



UPPSALA UNIVERSITET

Institutionen för geovetenskaper
Geoinformatiklaboratoriet

PHYSICAL AND HUMAN GEOGRAPHY OF SOUTHERN AFRICA

Requirements

This exercise requires a PC with Windows95/98 or Windows NT, a connection to the Internet, the freeware ArcExplorer 1.1, and/or ArcView 3.0 (or later). To install ArcExplorer from the Internet see appendix 1. The necessary data are retrieved from the Internet. (This means that you can do the whole project with freeware and free data!)

Objectives

This aim of the project is to show how freely available data from the internet can be used for geographical studies. The objective of the project is that the students should gain skills in applying geographical methods based on small scale data, improve their skills in doing independent studies, as well as improve their general GIS skills.

Task

To pass the project thematic maps over physical and human geography emphasising the water situation and covering southern Africa should be presented. As part of the project a report produce a report, including texts and maps must be produced. If you want to present the study as an article or a poster is your choice. In both cases a minimum standard of contents and references is required as specified below.

Problem

Southern Africa is a region full of natural resources, but partly hampered by scarce water resources. The water crisis is escalating in countries like Namibia and Botswana. The aim of this project is to produce a set of thematic maps relating the water situation to physical and human geographical conditions. The Okavango river and the Okavango delta should be used as a case study. You find some information on the Okavango below, and further information you must find yourself.

Introduction

The Okavango delta in Botswana is a unique inland wetland in the Kalahari desert fed by water from the Angolan mountains. The delta gives shelter to a rich wild life, that also forms the backbone of the rapidly growing tourist industry in Botswana. The delta, however, is threatened by a changing climate and water needs in upstream Namibia and Angola (albeit Angolan plans are severely set back by war). The most acute problem is to find water for Windhoek, the capital of Namibia. And then Angola wants to develop hydropower in the main tributaries to the Okavango delta. There is quite a lot of data on this problem available - also via the internet.

To find out more about the Okavango delta just use any internet search tool. The best research of the Okavango is done at Witwatersrand university, Johannesburg in South Africa. They have what they call an Okavango Research Group. All there publications are listed on the net:

<http://www.wits.ac.za/science/geology/vango.htm>

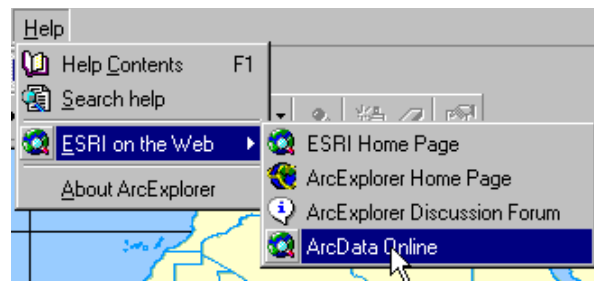
Create a GIS database over southern Africa

In order to be able to create maps of natural and human geography over southern Africa data must be retrieved from several places on the internet. The best way to retrieve most of the data is actually to use ArcExplorer. If you did the exercise Digital cartography, you know how to use ArcExplorer. If you did not do that exercise, it is recommended that you do it before proceeding. That exercise also tells you how to download and install ArcExplorer.

Start ArcExplorer and select the **www** tab in the legend window. Use **Add theme** to connect to the URL “ESRI ArcExplorer Web Site”. Select World BaseMap from the legend. In the global dataset that appears zoom in to southern Africa so that you retrieve cities. Angola, Namibia and Botswana should be completely in the view. Retrieve this view and add the data to your local view.

We also want to get other data from the web –some of which is especially prepared for ArcExplorer, and some that must be downloaded separately.

If ArcExplorer is not running, start it. To get the data we are interested in we will use another route in ArcExplorer. In the menu select **Help** and then **ESRI on the Web** and finally **ArcData Online** as shown to the right.



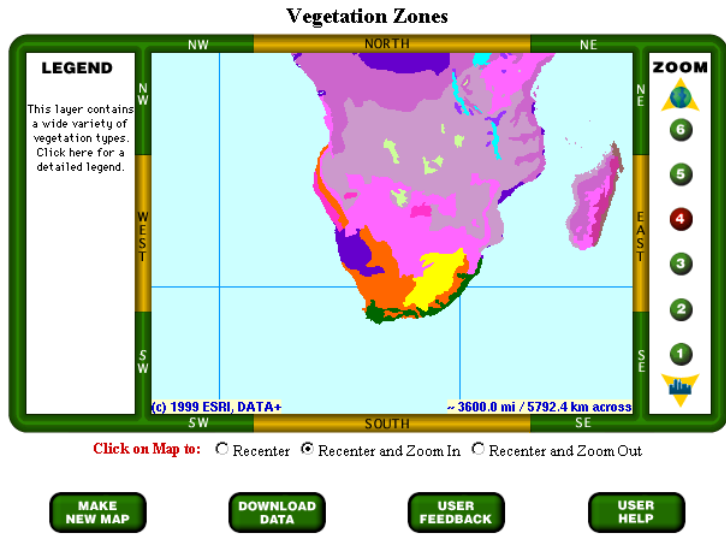
You will automatically be transferred to <http://www.esri.com/data/online/>. Further down on that web page open the pop up menu for **Select by Geographic Area** and find **GLOBAL**.



There are several alternative data sources to choose from. Browse around among the data and have a look of some of it. The data that you retrieved earlier were from ESRI World Basemap Data. For the Africa project you need to download data both from ESRI World Thematic Data (physical geography) and Newsweek world thematic data (human geography). In both cases we just want to download southern Africa. Download the following themes:

ESRI World Thematic Data	Newsweek World Thematic Data
Natural Landscape Zones	Choose for yourself – when
Vegetation Zones	downloading you always get all
Population Density	thematic data anyway.
Precipitation	

When downloading the data do select a view as small as possible to minimize the time needed for downloading as well as disk space (as shown to the right). Make sure that Angola, Botswana and Namibia are included. When the map is prepared press **Download data**. Accept the license agreement and choose PC Compatible Zip as format and **Proceed to download**. Save the data to the directory where you did put the other data. Unzip the files that you transferred and put them in your working directory.



If you do not have WinZip you have to download that first – for example from <http://spap.cac.washington.edu/project/wwwmm/winzip.html>.

Add the themes over Africa that you just retrieved to your view to check if they are OK. You can use ArcExplorer for the rest of the project if you want to (or do not have access to ArcView). Doing the remaining part in ArcView will, however, enhance your possibilities to do good geography.

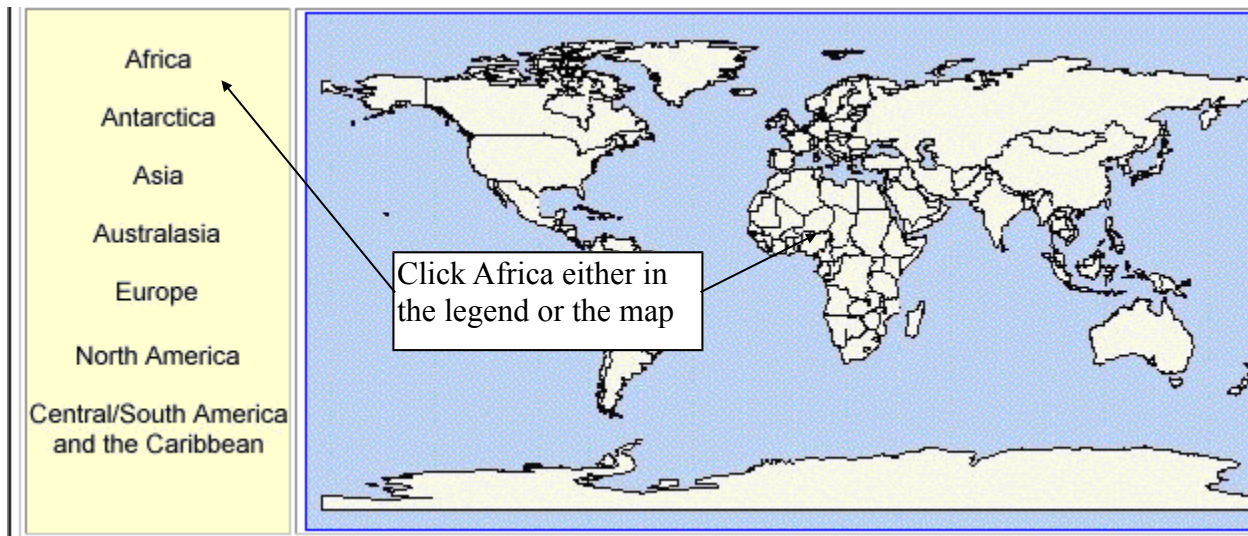
Retrieve the digital chart of the world (DCW) from the internet

There is another www site that holds free data but with some more details at a country level. We will use this site for mining data over land cover, roads, hypsography (elevation), towns, lakes and rivers over Angola, Botswana and Namibia. You have to retrieve the data covering these three countries by iterating the procedure described below three times, once for each country.

DCW is a set of maps with global coverage, and is originally actually also a product from ESRI. DCW exists in many versions, and we will use the one available at Penn State University. Their version exist as the ArcInfo export format *.e00 that can be used by ArcExplorer and ArcView as well. However there are many steps before we get a useful map. To learn more about DCW look at www.maproom.psu.edu/dcw/

When you have learnt about DCW, download the maps of Angola, Botswana and Namibia.

Use Internet Explorer or Netscape navigator to go to www.maproom.psu.edu/dcw, from the world map that appears select the Africa tile to work with and then "your country" from the list that appears to the right.



Digital Chart of the World

Download the following themes:

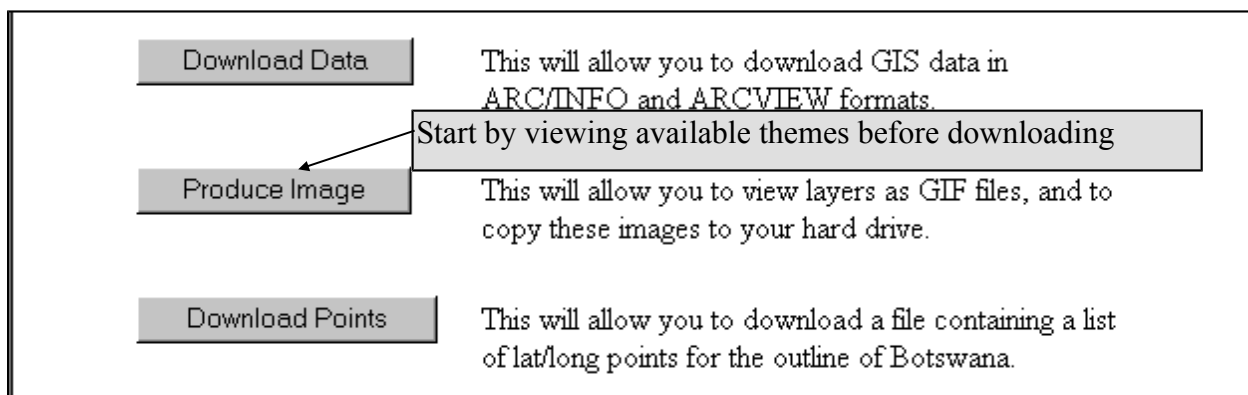
Populated places (points)

Roads (lines)

Drainage (network)

Hypsography (network)

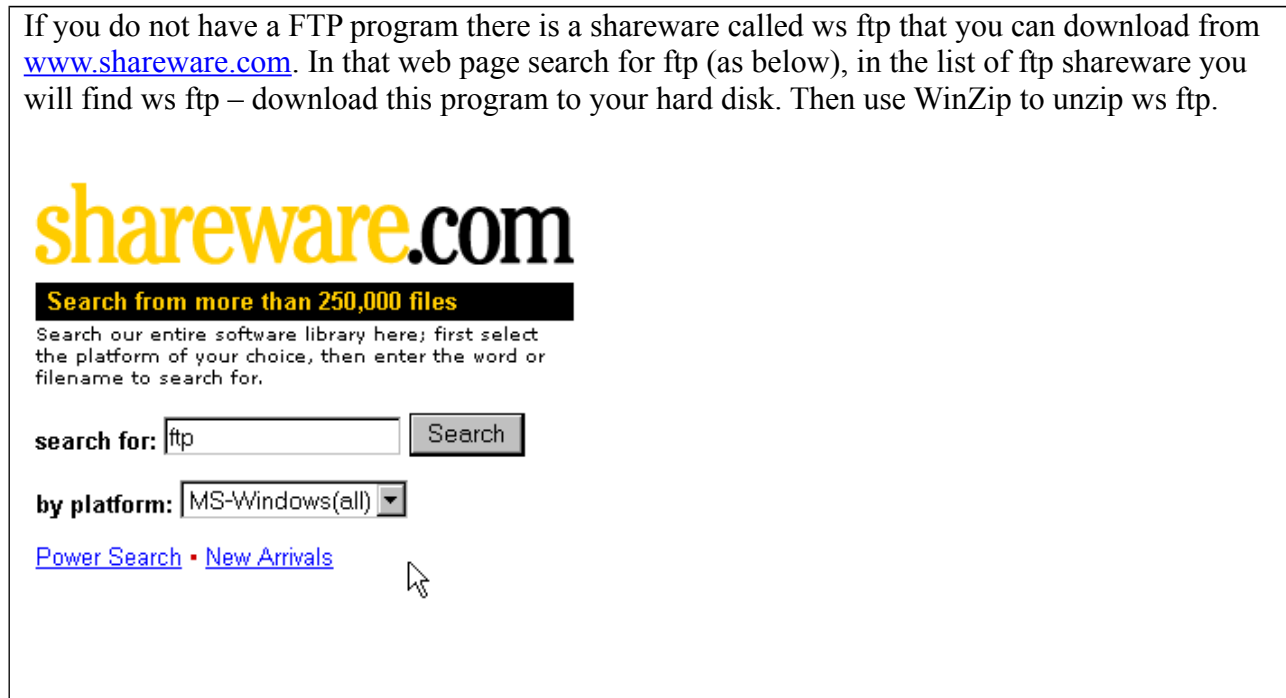
Land cover (polygon)



DCW download manager

Select the layers you want to download and continue. In the DCW download manager do select [Data Compression Type] to be PC/NT and [Optional Arc View Projects] to be NONE. Then press [Compute Data]. Then just [Download Coverages]. If the downloading does not work (not uncommon) you must use a manual FTP program to download. Note the name and directory of the file that the Download Manager created for you.

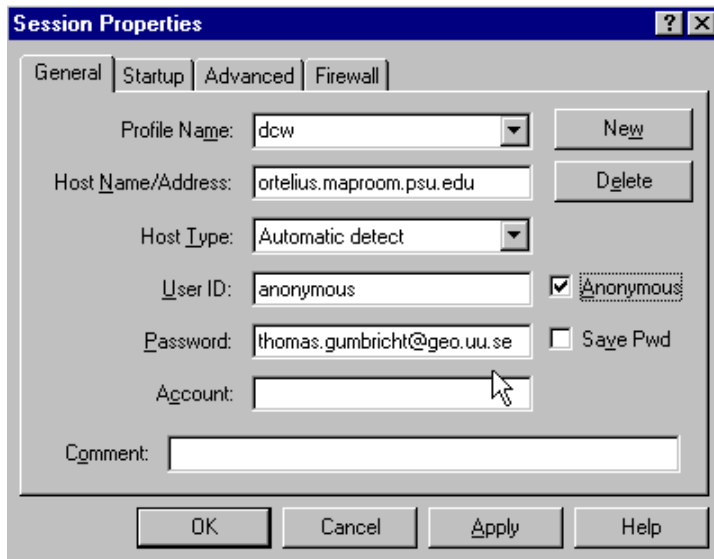
If you do not have a FTP program there is a shareware called ws ftp that you can download from www.shareware.com. In that web page search for ftp (as below), in the list of ftp shareware you will find ws ftp – download this program to your hard disk. Then use WinZip to unzip ws ftp.



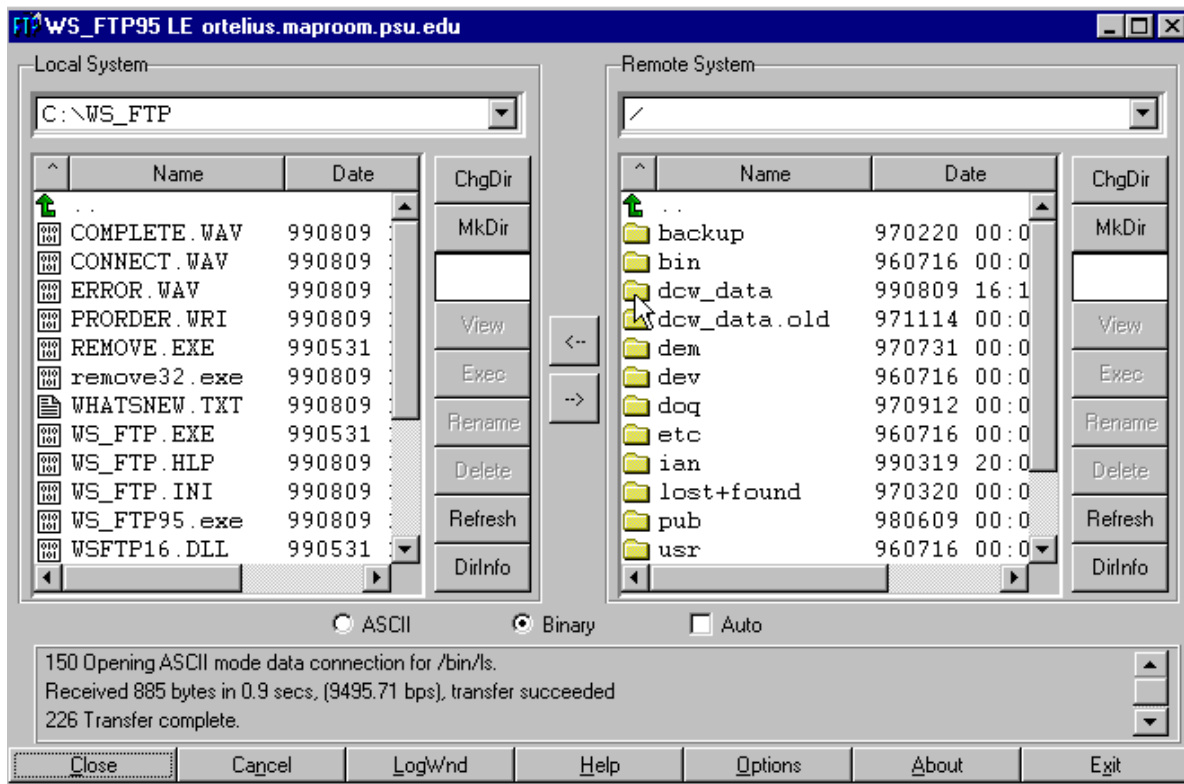
To ftp your file with DCW from PSU use the following declarations for connecting:

URL	ftp://maproom.psu.edu/dcw_data/xx (where xx is a number given to your file by the DCW download manager)
Host name	Ortelius.maproom.psu.edu
Host type	Automatic detection
User-ID	Anonymous
Password	Anonymous or your own e-mail

In ws ftp the declarations looks like this (where you can enter your own e-mail as password).



Once connected to ortelius.maproom.psu.edu change remote directory to dcw_data and then xx (where xx is the name given to you by the ftp server – see above). Change your local directory and press transfer button, <-- (between the two windows).

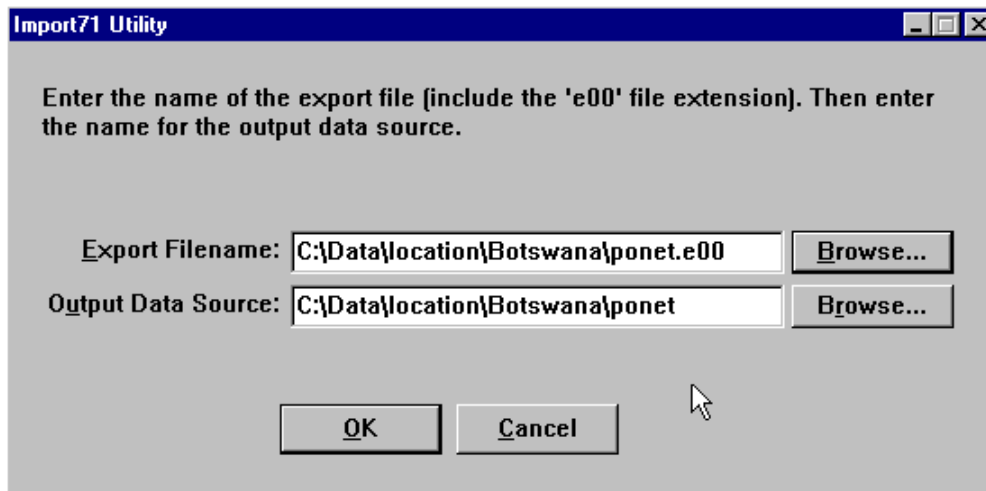


Unzip the DCW maps and import them to ArcExplorer/ArcView

The DCW files that you got from PSU are zipped, so you need to unzip them. After unzipping you should have the following files in your directory

Name	Content	Type
dnnet	Drainage	Coverage (arcs and polygons)
hynet	Hypsography (digital elevation model)	Coverage (arcs and polygons)
lcpoly	Land cover	Polygon
ponet	Political/ocean boundary (comes automatically)	Coverage (arcs and polygons)
pppoint	Populated places (i.e. cities)	Points
rdline	Roads	Arcs

The unzipped files all have the extension *.e00, this is the export format of Arc Info, and it can be imported to ArcExplorer or ArcView. Use the program Import71 which you can download from ESRI's homepage (if you have ArcExplorer or ArcView on your computer you probably also have Import71). As Import71 will produce ArcInfo coverages you must put each imported theme in a separate directory. Thus for each e00 file that you import create a directory with the same name (as in the example below). You have to import all the maps individually.

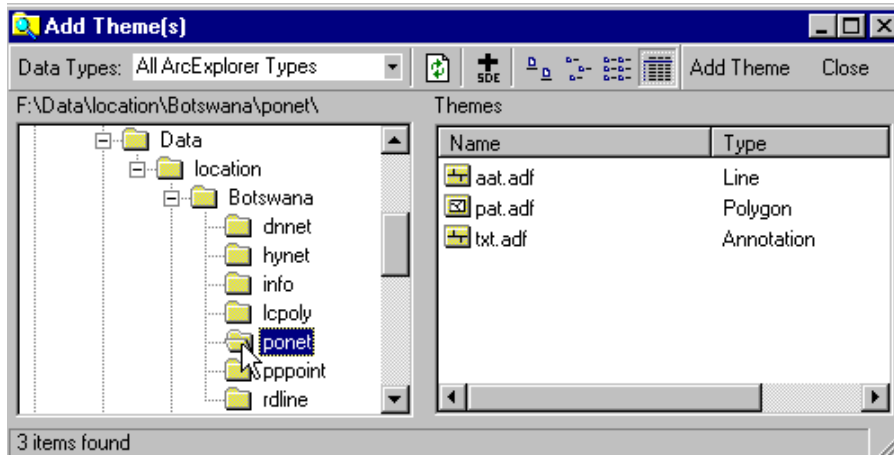


Adding ArcInfo coverages to ArcExplorer

Use the Add theme tool to pick up the DCW data layers that you imported. The DCW data that you imported from www are now stored on your local hard disk so they should be added as local themes. In the Add theme dialogue box navigate to the directory where you saved the files you created with Import71. If you use ArcExplorer make sure data types is either “All ArcExplorer

Types” or “Arc/Info Coverages”, . As the files you got from DCW were ArcInfo coverages they usually contain more than one theme. For example ponet (political ocean boundary) contains one theme as polygon (a closed area showing the borders),

one theme as line (a line showing the borders) and a theme with annotations (text labels to put on the map). Other themes might contain other types.



Adding ArcInfo coverages to ArcView

Use the **Add** tool to pick up the DCW data layers that you imported. When you get the add menu, do select the feature you want to add with one click on the mouse (do not double click), and do put the mouse marker over the graphics of the file not over the text! The features shadowed by a yellow portfolio are coverages. This means that they contain more than one feature. If you have clicked once on the graphics for a coverage you should get a subset list of available features to add.

What coverages to add

Here is a suggestion on what DCW themes to add


Content	Add as
Political/ocean boundary	Polygon
Land Cover	Polygon
Land Cover	Annotation
Drainage	Polygon
Drainage	Line
Drainage	Annotation
Hypsography	Line
Roads	Line
Population (cities)	Point
Population (cities)	Annotation

The colours of the themes that you have added were set in a random manner. Thus the next step is to set colours and classify your data.. Before you can do that you must find out what is actually shown in the different themes. This you can do via the www site of DCW. Thus navigate to <http://www.maproom.psu.edu/dcw/> and choose ABOUT DCW.

Try to find out information about the coding of land cover, drainage and roads. If you do not find the information here is the URL to write for these themes:

Theme	URL
Land cover	http://www.maproom.psu.edu/dcw/dcw_about.shtml#LANDDESC
Drainage	http://www.maproom.psu.edu/dcw/dcw_about.shtml#DRAINDESC
Road	http://www.maproom.psu.edu/dcw/dcw_about.shtml#ROADDESC

Once you have noted which field hold which information you can classify and set colour to your data. This is done in the **Theme properties dialogue box** which you can open by either double click the name label in the legend, or under theme in the menu bar.

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

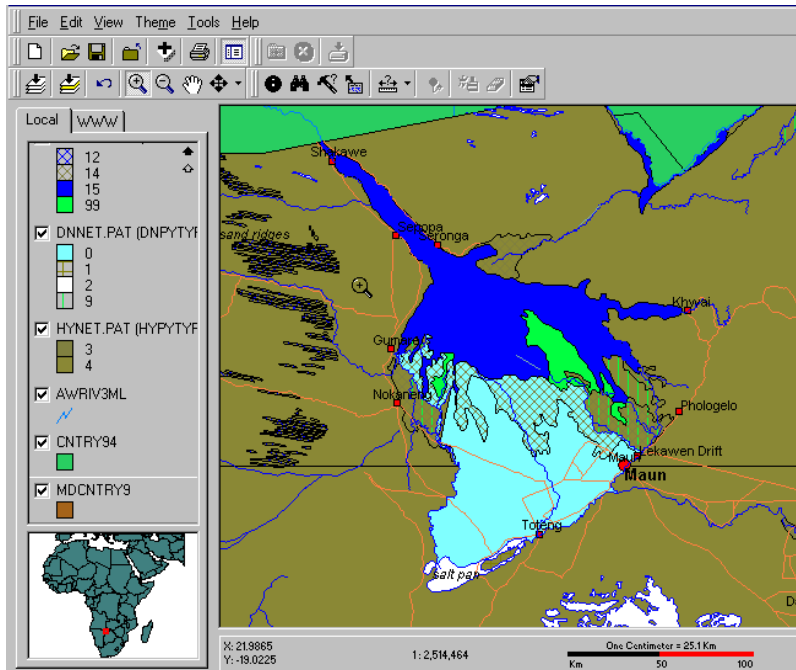
Your task

Having added all the data over southern Africa it is time to create a set of thematic maps over physical and human geography that highlight the water situation of the area. Some of the relations that is possible to analyse are the following:

- precipitation and natural landscapes,
- precipitation and vegetation,
- precipitation and population,
- precipitation and intermittent vs. permanent lakes,
- precipitation and intermittent rivers vs. permanent rivers,
- precipitation and water sanitary situation,
- agricultural production and precipitation,
- agricultural production and natural landscapes
- agricultural production and lake and river density,
- urban vs. rural population and agricultural production, and
- military capacity and water situation.

Use your imagination to try to find out some interesting relation to analyse. Use the data to explore this relation, and present the outcome by using cartography. Your analysis should include both physical and human geography if you want to achieve a higher grade.

An example showing the physical geography of just the Okavango delta done in ArcExplorer is shown below.



As part of the project you must produce a report, including texts and maps. If you want to present the study as an article or a poster is your choice. In both cases a minimum standard of contents and references is required as specified below.

The project must be reported in a written paper or a poster. If in article form use times roman, size 12, with double spacing and margins on all sides of 2.5 cm. The paper/poster should contain the following parts:

Title	
Abstract	
Key words	
Introduction	Why did you start?
Material and methods	How did you do it? What data did you use?
Results	What answer did you get?
Discussion	What does it mean?
References	What sources of information did you use!

Your report shall contain (at least) two maps, one showing physical geography and one human geography. The relation between the two maps should be discussed.

Send in your report either in digital format or as a paper copy.

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. 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>.