PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations

UNDP Empowered lives. Resilient nations.

UNEP

WHERE IS CARBON LOCATED?

EXERCISES FOR QGIS

Xavier de Lamo, UNEP-WCMC

Ulaanbaatar, Mongolia
November 2015

PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations | UNDP Empowered lives. Resilient nations. | UNEP

In the following set of exercises we are going to review some global carbon datasets available for Mongolia and explore its distribution among different land categories.

- Ruesch & Gibbs 2008
- Thurner et al. 2014
- Scharlemann et al. 2014

PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations

UNDP Empowered lives. Resilient nations.

UNEP

EXPLORING THE DATASETS

1. Open the following files in E:\\...Cabon_Maps

- Ruesch & Gibbs 2008:
- Thurner et al. 2014
- Scharlemann et al. 2014

2. Using the knowledge acquired in the previous sessions, change the symbology of the layers to allow an easier interpretation of the data.

3. Visually review the distribution of carbon density in the different layers. Does it makes sense according to the your knowledge on the matter?

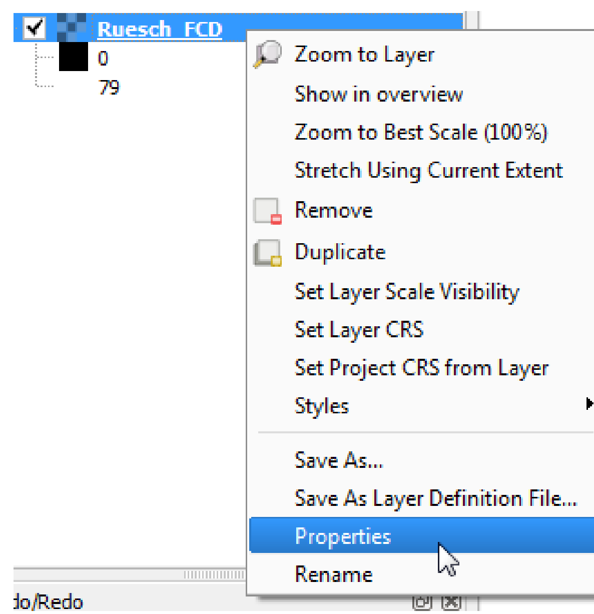
PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations UNDP Empowered lives. Resilient nations. UNEP

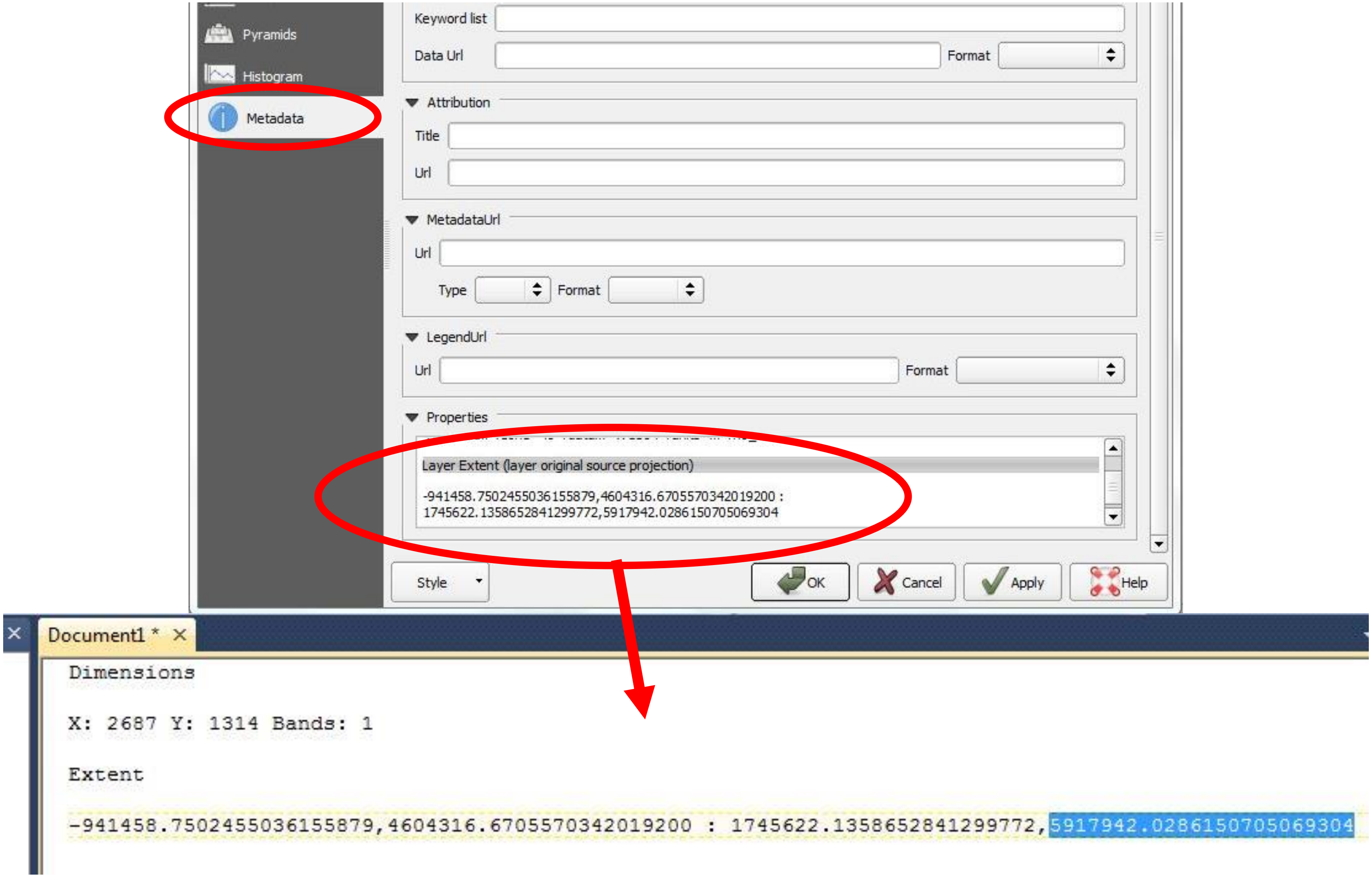
We are now going to apply different techniques to compare, visually and quantitatively, the values estimated by the different datasets. Let's first compare the two datasets containing estimates of forest living biomass: **Thurner** and **Ruesch & Gibbs.**

To do that, first we need to ensure that the **projection**, **resolution** (size of the cells) and **extent** (geographic boundaries) are the same in all layers.

Right click on each layer, go to *Properties* and check this 3 layer properties in the *Metadata* tab.



When finished, the dimensions of each raster layer (number of rows and columns Should be exactly the same



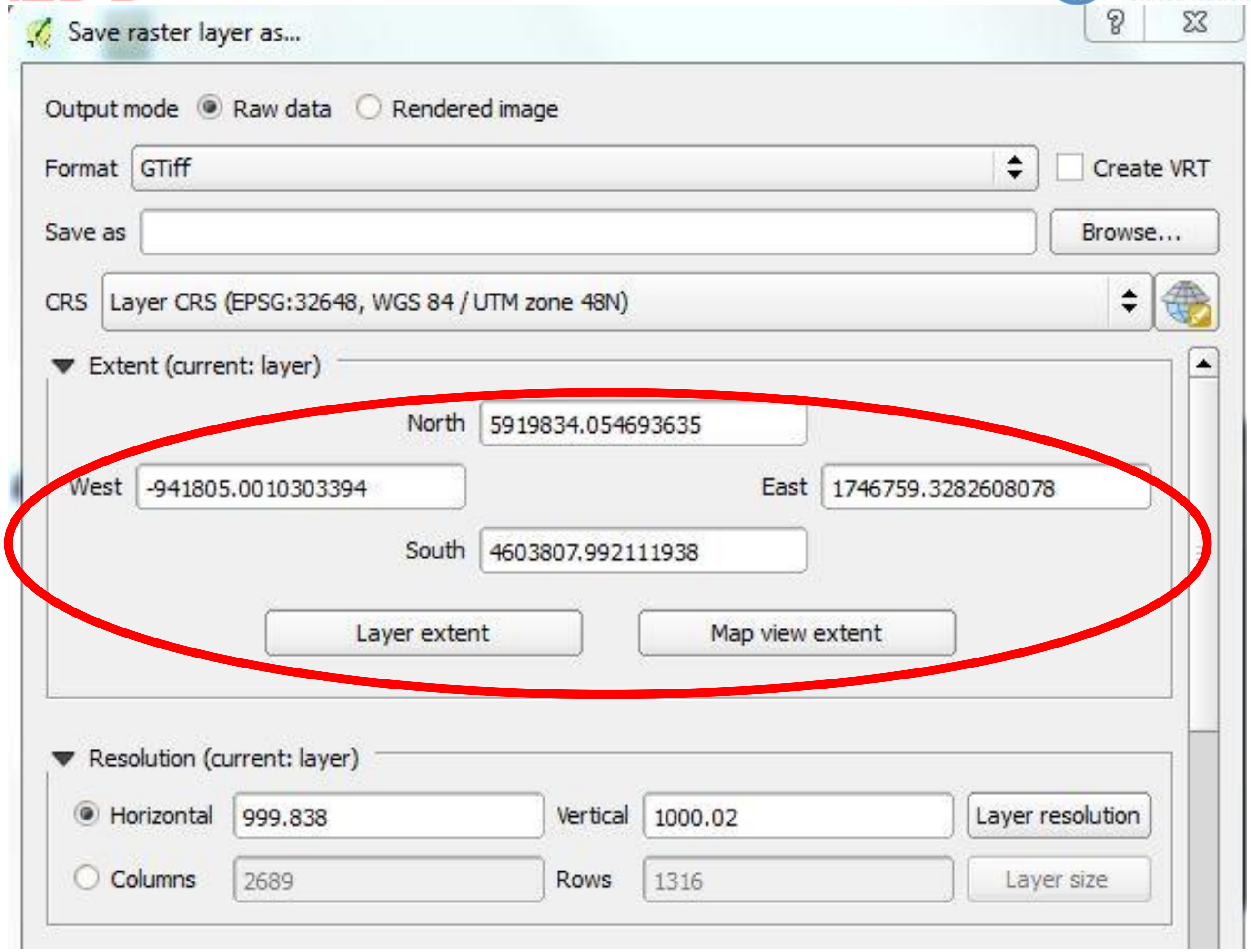
Only the layer extent is different so this is the only thing we wil need to change, copy the extent values of the Thurner layer in a text file .

PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations

UNDP Empowered lives. Resilient nations.

UNEP

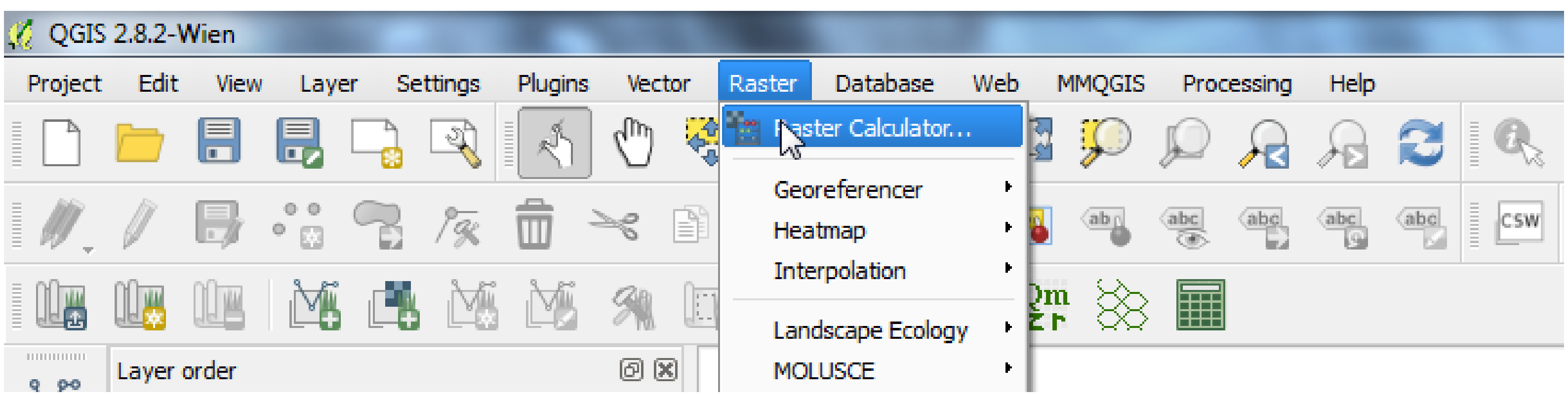


Save the Ruesch layer using the same extension of the Thuner data. Ensure that the CRS system is correct (EPSG: 32648) and that the extent we are changing is layer extent and not the map extent

Do the same for the Soil_C data.

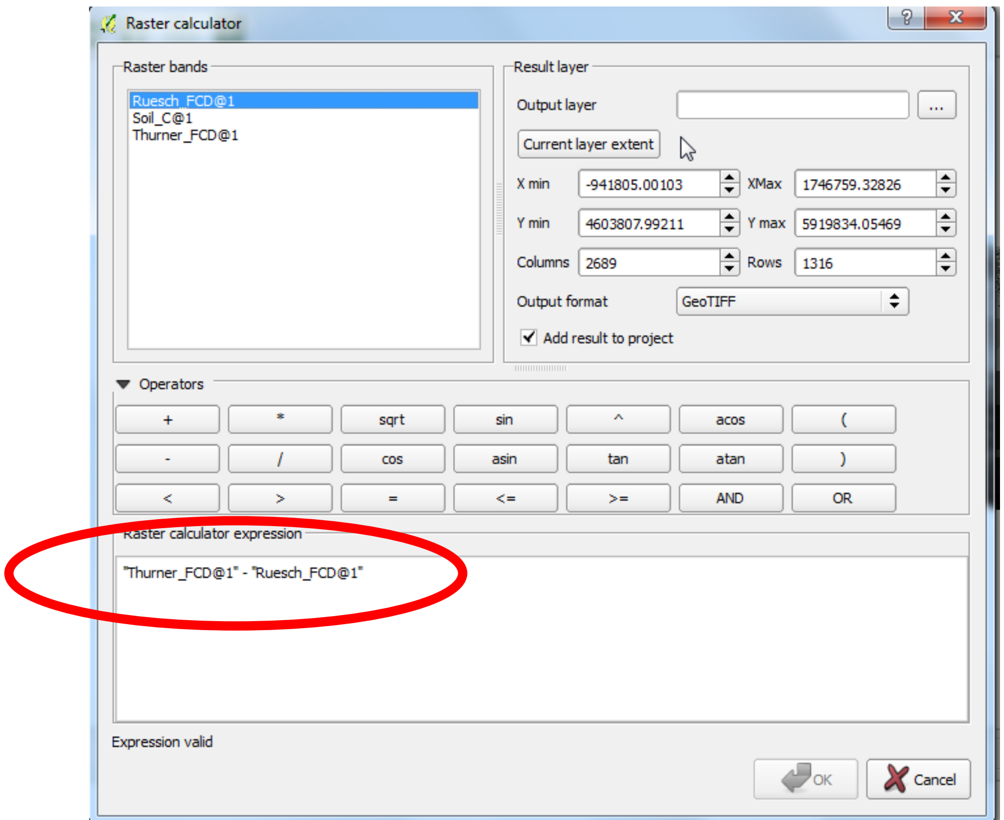
We are going to compare the carbon values estimated by Thurner et al. and Ruesch by making a difference map and graphically see where these estimations agree and disagree.

Go to Raster > Raster Calculator

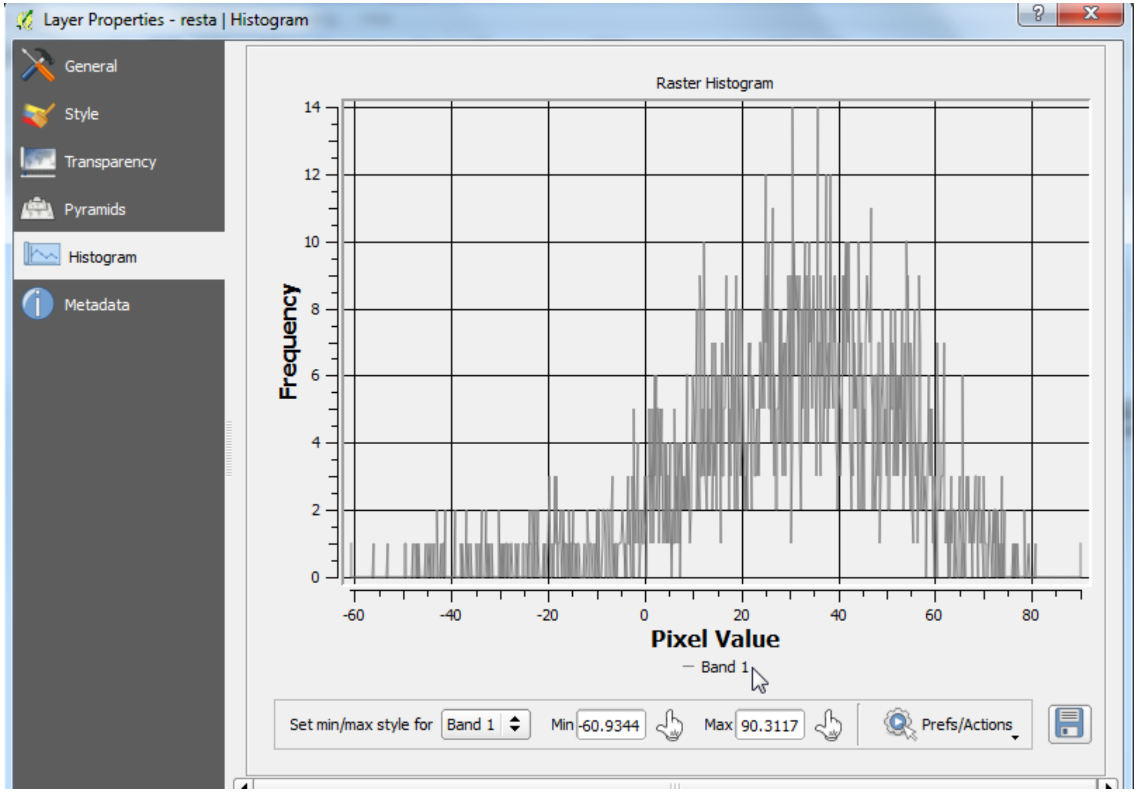


We are going to substract one layer to the other, in order to graphically and spatially explore the level of agreement of the between both datasets.

We are going to substract Ruesch to Thurner.



When done, right click on the resulting file go to Properties > Histogram. Click on compute histogram.



QGIS will compute a graphical representation of the distribution of the values.

PROGRAMME ONU-REDD

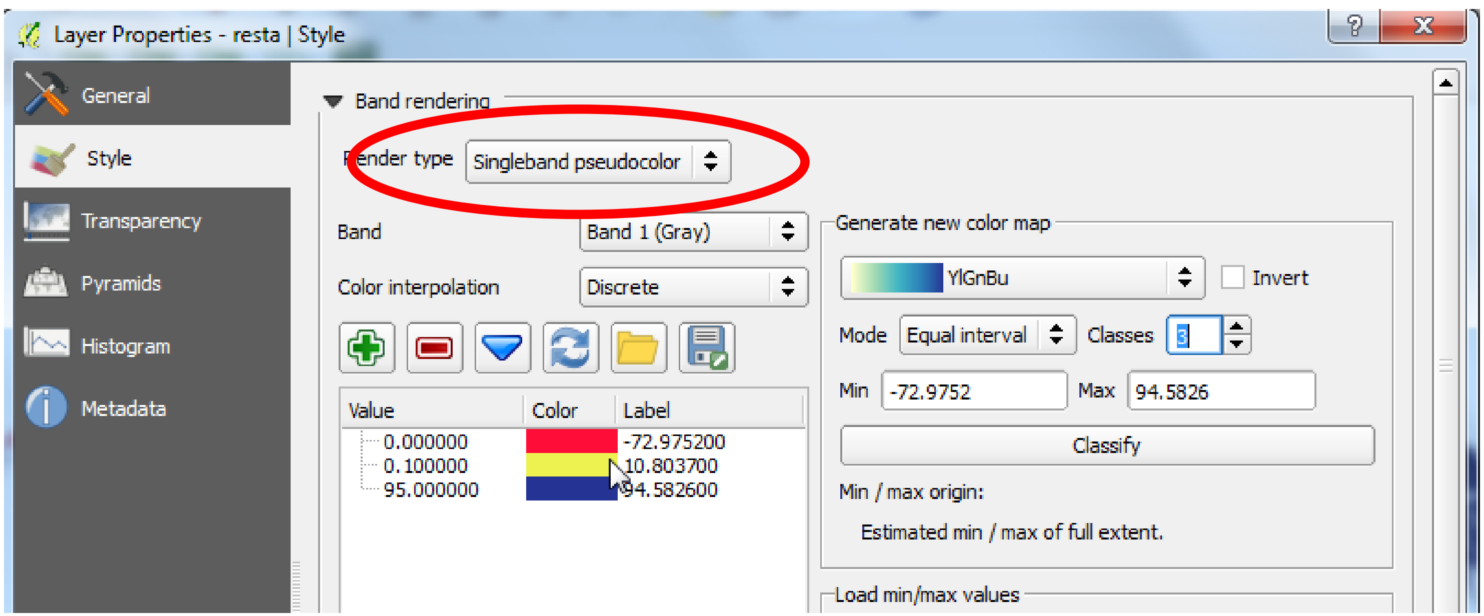
Food and Agriculture Organization of the United Nations

UNDP Empowered lives. Resilient nations.

UNEP

We are now going to represent this graphically. Change the symbology of the layer to represent negative values in red, neutral in yellow, and positive, in blue. In this way, we will be able to see where are the areas for which Thurner estimates higher or lower carbon than Ruesch.

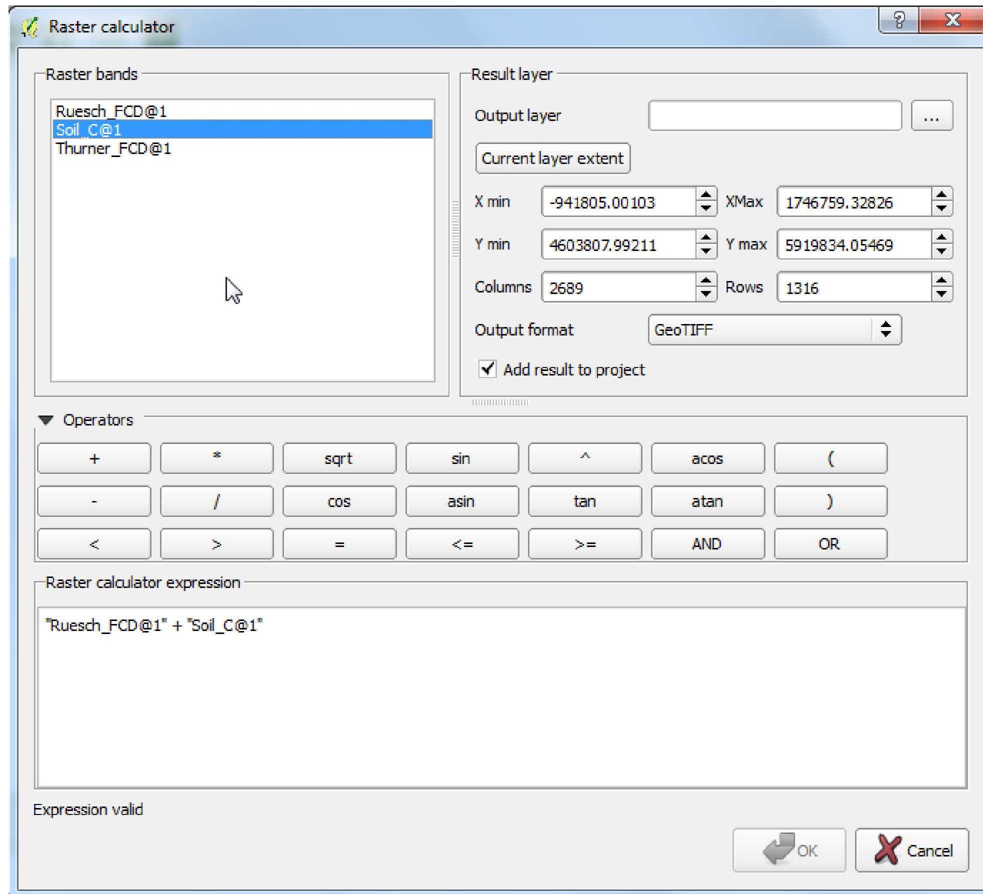
Right click on the layer go to Properties > Style



We are now going to use Raster Calculator to produce a combined Carbon map for Mongolia, by combining biomass and soil carbon

Open Raster Calculator

The combined map will have estimation for both soil and living biomass



Let's Make our own Carbon Map

The simplest approach to derive a carbon stock map is to assign a single value (or a range of values) to each of a number of land cover, vegetation type, or other thematic map classes (Stratify and Multiply Approach)

These thematic class areas are then multiplied by the assigned values to estimate total carbon stock values

We are now going to produce a carbon map for Mongolia using the default values of IPCC.

PROGRAMME
ONU-REDD

Food and Agriculture Organization of the United Nations

UN DP
Empowered lives. Resilient nations.

UNEP

COUNT: Number of pixels within each class
MEAN: Mean pixel value within each class

Attribute table - Zonal statistics :: Features total: 7, filtered: 7, selected: 0

	GROUPID	GROUPENG	_min	_max	_sum	_count	_mean	_std	_unique	_range
0	7	Other soils and b...	7.787300	152.080795	1780644.750000	50608.000000	35.185045	25.904836	110.000000	144.293495
1	6	Saline soil	7.787300	124.113503	729572.312500	24200.000000	30.147616	16.497452	71.000000	116.326202
2	5	Piparian soil	10.512000	152.080795	1706160.375000	28364.000000	60.152319	33.191984	96.000000	141.568795
3	4	Soil of humid areas	7.787300	152.080795	3430574.250000	45126.000000	76.022121	34.558511	100.000000	144.293495
4	3	Soil of steppe val...	6.765700	151.316193	21221818.000000	633145.000000	33.518101	22.997048	151.000000	144.550493
5	2	Low mountains a...	7.787300	152.080795	11061797.000000	267846.000000	41.299094	23.010255	136.000000	144.293495
6	1	Mountain soil	7.787300	152.080795	34454616.000000	520821.000000	66.154429	33.708623	158.000000	144.293495

PROGRAMME ONU-REDD

Now, we want to explore how carbon is distributed among different land categories through different methods.

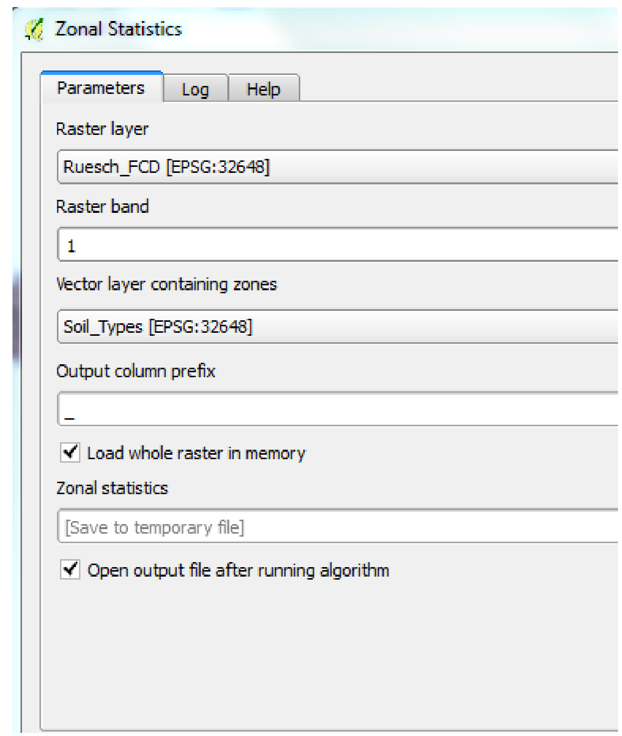
The **Zonal statistics** algorithm produces statistics for raster layers based on a zonal polygon layer. For example, you can generate statistics of forest cover (raster layer) within protected areas (vector polygon zones layer).

Open *Zonal Statistics* in the *Processing Toolbox*

First, we are going to explore the relationship between Soil C and soil types;

Choose Ruesch_VCD as a raster Layer and Soil_Types as a vector file

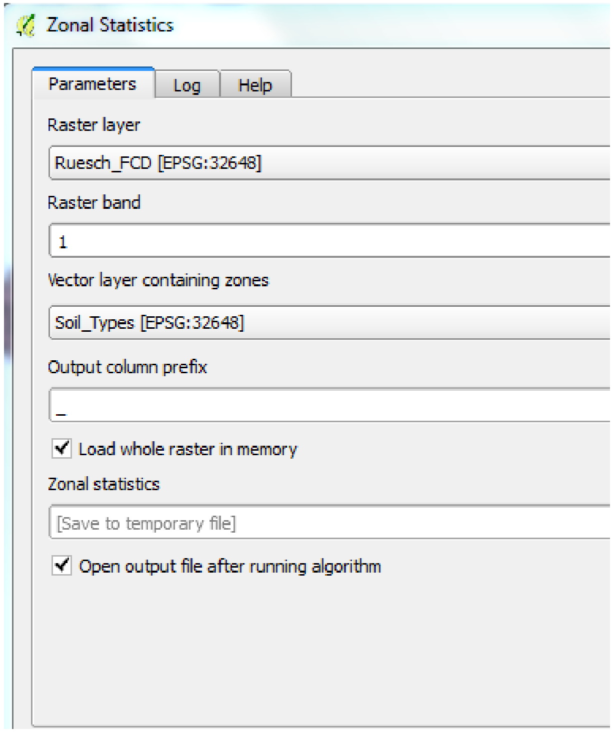
Click run.



Now, we want to explore how carbon is distributed among different land categories through different methods.

The **Zonal statistics** algorithm produces statistics for raster layers based on a zonal polygon layer. For example, you can generate statistics of forest cover (raster layer) within protected areas (vector polygon zones layer).

Open *Zonal Statistics* in the *Processing Toolbox*



First, we are going to explore the relationship between Soil C and soil types;

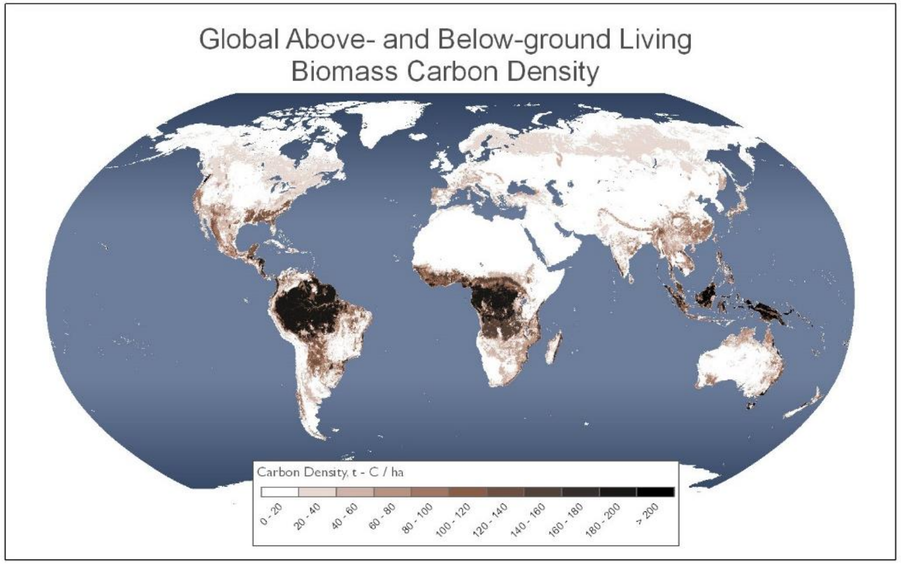
Choose Ruesch_VCD as a raster Layer and Soil_Types as a vector file

Click run.

ANCILLIARY CARBON MAPS

Ruesch & Gibbs. 2008

- Global Biomass Carbon Map For the Year 2000
- Above and belowground living vegetation for all land cover types.
- Based on IPCC Tier-1 methodology.



PROGRAMME ONU-REDD

Food and Agriculture Organization of the United Nations

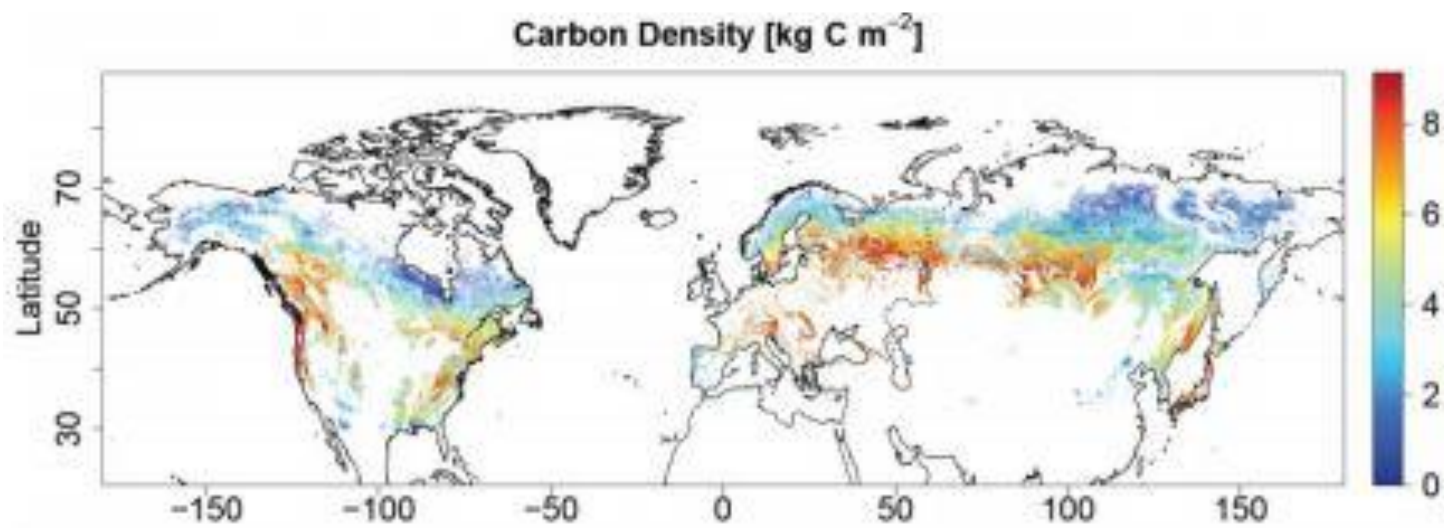
UNDP Empowered lives. Resilient nations.

UNEP

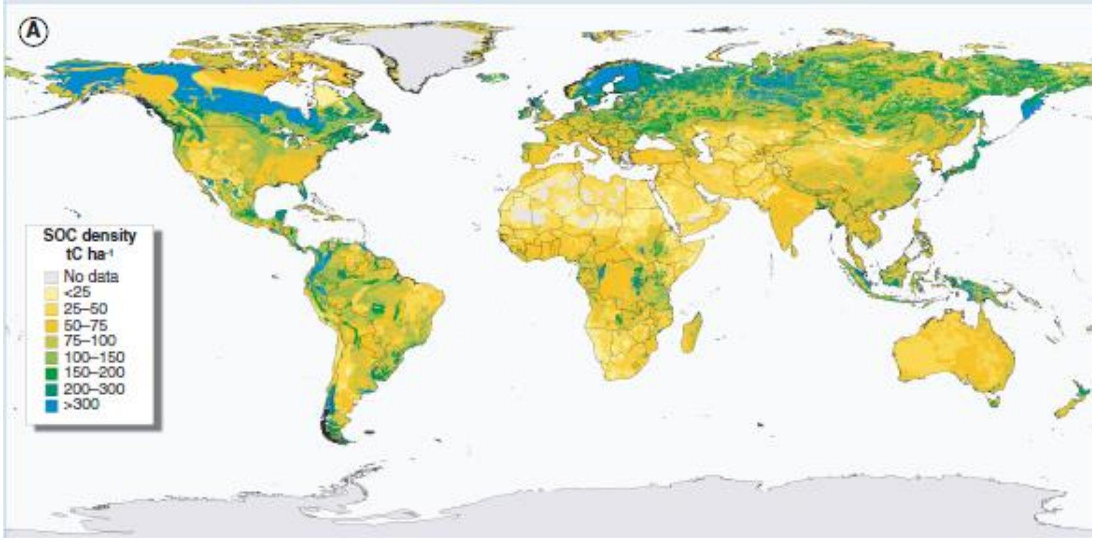
ANCILLIARY CARBON MAPS

Thurner et al. 2014

- Carbon Density Map for Temperate and Boreal Forests of the world
- Above and belowground living vegetation, but only for forest habitats.
- Based on the combination of Radar remote sensing data and field measurements.



ANCILLIARY CARBON MAPS



DISCUSSION

What carbon data is available for Mongolia?

Review global datasets and explore its spatial distribution among different land cover types.