


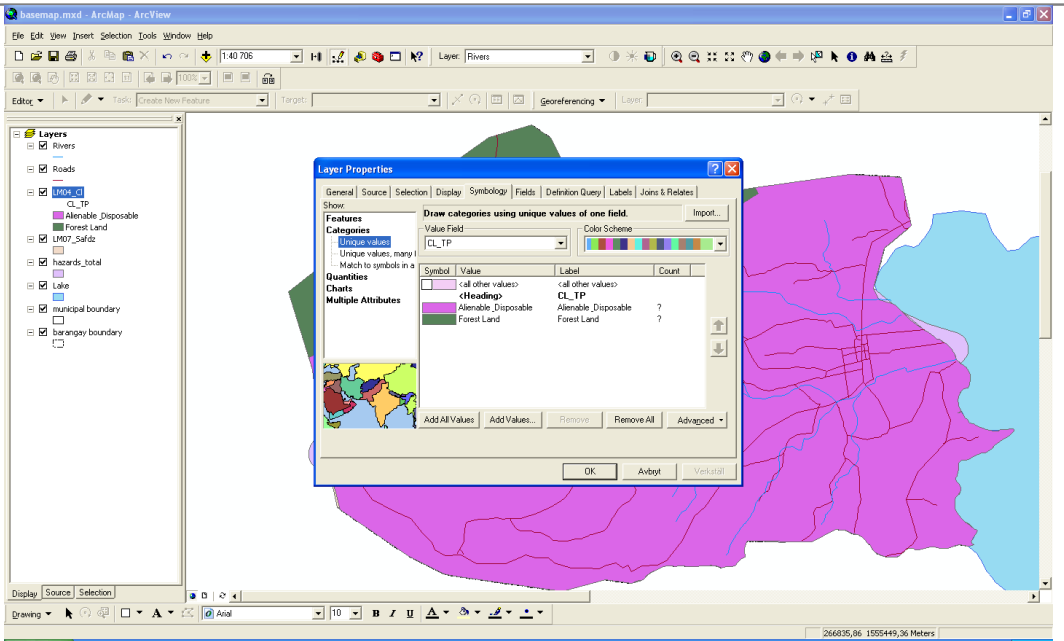
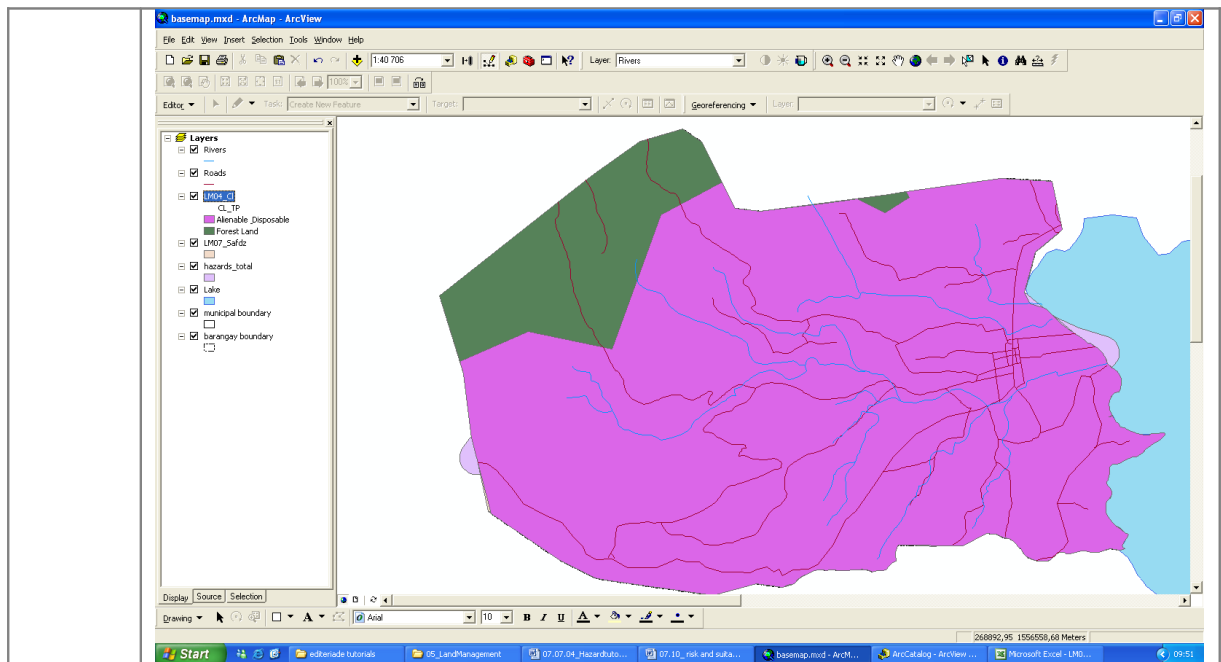




## 7.10 Risk and Suitability Analysis Tutorial

	<p><b>Disclaimer</b></p>
	<p><i>The objective of this tutorial is to get familiar to the GIS software. The tutorial only covers some parts that are being done In a real analysis. The results that are being displayed in the tutorial can't be compared with the results a real analysis would generate.</i></p>
	<p><b>Introduction</b></p>
	<p><i>The Output map of this tutorial is a map showing the Suitable Areas for Future Urban Development shown below.</i></p>
	<p><i>All map layers are presumed to have been digitized, projected and georeferenced before proceeding to this R&amp;S tutorial.</i></p>
	<p>The screenshot shows the ArcMap interface with a map titled 'basemap.mxd'. The map displays a complex network of roads and boundaries. The Layers panel on the left lists several layers, including 'unsuitableareas_and_AandD select', 'unsuitableareas_and_AandD', 'unsuitableareas_total', 'Rivers', 'hazards_total', 'Lake', 'municipal boundary', 'barangay boundary', and 'Able to be disposed'. The ArcToolbox on the right is open, showing various tool categories like 3D Analyst Tools, Analysis Tools, Extract, Clip, Overlay, Intersect, Union, Proximity, Cartographic Tools, Conversion Tools, Data Management Tools, Geocoding Tools, Geostatistical Analyst Tools, Linear Referencing Tools, Spatial Analyst Tools, and Spatial Statistics Tools. The map shows a network of roads and boundaries, with some areas shaded in grey and red lines indicating specific features.</p>
<p><b>1</b></p>	<p><b>Getting started</b></p>
<p>1.1</p>	<p>Open ArcMap, select a new empty map. You will now save the map file. Click on File&gt;Save as... in the menu bar. Browse to the folder C:\CLUP_EXERCISE_DATA\06_Workfolder and type 'risk_and_suitability_v1.mxd'. Click <b>Save/OK</b></p>
<p>1.2</p>	<p>Click on the add data button  and browse to C:\CLUP_EXERCISE_DATA\00_BM and select the files: barangays_bndry Lake municipal_bndry</p>

	<p>Rivers Roads Click <b>OK</b>.</p> <p>Click on the add data button  and browse to C:\CLUP_EXERCISE_DATA\03_EN and select the file: Hazards_total Click <b>OK</b>.</p> <p>Click on the add data button  and browse to C:\CLUP_EXERCISE_DATA\04_LM and select the files: LM04_CI (land classification) LM07_Safdz Click <b>OK</b>. (See image below.)</p>
<p><b>2</b></p>	<p><b>Categorizing the land classification layer</b></p>
<p>2.1</p>	<p>The land classification layer has to be categorized.</p>
<p>2.2</p>	<p>In the table of contents, double click on the <i>LM04_CI</i> &gt; <b>Symbology</b> &gt; <b>Categories</b>.</p>
<p>2.3</p>	<p>Choose “Unique values”</p>
<p>2.4</p>	<p>In the “Value Field” chose “<i>CL_TP</i>”</p>
<p>2.5</p>	<p>Press the “<b>Add all values</b>” button</p>
<p>2.6</p>	<p>Press the <b>Apply</b> button</p>
<p>2.7</p>	<p>Press the <b>Ok</b> button</p>
	

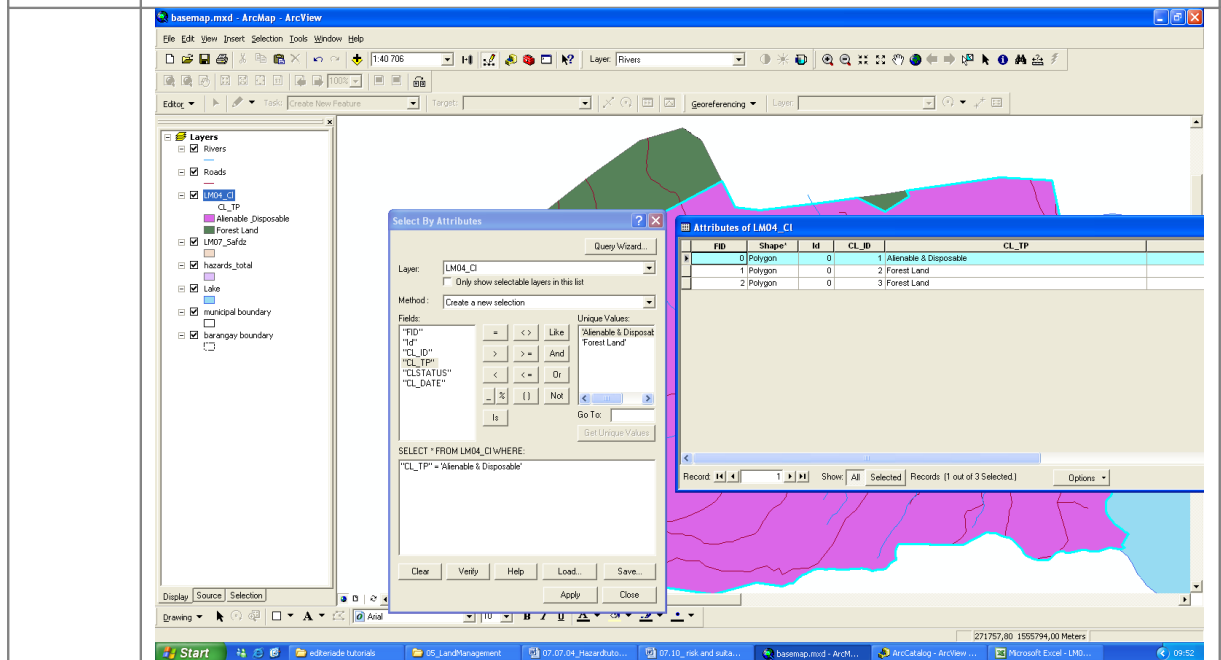


**3 Making the Alienable and Disposable layer**

*We are interested in the areas that are alienable and disposable. Making the layer that contains this information. The following steps have to be conducted.*

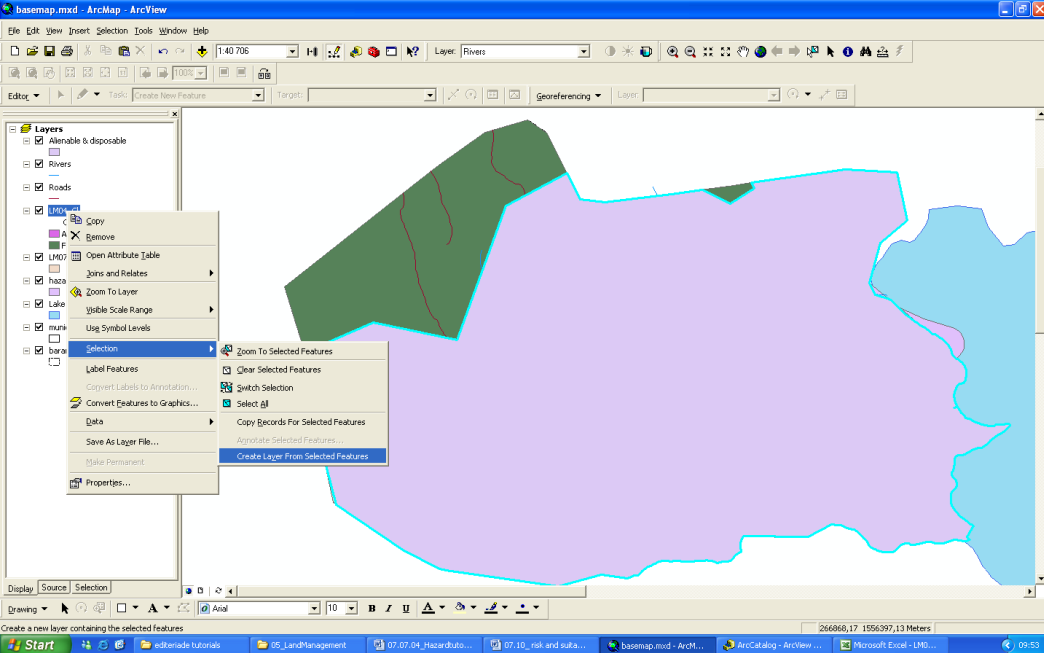
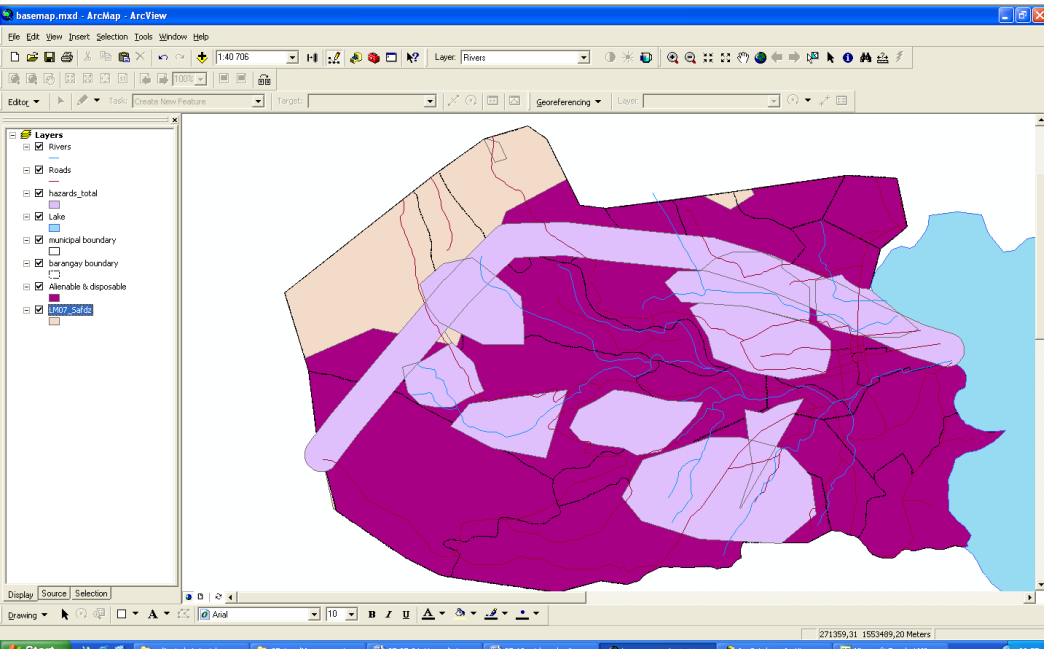
3.1 Open the **selection menu >selection by attribute**

3.2 The layer that we are making our selection from is the *landclass* layer. In the operator window type "**CL\_TP**" = '**Alienable & Disposable**'

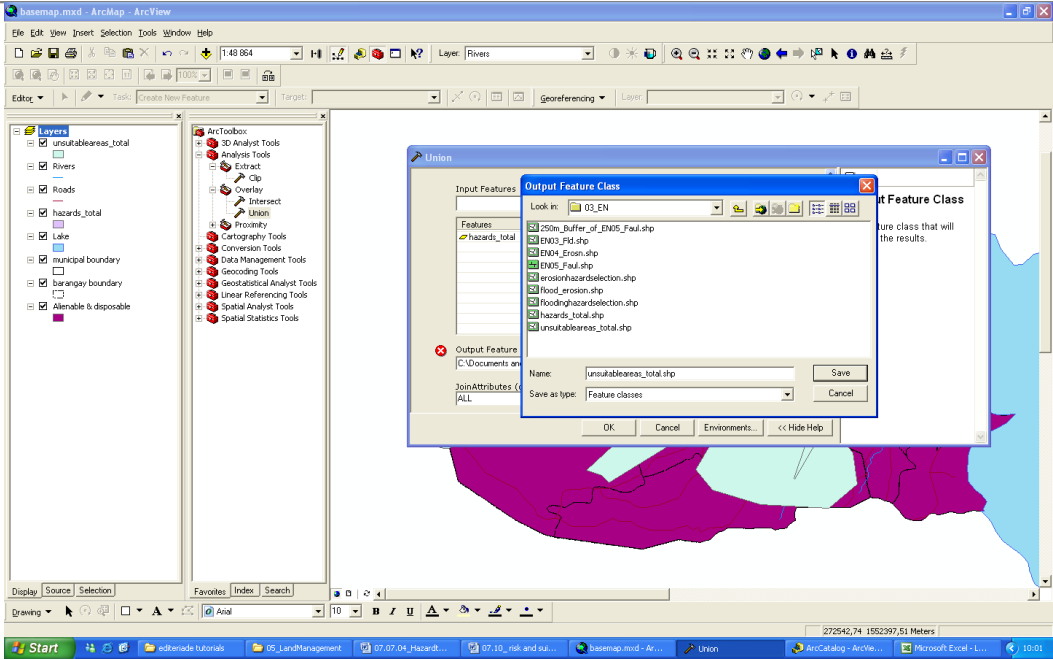


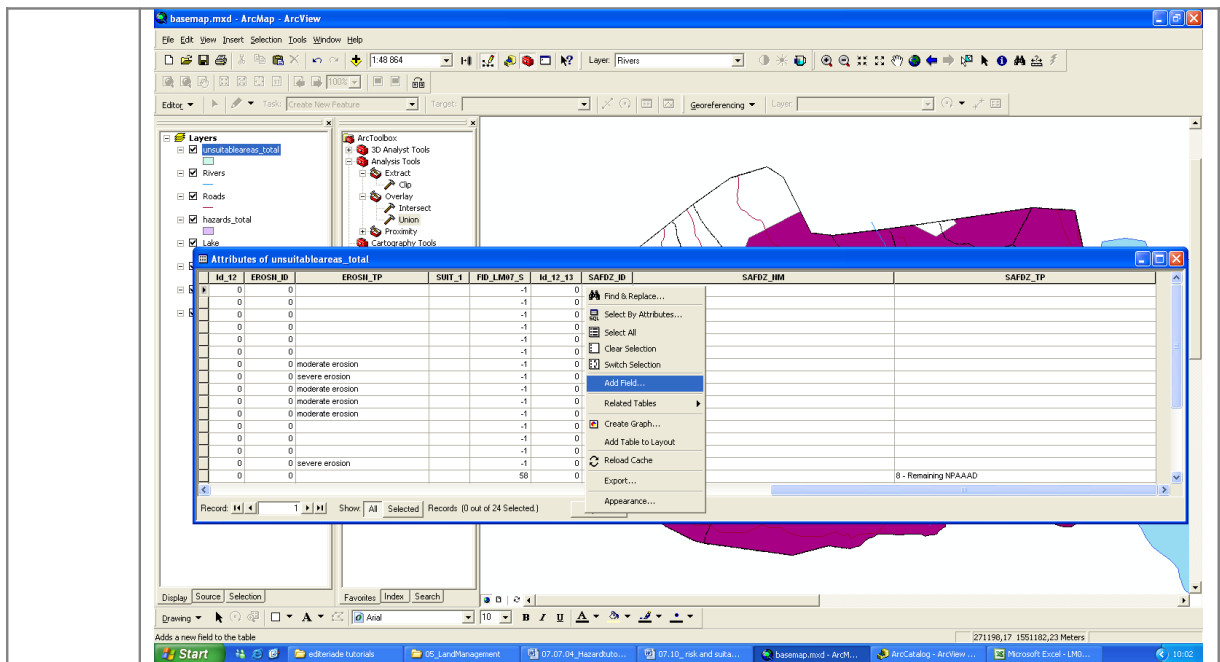
3.3 Press the **Apply** button

3.4 In the layer menu right click on the *LM04\_CI*, then> **Selection >Create Layer From Selected Features**

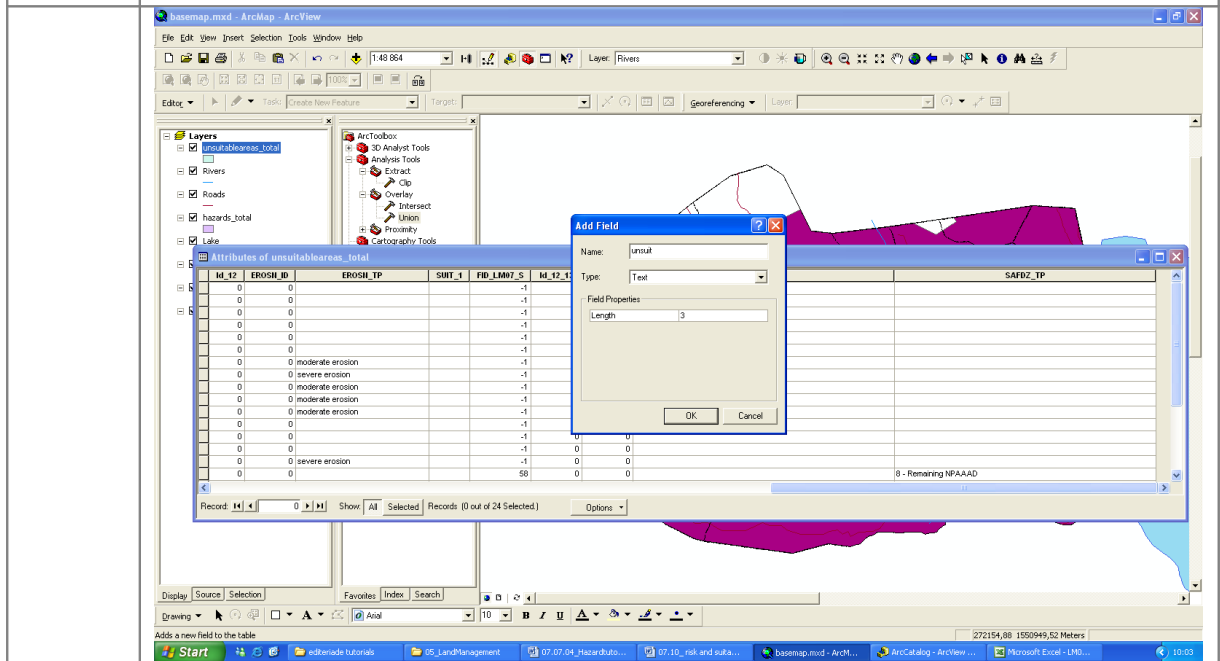
	 <p>The screenshot shows the ArcMap interface with a map of a region. A context menu is open over a layer named 'alienable and disposable'. The menu options include: Copy, Remove, Open Attribute Table, Zoom and Relates, Zoom To Layer, Visible Scale Range, Use Symbol Levels, Selection, Label Features, Convert Labels to Annotation..., Convert Features to Graphics..., Data, Save As Layer File..., Make Permanent, and Properties... The 'Selection' sub-menu is expanded, showing options: Zoom To Selected Features, Clear Selected Features, Switch Selection, Select All, Copy Records For Selected Features, and Create Layer From Selected Features.</p>
<p>3.5</p>	<p>Rename the newly created layer <i>alienable and disposable</i></p>
<p>4</p>	<p><b>Saving the alienable and disposable layer that you have created as a layer file</b></p>
<p>4.1</p>	<p>In the layer menu, right click on the layer <i>alienable and disposable</i>&gt;<b>Save As Layer File</b></p>
<p>4.2</p>	<p>Name the layer <i>alienableanddisposable.lyr</i></p>
<p>4.3</p>	<p>Press the <b>Save</b> button</p>
	 <p>The screenshot shows the ArcMap interface with a map of a region. The 'Layers' panel on the left is visible, showing a list of layers: Rivers, Roads, hazards_total, Lake, municipal boundary, barangay boundary, Alienable &amp; disposable, and Slope_Suitable. The 'Slope_Suitable' layer is selected and highlighted in blue. The map shows a complex pattern of colored regions representing different land classifications.</p>
<p>5</p>	<p><b>The Slope layer</b></p>
	<p><i>In this tutorial we have access to the land classification layer. Assessments' regarding the slope has already been considered</i></p>

	<p><i>within the classification procedure for the alienable and disposable land. Therefore we don't have to add the slope layer to the analysis. However if you don't have access to the land classification layer, the slope layer is a crucial part of the risk and suitability analysis.</i></p>
<b>6</b>	<p><b>The Air- and Water pollution layer</b></p>
	<p><i>We have not included the air- and water pollution layer in this tutorial. However it's not recommended to neglect these hazards when you are doing a risk and suitability analysis in real life. See chapter 4.08.07 for more information.</i></p>
<b>7</b>	<p><b>Ancestral domain</b></p>
	<p><i>We have not included the ancestral domain areas in this tutorial. However this is also a factor you have to consider when you are doing a risk and suitability analysis in real life. For further information regarding Ancestral domain, see chapter 4.09.05</i></p>
<b>8</b>	<p><b>SAFDZ layer</b></p>
8.1	<p>Open up the SAFDZ layer. The layer contains Agro-Forestry Zone, Agusan River, Built-up areas, Crop Development zone, Fishery development zone, Remaining NPAAAD and Watershed/Forestry zone. The only one that is fully protected and therefore not suitable for future development is the "Remaining NPAAAD". The next step is to create a layer that only contains the "Remaining NPAAAD".</p>
8.2	<p>Open the <b>selection menu &gt;selection by attribute</b></p>
8.3	<p>The layer that we are making our selection from is the <i>landclass</i> layer. In the <i>operator window</i> type <b>"SAFDZ_TP" = '8 - Remaining NPAAAD'</b></p>
8.4	<p>Press the <b>Apply</b> button</p>

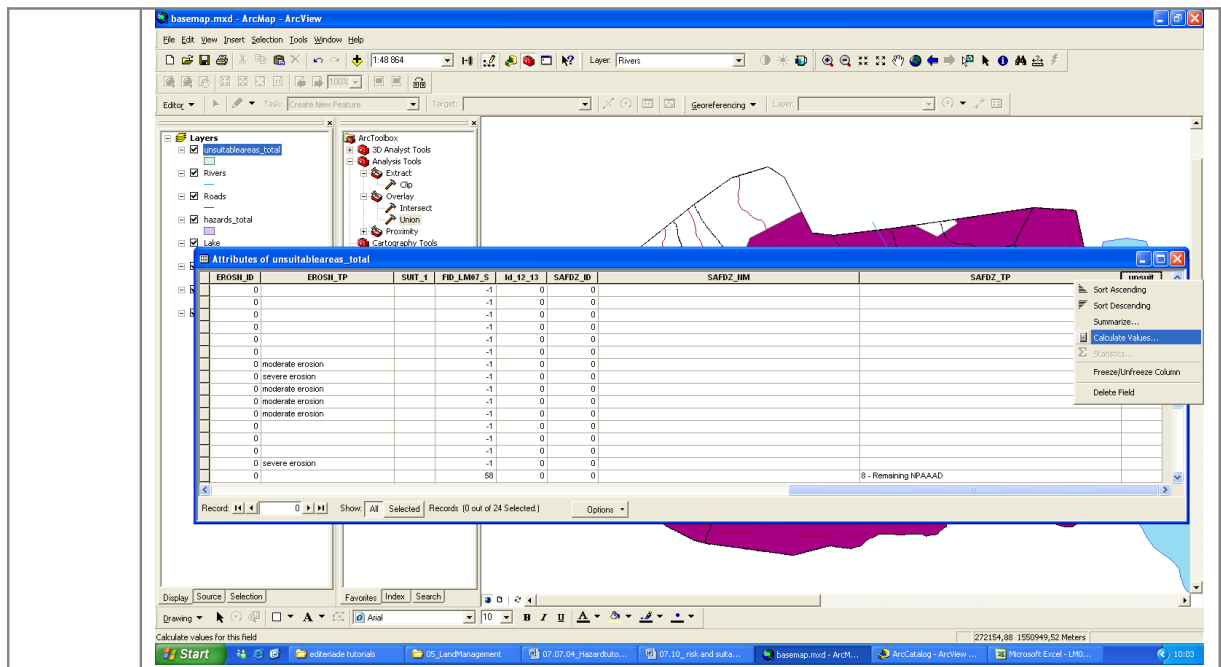
8.5	In the layer menu right click on the SAFDZ layer, then <b>&gt; Selection &gt; Create Layer From Selected Features</b>
8.6	Rename the newly created layer <i>Remaining NPAAAD</i>
<b>9</b>	<b>Unite all the layers that are unsuitable for future development</b>
	<i>The next step is to union all the layers that are unsuitable for future development in to one layer. The reason why we do this is that the final step will be to union this layer with the A&amp;D layer and then delete those areas of the A&amp;D layer that are unsuitable.</i>
9.1	Open up the ArcToolbox window  , then <b>Analysis tools &gt; Overlay &gt; Union.</b>
9.2	Double click on Union and a window like the one below should pop up.
9.3	In output features select the layers “hazards_total” and “remaining NPAAAD”.
9.4	In the field Output Feature Class, name the output file <i>unsuitable areas_total</i>
	
<b>10</b>	<b>Adding an extra field in the newly created table</b>
	<i>The reason for this is to make it easier later on when you union the layer that contains all the unsuitable areas with the A&amp;D layer and then filter out those A&amp;D areas that are affected by unsuitable areas.</i>
10.1	In the layer menu, right click on the layer <i>unsuitable areas_total</i> , then <b>&gt;Open attribute table</b>
10.2	Click on <b>options &gt; Add Field</b>



10.3 Name the field *Unsuit*. Type=Text and Length=3

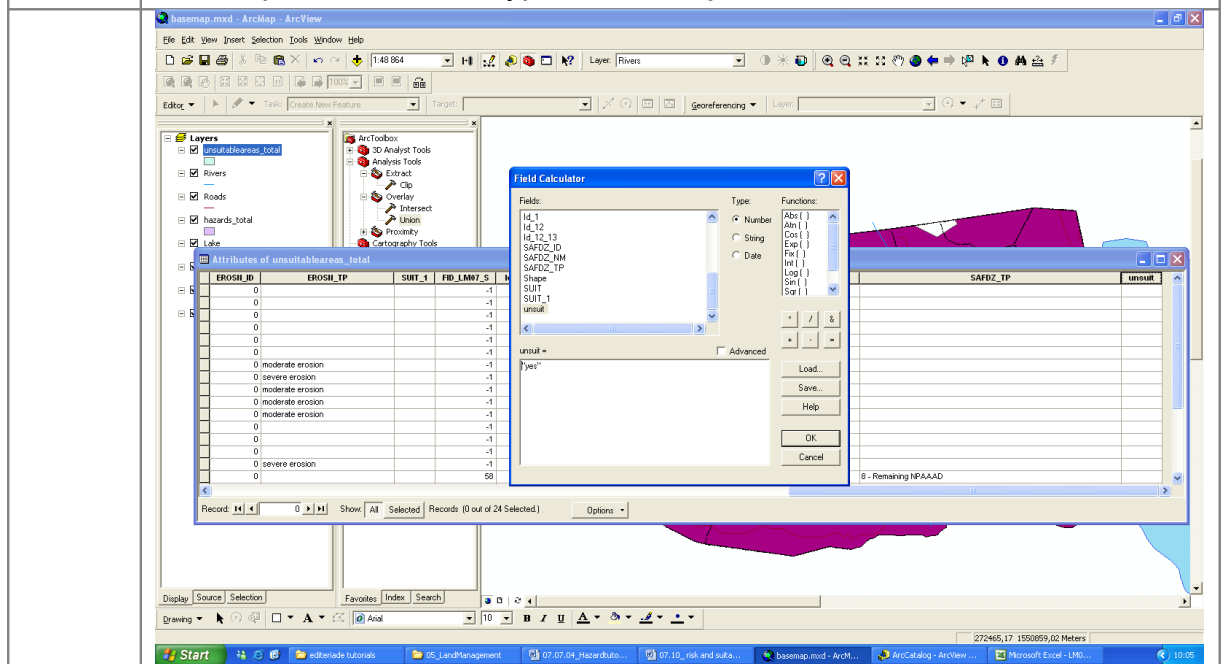


10.4 Right click on the header of the *Unsuit* column, then >Calculate Values.



A window pops up informing that you are about to do a calculate outside of an edit session and asks if you wish to continue. Press **yes** to continue.

10.5 In the operator window, type the word “yes”

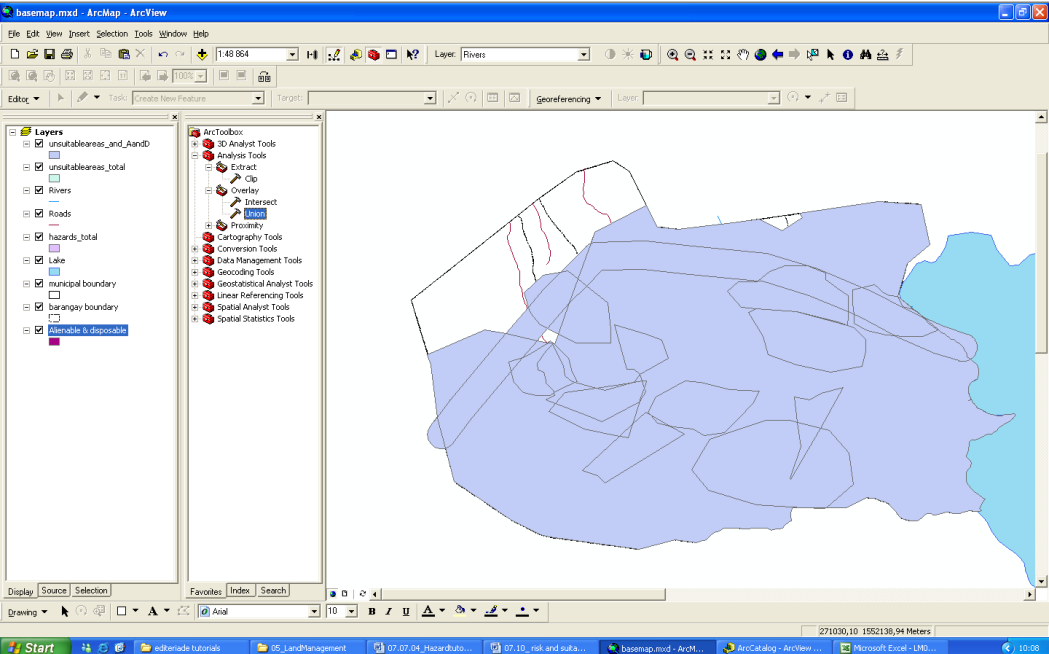


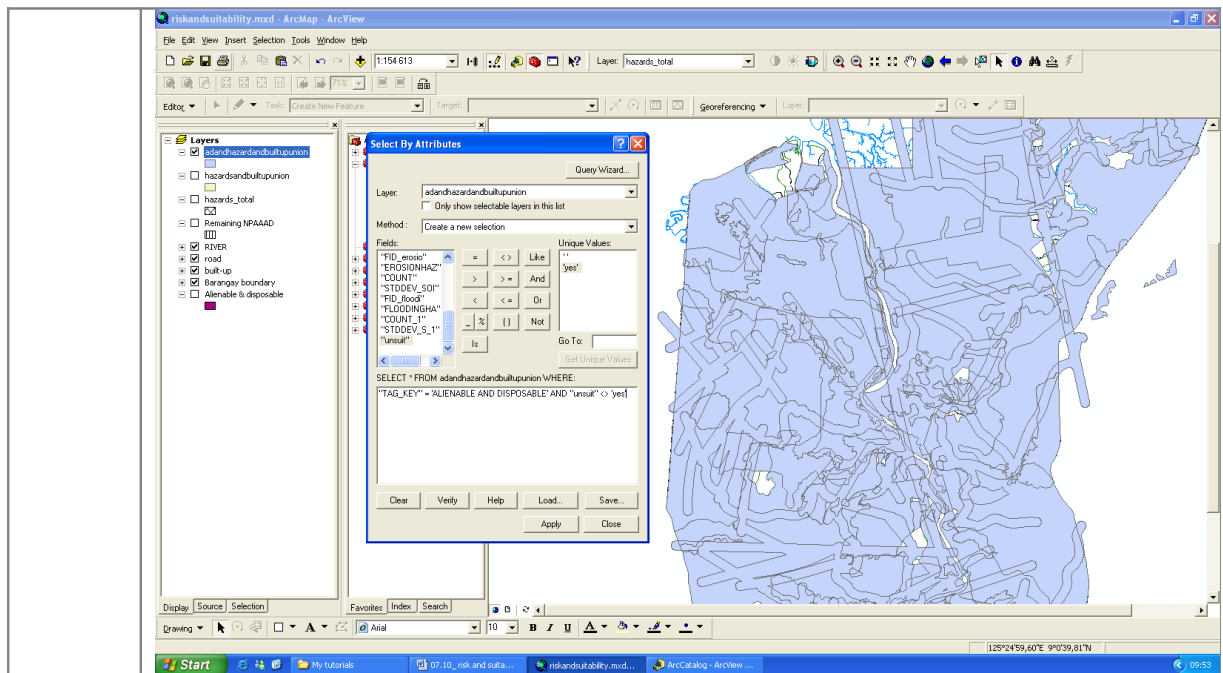
10.6 Press the **Ok** button

**11 Unite the alienable and disposable layer with the layer that contains all the unsuitable areas**

*The next step is to create a layer that contains the A&D areas that is not affected by the unsuitable areas.*

11.1 Open up the ArcToolbox window , then Analysis tools > **Overlay**

	<b>&gt;Union.</b>
11.2	Double click on Union and a window like the one below should pop up.
11.3	In output features select the layers <i>"unsuitable areas__total"</i> and <i>"Alienable &amp; disposable"</i>
11.4	In the field <i>Output Feature Class</i> , name the output file <i>unsuitable areas__and_AandD</i>
	
<b>12</b>	<b>Select those areas that is alienable and disposable and that is not affected by areas that are not suitable for future urban development</b>
	<i>When you have made a layer that both contains the unsuitable areas and the A&amp;D areas. You want to select those areas that are A&amp;D and not unsuitable. To do this the following query has to be made:</i>
12.1	Open the <b>selection menu &gt;selection by attribute</b>
12.2	The layer that we are making our selection from is <i>unsuitable areas__and_AandD</i> . In the operator window type <b>"CL_TP" = 'Alienable &amp; Disposable' AND "unsuit" &lt;&gt; 'yes'</b> .



12.3	Press the <b>Apply</b> button
12.4	As you can see the query is dependent of two criteria's. The first is that it is <i>Alienable &amp; Disposable</i> . And the second is that the area is not unsuitable. The <> means not. So in plain text the query above says that the selected areas will be A&D <b>and</b> not unsuitable.
<b>13</b>	<b>Create a new layer for the selected features</b>
13.1	In the layer menu right click on <i>the unsuitable areas_and_AandD</i> layer, then> <b>Selection &gt;Create Layer From Selected Features</b> .
13.2	Rename the newly created layer <i>Suitable areas for future urban development</i>
13.3	Now you have made a layer that only contains A&D areas that is not affected by unsuitable areas. When you put this layer on top of the base map layer, your map should look like the one below.

