GIS Exercise
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INTRODUCTION TO DIGITAL CARTOGRAPHY

Requirements
This exercise requires a PC with Windows 95/98 or Windows NT, a connection to the internet and the freeware ArcExplorer 1.1. To install ArcExplorer from the internet see appendix 1. The necessary data are mined from the Internet.

Objectives
This exercise aims at introducing digital cartography by using freely available GIS data over the World Wide Web (www). The objective of the exercise is that the students should gain basic insight into digital cartography including scale, georeferencing, labelling and layout, and the www as a source of data and exploration tools for georeferenced data. After completing the exercise students should be able to create small scale thematic maps from tools and data available over the www.

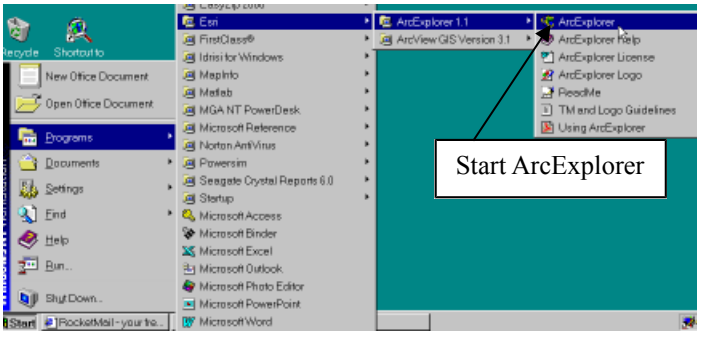
Task
To pass the exercise a thematic map over political boundaries in Europe that showing European cities symbolised based on inhabitants should be handed in.

Start the GIS Viewing program and add data from internet

In this exercise we will use ArcExplorer - a GIS freeware offered by ESRI – see appendix for instructions on how to retrieve ArcExplorer from the internet.

For this exercise you will find ArcExplorer under **"Start\Program files\Esri\ArcExplorer1.1".**

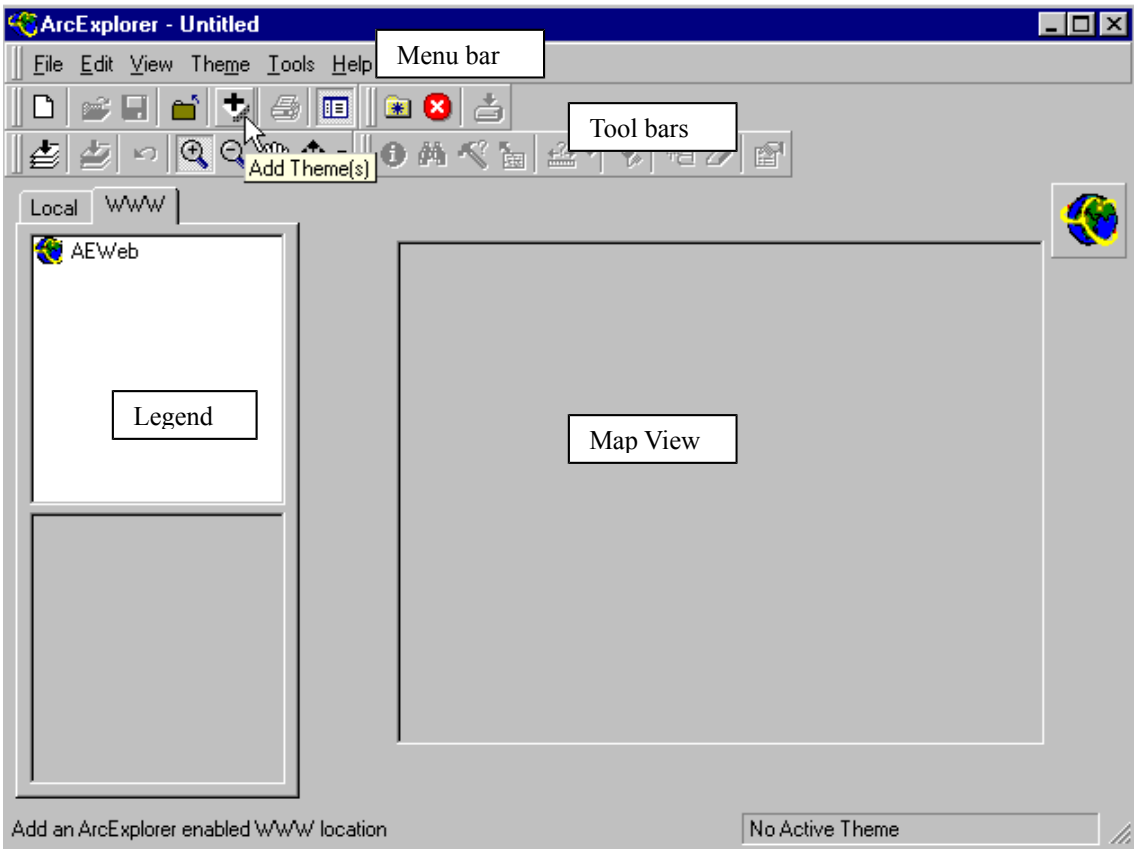
Start **ArcExplorer**.



If you are doing the exercise at home you will need to download Arc Explorer, (see Appendix). The main parts of the ArcExplorer interface are shown in the figure below. You will be presented with an empty project called untitled. The legend window contains two tabs (pages), one for local themes (themes that are stored on your local computer or local area network) and one for WWW themes (themes stored on Web sites). To get help on any topic just press F1, or search via help in the menu bar. You can also find the document Using ArcExplorer (**Arcexplorer.pdf**) in

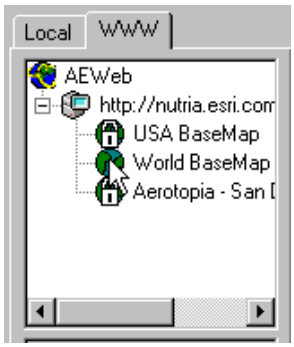
the same folder as the program file. This manual can be read by using Adobe Acrobat reader (see appendix for download of Adobe Acrobat).

In the interface you will notice that some menu and tool items are gray (fuzzy) that means that they are not available at the moment. Many items require that you have some themes in the view, (a theme is a maplayer in GIS jargong) and some that you have at least one theme active (this will soon be clear to you).



We will start by adding some maps directly from www. Choose the www tab from the top of the legend, where after the legend should look like the one in the figure above. Press the Add theme button, , and select ESRI ArcExplorer Web Site (default – as to the right). Press Add URL. ArcExplorer will now load data from the World Wide Web.

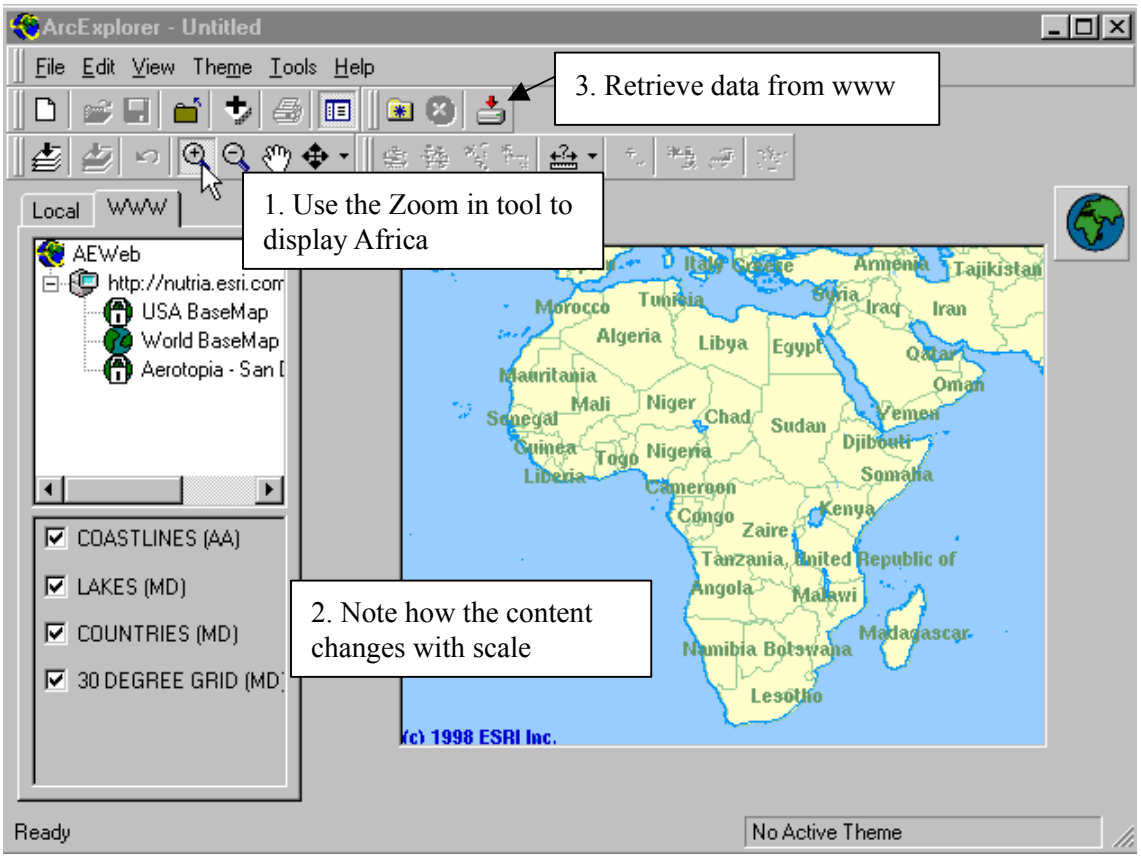
The legend window should now have some more items, as shown to the right. Click on “World BaseMap”. The transfer might take a while but you will then get a view of the whole globe, with labels for the continents. If you do not get a map the most likely problem is that you do not have permission to alter the contents in the archive where you have ArcExplorer i.e. the archive **Esri**\ - contact your system administrator (see appendix).



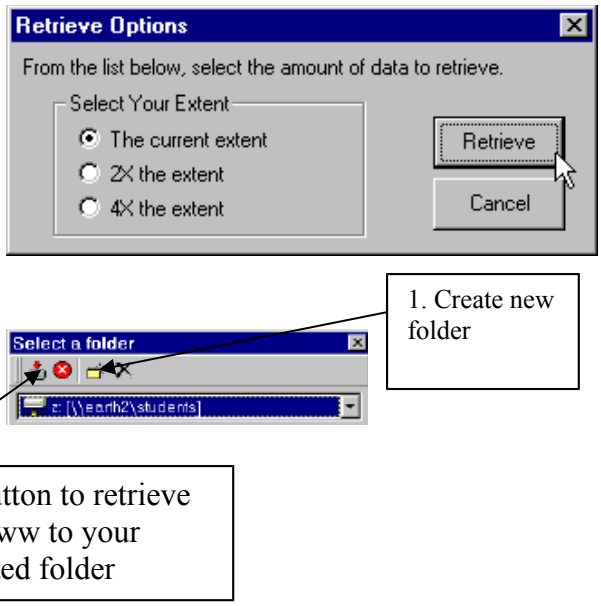
Select Data

Use the Zoom in tool, , to zoom in on Africa and the Zoom out tool to to zoom out. Click the left mouse button, do not relese the button, and drag the window you want to zoom and then release the mouse button. If you do not succeed use the Zoom to full extent button . If you just click in the view with the zoom in tool active the position you clicked will be the center of the new display area after the zoom. When you zoom in new themes will be displayed in the map view, as shown below. Try to zoom in further to see what other themes are displayed at increasingly larger scales.

Also try the pan tools and .



With the whole of the African continent displayed (as above) press the Retrieve data from www button, . Select The current extent and press the Retrieve button (as to the right). Accept the license agreement and put the data in a separate folder (create a folder if necessary). Again press the Retrieve data from www button to start the process. The data is transferred from the www to your computer.



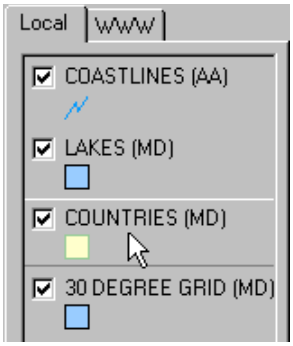
Loading data

Answer Yes to the question "Would you like to add the data into your local view?" You will then be transferred to the local view. Notice that the retrieved map is exactly clipped as the area you had zoomed in, and that the labeling is lost in the view in the local mode.

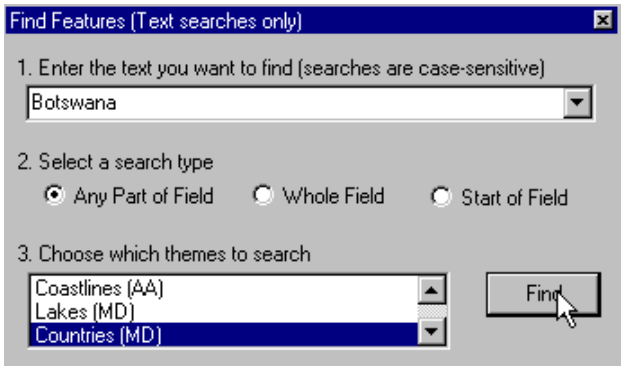
If you do not get the map to your local view, try again later, the problem could be that the server is busy.

Finding data

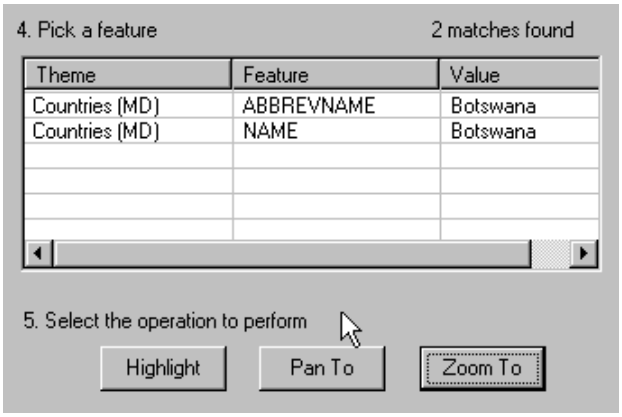
The legend should now look as the example to the right. With the check box to the left of the label you can include or exclude the theme from the view (try it). If you click once on the name label the theme will become active, it appears lifted. Activate the theme COUNTRIES (MD) as shown to the right. We will now locate Botswana (or another country) in our view by using the Find tool, . Click the find tool.



In the dialogue box that appears enter Botswana and select the theme Countries(MD) as shown to the right. Press the Find button. The lower part of the dialogue box will be changed as shown below. Select one of the two fields. Try all options, Highlight, Pan To and Zoom to – in that order.



Notice that Botswana is a name.

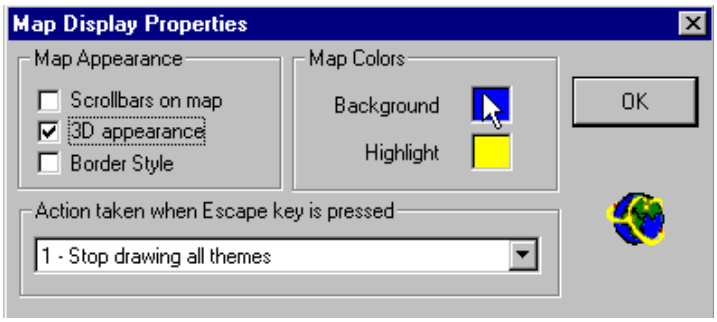


Close the find feature dialogue box.

Symbolizing data

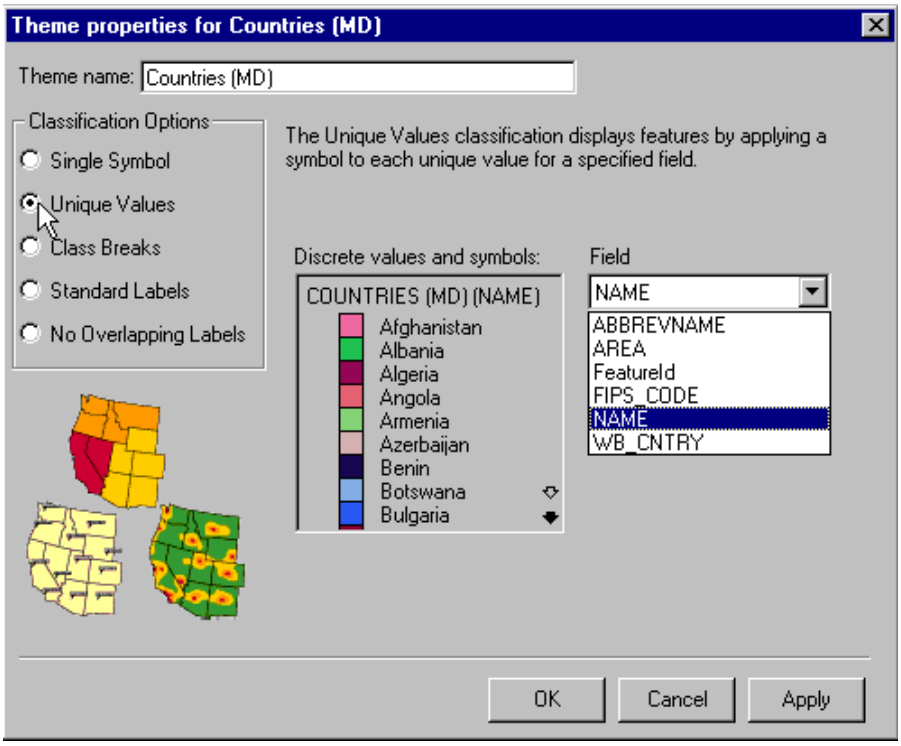
Use the Zoom to full extent button, to get the view of the whole of Africa. As you can see the theme coastlines (AA) also contains the borders between countries, but that the lines do not coincide with the COUNTRIES theme. Turn of all themes except COUNTRIES (i.e. click the check boxes to empty them).

To set a background color and other map display properties press View in the menu bar and then Map display properties. You can add scrollbars make the map appear 3D and change the color of the background (the sea in our case) and Highlight (when you query the data the result is highlighted in this color – yellow is default).



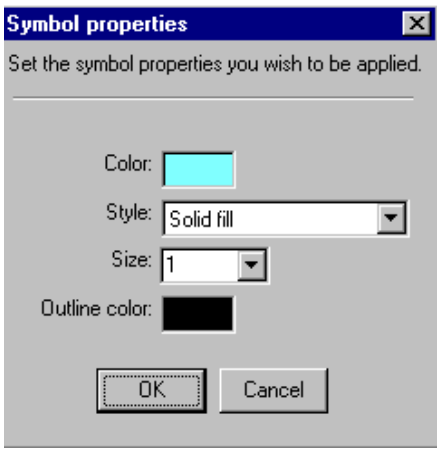
The next step is to symbolize and put name tags for each country.

Make the theme COUNTRIES active. Open the theme properties dialogue box, either via the Theme properties button, , or double click a theme's name in the legend. Set Classification option to be Unique value and Field to NAME. Press Apply.



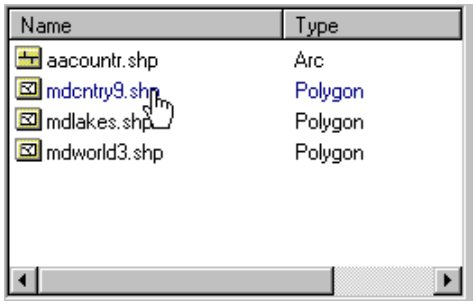
To clear the selected/highlighted features from the map view press Clear Selection Button. If you want to remove thematic classification from the active theme press Clear Thematic Classification button.

The **Symbol properties** box is find in the **Theme properties** box, simply click an attribute and than select **Color, Style** and **Size**.
You can set individual colors, style and size (line width) of each attribute by clicking each attribute.
In the second part of the exercise you must symbolize European cities using this dialog box. Cities are point themes and shape, size and color can all be changed via symbol properties.

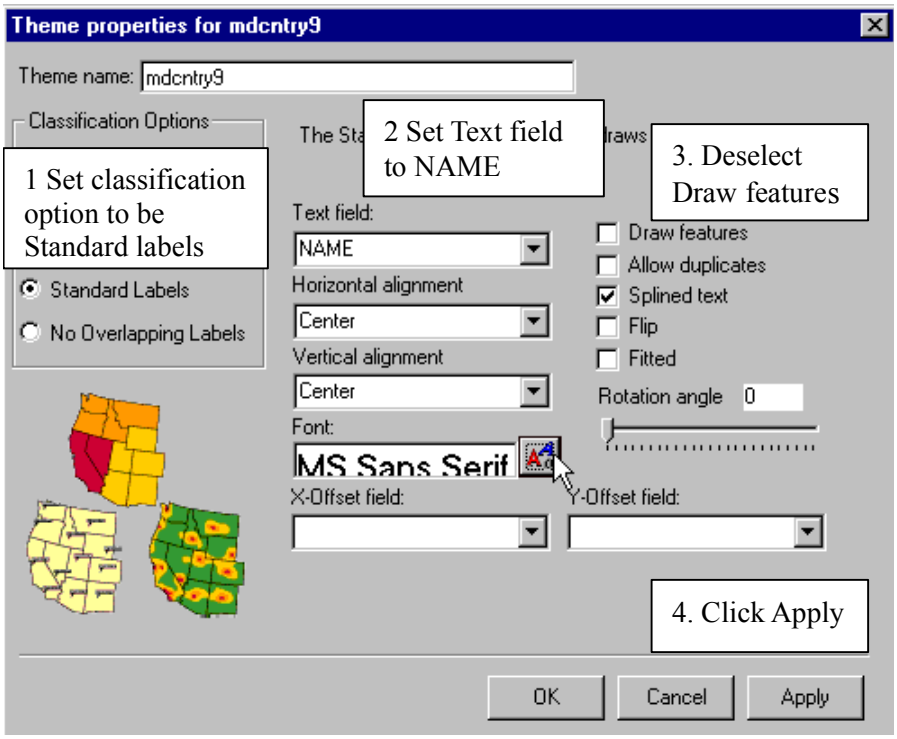


Labeling maps

To label the map in ArcExplorer add a duplicate copy of the theme countries. Use the Add theme button, , and navigate to the directory where you did put the retrieved data. It is the theme called mdcntry9.shp (as shown to the right) that you should add. Put the new theme highest up in the **legend** (grab it by holding down the left mouse button and slide it to the top of the legend).

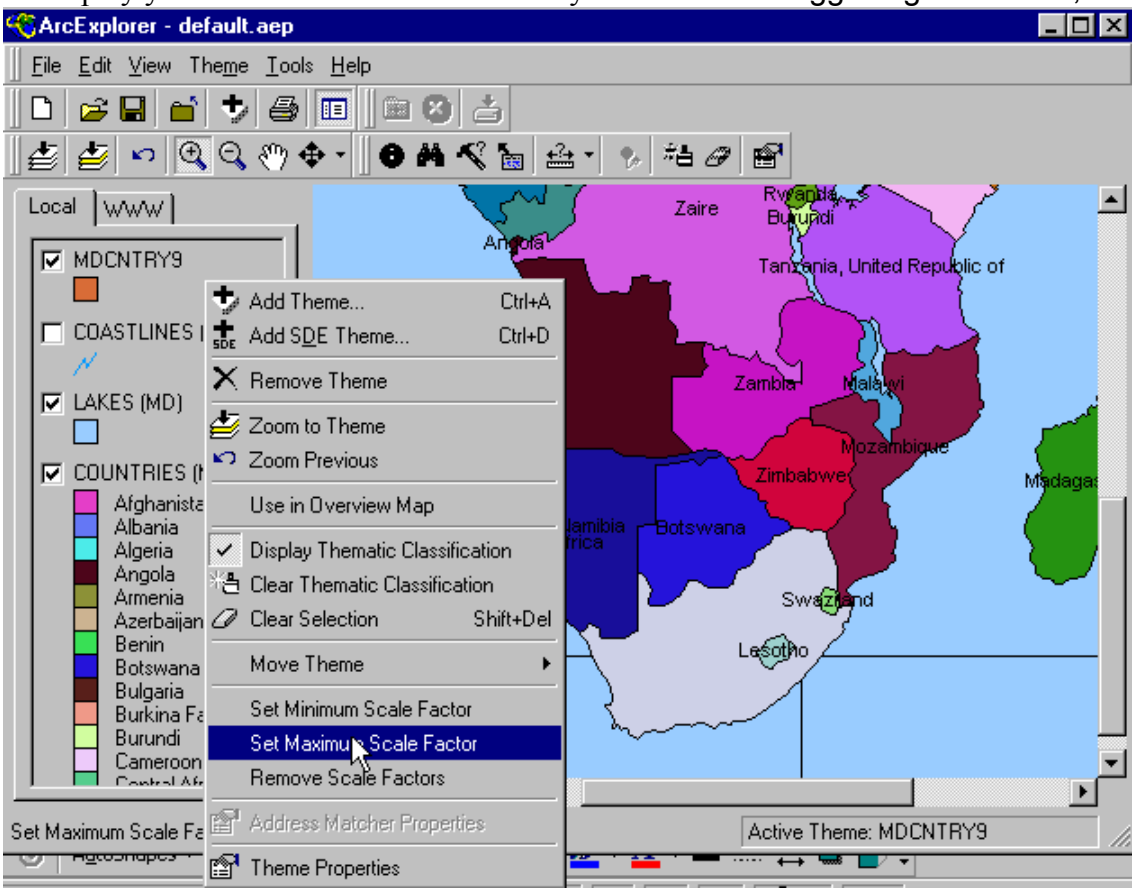


Open the theme properties dialogue box for this second countries theme – either by double clicking, through the right mouse button or under Theme in the menu bar.
In the theme properties menu set Classification Options to be Standard Labels. New labels and edit boxes will appear. Select NAME as Text field and deselect Draw features. You can also change the font if you feel like it. Press Apply and then OK. Your map should now have name labels for countries in Africa



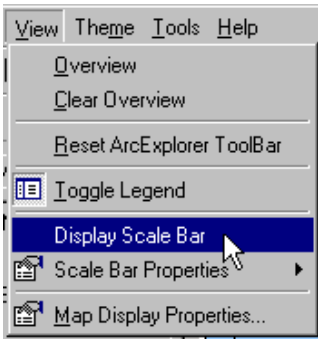
As you will see when you display the whole African continent the name labels are too large; it is difficult to read the names as well as distinguish which name belongs to which country. To improve the layout of the map you can decide a scale above or below which the name labels will not be displayed. First zoom the map of Africa so that you can conveniently read the labels and associate them with a particular country. Then open the theme manipulator (activate the theme and press the right mouse button). Select the option Set Maximum Scale Factor. Zoom to full extent – and voila no name labels, if you zoom in they will reappear.

To display your view over the whole screen you can use the Toggle legend button, . Try it.



Zoom to full extent. If you followed the instructions no labeling should be seen. You should now add a tool that allows you to use the mouse for displaying selected properties of a theme. Make sure the theme COUNTRIES is active. Click the Map tips tool, , to display the Map Tips dialog. Select NAME in the list and click OK. When you move the cursor in the view the name of the country where you slide the cursor will be shown in a little box. Hands on your heart - how many African countries do you really know?

Set the scale and scale units

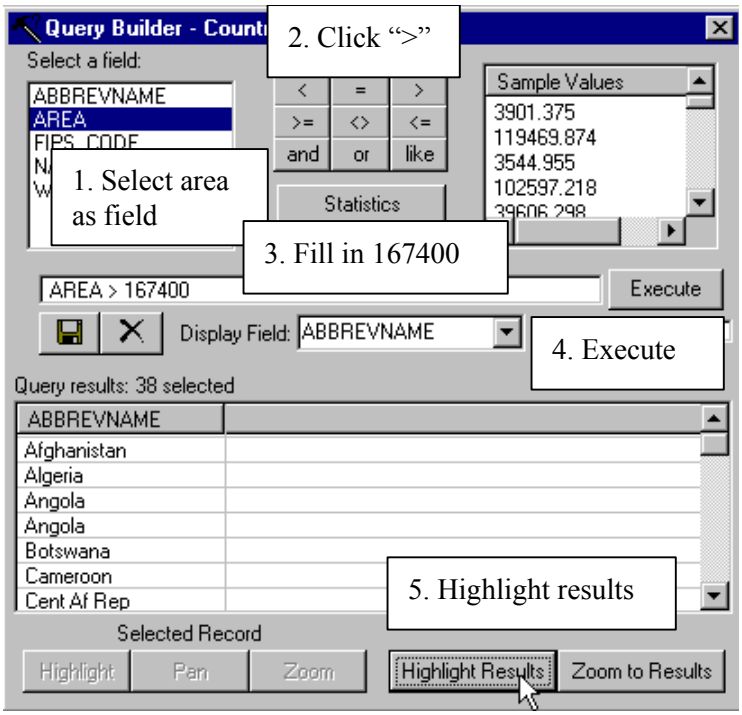


A scale bar is obligatory for a map. Thus you must add one. This you do under View in the menu bar as shown to the right. To change the scale bar to display kilometers and be in centimeter units change the Scale Bar Properties (also found under View in the menu). Map units are decimal degree so you must not change them, set Scale Units to kilometers and Screen Units to centimeters You also need to set measure units to be able to interactively calculate distances in the map. This is done under Tools in the menu. Set the Measure units to be kilometers and see how far the distance is between Egypt and South Africa (should be approximately 6 000 km).

On the map view, click and drag a line representing the distance you wish to measure.

Querying data

Next we will try the Query builder, , to see which African nations are larger than Sweden. The area of each country is given in square miles in the theme COUNTRIES. Make sure COUNTRIES is the active theme and click the query builder. In the query dialogue box select AREA as field then press the "**>**" sign and fill in 167400 (the area of Sweden in square miles) by hand in the query below (as to the right). Press Execute, and then Highlight Results. Most African countries are larger than Sweden - Africa is not a small continent. In the query builder you can also calculate summary statistics for numerical fields. Try it out for the area of countries.



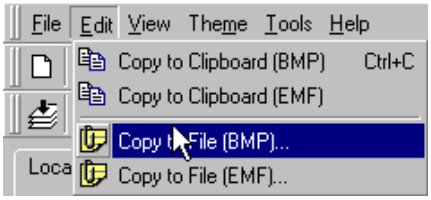
Your map of Africa should now be classified in colors representing individual countries, and also selected according to relative size versus Sweden. To clear the classification you can use the Clear Thematic classification tool, , and to clear selected areas you can press the Clear selection tool, . In both cases you can also open the theme manipulator to clear thematic classification and selection.

Save the ArcView project, , that you have created, preferably in your working directory. Change the name into something logical.

Your turn

To complete the exercise you should create a map of Europe like the one shown below. The map of Europe should include cities and countries. When you retrieve Europe from the www you must thus zoom in enough to get cities. Use the classification options in the theme properties dialog for setting city symbol properties related to the population (as in the example). Also add name tags for both countries and cities – and set maximum scale factor for both. Toggle away the legend and print the map.

When you are satisfied with your cartographic product it is time to transfer to another media. Either print it, , if you are connected to a printer. Or export the map as a bitmap –found under Edit in the menu bar as shown to the right.

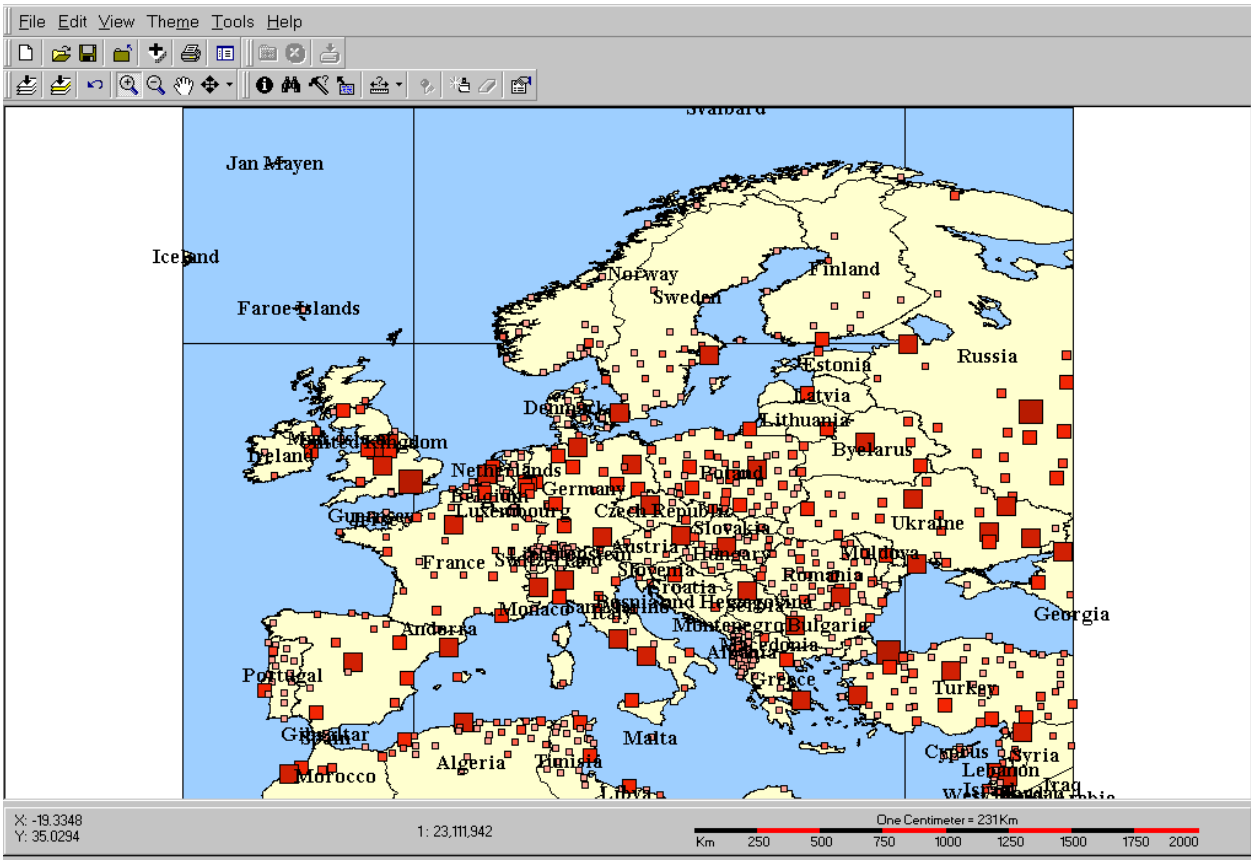


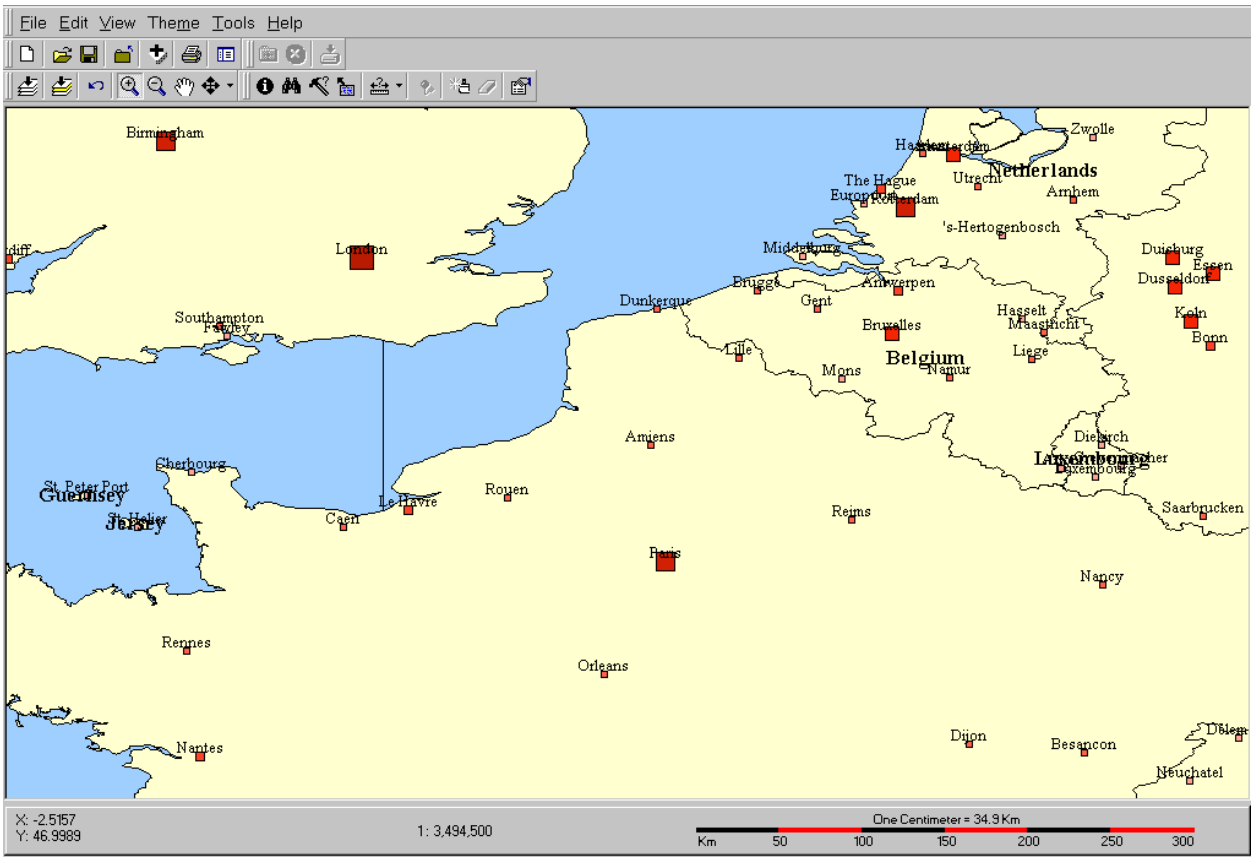
If the map is only built from vektordata copy it to EMF format, **Copy to File [EMF].** If the map contains raster data copy it to BMP format, **Copy to File [BMP].**

To pass this exercise you must hand this map in to the course staff – either as a paper copy or in electronic format – your choice.

Remember to write your name on the maps and hand it in for passing the exercise.

Exercise: Create two maps over Europe including cities and nametags for both countries and cities as shown below.




File Edit View Theme Tools Help
Birmingham
London
Southampton
Fawley
Dunkerque
Brugge
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St. Peter Port
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One Centimeter = 34.9 Km
Km 50 100 150 200 250 300

Appendix: How to get ArcExplorer from www

Use a web-browser (Netscape, Internet explorer) and navigate to ESRI´s homepage (http://www.esri.com/) and to the page with free resources, select ArcExplorer (you should then be transferred to the site http://www.esri.com/software/arcexplorer/index.html). Read about ArcExplorer and then press Download ArcExplorer 1.1 in the left margin of the page (version 1.1 is the latest at the time of writing this instruction). You should then be transferred to the page http://www.esri.com/software/arcexplorer/aedownload.html.

Close all windows applications that is running on your PC and install ArcExplorer by running the program aeclient.exe (the program that you downloaded). To be able to install ArcExplorer you must have administrative rights on the computer you are using – if you do not have that you must ask your system administrator to help you. To install and run ArcExplorer the user should have full access (read and write) to the archive C:\Esri\ (not only for installation – also for running). When you install the ArcExplorer the default path for installation is "**Program files\ESRI\ArcExplorer**". It is recommended that you accept that.

With the download you also got the manual for ArcExplorer. It is the file called **Arcexplorer.pdf**, which you can read by using Adobe Acrobat reader. If you get stuck or do not understand a command, please refer to this document. If you do not have acrobat reader you can download it from http://www.adobe.com/prodindex/acrobat/readstep.html.

ESRI maintains web pages where you can find various free data. Their own main data can be found at ArcData online - http://www.esri.com/data/online/index.html. Other data suppliers can be found under the page http://www.esri.com/data/index.html, especially the data hound is useful for finding thematic data over specified regions -http://nt1.esri.com/scripts/production/esri/marketing/datahound/main.cfm.