



## Mapping Made Easy: Google Earth, Maps, and Sheets

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**OBJECTIVE:** This session demonstrates two Google products that can be used to easily create maps. There will also be a basic introduction to good map making, complete with a discussion of tips to use and pitfalls to avoid. Students will learn how to create original maps for use in papers and presentations without having to learn either GIS or statistical software packages where the learning curve is much steeper.

**PLAN OF WORKSHOP:** This session will have three parts:

1. Principles of Good Maps and Bad Maps to Avoid
2. Mapping with Google Earth
3. Mapping with Google Sheets

**LEARNING OUTCOMES:**

1. Understand proper sizing of maps, notations, and the Goldilocks Principles
2. Understand the importance of integrating text with maps
3. Download, open, and understand the layout of Google Earth
4. Understand the principle of “layers” in GIS
5. Use Google Earth to create, customize, and annotate maps
6. Create and customize tours with Google Earth
7. Gain familiarity with additional and advanced features of Google Earth
8. Create choropleth and marker maps with Google Sheets
9. Save, embed, publish, and share the maps you create as both images and interactive maps.

# Introduction to Google Earth and Google Earth Pro

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Download Google Earth for free at <http://www.google.com/earth/index.html>

Google Earth's website also includes several free tutorial videos, in beginning and intermediate topics at <http://www.google.com/earth/learn/>

## I. NAVIGATING THE GOOGLE EARTH LAYOUT

- **Search bar:** You can use this like a Google Maps search - search for addresses, landmarks, businesses, or latitude/longitude, or use this to get directions.
- **Places:** This pane displays the customized information available for your map. [The "Sightseeing Tour" and "Temporary Places" folders appear by default]. You can edit and delete your places by right-clicking the name of the location.
- **Layers:** Explore the Earth Gallery to see layers created by other Google Earth users and choose to hide or reveal layers made available by Google Earth.
- **Toolbar:** Use the placemark, polygon, path, ruler, and other tools to customize your map.
- **Navigation:** Use the arrows to zoom in and out of the globe, all the way to street views, and control the camera to view your map in unique perspectives. In addition to using the arrows on the right side of the screen, you can use the right-click button on your mouse to zoom in and out and rotate your map. (Hold the right-click button down and move the mouse up or down.)

## II. UNDERSTANDING LAYERS

A plain satellite image is just a picture until you add information to coordinate the geographic reference points and add information specific to the information you want to convey. This specific information is organized into *layers*. You can think of layers as a transparent sheet with information that goes over a plain map. For example, you can add a "transparent sheet" with blue lines over a plain map to represent rivers. You can put another transparent sheet over that with polygons that represent flood zones over that sheet. Now the plain map shows information on rivers and flood zones. If you want to just display the flood zones, you can remove the river sheet.

This concept works for understanding layers in Google Earth. In the bottom left-hand corner, you will find layer options provided by Google Earth.

To make a layer visible, click on the box next to the layer name and the layer will appear on the map. To hide a layer, simply unclick the layer.

### III. GOOGLE EARTH GALLERY

You can also explore layers created by other Google Earth users. These are layers submitted by research institutions, universities, NGOs, and other individuals who share their data and information with the Google Earth community.

To access the Google Earth Gallery, click on the “**Earth Gallery**” button in the layers box. Once you are in the Gallery, you can search for specific topics in the search box at the top of the screen. Select a layer to explore and choose “**Open in Google Earth**”. The layer will appear as an option in the “Places” box.

To return to Google Earth, click on the “**Return to Google Earth**” button at the top.

### IV. TOOLS FOR CUSTOMIZATION

Like the many examples in the Google Earth Gallery, you can create your own layer of information on Google Earth. You will use the tools located at the top of the screen:



#### **Customization:**

1. Placemark
2. Polygon
3. Path
4. Image Overlay
9. Ruler

#### **Extra:**

5. Tour
6. History
7. Day/Night
8. Explore Sky, Moon, or Mars

#### **Share:**

10. Email
11. Print
12. View in Google Maps

#### **Place marks**

To create a place mark, or *point*, click on the **Placemark** button. You can manually position the pushpin, or insert latitude and longitude in the **Properties Box**. You can customize the name, description, style, color, and icon in the properties box. You can also adjust and save the angle of view, the opacity of the placemark, altitude of the point relative to the ground, or add an image or link to go along with the point.

When you're finished, click OK. If you want to edit the properties of your placemark again, right-click on the placemark or on the placemark name on the left hand side and choose “Properties”.

#### **Polygon**

A polygon represents an area over the map, rather than a single point. Creating a polygon is similar to creating a point. After you click on the polygon button on the toolbar, the properties box will also appear and so will a small target box on the map. Click and hold the mouse over the area where you want to create the polygon and begin drawing your shape. Once you complete the shape, you can enter the description of the polygon in the **Description** tab and adjust the style and color of the lines and area of the polygon. You can also control the opacity or take a snapshot image of the angle of your map.

The **Altitude** tab can be useful for polygon display, to differentiate the feature from the underlying satellite imagery.

To edit the properties of the polygon, right-click the polygon on the map or the name of polygon in the Places box located at the left of the screen.

## Path

The steps for creating a path are generally the same as creating a polygon. Click on the path button at the top of the screen, and use the target box to create your line.

In the properties box, give the line a name and a description. Adjust the color and thickness of the line in the **Style, Color** tab. In View, choose an angle to see your map. In the **Altitude** tab, you can choose how you can lift your line from the ground by adjusting the distance from the ground.

In the **Measurements** tab, Google Earth measures the distance of the line you created in various distance measurements.

## Image Overlay

You can also add an image to your map using the image overlay option. This option places a picture or map image over the existing Google Earth map for further customization.

## Ruler

Use the ruler option to measure distances on the map. Click on the **Ruler** button and create a line across the map using the target box. The ruler measures distances for lines and paths in various distance measurements. Click on “**Mouse Navigation**” if you need to navigate the map. Unclick it when you’re ready to create the line for measurement.

## Organizing your placemarks

It is best to organize all your placemarks, polygons, and lines in one folder, especially if you are intending to create one layer out of multiple features.

To create a folder in the Places box, right-click “Temporary Places” and select **Add > Folder**. You will be asked to give your folder a name and optional description. Keeping the “Allow this Folder to be Expanded” option is recommended so you can easily see what is inside the folder and move your placemarks between folders if necessary.

To move your placemarks into the folder, simply click and drag the placemarks into the folder you created on the left side of the screen.

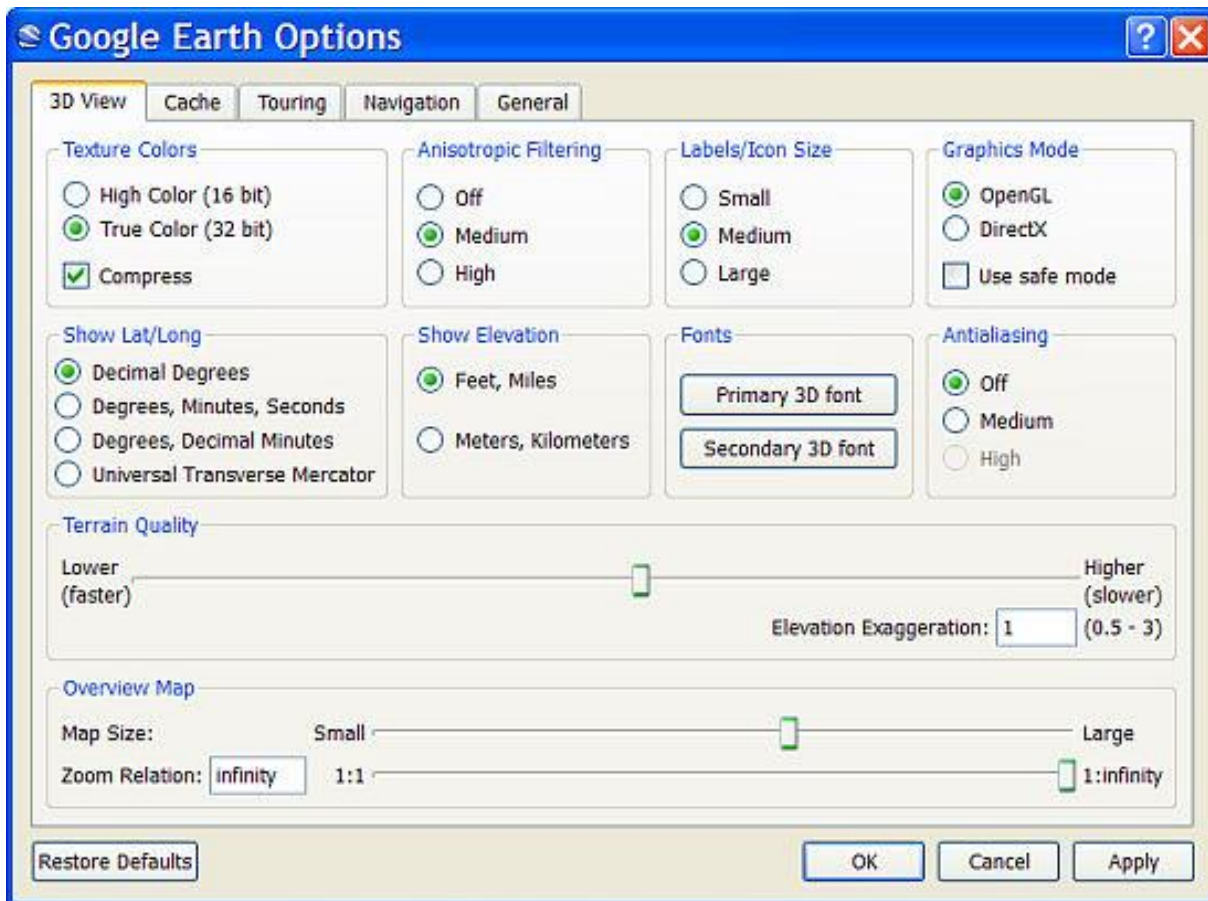
## V. EXTRA FEATURES

### Tour in Google Earth

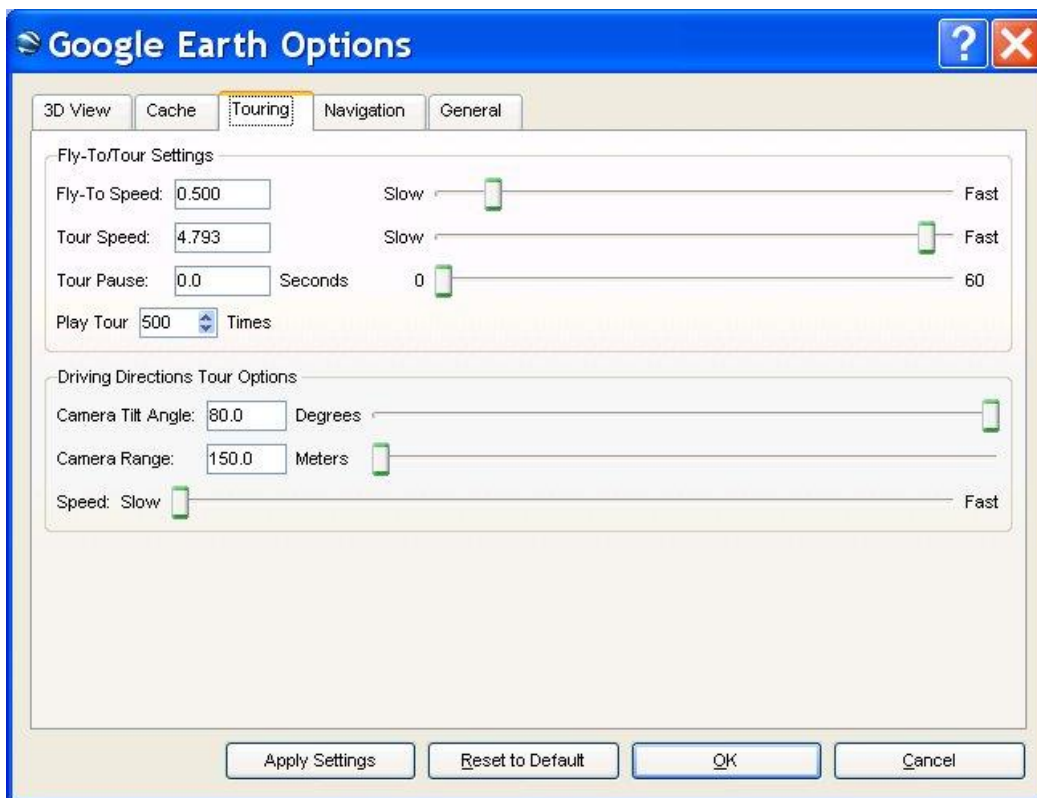
You can record a tour of all your place marks using the **Tour** option. When you click on the Tour button, you'll find two buttons at the lower left hand corner of the map: an audio button to record narration, and a record button. The record function will track all of the navigation you conduct while it is recording. You can visit your place marks, follow a path, or freely navigate. Stopping the recording will bring up playback features. You can save your tour to the "Places" pane. Unfortunately, in the free version of Google Earth you cannot save the tour in a video format, but can only access it through Google Earth.

### Tour in Google Earth Pro

For Google Earth Pro, the tour works in the same manner. However you can save it as a separate movie file and post it on web sites. You see this employed in many news broadcasts. Though it seems to render for differing output formats, we used the .wmv format. But you can convert that to other formats using programs such as "Switch". You could edit the video and add a voice overlay for example. We did discover that you will need to change some of the default settings to make it work correctly. Make sure that you use these 3D settings, particularly the Graphics Mode.

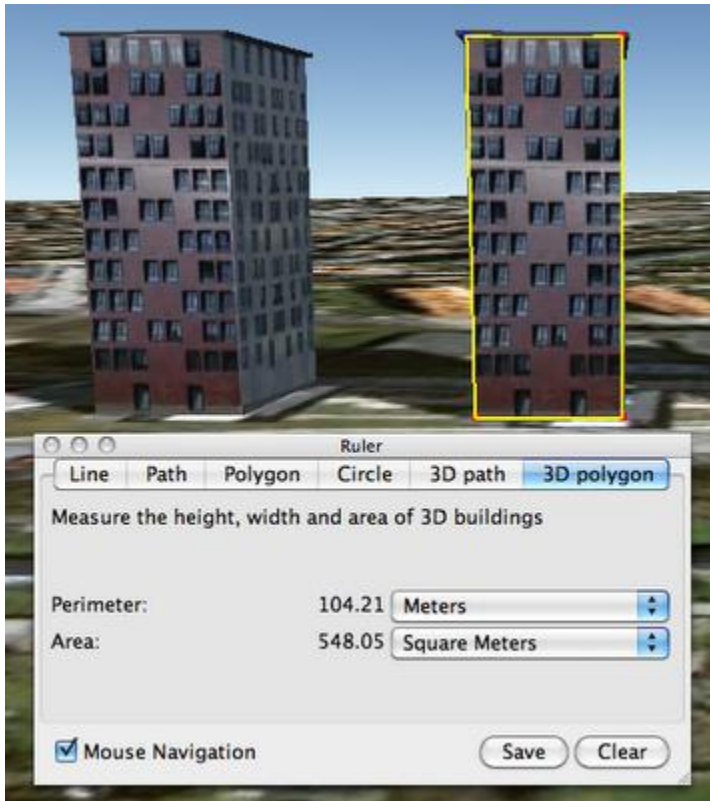


You can also set some defaults that regulate the tour characteristics such as speed and camera angle.



## Measurement in Google Earth Pro (and some features in Google Earth 6.0)

Google touts this new feature: “To measure buildings and distances between buildings, just turn on the 3D Buildings layer and click the Ruler Tool icon in the toolbar. If you’re running Google Earth Pro, you’ll notice two new tabs for measuring in 3D: **3D Path** and **3D Polygon**.”



## History

For comparative time-series analysis, you can also see maps of an area from the past (depending on if Google Earth has the images for that region). When you click on the History button, you will see a slider at the top of the map that allows you to move back in time. Move the slider back to see the image from a different month and year. The images available vary for different regions, so you may not be able to go as far back as you would like for some areas.

## Day/Night

The Day/Night button allows you to view the map at different times of the day. Watch the sunlight appear and draw back over your selected area.

## Explore the moon/sky/mars

In addition to exploring Earth, you can explore the sky, the moon, and even Mars. Click on the planet button and choose which extraterrestrial body you want to discover. The rules for navigation and customization work the same for the moon and Mars as for Earth, and Mars is continuously updated



with information from NASA's Curiosity rover. The Sky function's navigation is reversed, and takes some practice to master.

## VI. HOW TO SAVE /SHARE YOUR MAP OR IMAGE

You can save your map as an image or as a geographic data format so that other Google Earth users can view and customize your layer information.

### To save the image of your map in .jpeg format:

#### File > Save > Save Image

You can save the image currently shown in your Google Earth navigation window to a .jpeg file. This is the best option for presentation of a customized map in slideshows or papers.

### To save a single place mark (polygon, or line):

#### File > Save > Save Place As...

Or, you can right-click the placemark in the places pane and select **Save Place As**.

You can save your place mark as a **.kmz or .kml** (these are special file formats by Google Earth. **.kmz** is recommended for saving single place marks). When you open a .kmz file, the file will instantly open in Google Earth in the exact angle that you saved your place mark location. This is the way to save ongoing work for later editing. You can email the .kmz file to your friends, and they will see the exact place mark on Google Earth on their computers.

### To save an entire layer:

Right-click the name of the layer folder and select **Save Place As**.

You can save it as either a **.kmz or .kml** (.kml is recommended). When you open a .kml file, the file will open in Google Earth. You will see all of your saved place marks. To expand the folder, click on the little "+" next to your file name under "Places" and you will see each individual place mark for your layer. You can also edit your layers and re-save them.

## VII. CONVERT ESRI (ArcGIS) FILES FOR USE IN GOOGLE EARTH

- Select icon for ArcToolbox > Expand the conversion tools option
- We are going to convert to KML. KML and KMZ files are the standard file format for Google Earth.
- Expand "to KML" and select "Layer to KML"
- Select your "selected\_states" layer
- Browse your output file, save to the desktop folder and name "selected states"
- Hit OK
- Go to your desktop folder and find your "selected states" KMZ file, click to open – your ArcGIS layer is now on the Google Earth Globe



- Drag your “selected\_states” layer from **Temporary Places** to **My Places**
- **If you click on any feature you brought in, you will see the data that was attached to that polygon in ArcMap is preserved and still available in Google Earth**
- If you expand the file name under places, you see that each polygon is listed separately. Each polygon can be turned on or off, and manipulated individually within Google Earth.
- *This is a nice feature if you want to share ArcGIS layer files with people who do not have ArcGIS software. Further manipulations can be added and saved within the Google Earth KMZ file. You can also add additional ArcGIS shapefiles.*

## **VIII. ESRI (ArcGIS) FILES IN GOOGLE EARTH PRO**

- Once in Google Earth Pro select **File > Import**
- You will navigate to the folder holding your ArcGIS shapefiles, you will notice that none of your shapefiles show up
- Click the drop down bar in the bottom right corner and switch from “Generic Text (\*.txt\*.csv)” to “ESRI Shape (\*.shp)”
- Select the shapefile you are interested in importing
- This will import your shapefile into your **Temporary Places**. Check the layer to turn it on, and drag it into **My Places**

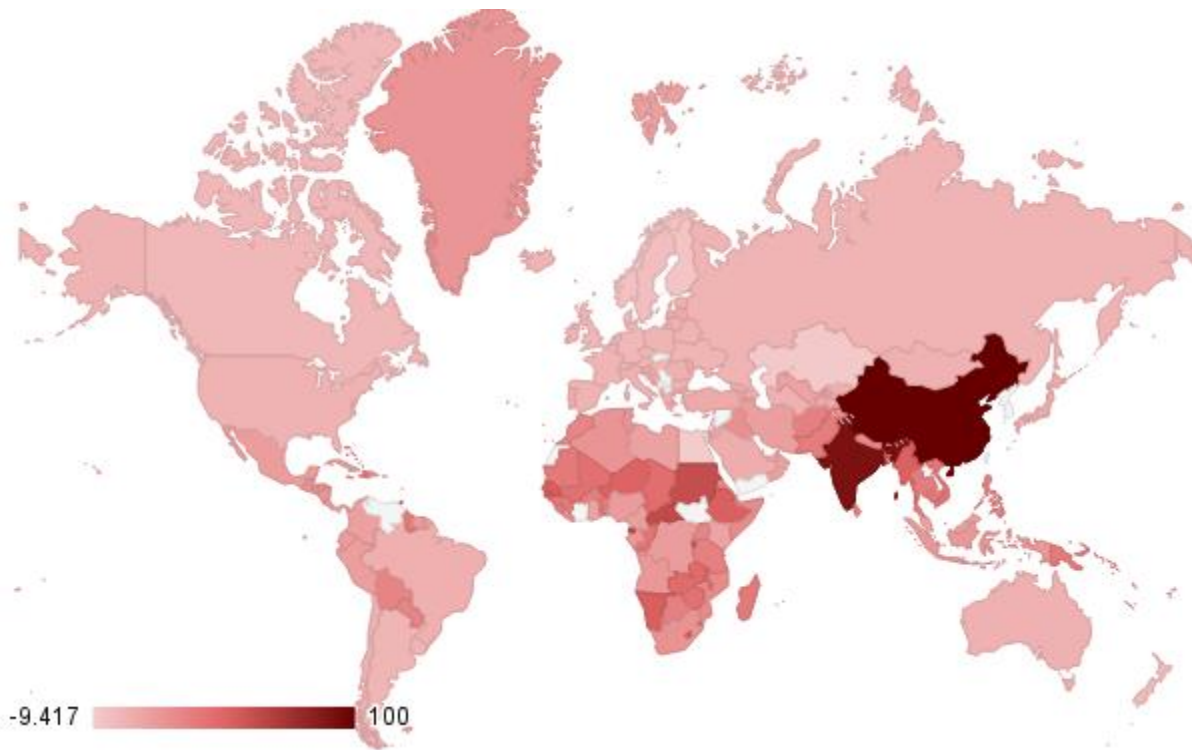
Some of your formatting (specifically the color of your polygons) may not be preserved with this import feature. However, it is nice because you don’t have to convert the ESRI shapefile to use it.

# Maps in Google Sheets

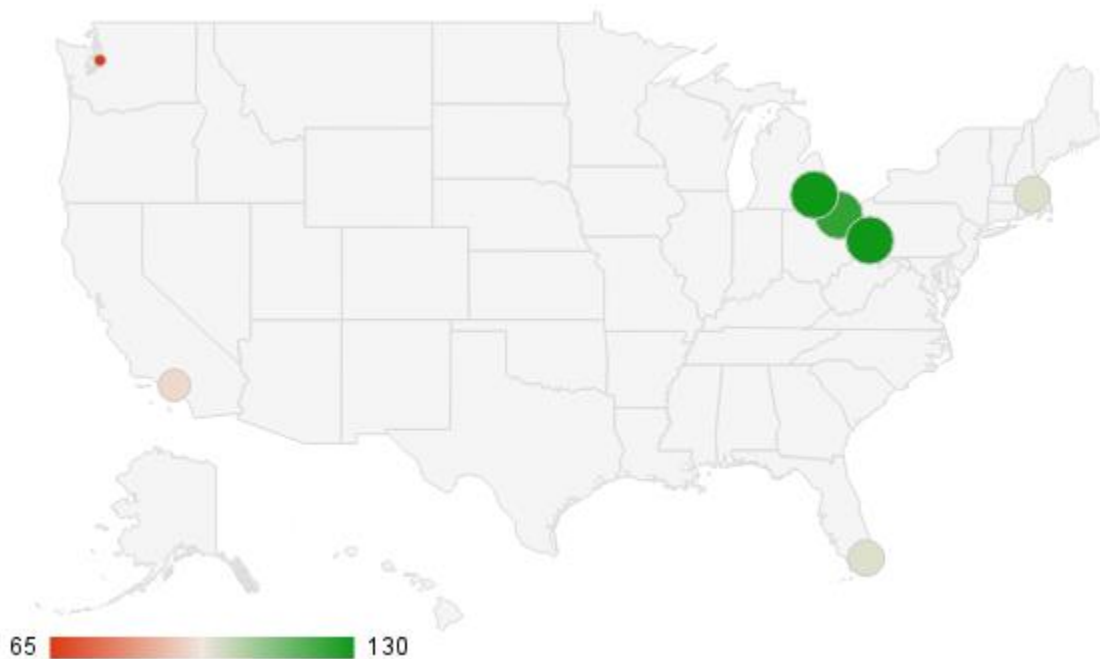
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## I. MAP TYPES

You have two map types to choose from. First there are region maps using choropleth colors. You can set the colors however you like. Many will use a single color with several gradients, while others might go from a green (good) to a red (bad) as an indicator. The following is an example of a country map based on climate drivers, using the world map type:



The second type of map is a marker maps that uses both color and marker size as proportional indicators. The following is an example of a map of cities (based on fake data) using a U.S. map:



## II. INPUT AND FORMAT DATA IN GOOGLE SHEETS

- Your data must be arranged in two columns. Column A will include the alphabetic place identifier and Column B which is the numeric value.
- Note: Google is pretty good about recognizing names, but it may take some trial-and-error if Google doesn't recognize a place name. You can use countries, U.S. state names, or cities. Obviously cities would only be useful as map markers. Sometimes the name differences are quite small. For example: Google does not recognize "Congo, D.R.", but "Democratic Republic of Congo" is recognized.

## III. Creating a Map

- **Insert>Chart>Chart types**
  - Make sure your data is selected in the first box.
  - Scroll down and select either type of map.
- **Customization Tab**
  - Select your background color; the map region; the colors for the minimum, mid-point, and maximum values; and the color for locations without a value.
- **Insert**

#### **IV. Editing and Publishing Maps**

Once you have created a map, use the triangle button in the upper right corner of the map to edit, delete, save, copy, publish, or add alt text to the map.

#### **V. Other Notes**

Google Earth and Google Earth Pro can be downloaded for free online. Google Earth Pro is available on one desktop and one laptop computer in Hurst 203.

ArcGIS is available on computers in the CTRL Research Lab (Hurst 202 and 203) and Anderson Computing Labs

For a full list of our other workshops, go to <http://www.american.edu/ctrl/rsgevents.cfm>

Assistance with Google Earth is also available in the CTRL lab during normal business hours. For more information, go to <http://www.american.edu/ctrl/lab.cfm>