river in purple and agricultural plantations in orange (vegetation) over the border with Burundi.

COLLECT EARTH

Settlement – City
(Essaouira, Morocco)

Year 2020
3/30/2020
Essaouira, Morocco
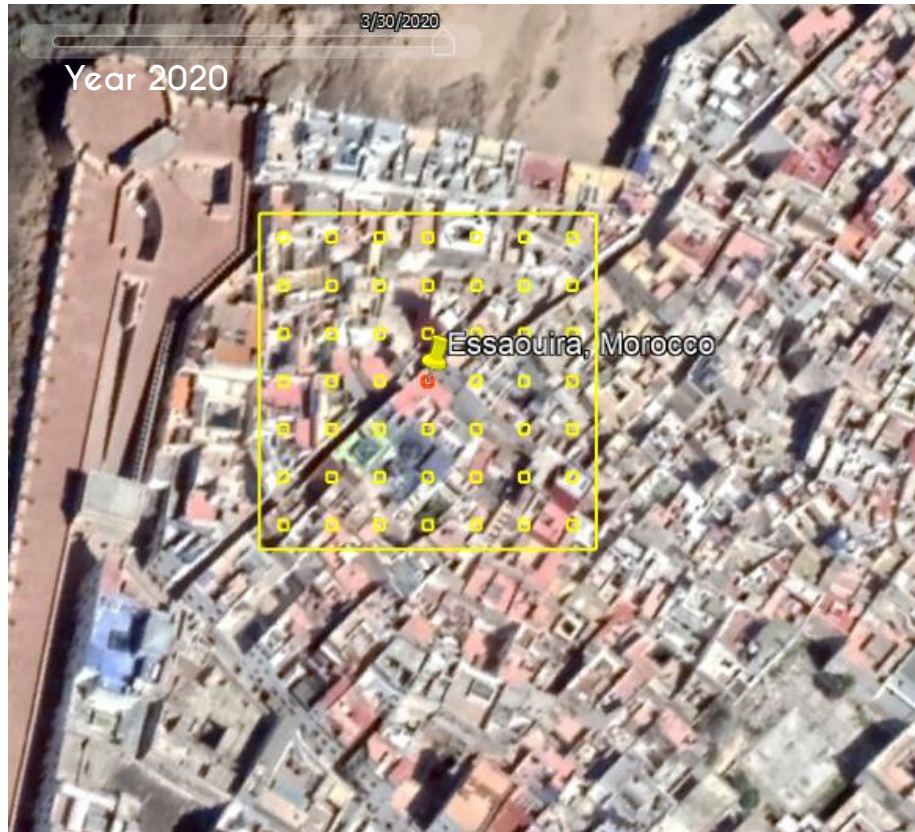
Category: Settlement

Subcategory: City

Description: The plot is located in the old medina of the coastal city of Essaouira in Morocco.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Settlement – City
(Essaouira, Morocco)

Land use changes in time: In the medina of the city, no land use change would be expected as the city has been occupied since prehistoric times.
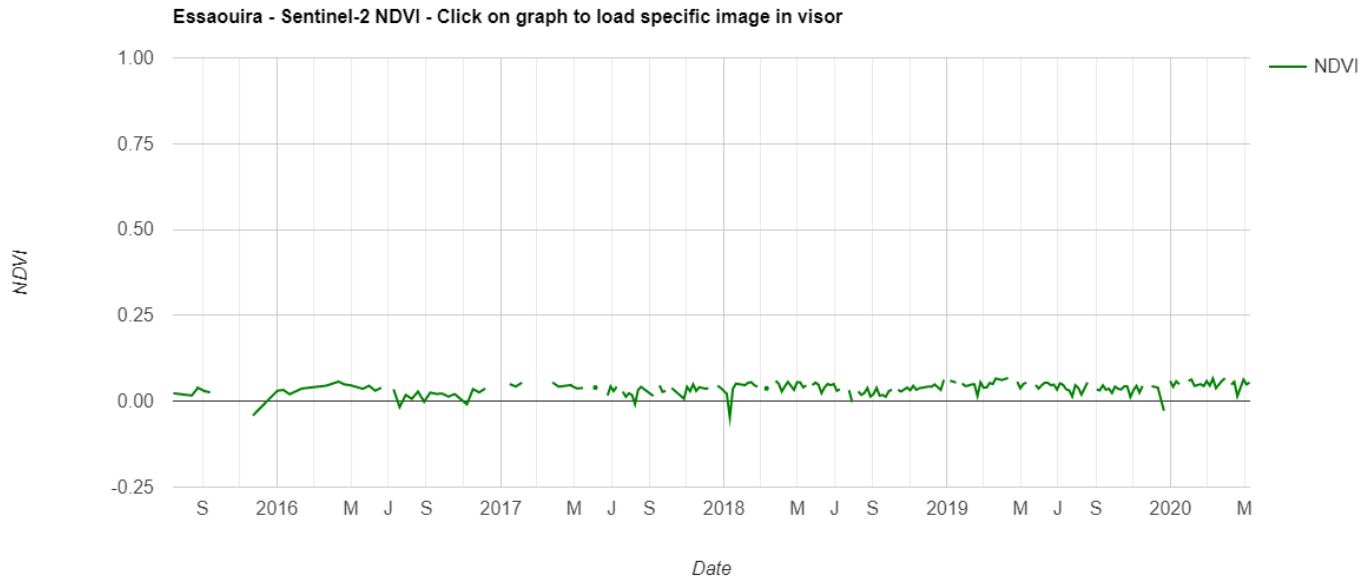
COLLECT EARTH

Settlement – City
 (Essaouira, Morocco)

Essaouira - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphic:
NDVI values close to and above 0 are expected as in this part of the city no trees are found. The variation of the value is due to differences on the illumination of the images (taken at different times of the day or affected by the seasonal tilting of the sun), shades and clouds.
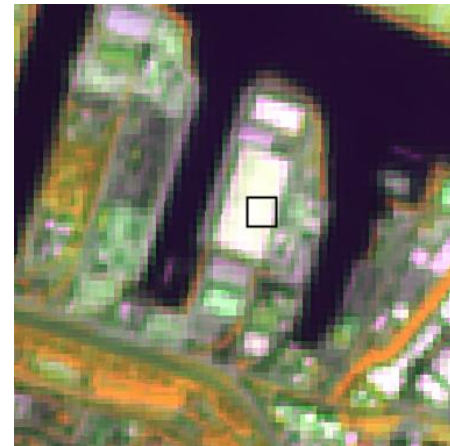
COLLECT EARTH

Settlement – Infrastructure
(Hamburg, Germany)

Category: Settlement

Subcategory: Infrastructure

Description: The plot is located in the port in Hamburg on the sidelines of the Elbe river.

Year 2019
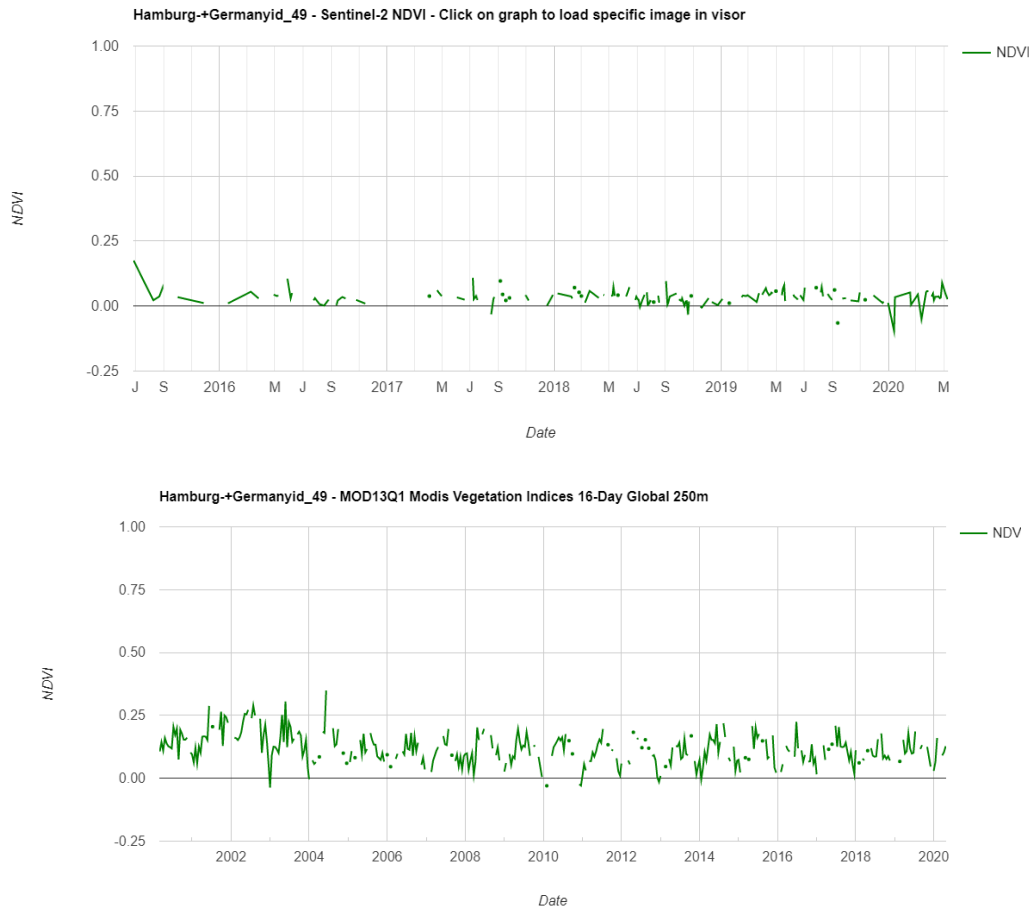4/18/2019
Hamburg- Germany

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Settlement – Infrastructure
 (Hamburg, Germany)

Hamburg-+Germanyid_49 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Hamburg-+Germanyid_49 - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m

Interpretation of NDVI graphs:

- Sentinel 2 (20 m pixel): NDVI values close to 0 concords with the VHR images from Google Earth. Variation due to clouds/shades and illumination conditions.

- MODIS (250 m pixel): NDVI values between 0 and 0,25 means the surroundings of the plot with green areas are also being considered.

COLLECT EARTH

Settlement – Mining
(North Rhine Westphalia, Germany)

Category: Settlement

Subcategory: Mining

Description: The plot is located in the Hambach coal mine in North Rhine Westphalia.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Settlement – Mining
(North Rhine Westphalia, Germany)
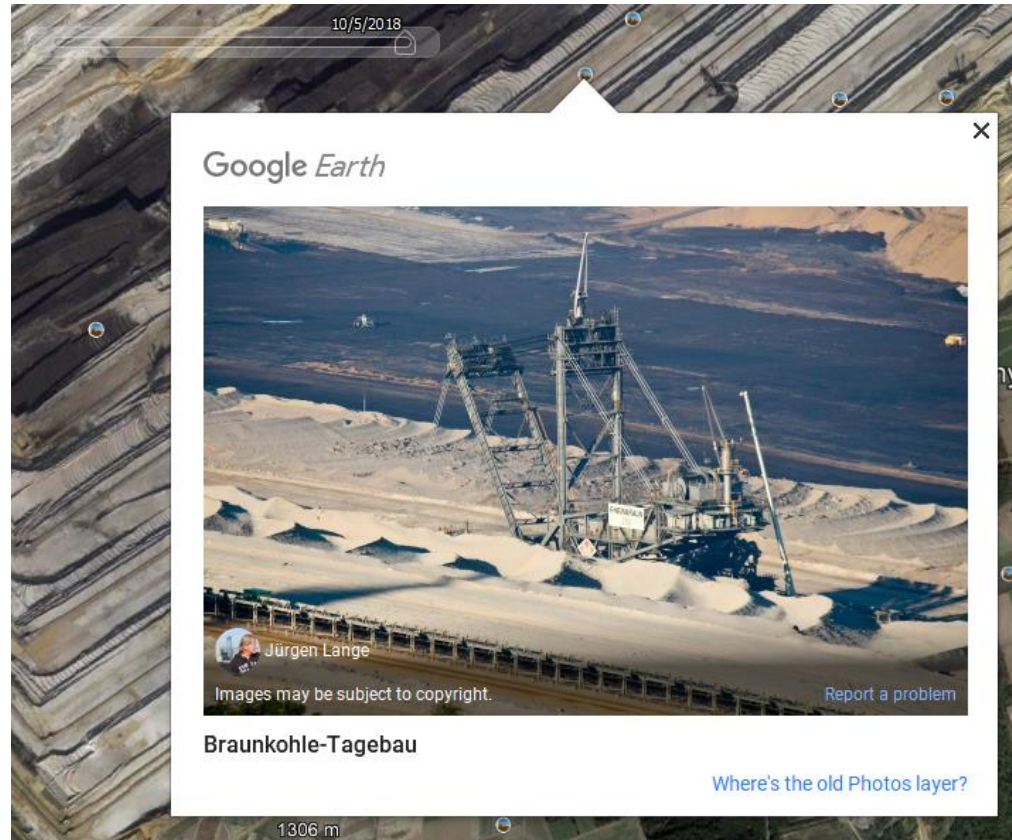
In this case the Google Earth picture shows the landscape in Hambach coal mine which is the largest open pit mine in Germany.

Settlement – Mining
(North Rhine Westphalia, Germany)

Land use changes in time: The mine is on the site of the ancient Hambach Forest which was purchased in 1978. The forest was cut down and cleared into a mine.
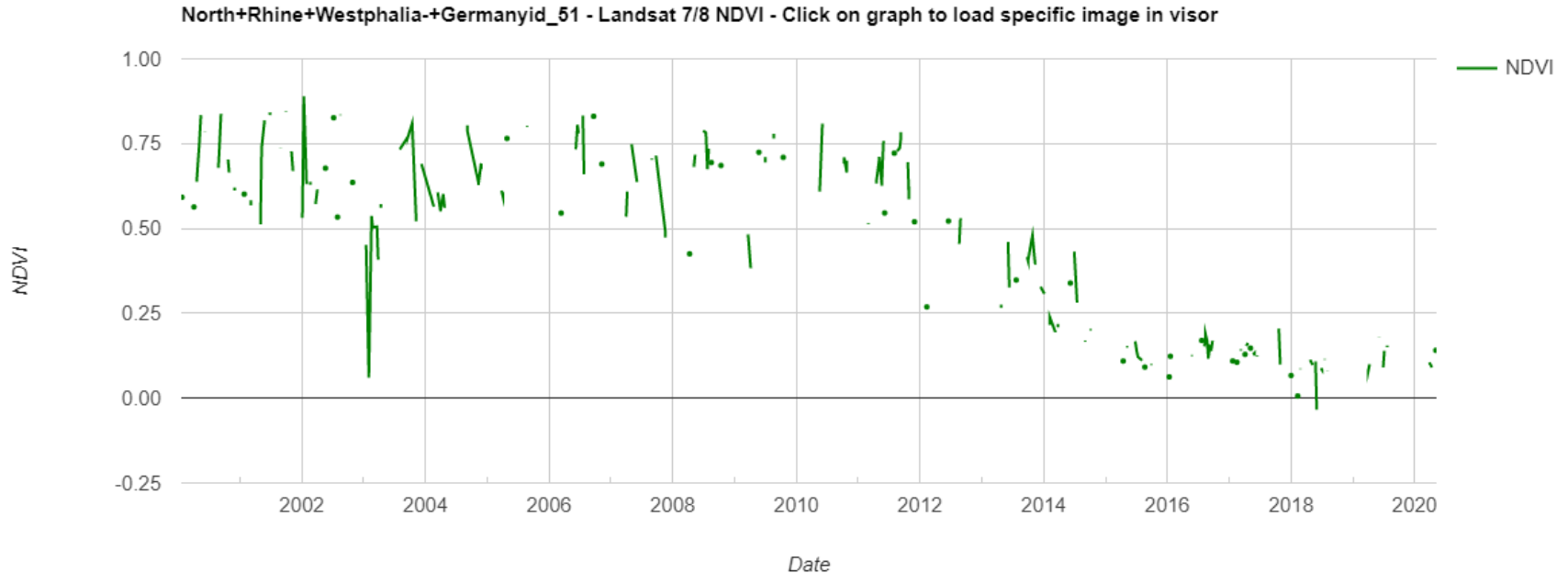
COLLECT EARTH

Settlement – Mining
(North Rhine Westphalia, Germany)

North+Rhine+Westphalia-+Germanyid_51 - Landsat 7/8 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graph:
NDVI values in the graph reflect the land use change from forest to bare soil in 2012. NDVI values slowly drop and start approaching close to 0 values.

COLLECT EARTH

Settlement – Village
 (Island, Lake Chad)

Year 2012

12/2012

Island, Lake Chad

View in Google Earth

Category: Settlement

Subcategory: Village

Description: The plot is located in a little village in one of the Lake Chad Islands. Housing and bare soil can be seen within the plot.
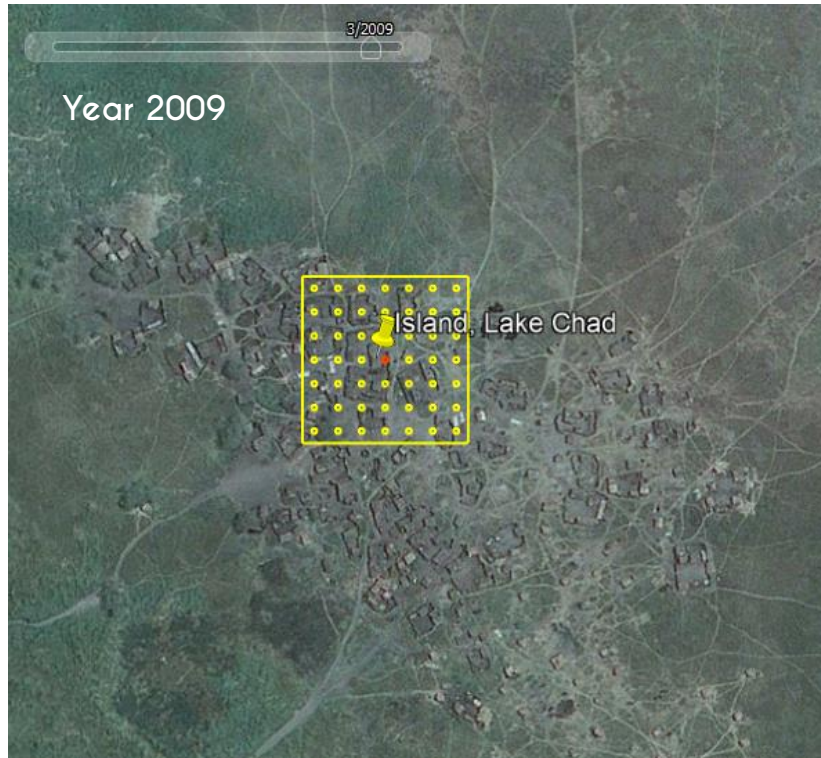
ADVANCED PLOT

COLLECT EARTH

Settlement – Village
(Island, Lake Chad)

Land use changes: Between 2009 and 2012, the village got smaller and its inhabitants built a fence around the settlements. In the last image the village seems to be affected by a flooding, no land use change.

Settlement – Village
(Island, Lake Chad)

Island - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphic:
The NDVI values range between 0 and 0,3. The village is located on a grassland with vegetation that fluctuates with the rainy and dry seasons. The area is affected by fires and floodings.

COLLECT EARTH

Settlement – Urban Park
(London, UK)

Year 2019

8/2019

London- UK

Category: Settlement

Subcategory: Urban Park

Description: The plot is located in a famous urban park, the Hyde park in London. Even though an urban park has a green cover it would be categorized as a settlement.
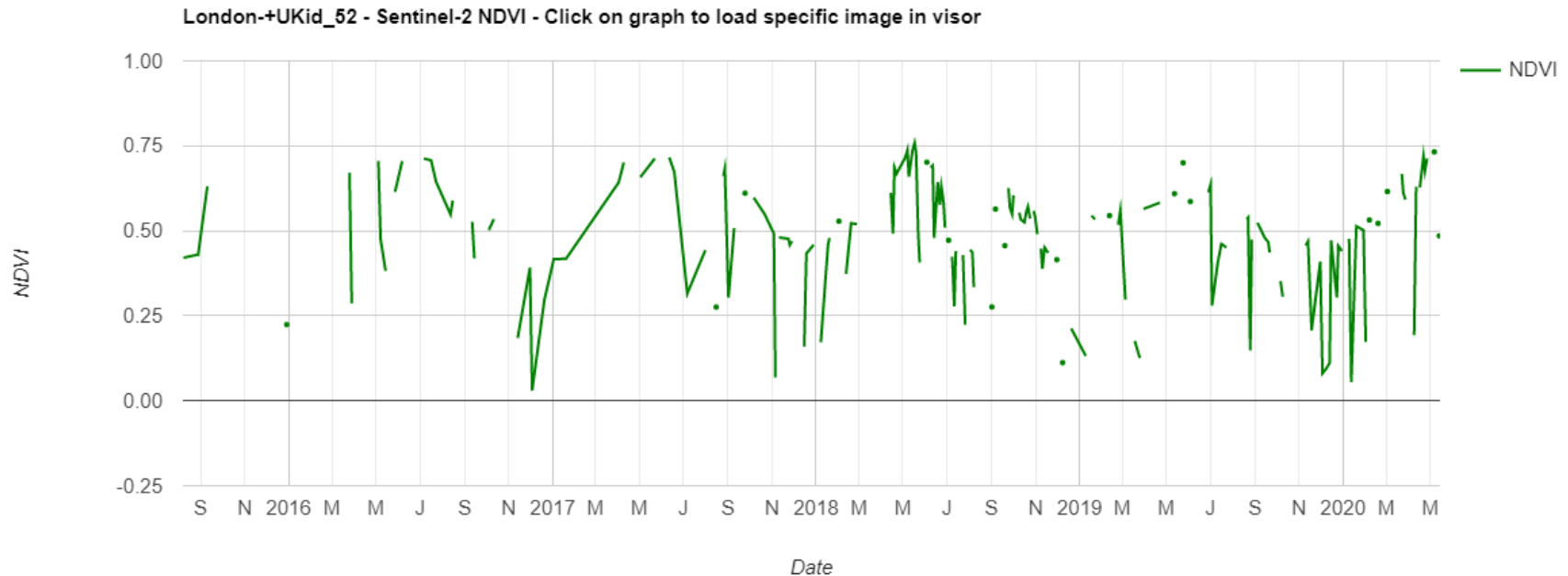
ADVANCED PLOT

COLLECT EARTH

Settlement – Urban Park
 (London, UK)

London-+UKid_52 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graph:
The NDVI values range between 0,3 and 0,5. The urban park is covered by grassland with trees and fluctuates depending on weather seasonality.
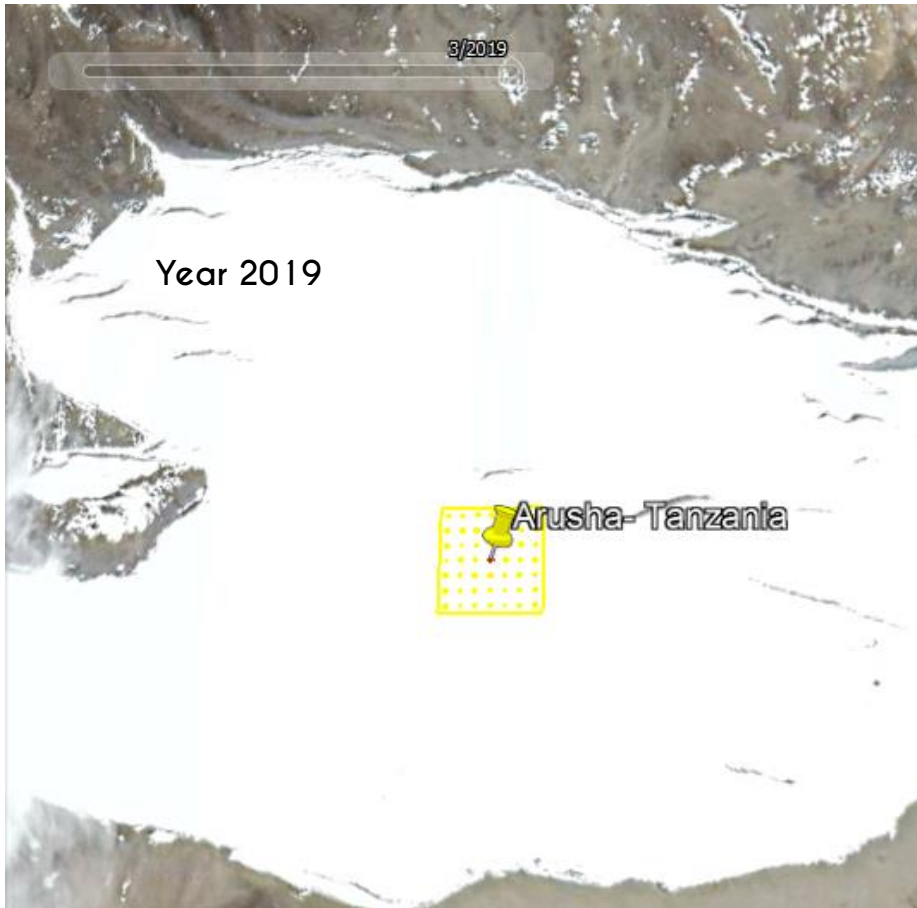
COLLECT EARTH

Otherland – Snow
(Arusha, Tanzania)

Year 2019

3/2019

Arusha- Tanzania

Category: Other land

Subcategory: Snow

Description: The plot is located on Mt-Kilimanjaro in Arusha, Tanzania close to the crater of an inactive volcano at 5779m altitude.
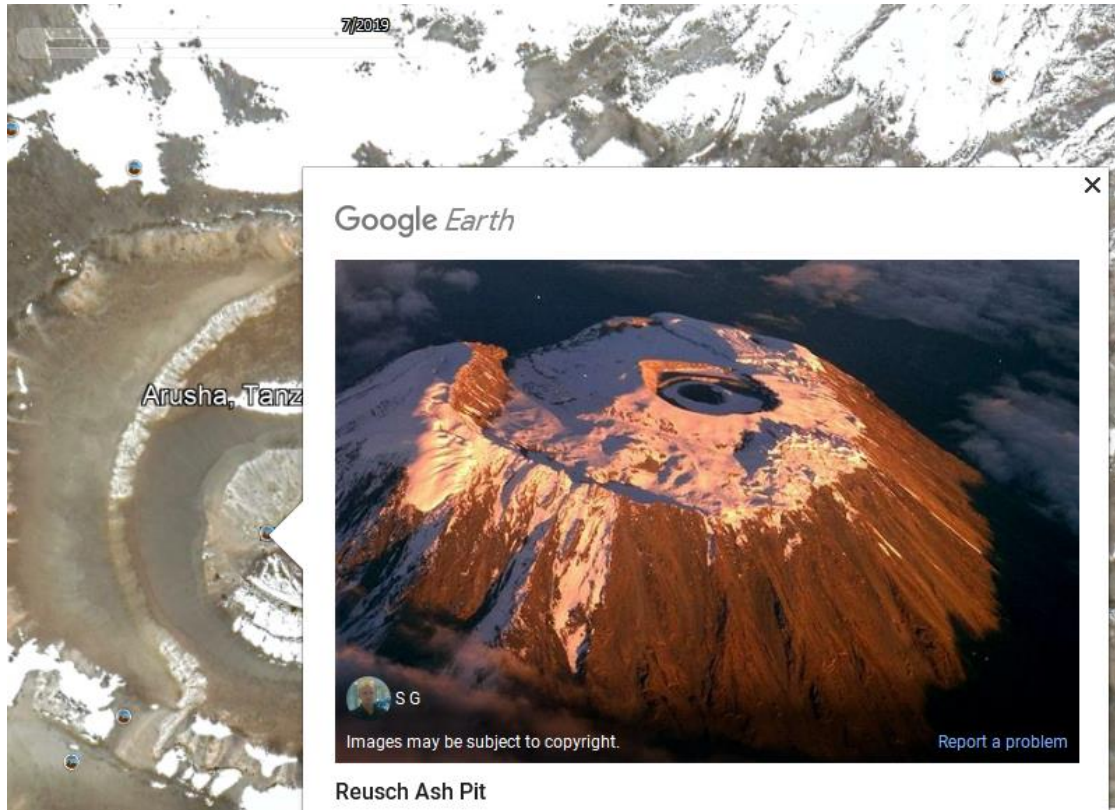
View in Google Earth

COLLECT EARTH

BEGINNER PLOT

Otherland – Snow
(Arusha, Tanzania)

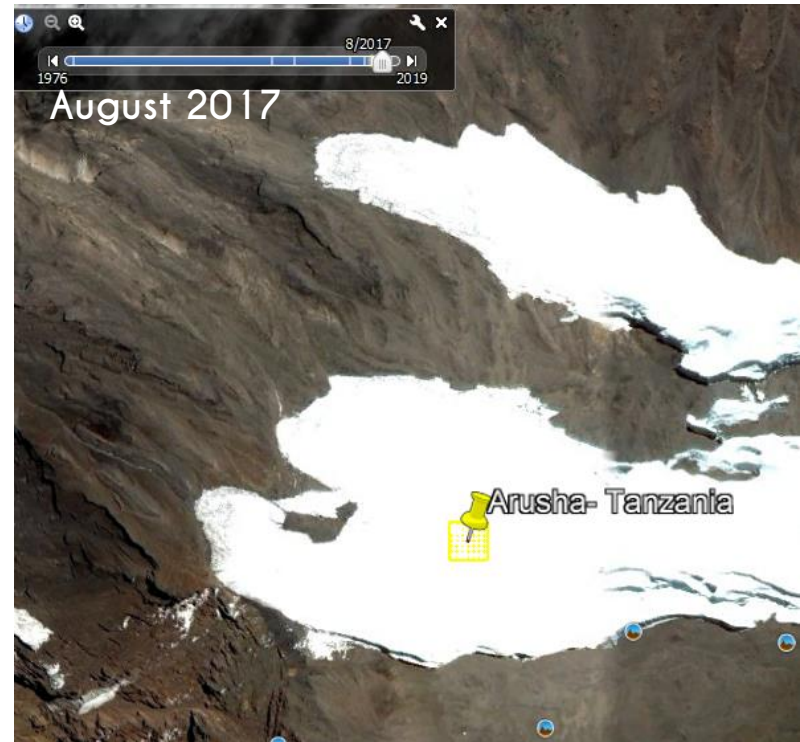In this case the Google Earth picture shows an areal image of the Mt- Kilimanjaro covered with snow.

Otherland – Snow
(Arusha, Tanzania)

February 2003

August 2017

The area is covered by snow in both winter and summer seasons

COLLECT EARTH

Otherland – Snow
 (Arusha, Tanzania)

Arusha-+Tanzaniaid_1 - MOD13Q1 Modis Vegetation Indices 16-Day Global 250m
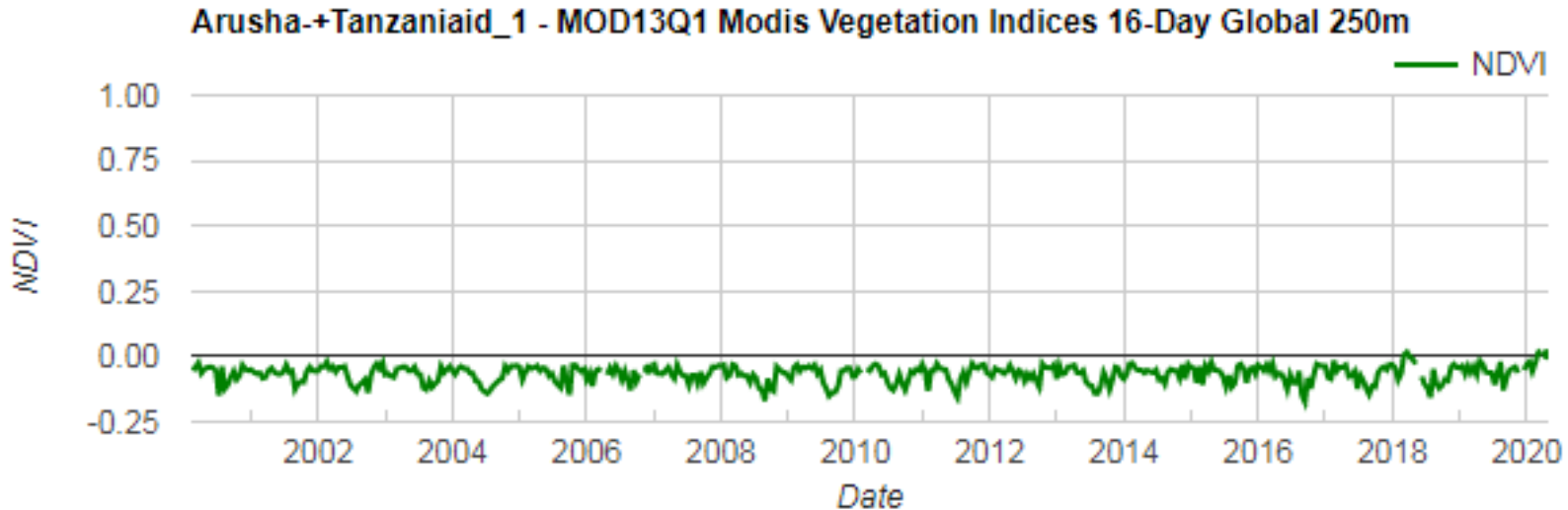
Interpretation of NDVI graphic:
NDVI values are below 0 throughout the year indicating that the area is permanently covered with snow.

COLLECT EARTH

Otherland – Sand
(Easter Island, Chile)

Category: Other land

Subcategory: Sand

Description: The plot is located on a beach in the Eastern Island in the middle of the Pacific.
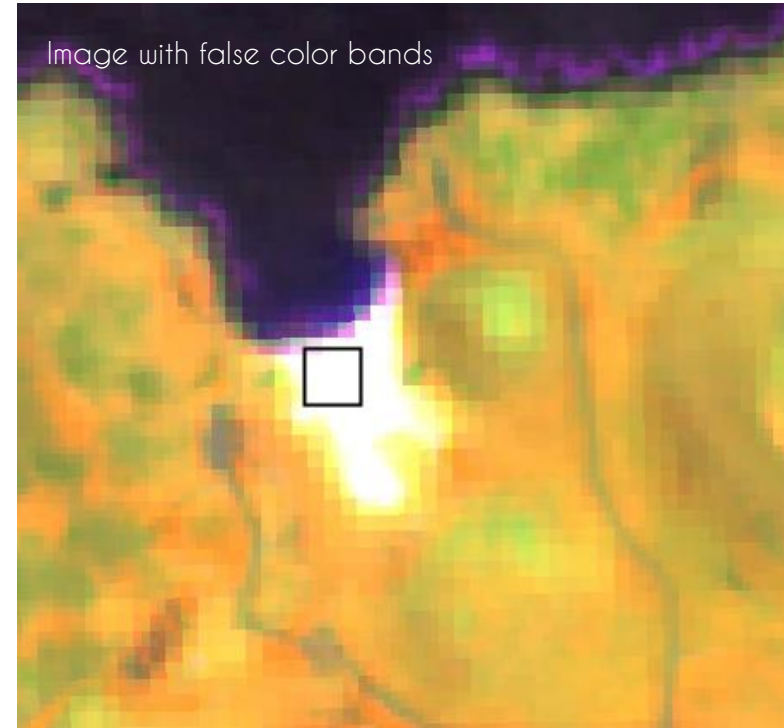
View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Otherland – Sand
(Easter Island, Chile)

12/27/2002

Easter Island, Chile

Image with false color bands

Land use change: In these Sentinel 2 composite images water is represented in black, vegetation in orange and sand in withe. No land use change can be perceived.
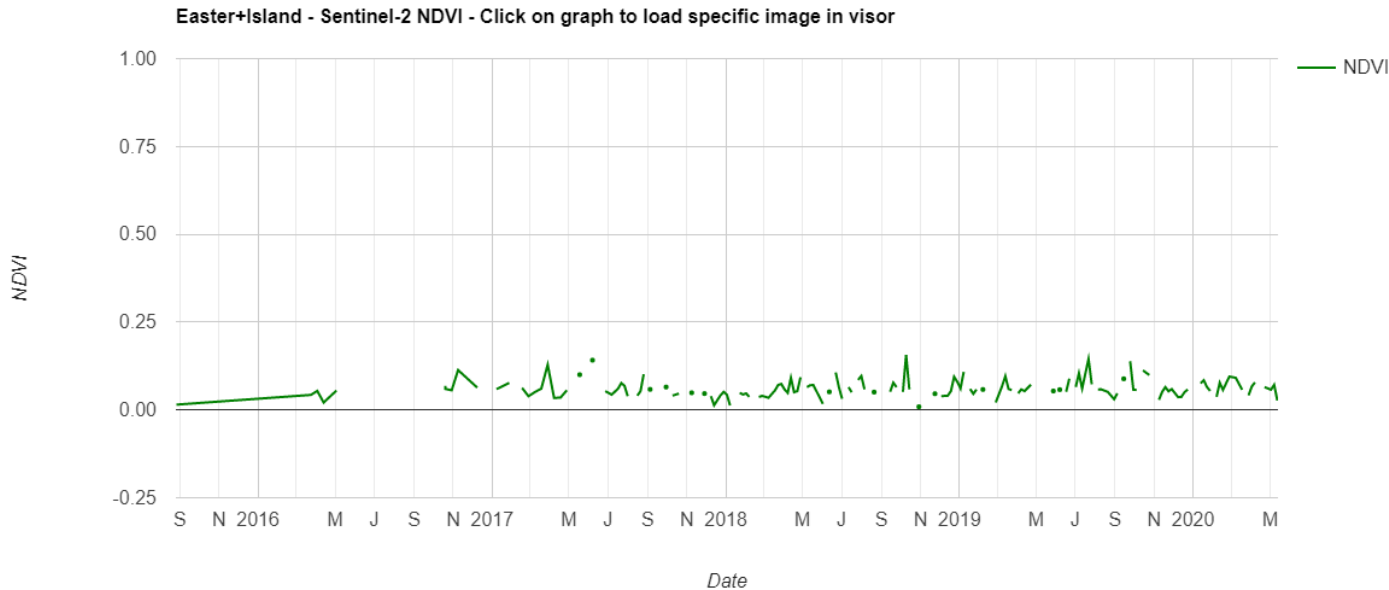
COLLECT EARTH

Otherland – Sand
 (Easter Island, Chile)

Easter+Island - Sentinel-2 NDVI - Click on graph to load specific image in visor

Interpretation of NDVI graphic:
NDVI values are slightly above 0. These values represent bare soil or sand. The peaks are usually caused by clouds or sun reflection
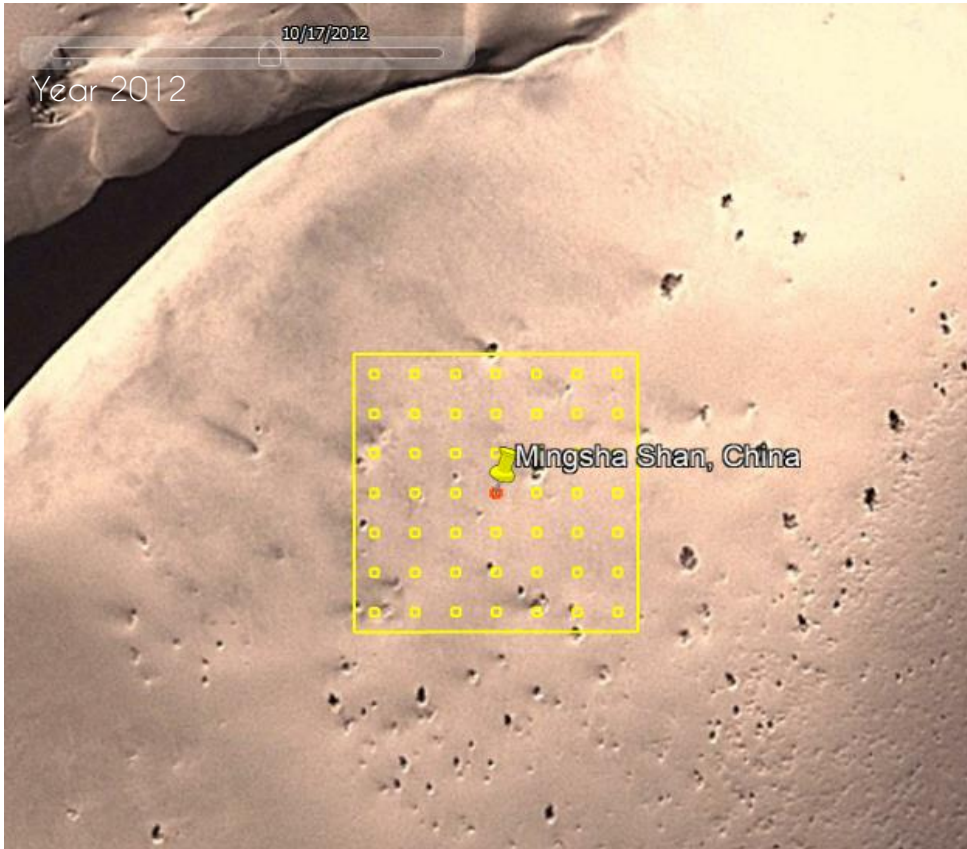
COLLECT EARTH

Otherland – Dune
(Mingsha Shan, China)

Category: Other land

Subcategory: Dune

Description: The plot is located in the middle of a gigantic sand dune in Mingsha Shan, China.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Otherland – Dune
(Mingsha Shan, China)

Year 2003

Year 2020

Land use change: High resolution satellite images from the area are available since 2003.

COLLECT EARTH

Otherland – Dune
(Mingsha Shan, China)

Mingsha+Shan - Sentinel-2 NDVI - Click on graph to load specific image in visor

Sentinel 2 image with false color bands
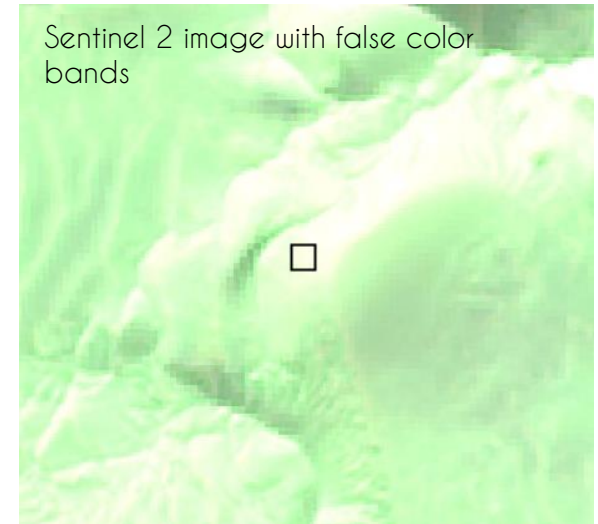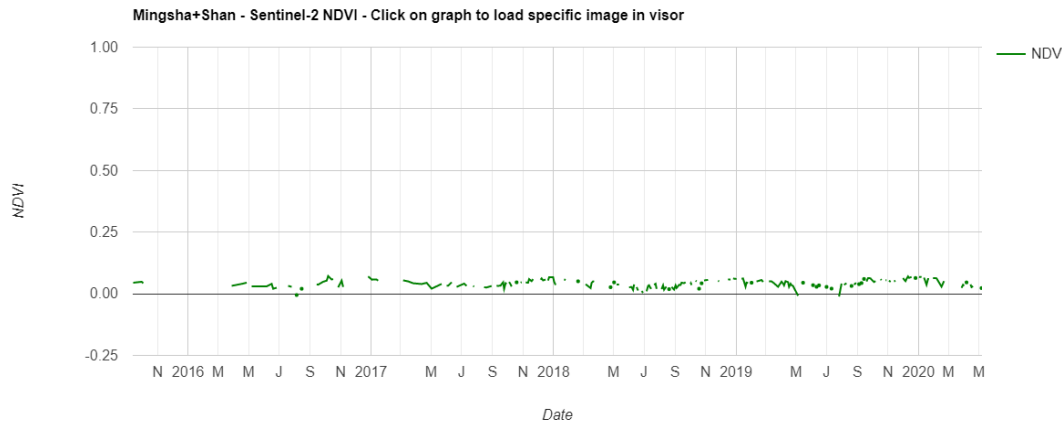
Interpretation of NDVI graphic and false color image:
NDVI values are slightly above 0. These values represent bare soil or sand. The presence of green and white in the false color image shows the lack of vegetation.

COLLECT EARTH

Otherland – Ice
(Graham Land, Antarctica)

Year 2019

8/6/2019

Graham Land- Antarctica

Category: Other land

Subcategory: Ice

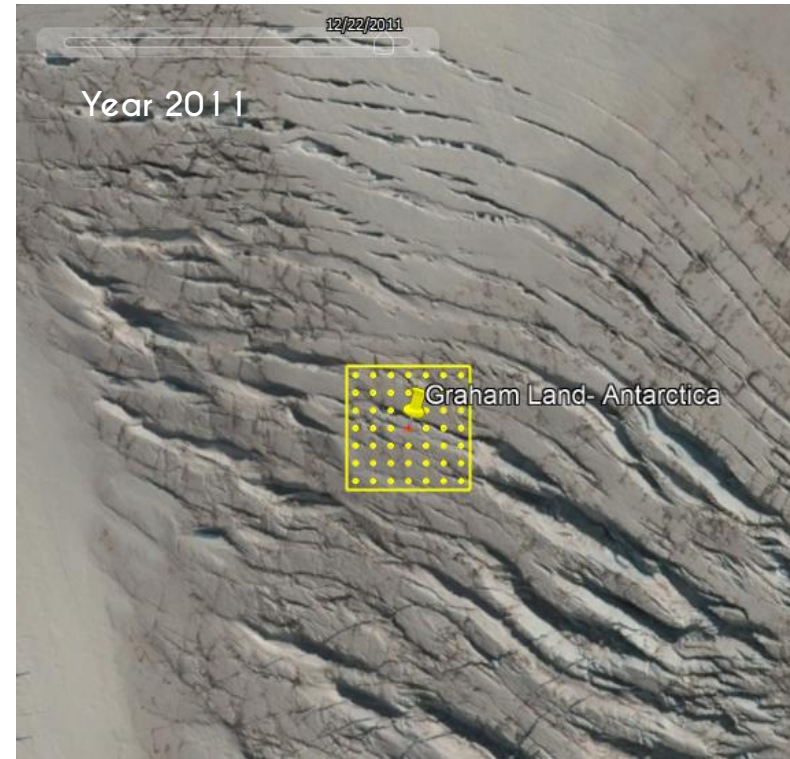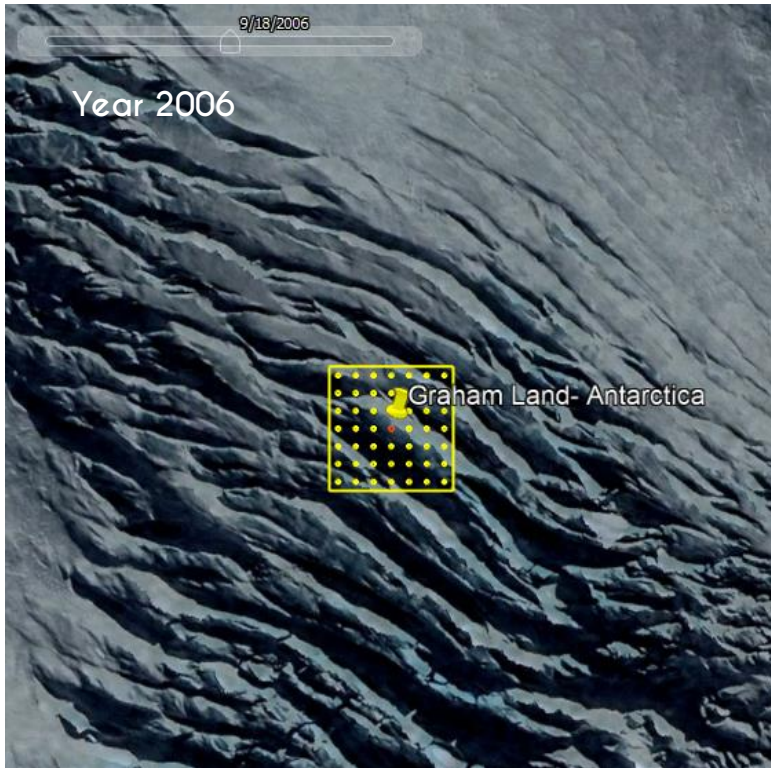**Description:** The plot is located in Graham Land in Antarctica.

View in Google Earth

BEGINNER PLOT

COLLECT EARTH

Otherland – Ice
(Graham Land, Antarctica)

Year 2006 — 9/18/2006 — Graham Land- Antarctica

Year 2011 — 12/22/2011 — Graham Land- Antarctica

Land use change: The ice sheet has not changed since 2000.

Otherland – Ice
 (Graham Land, Antarctica)

Graham+Land-+Antarcticaid_57 - Sentinel-2 NDVI - Click on graph to load specific image in visor

Sentinel 2 : Composite of last 12 months. To select single image click on Sentinel NDVI chart

Sentinel 2 image with false color bands
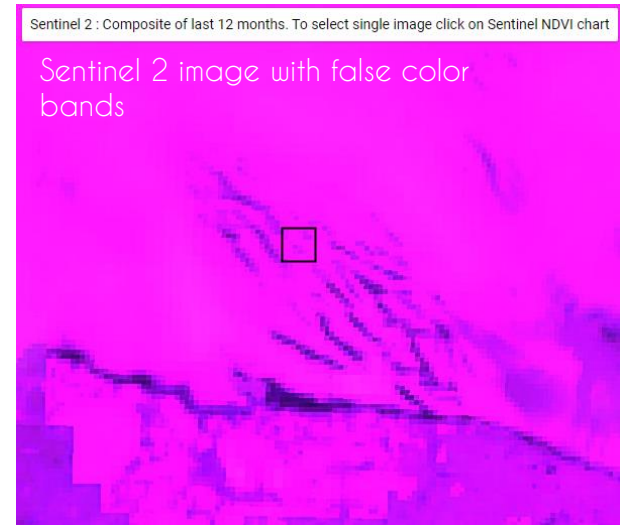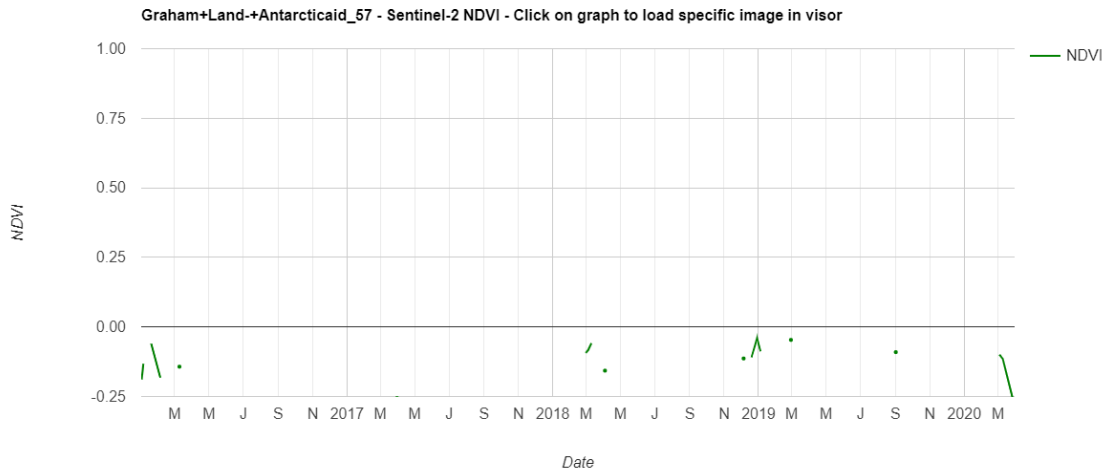
Interpretation of NDVI graphic and false color image:
NDVI values are below 0. These values represent water or ice.
Pink/Purple colors indicate the presence of snow or ice.

COLLECT EARTH