

Exercise 3

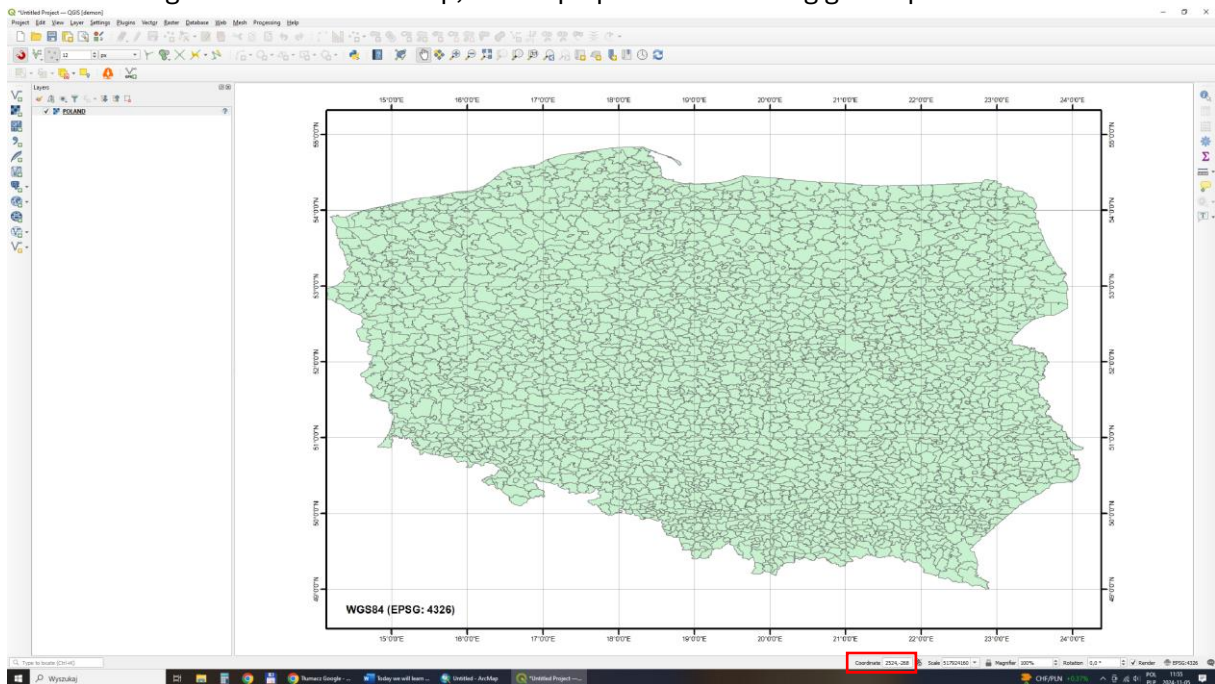
Topic: map calibration (georeferencing raster files), data conversion between coordinate systems

Today we will learn how to adapt raster data (scanned maps, map graphics) for further work in QGIS. We will give them a spatial reference, so that when they are superimposed on the vector layer we have, they will become a source of information for us, as well as a basis for further activities.

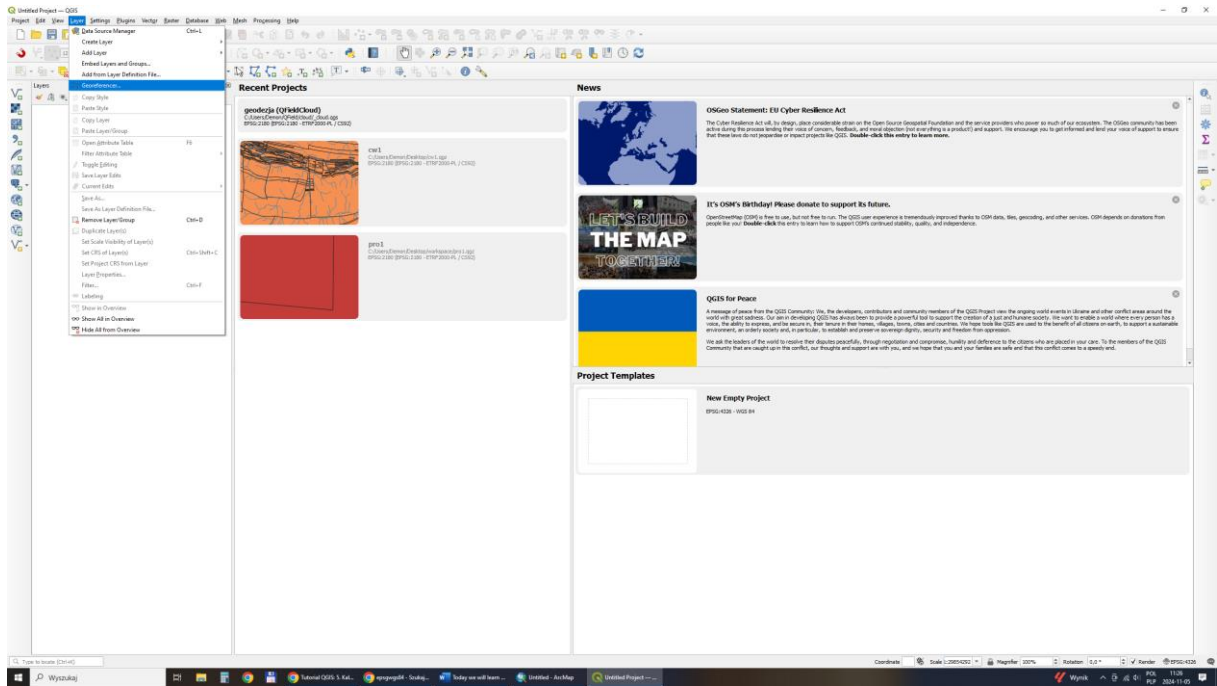
Once we have acquired an image (map) containing information that is important to us and have downloaded it in QGIS, it is time to adjust it accordingly. In the previous tutorial, despite reading the raster layer correctly, we noticed that it does not overlap the boundaries of our layer of Polish municipalities.

It is at this point that we need to perform calibration. To explain, calibrating a raster map is simply the process of giving the map a georeference while simultaneously removing geometric raster distortions.

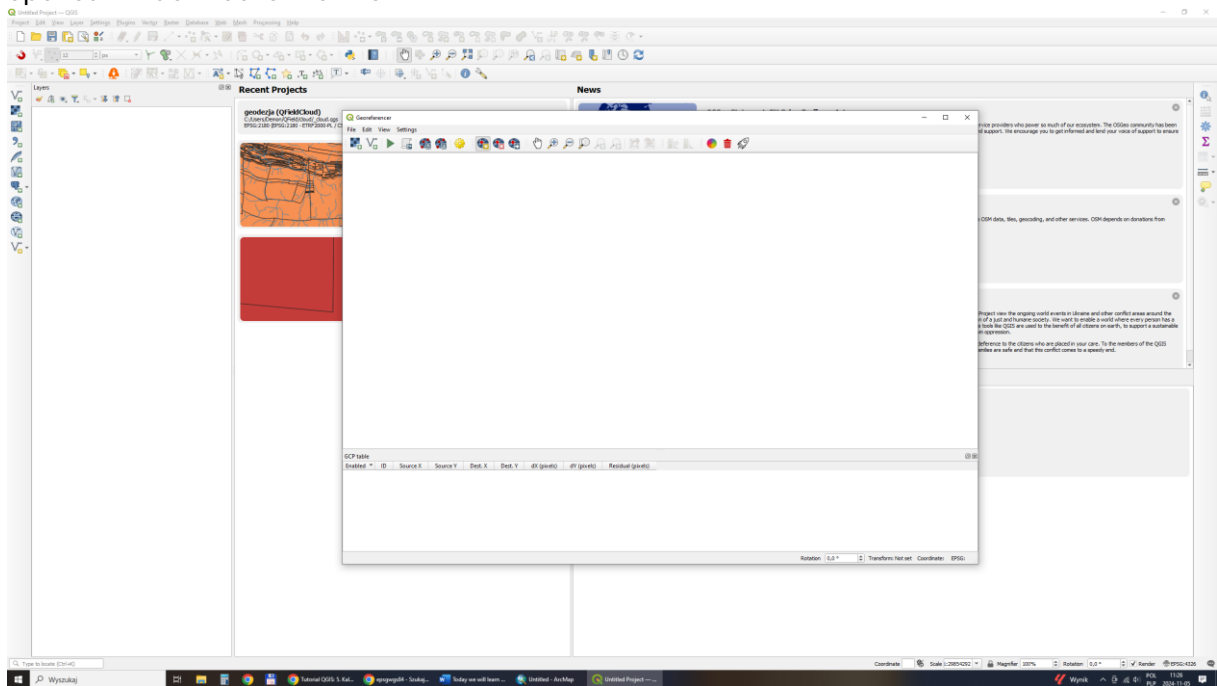
When loading a non-calibrated map, the map opens in the wrong global position.



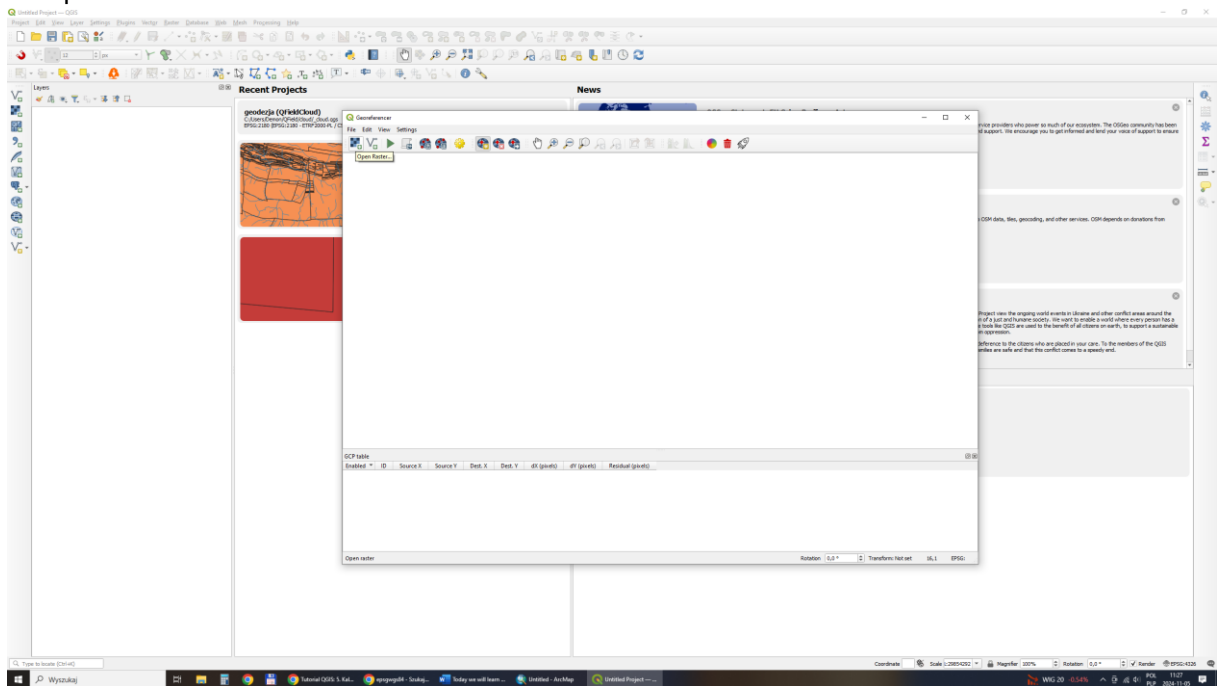
We perform the calibration process in the Georeferencer window by selecting this option from the menu bar:



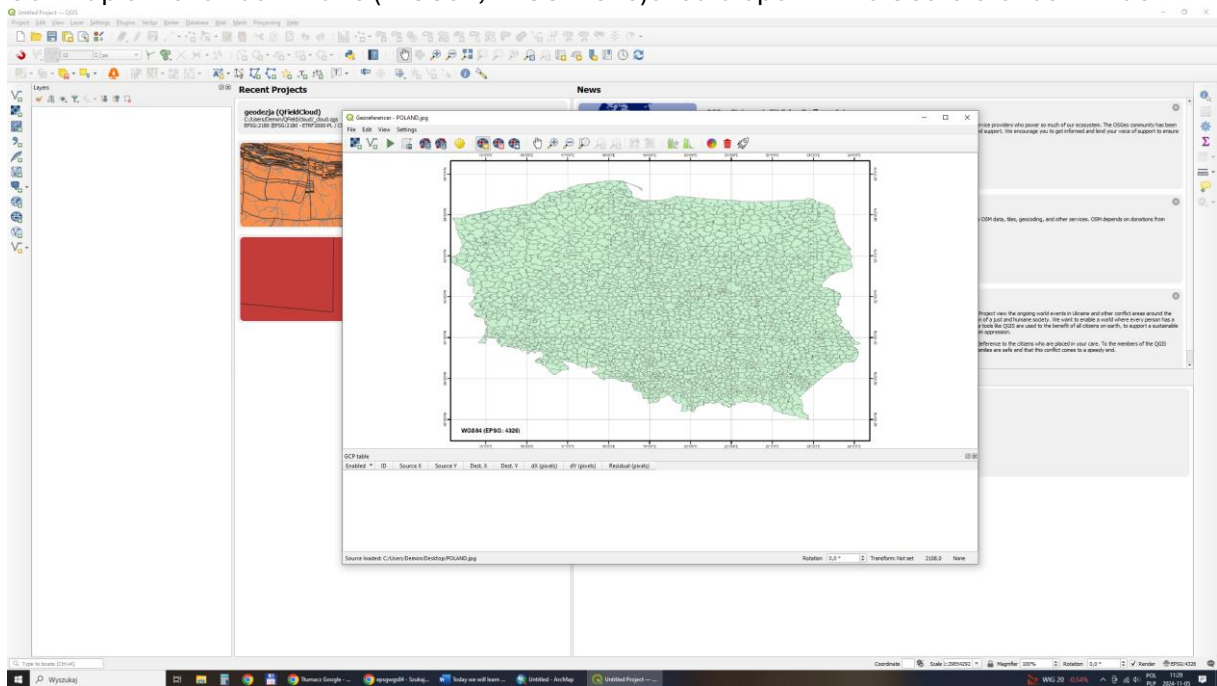
Then a new dialog box opens for us, in which we will perform the calibration process. The newly opened window looks like this:



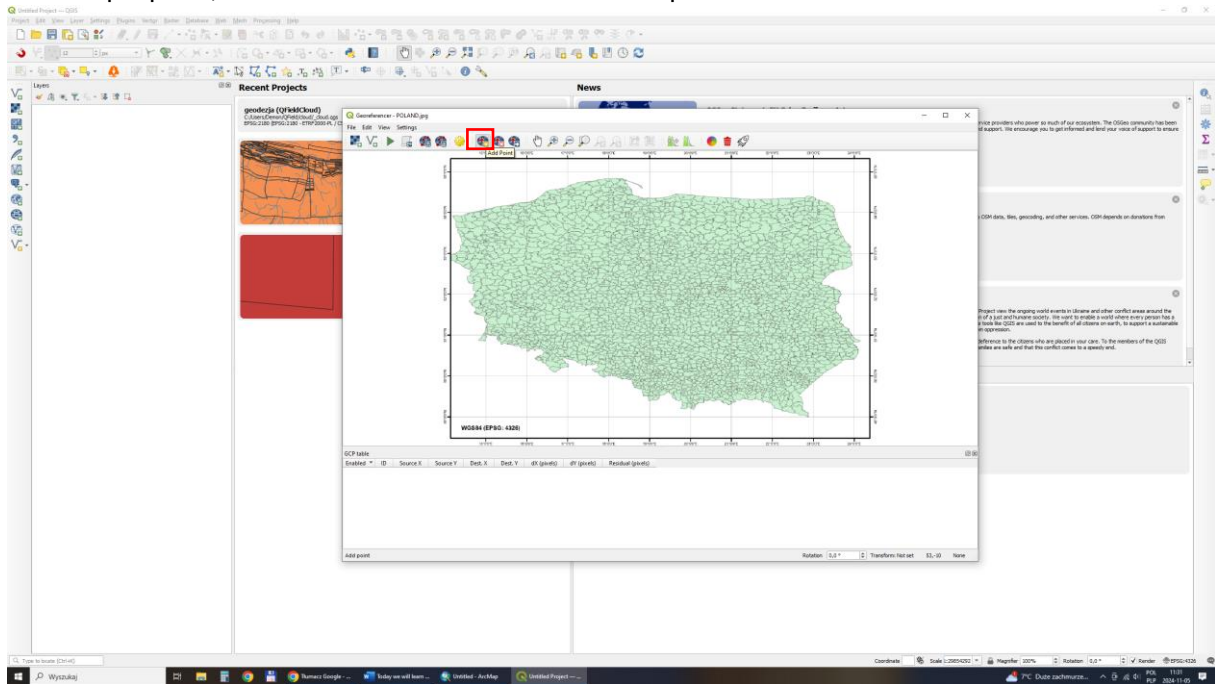
Using the first icon "Open raster" we select the image again, indicating its location on our computer's disk.



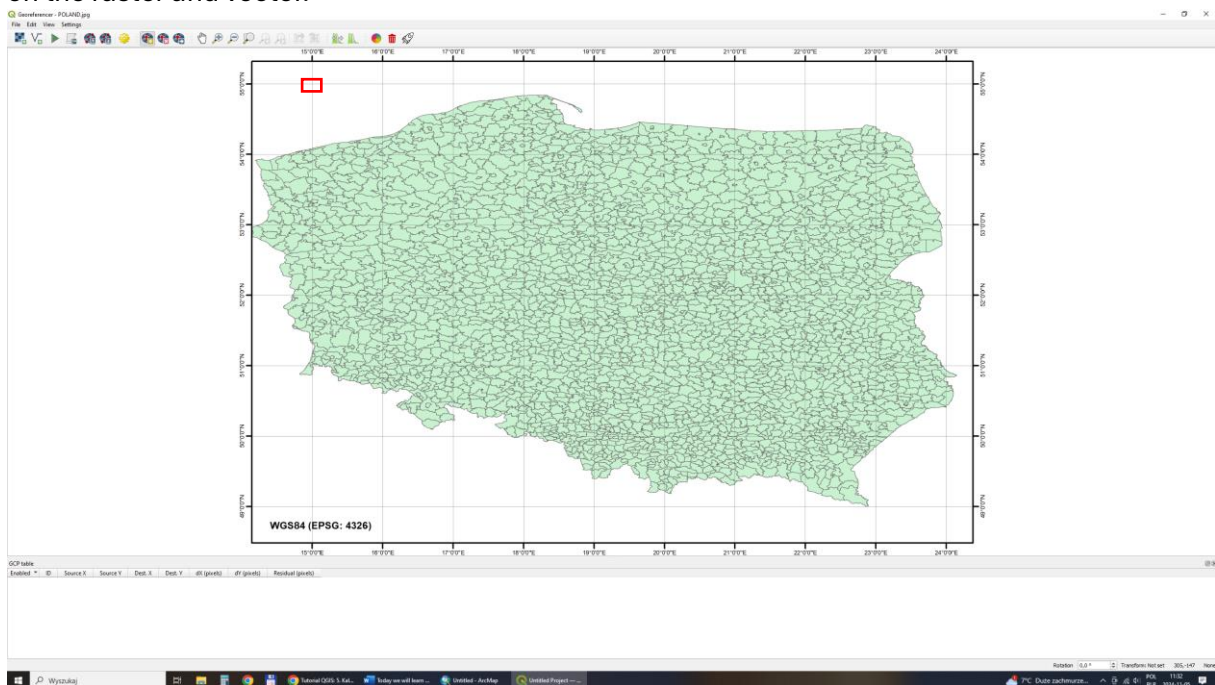
Our map of Polish commune (WGS84, EPSG: 4326) should open in the Georeferencer window:



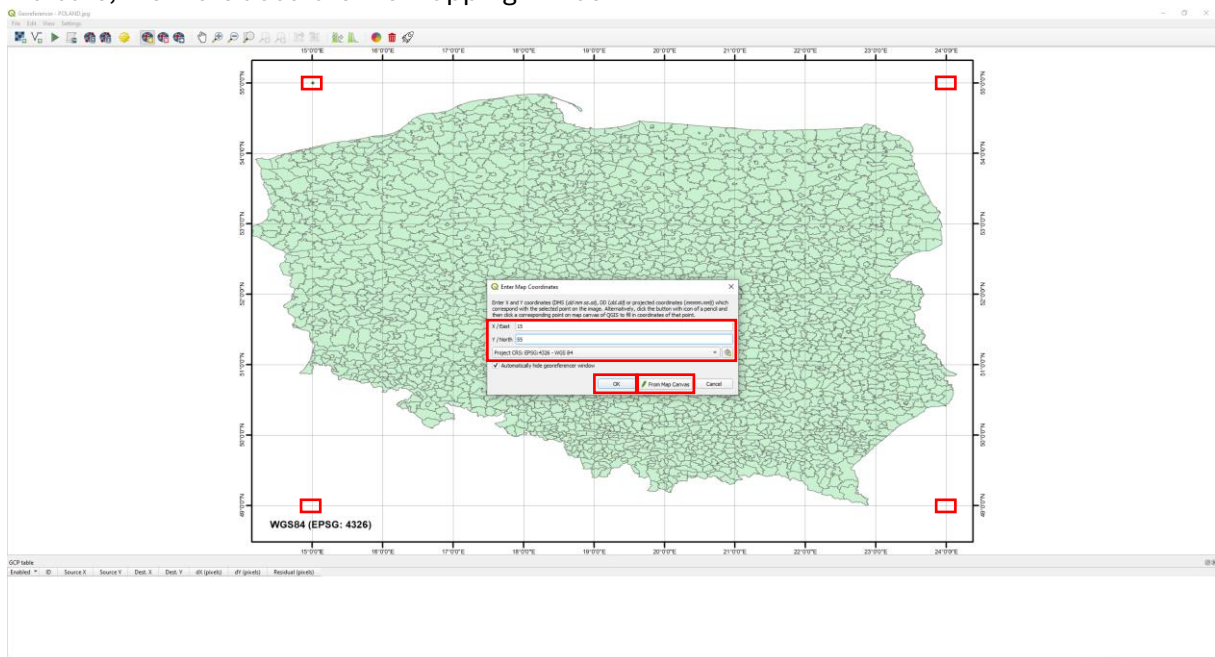
Now we move on to calibrating the raster, i.e. we will indicate points on the image and corresponding points on our vector map. It is important to select characteristic places, these can be, for example, sharp breaks in the border, clear protrusions, intersections of the geographic grid. For this purpose, we will use the toolbar to add more points:



After indicating a point on our raster, we get a return window, where we can indicate the point manually by clicking an identical place on the vector layer. We also have the option of entering coordinates, if we have such information. We will click through subsequent corresponding points on the raster and vector.

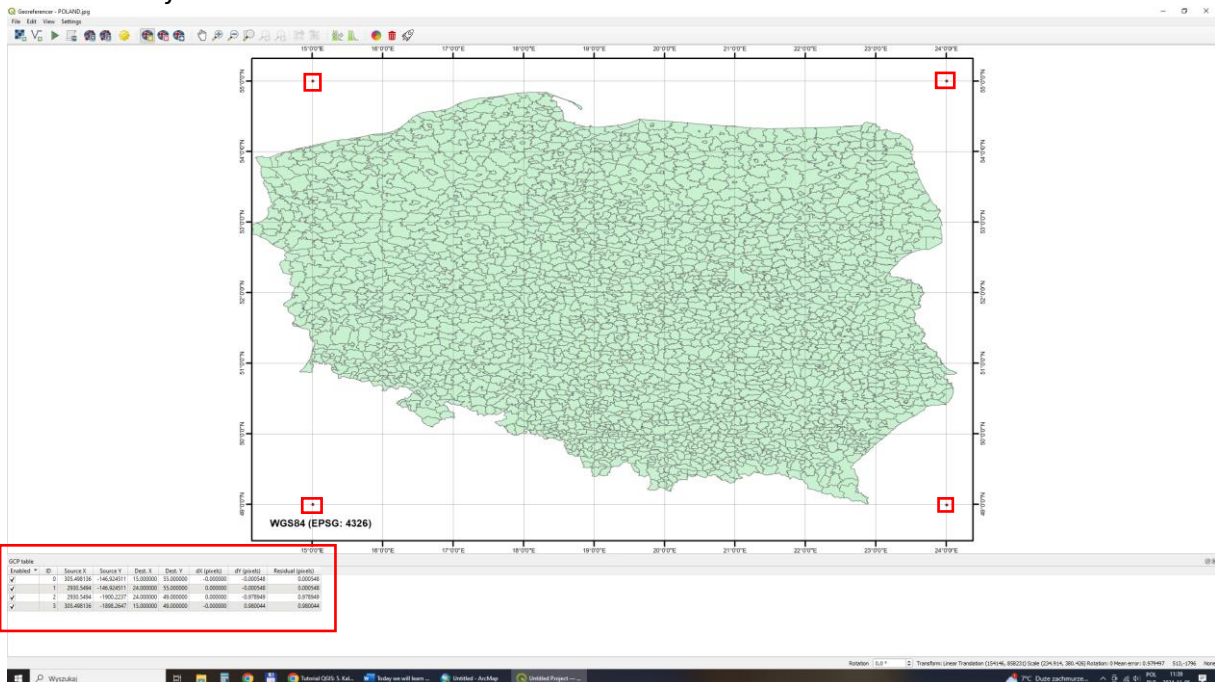


The raster can be freely enlarged, so that the indicated points are determined with the greatest possible accuracy. Additionally, the points should be distributed (at least) on 4 opposite edges, so that the stretched raster is as little distorted as possible. It is obvious that the more points we indicate, the more accurate the mapping will be.

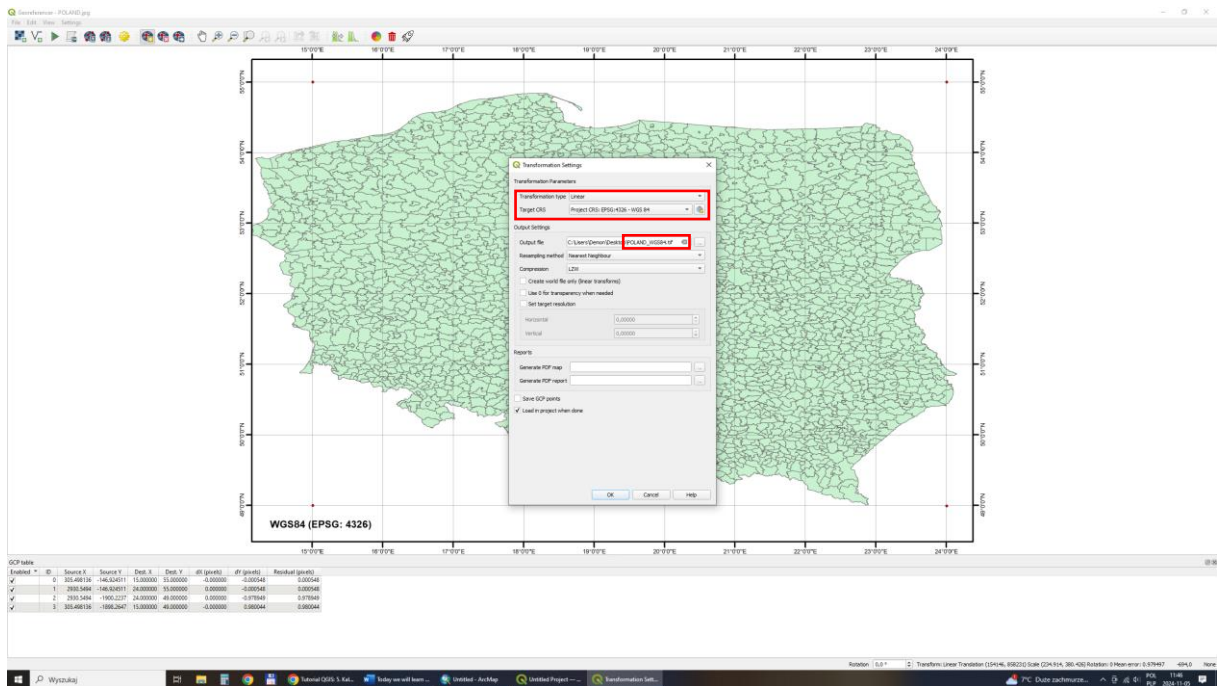
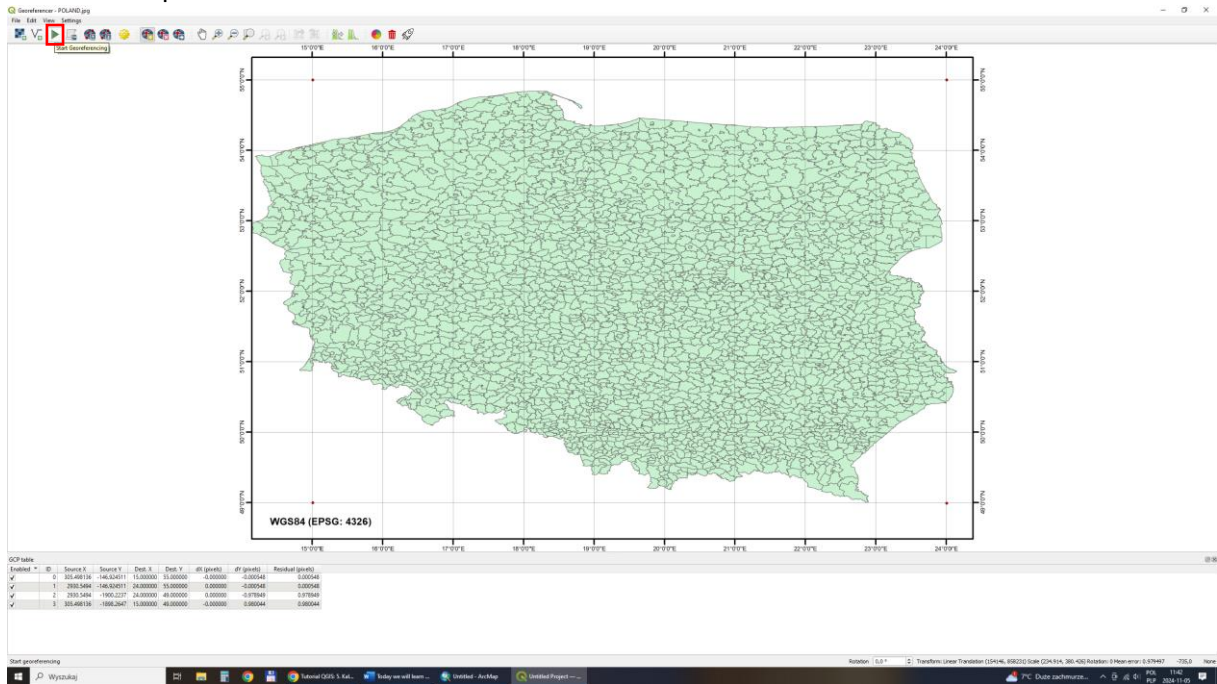


The From Map Canvas function allows you to automatically indicate coordinates from read vector or raster data (both types of data should be correctly georeferenced).

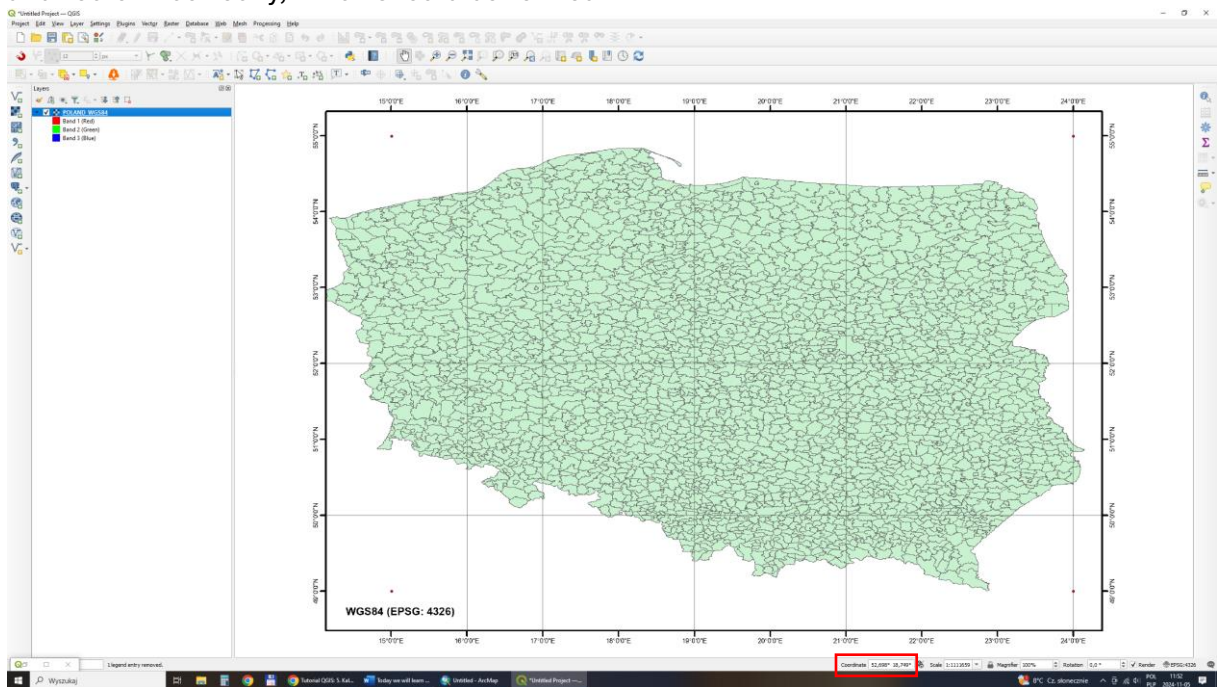
We have added 4 control points, which are displayed in a table at the bottom of the Referencer window. Ground control points (GCP) are selected locations on the calibrated map, on which the program will base the transformation, aiming to fit them into the indicated locations in the coordinate system.



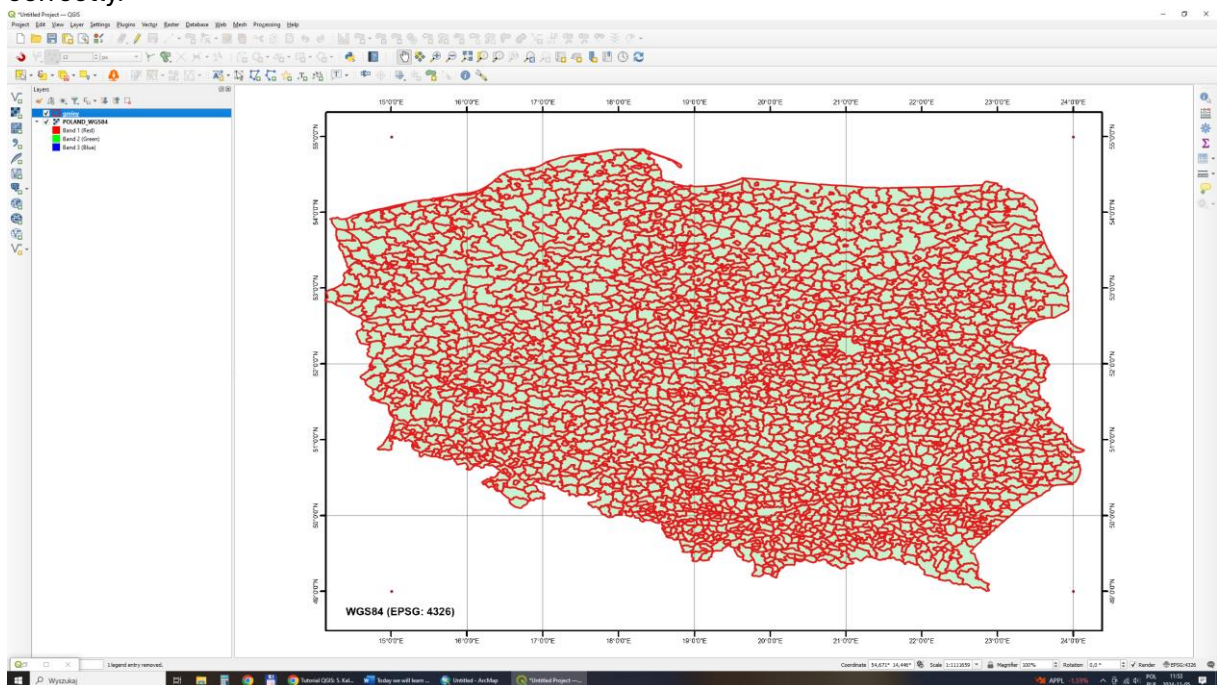
Of course, the points can be freely modified or completely removed. Once we decide that the points we have added are indicated correctly and we have the required number of them, we select the "Start georeferencing" option. We indicate the transformation mode (we decide on linear) and indicate the place where the calibrated raster is saved on the disk.



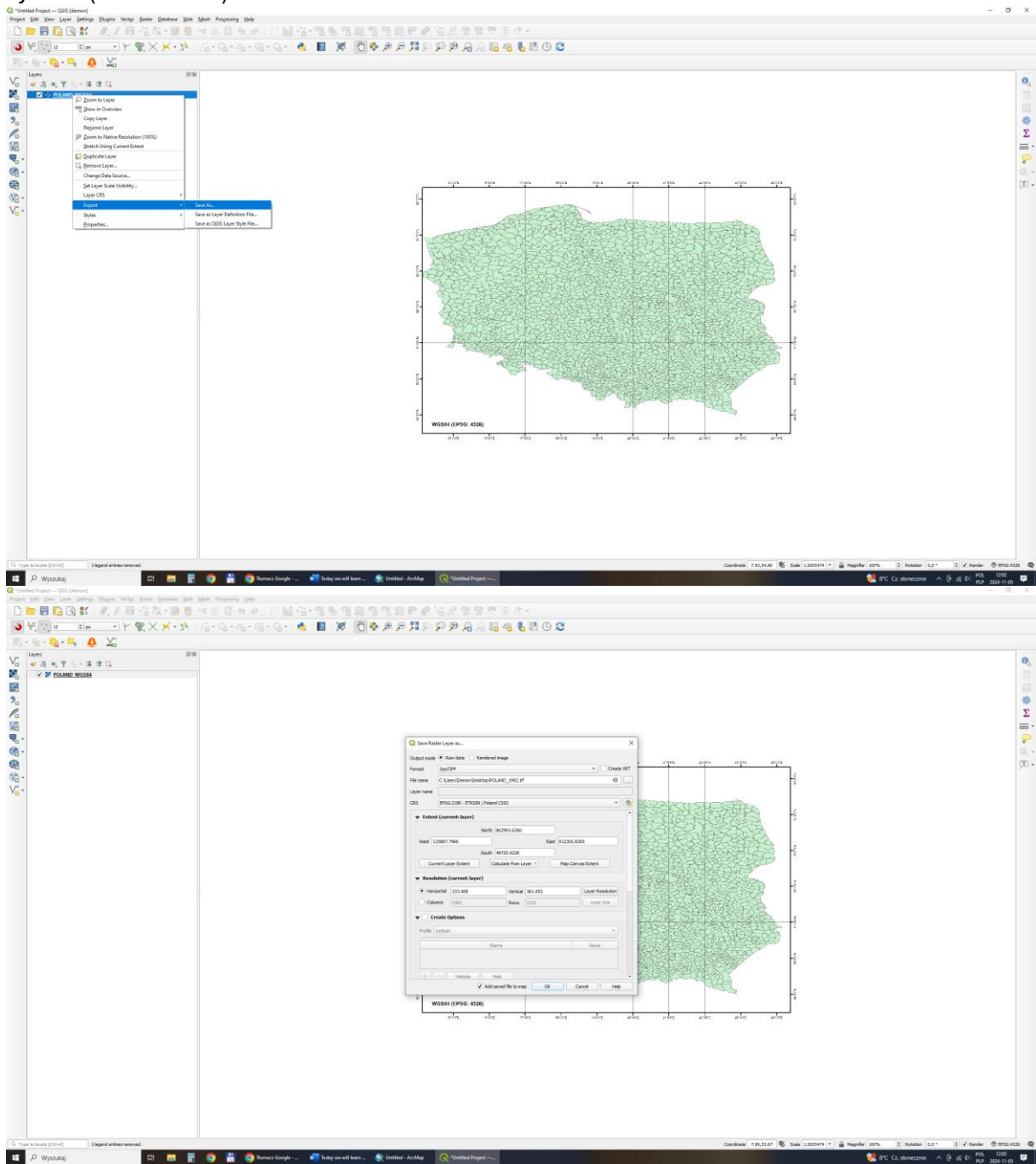
We can see changes in the GCP control points table, where we received information about the transformation. If the values are too high, it is a sign that we have indicated the point on the raster and vector incorrectly, which should be verified.



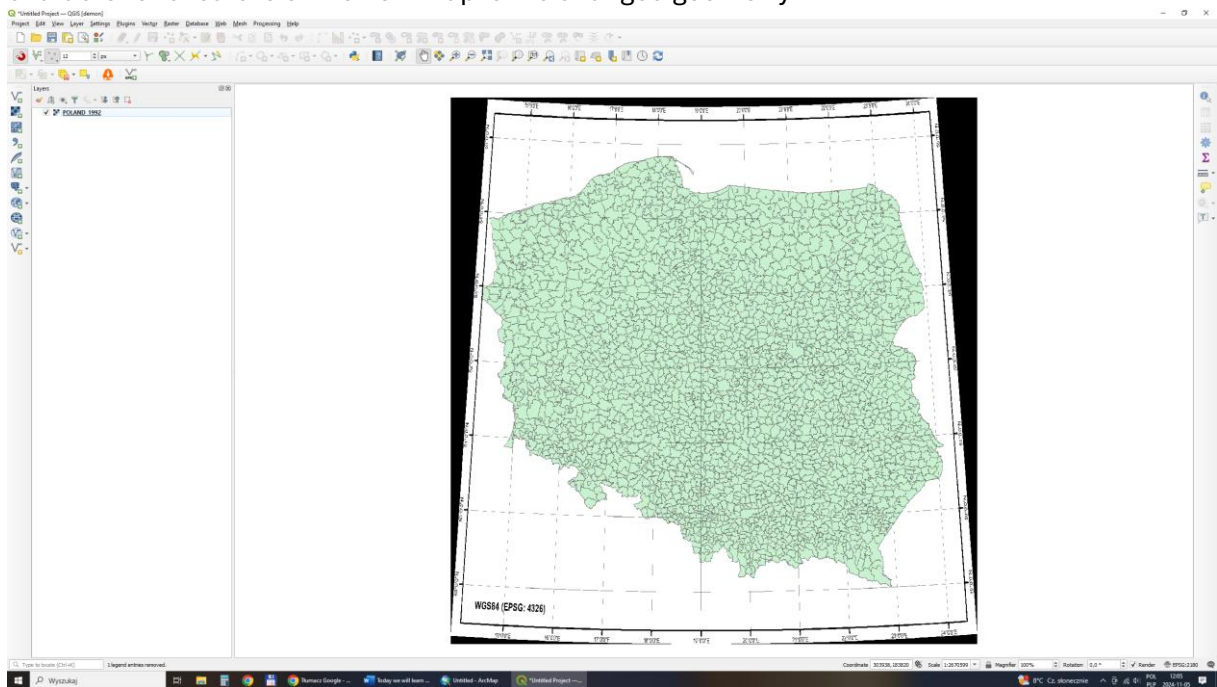
Now let's check whether we have performed the calibration process correctly - let's read the raster modified by us in the QGIS window. To prove to you that the boundaries of the vector layer fully match the calibrated raster, we will show them to you with the raster transparency set. If you have achieved the effect shown below, you can be sure that you have performed the calibration correctly.



The next step is to convert the map from the WGS84 coordinate system to the 1992 coordinate system (EPSG: 2180).



As a result of these actions we get a new file (POLAND_1992.tif) in a new coordinate system. The characteristic feature of the new map is the changed geometry.



Changing the coordinate system in the lower right corner only gives an apparent change in the coordinate transformation, the change is only visual and temporary.

Homework: calibrate the map of Poland's regions to the 1992 system using the sent vector data (regions_1992). The map should be calibrated to at least 15 points. Please send the calibrated map and a screenshot of the control point table received during calibration.