How To: Make a map displaying party support using ArcMap 9.3

This paper aims at providing a useful step-by-step guide on how to display party support and related variables graphically in a shapefile using ArcMap 9.3. As a practical illustration of the procedure the paper will make use of an explicit example, namely by looking at party support in every Danish polling district[1] at the Danish National Election held on November 13th 2007. The paper is organized in five different parts. The first two entail the preparation for the subsequent display of party support in ArcMap (the third part), whereas the fourth and fifth part involve the refinement of the final map and a demonstration of the procedure for exporting a map into another and more compatible file format such as JPEG.

1) Getting election data ready to import into ArcMap

First thing to do, whenever you want to display one or more variables from a standalone table (i.e. a table without a direct geographic representation attached) in a shapefile, is to import/ add this external table data into ArcMap. For this to happen, your data (be it in Excel, SPSS, Stata or any other data file format), must first be converted into an ArcMap-friendly file format. The dBase IV-file format is a good choice. By utilizing the software StatTransfer this conversion operation is quite an easy task to perform. Having converted your table data into dBase-file format, you are now ready to launch ArcMap and add both the relevant shapefile, on which you want to display the results of your analysis, and the dBase-file containing the data you want to have displayed.

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[1] Of which there were 1645 in total.

2) Adding party support data into ArcMap and joining it to a relevant geographic boundary file

Now, open ArcMap version 9.3 (or possibly an earlier version) and choose to start with a new empty map. Then add to the empty data frame the necessary layer-file/shapefile and table data that are to be used for a display of party specific support as mentioned just above. In this case we want a shapefile containing the 1645 Danish polling districts with the geographic location they had on election day, November 13th 2007. We also want to add the newly made dBase IV-file containing the data on party specific support including logit-transformed vote percentages for every party that ran for this election. To add these data to the empty map you can either click on the "Add Data"-option in the "File"-drop bar in the menu bar at the top of the screen or simply by pressing the "Add Data"-icon (depicting a black addition sign on top of a yellow tilted square) positioned right above the main panel, see figure 1 below.

Figure 1: Data View containing the shapefile of the 1645 Danish polling districts on election day, November 13th 2007
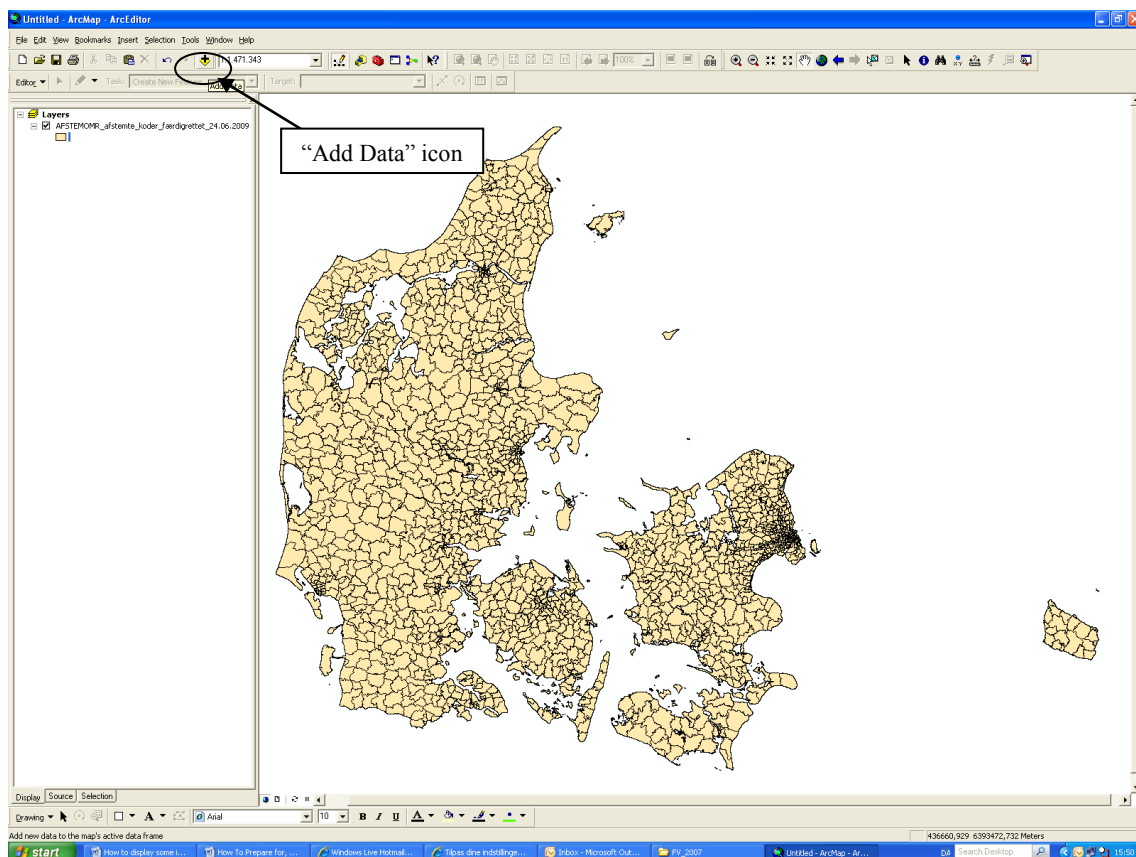
Either way, when clicking "Add data", the "Add Data"-window pops up, see figure 2 below.

Figure 2: The "Add Data"-window
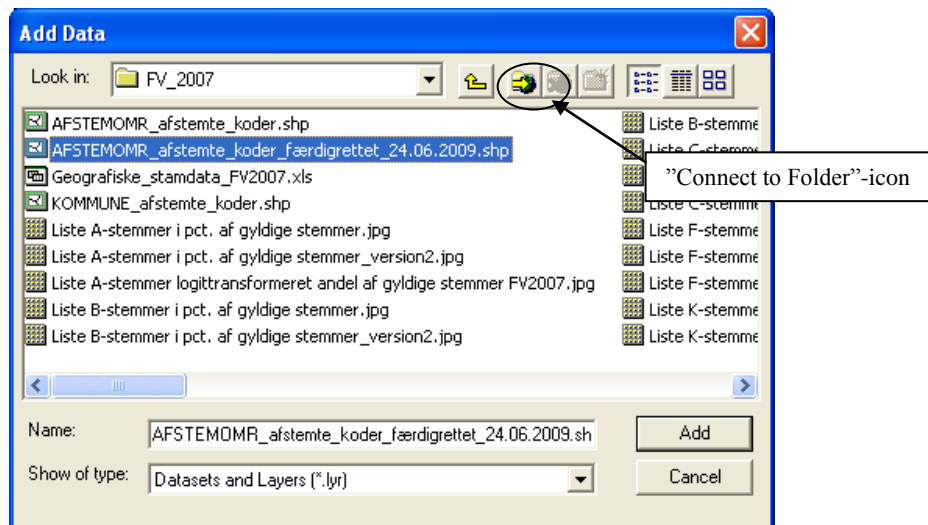
You must now navigate to the relevant folder(s) where the layer-file(s)/shapefile(s) and dBase-file(s) of interest are located. If the relevant drive (e.g. the O-drive) from where you need to pick your data is not readily accessible, you will need to establish a connection to this drive in the program's file ordering system. This is done by first clicking the "Connect To Folder"-icon in the "Add data" pop-up window (depicting a yellow arrow pointing to a globe) and next by choosing the appropriate drive and folder (in this case we will choose O:\PEDA\GIS\Afstemningsområdekort i GIS\FV_2007). Now add the relevant data, i.e. the shapefile named "AFSTEMOMR_afstemte_koder_færdigrettet_24.06.2009".shp as well as the dBase-file named "valgdata_afstomr_fv2007_med_logittransformationer".dbf, to the empty data frame. Ignore for the present purpose any potential warnings of a lack of spatial reference information.

Before we can display any analysis results or merely the geographic distribution of some interesting variables on the basis of data from a dBase-file, these data must be joined to a geographic boundary file in ArcMap. In this instance, we want a graphical presentation of the results of logit-transforming vote percentages for each party that ran for office at the 2007 Danish National Election in each polling district. The "Join"-operation links one or more table attributes from a standalone table (in this case the logit-transformed party specific vote percentages in the dBase-file) to a geographic boundary file, i.e. a layer-file/shapefile (here the shapefile of the 1645 Danish polling districts), so that the party support data can be attached to the respective polling districts in the shapefile. Literally speaking, the "Join"-

operation inserts the relevant table data into the shapefile's original attribute table (the attribute table can be accessed by right-clicking the shapefile and selecting "Open Attribute Table" from the drop bar). However, for the "Join"-operation to succeed, each polling district code in the dBase-file must relate to the exact same polling district code in the shapefile. In other words, a unique key variable linking the party support data for each polling district to the same polling district features in the shapefile is necessary for the "Join"-operation to happen as expected. In this example, the unique key variable will be the polling district code just mentioned, because it is found in both the dBase file (named "VALGSTEDID") and in the shapefile (named "Afsomrkode"). Now, right-click the relevant layer-file/shapefile which you want to join data *to* (in this case "AFSTEMOMR_afstemte_koder_færdigrettet_ 24.06.2009.shp) and navigate to the "Join"-option via the "Joins and Relates"-option in the drop bar that appears when right-clicking. The "Join Data"-window pops up as shown below in figure 3. The window should be filled out as illustrated.

Figure 3: The "Join Data" window
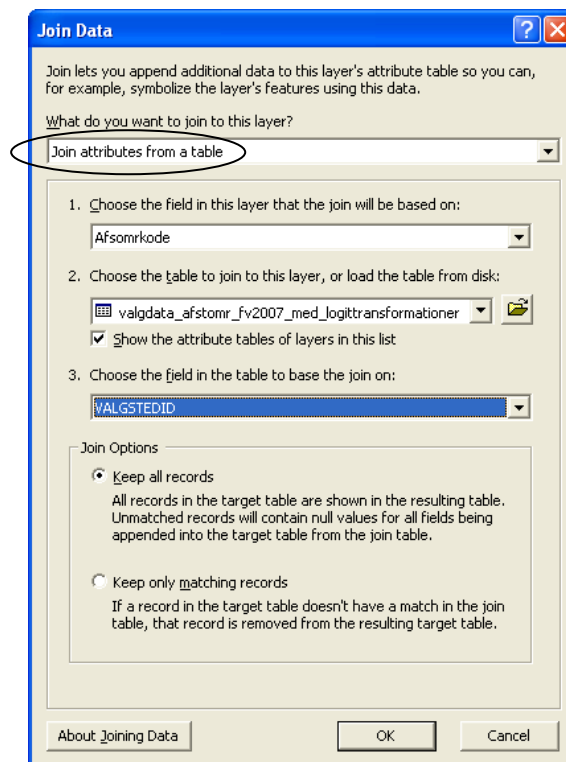
By clicking the "OK"-button at the bottom of the "Join Data"-window, the party support data (i.e. the logit-transformed party specific vote percentage variables) will be inserted into the shapefile's attribute table and are now ready to be presented graphically in the shapefile. It is worth mentioning that a "join" is not a permanent operation in ArcMap, that is, the join(s) that are made can easily be removed again by right-clicking the layer-file/shapefile upon which the join was made and subsequently selecting the "Remove Join(s)"-option from the "Joins and Relates"-option drop bar. The join, however, can also be made permanent. This is done by right-clicking the layer-file/shapefile and from there selecting "Export Data" from the "Data"-drop bar and then saving the layer-file/shapefile under a new file name.

3) Displaying different measures of party support in ArcMap

Now we are finally ready to display the variables of interest in the shapefile. Joining the party support data to the shapefile did nothing to the graphic representation of the polling districts. All geographic features (i.e. the 1645 polling districts) still have the same single random color as in the default setting, see figure 2 above. However, since at this point the logit-transformed party specific vote percentage variables are contained in the shapefile's attribute table, the shapefile can be colored on the different values within each of these logit-transformed vote percentage variables as e.g. shown below for the variable "LN_ANDEL_B". As the name indicates, this variable contains the values of taking the natural logarithm to the vote percentage for the Danish party Det Radikale Venstre in every polling district at the Danish National election held on November 13th 2007.

Figure 4: The "Attribute Table" of the shapefile "AFSTEMOMR_afstemte_koder_færdigrettet_ 24.06.2009".shp. The party support variable "LN_ANDEL_B" has been highlighted together with the party support in a specific polling district.


Figure 5 below shows another part of the attribute table shown in figure 4 with the same row highlighted. The highlighted row happens to relate to "Afstomrkode" = "VALGSTEDID" = 849014, which is the polling district named Thorup. According to the data, Det Radikale Venstre had a logit-transformed vote percentage of –3,423564 in Thorup, which seems to lie somewhere in the middle of the party support obtained by the other parties in Thorup at this election.

Figure 5: The "Attribute Table" of the shapefile "AFSTEMOMR_afstemte_koder_færdigrettet_ 24.06.2009".shp. The highlighted row relates to one specific polling district, namely Thorup (849014).

Colouring a layer-file/shapefile on the basis of an attribute happens inside the "Properties"-window, which pops up if you right-click the relevant layer-file/shapefile (in this case AFSTEMOMR_afstemte_koder_færdigrettet_24.06.2009".shp) and choose the "Properties"-option at the bottom of the drop bar.

Figure 6: The "Layer Properties"-window with the "Symbology"-tab opened
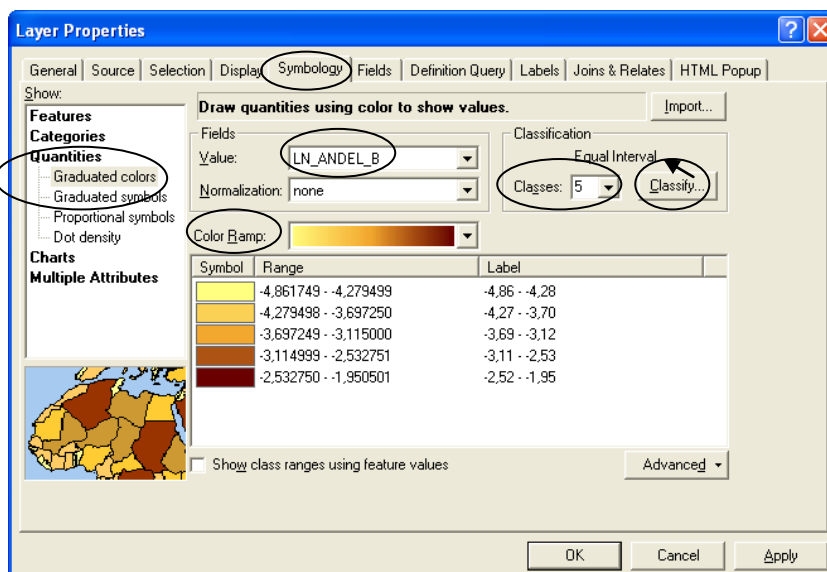
When in the "Layer Properties"-window, navigate to the "Symbology"-tab. Figure 6 just above shows the content of the "Symbology"-tab. ArcMap 9.3 contains various options for colouring a shapefile (for a more thorough investigation of these possibilities, consult the paper "How To: Colour different types of features or attributes using ArcMap 9.3"). Consequently, you should always spend some time thinking of the best possible method to use for colouring you map given the purpose of your analysis. Because logit-transformed party specific vote percentages contain continuous values, we will use the option "Quantities – Graduated colors" that can be found to the left inside the "Symbology"-tab. Had we chosen instead to use the "Categories – Unique values"-option, the shapefile would have gotten as many different colours as the number of unique values, that is, up to 1645 colours(!) did all polling districts have a different logit-transformed vote percentage for a given party. It therefore only makes sense to choose the "Quantities"-option in our example[2]. Included under the "Quantities – Graduated colors"-option are a bunch of different colouring sub-options. In this case, we will choose to display the variable "LN_ANDEL_B" using the "Graduated colors"-sub-option as mentioned above. We do this by using the "Fields Value"-drop bar. Furthermore, we will choose to display this variable with a specific colour ramp containing only yellow, orange and brown shaded colours (but many other colour ramps could have been chosen) by clicking the drop bar to the right of the "Color Ramp"-option. Also, we choose to make five intervals of values by selecting 5 classes under the "Classification"-option so that the final map will contain five different shadings only. This should make the interpretation of the final map somewhat simpler (and this was exactly the reason why we chose the "Quantities"-option in the first place!). As part of the "Classification"-option we must also choose which classification method to use for making these five intervals. Here we will use the "Equal Interval"-sub-option.

Having made the choices inside the "Symbology"-tab, as described above, our map displaying the logit-transformed vote percentages for the Danish party Det Radikale

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[2] For an example of colouring a map on the basis of the "Categories"-option, consult the paper "How To: Prepare for, carry out and display a cluster analysis in ArcMap using the Ward's cluster analysis technique" by Malene Rode Larsen.

Venstre in every Danish polling district as they existed on November 13th 2007, should look like the following (figure 7):

Figure 7: Map showing logit-transformed vote percentages for the Danish party Det Radikale Venstre in every polling district at the Danish National election, November 13th 2007

Shift between "Data View" / "Layout View"   "Data View"
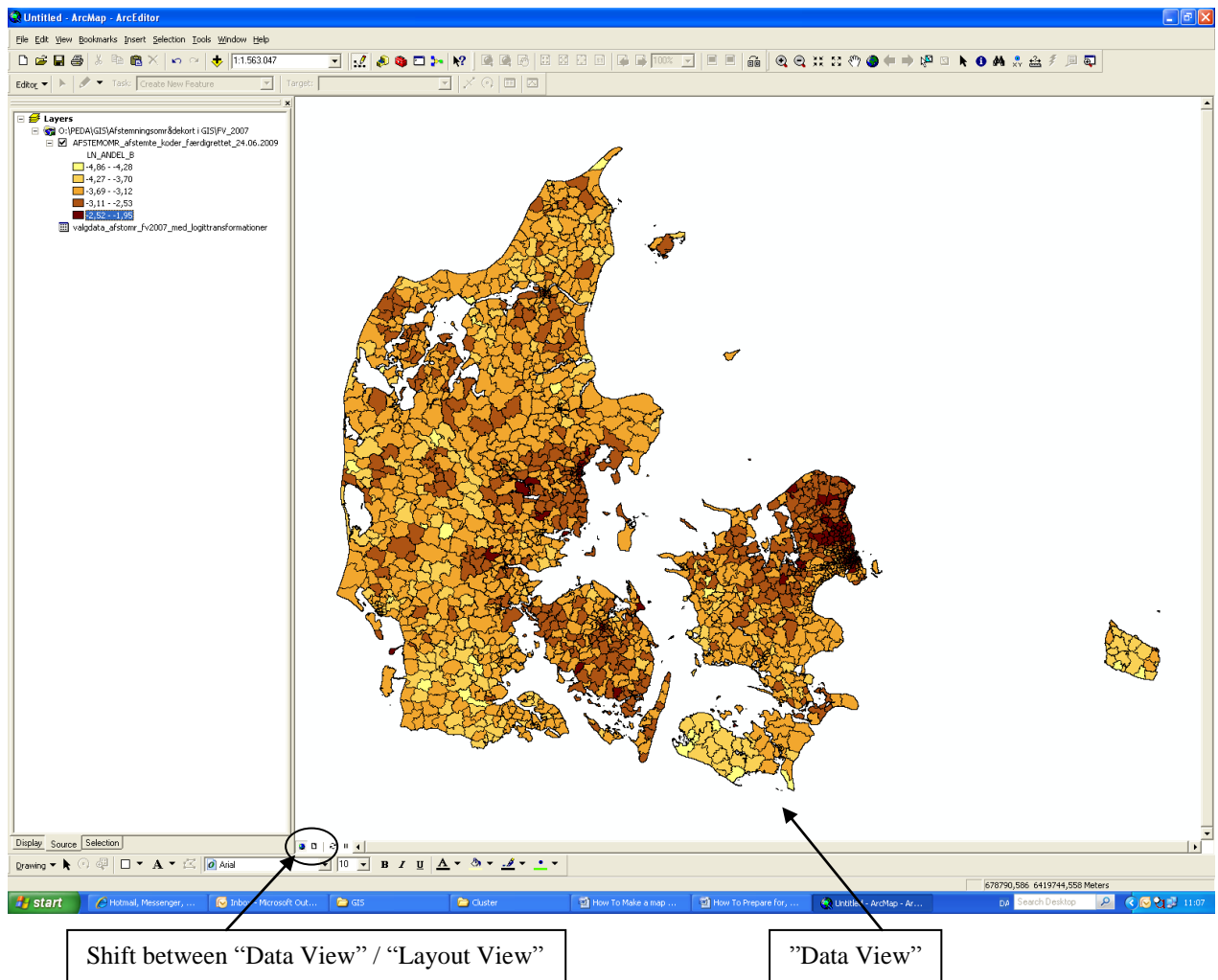
As should be apparent from the above mentioned there are numerous ways of illustrating one's attributes of interest in ArcMap 9.3. The best way to learn about the different colouring and symbolizing options is to try them out yourself using different data and also by consulting the referred-to paper as well as other relevant literature on the subject.

4) Making a nice final map layout in the "Layout View"

Whenever you have come this far thus having made a proper display/representation of your attributes of interest in the "Data View", it is crucial to make a nice map layout. A high-quality map should be 1) nice to look at, 2) informative and 3) not too complicated to interpret at the same time. Regarding the third factor, this has already been accomplished given the choices we made above of colouring on the basis of a few intervals only. As to the first two factors, they can be brought about from inside the "Layout View"[3].

To inform the reader in the best possible way, in the "Layout View" you should at least provide your map with a title and a legend depicting the attribute(s) that is/are displayed in the shapefile as well as the categories of each. In our case an informative legend would display the five intervals of logit-transformed vote percentages generated for Det Radikale Venstre, each interval having a different colour corresponding to the colour ramp we chose inside the "Symbology"-tab and possibly also with a short indication of the numbers that constrain each interval, see figure 8 below. In some cases it would also be illustrative to provide your map with a scale bar and a north arrow giving the direction of the map, however, this is not important for our analysis purpose. All these informative features can be found by clicking the" Insert"-drop bar at the top of the screen. Remember, however, that the features can only be selected from inside the "Layout View". They will be shaded and therefore cannot be chosen from inside the "Data View".

Two other great features in ArcMap has to do with 1) the possibility of using more layers in the same map, i.e. showing more layers on top of each other, and 2) the possibility to have more than one data frame as part of the map layout. The first feature will not be discussed in this paper, since it is not relevant to this specific analysis of displaying party support (to learn more on how to do so, consult the paper "How To (2): Manipulate Existing Data to Produce a Display of Aggregated Features" by Kristian Pedersen (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3). The facet of having more than one data frame contained in the final map layout, on the other hand, becomes relevant in our case,

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[3] It is possible at any time while working in ArcMap to shift between the "Data View" and the "Layout View" by selecting either view through either the "File"-drop bar from the menu bar at the top of the screen, or simply by pressing the respective icons positioned right below the main panel (depicting a globe and a sheet of paper), see the illustration in figure 7 above.

since we want both the island of Bornholm to have its own frame (positioned in the top right corner of our final map layout) and also to have Copenhagen with suburbs blown up in its own data frame otherwise it will be hard to distinguish some of the Copenhagen polling districts from each other. On how to insert extra data frames on top of the original one, consult the paper "How To (2): Manipulate Existing Data to Produce a Display of Aggregated Features" by Kristian Pedersen (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3).

The final result of these map layout exercises can be seen in figure 8 below showing the logit-transformed vote percentages for Det Radikale Venstre in every polling district at the Danish National Election, November 13th 2007. Especially, you should notice the title, the legend and the two extra data frames containing Bornholm and Copenhagen with suburbs, respectively.

Figure 8: The final map layout as it looks from inside the Layout View
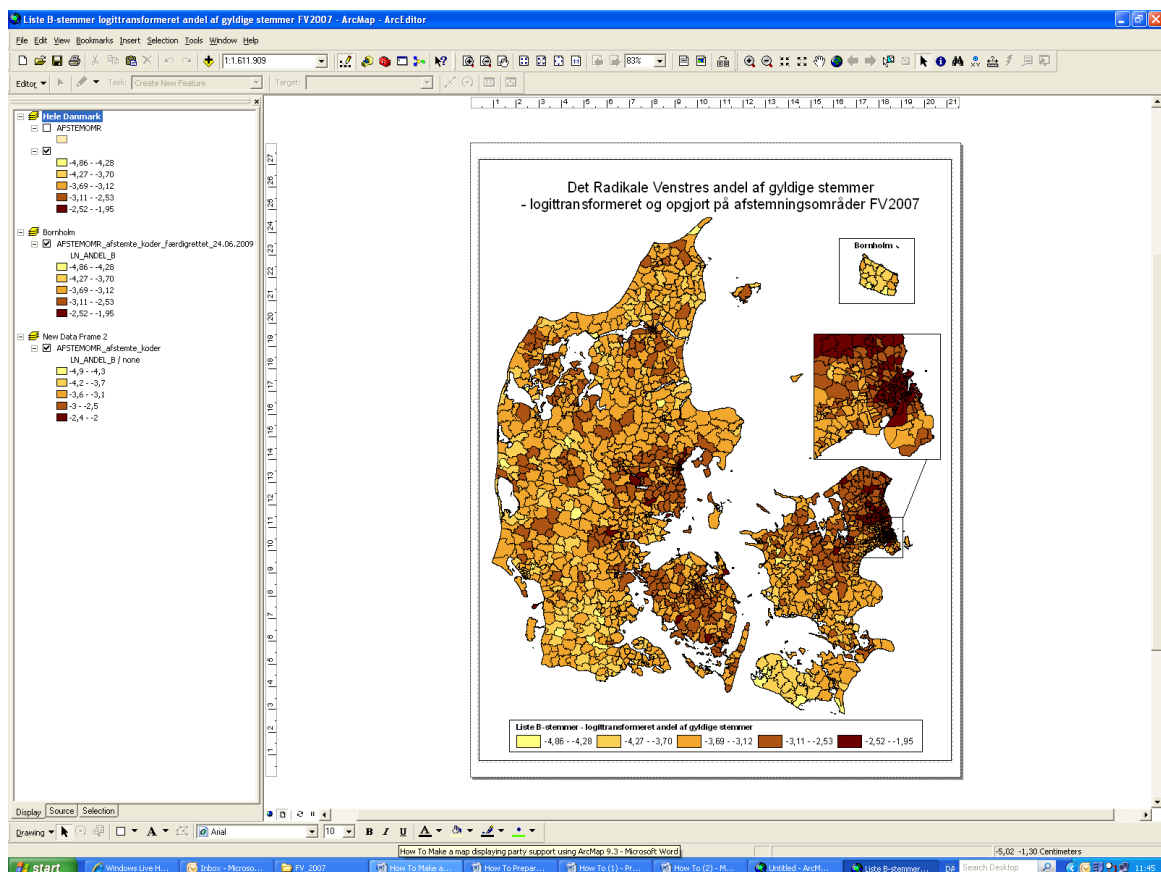
5) Exporting your final map layout to JPEG or any other compatible file format and importing it into PowerPoint

Last, but not least, it is important to know how to export your final map which is currently in .mxd-file format into another file format, e.g. JPEG or EMF, as these are capable of being imported into for example a Word- or PowerPoint-document for later presentational uses. The procedure for doing this is fairly simple. Go to the "File- drop bar in the menu bar at the top of the screen and navigate to the "Export Map"-option. A window looking like the one below will pop up.

Figure 9: The "Export Map"-window
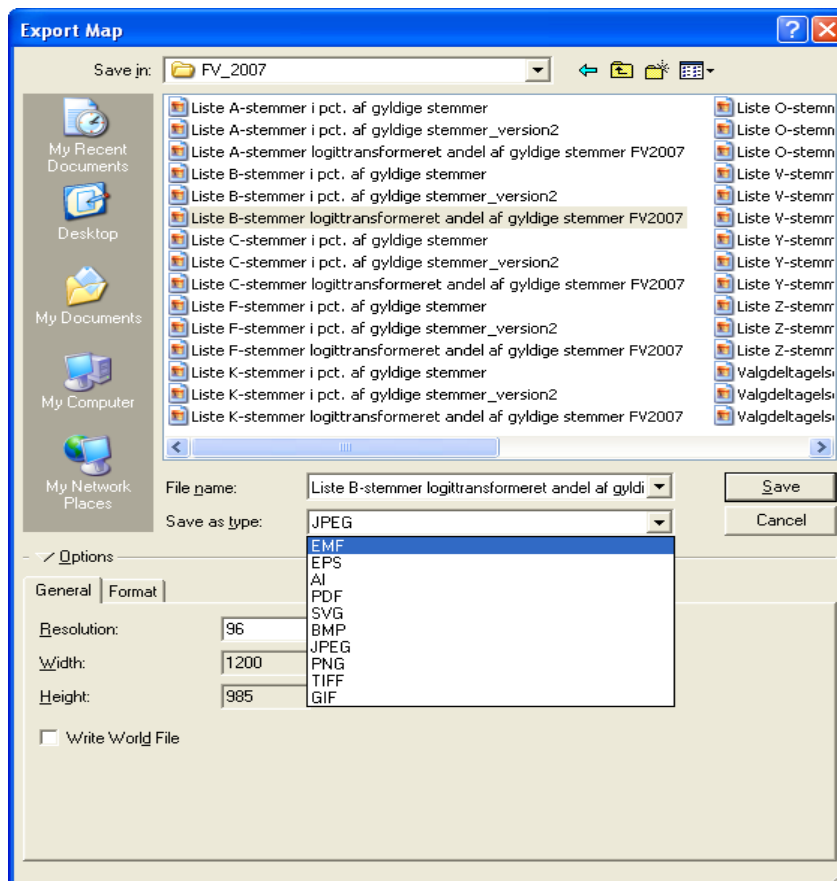
Next, navigate to the relevant folder where you want your file containing the map to be stored. Choose the file format of interest, e.g. JPEG, name the file and finally press the "Save"-button, figure 10 below shows the result.

Figure 10: The final map converted into JPEG-file format
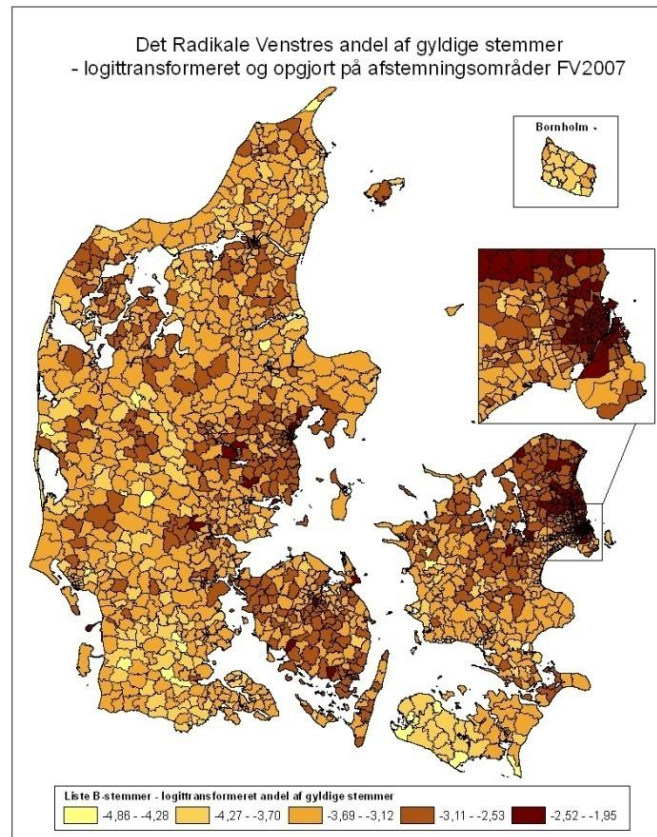
Malene Rode Larsen, January 2010

References:

- Pedersen, Kristian: "How To (1): Produce a Display of Some Interesting Data Attributes with a Spatial Distribution" (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3)

- Pedersen, Kristian: "How To (2): Manipulate Existing Data to Produce a Display of Aggregated Features" (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3)

- Larsen, Malene Rode: "How To: Prepare for, carry out and display a cluster analysis in ArcMap using the Ward's cluster analysis technique" (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3)

- Larsen, Malene Rode: "How to: Colour geographic features and different types of attributes using ArcMap 9.3" (O:\PEDA\GIS\ Introductory papers to ArcMap 9.3)