

Pre-Assignment Activity: (1) Browsing Examples from the Tableau Gallery

(Collaborative Google Document)

Find a data visualization that interests you from Tableau Viz of the Day (<https://public.tableau.com/s/gallery>).

Paste it into this shared Google Doc. Please work in pairs and write your names above the figure.

In addition, please answer the following questions:

- 1) What you think the most obvious point made by the figure is.
- 2) Talk about any more subtle points that can be taken away upon further investigation.
- 3) What did you like about this presentation of the data? i.e. what about this figure works well for making the point in question 1?
- 4) How could the data have been presented more clearly? Anything misleading? Color choices? Distracting information? Font size? Font? Etc.

Pre-Assignment Activity: (2) Crowdsourced Climate Change Data

(Discussion Board)

Today we will continue practicing using Tableau to visualize data related to climate change. Before today's class, please spend some time exploring possible data sources on climate change. Please post at least two website sources on this discussion board before class time.

Examples:

- NOAA Climate Data: <https://www.ncdc.noaa.gov/cag/global/time-series>
- World Bank CO2 emissions data: <https://data.worldbank.org/indicator/EN.ATM.CO2E.PC>

Post the link to the website on the discussion board, write a short paragraph describing the data set, propose two possible questions that you can explore with the data set, and possible visualization ideas for answering your proposed research questions.

Example post template:

1. Website xxx, URL:

- A short description about the data set
- 2 possible questions that you can explore with the data set
- Possible visualization ideas for answering the above research questions

2. Website xxx, URL:

- A short description about the data set
- 2 possible questions that you can explore with the data set
- Possible visualization ideas for answering the above research questions

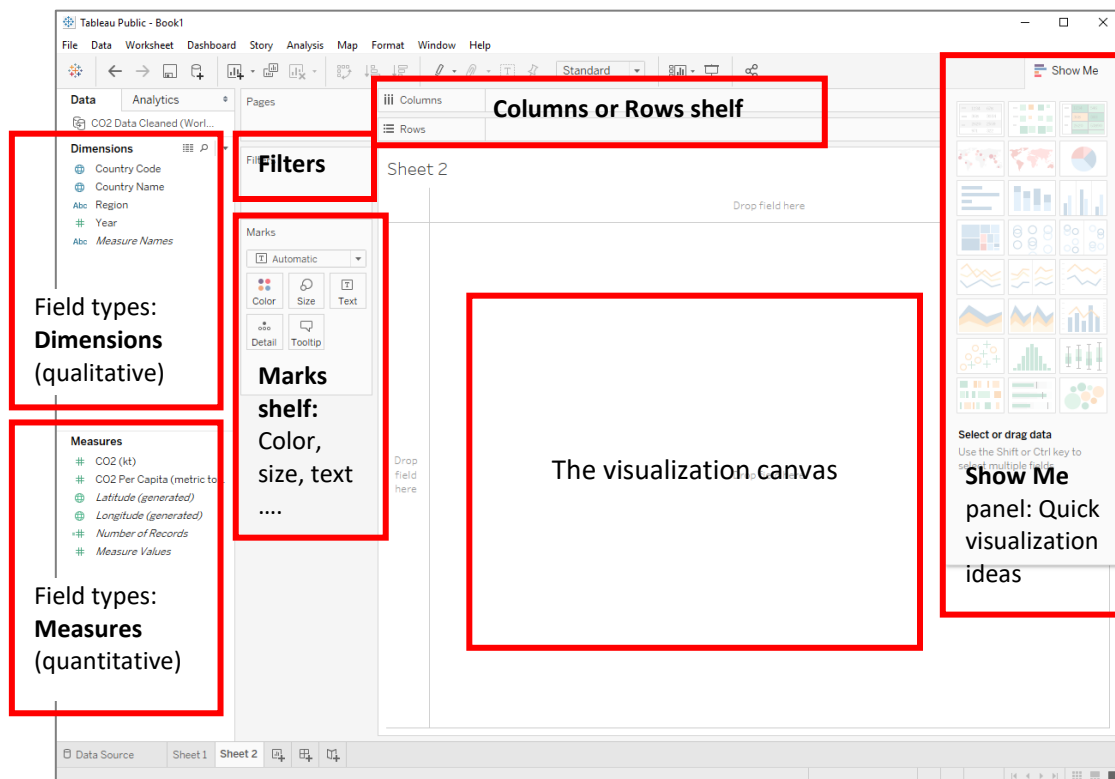
Assignment: Visualizing CO2 Emissions: Tableau Dashboard

(Total Points: 50 Points)

In this assignment, we will learn some basic data visualization tools with Tableau. In the first part of the assignment, we will work with CO2 emissions data from the World Bank. In the second part of the assignment, you will go find another dataset to perform similar data visualization.

Part 1-1: Set up the Tableau Environment

- 1) Please download and install the Tableau Public program on your personal computer:
<https://public.tableau.com/en-us/s/>
- 2) Next, please sign up for a Tableau public account. This is where you will share your tableau work. Click on “Sign in” on the upper right corner of the previous webpage.
- 3) After you have installed the program and set up an account, let’s watch a tutorial on how to work with Tableau. You can learn about all the basic functions in Tableau from this “Resources” website:
<https://public.tableau.com/en-us/s/resources>
- 4) Please download the World_Bank_CO2 excel file from Assignment #5. After launching the Tableau Public program, please click on “Connect Microsoft Excel” and choose “World_Bank_CO2” file.
- 5) Next, drag the Sheet named “CO2 Data Cleaned” on the left-side panel and drop it to the workbook region. Tableau will then show a preview of the spreadsheet.
- 6) Next, go to Sheet 1. Let’s familiarize ourselves with the layout of the Tableau platform.

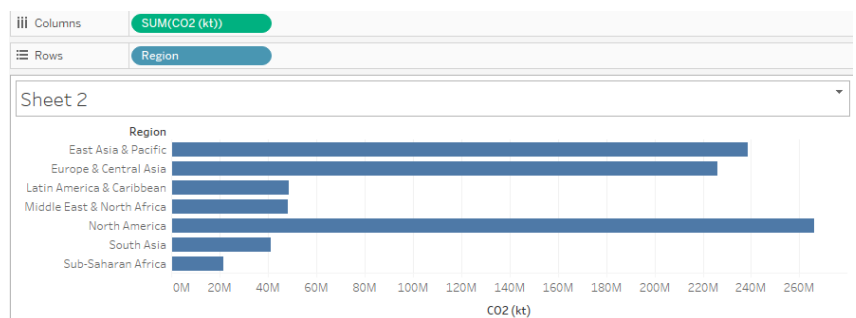
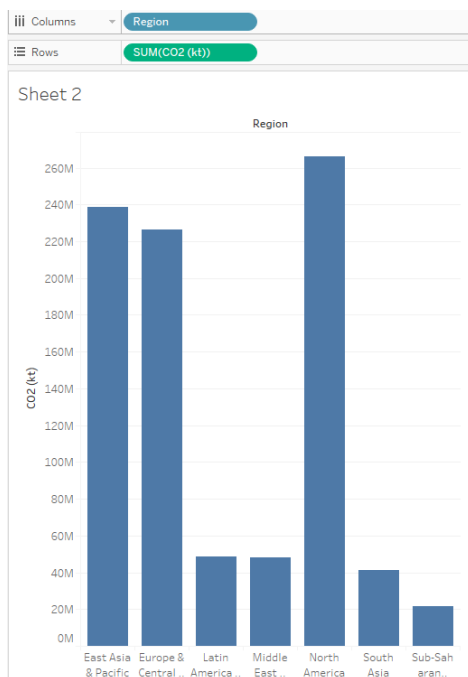


7) Take a look at what variables are available in this dataset and brainstorm some data charting ideas. In this exercise, we will practice creating the following:

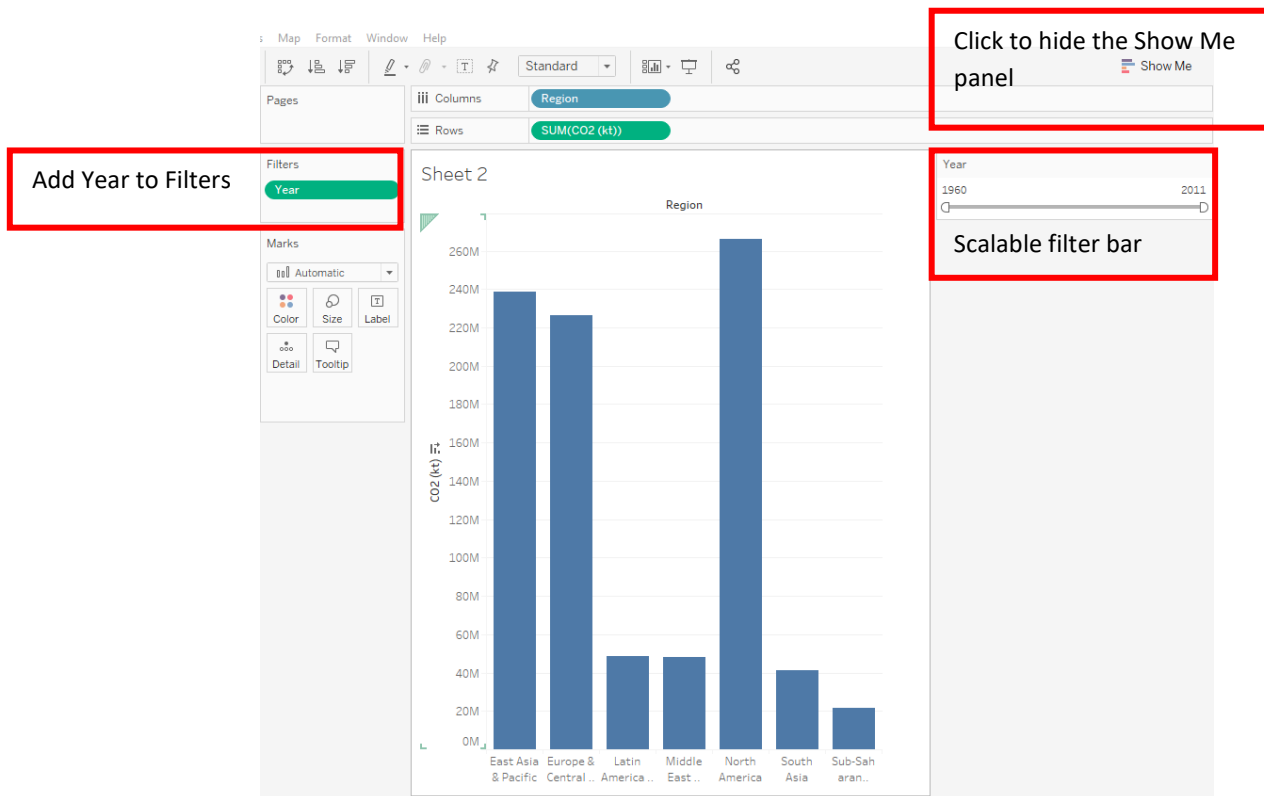
- A bar chart
- A time series line chart
- A map with proportional symbols
- A choropleth map
- A Tableau dashboard

Part 1-2: Create a Bar Chart in Tableau

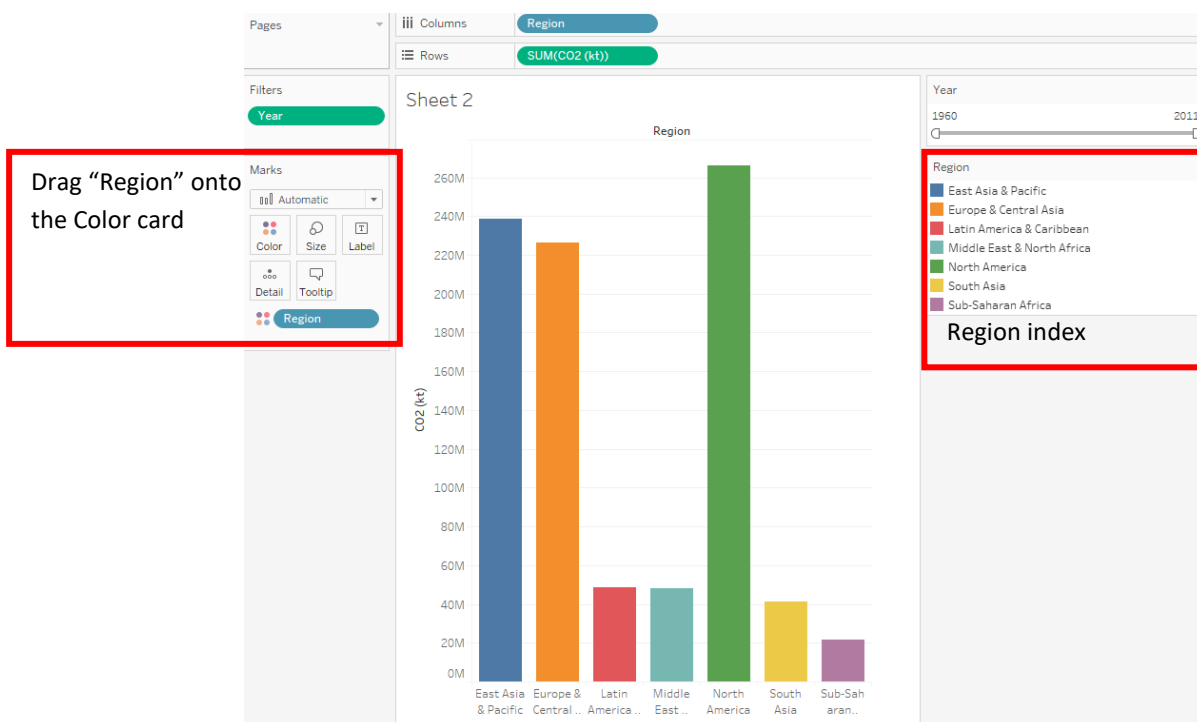
- 1) Double-click “CO2” (which is total CO2 emissions) from Measures. You will see a single bar showing the total amount of CO2 emissions of all countries of all the years (1960-2011) – basically the sum of all the numbers in the CO2 column. This single bar is not really informative.
- 2) Let’s try some other ways to present the data differently. How about dividing the data by region? Please double-click “Region” from Dimensions. Now the data is shown by region and we can compare the total amount of CO2 emissions by region.
- 3) By double-clicking on the field that you want to chart, Tableau is usually smart enough to put the field in the correct shelf. But you can always control this by dragging the field directly to the Columns or Rows shelf. In our example, the SUM of CO2 is placed on the Rows shelf and Regions is placed on the Columns shelf. This arrangement creates a vertical bar chart. If you switch the two, you get a horizontal bar chart. Play with the different arrangements and see how the chart changes as a result.



- 4) The chart we created above shows the sum of data from all years. What if you want to compare total CO2 emissions by year (or by decade)? We can add a filter to the chart. Drag “Year” from Dimensions to the Filters shelf. Click on Years in the Filters shelf and check “Show Filter”. Then you will see a scalable year bar added to the right-side panel. (You may need to click on Show Me to hide the Show Me panel.) Now you can filter the data to show only data from a certain time period.



- 5) Next, let's add some colors to our chart. Drag “Region” onto Colors on the Marks shelf. Now our bars are colored by different regions. There is also a Region index being added to our right-side panel. You can click on the different region on the index to only show data from a certain region (this acts as a filtering effect).

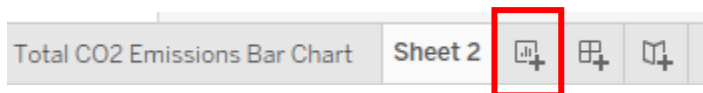


- 6) Play with the functions that we have learned so far and design a bar chart that shows Total CO2 emissions by region. When you are satisfied, please re-name the Sheet **“Total CO2 Emissions Bar Chart”**. You do this by double-clicking on Sheet 1 at the bottom of the Tableau window.

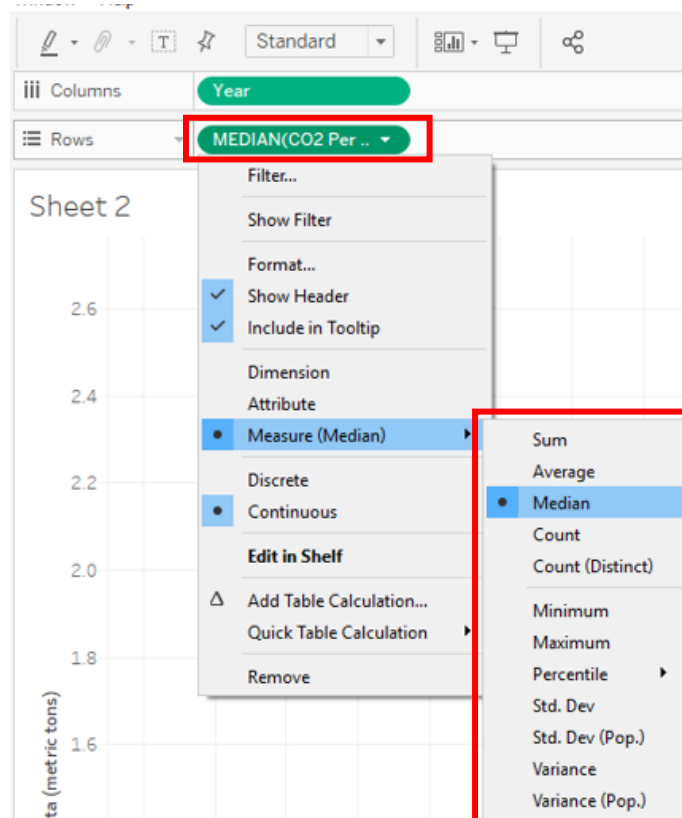
[Part 1-2] Save a screenshot of your finalized bar chart and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your chart design and describe some trends shown by your chart. (4 points)

Part 1-3: Create a Time Series Line Chart in Tableau

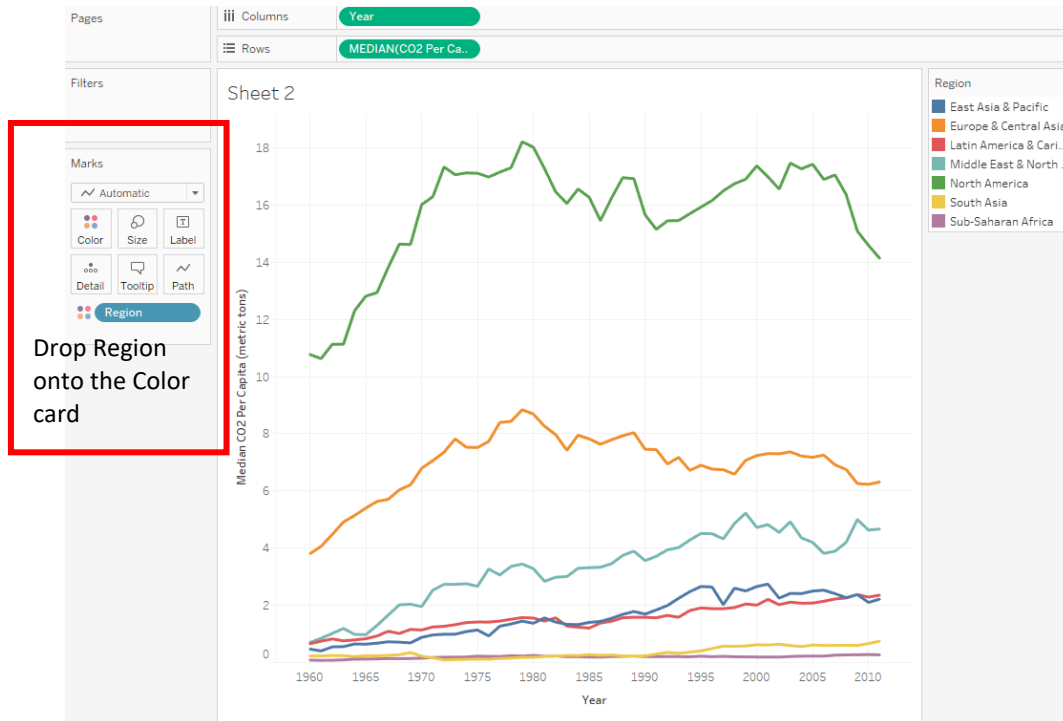
- 1) Add a new worksheet by clicking on the “New Worksheet” tab at the bottom of the Tableau window. Let’s now look at CO2 Per Capita data through time.



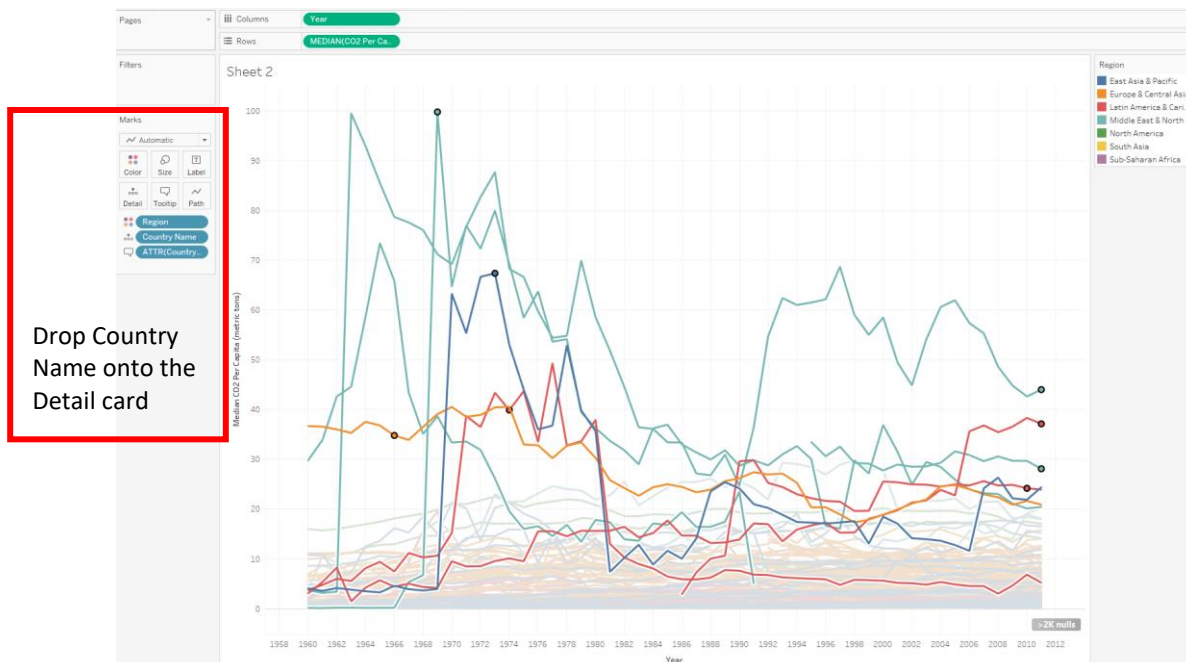
- 2) Double-click “CO2 Per Capita” from Measures. Double-click “Year” from Dimensions. Tableau automatically creates a time series line chart from these two clicks.
- 3) By default, this chart shows the SUM of CO2 Per Capita from all countries and plots the data by year, which does not make a lot of sense. You can change what statistics to show with your dataset. On the Rows shelf, click on the inverted triangle at the end of the CO2 Per Capita pill to show more options. Change SUM to AVERAGE or MEDIAN to see how the line chart changes. You can also choose to show other statistics. For the purpose of showing how around the world CO2 Per Capita has increased through the years, “median” display makes the most sense.



- 4) Next, let's divide our data by region to see if there are any differences geographically. Double-click on "Region" from Dimensions. (or drag "Region" onto Colors on the Marks shelf.) Now we see the time-series line chart displays data from different geographic regions. This is a more powerful visualization than the single line chart we created earlier.



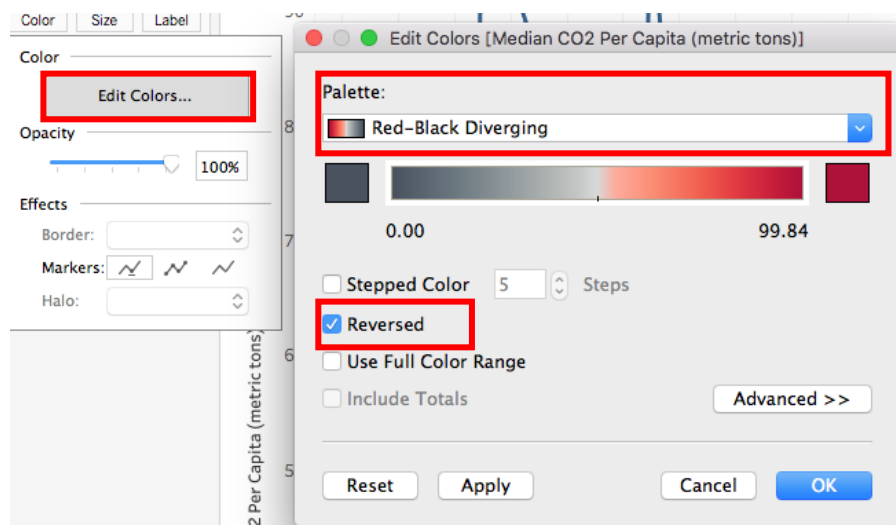
- 5) Are you interested in finding out CO2 Per Capita Emission by country? Drag "Country Name" from Dimensions and drop it to the canvas (or onto Details on the Marks shelf). Now we see some strong outliers. If you want to highlight certain countries from all the lines on this chart, you can click on individual lines. Hold on Ctrl to select multiple lines. As you hover over the individual line, you can see more detailed data from each country.



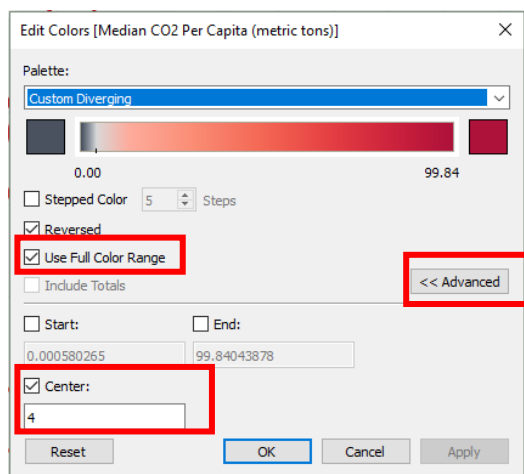
- 6) Play with the settings and once satisfied, you can save this worksheet as **“CO2 Per Capita Colored by Region”**.

[Part 1-3-1] Save a screenshot of your finalized time-series line chart colored by region and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your chart design and describe some trends shown by your chart. (4 points)

- 7) Let's duplicate this sheet and try another color scheme. Right click on the worksheet tab and choose “Duplicate”. Rename the new worksheet “CO2 Per Capita Colored by Value.” Remove Country Name from the Colors shelf.
- 8) Instead of coloring our time-series line chart by geographic region, let's try to color the lines by the value of CO2 per capita (a color scale effect). In our new worksheet, take out “Region” from the Color marks card. Drag “CO2 Per Capita” to the Color marks card. Make sure to specify which statistic you choose to display.
- 9) Click on “Color” and “Edit Colors” to choose a Red-Black Diverging color palette. Then check “Reversed”, meaning that the higher values are shown in red whereas the lower values are shown in gray/black. Click OK to apply the color scheme to your time-series line chart.



- 10) By default, the resulting chart does not have a lot of color variation, most of the lines are in gray/black. We can modify the color ramp by click on “Advanced” and set the center value to “4” – which is the average of Per Capita CO2 emissions. And check “Use Full Color Range”.

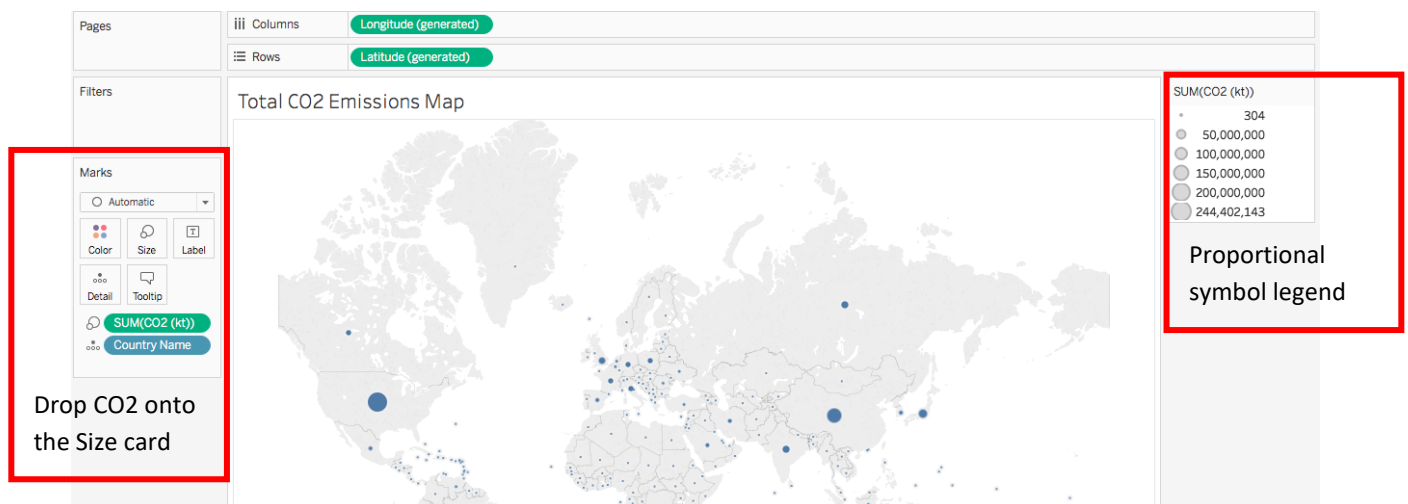


- 11) Play with the color design and once satisfied, you can save this worksheet as **“CO2 Per Capita Colored by Value”**.

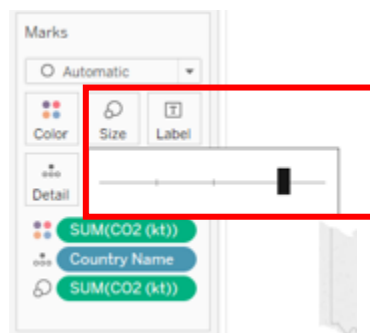
[Part 1-3-2] Save a screenshot of your finalized time-series line chart colored by value and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your chart design and describe some trends shown by your chart. (4 points)

Part 1-4: Create a Map (Proportional Symbol & Choropleth) in Tableau

- 1) Let's try to make a map with the CO2 emissions data. Drag "Country Name" from Dimensions and drop it to the canvas. Now it creates a map with each dot representing each country. That's not really interesting. We want the map to show CO2 emissions data by country. To do so, please drag "CO2 (kt)" from Measures and drop it onto Size in the Marks card. Now you see bubbles of various sizes representing how much total CO2 emissions there is from each country. This type of map is called "proportional symbol" map. You can see the map legend on the right-hand panel.

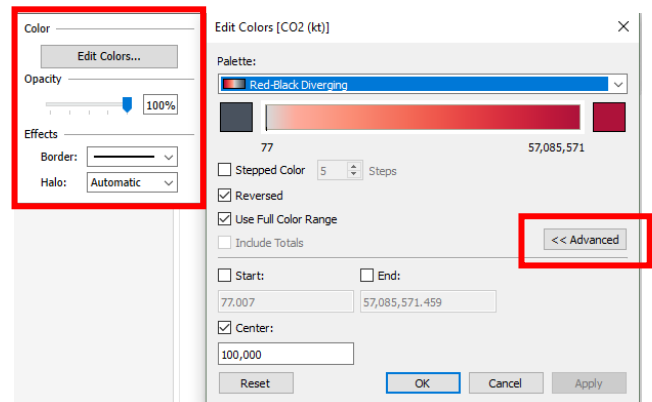


You can increase the size of the bubbles to make them more visible. Click Size on the Marks shelf and scroll to make the bubble size bigger.



- 2) Currently, this map shows the sum of all years' data from each country. If you want to specify a year range, you can add Years to the filters as we did before.

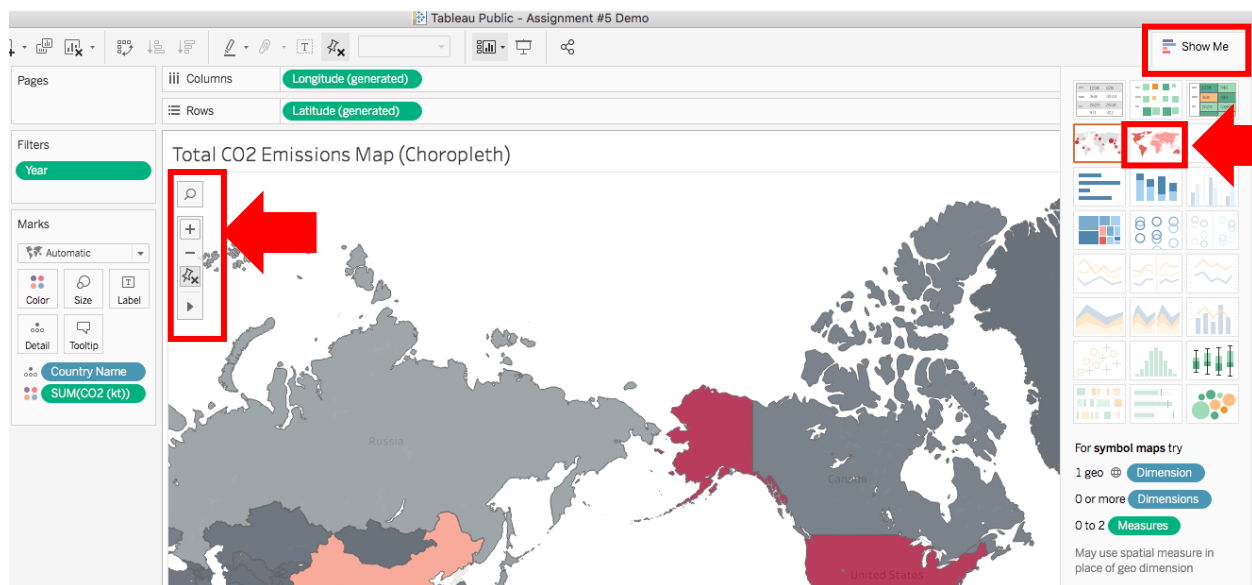
- 3) You can also add a color scale like we did before. If you choose to add a color scale, please make sure that it is the same scale you used in the time-series line chart to ensure consistency across our charts. If you choose to add color, think about modifying the color ramp by using the “Advanced” setting. You can also add borders to the bubbles to make them easier to see.



- 4) Once you are satisfied with your map design, please save this worksheet as **“Total CO2 Emissions Map (Proportional Symbol)”**.

[Part 1-4-1] Save a screenshot of your finalized proportional symbol map and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your map design and describe some trends shown by your map. (4 points)

- 5) Another type of map you can create with Tableau is a “choropleth” map. Right-click on the previous map worksheet and duplicate. Re-name it as “Total CO2 Emissions Map (Choropleth)”.
- 6) Click on Show Me on the upper-right corner of the Tableau window and choose the map with varying shades of red color (that’s a choropleth map).
- 7) You can adjust the zoom by using the zoom tool on the left-hand side of the map.
- 8) Once you are satisfied with your map design, please save this worksheet as **“Total CO2 Emissions Map (Choropleth)”**.



[Part 1-4-2] Save a screenshot of your finalized choropleth map and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your map design and describe some trends shown by your map. (4 points)

Part 1-5: Create one more visualization of your choice in Tableau

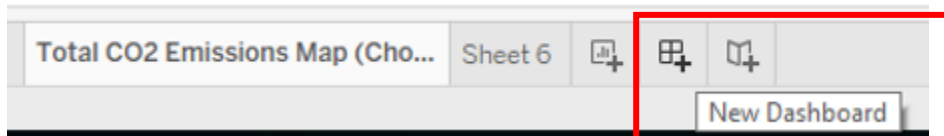
- 1) At this point, we have practiced creating a bar chart, a time-series chart, and two maps with our CO2 emissions data. There are a lot more visualization options you can do with Tableau. Explore the “Show Me” panel and brainstorm one more idea for presenting data from our example data set.
- 2) You can learn more about the types of visualization Tableau can create by searching their help menu:
https://onlinehelp.tableau.com/current/pro/desktop/en-us/buildauto_showme.html

[Part 1-5] Save a screenshot of the visualization you created on your own and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your design and describe some trends shown by your visualization. (4 points)

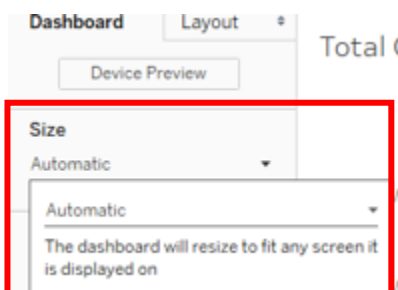


Part 1-6: Putting it together – Creating a Tableau Dashboard

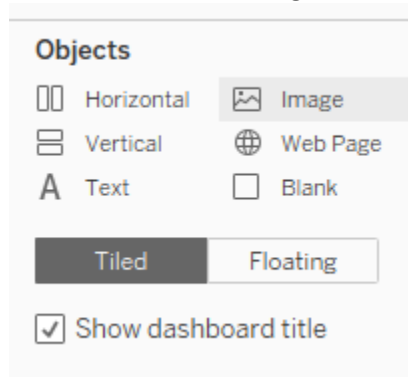
- 1) At this point, we have created five pieces of visualization work (some charts and some maps). We are ready to put all these together to create a dashboard. Go to the bottom of the Tableau window and click on “New Dashboard”.



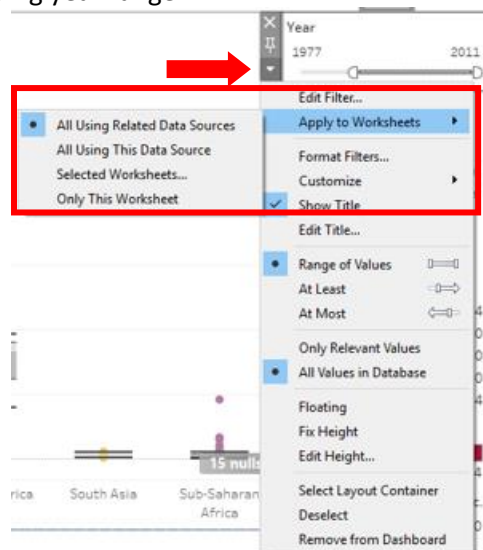
- 2) Before putting all the visualization onto the dashboard, you want to make sure that the color design is consistent across all the charts and maps.
- 3) Next, let's define our dashboard size. Click on “Size” and choose “Automatic”, which will fit the dashboard to the screen size automatically.



- 4) Then you can just drag and drop the sheets that you want to include onto the Dashboard. Play with the arrangement and layout. If you want to add more panels or other objects, click on Objects on the lower left corner of the Tableau window. You can also add a Dashboard title by checking the “Show dashboard title” box. Double-click on the title region to enter a title and change the font display.



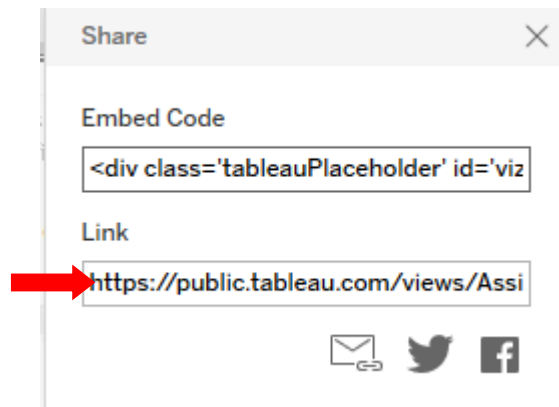
- 5) Try to keep all the legends in the same place for the ease of navigation. Here are some additional things you can do to apply the same filter to all charts and maps and to link all the charts and maps on a dashboard.
- 6) On the Years legend, click on the inverted triangle and hover over “Apply to Worksheets” → “All Using Related Data Sources”. By setting this up, every time you adjust the year range, all the charts and maps will show data from the corresponding year range.



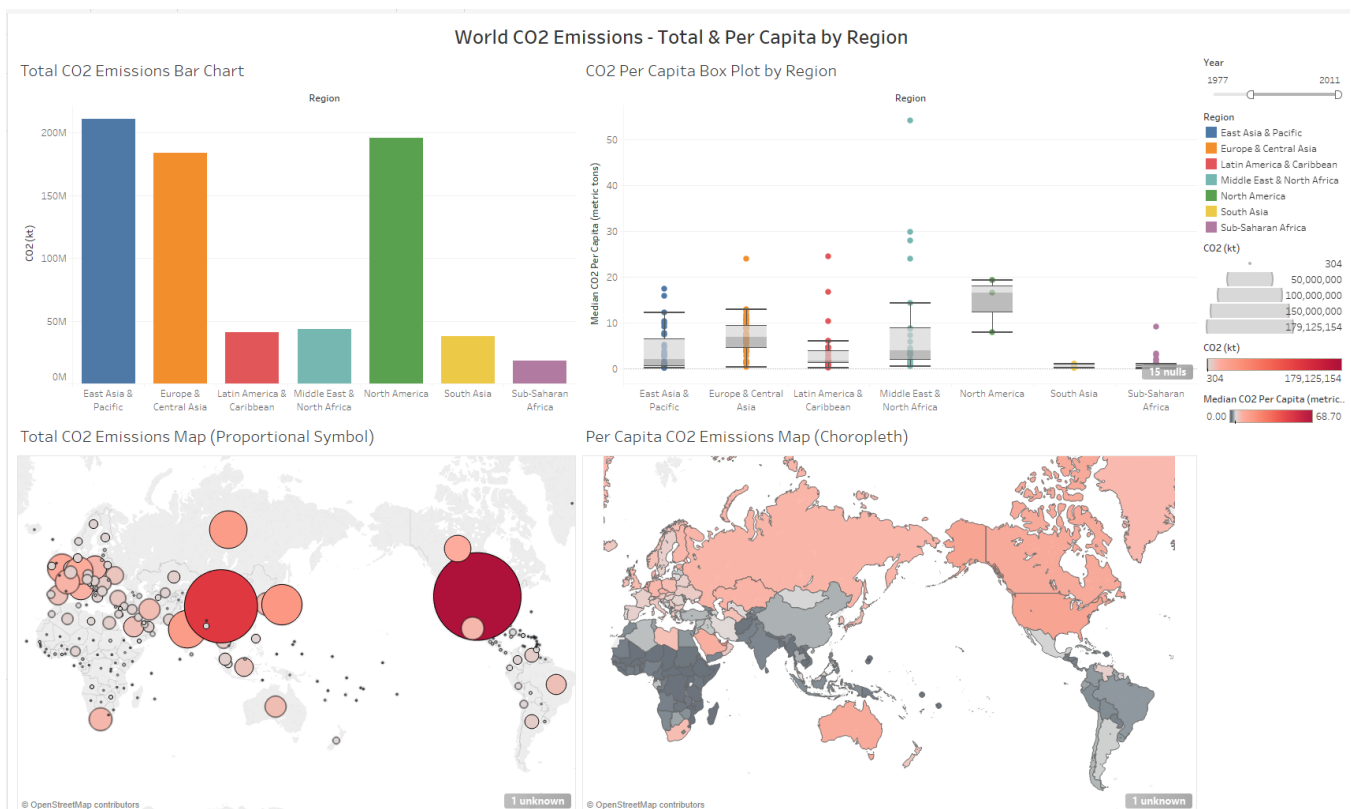
- 7) To link countries across all charts and maps, go to one of the maps, and click on the funnel icon to use it as the filter. Now when you click on a country on this map, all panels will show data only from that country. You can just un-click the funnel to de-link the charts and maps. Or to use another chart/map as the filter.



Click on “share” at the lower right corner of the Tableau Public webpage and copy and paste the link here. Below the screenshot, please explain your design. (6 points)



Here is an example:



https://public.tableau.com/views/Assignment5Demo/Dashboard1?:embed=y&:display_count=yes&publish=yes

Part 2: Design your own data visualization dashboard

- 1) For the second part of this assignment, please find another data set that you would like to explore with Tableau data visualization tools.
- 2) Requirement for data:
 - Must include more than 100 data records (i.e. rows in a spreadsheet)
 - Must include at least 2 qualitative variables (categories/dimensions) and 2 quantitative variables (numerical/measures)
 - Geographical attributes (coordinates) that enable you do the map visualizations are optional, not required
 - You can explore the Tableau Public Resources for sample data sets: <https://public.tableau.com/en-us/s/resources> (Click on the Sample Data tab)
 - Remember, you might need to do some data cleaning or reorganize the data in a format that works for the purpose of your analysis.
- 3) Once you have the data set ready, please follow the same steps we learned in Part 1 to create some visualization and turn in the following:
 - **2-1 Describe your data set. Provide a link to the data or upload the data file to the assignment. Describe specific questions that you would like to explore with this data set. (4 points)**
 - **2-2 Create three different visualizations with your data set. Note: these should be three different types of visualization. For each visualization, please save a screenshot and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Below the screenshot, please explain your design and describe some trends shown by your visualization. Repeat the same for the three visualizations. (4 points each)**
 - **2-3 Put together a Tableau Dashboard of the three visualizations you created in the previous step. Please save a screenshot of the dashboard and paste it to the assignment document. Please include the entire Tableau window in the screenshot. Then save and publish the dashboard to your Tableau Public Account. Click on “share” at the lower right corner of the Tableau Public webpage and copy and paste the link here. Below the screenshot, please explain your design. (4 points)**