

Access Geodata from the Web

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1 Exercises overview

- Exercise 1 - Download DEM and analyse terrain surface height values.
- Exercise 2 - Download and style multi-temporal rainfall rasters.
- Exercise 3 - Find new human settlements using lights visible from space.
- Exercise 4 - Styling a raster from color look-up tables.

The following handout gives instructions on how to access and download geospatial data from the web with different means:

1. Downloading data in your computer
2. Web Services WMS¹ / WFS / TMS
3. OpenStreetmap Data²

The objective is to be able to hunt for geospatial data for your future projects, including the project required for passing the exam.

Downloading geospatial data from web providers

¹Check tutorial *Working with WMS Data*

²Check tutorial *Searching and Downloading OpenStreetMap Data*

An internet portal that provides several geospatial datasets for downloading is usually called a “Catalogue”. Finding catalogues can be as easy as search using a search engine (e.g. Google), but sometimes require further investigation. In the next session some examples of web portals providing geospatial data with global, national and regional scales.

2 Global Datasets

2.1 GENERAL COLLECTIONS

2.1.1 Natural Earth Data

Free vector and raster map data at 1:10m, 1:50m, and 1:110m scales

<https://www.naturalearthdata.com/>

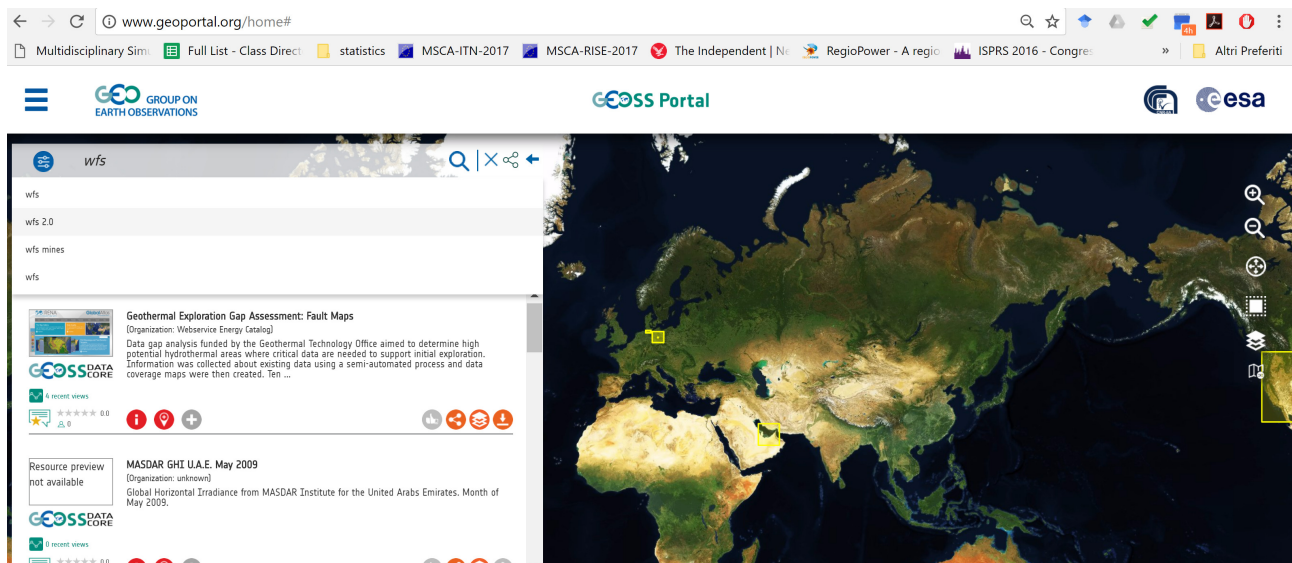
2.1.2 Essential Climate Variables

GCOS Essential Climate Variables (ECV) Data Access Matrix

<https://www.ncdc.noaa.gov/gosic/gcos-essential-climate-variable-ecv-data-access-matrix/>

2.1.3 GEOSS portal

<http://www.geoportal.org/> Geoportal allows to search for both downloads and W(FCM)S services (see section “Online web mapping services WMS / WCS / WFS”)



There are many options for filtering data. Not all data links are “live”, some links do not work, so it requires some searching for data.

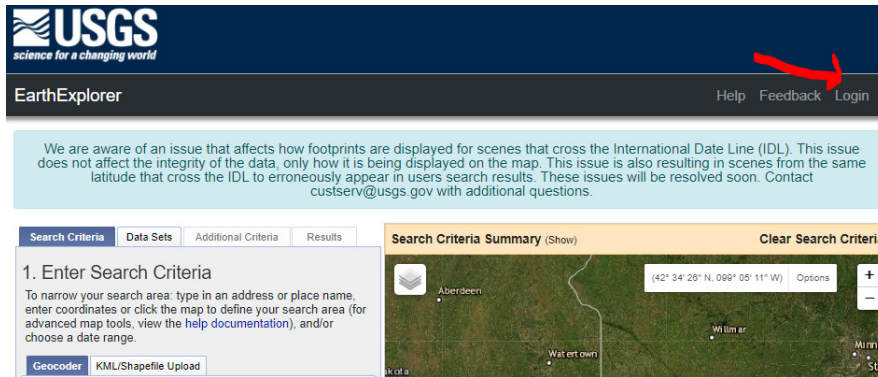
2.1.4 USGS: EarthExplorer

USGS EarthExplorer <https://earthexplorer.usgs.gov/> provides **raster** data from satellite and airborne missions. Some missions provide a raster of **height values** (**DEM** - digital elevation model). In the following

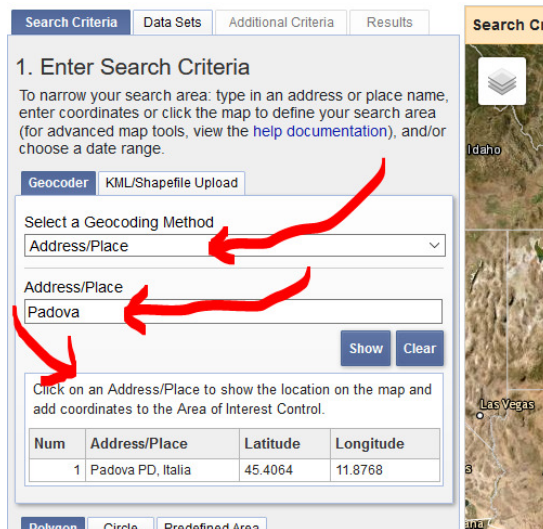
tutorial we will learn how to download a digital surface model (**DSM**) from the SRTM which differs from a digital terrain model (**DTM**) as the DSM values include heights of buildings and trees, whereas the DTM values are of the bare terrain.

In the following exercise we will learn how to get two DSM rasters from two different sensors,

1. Create a user profile by registering from <https://earthexplorer.usgs.gov/>



2. After registration proceed to login <https://earthexplorer.usgs.gov/> with your registration credentials (username and password) by clicking “login” (see image above)



3. Polygon Circle Predefined Area

Identify your area in the map. There are several ways to do this:

- a. Search by address / place (e.g. select “AddressPlace” and select Padova like the image on the right)
NB this is available only if you are logged in!
- b. Click the map directly to create a polygon or a point defining your area of interest like in the image below. You can **remove polygon points** on the table that appears or you can drag the points with the mouse to change the area.

We are aware of an issue that affects how footprints are displayed for scenes that cross the International Date Line (IDL). This issue does not affect the integrity of the data, only how it is being displayed on the map. This issue is also resulting in scenes from the same latitude that cross the IDL to erroneously appear in users search results. These issues will be resolved soon. Contact custserv@usgs.gov with additional questions.

Search Criteria Data Sets Additional Criteria Results

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Geocoder KML/Shapfile Upload

Select a Geocoding Method

Address/Place

Show Clear

Polygon Circle Predefined Area

Degree/Minute/Second Decimal

1. Lat: 45° 23' 12" N, Lon: 011° 48' 27" E

2. Lat: 45° 30' 50" N, Lon: 011° 49' 46" E

3. Lat: 45° 30' 57" N, Lon: 012° 01' 48" E

4. Lat: 45° 23' 33" N, Lon: 011° 59' 09" E

Search Criteria Summary (Show) Clear Search Criteria

- At the bottom of the page, click on “**datasets**” (in some cases you can choose to select a certain time window – that’s in case of multitemporal datasets)

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Address/Place Path/Row Feature Circle

Show Clear

Coordinates Predefined Area Shapefile KML

Degree/Minute/Second Decimal

1. Lat: 46° 11' 39" N, Lon: 011° 35' 10" E

2. Lat: 46° 13' 28" N, Lon: 012° 10' 06" E

3. Lat: 46° 35' 17" N, Lon: 012° 10' 45" E

4. Lat: 46° 34' 50" N, Lon: 011° 30' 33" E

Use Map Add Coordinate Clear Coordinates

Date Range Result Options

Search from: mm/dd/yyyy to: mm/dd/yyyy

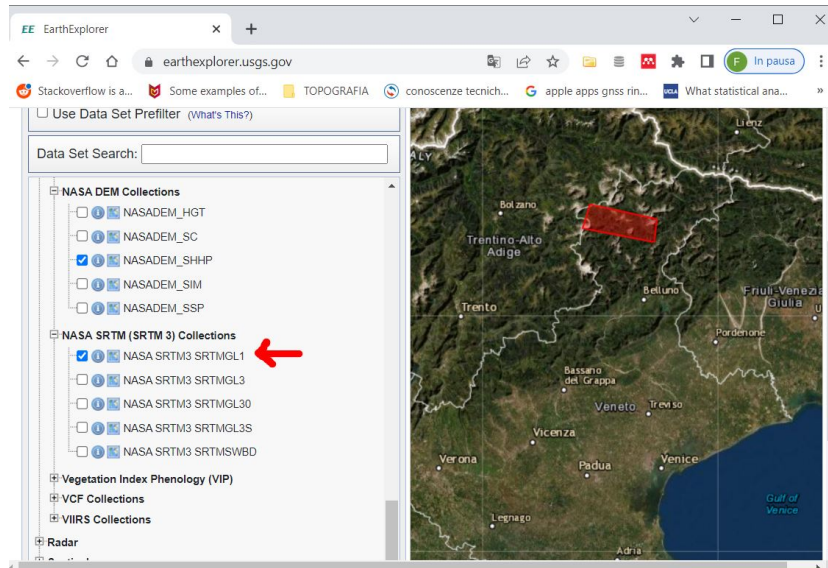
Search months: (all)

Data Sets » Additional Criteria » Results »

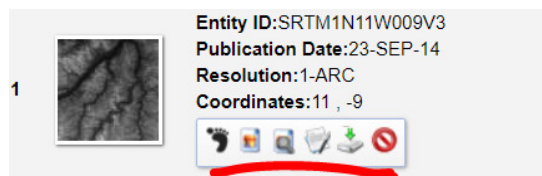
Search Criteria Summary (Show)

Map Satellite

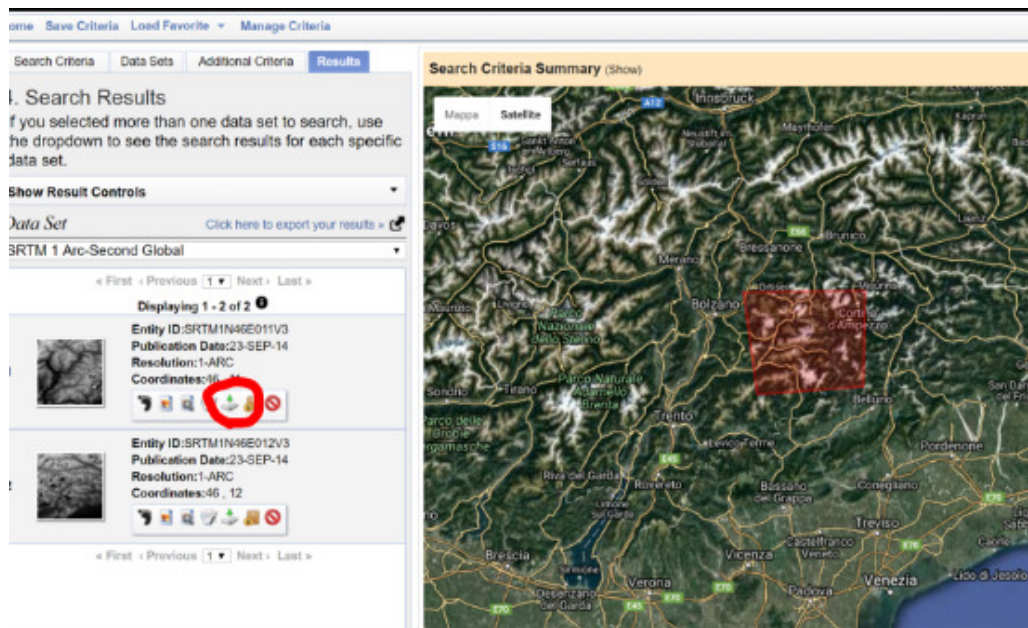
5. In the input space of “Data Sets Search” type “**SRTM**” – you will see the product that you can select by clicking the checkbox



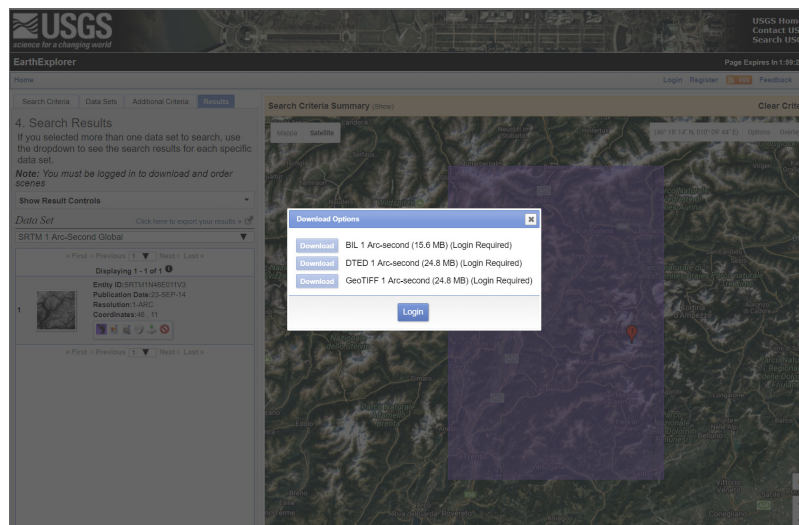
6. All SRTM products intersecting your area will appear – for each product you can select from the toolbar the following (from left to right – see image below)



- Show footprint
- Show preview on map
- Browse data
- Show metadata
- Download.



7. You can choose from three different raster formats, QGIS is able to read all of them (more on Raster Formats @ http://www.gdal.org/formats_list.html)



8. Load the file in your QGIS project –CRS of this file is 4326 (geographic latitude and longitude) – check handout on coordinate reference systems for more info in CRS.

2.1.4.1 Exercise 1 Exercise: download DEMs and analyse differences: with the procedures above download any two elevation datasets from the EarthExplorer portal and self-assess if you know how to answer the following two questions: - what are the two spatial resolutions? - compare differences in elevations of the two DEMs using the raster calculator in QGIS and style the map. What are the minimum and maximum values of the differences?

2.1.5 FAO: GeoNetwork

<http://www.fao.org/geonetwork/srv/en/main.home>

Excellent source of global and agricultural and environmental data

2.1.5.1 Exercise 2 Search for “rainfall African Water Resource Database” keywords and download rainfall data for Africa in two time windows, e.g. “APRIL 1ST-DECADAL SHORT MEAN RAINFALL”. This is Arc/Info Binary Grid.adf format (click link for more info). Style the map using QGIS. NB: the CRS (coordinate reference system) of this map is not known. Apply the same color scale to compare the two rasters.

2.1.6 United Nations - UNEP

<http://geodata.grid.unep.ch/>

United Nations Environment Programme
environment for development

Environmental Data Explorer

English | Français | Contact | Help | System

select a dataset

Number of entries found: 37

back continue

Data Set Type:
All types of data sets

	Data Set Type	Extent	Covered Time	Download protected?	Data Provider	Last updated	Preview
<input type="radio"/>	Annual Temperature	Geospatial	World	1970-2002	CRU	08/2008	
<input type="radio"/>	Average Monthly Maximum Temperature - April	Geospatial	World	1950-00	WorldClim	04/2009	
<input checked="" type="radio"/>	Average Monthly Maximum Temperature - August	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - December	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - February	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - January	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - July	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - June	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - March	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - May	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - November	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - October	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Maximum Temperature - September	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - April	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - August	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - December	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - February	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - January	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - July	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - June	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - March	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - May	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - November	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - October	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Average Monthly Minimum Temperature - September	Geospatial	World	1950-00	WorldClim	04/2009	
<input type="radio"/>	Change in Glacier Mass	Glaciers	World	1980-2004	WGMS	01/2004	
<input checked="" type="radio"/>	Change in Glacier Mass - Mean Cumulative Net Balance	Global	World	1980-2014	WGMS	05/2015	
<input type="radio"/>	Global Average Temperature	Global	World	1881-2010	NOAA/ESRL	02/2011	
<input type="radio"/>	Global Land-Ocean Temperature Anomaly	Global	World	1880-2013	NOAA/ESRL	06/2014	
<input type="radio"/>	Global Mean Land Surface Temperature	Global	World	1858-2015	Met Office Hadley Centre observations datasets	07/2015	
<input type="radio"/>	Global Mean Sea Surface Temperature	Global	World	1850-2015	Met Office Hadley Centre observations datasets	09/2015	
<input type="radio"/>	Sea Ice Area (North)	Global	World	1979-2015	NSIDC	09/2015	
<input type="radio"/>	Sea Ice Area (South)	Global	World	1979-2015	NSIDC	09/2015	



2.1.6.1 Exercise 3 Find new human settlements using lighting visible from space. The Landsat satellite records (also) night-time imagery allowing to monitor human settlements using visible lights from space (~700 km from the Earth surface). Search and download “Nightlights” from two dates and use raster calculator to detect new human settlements in the most recent date. Try to come-up with mathematical expression to reach that objective. You can find a hint here - but try yourself first!

2.1.7 Google Earth Engine

Google Earth Engine is an advanced portal for processing satellite imagery and other geospatial big-data online through their map-reduce paradigm. You can put your hands on many datasets, process them and even download results or any intermediate data you produce – with limitations on the size of the data you can download. **Coding** is required (Javascript language through their online <https://code.earthengine.google.com/> or Python through Jupyter notebooks). Welcome to coding/programming if you want to dive deeper in more advanced GIS.

2.2 SPECIFIC topics

2.2.1 Night lights map

<https://eogdata.mines.edu/products/dmsp/> in this page you can download maps of night lights.

2.2.2 USGS: Land-cover

<https://landcover.usgs.gov/> at link “Global Land Cover” (see image below) you will find a link to European Space Agency (ESA) datasets, see next section.

At link “30 meter Global Land Cover” also an interesting set of data for further GIS analyses (<https://landcover.usgs.gov/glc/>).



2.2.3 ESA: Land-cover

<https://www.esa-landcover-cci.org/>

<https://land.copernicus.eu/>

due

data user element

ESA

DUE HOME

USERS

PROJECTS

COMPANIES

INFORMATION

User Partnership

User Workshops

SENTINEL 2

MWBS 2015

MUAS 2015

News

FAQ

DUE DATA

ATSR World Fire Atlas

GlobCover

Sentinel-2 Time Series Emulation

ESA Data User Element > GlobCover

GlobCover

Welcome to the European Space Agency GlobCover Portal

The GlobCover Portal provides access to the results of the GlobCover project. GlobCover is an ESA initiative which began in 2005 in partnership with JRC, EEA, FAO, UNEP, GOC-GOLD and IGBP. The aim of the project was to develop a service capable of delivering global composites and land cover maps using as input observations from the 300m MERIS sensor on board the ENVISAT satellite mission. ESA makes available the land cover maps, which cover 2 periods: December 2004 - June 2006 and January - December 2009.

Please see below the links to download the products.

References

GlobCover Land Cover Maps

Use the links below to download the map.

GlobCover 2009 (Global Land Cover Map) **RELEASED ON 21st December 2010**

Here you can find:

- 1) The zip file Globcover2009_V2.3_Global.zip (information can be found in the Globcover2009_ReadMe.pdf which is included),
- 2) Updated Product Description and Validation Report (files/GLOBCOVER2009_Validation_Report_2.2.pdf)
- 3) A coloured version of the map in GeoTIFF format (CLICK HERE)

Data policy

CCI LAND COVER - S2 prototype Land Cover 20m map of Africa 2016

10m Sentinel-2A cloud-free composite - Southern Africa 2016

S2 Monthly Composites North Morocco

WorldCover 2017

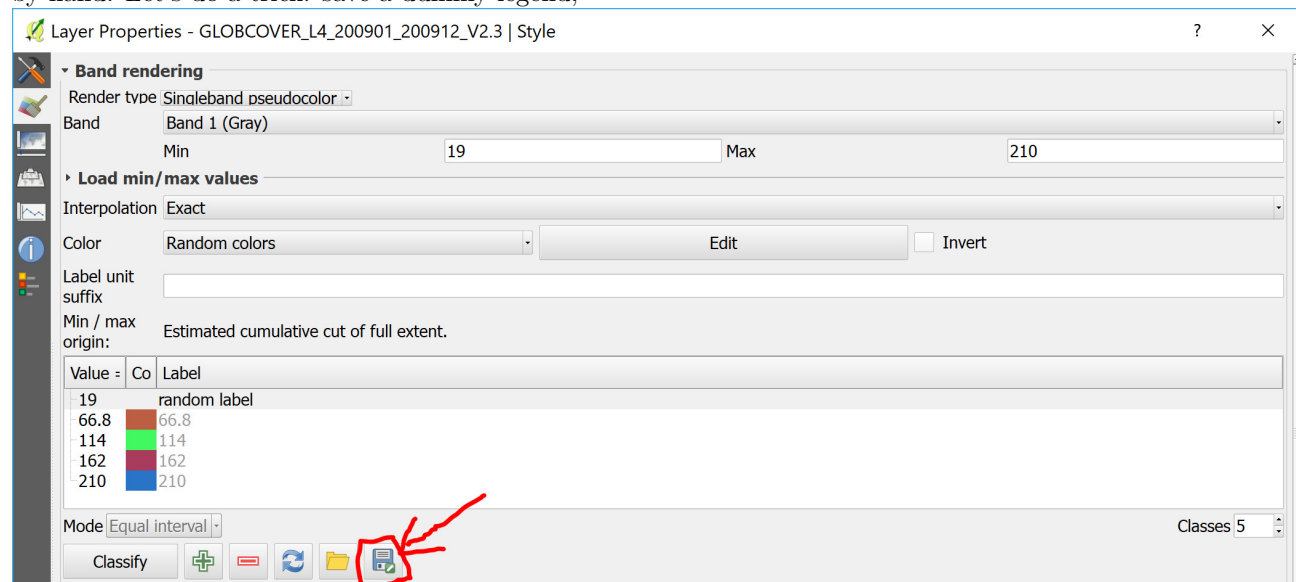
2.2.3.1 Exercise 4 Styling exercise with ESA GlobCover

When you open with QGIS the GeoTIFF file, you only see numeric values of the single cells. Each cell value corresponds to a legend label. The label is found in the MS Excel file that is distributed with the dataset. In this exercise you will learn how to create a legend file to style the layer automatically.

11

Appunti		Carattere		
24		X	✓	fx
No data (burnt are				
A	B	C	D	E
Value	Label	Red	Green	Blue
11	Post-flooding or irrigated croplands (or aquatic)	170	240	240
14	Rainfed croplands	255	255	100
20	Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	220	240	100
30	Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	205	205	102
40	Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	0	100	0
50	Closed (>40%) broadleaved deciduous forest (>5m)	0	160	0
60	Open (15-40%) broadleaved deciduous forest/woodland (>5m)	170	200	0
70	Closed (>40%) needleleaved evergreen forest (>5m)	0	60	0
90	Open (15-40%) needleleaved deciduous or evergreen forest (>5m)	40	100	0
100	Closed to open (>15%) mixed broadleaved and needleleaved forest (>5m)	120	130	0
110	Mosaic forest or shrubland (50-70%) / grassland (20-50%)	140	160	0
120	Mosaic grassland (50-70%) / forest or shrubland (20-50%)	190	150	0
130	Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)	150	100	0
140	Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichen/mosses)	255	180	50
150	Sparse (<15%) vegetation	255	235	175
160	Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	0	120	90
170	Closed (>40%) broadleaved forest or shrubland permanently flooded - Saline or brackish water	0	150	120
180	Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	0	220	130
190	Artificial surfaces and associated areas (Urban areas >50%)	195	20	0
200	Bare areas	255	245	215
210	Water bodies	0	70	200
220	Permanent snow and ice	255	255	255
230	No data (burnt areas, clouds,...)	0	0	0

We can style the layer by right-click “Properties” and go the the “style” dialogue, but it would take a long time to enter all values by hand. Let’s do a trick: save a dummy legend,



and then use a text editor to check format

```

dummy.txt
1 # QGIS Generated Color Map Export File
2 INTERPOLATION:EXACT
3 19,221,169,57,255,random label
4 66.8,187,94,65,255,66.8
5 114,66,248,96,255,114
6 162,169,59,92,255,162
7 210,42,116,200,255,210
8

```

Steps:

1. In MS Excel in the legend file information change columns to mirror the above table

	A	B	C	D	E	F	G
	Value	Red	Green	Blue	alpha	Label	
1	11	170	240	240		255 Post-flooding or irrigated croplands (or aquatic)	
2	14	255	255	100		255 Rainfed croplands	
3	20	220	240	100		255 Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	
4	30	205	205	102		255 Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	
5	40	0	100	0		255 Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	
6	50	0	160	0		255 Closed (>40%) broadleaved deciduous forest (>5m)	
7	60	170	200	0		255 Open (15-40%) broadleaved deciduous forest/woodland (>5m)	
8	70	0	60	0		255 Closed (>40%) needleleaved evergreen forest (>5m)	
9	90	40	100	0		255 Open (15-40%) needleleaved deciduous or evergreen forest (>5m)	
10	100	120	130	0		255 Closed to open (>15%) mixed broadleaved and needleleaved forest (>5m)	
11	110	140	160	0		255 Mosaic forest or shrubland (50-70%) / grassland (20-50%)	
12	120	190	150	0		255 Mosaic grassland (50-70%) / forest or shrubland (20-50%)	
13	130	150	100	0		255 Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)	
14	140	255	180	50		255 Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichen/mosses)	
15	150	255	235	175		255 Sparse (<15%) vegetation	
16	160	0	120	90		255 Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	
17	170	0	150	120		255 Closed (>40%) broadleaved forest or shrubland permanently flooded - Saline or brackish water	
18	180	0	220	130		255 Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	
19	190	195	20	0		255 Artificial surfaces and associated areas (Urban areas >50%)	
20	200	255	245	215		255 Bare areas	
21	210	0	70	200		255 Water bodies	
22	220	255	255	255		255 Permanent snow and ice	
23	230	0	0	0		255 No data (burnt areas, clouds,...)	

2. Select (as image above) and copy/paste to the text file

```

dummy.txt
1 # QGIS Generated Color Map Export File
2 INTERPOLATION:EXACT
3 19,221,169,57,255,random label
4 66.8,187,94,65,255,66.8
5 114,66,248,96,255,114
6 162,169,59,92,255,162
7 210,42,116,200,255,210
8
9
10 11      170 240 240 255 Post-flooding or irrigated cropl
11 14      255 255 100 255 Rainfed croplands
12 20      220 240 100 255 Mosaic cropland (50-70%) / veget
13 30      205 205 102 255 Mosaic vegetation (grassland/shr
14 40      0 100 0 255 Closed to open (>15%) broadleaved
15 50      0 160 0 255 Closed (>40%) broadleaved decidu
16 60      170 200 0 255 Open (15-40%) broadleaved decidu
17 70      0 60 0 255 Closed (>40%) needleleaved everg
18 90      40 100 0 255 Open (15-40%) needleleaved decid
19 100     120 130 0 255 Closed to open (>15%) mixed broa
20 110     140 160 0 255 Mosaic forest or shrubland (50-7
21 120     190 150 0 255 Mosaic grassland (50-70%) / fore
22 130     150 100 0 255 Closed to open (>15%) (broadleav
23 140     255 180 50 255 Closed to open (>15%) herbaceous
24 150     255 235 175 255 Sparse (<15%) vegetation
25 160     0 120 90 255 Closed to open (>15%) broadleaved
26 170     0 150 120 255 Closed (>40%) broadleaved forest
27 180     0 220 130 255 Closed to open (>15%) grassland
28 190     195 20 0 255 Artificial surfaces and associat
29 200     255 245 215 255 Bare areas
30 210     0 70 200 255 Water bodies
31 220     255 255 255 255 Permanent snow and ice
32 230     0 0 0 255 No data (burnt areas, clouds,...)

```

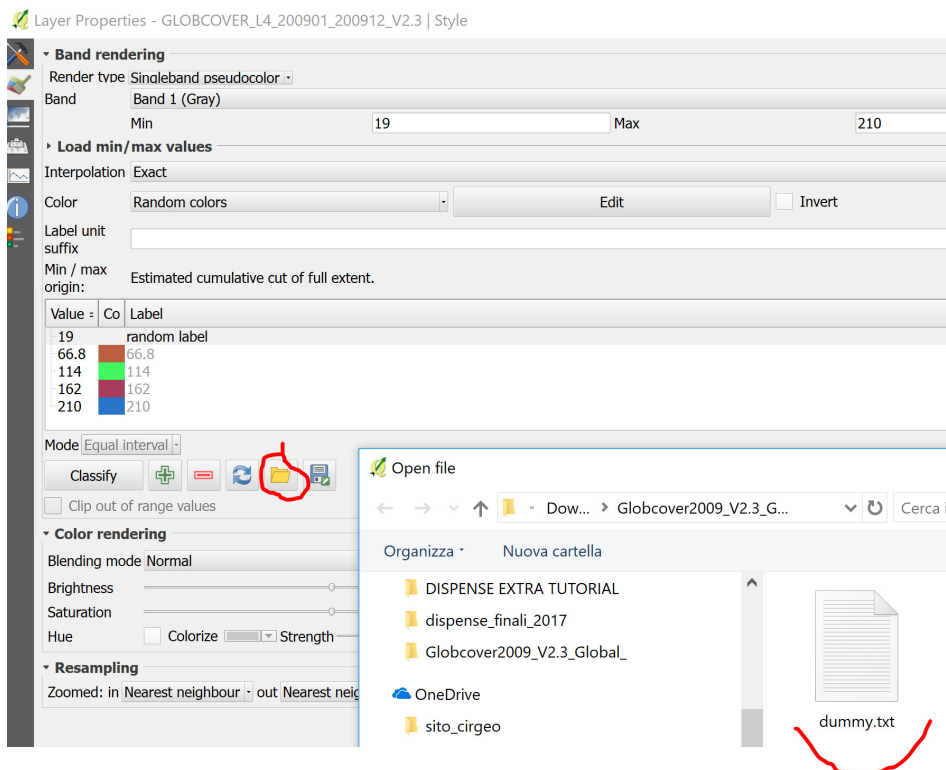
3. Make sure to change column separators to correct ones (commas)
 - a “find and replace” should work on any text editor. The final result should be like the image below.

```

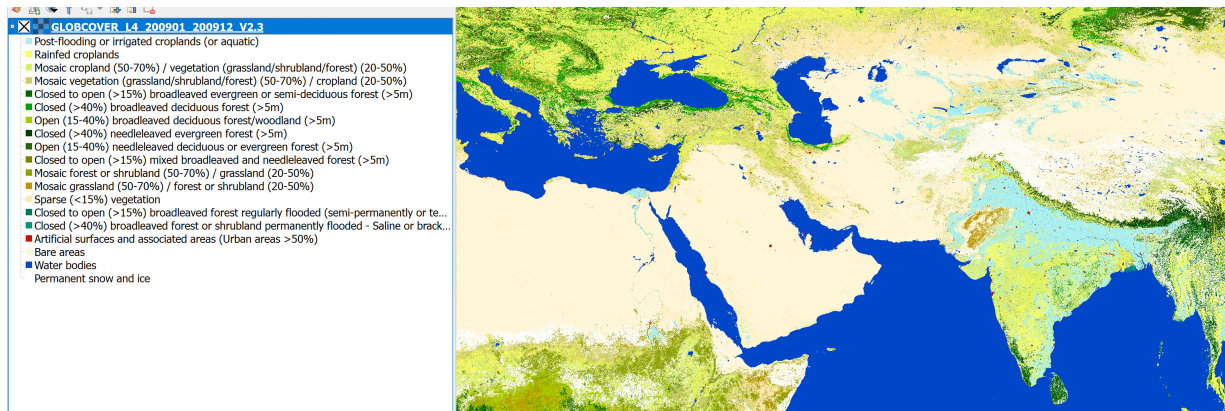
1 # QGIS Generated Color Map Export File
2 INTERPOLATION:EXACT
3 11,170,240,240,255,Post-flooding or irrigated croplands
4 14,255,255,100,255,Rainfed croplands
5 20,220,240,100,255,Mosaic cropland (50-70%) / vegetative
6 30,205,205,102,255,Mosaic vegetation (grassland/shrubland)
7 40,0,100,0,255,Closed to open (>15%) broadleaved evergreen forest
8 50,0,160,0,255,Closed (>40%) broadleaved deciduous forest
9 60,170,200,0,255,Open (15-40%) broadleaved deciduous forest
10 70,0,60,0,255,Closed (>40%) needleleaved evergreen forest
11 90,40,100,0,255,Open (15-40%) needleleaved deciduous forest
12 100,120,130,0,255,Closed to open (>15%) mixed broadleaved forest
13 110,140,160,0,255,Mosaic forest or shrubland (50-70%) / forest
14 120,190,150,0,255,Mosaic grassland (50-70%) / forest
15 130,150,100,0,255,Closed to open (>15%) (broadleaved forest)
16 140,255,180,50,255,Closed to open (>15%) herbaceous vegetation
17 150,255,235,175,255,Sparse (<15%) vegetation
18 160,0,120,90,255,Closed to open (>15%) broadleaved forest
19 170,0,150,120,255,Closed (>40%) broadleaved forest or shrubland
20 180,0,220,130,255,Closed to open (>15%) grassland or wetland
21 190,195,20,0,255,Artificial surfaces and associated areas
22 200,255,245,215,255,Bare areas
23 210,0,70,200,255,Water bodies
24 220,255,255,255,255,Permanent snow and ice
25 230,0,0,0,255,No data (burnt areas, clouds,...)
26

```

4. Open the style dummy.txt that you modified



5. You will get a correct legend



2.2.4 Forest Global Maps

University of Maryland's Global Land Analysis and Discovery lab has two interesting datasets.

1. **Forest Cover** (with Gain and Loss from 2000) [LINK HERE!!](#)
2. **Forest height** - this is an estimation using remote sensing and GEDI laser altimeters data [LINK HERE!!](#)

2.2.5 Climate WC v1

WorldClim is a set of global climate layers (gridded climate data) with a spatial resolution of about 1 km². These data can be used for mapping and spatial modelling, and multi-criteria analysis (see the dedicated tutorial). <http://worldclim.org>

From the Google Earth Engine Catalogue description:

WorldClim V1 Bioclim provides bioclimatic variables that are derived from the monthly temperature and rainfall in order to generate more biologically meaningful values.

The bioclimatic variables represent annual trends (e.g., mean annual temperature, annual precipitation), seasonality (e.g., annual range in temperature and precipitation), and extreme or limiting environmental factors (e.g., temperature of the coldest and warmest month, and precipitation of the wet and dry quarters).

WorldClim version 1 was developed by Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC).

2.2.6 Climate WC v2

WorldClim version 2 is a set of global climate layers (gridded climate data) with a spatial resolution of about 1 km². These data can be used for mapping and spatial modelling, and multi-criteria analysis (see the dedicated tutorial). <https://worldclim.org/data/worldclim21.html>

For the GIS courses, the bioclimatic variables have been added to a Web Coverage Service (WCS - see dedicated section on how to load WCS services in your GIS here)

Right click this link and “copy link” to get the WCS address for WorldClim2 to add to your QGIS.

NB as readme.txt file states ”

This is WorldClim 2.1 (January 2020) downloaded from <http://worldclim.org> They represent average monthly climate data for 1970-2000.

The data were created by Steve Fick and Robert Hijmans
You are not allowed to redistribute these data
” Therefore please only use them for educational purposes and do not redistribute data in any way.

2.2.7 Soil Carbon

From the website: “SoilGrids and WoSIS Soilgrids is a system for digital soil mapping based on a global compilation of soil profile data (WoSIS) and environmental layers. Read about the SoilGrids and WoSIS projects on isric.org” <https://www.isric.org/explore/soilgrids>

2.2.8 Precipitation: CHIRP

Researchers at Climate Hazard Center at University of California at Santa Barbara provide grid of 0.05° (around 5 km at the equator) with daily rainfall data <https://chc.ucsb.edu/data/chirps>

3 Regional datasets (Europe)

3.1 European Statistical (EUROSTAT)

<https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data>

Provides vector data of boundaries and other important information at European and global level.

Example: <https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/countries#countries20> and download boundaries in TopoJSON format. You can drag and drop the whole downloaded ZIP-file to QGIS! You will see that you can choose which files to open.

3.2 European Environmental Agency (EEA)

<https://discomap.eea.europa.eu/Index/>

Provides mostly WMS services (see section “Online web mapping services WMS / WCS / WFS”)

3.3 CORINE Land Cover

<https://land.copernicus.eu/>

“An inventory of land cover in 44 classes, and presented as a cartographic product, at a scale of 1:100 000. This database is operationally available for most areas of Europe.”

You have 4 options for download

1. Raster (GeoTIFF) 100 m cell size
2. Raster (GeoTIFF) 250 m cell size
3. Vector model (ESRI Shapefile)
4. Vector model (SQLite Database).

Global Pan-European Local Reference data FAQ

You are here: Home / Pan-European / CORINE Land Cover / CLC 2012

CLC 2012

Map View Metadata **Download**

The current CLC 2012 version is v.18.5.1, which covers all EEA39 countries. For details click [here](#).

Corine Land Cover products are available in both raster (100 and 250 meter resolution), and vector (ESRI and SQLite geodatabase). The Minimum Mapping Unit (MMU) for the CLC is 25 hectares for areal phenomena and 100 meter for linear phenomena. The time series (1990, 2000, 2006 and 2012) are complemented by change layers, which highlight changes in land cover with an MMU of 5 ha. If you are interested in changes between two surveys always use the CLC-Change layer, as this has a higher resolution than the status layer. Results can be filtered by using the search box.

Please, remove **popup block** on your browser for <http://land.copernicus.eu/> to download the products.

Search:

<input type="checkbox"/>	Name	Year	Type	Format	Version	Size	Download
<input type="checkbox"/>	Corine Land Cover	2012	Raster	100m GeoTIFF	18.5.1	71.4 MB	
<input type="checkbox"/>	Corine Land Cover	2012	Raster	250m GeoTIFF	18.5.1	31.8 MB	
<input type="checkbox"/>	Corine Land Cover	2012	Vector	ESRI Geodatabase	18.5.1	1.8 GB	
<input type="checkbox"/>	Corine Land Cover	2012	Vector	SQLite Database		2.5 GB	

Download selected items (0) Download all

3.4 Copernicus CORINE

The service below provides viewer and download capabilities, but you must register and login.

<https://land.copernicus.vgt.vito.be/PDF/portal/Application.html>

There is also a OGC services! (WMS/WFS/WCS)! You have to use the url

<https://viewer.globalland.vgt.vito.be/geoserver/ows>

and use the username and password in the credentials of QGIS. (see dedicated section on how to load OGC services in your GIS here)

4 Regional datasets (Italy)

4.1 ISTAT boundaries

Municipal boundaries updated every two years in ESRI shapefile at different detail. <https://www.istat.it/it/archivio/222527>

4.2 Lombardy Region

<http://www.geoportale.regione.lombardia.it/download-dati>

4.3 Veneto Region

The Veneto Region portal - <https://idt2.regione.veneto.it> - provides downloading capabilities and also services (see chapter **Online web mapping services WMS / WCS / WFS**).

For downloading raster and vector datasets:

<https://idt2.regione.veneto.it/idt/downloader/download>

You can choose the CRS (see the handout on coordinate reference systems), and filter using the province and municipality of interest (e.g. Padova) – below an example for downloading the Urban Agricultural Areas.

DOWNLOAD DATI

All'interno di questa Sezione è possibile effettuare il download delle banche dati della Regione del Veneto (dati vettoriali, raster o alfanumerici). L'utente ha la possibilità di ricercare i dati di interesse attraverso il Catalogo (Catalogo Metadati), effettuare il download dell'intero Quadro Conoscitivo Regionale (link a pagina di spiegazione) suddiviso per limiti amministrativi, o per singolo layer ritagliato per comune di interesse. Nella stessa sezione è possibile effettuare il download dei Prodotti Cartografici (link a pagina di spiegazione) suddivisi in Punti Geodetici (Capisaldi e Vertici), Carta Tecnica Regionale (CTRN e GeoDB Topografici) e DTM (Modello Digitale del Terreno a 5 e 25 metri).

DOWNLOAD
DA CATALOGO

QUADRO
CONOSCITIVO

LAYER

PUNTI
GEODETICI

CARTA
TECNICA

MODELLI
DIGITALI

LAYER

This section allows the download of an information layer. To start the procedure select the province, the municipality and the layer of interest and press the Download Layer button.

Sistema Riferimento
CRS nativo

Layer
Progetto Area Agricola Metropolitan

Elenco Province
Padova

Elenco Comuni
Padova

Download Layer

Confirm

⚠ Procedere con il download?

Confirm

Annulla

If you want to mine for data using key-words, you can use the Catalog

REGIONE DEL VENETO

[Area Riservata](#)
[Login Enti Locali](#)
[Contatti](#)
[FAQ](#)

[Home](#)
[Aerofototeca](#)
[Gestione Metadati](#)
[Ricerca Da Catalogo](#)
[Condizioni d'utilizzo](#)

IDT-RV 2.0 – INFRASTRUTTURA DATI TERRITORIALI DELLA REGIONE DEL VENETO

VISUALIZZATORI GEOGRAFICI
 Accesso Libero

RICERCA DA CATALOGO
 Accesso Libero

DOWNLOAD DATI GEOGRAFICI
 Accesso Libero

TRASFORMAZIONE COORDINATE
 Accesso Riservato

NOTIZIE

ACCESSO LIBERO AL GEOPORTALE

19 febbraio 2019

Viste le numerose richieste di registrazione da parte di utenti "privati" si ricorda che l'accesso ...

[\[Continua\]](#)

Il GeoPortale regionale consente di visualizzare, consultare e scaricare dati territoriali ed ambientali messi a disposizione dalla Regione del Veneto.

L'accesso è libero e non necessita di alcuna registrazione.

Il portale è suddiviso in 4 specifiche sezioni:

1. Sezione "Visualizzatori Geografici", dove sono presenti i vari WebGIS realizzati e classificati in base alle funzioni svolte (Aerofototeca, Cartografia di base, Progetto Venezia etc...)
2. Sezione "Catalogo Metadati", permette di ricercare le informazioni territoriali e ambientali della Regione Veneto e degli altri Enti che pubblicano il proprio catalogo in formato OGC - CSW (Catalogue Web Service); il Catalogo è sviluppato completamente con tecnologia open source e si basa su ESRI Geoportal Server;
3. Sezione "Download Dati", permette di effettuare il download dei dati vettoriali, raster, alfanumerici, suddivisi in base alla tipologia di prodotti ricercati. Per il download del Quadro Conoscitivo per la redazione degli strumenti urbanistici e territoriali (legge regionale 11/2004) riservato agli Enti Locali, cliccare qui;
4. Sezione "Trasformazione coordinate" disponibile, consente di convertire in tempo reale coordinate planimetriche tra i Sistemi di Riferimento più usati in Italia. Attualmente il servizio è disponibile solo per gli Enti Locali, previa registrazione.

Servizi OGC messi a disposizione:

SONDAGGI

Quale nuova funzionalità ritieni più utile nel Geoportale?

☐ La disponibilità del WebGIS per visualizzare in mappa i dati in maniera semplice e veloce.

☐ La ricerca dei dati attraverso il nuovo catalogo.

☐ La possibilità di compilare i metadati online e validarli secondo standard RNDT.

[Vota](#)

[Visualizza risultato sondaggi](#)

With key-words you can find both geospatial data and documents. If you want only geospatial data you can filter using only “Layers”



RICERCA DA CATALOGO

Il Catalogo permette di ricercare le informazioni territoriali e ambientali della Regione Veneto e degli altri Enti che pubblicano il proprio catalogo in formato OGC - CSW (Catalogue Web Service) e aderiscono al GeoPortale. Una volta individuato il dato d'interesse, è possibile consultarne il metadato, visualizzare il dato in un visualizzatore (insieme agli altri temi di interesse) e scaricarlo ove previsto dalle politiche di diffusione assunte dai proprietari. È possibile, inoltre, consultare i metadati da client esterni attraverso il servizio di CSW (CSW 2.0.2 ISO Profile):

Il CSW - Catalog Service for the Web è uno standard dell'OGC adottato anche in ambito INSPIRE per definire un'interfaccia per servizi di ricerca, navigazione e interrogazione di metadati su dati e servizi, in modo che i metadati siano consultabili anche da client esterni al catalogo proprietario, in maniera automatica.

Se si dispone quindi di un'applicazione in grado di utilizzare il servizio CSW è possibile invocare il servizio digitando nell'applicazione la URL del CSW, impostando i parametri eventualmente richiesti secondo necessità.

Istruzioni per la ricerca

Ricerca Semplice

Digitare la parola esatta da ricercare o parte di essa seguita dal carattere jolly (*).

ATTENZIONE: non in prima posizione.

Ricerca Avanzata

Classificazione RV

Digitare la parola esatta da ricercare o parte di essa seguita dal carattere jolly (*). ATTENZIONE: non in prima posizione.

Dettagliata

Testo esatto

Digitare la parola esatta. Verranno restituiti risultati solo nel caso in cui il testo conterrà esattamente la parola digitata.

Almeno una parola (OR)

Digitare una o più parole (separate da spazi). Verranno restituiti risultati nel caso in cui il testo contenga almeno una delle parole digitate.

È possibile utilizzare il carattere jolly (*) accanto a ciascuna parola digitata per estendere i risultati.

Tutte le parole (AND)

Digitare una o più parole (separate da spazi). Verranno restituiti risultati nel caso in cui il testo contenga tutte le parole digitate non necessariamente in sequenza.

ATTENZIONE: Se anche una delle parole digitate non dovesse essere presente non verranno restituiti risultati.


The screenshot shows the search interface of the Geoportal. At the top, there is a search bar with the text "RICERCA:" and a search input field containing "agricol*". To the right of the input field is a dropdown menu set to "Ovunque" and a search button with a magnifying glass icon. Below the search bar, there is a section for "Ricerca avanzata" with two tabs: "Classificazioni RV" (selected) and "Dettagliata". Under the "Classificazioni RV" tab, there is a section titled "TIPO DI DATO DA CERCARE" with four radio buttons: "Tutti", "Layer" (selected and highlighted with a red circle), "Documento", and "Serie". At the bottom, there is a link "RICERCA SU BASE".

From results you can:

1. Read metadata. Metadata keep all information that are not directly in the data – for example who is the owner, the date that data were acquired, copyright etc. . .

Esporta risultato in CSV Esporta risultato in JSON Vista da 1 a 3 di 3 elementi Ordina per: Titolo


IDT Regione Veneto
 Guid: arpa_ve:c0507061_RischioPerAzot
 Titolo: Carta del rischio di percolazione dell'azoto
 Descrizione: Suddivisione del territorio regionale di pianura in 5 classi di rischio di percolazione dell'azoto di origine agricola nelle acque profonde



Apri
 Download
 Dettagli

Scheda Metadati
 Metadati-XML


IDT Regione Veneto
 Guid: arpa_ve:c1016281_CarichiAzotoAgr
 Titolo: Carichi di azoto agricolo, da allevamento e da fertilizzanti
 Descrizione: Carichi sul suolo di azoto agricolo a livello comunale, suddivisi in apporti da effluenti da allevamento e da concimazione



- You can download the layer for all the Region or for only a municipality or province.

Esporta risultato in CSV Esporta risultato in JSON Vista da 1 a 3 di 3 elementi Ordina per: Titolo


IDT Regione Veneto
 Guid: arpa_ve:c0507061_RischioPerAzot
 Titolo: Carta del rischio di percolazione dell'azoto
 Descrizione: Suddivisione del territorio regionale di pianura in 5 classi di rischio di percolazione dell'azoto di origine agricola nelle acque profonde



Apri
 Download
 Dettagli

Download Layer
 Download per Comune o Prov.

IDT Regione Veneto
 Guid: arpa_ve:c1016281_CarichiAzotoAgr



- Almost all data are available also via web services, check Online web mapping services WMS / WCS / WFS section below.

5 Online services WMS / WCS / WFS

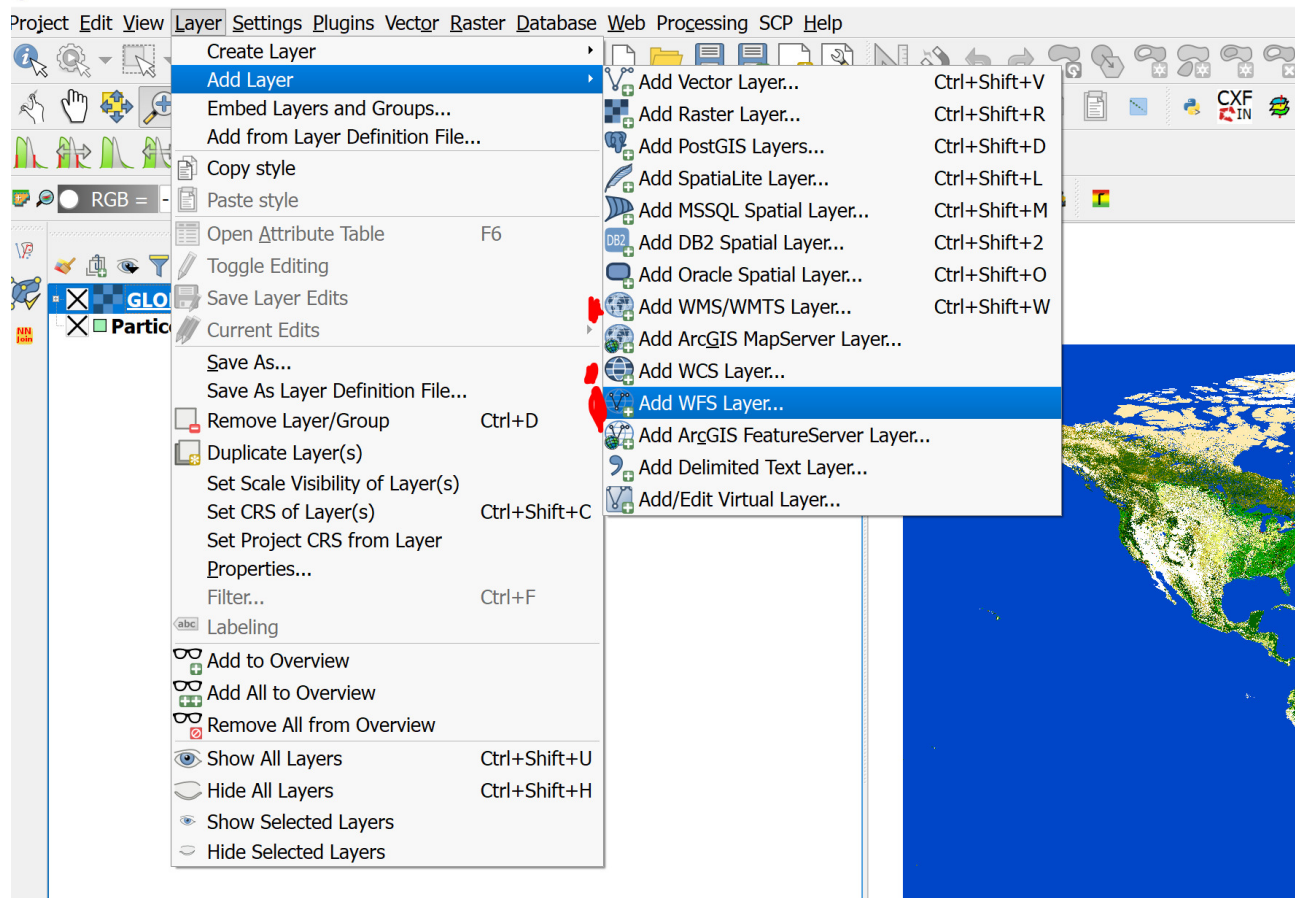
These are online services providing access to the data for download or visualization. WMS is only for visualization, WCS and WFS are respectively for downloading data as well, for raster (grid) data and vector data respectively.

1. WMS – Web Mapping Services – see also tutorial
2. WCS – Web Coverage Services
3. WFS – Web Feature Services

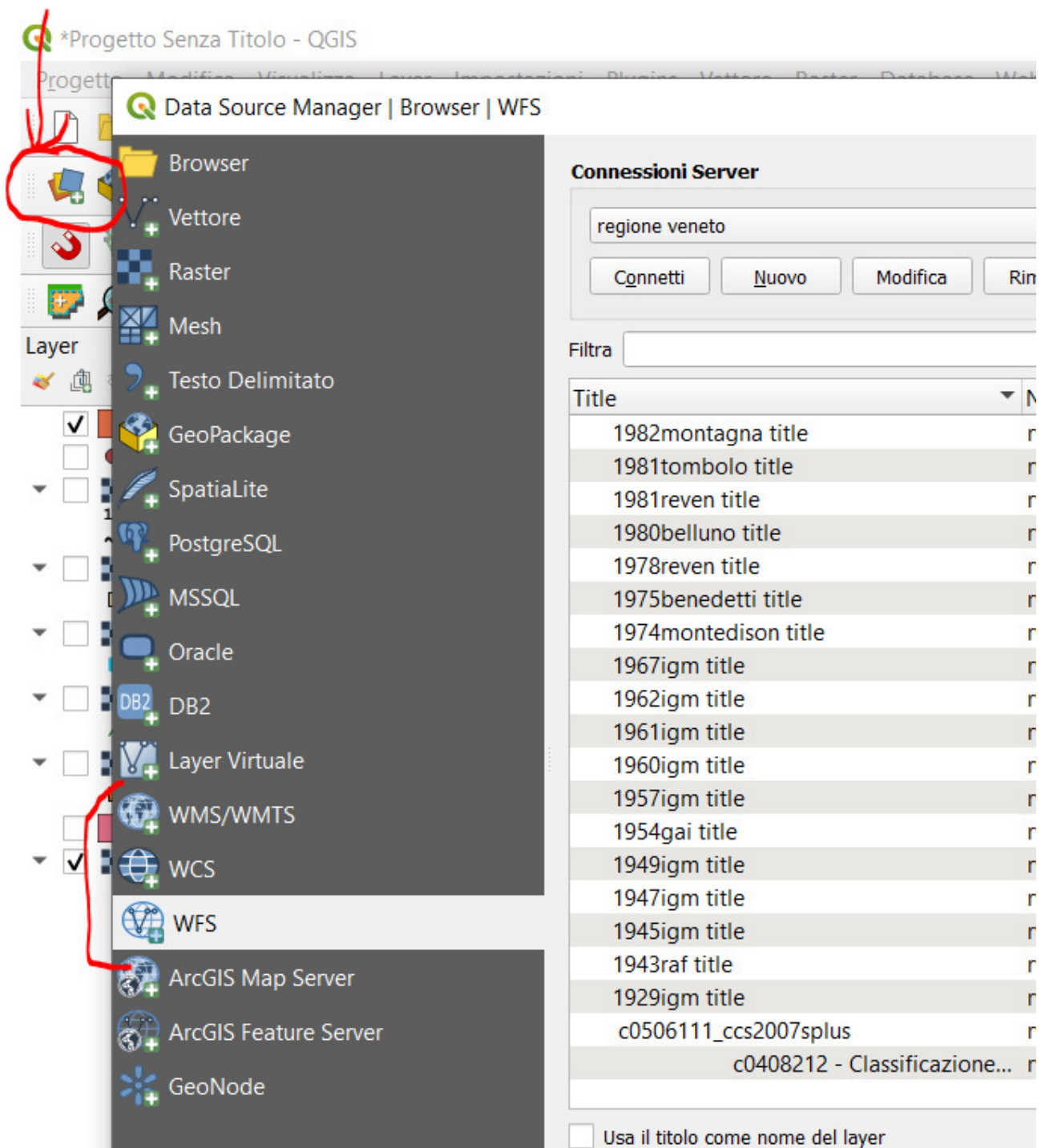
There are many more services, which are standards defined by user community of the Open Geospatial Consortium (https://en.wikipedia.org/wiki/Open_Geospatial_Consortium) - OGC. As a matter of fact these services have been recently referred to the term: **OWS – Open Geospatial Consortium (OGC) Web Services**.

You access these data either from the menu bar, “Layer” “Add layer”

QGIS 2.18.9



...or you can use the Data source manager by clicking the icon in the toolbar (see figure below).



In all cases you will need to add a web address (URL) to the dialogue window. See next example and bottom of next section for some URL sources.

5.1 National Geo Portal – WFS services

<http://www.pcn.minambiente.it/mattm/en/>

Click “Services”Network Services - OGC”.



GEOPORTALE NAZIONALE



Select in the next page WFS Services



GEOPORTALE NAZIONALE

[Sitemap](#)[Contacts](#)

[Home](#) | [INSPIRE](#) | [Directives](#) | [Services](#) | [Projects](#) | [Agenda](#)

purposes of environmental policies or activities which may affect the environment. It is the access point for the national level of national infrastructure for spatial information and for environmental monitoring.

According to [Legislative Decree 32/2010](#) which transposes the INSPIRE Directive, in fact, the National Geoportal is required to provide services for the spatial data and environmental monitoring for which it has been created the appropriate metadata accessible via the internet or through interoperability tools.

The network services provided by National Geoportal allow the use of data [search](#) services available through their metadata, offering the opportunity [to consult](#) in accordance with OGC standards, and [to download](#) them with their licenses, proposing appropriate tools for their [transformation \(conversion\)](#). The use of such services is carried out through a GIS client (such as the open source QGIS), for the use of which is described in the relevant manuals.

The [INSPIRE](#) guidelines for the implementation of Research Services recommended that this service is implemented using the OGC™ (*Open Geospatial Consortium Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0*)

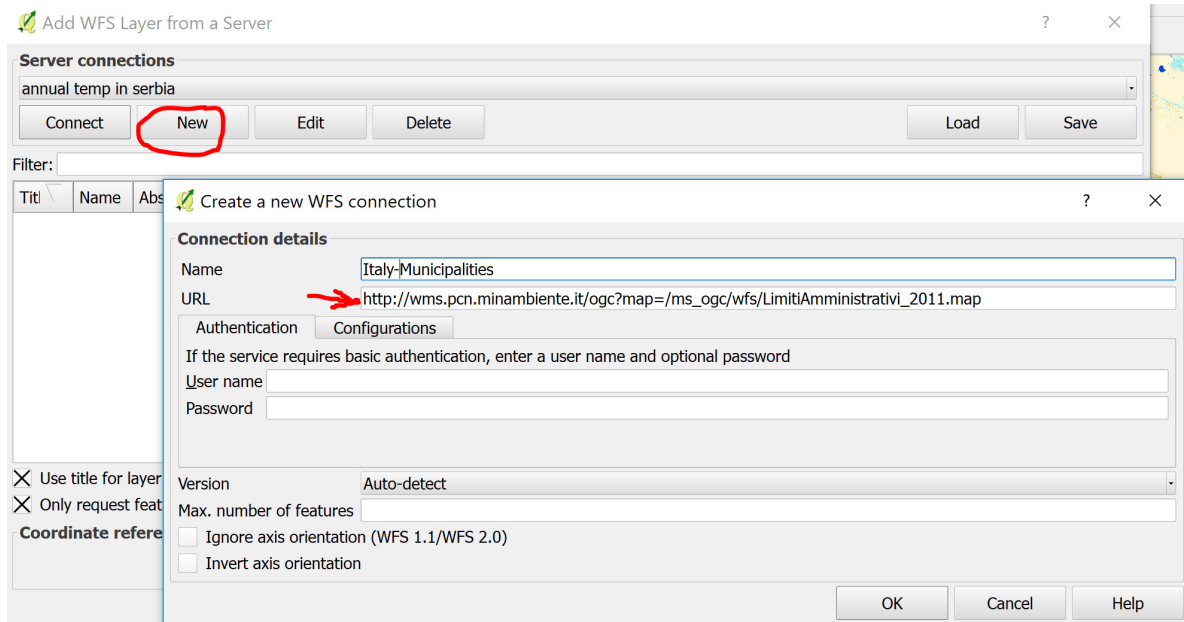
- Classic Viewer
- Coordinate Conversion
- Network Services - OCG
 - Discovery Service CSW
 - WMS View Service
 - Download Services
 - >> WFS Service**
 - >> WCS Service
- WPS Conversion Services
- Software Distribution

You will see a list of datasets, all have a URL address – we will “Copy URL” of the data we want. For

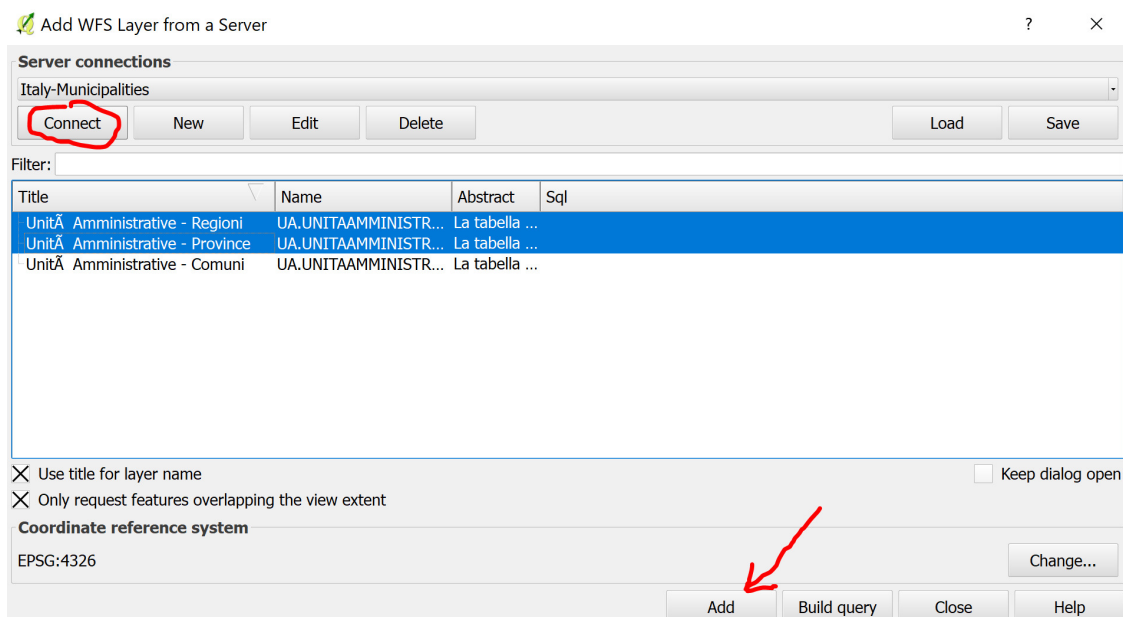
example “Unità amministrative” is the border of municipalities in Italy (layer names are only in Italian).

Toponimi d'Italia IGM	http://wms.pcn.minamk	Capabilities
	Copia Url	
Unità amministrative regionali, provinciali e comunali	http://wms.pcn.minamk	Capabilities
	Copia Url	

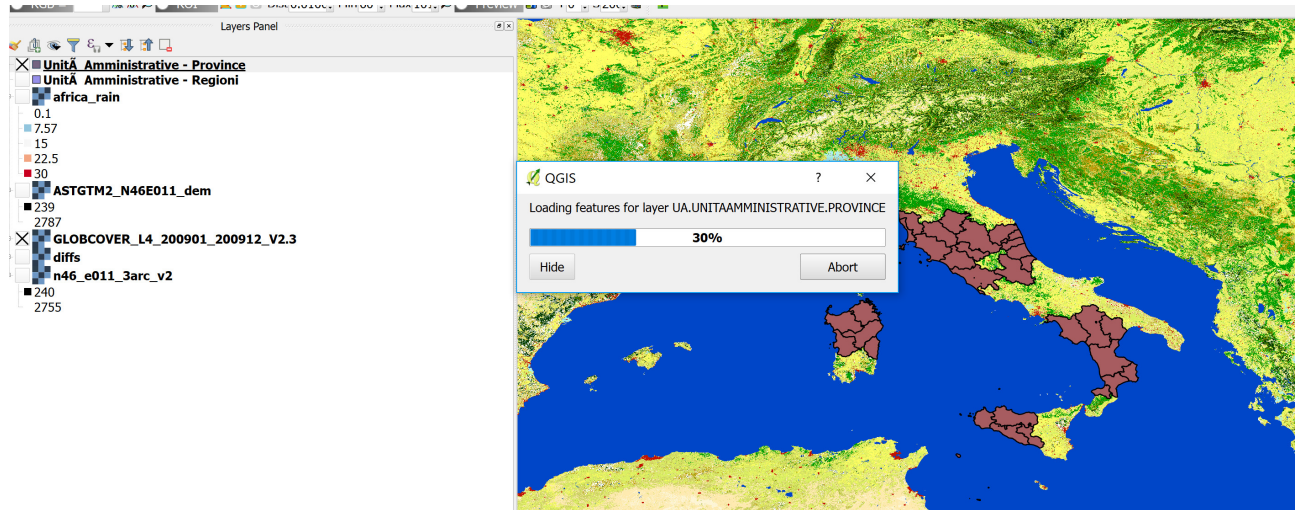
In the QGIS menu “Layer” “Add Layer” “Add WFS layer” you will get a dialogue window, click “New” and copy the URL in the input area, and give a Name to the layer



After click “ok” and “connect” from the main window. You will get three sub-layers: regions, provinces and towns – you can choose one ore more layers and then “Add” to add to project:



The layers will load: it might take some time depending on the size of the data, on internet connection speed and on the speed of the server providing the WFS service



NB: the same identical procedure can be used to add WMS or WCS service layers, which add raster data: QGIS menu “Layer”“Add Layer”“Add WCS layer” or “Add WMS layer”

5.2 Other OGC OWS services

https://www.qgistutorials.com/en/docs/working_with_wms.html

WMS

<https://mrdata.usgs.gov/wms.html> - USGS OGC Web Mapping Services

<https://idt2-geoserver.regione.veneto.it/geoserver/ows> - Veneto Region Styled raster

<https://idt2.regione.veneto.it/gwc/service/wmts> - Veneto Region orthophotos

WFS

<https://mrdata.usgs.gov/wfs.html> - USGS OGC Web Feature Services

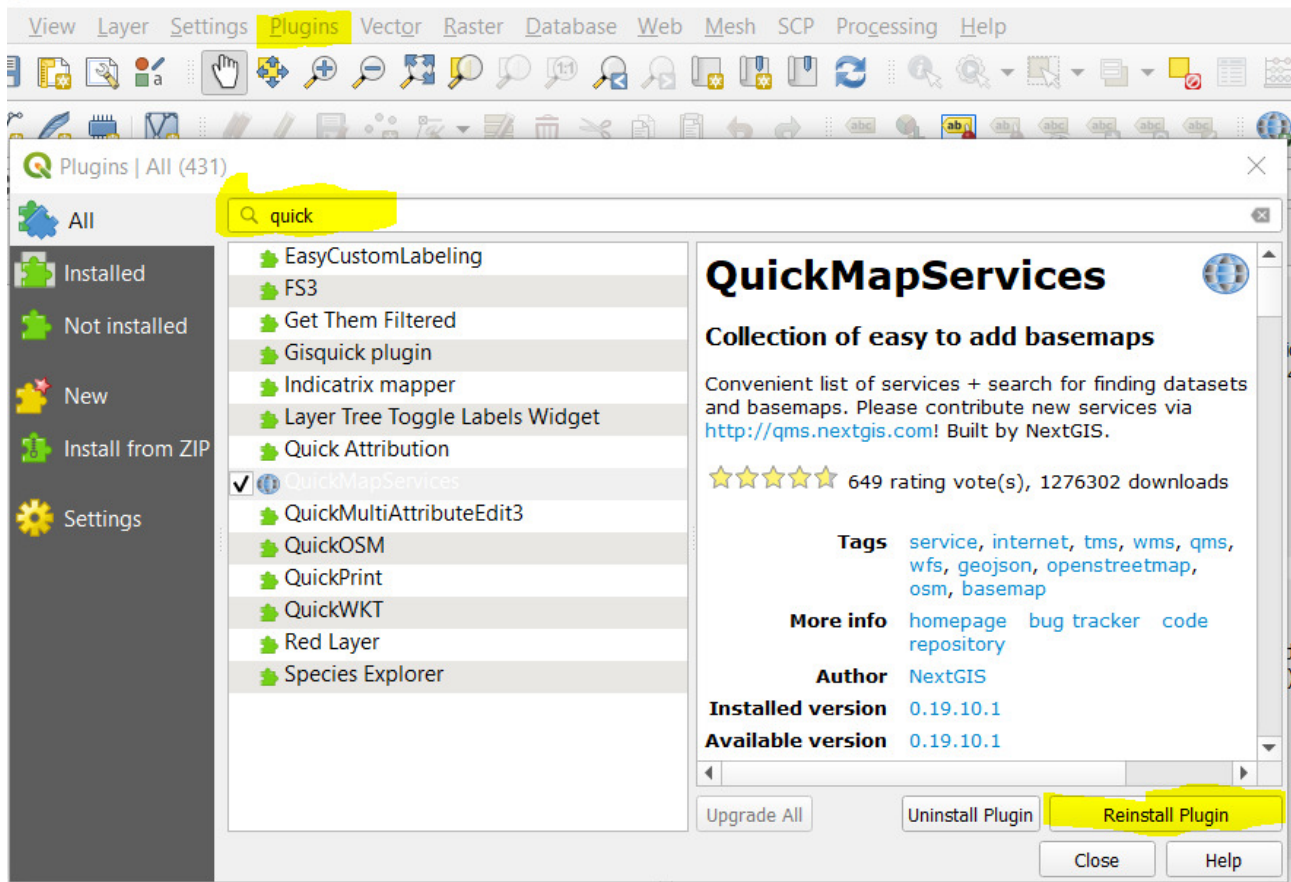
<https://idt2-geoserver.regione.veneto.it/geoserver/ows> - Veneto Region

5.3 TMS services (OpenStreetMap)

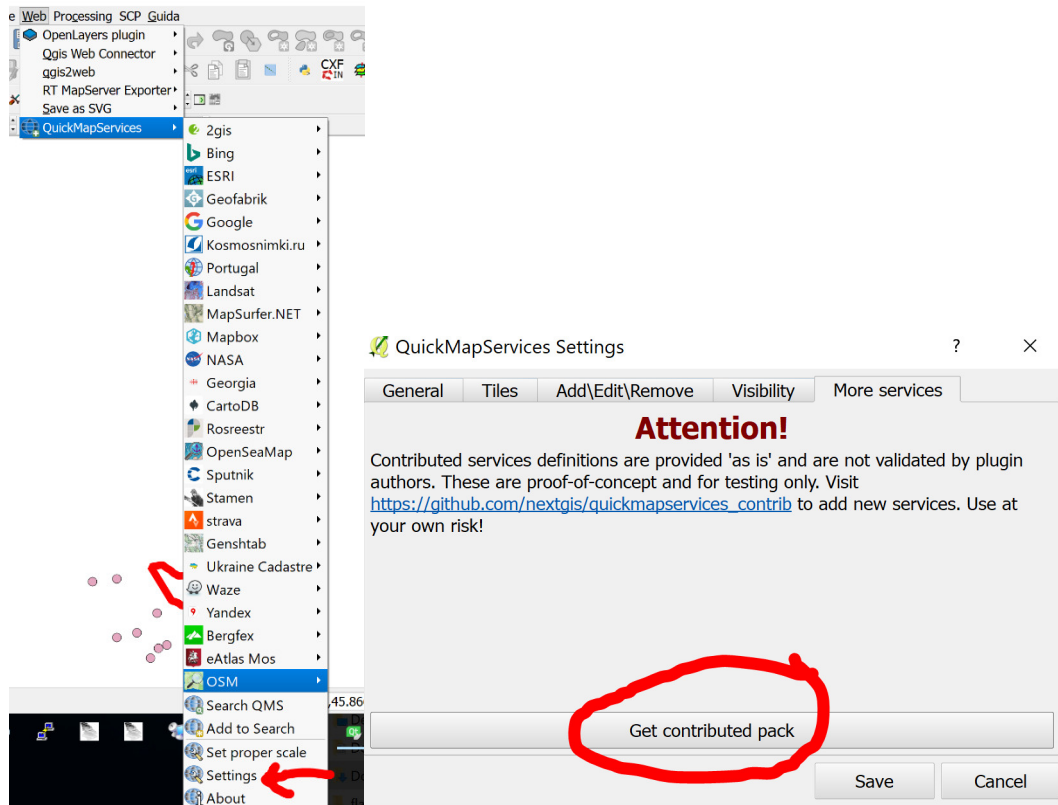
TMS Services are a particular type of online services that provide visual maps, usually styled maps and aerial imagery (e.g. Google Maps). They are very fast to load and are used as base maps to view study area extents and provide visual information of your area.

QGIS provides two plugins to access TMS data, OpenLayers and QuickMapServices. We will use “QuickMapServices” as it is more robust. The procedure to install the plugin is the following:

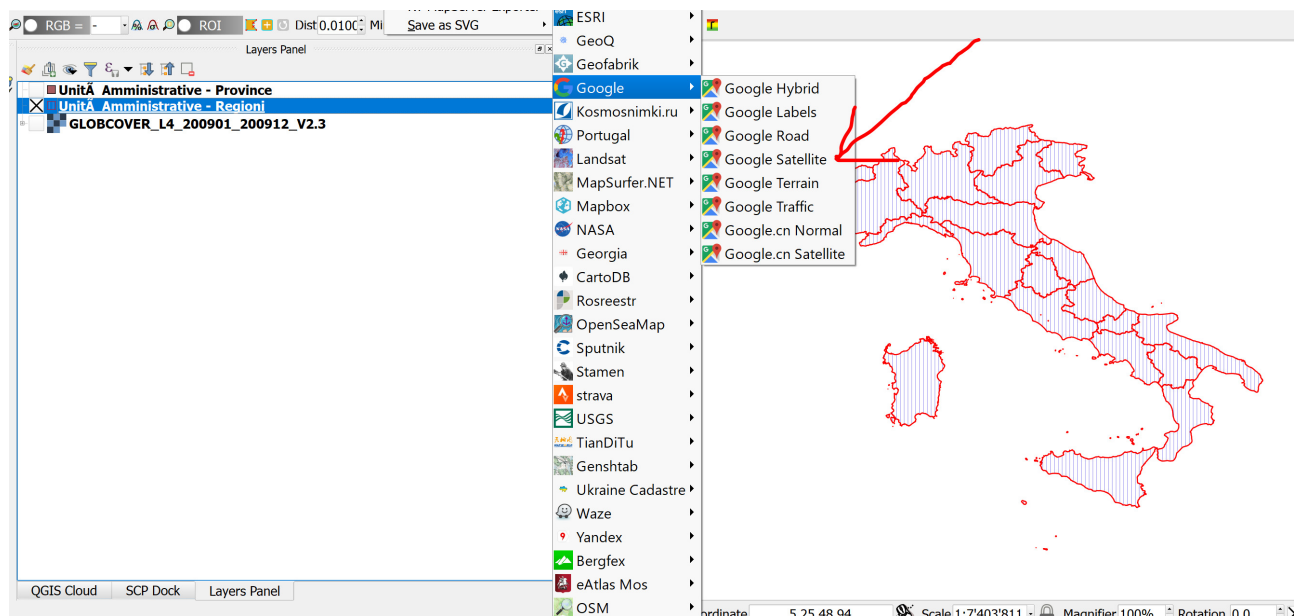
1. Download the plugin “QuickMapServices” (menu “Plugins”“Manage and install plugins”). NB is you do NOT see a large list of plugins, you might not be connected to the internet or maybe QGIS has trouble connecting – to solve (i) check that internet is working (ii) close and reopen the Plugin panel window (iii) if still no plugins, restart QGIS.

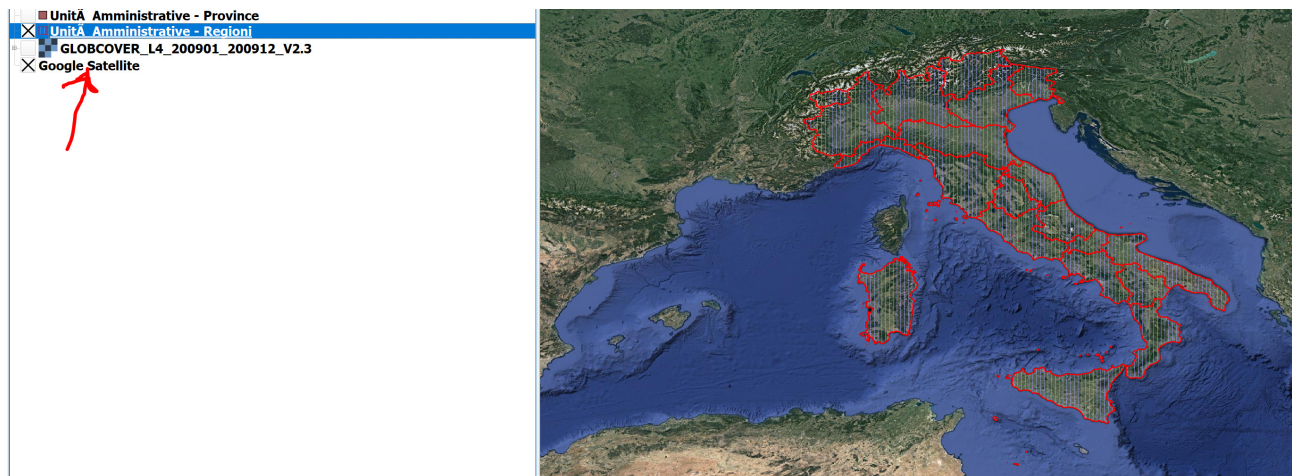


2. Once installed, you will see the plugin in the menu at “Web” “QuickMapServices” – you will see many available map services that can be loaded, **but not all**
3. to load all services go to menu “Web”“QuickMapServices”“Settings”: from dialogue window click “More Services” “Get Contributed Pack”



4. Now from menu “Web” “QuickMapServices” you will see all available services: select “Google” “Google Satellite” you will have access to Google image database up to a resolution below 1 m in almost all of the Earth surface!!





5.4 Open Streetmap

Open StreetMap is a special type of service providing access to their data also for download. Check online tutorial Searching and Downloading OpenStreetMap Data

Exercies 3 hint: formula can be - $(\text{"Nightlights_1993@1"} = 0) * \text{"Nightlights_2003@1"}$ - the first part creates a 0/1 result called "mask" that is then multiplied by the values from the recent image. Thus areas without lights in 1993 but with lights in 2003 will have a values > 1 , whereas areas already having lights in 1993 (settlements already present) will have value 0 (we are only interested in **new** settlements)