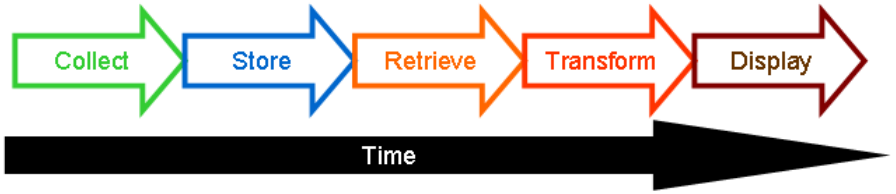
Exercise – GIS in the Cloud and on the Net

Introduction

This course takes its starting point at the GIS definition as presented by Peter Burrough (1986).
We hope that all of you have received this message.
If you for some reason have missed it, or even forgot about the definition, we will gladly repeat it once again:

"A powerful set of tools
for collection, storing, retrieval, transforming and displaying
spatial data from the real world"



Although this definition is a good representation of the basic workflow of geodata in a GIS project, it has some flaws.
Peter Burrough is not to be blamed for this, though.
Little would he know back in 1986 about the IT revolution that took off in the 90´s.

Communication

Earlier during this course, we mentioned one flaw of the 1986 GIS definition – *Communication*.

On the one hand, communication is dealing with conveying a message – how you are displaying the results of a GIS.
This perspective relates to cartography, pedagogics and psychology and was dealt with in the Map Comprehension module of the course.

On the other hand, communication is about making your GIS public.
This is to a greater deal relating to technology and who the audience is.
Is the audience your mother, your friends, your professional colleagues, or the whole World?

Mass medium

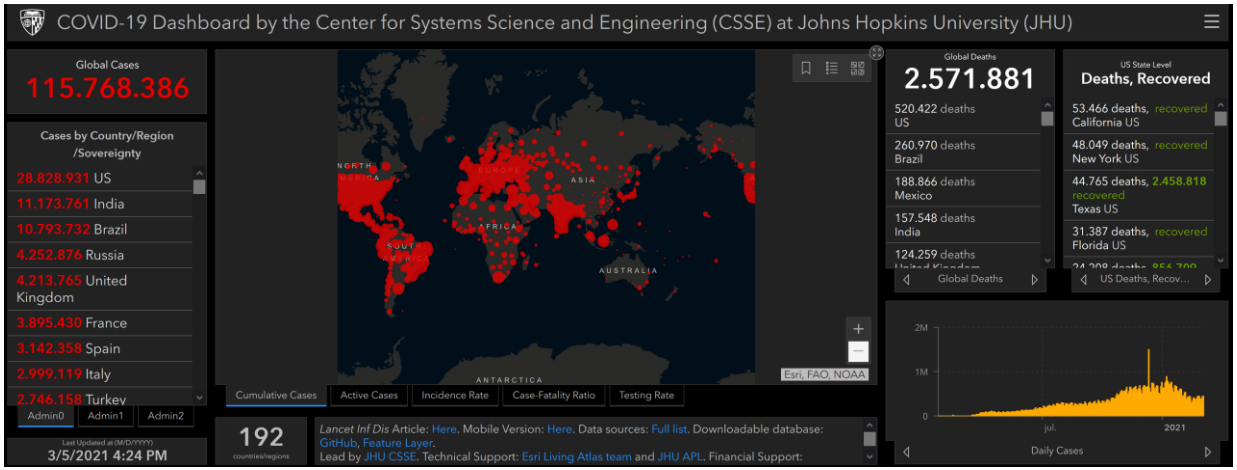
And, do they have a possibility to respond to your GIS.
This exercise is about using technology to make GIS a 'mass medium'.

Introduction

The Internet and the WWW are two such technologies that have facilitated the outburst of new mass media.

Without them a GIS still would have been a concern within a more narrow audience, like the members of a project, or within an organisation or a workplace.

On the WWW, however, a GIS can be of concern to anybody, or in fact everybody.



Objective

Aim:

In this exercise we will show you how GIS has been integrated with the Cloud and the Internet.

You will:

- Be introduced to ArcGIS Online (at www.ArcGIS.com) and 'The Cloud' concept.
- Retrieve geodata from the Living Atlas.
- Share and Communicate your 'story' using StoryMaps.
- Learn some basic functionalities of Google Earth Pro.
- Convert between geodata file formats.

Exercise

ArcGIS Online (AGOL)

ArcGIS Online was launched quite a long time ago, as the online version of ArcGIS Desktop/Pro.
That is, a way to use ArcGIS, without having to install the software onto your computer.
Instead, ArcGIS Online may be reached from any web browser, using 'lighter' hardware, like a tablet or a smartphone.

However, ArcGIS Online and ArcGIS Pro are not equivalent products (at least not yet).
Of the two, ArcGIS Pro is still the superior choice for capturing, editing and analysing geodata.
ArcGIS Online, on the other hand, is a great environment for producing apps and other products, which are directed towards an online community.

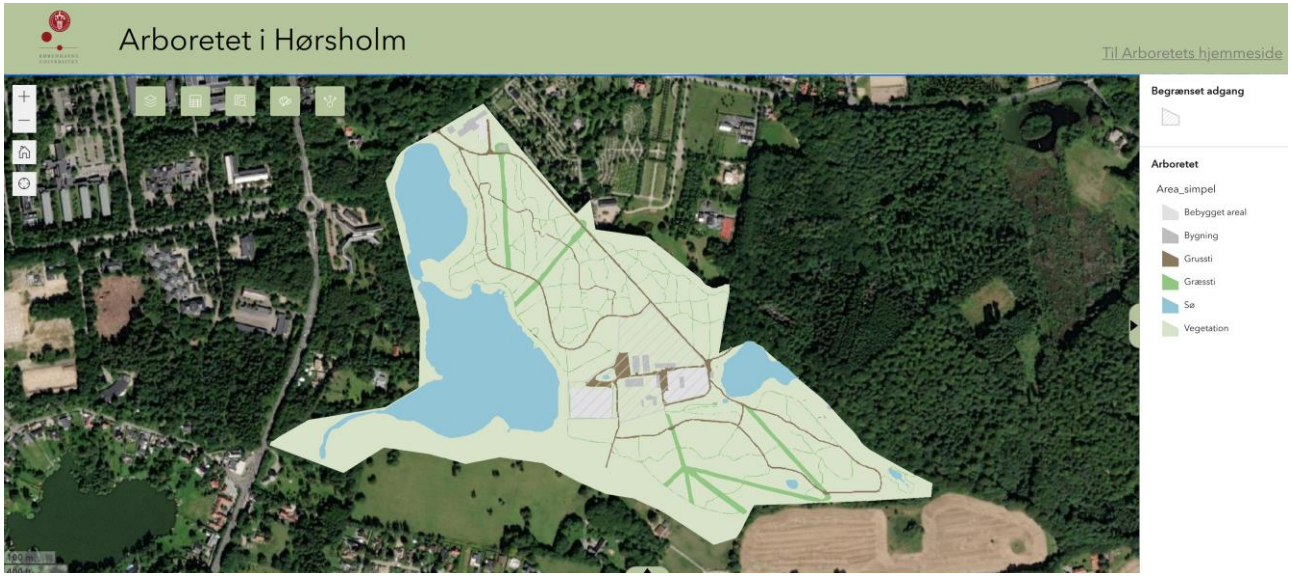


Fig. 1. The KU Arboretum web app. This is a service for visitors and the university staff, where they may search and find specific exotic tree species. The app may be visited from here. (You need to zoom in to view individual trees.)

Fortunately, there are no watertight compartments between the two environments any longer – it is far more easy to move geodata between them.
You may start your work in ArcGIS Pro and finish by producing a nice web map app in ArcGIS Online (Fig. 1).
We will look at this 'bridge' between ArcGIS Online and ArcGIS Pro in this exercise too.

It is also worth mentioning that ArcGIS Online lately have taken giant leaps in the direction of providing easy access to many valuable geodata assets, and some impressive analytical tools.
Some of them are not even available in ArcGIS Pro(!)
We will soon present one of those assets and analytical tools in this exercise.

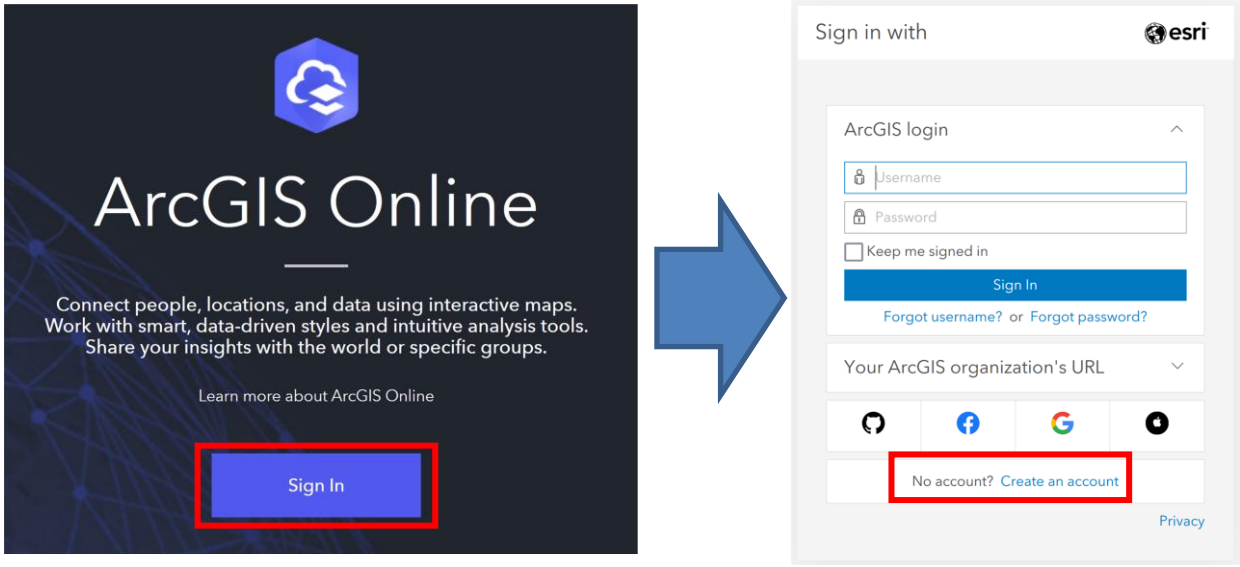
Exercise

ArcGIS Online registration

Sign In

But first, to gain access, you will need to become a user of ArcGIS Online.
There is a free 3-week trial license.

1. a) Go to https://www.arcgis.com ➔ Click Sign In.



Trial account

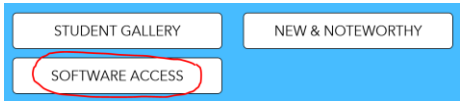
Student

Note!
The exact procedure may vary a bit, due to quite frequent changes.
The main thing is that you manage to get a free 3-week trial license.

b) In the Sign In window: Click the Create An Account link (at the bottom)

c) Next, click Create a trial account → ➔ Scroll down and shift to the 'Students' tab.

d) Then, click Sign up for the trial → ➔ Click the 'Software Access' option.



e) On the next webpage, fill out your name and E-mail. ➔ Choose 'Education' and 'Higher Education'

f) Finally, check the required checkboxes ➔ Click Submit

g) Check the E-mail inbox for an ESRI/ArcGIS mail with an activation link (Check also the Spam) ➔ Click the link.

h) Type a new password, and set up a security question ➔ Submit. Registration is finished and you´re ready to go!

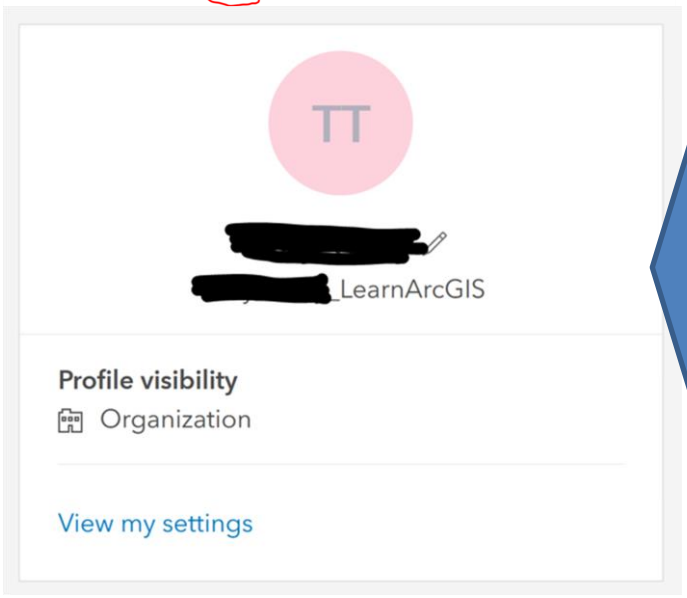
Exercise

Alternative A.
You will be guided automatically to the ArcGIS Online homepage. – All is fine. ☺

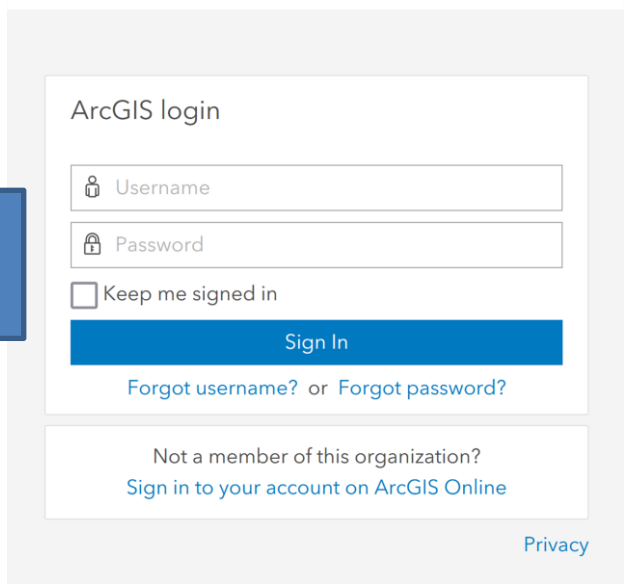
Log in

Alternative B.
If nothing happens, go to https://learngis2.maps.arcgis.com
➔ Log in using your new username (typically ends with *_LearnArcGIS*), and your new password.

A.



B.



Map Viewer

2. On the ArcGIS Online homepage, click Map (in the top menu).

Exercise

There are currently two versions of the Map Viewer in ArcGIS Online – a new one and the old, classic one. We are going to use the new Map Viewer.

Map Viewer vs. Map Viewer Classic

3. a) If the Map Viewer looks like in Figure 2a (image on top), everything is fine.

b) If the Map Viewer looks like in Figure 2b (image at bottom), you need to swap ➔ Click Open In Map Viewer.

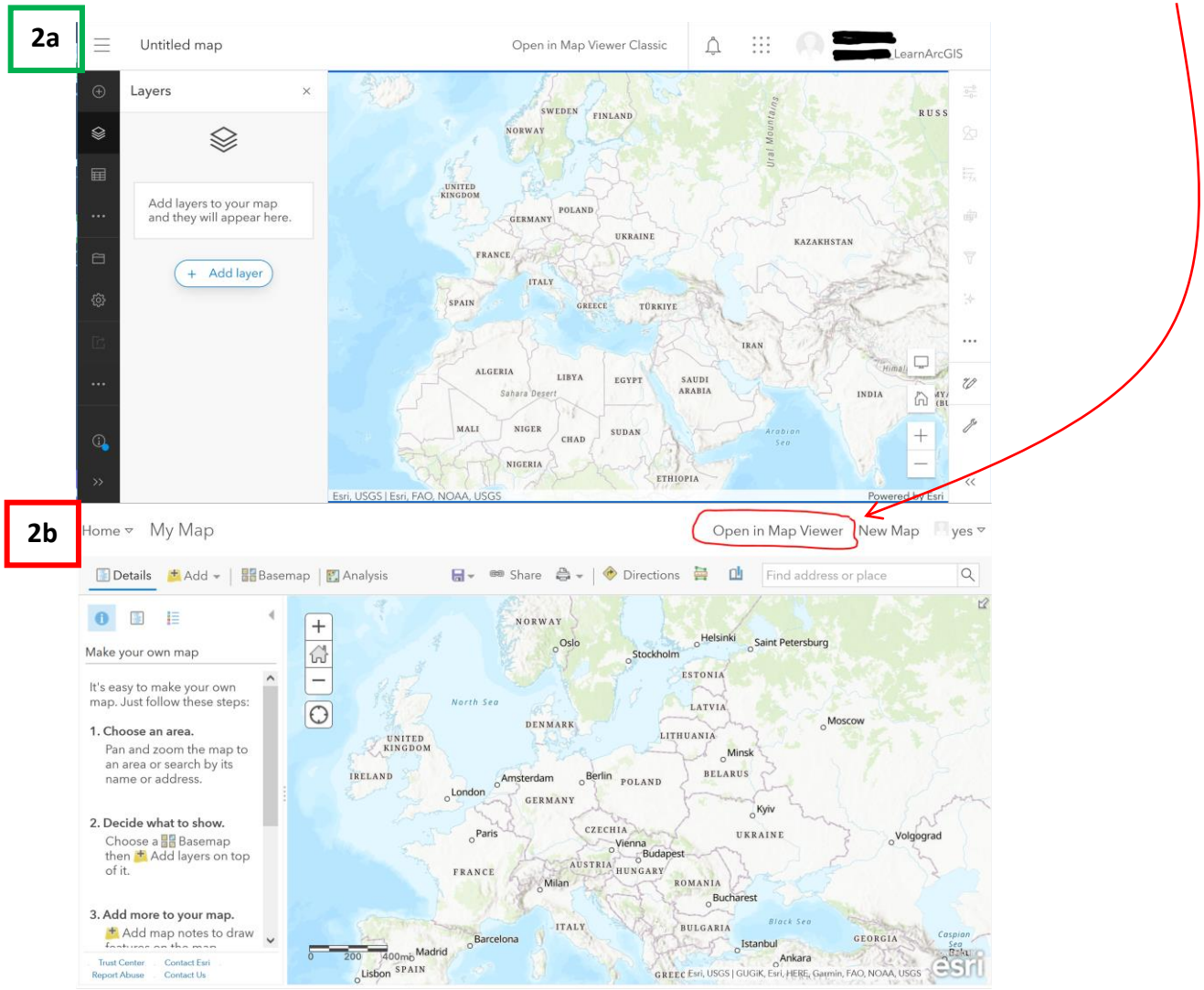


Fig. 2a) Map Viewer (top, the new version)
b) Map Viewer *Classic* (bottom, the old version)

Introduction

Before you head further into the functionalities of ArcGIS Online, we will present the Cloud concept.

'The Cloud'

The Cloud is a utility that provides:

- *computation*,
- *software*,
- *data access*, and
- *storage*

services to a remote end-user (Fig 3).

A remote end-user of 'The Cloud' could be an employee or a private person.
What the end-users have in common is that they do not require knowledge of the physical location and configuration of the system that delivers the services.

Up till now you have utilized a specific software (ArcGIS Pro) installed on the hard drive next to you.
You have been using geodata from a rather well-known GIS server also situated quite close to you, at the school.
You have also been saving the data you have generated on a server somewhere rather close, on the campus.

IT oracles mean that this geographically restricted setup has seen its heydays and that we need new solutions.
Clearly, one of the drawbacks with the current (old) setup is that each organization needs their own IT staff, which is managing the softwares, servers and the network.

With The Cloud setup, the computational tools of a software (*e.g.* ArcGIS Pro) would be accessed from the developer directly via the Internet.
The data you generate would be saved elsewhere too.
And, the actual data processing (*e.g.* an overlay operation) would not take place on the hard drive right beside you, or on any other known stationary place.
Instead, all the computing is 'in the cloud', shared by the communal processing power of a computational network.

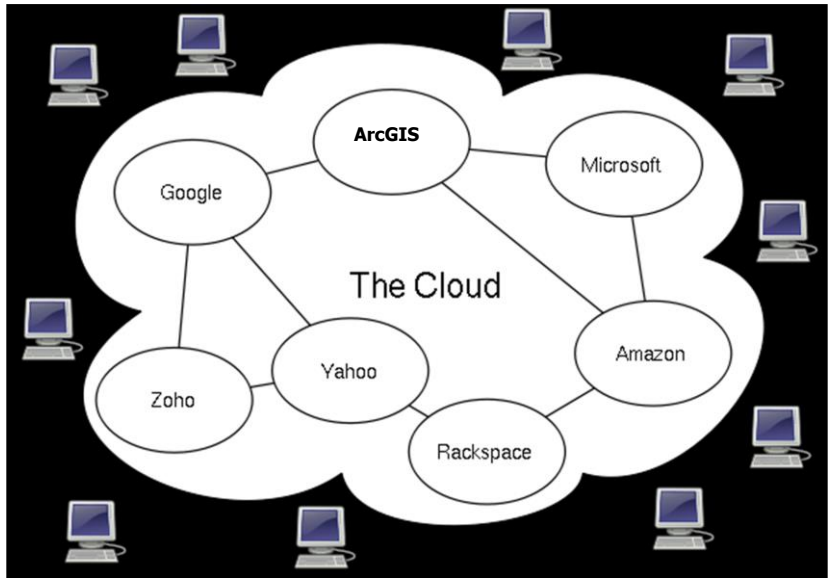


Fig. 3 A schematic representation of 'The Cloud'.

Cloud computing

Exercise

The Cloud is now a reality...

ArcGIS Online is a website and presents itself as 'Maps and Apps for everyone'.
It is also a component of what is popularly referred to as 'The Cloud'.
More specifically it is an integrated part of the 'Amazon Cloud'

ArcGIS Online/AGOL vs. ArcGIS Pro

You are going to be introduced to some of the utilities of the ArcGIS Online (AGOL) website.
Basically, you may do all the things you can do in ArcGIS Pro – from capturing, managing, analysing geodata to presenting the results.
So, why are you not learning ArcGIS Online instead of ArcGIS Pro, when AGOL is clearly the future of GIS?
The main reason is that AGOL is still a light version of ArcGIS Pro.
For example, in terms of the dexterity to capture geodata and analytical variety, AGOL is simply not there yet.

On the other hand, AGOL is really a amazing arena, where you may quickly display and share some remarkable phenomena in a stunning and straight-forward manner.

Bushfire

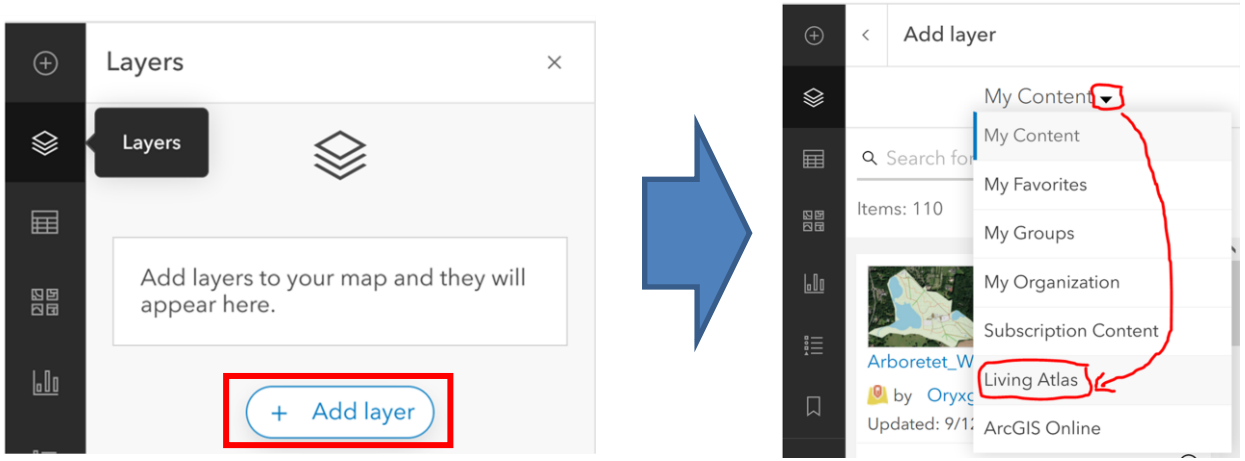
Remote sensing - Satellite imagery

In this exercise you will witness how bushfires may be detected and displayed using data from satellites.

Add Layer

4. a) In the Map Viewer, in the left panel, click Layers ➔ Add Layer.

b) Then, expand the Add Layer dropdown list ➔ Select Living Atlas.



Exercise

Living Atlas

MODIS
(= Moderate Resolution Imaging Spectroradiometer)

Living Atlas is a formidable resource providing geographic data layers, which you may use for your maps and apps. What´s so good about it, is that many layers may feed directly into your analysis – they are not just nice to view. Moreover, every data layer that enters the Living Atlas needs to be well documented, and metadata is readily available.

One of those curated data layers is based on analysis of satellite data from the MODIS instruments on board the Terra and Aqua satellites.

5. a) In the Add Layer pane, select Living Atlas among the dropdown options
   ➔ Type 'MODIS' in the Search For Layer field.

   Make sure the *Satellite (MODIS) Thermal Hotspots and Fire Activity* layer turns up among the options.

   b) Click the Add/Plus ＋ Add button in the lower right corner of the layer.

   The layer will now be added as the first layer to your Web Map.

   c) Click the Back (<) button in the Add Layer pane.

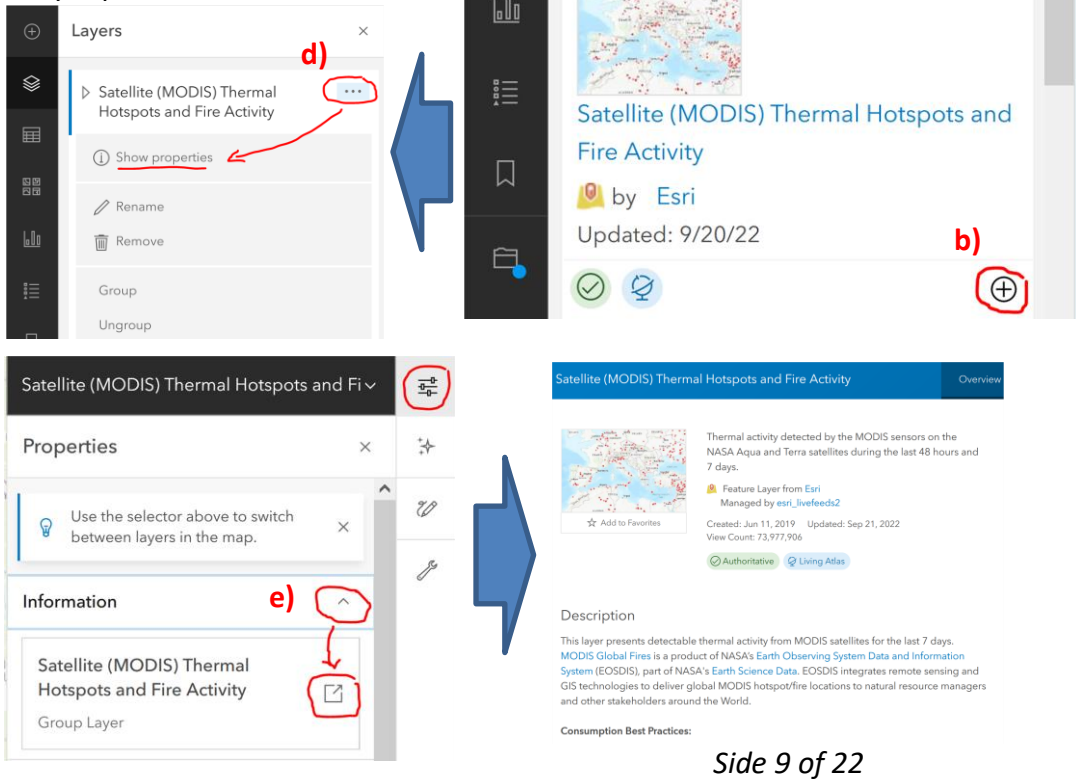
   Now, you will see the added layer in what would be equivalent to the Contents Pane in ArcGIS Pro.

   d) Click the Options (···) button
   ➔ Show Properties.

   In the right edge of the Map Viewer, the Properties Pane opens.

   e) Expand the Information section
   ➔Click the Open In New Tab

   A new webpage will open.
   This page contains not only details about the data, but also instructions on how to use the layer etc.



Exercise

Thermal activity

As the name of the layer says, *Satellite (MODIS) Thermal Hotspots and Fire Activity*, it points out locations around the Globe, where abnormal heating has been detected, by use of the imagery data captured by the satellite.
In the metadata you may read what kind of analysis they have conducted, the update frequency etc.

The thermal activity hotspots are displayed as points (Fig. 4),
which makes it easy for the user to see them on a World map.
You may need to pan to another area of the world to see any points.
(Remember, the southern hemisphere experience summer, as we have winter.)

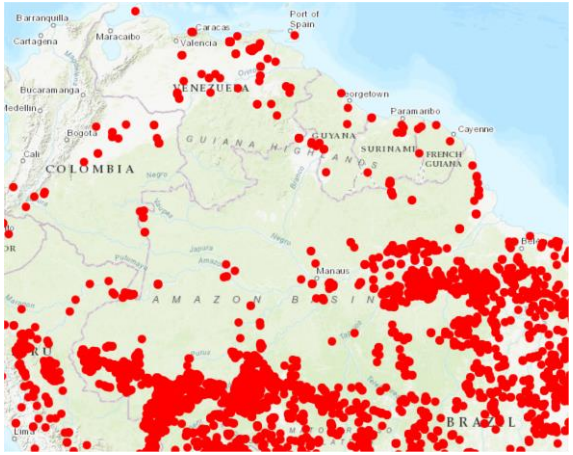


Fig. 4 Thermal hotspots i northern South America.

Save a Web Map

You will soon have a look at burning activity in more detail.
However, first you will save the current Map Viewer as a Web Map.

6. a) In the menu along the left edge, select Save And Open.

   b) Click Save As.

The Save Map dialog opens.

7. Fill out:

Title

   a) A Title

Tags

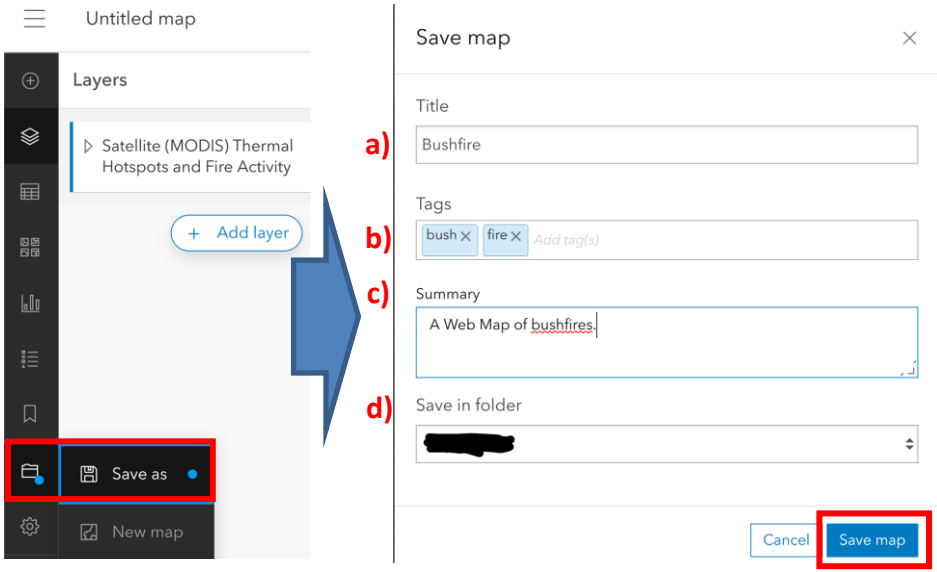
   b) Some Tags
      (Tags are used as keywords, if you would like to search for a Web Map later.)

Summary

   c) A Summary (describing your Web Map)

Folder

   d) Save In Folder
      (This is a folder in your ArcGIS Online account. At the moment you probably only have the default folder, but later you may create your own catalogue of project folders.)



8. Click Save Map.

Exercise

Web Map

Image analysis

Sentinel-2
obtains multi-spectral, multi-temporal global imagery from two satellites launched by the ESA (European Space Agency).
Every location of the Earth is revisited at least every 5 days at a resolution of 10m (at best).

A Web Map is much like an ArcGIS Pro project (*.aprx*).
The Web Map (project) will remember which layers you have added, and any symbology you have given them.
This means, once you open a saved Web Map, everything will look like last time you saved it.

Your next task is to do some image analysis on-the-fly.
With the help of some very user-friendly tools you will be able to study bushfires in more detail.

For this purpose you will add another astounding layer – the Sentinel-2 satellite imagery (Fig. 5).

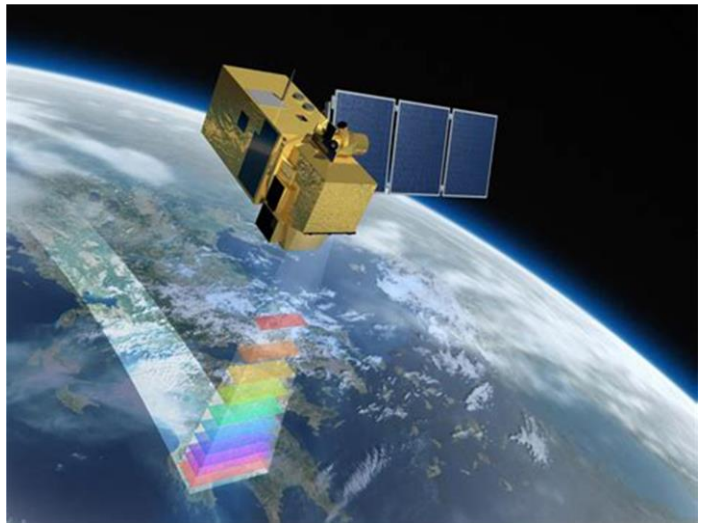


Fig. 5 The Copernicus Sentinel-2 mission satellite.

9. a) In the Add Layer pane, select Living Atlas in the list
➔ Type 'Sentinel-2 Views' in the Search For Layer field.

Make sure the *Sentinel-2 Views* layer turns up.

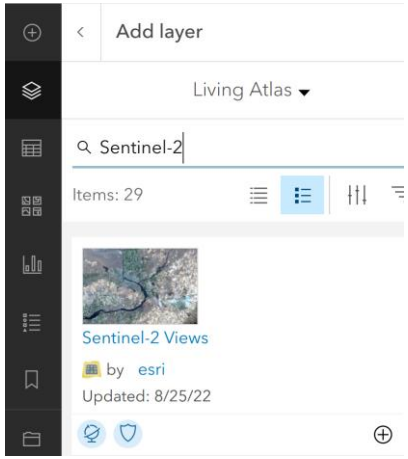
b) Click the Add/Plus ＋ Add button in the lower right corner of the layer.

The layer will now be added as the first layer to your Web Map.

c) Click the Back (<) button in the Add Layer pane.

Now, you will see the added layer in the Contents Pane.

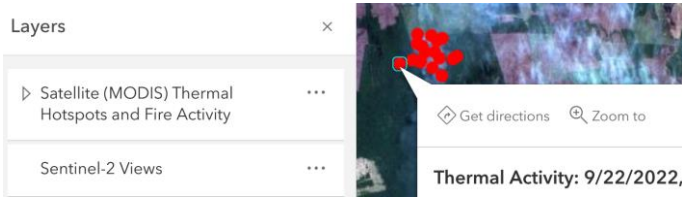
d) Once again, you may click the Options (•••) button
➔ Show Properties (and you will be able to get more layer info).



10. a) Drag-and-drop the MODIS layer, so that it is positioned above the Sentinel-2 layer in the Contents Pane.

b) That way, you may locate and zoom in to an area where there is a cluster of thermal activity (red) points in a nature environment.

c) When you click on a point, you will get a popup with the date.



Exercise

When you add the Sentinel-2, it will always show the most recent captured images.

Natural colour imagery

11. a) As you zoom in on the red points you may suspect that there is some thermal activity going on.
For example, there might be visible smoke in the imagery.

However, sometimes it may be difficult to tell the difference between smoke and ordinary clouds (Fig. 6a).
One way to make sure, is to make use of one of the analytical outputs, which is inherent to the Sentinel-2 layer.

Short-wave infrared imagery

DRA = Dynamic Range Adjustment

b) Along the right edge of the Map Viewer, select Processing Templates.
➔ Scroll down and click Short-wave Infrared With DRA (Fig. 6b), instead of the Natural Color template.

With this template, the fire is now very obvious, and you may even tell in which direction it is moving.

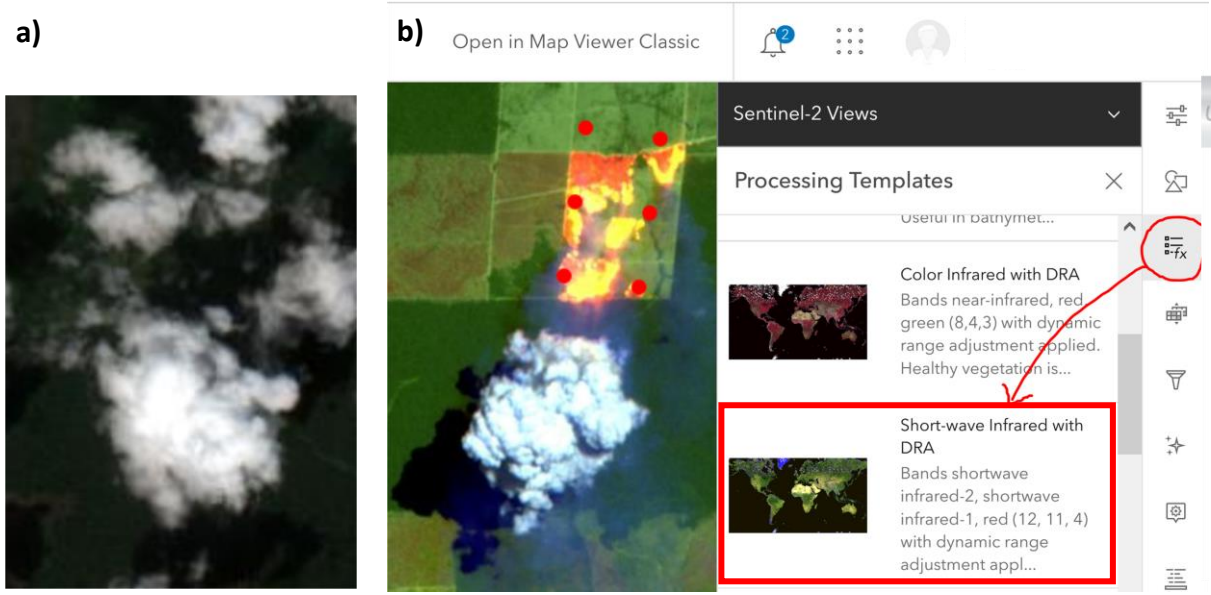


Fig. 6a) Natural colour imagery over the Amazonas from the Copernicus Sentinel-2 mission satellite.
b) Short-wave infrared imagery representing the same area.

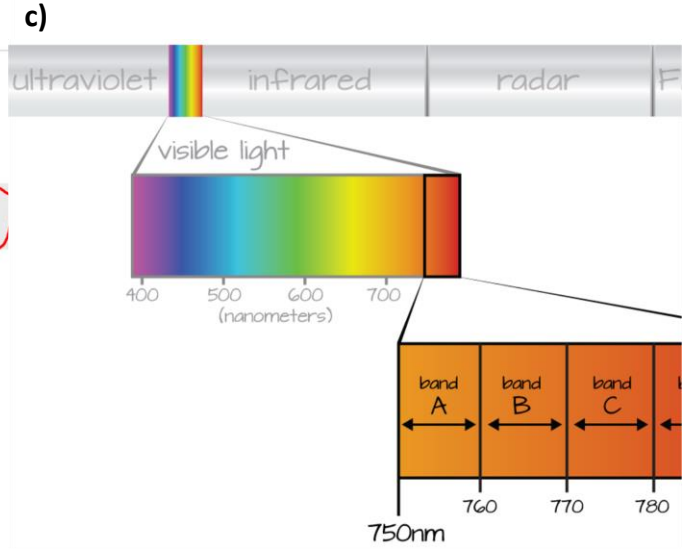


Fig. 6c) A part of the Electromagnetic Spectrum.
Examples of a few bands (10nm) within the wavelengths of the visible light spectrum.

What is a Processing Template?

Electromagnetic Spectrum

Band

Imagery analysis

Imagery from the Sentinel-2 sensors capture a wide range of wavelengths from the Electromagnetic Spectrum (Fig. 6c).
A band represents a segment of the electromagnetic spectrum. You can think of it as one 'type' of light (*e.g.* red, blue).
By combining certain bands you may detect certain phenomena on the surface of the Earth or in the atmosphere.
For example, one combination may help you identifying what is natural vegetation, another one what is water etc.

Exercise

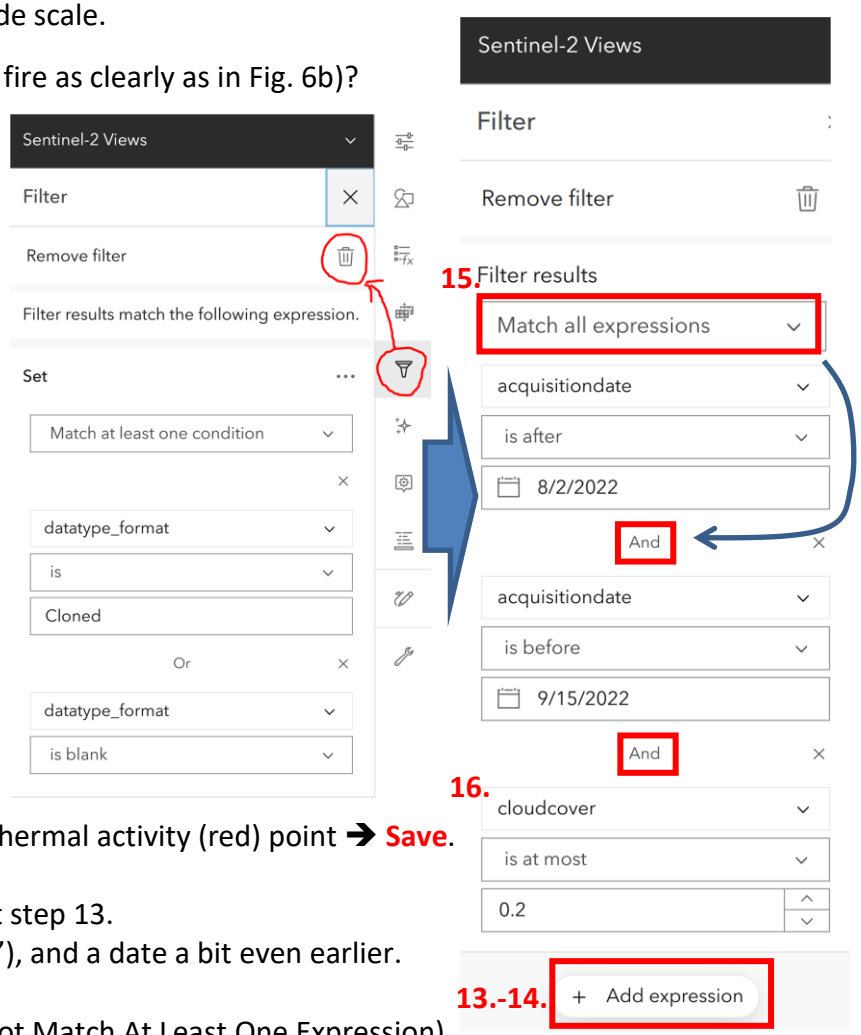
Global monitoring

Workaround

As you may realize, this is a formidable tool to detect and document suspected illegal burning, not only on a local level, or regionally in the Amazonian rainforest, but on a worldwide scale.

Does the Sentinel-2 imagery in your Map Viewer not present fire as clearly as in Fig. 6b)?

The reason may be that there is no on-going fire any longer (Recall that the latest images are shown automatically).
Another cool feature of the layer is that you may select a time interval for the presented images.
So, perhaps you may visualize the fires better by using images from a couple of days ago.



12. a) Along the right edge of the Map Viewer, select Filter.

    b) If available, click the dustbin icon (Remove Filter). This will remove any default filter.

13. a) Click the Add Expression button.

    The expressions are built in an SQL manner:

    b) In the top dropdown list, select 'acquisitiondate'.

    c) In the mid dropdown list, select 'is before'.

    d) Finally, select a date a couple of days earlier than the thermal activity (red) point ➔ **Save**.

Acquisition date
(= date of image capture)

Trouble-shooting ➔ ➔ ➔
If the Sentinel-2 Level-2A layer disappears, you may need to wait a while for it to appear.
If the delay is too long, just skip and go to step 17.

14. To create a more narrow time interval, you should repeat step 13.
    This time, you would select 'is after' (instead of 'is before'), and a date a bit even earlier.

15. At the top, make sure it says Match **All** Expressions (*i.e.* not Match At Least One Expression).
    This way all the SQL statement will be set to 'AND' (instead of 'OR').

16. Finally, add another expression so that relatively cloud-free images are displayed.

    In this example, the entire expression is:

    SELECT the images acquired AFTER 2. August AND BEFORE 15. Sept. AND where the cloud cover was LESS THAN 0.2.

Cloud cover
(0.2 means 20%)

Exercise

Remote Sensing

Image Classification

Object-Based Image Analysis

As illustrated above, imagery obtained by remote sensing may be used for analysis, monitoring and planning.
Another common application is refinement of the data capture product (*e.g.* satellite or aerial imagery).
The imagery is initially rather 'dumb' – It takes your brain to interpret that for example green pixels may be vegetation.
Using Image Classification you may assign individual pixels as vegetation, urban, water etc.

Even better, Object-Based Image Analysis is an automated technique where pixels are grouped together, based on:

- spectral,
- geometrical, and
- spatial properties.

These groups of pixels may then be transformed into vector objects, like polygons of buildings, lakes, forests, roads, rocky terrain and other typical land use/land cover classes (Fig. 7).

As you realize, this is a technique, which may save you a lot of time, that you else would have spent on manual digitizing.

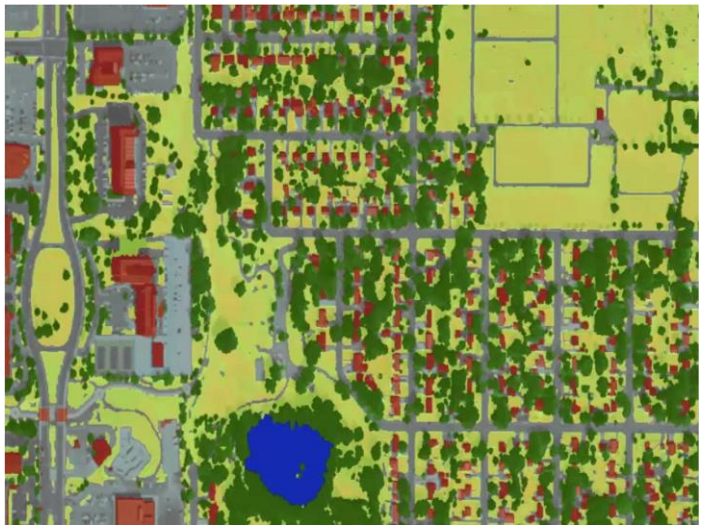


Fig. 7 The output of Object-Based Image Analysis. You may extract various land cover features, like roads, buildings, lakes and forests etc. from imagery.

Before leaving ArcGIS Online, you will have a brief introduction to the Living Atlas as a source of geodata.

AGOL ↔ ArcGIS Pro

And soon enough, how you may open those geodata in ArcGIS Pro.

17. a) In the Contents Pane, click the Add Layer button 

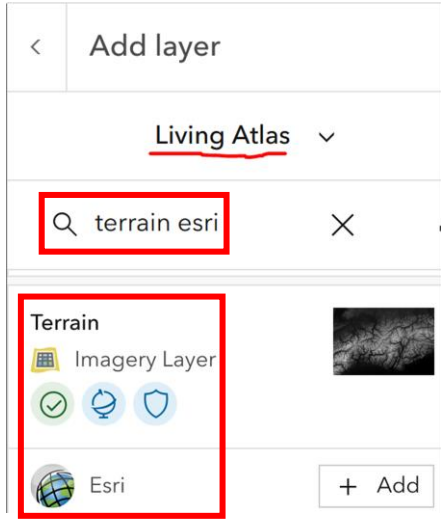
Terrain

b) In the Add Layer Pane, select Living Atlas in the list
➔ Type 'terrain' and 'esri' in the Search For Layer field.

Make sure the *Terrain* layer by ESRI turns up.

c) Use your skills to add this layer, and to view the layer among the other layers in your stack in the Contents Pane.

Do not worry if the Map Viewer window is all black.
(If you zoom out you will discern some shades of gray too).



Exercise

18. Use your skill to Save the Web Map.

Next, you will take a look at what your AGOL user catalogue looks like.

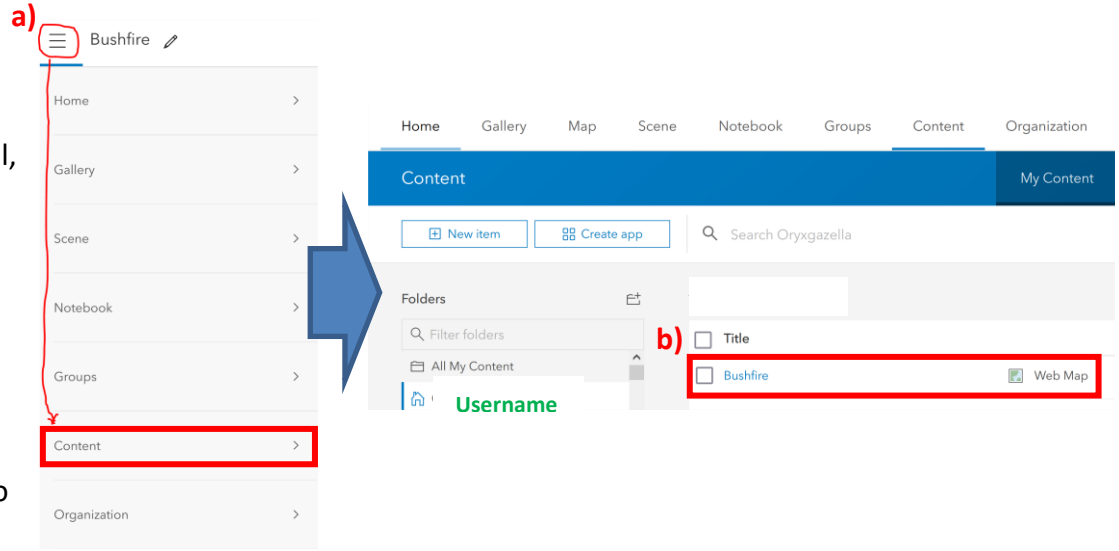
Content

19. a) In the top left corner, click the button with the 3 horizontal lines ☰ ➔ Content.

You will be guided to your AGOL user catalogue, where you will find only one item this far – your saved Web Map.

b) Click the title of the your Web Map, and you will be moved to the page of the Web Map with information about date of creation, a thumbnail, among other things.

c) If you click the Open In Map Viewer button, Open in Map Viewer you will be guided back to the Map Viewer window again.



In the next steps you will learn how you may open your Web Map in ArcGIS Pro and make use of your layers there.

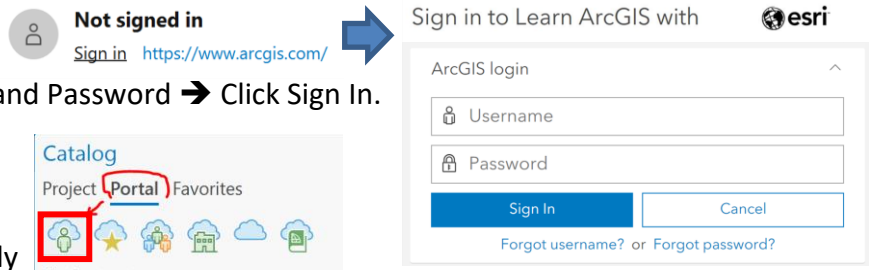
AGOL ↔ ArcGIS Pro

20. Start ArcGIS Pro ➔ Create a new Map/Project.

In order to make a 'bridge' between your ArcGIS Pro project and your AGOL resources, you need to sign in to your ArcGIS Online account.

Sign In

21. a) In the top right corner of ArcGIS Pro, click Sign In.



b) In the Sign In window, fill out your AGOL Username and Password ➔ Click Sign In.

Portal tab

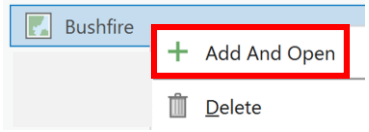
My Content

22. In the Catalog Pane, select the Portal tab (*i.e.* mid tab) ➔ Then click the leftmost button called My Content.

This corresponds to Content in AGOL, and since you only have one piece of content, your Web Map turns up.

Exercise

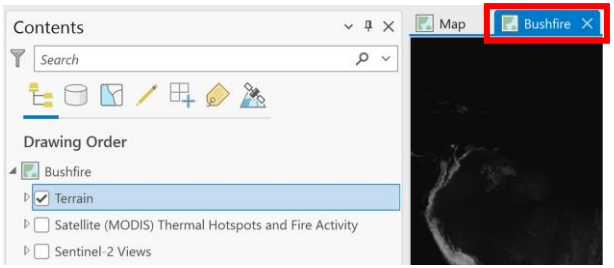
(*cont.*)



Now, you will open the Web Map in ArcGIS Pro:

23. In Catalog Pane, R-click the Web Map ➔ Click Add And Open.

The AGOL Web Map will open as a separate Map View in ArcGIS Pro. All the layers from the Web Map are visible in the Contents Pane.



Let´s say you are interested in some elevation data from a particular location in the world. The fastest way to retrieve those geodata and to store them in your own project geodatabase (*.gdb*) is to:

Note! ➔ ➔ ➔ ➔ ➔ ➔ ➔
Focus on a small area.
The layer is currently restricted to a 5,000 x 5,000 pixel limit in a single request.
Consequently, a download of approx. ***1 x 1km*** *is allowed at the default Cell Size.*

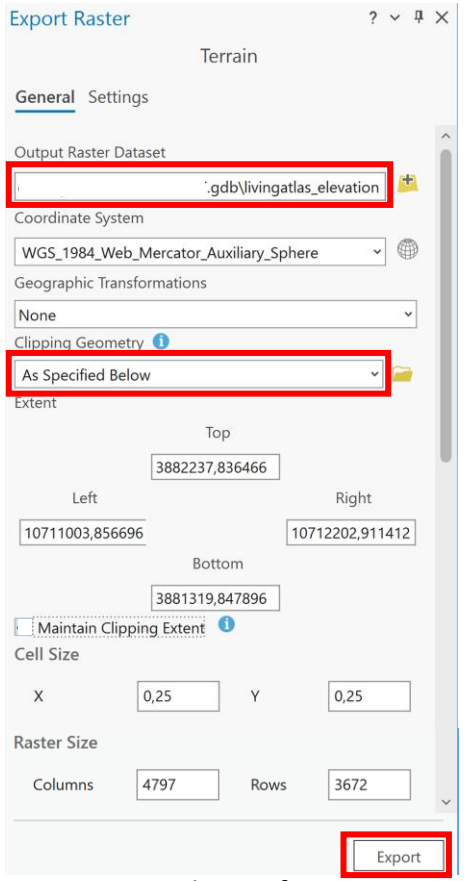
24. a) Zoom in to that area in the Map View.

b) R-click the Terrain raster layer ➔ Data ➔ Export Raster.

In the Geoprocessing Pane (far right edge), the Export Raster tool is displayed:

- Output Raster Dataset: Type a name (and save it in your project *.gdb*)

- Clipping Geometry: Select Current Display Extent
(It may automatically change to As Specified Below.)
(This corresponds to what you see in the Map View,
and will ensure that you export only the current Map View extent
so that you do not happen to export the dataset of the entire world). ☺



Export Raster

c) Click the Export button (at the bottom of the Export Raster tool).

The export process will start, and after a while the downloaded extent will display as a new layer at the top of the stack in the Contents Pane.

Now, with this geodata stored in your own geodatabase, you have the complete freedom to manipulate it as you wish in ArcGIS Pro. For example, you may use the:

- Contour tool (to create contour lines/'højdekurver'), or the

- Hillshade tool (which will help the visual interpretation of the terrain)

Contour lines

Hillshade

You may check out those tools at your own free will.

Exercise

Display

'Display' is the final step of the GIS definition postulated by Peter Burrough in 1986.
For natural reasons, the main output of GIS has been maps in both analog and digital format – often supplemented by tables, figures and graphs.
The traditional media of such maps have been books, scientific papers, reports and posters (Fig. 8).

However, nowadays the possibilities are so much wider, thanks to the rapid digital development.
With the help of digital media, you may paint a whole different narrative.
And, that is exactly what you are going to do – Tell your own story.

StoryMaps

To your aid, is a rather new web-based application, called StoryMaps.

With this tool, you may use your saved Web Map (or Web Map App) and build a 'weave' of text and other multimedia content around it.
Moreover, unlike traditional media, there are so many more options to engage the user by adding interactive elements.

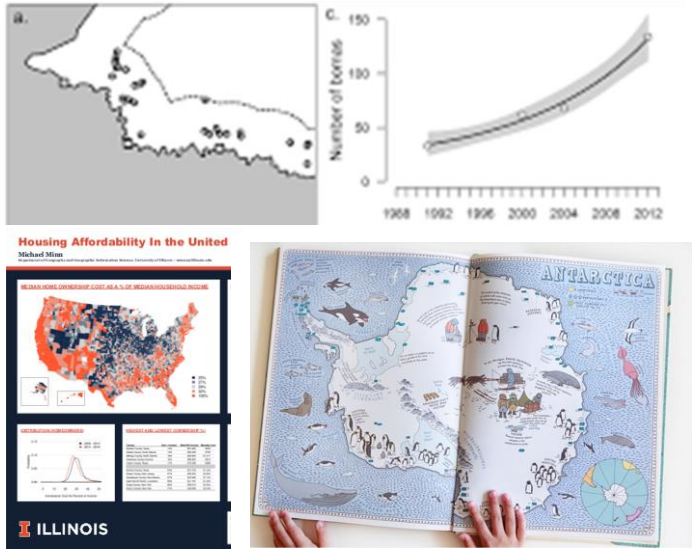


Fig. 8 Maps as output in scientific papers, posters and books.

Intro to ArcGIS StoryMaps

25. Check out this Introduction to StoryMaps.
(Note that the presentation itself was made in StoryMaps. 😊)

26. a) To start StoryMaps, go to: https://storymaps.arcgis.com/

b) Log in to ArcGIS StoryMaps using the ArcGIS Online/AGOL credentials you acquired earlier in this exercise.

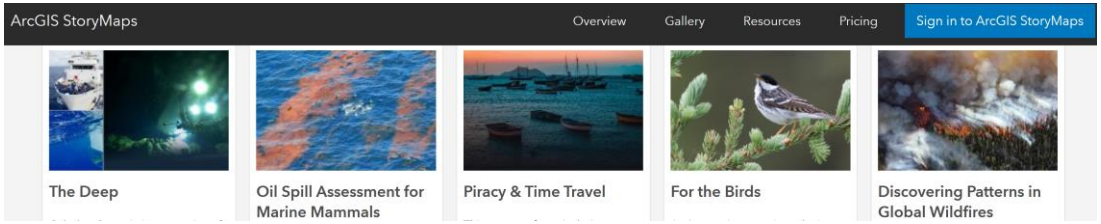
In the left panel you will see some resources and ways to get inspiration from other storytellers.

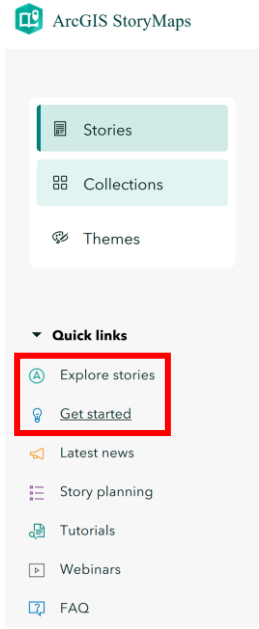
Explore stories

c) If you click Explore Stories, you will be presented to published StoryMaps from all over the world.

Get started

d) Click Get Started and you will be introduced to a 7-step guide to make and publish a StoryMap.





Exercise

There are even more instruction videos on YouTube.

StoryMaps in this Exercise

Obviously, there is so much you can do in StoryMaps – it´s really a fun and creative process.
The purpose, here and now, though, is not to make you a story-telling expert, but to give you an introduction.
Therefore, we will ask you to make a simple StoryMap, based for example on the 'bushfire' Web Map you saved earlier.
(You may of course use another Web Map if you like, or some material from the Living Atlas, or…)

StoryMaps in the Project

To make it clear, the requirements of this submission are set low. As explained, you may submit a very simple StoryMap
However, we advise you to return to the StoryMap resources in your free time, because later, the output of the Project may be submitted as another a StoryMap. Then, your Project StoryMap will undergo closer scrutiny by the teachers, so naturally, it will be advantageous if you do not enter your Project phase completely unprepared.

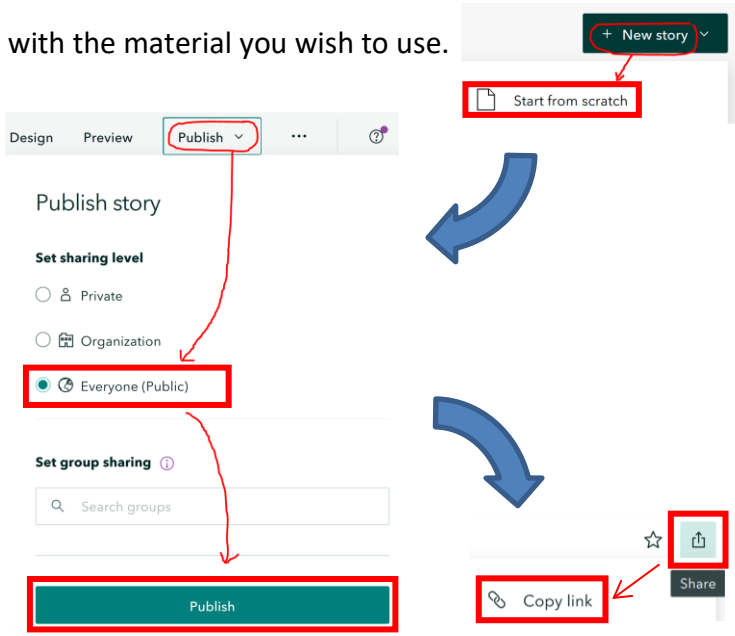
27. a) Click New Story and make a StoryMap of your own From Scratch, with the material you wish to use.

b) When you are done, click Publish to publish the StoryMap.
➔ Select **Everyone (Public)** (This is important!!!)
➔ Click the Publish button.

Share with Everyone (Public)

28. On the following webpage, click the Share button
➔ Select Copy Link.

29. Try out the copied link in a new tab in your web browser, to make sure that the link works and your StoryMap is OK.



Submission

30. a) Open a Word document and paste the link there.

b) Write a short description (a few sentences) of your StoryMap.

c) Submit the document on Absalon.

It´s not over yet!

Before we end this exercise, you will be presented to another GIS application – Google Earth.

Exercise

Google Earth

Google Earth was launched in the mid 00´s.

It has found widespread use all over the world, much thanks to:

- The user-friendly interface.

  With a few mouse clicks you may:

  - Make a stunning aerial journey across the globe, and in history.
  - Digitize your own feature geodata (points, lines or polygons).

- The detailed database.
  You may for example search by:

  - Coordinates
  - Addresses
  - Named locations, and even
  - Physical structures/buildings

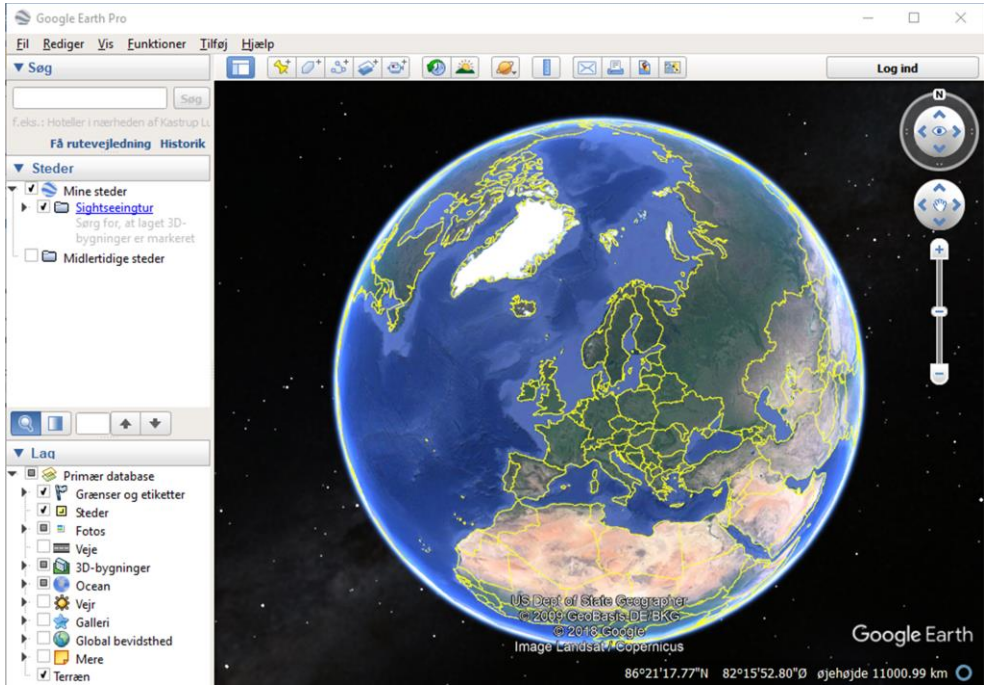


Fig. 9 Google Earth Pro

People's curiosity adds to its popularity.
There are so many peculiarities in the world, and just anyone may discover them.
But, first you will learn the digitizing function.

31. Double-click the Google Earth Pro shortcut on the desktop
    (alt. START ➔ All Programs ➔ Google Earth Pro).

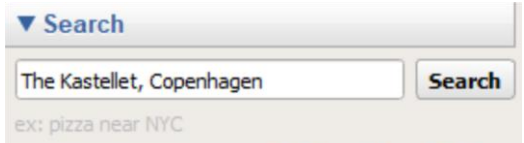
    Google Earth Pro starts (Fig. 9).

Search

32. In the search field (upper left corner), type 'The Kastellet, Copenhagen'.
    ➔ Click the Search button (Fig. 10a).

    You are automatically zoomed in to the Kastellet in Copenhagen (Fig. 10b).

a)



b)

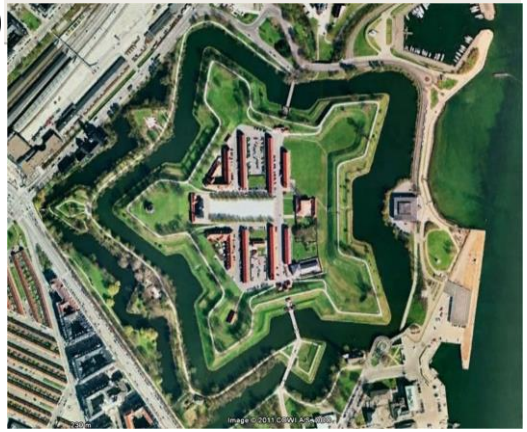


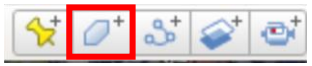
Fig. 10 The Kastellet in Copenhagen.

Exercise

Digitizing

Google Earth Pro has feature digitizing functionalities. You may digitize points, lines or polygons.

33. a) In the top menu, locate and click the Add Polygon tool button.



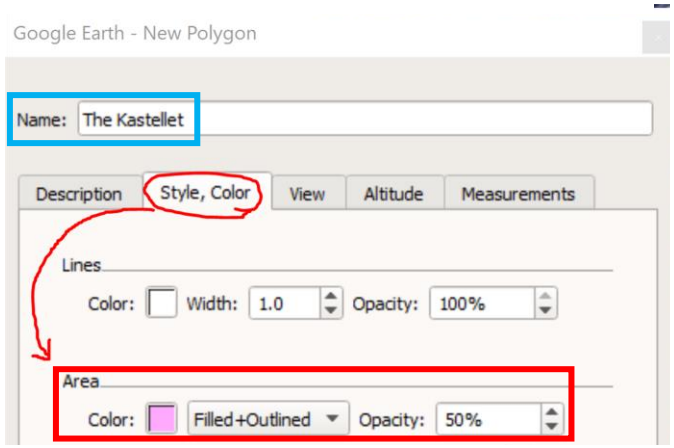
The New Polygon tool window opens.

b) In the Name field: Type a name.

c) Select the Style, Color tab ➔ In the Area section:

- Color: Select a non-white colour.
- Select Filled-Outlined.
- Opacity: Change to 50%

This way, you will draw a semi-transparent polygon, which will make it easier for you to complete the drawing.



34. a) Do NOT close the New Polygon tool window! (You may only digitize, when this window is open.)

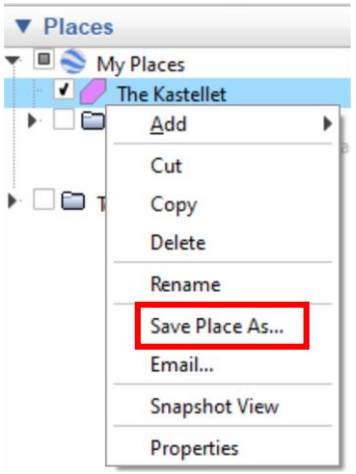
Tip! ➔ ➔ ➔ ➔ ➔ ➔ ➔
Untick the 3D Buildings layer, if the buildings are blocking the view of the coastline.

b) Start digitizing The Kastellet island (Fig. 11).

c) When you are done digitizing, click OK.

You will now save the feature as a physical file.

d) In the Places Pane (along the left edge), R-click the Kastellet feature ➔ Save Place As.



e) In the Save File window:

- Navigate to a folder of your own.
- Type a name of the file.
- You may select either of the formats presented – *.kmz* or *.kml*. (Both file formats may be added to ArcGIS Pro.)

Google Earth Pro geodata file formats:

- *.kml*
- *.kmz*

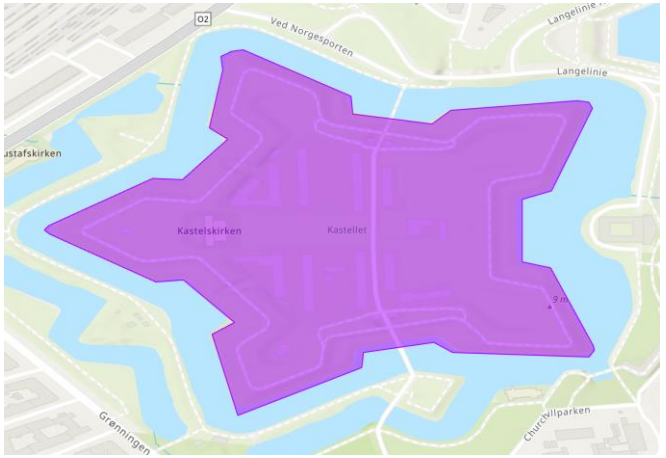
The .kmz is a compressed .kml file.

Exercise

Geodata may come in a wide variety of file formats.
Although you are most often likely to encounter a few common types, you always need to be prepared for new ones.
Fortunately, ArcGIS Pro have ways to handle a vast majority of them.

Geodata conversion

However, it is often a good procedure to convert the geodata into a file format you are well acquainted with, so that you may judge the quality of them, and make the necessary edits/adjustments, if needed.



35. a) Start a new ArcGIS Pro project.

b) Add the *.kml/.kmz* file you generated in Google Earth Pro to the Map View.

The polygon may look a bit skewed.
The reason is that geodata generated in Google Earth Pro are stored in the WGS 1984 coordinate system by default.

You are now going to convert the added *.kml/.kmz* layer into an ArcGIS feature class.

KML To Layer

36. a) In the Geoprocessing pane: Find and open the KML To Layer tool:

- Input KML File: Select the *.kml/.kmz* file from the Contents pane.
- Output Location: Will automatically be assigned as your Project folder.
- Output Data Name: Type a name.

b) Click Run to execute the conversion operation.

The main outputs of this geoprocessing operation are two things:

i) A new geodatabase (*.gdb*) will be created (Same name as the *.kml/.kmz* file).

ii) Inside the geodatabase is a new feature class.
(It is a copy of the *.kml/.kmz* file, and was also added to the Contents Pane automatically.)

Exercise

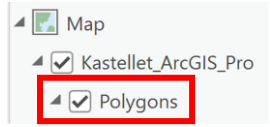
Transformation of coordinate system

Export Features (=Make a geodata copy)

Use your skills

Unfortunately, the new feature class is still set in the *WGS 1984* coordinate system.
We need to generate yet another copy, and set this one in the *ETRS 1989 UTM Zone 32N* projected coordinate system.

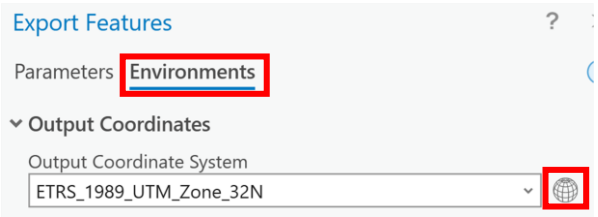
37. a) In the Contents Pane, expand the newly added layer:
Right-click 'Polygons' ➔ Data ➔ Export Features.



The Export Features tool dialog opens:

b) Output Feature Class: Choose a new name and a location for this copy.

c) Click the Environments tab.
Output Coordinate System: Browse and select *ETRS 1989 UTM Zone 32N*.



d) Click OK to execute the operation.

38. Use your skills to check the Properties of the feature class copy.

What you are most interested in, is that the projection is set to ***ETRS89 utm 32N***, not the *WGS84* coordinate system.

Important! Make sure your feature class is alright. You will be using it in a subsequent exercise.

You have now finished the compulsory part of this exercise. –Congratulations. ☺

It´s a wonderful world…

Earlier, we introduced Google Earth Pro as an application for stunning aerial journeys around the world, and in history.

If you like, you are welcome to come along on a trip across our fantastic globe, using this guide.

Thanks for your attention!

A quite remarkable landmark, seen from the sky.