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## **WFP Liberia Country Office**

### **GIS training - Summary**

#### **Objectives**

- 1 To introduce to participants the basic concepts and techniques in using Geographic Information System (GIS)
- 2 To equip participants with practical GIS skills to produce Layout Map for the report

#### **Session 1**

##### ***Introduction to GIS***

1. Recognizing ArcMap user interface
2. Learning about the basic mapping functions of ArcMap
3. Exploring and query map data under ArcMap environment
4. File Management : Shape file and Raster files format

#### **Session 2**

##### ***Exploring GIS***

1. File management exploring ArcCatalog
2. Creating a new layer file and use of editing tool in ArcMap
3. Creating a layer from Gps Data
4. Selecting features by creating a query
5. External Tables and joins
6. Spatial Join
7. Preparing Map Layout (functions)
8. Changing the Symbology options
9. GIS resources: books and websites

## Session 1: Introduction to GIS - ArcMap Basics

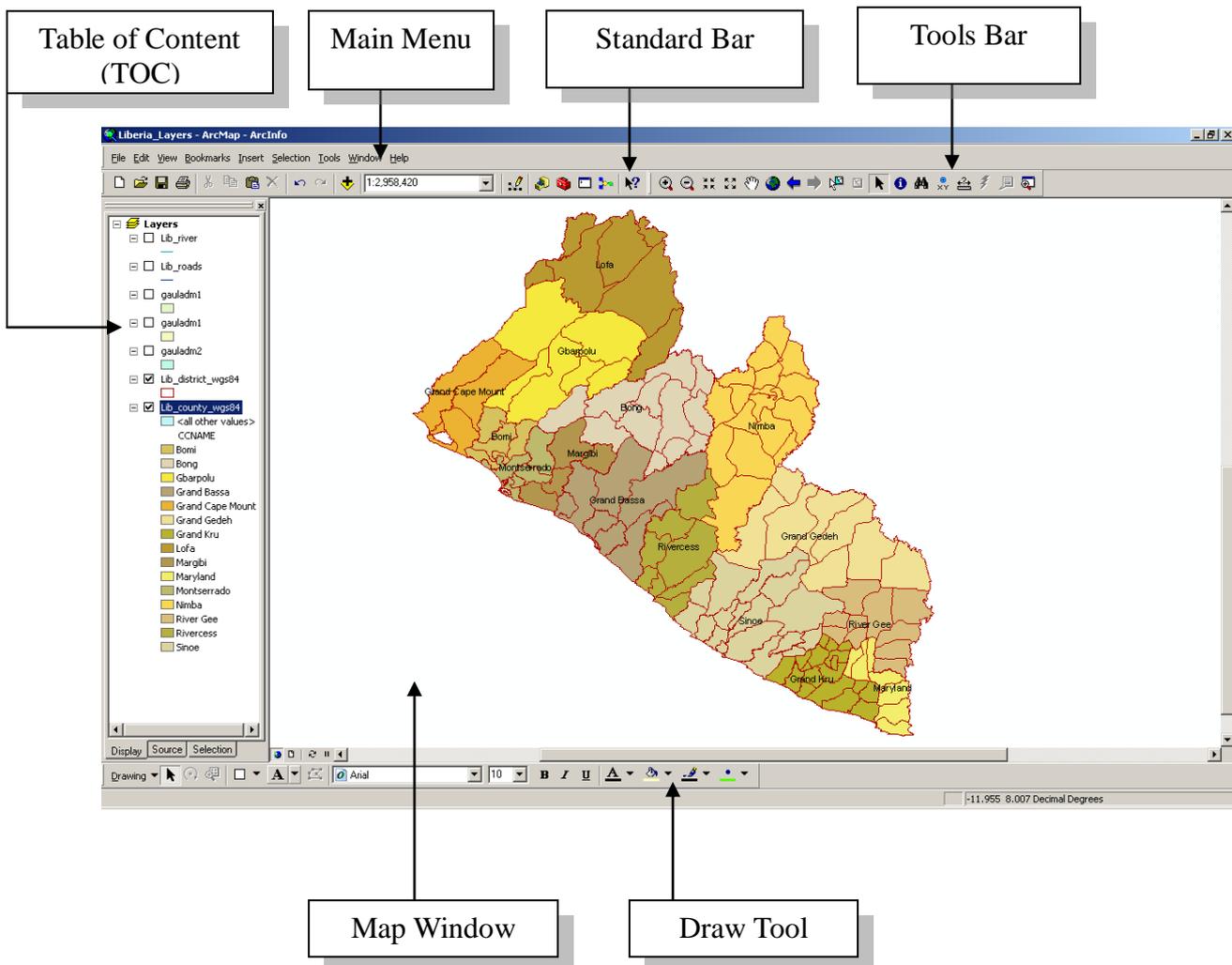
### Objectives

- To recognize ArcMap (ArcView 9.x) user interface
- To learn about the basic mapping functions of ArcMap
- To explore and query map data under ArcMap environment

### Task 1: Recognizing ArcMap user interface

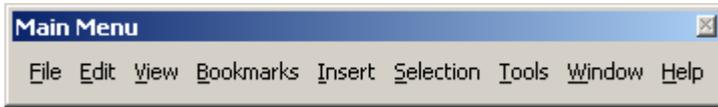
#### Toolbars:

Look at the top of the ArcMap window. There are four bars shown as below. We will use these buttons to perform various GIS functions.

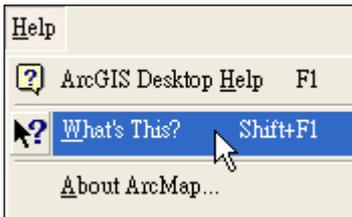


3

1. **Main Menu:**



a. Getting help in the ArcMap

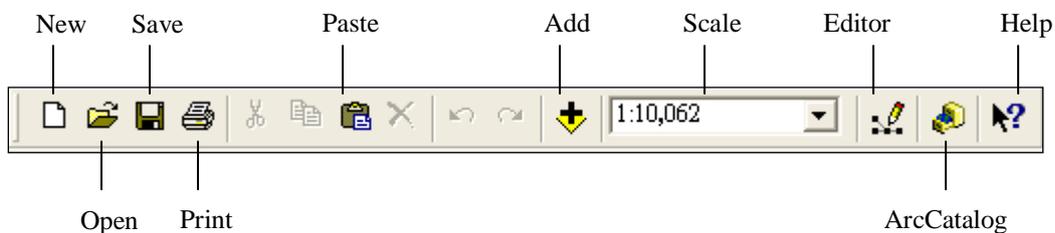


- Click the What's This? Button
- With the Help pointer, click the item in the ArcMap window about which you want more information

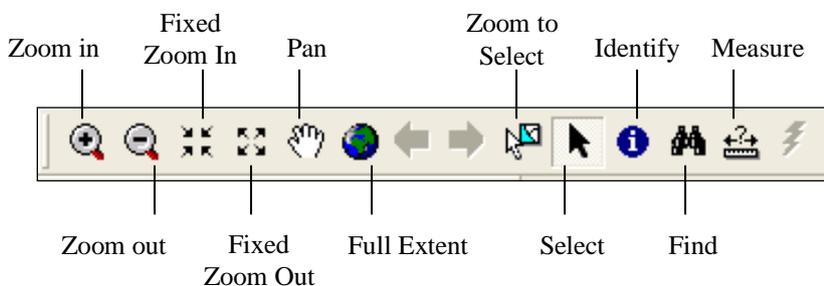
b. Using the Help Contents to get help

- Click the Help menu and click ArcGIS Help
- Click the Contents tab
- Double-click a book to see a list of topics in that category
- Click the topic you want to read

2. **Standard:**



3. **Tools:**



4. **Draw Tool:** used to add map elements

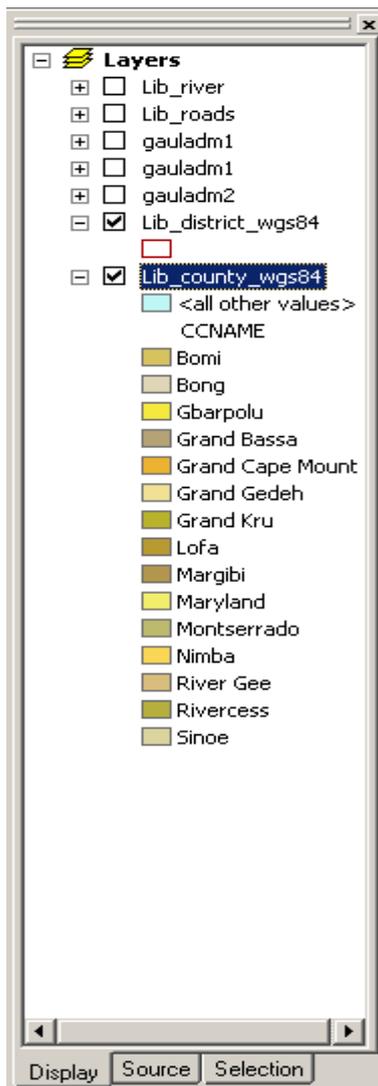


### Table of content (TOC)

It shows what layers the map contains and how the map presents the geographic features in those layers

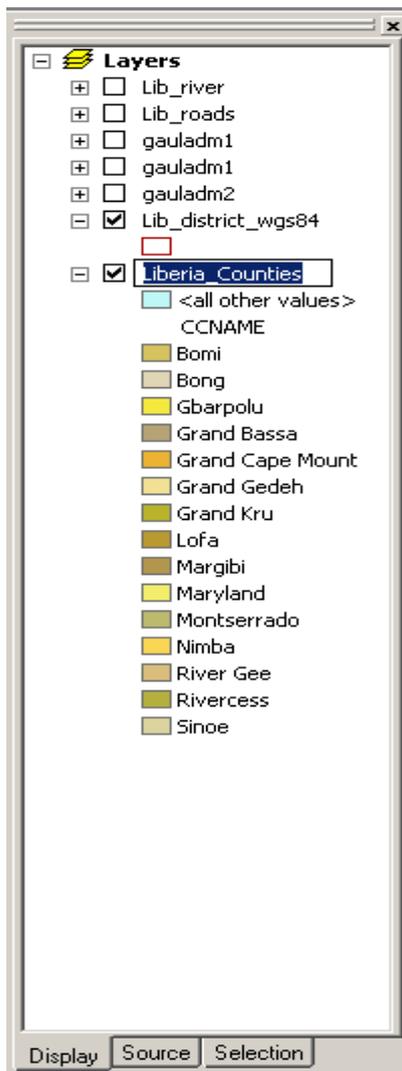
#### 1. Showing or hiding map symbol

- In the TOC, click the + and – sign to the left of the layer name to show and hide the layer symbol respectively



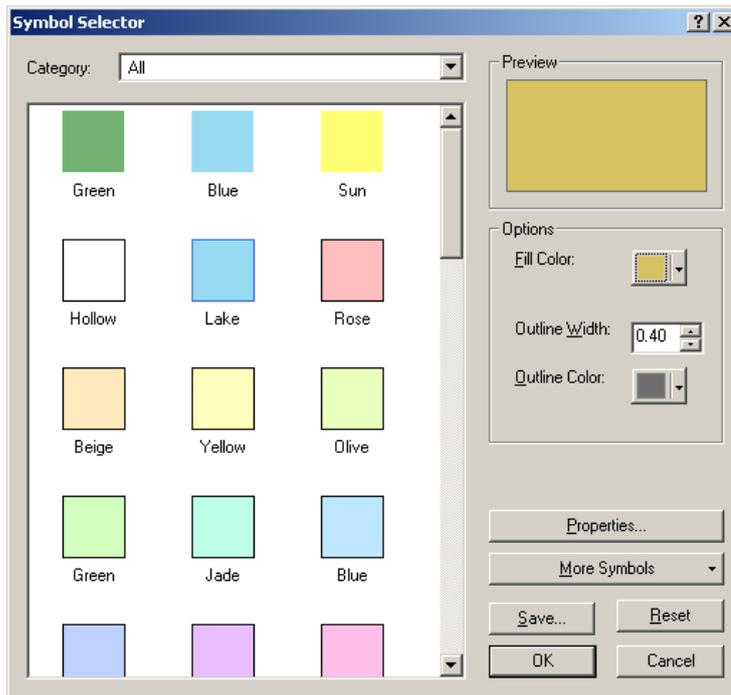
#### 2. Changing the name of a layer

- In the TOC, click the layer to select it
- Click again over the name
- Type the new name and press enter

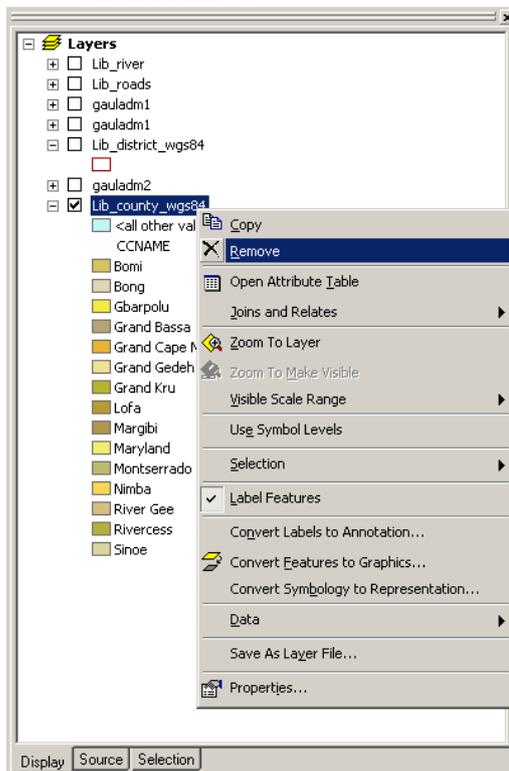


3. Changing the display symbol for the layer
  - In the TOC, click the box on the left of the layer name to show symbol
  - Click the symbol (for ex. Bomi, see below *Color Preview*)
  - Select symbol in symbol selector interface

6



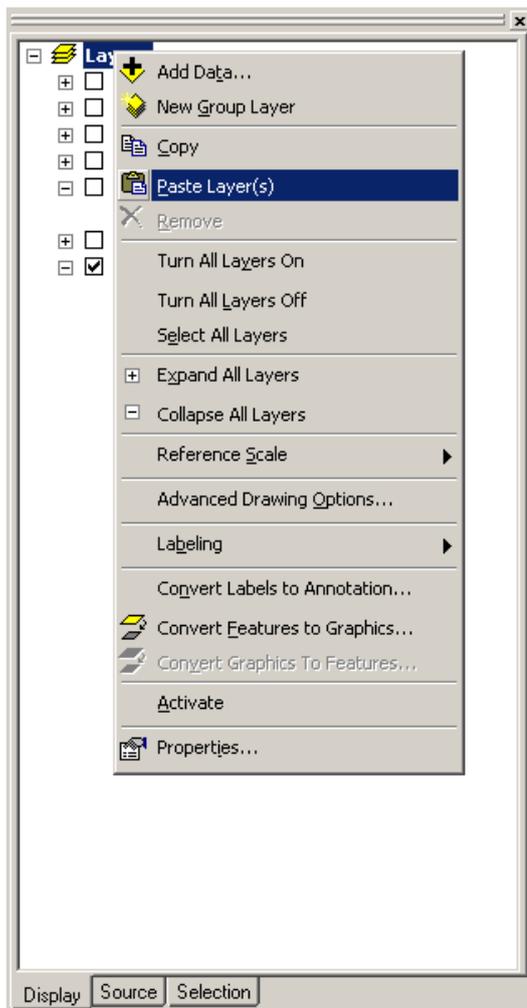
4. Changing a layer's drawing order
  - In the TOC, click and drag the layer up or down
  - Release the mouse pointer to drop the layer in its new position
5. Removing a layer
  - In the TOC, right-click the layer you want to remove
  - Click Remove



7

6. Copy and past a Layer into the same TOC

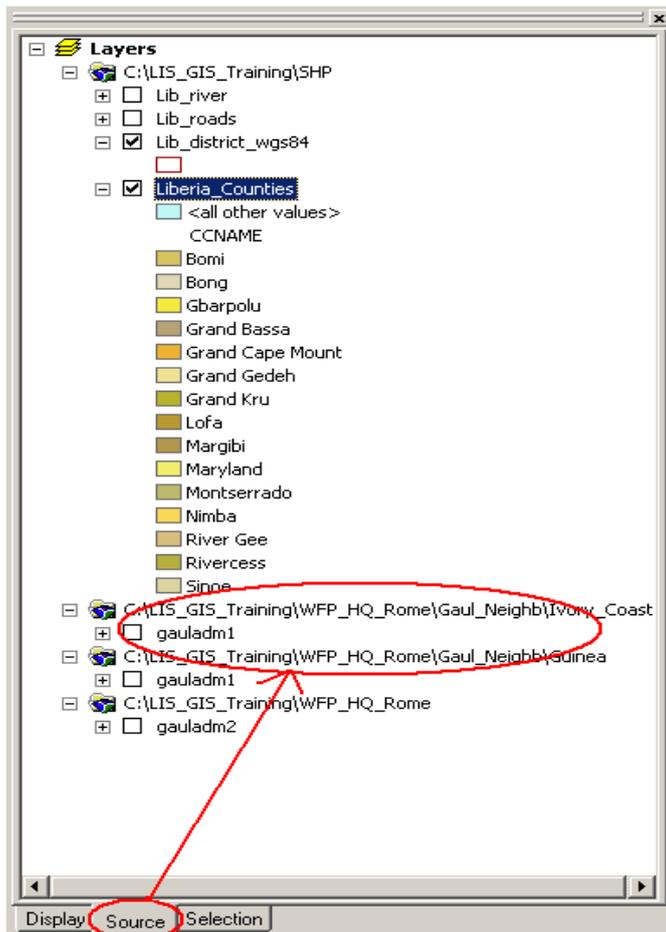
- In the TOC, after to select the layer you want to copy and right click from the list select “Copy” and than go on the top of TOC select “Layers” and than right click and select “Paste Layer(s)”,you will have a duplication of the layer chosen into TOC



8

7. Using *Source* Instead of *Display* on the TOC

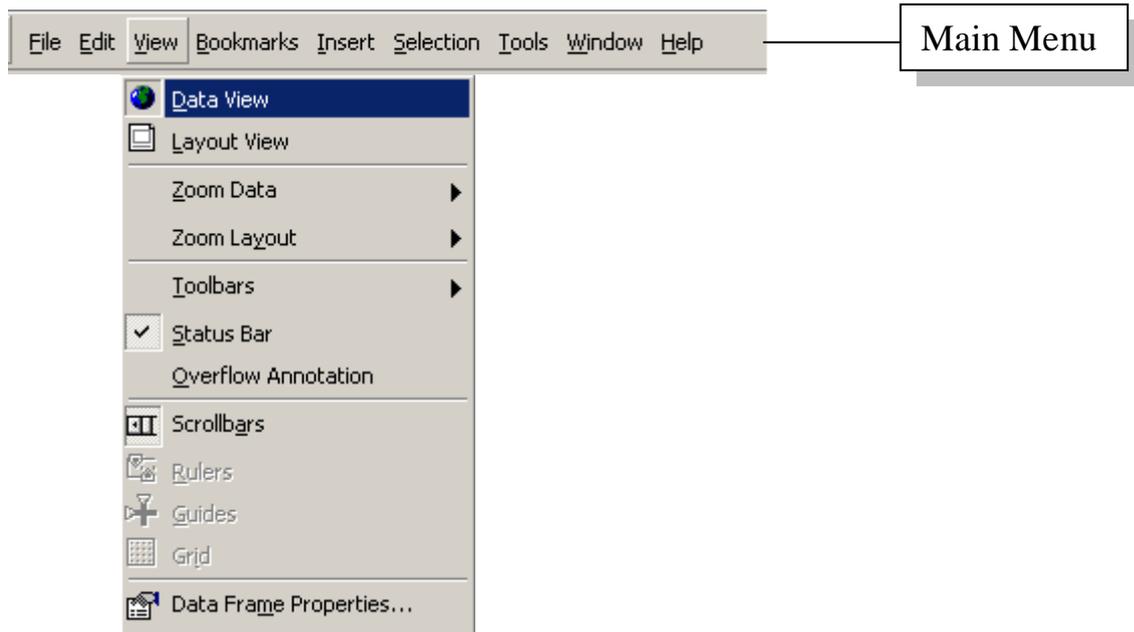
- In the TOC, on the bottom click on the *Source* instead of *Display* using that you can visualize the path where are the layers of the *Project* (when you use this it's not possible to change layer's order)



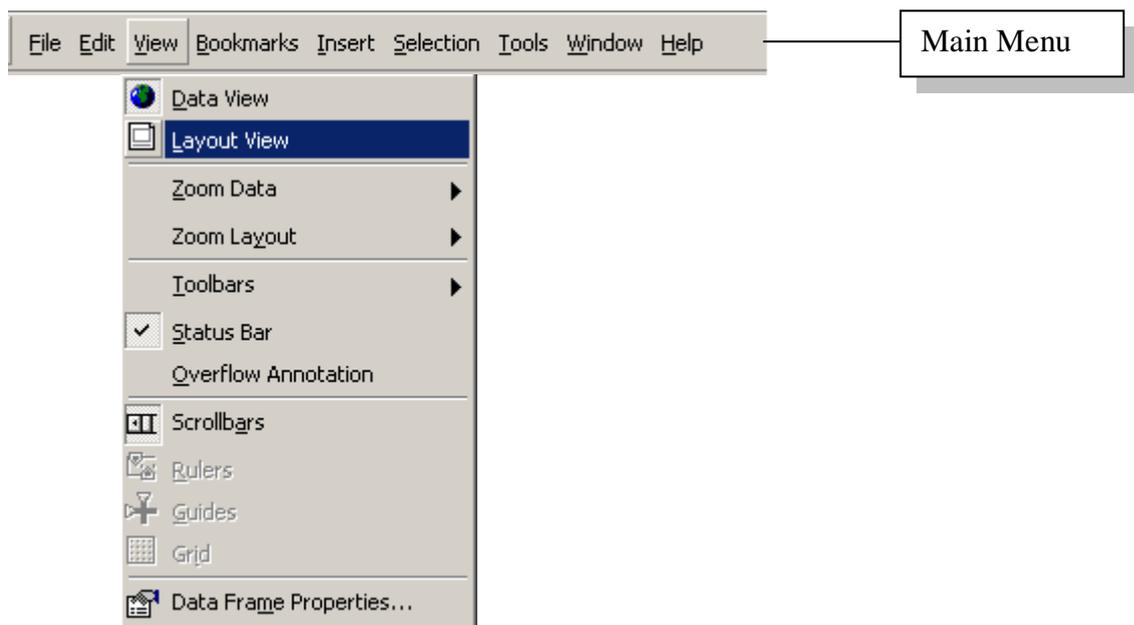
### Map window

Use 2 buttons or use View menu on the Standard toolbar to quickly switch between data view and layout view

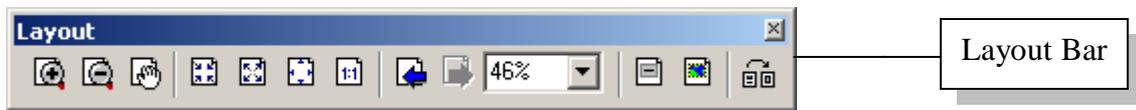
1. **Data View** is an all-purpose view for exploring, displaying, and querying the data on the map. But the view hides all the map elements on the layout, e.g. titles, North arrows. (From “Main Menu” → “View” and then → “Data View”).



2. **Layout View** is for laying out a map. In it, we can do almost everything in data view, plus design a map / arrange map elements.

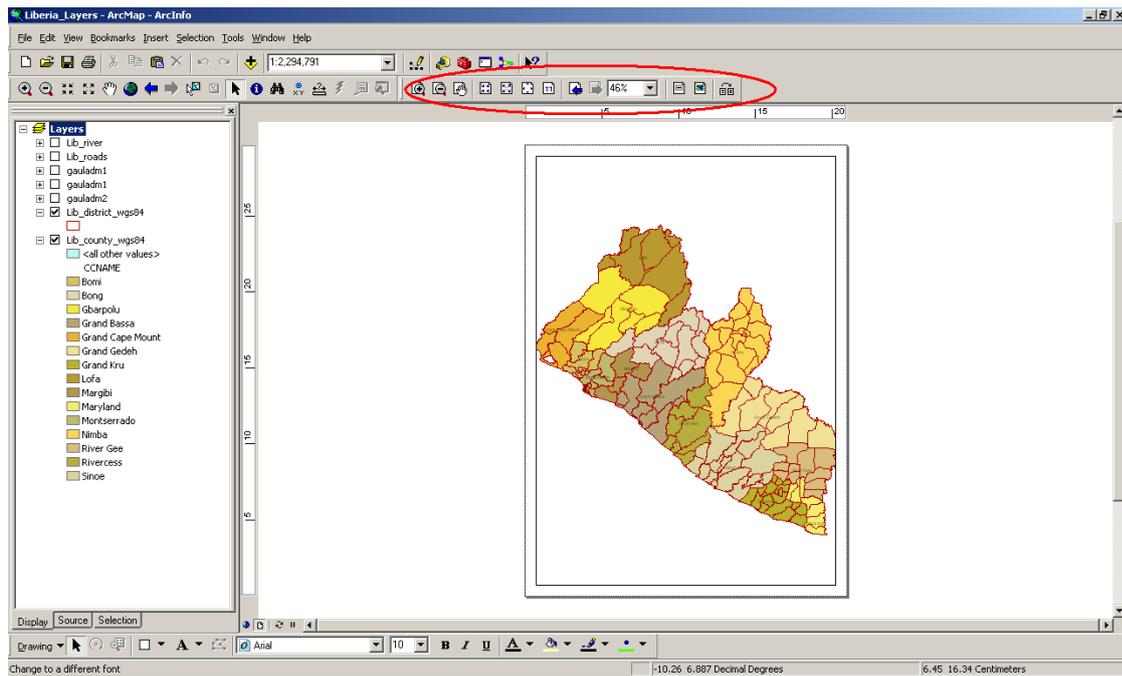


One click on *Layout View* and we will get a *Layout bar* (as below)

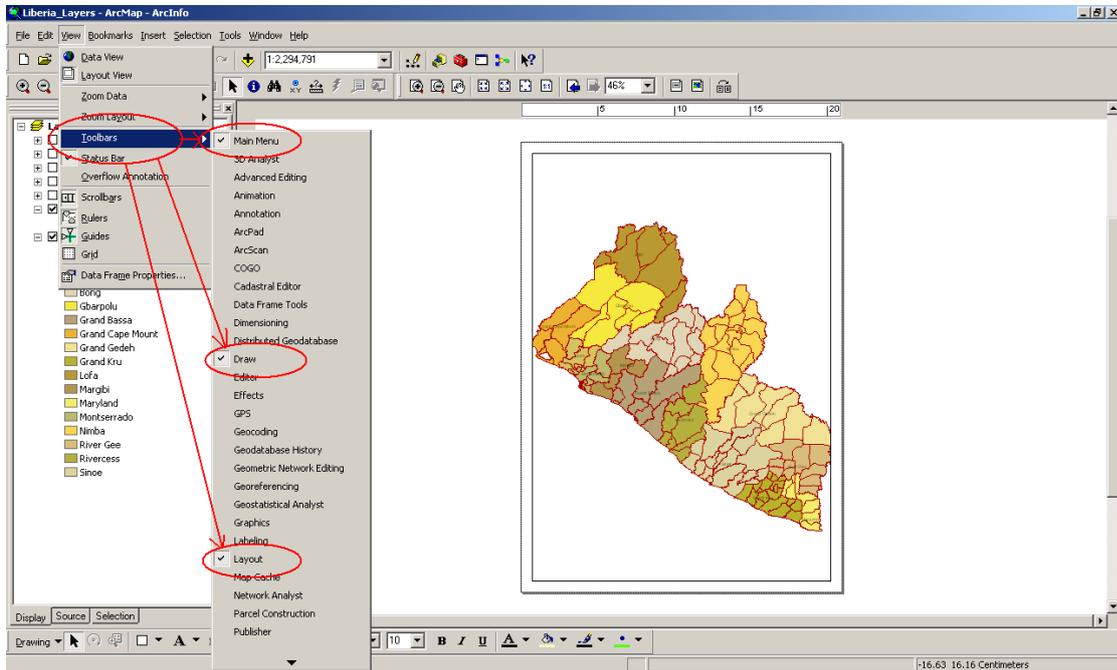


*Map Window* change as well (see below).

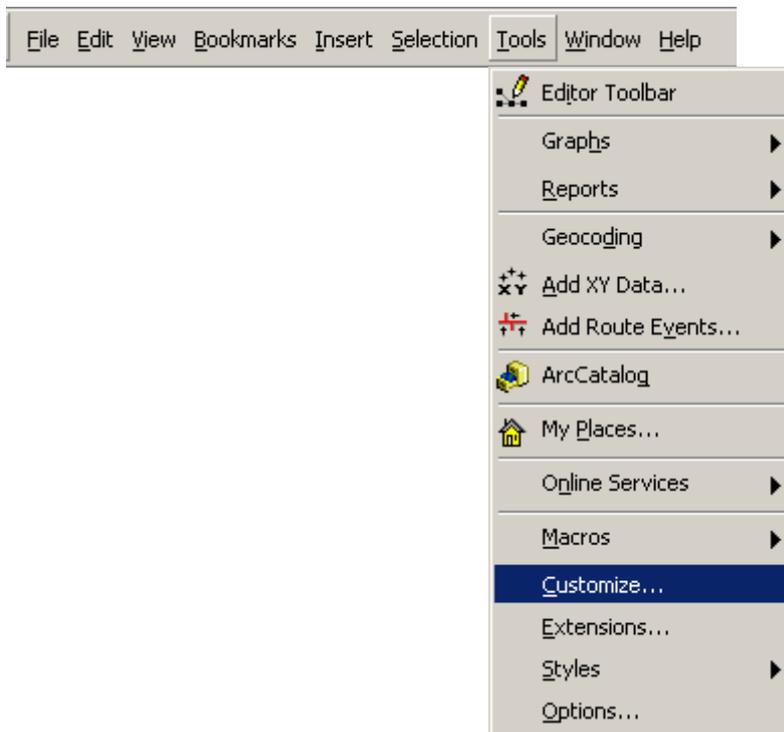
We will use *Layout view* every time we have to produce a Map (A4,A3 for paper format Or for digital format Jpeg, Png)

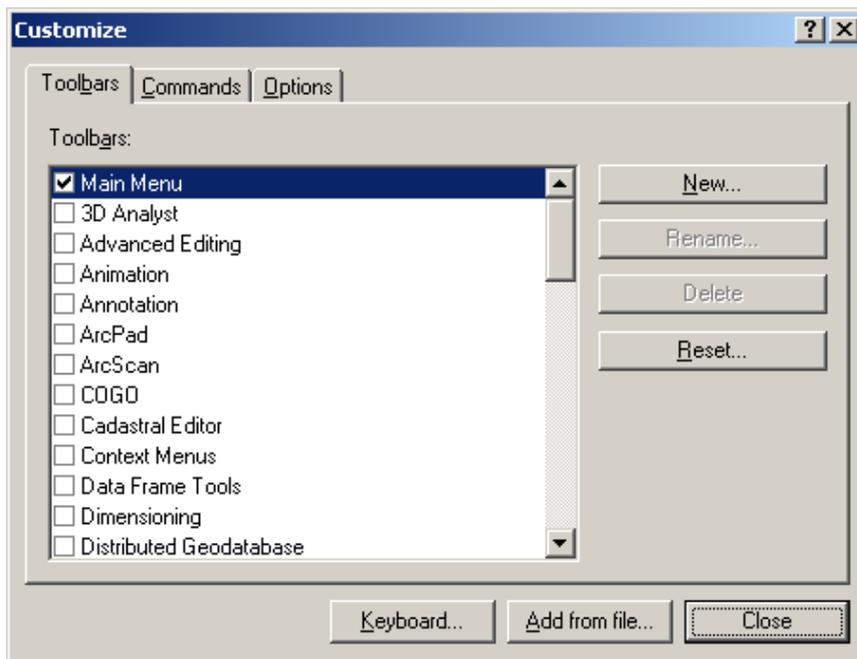


Every time we have to add a function to our *Project* we have to go to *Main menu bar* → *Toolbars* after that check in to activate the functionality you want to get.

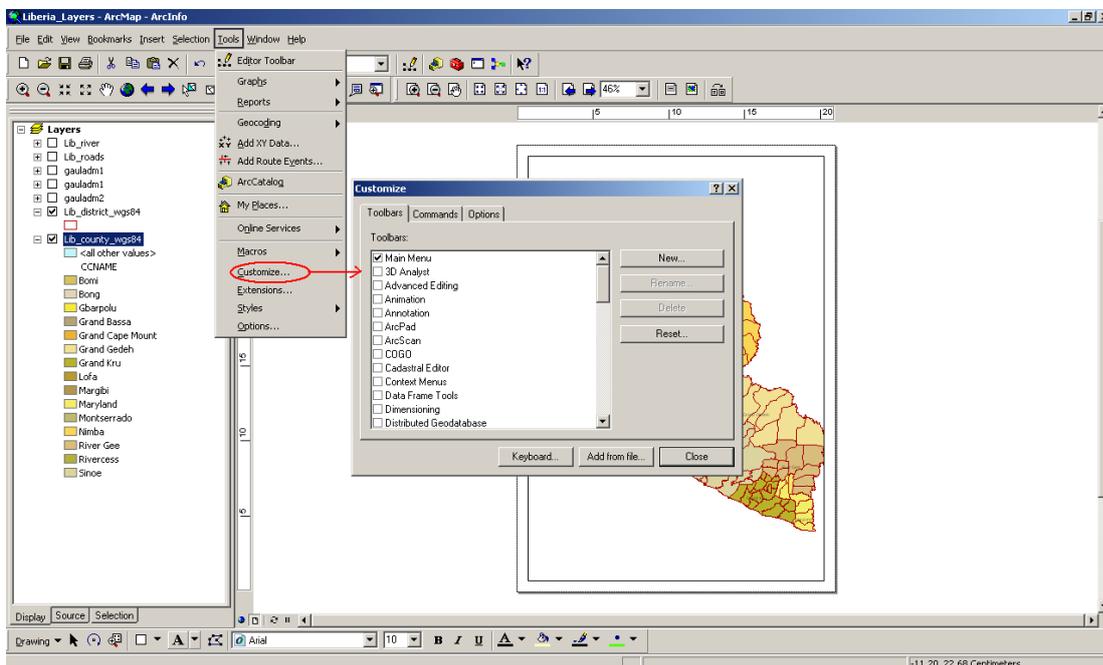


Another way for activate (or for switch off ) all the functionality you need to use *Main Menu* → *Tools* → *Customize*, where you find all the functionality and where choice the right one you need, check in (check out for excluding) See below.





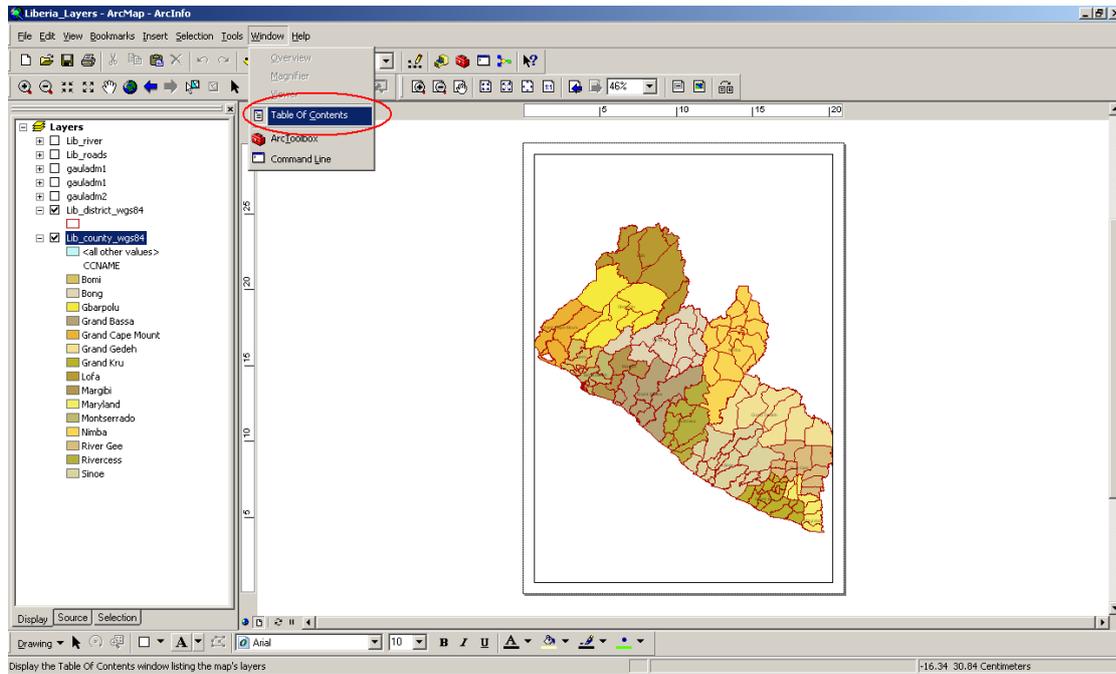
Check in to activate the bar you are interested or uncheck to switch off for excluding that bar. See below the screen shot:



The lonely functionality you cannot excluding is *Main Menu* (of course) otherwise There isn't way to check in or check out all others functionality.

To visualize or to switch off the TOC:

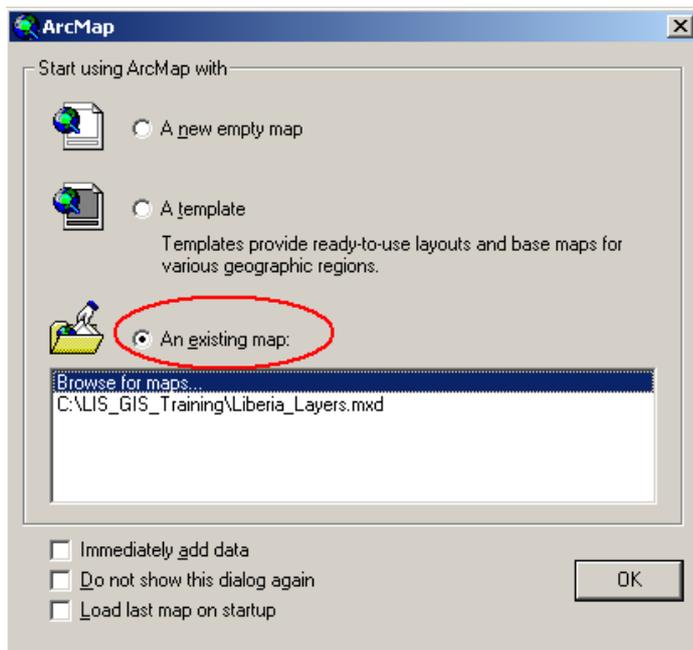
- From *Main Menu*
- *Window*
- *Table of Contents*



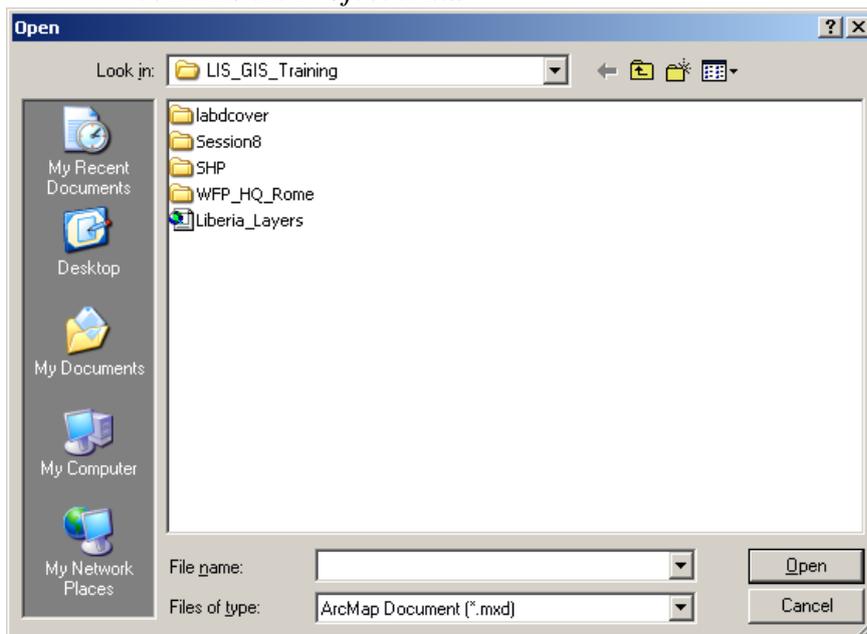
## Task 2: Learning about the basic mapping functions of ArcMap

### Open a Project (.Mxd) from the Startup dialog box

- Start ArcMap
- Click to open “an existing map” option



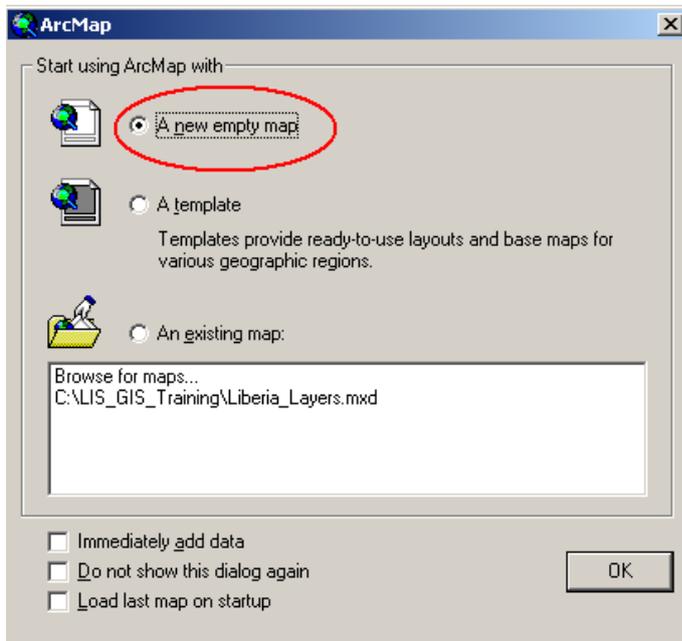
- Click OK
- In the dialog box click the Look in dropdown arrow and navigate to the folder that contains the *Project .Mxd*



- Select the *Projects* you want to open and

15

- Click open
- Otherwise if there is no *Project (.Mxd)* and you want to make it a new one click on “A new empty map” after that you have to import the layers you want to working on.

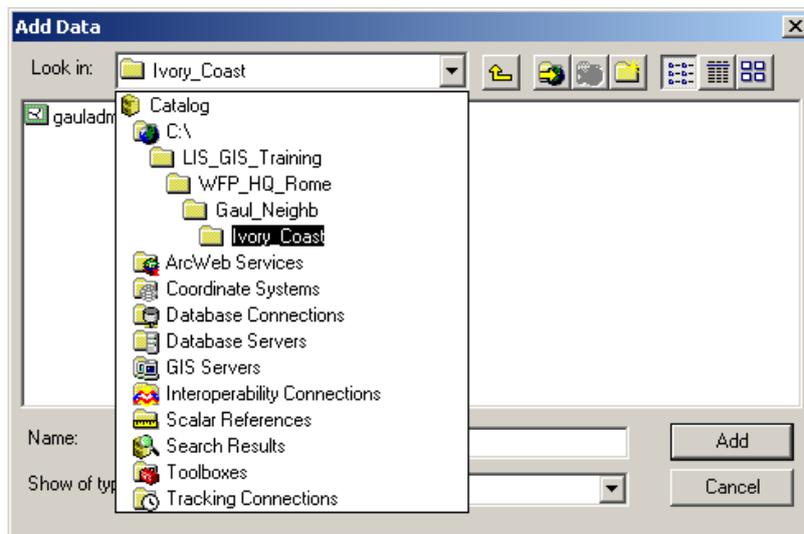


## 2. Adding a map layer

- Click the Add Data button on the “*Standard toolbar*”



- Navigate to the map folder



- Selected layer and Add

### 3. **Displaying a layer** (turning on / off the map display)

- In the TOC, check the box next to the layer's name when you display a layer. But uncheck it when you turn the layer off.

### 4. **Overlapping map layers**

- In the TOC, click and drag the layer up or down
- Release the mouse pointer to drop the layer in its new position

### 5. **Moving around the map on data view**

#### Zooming in or out

- Click and drag a rectangle defining the area you want to zoom in or out



#### Zooming in or out a fixed amount

- Move the mouse pointer over the map display
- Click once to zoom around a point



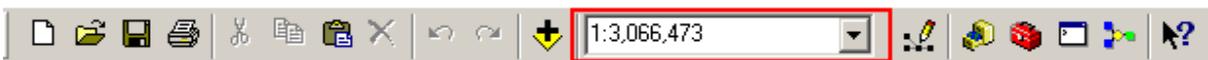
#### Zooming to the full extent of the data

- Click the Full Extent button



#### Zooming to a specific scale

- Type the appropriate scale in the scale bar

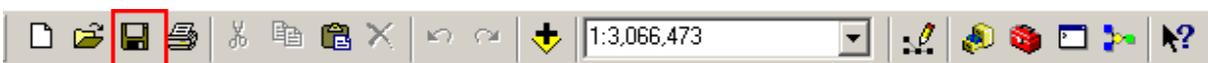


#### Moving back or forward one display

- Click the Back or Forward Extent buttons

### 6. **Saving a map document** (*Project* and all changing done ex: Name of layers, scale etc)

- Click the Save button on the Standard toolbar



**Task 3: Exploring and query map data under ArcMap environment**

1. Identifying features by pointing at them
  - Click the Identify tool on the Tools toolbar



- Before to move the mouse pointer over the selected feature choice from the layers for which one you want to get information

Identify from: Lib\_county\_wgs84

- <Top-most layer>
- <Visible layers>
- <Selectable layers>
- <All layers>
- Lib\_river
- Lib\_roads
- gauladm1
- gauladm1
- Lib\_district\_wgs84
- gauladm2
- Lib\_county\_wgs84

Identified 1 feature

Layer chosen

All Layers into TOC

- Move the mouse pointer over the selected feature on *Map Window*

Identify from: Lib\_county\_wgs84

Location: -10.404193 7.589598 Decimal Degrees

Field	Value
FID	2
Shape	Polygon
CCNAME	Gbarpolu
COUNT	148
SUM_TOTAL	83388
SUM_MALE	43906
SUM_FEMALE	39482
SUM_HH	14533
FIRST_CCOD	45
DENSITY	117963
Area	9836722579.28

Identified 1 feature

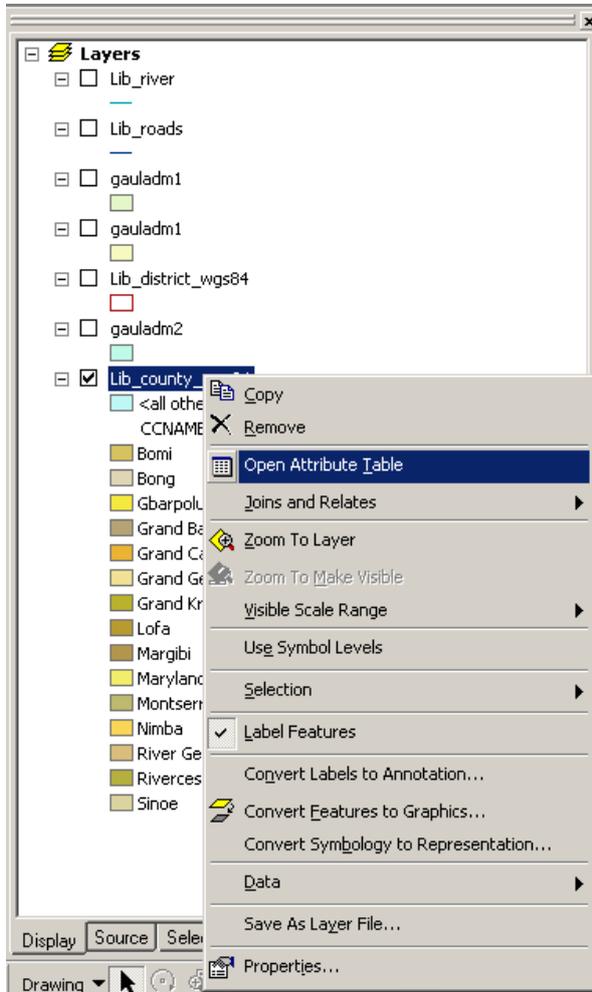
Specific record of The database

Specific record of the database

All the Field Names of the database

## 2. Viewing a layer's attribute table

- In the TOC, right-click the layer for which you want to display the attribute table
- Click Open Attribute Table



FID	Shape *	CCNAME	COUNT	SUM_TOTAL	SUM_MALE	SUM_FEMALE	SUM_HH	FIRST_CCOD	DENSITY	Area
0	Polygon	Bomi	273	84119	42940	41179	20508	03	22695	1909116217.92
1	Polygon	Bong	927	333481	164859	168622	69810	06	26086	8699305347.05
2	Polygon	Gbarpolu	148	83388	43906	39482	14533	45	117963	9836722579.28
3	Polygon	Grand Bassa	468	221693	110913	110780	47440	09	35383	7844238731.33
4	Polygon	Grand Cape Mount	278	127076	65679	61397	23950	12	37198	4726989466.47
5	Polygon	Grand Gedeh	176	125258	64994	60264	18143	15	85648	10728045393.2
6	Polygon	Grand Kru	130	57913	29648	28265	8969	18	66479	3849994909.91
7	Polygon	Lofa	501	276863	133611	143252	49642	21	35639	9867071956.9
8	Polygon	Margibi	431	209923	105840	104083	45095	24	12171	2555049251.59
9	Polygon	Maryland	171	135938	70855	65083	19254	27	16705	2270815918.14
10	Polygon	Montserrado	2250	1118241	549733	568508	232585	30	1661	1856996214.16
11	Polygon	Nimba	781	462026	230113	231913	80734	33	24713	11417833236.6
12	Polygon	River Gee	108	66789	34863	31926	9822	42	75649	5052550927.48
13	Polygon	Rivercess	152	71509	37224	34285	13981	36	77311	5528452928.63
14	Polygon	Sinoe	218	102391	54767	47624	15829	39	94287	9654165923.15

Feature ID

County Records

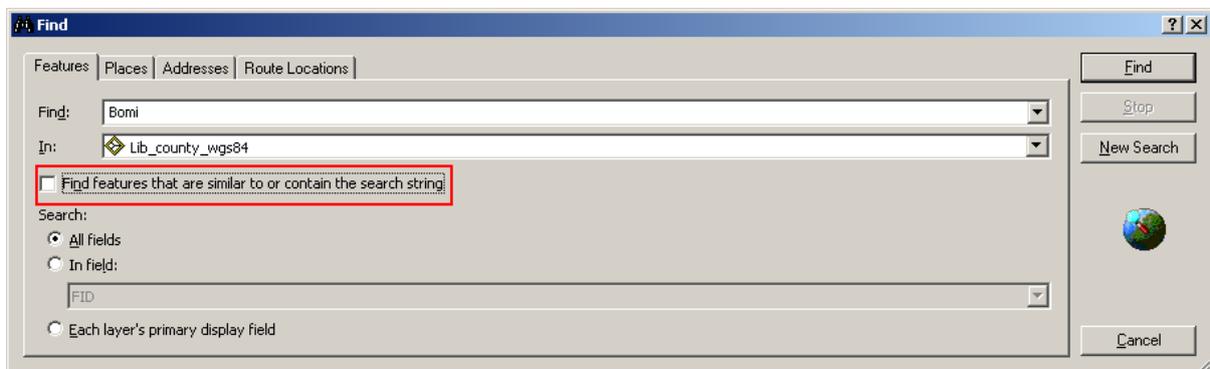
The “*Feature ID*” is a counter of the records automatic after to created the Shapefile Starting to 0 until 15 (in our example), the rest of the Fields are created and populated.

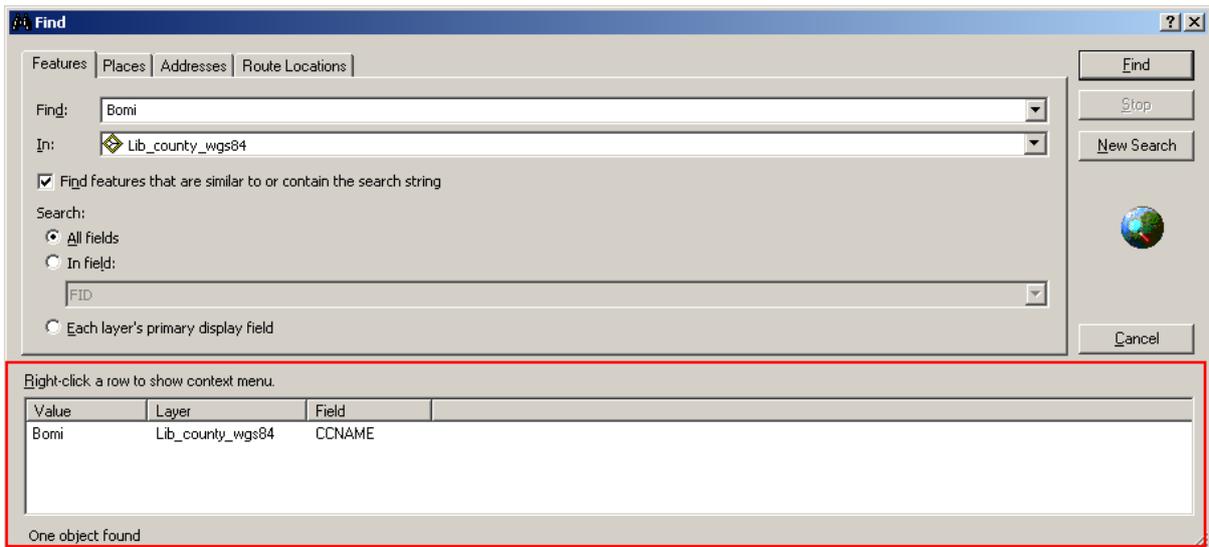
- Finding features with particular attributes
  - Click the Find button on the Tools toolbar



If you are seeking a Record name containing in a layer that is on TOC:

- Click the *In* layers dropdown arrow and click the layer you want to search
- Type the string you want to find in the Find text box
- Uncheck Find features that are similar to or contain the search string if the string must match exactly
- Search for the string in all fields, in a specific field, or in the primary display field
- Click “*Find*”





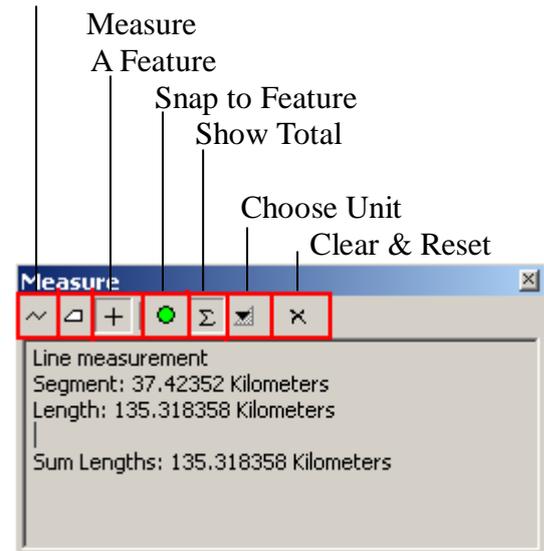
On the bottom of the window we have the information requested: "Value" record,"Layer","Field".

4. Measuring distance

- Click the Measure button on the Tools toolbar

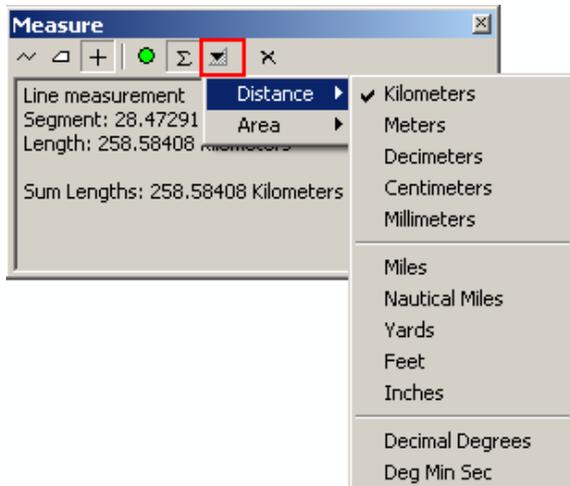


Measure  
Line



In the case we want to measure a linear distance between two points in Kilometers, Meters, Decimal Degrees:

- Click on Choose Unit
- Distance
- Choice Kilometers or what you want (Meters, Decimal Degrees)



- Come back to Measure Line and go to the Map Window and use the mouse pointer to draw a line representing the distance you want to measure.
- The line can have more than one line segment
- Double-click to end the line

#### Task 4: File management: Shapefile and Raster files structure

##### a) Shapefiles

Shapefiles are a vector format invented by ESRI. They are very easy to use because they contain the data in a table format, where each *feature* (vector element) is independent from the other ones.

Shapefiles consist of the following files:

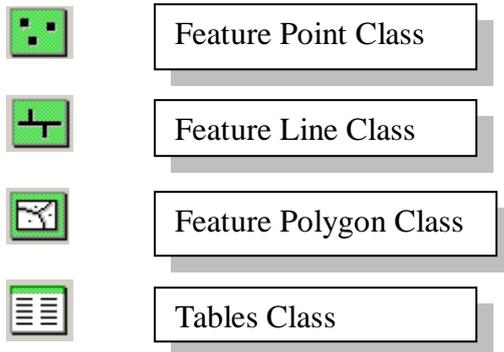
- \*.SHP the main “shape” file. It contains the shapes
- \*.DBF the attribute table. This is a standard DBF version 4 file
- \*.SHX this links the first two files together

ESRI also uses the following files together with shapefiles to add extra functionality:

- \*.SBN, \*.SBX these are index files that speed up the usage of shapefiles.
- \*.AUX this is extra information ArcMap needs for all layers
- \*.PRJ this is the projection file (see section about projections) in text

Format

The Symbology in Arc Map/ArCatalog for the three Feature Class are:



### b) Image Files

Image files are graphical files that are georeferenced (see previous section). A graphical file can be one of many formats (JPG, BMP, TIF, GIF.....)

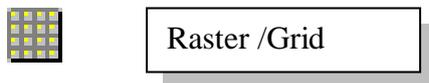
The files that will be associated with it for georeferencing are:

- \*.JGW                               the *world* file containing coordinates for  
or (.BPW, TFW, GFW...)   positioning, scaling and rotating the image.
- \*.PRJ                               the projection file (see section on projections)

ArcMap also creates the following files for each image layer:

- \*.RRD                               the pyramid file (a type of indexing for faster use of rasters)
- \*.AUX                               extra information

The Symbol representing the Raster file is:



### c) Grids

Grids are raster layers like images. The difference between images and grids is that an image is a picture (it is used for visual interpretation by the user) while a grid is a matrix of values and each pixel value has a meaning. For example in a *digital elevation model*, each pixel's value represents the height in meters above sea level.

A grid can also has an attribute table just like a vector layer, but the attribute table has one record for each value that is present in the grid. The attribute table shows the number of pixels present for each value.

Each grid is held in a series of files that are contained within a sub-directory. The files all have a \*.ADF file extension.

#### d) ArcMap Project

When a project is saved in ArcMap, all the information is written in a file with a MXD extension.

This file does not contain any data. All the data (layers and tables) are stored externally and the MXD file only contains links to these files.

The MXD file contains the all the display properties of layers, symbology (legends), page layouts with all the graphical elements, and everything that is configured in ArcMap.

The Symbology representing the Project *.Mxd* containing the Feature Classes is:



Project (.Mxd)

