

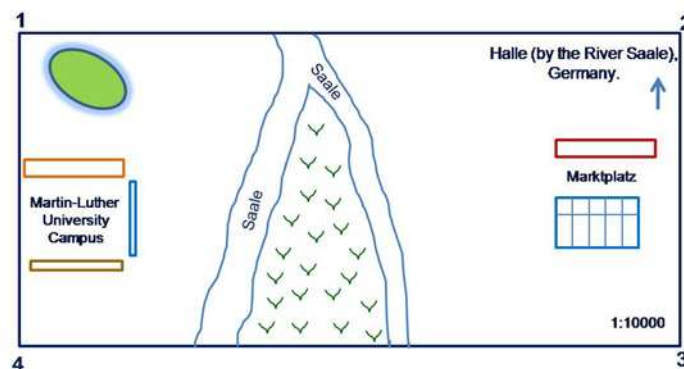
## How to Georeference an Image in ArcGIS

In this tutorial we will Georeference an Image in ArcGIS. The following is the image of the beautiful city of Halle (by the River Saale) in Germany. Let's say we have the coordinates of four points (marked as 1, 2, 3, and 4) in Universal Transverse Mercator or in other words, the UTM Coordinate System.

We will first **georeference** it in UTM Coordinate System, and then **transform** the georeferenced image into Germany Zone 4 Coordinate System. You can play with this image to get used to georeferencing, and then work with your serious-type image. ☺

So below are our Image of City Halle and the coordinate points of four corners. Please note that the coordinates are not very accurate. But don't bother about it. One good thing will be if you first go through the tutorial just reading it, and then set yourself to start georeferencing.

In simple words, Georeferencing means you just set or register your image with its real-world coordinates in GIS. That's it.



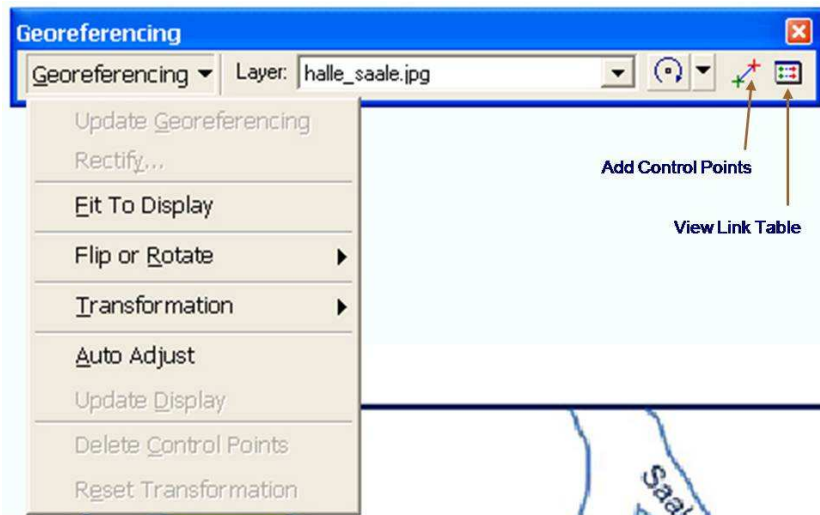
So above is the image of Halle (right click on the image > Save Picture As, save the image in your tutorial folder). Now get the coordinates of four corners.


Points	X- coord	Y-coord
1	703612,64	5708608,45
2	706706,50	5708722,54
3	706730,40	5706993,69
4	703682,88	5706854,27

Open ArcMap selecting a new empty map option.

Let's first add the Georeferencing tool bar:

View > Toolbars > Georeferencing. The Georeferencing toolbar will pop up.



Now add your image to ArcMap by using the 'Add Data' button . A small window of 'Unknown Spatial Reference' will pop-up. Just click OK. If you are asked to 'build pyramids' – say yes.

Now from your Georeferencing toolbar switch OFF 'Auto Adjust'.

Right mouse click on the Layers > Properties. The 'Data Frame Properties' window will open. Here you will select your Coordinate System to define the type of projection you would like to use. Click on the 'Coordinate System' tab > Predefined > Projected Coordinate Systems > UTM > WGS 1984 > WGS 1984 UTM Zone 32N. Click OK to close the window.

Now you will see on your status bar below, the unit has changed to Meters. Before it was showing you Unknown Units.

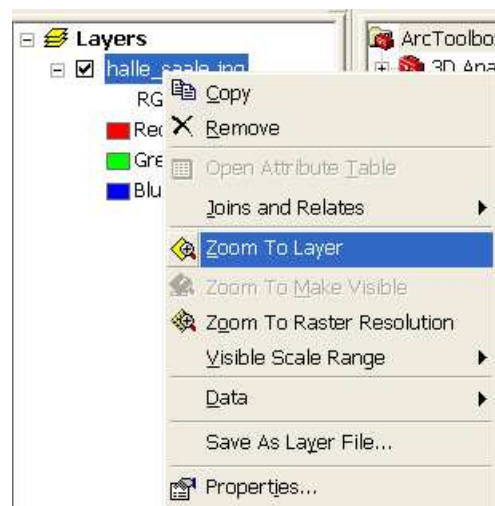
From the Georeferencing toolbar select the 'Add Control Points' icon.

Now click on any known point on the image (a cross mark will appear), right mouse click > Input X and Y. Enter Coordinates window will open. Now enter your X and Y coordinates here. For better accuracy, you should zoom in to your selected point so that you can see it more clearly.



Repeat this step for the rest three points (you can have even more points, e.g. you could take an additional point in the middle).

When all points are added, switch ON auto adjust. If your image suddenly disappears, don't get nervous. On the Table Of Contents click on your image layer > right mouse click > Zoom To Layer. You will have your image back.



You can check the residual error by clicking on the 'View Link Table' icon from the Georeferencing toolbar. You can delete any point that has high errors, and add the point again (however, don't forget to zoom in to the point). But most probably you will not need to do anything here. So just leave it.

Now if you find the orientation of your map satisfactory, click on Rectify from your Georeferencing toolbar. This will prompt a 'Save As' window to open. Save the georeferenced image to your desired location. You can give any name in the Name option. Let's name it halle\_saale\_2. It can take few seconds to save it.

So now you are done. You have successfully georeferenced your image in ArcGIS. Congratulations!!!

Now you are ready to move on with your other works like digitizing new features, making spatial analysis of data etc. [Before you close GIS, save all your works done till now from File > Save as. You will now save the file as ArcMap Document (\*.mxd). Choose your favorite name. But now leave it, means don't save it as \*.mxd file.].

### **Because you haven't finished our tutorial yet...**

We would like to convert the UTM coordinate system to Germany Zone 4 Coordinate System. To do this, it's better you close your ArcMap now....make coffee....enjoy the blue sky etc. etc.

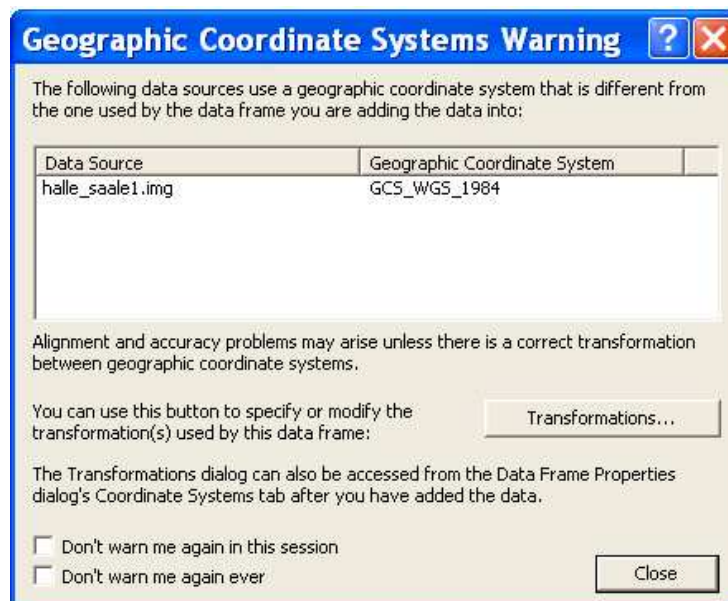
So let's guess your break is over now and your are ready to accomplish your mission.

Open ArcMap, again with a new empty map.

Click on Layers > Properties. Data Frame Properties window will open. Under Coordinate System tab > Predefined > Projected Coordinate Systems > (this time) National Grids > (scroll down until you find) Germany Zone 4. Select it, click OK.

Now you have to add your georeferenced image (the image you saved after rectifying, e.g. halle\_saale\_2). Click on 'Add Data' button, get your georeferenced image and add it. The following 'Geographic Coordinate Systems Warning' window will open.

If you click on the 'Transformations' button a new window will open that shows you from what coordinate system into what coordinate system its transforming your data. Click OK to close it. Now 'Close' the warning window.



Now your image will appear with the newly transformed Coordinate System of Germany Zone 4. Look at the status bar below, you will see a change.

However, the image we are using in this tutorial has coordinates not accurately measured, which you can see after georeferencing, that it's not perfectly aligned in your GIS window. Don't bother – this is just a tutorial. You will make your own image perfectly accurate. Okayyyyy... ☺.

Don't forget to save this work. Go to File > Save as > (now save your work with a new name as) ArcMap Document (\*.mxd).

Many of you would like to use Google Earth for instances like, let's say for a presentation, so you can easily get your map from the Google Earth and Georeference it in ArcMap. In Google Earth, click on Tools > Options. In 3D View you can choose your latitude and longitude either in degrees or in Universal Transverse Mercator (UTM), and then go on georeferencing it in ArcGIS. So we are done.

One more thing: You are highly welcome to participate and contribute to our ArcGIS forum: [www.shamskm.com/forum](http://www.shamskm.com/forum)

One more thing (part 2): you can see the world UTM grid zones here:

<http://www.dmap.co.uk/utmworld.htm>

You can also download the PDF version here.

Have a Great Day my friend.

Yours,

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Halle, *and* Clausthal-Zellerfeld\*

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[www.shamskm.com](http://www.shamskm.com)

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