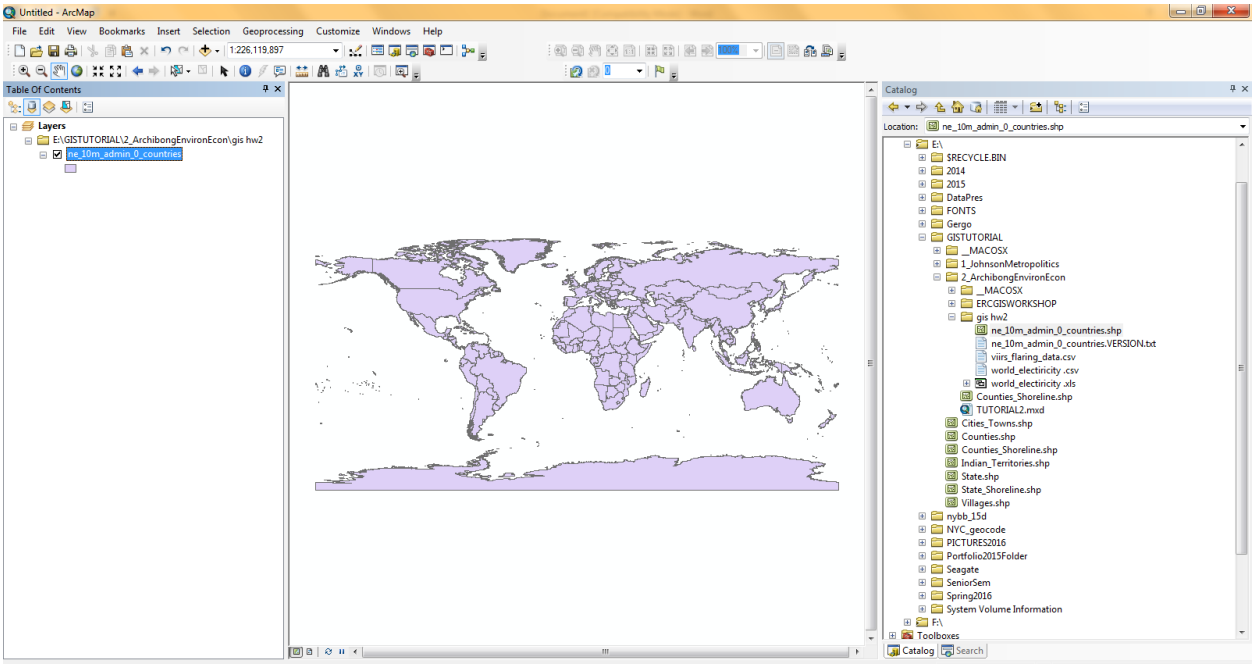
Environmental and Resource Economics (Archibong) Workshop 2 ERC Walkthrough

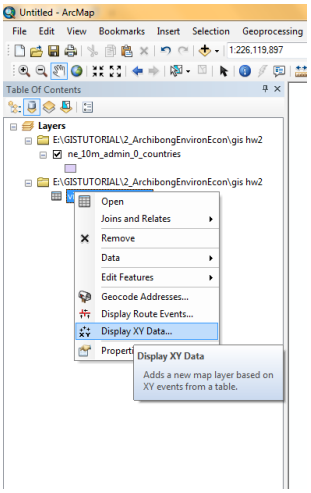
1. **Download and unzip** the Assignment 2 GIS data folder from the ERC Workshop Resource Page for this course. Unzip the file to your hard drive/flash drive working folder.

****We will be using a similar dataset to your assignment, but we will be using an example variable that has been added to the data, as opposed to your assignment which asks you to look at Temperature for the hot spot analysis.**

2. **Open** a new MXD document by searching ArcMap 10.3.1 and opening it from the Start Window on your computer.
3. **Open** the Catalog tab on the right side of your ArcMap page, and add your folder to the catalog view by clicking the 'Add Folder' icon on top right of the catalog. Once your folder is added, navigate to the shapefile 'ne_10m_admin_0_countries' and drag it into your **Table of Contents** on the left-hand side. A shapefile of the world should appear in your Data View.



4. Also drag in the '**viis_flaring_data.csv'** into your **Table of Contents.** Notice that your ToC changes from displaying layers by 'Drawing Order' to 'List by Source'.
5. We will be **Displaying the XY data** of the viis_flaring_data.csv' which is coded by latitude and longitude, or X and Y. To do so, right click the 'viis_flaring_data' table and choose, **'Display XY Data'.**
6. Fill out the corresponding dialog boxing, **NOTE: longitude is the X value, and latitude is the Y value.** Leave the coordinate system as is, for now. Click 'OK'.
7. **Notice** a new file has been added to your ToC called 'viis_flaring_data Events' which consists of a point for each record in the flaring data csv.
8. **Right-click** this new file, choose to 'Data' – 'Export Data' as we will be saving this 'Events' file as a shapefile. Click on the folder for 'Output

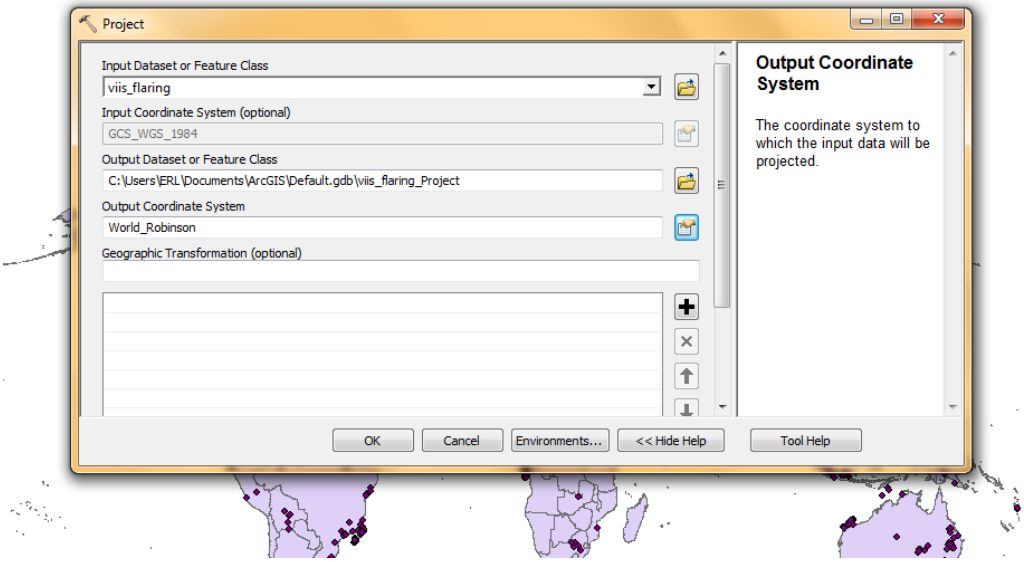


feature class' and choose your working folder location, and name this file **'viis_flaring.shp'.** NOTE: make sure you've chosen 'shapefile' in the dropdown save as file type option. Click 'OK', and then 'Yes' to adding the layer to your map.

9. **Right-click** and remove the 'viis_flaring_data Events' as we no longer need it.

We will now have a map of the flaring data points overlayed with the country shapefile. However, this data is un-projected, and must be projected to more accurately display area. We will use the 'Project' tool to alter the files.

10. **Open** the 'Search' tab on the right hand side of your ArcMap page. (If it's not there go to Windows - Search, or CTRL + F. In the 'Search' window, type Project and press 'Enter'. We are searching through ArcMap's toolboxes for the Project tool.
11. **Choose** the second option, 'Project (Data Management)' as this is the tool we want. It is in the Data Management toolbox.



12. **Fill** out the dialog box for the 'Project' tool – we will be projecting both the countries and the viis_flaring shapefile, so do whichever first. Choose the file you are projecting from the 'Input Dataset' dropdown. Then, click the folder next to 'Output Dataset' and navigate to where you want to save it, then name it **viis_flaring_proj** for the viis_flaring data and **world_countries_proj** for the country dataset. Make sure they are saved in your working folder. Next, choose the 'Output Coordinate System' as **World_Robinson.** To do so, click the icon next to 'Output Coordinate System' and in the dialog box that appears, type **Robinson** into the search then navigate to Projected Coordinate Systems – World – Robinson (world). When finished, click 'OK', and notice when the new file is added to the Table of Contents. Repeat the process for the second shapefile (the countries).
13. **Next,** right-click anywhere in your Data Frame, and go to 'Data Frame Properties'. In the dialog, click on the Coordinate System tab, and then choose the Robinson (world) projection for the Data Frame as well.

We will now be moving on to our Hot Spot Analysis of Radioactivity using the Getis-Ord Gi* Hot Spot Analysis Tool – for a background on how the tool works, see:

http://resources.esri.com/help/9.3/arcgisengine/java/gp_toolref/spatial_statistics_tools/hot_spot_analysis_getis_ord_gi_star_spatial_statistics_.htm

Also, to find information on any tool, open up that tool, and in the dialog box on the bottom right you will see 'Tool Help'. Click that to navigate to a detailed explanation of that tool and how it works.

The Hot Spot Analysis Tool, given a set of weighted features identifies clusters of high values (hot spots) and clusters of low values (cold spots). Each is given a z-score and p-value. Because we want to use the

Because we are using spatial statistics as opposed to traditional statistics in this analysis, we are taking the spatial relationships of our data directly into mathematic account. Thus, we must tell ArcMap how we want to conceptualize the spatial relationships of the data for our significance test.

To read in depth about the conceptualization of spatial relationships, see this page: http://help.arcgis.com/en/arcgisdesktop/10.0/help/#/Modeling_spatial_relationships/005p00000005000000/

We will be using the K nearest neighbors spatial relationship (taking into account the 8 nearest neighbors).

14. In the 'Search' tab, search 'Generate Spatial Weights Matrix'. This tool will allow us to create a spatial matrix that conveys the spatial relationship we are using to other tools, like the Hot Spot Analysis.
15. Open the 'Generate Spatial Weights Matrix,' and fill out the Input and Output fields. We will be using the 'viis_flaring_proj.shp' for the Input. The Unique field id will be a unique identifier field that distinguishes each point. Choose 'id'. Next, Choose where your spatial weights matrix file will be saved by clicking on the folder next to 'Output Spatial Weights' and name you file 'viis_flaring_sptwght'. Finally, choose the 'Conceptualization of Spatial Relationships', which will be 'K_NEAREST_NEIGHBORS'. The number of neighbors field will automatically filled in with '8' which is what we want. Press 'OK' when done.
16. Once the tool has completed processing, we are ready to do our hot spot analysis! Again in the 'Search' tab, type 'Hot Spot Analysis' and click on the Hot Spot Analysis (Getis-Ord GI*) tool in the Spatial Statistics Toolbox.
17. When the dialog box appears, fill out the 'Input Feature Class' with the 'viis_flaring_proj.shp' file we will be using. Next, choose the value field you are using for this significance test. In our case for the workshop, we are using a field of randomly generated values from 1-1000 that I created as practice. In your assignment, you are using TEMPERATURE. Choose the field. Also determine where your file with be 'Output' and name it 'viis_flaring_proj_HS.shp'. Next, choose the 'Conceptualization of Spatial Relationships' which in our case will be 'GET_SPATIAL_WEIGHTS_FROM_FILE'. Once you have chosen that input, you will see the 'Weights Matrix File' input become editable, in which case you will now click the folder icon and choose the spatial weights file ('viis_flaring_sptwght.swm') that you have just created. ONCE all the appropriate inputs and outputs are complete, click 'OK'.
18. YOU DID IT!!! Remember, the Hot Spot Analysis outputs a new shapefile, which have fields that provide the z-score and pvalues, which can help you in your analysis.

In the workshop we will also go over some basic ArcMap tools:

-Select by Attributes
http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Using_Select_By_Attributes
-Select by Location
http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Using_Select_By_Location
-Basic Geoprocessing tools: Intersect, Clip, and Buffer
http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=An_overview_of_commonly_used_tools