



Online Course
**Data Visualization
for Professionals**



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Tableau Desktop

An Introduction

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Visual+
Interactive
Data

design
informatics

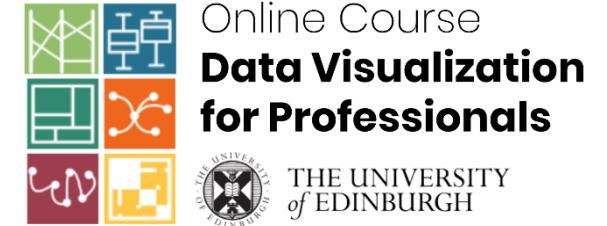


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outline for today

- What is Tableau?
- Example visualisations in Tableau
- Creating visualisations in Tableau Desktop
 - Juxtaposing multiple attributes
 - Creating calculated fields (attributes)
 - Plotting data on a map
 - Creating a dashboard in Tableau
 - Creating filters

what is Tableau?



what is Tableau?

- Software tool to visualize and analyze your data
- Versatile data sources supported
 - CSV, JSON, MS Excel
 - Databases: MySQL, PostGreSQL, MongoDB...
 - Data warehouses/cloud
- Some simple data processing
 - Transformation of data types
 - Some statistics
 - Possibilities to derive new data values
- Based on the design principles of data visualisation

Tableau Software

- Tableau Desktop → we will focus on this!
 - Authoring tool for interactive visualizations
- Tableau Public
 - Free online platform for exploring, creating and sharing interactive visualizations on the web
 - Visualisation and data are made public
- Tableau Prep
 - Data wrangling and transformation in Tableau
 - Clean, re-shape and combine data for analysis
- Tableau Server
 - Managing larger data-driven projects

where can I get Tableau Desktop?

- Tableau for Students
 - <https://www.tableau.com/academic/students>
 - Use your University of Edinburgh email to sign up!
- Tableau Desktop – 2 week trial version
 - <https://www.tableau.com/products/trial>

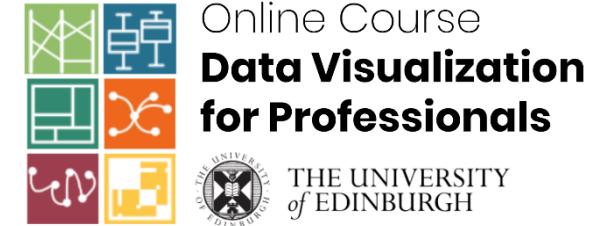
what is Tableau good for?

- Visualising categorical quantitative data using standard visualization techniques
 - (Simple) geographic visualisations
 - Interactive visualisations & dashboards
 - A range of standard customization features are available
- Good for quick explorations and computational sketches

what is Tableau NOT good for?

- Visualising textual data
- Visualising networks
- If you would like to design a non-standard visualisation
(customization is somewhat limited)

example visualisations in Tableau



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volcanoes of Kamchatka



Volcanoes Of Kamchatka

The Kamchatka Peninsula [Russia] is 1250 km long peninsula one of the most volcanically active places on earth. In this part of the Pacific "Ring of Fire", there are 109 active volcanoes. The Active volcanoes form a long belt from Lettunup in the North to Mashkovetsev in South. Intense volcanism is caused by the subduction of the Pacific Plate.

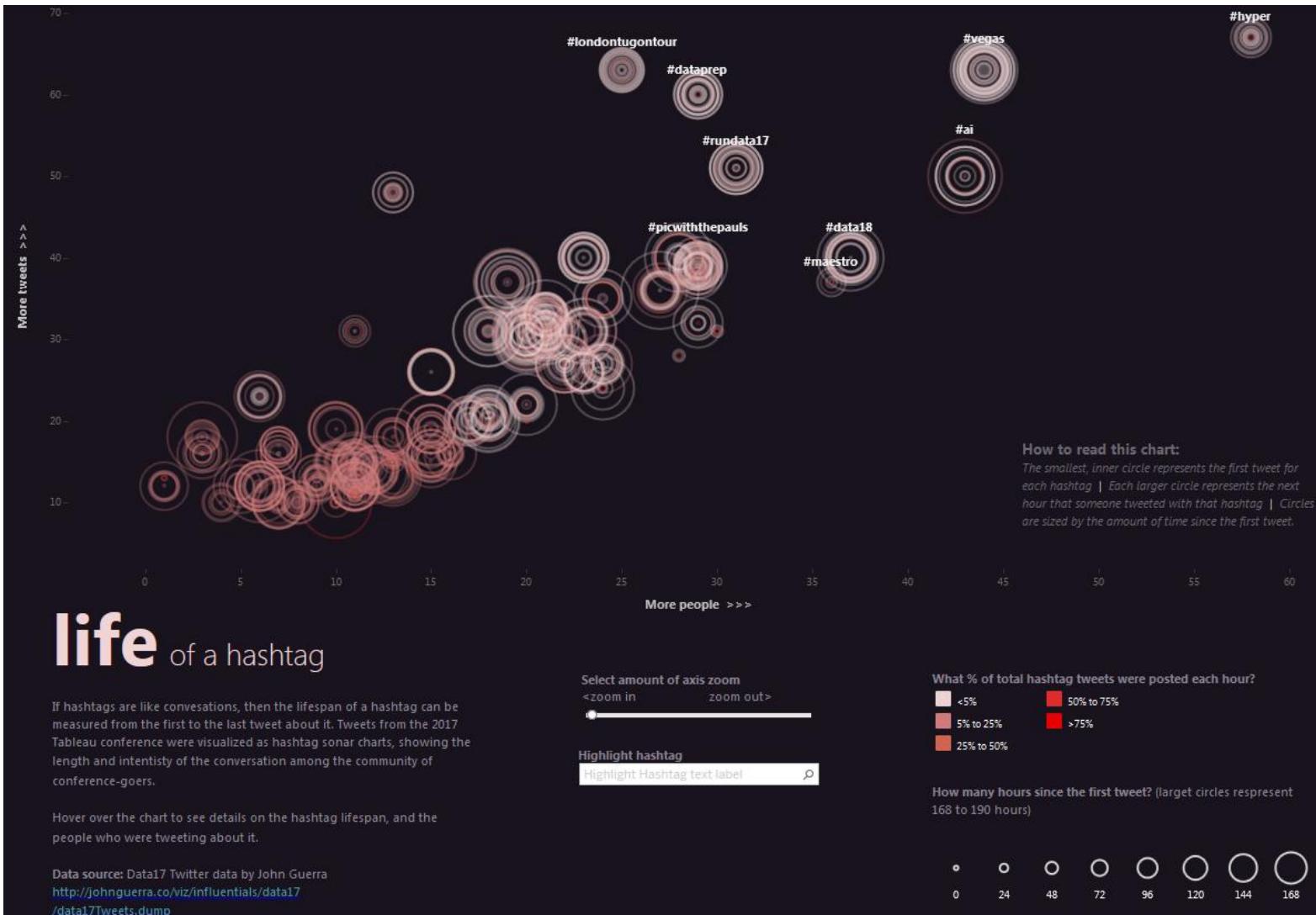
[https://public.tableau.com/app/profile/joti.gautam/viz/VolcanoesOfKamchatka/](https://public.tableau.com/app/profile/joti.gautam/viz/VolcanoesOfKamchatka/Dashboard1)
Dashboard1

Source: Volcano.si.edu, Wiki

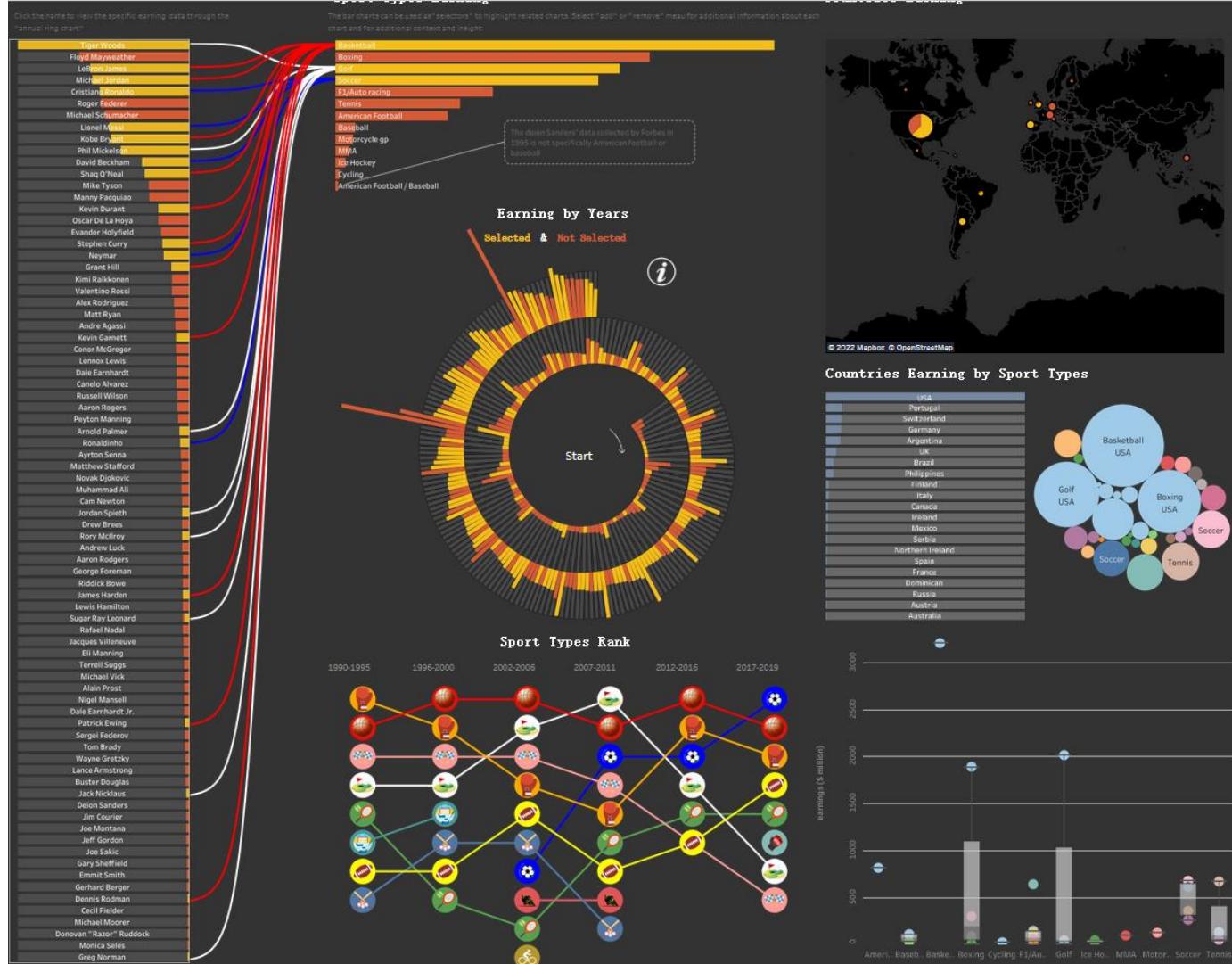
Author: Joti Gautam

life of a hashtag

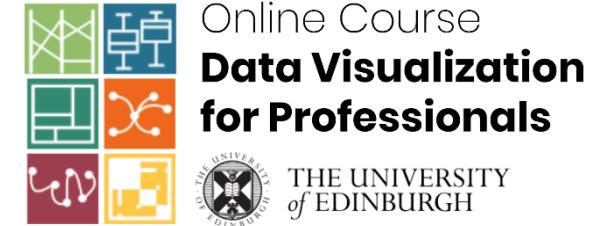
<https://public.tableau.com/en-us/s/gallery/life-hashtag?gallery=votd>



Forbes Lists of the World's Best Paid Athletes



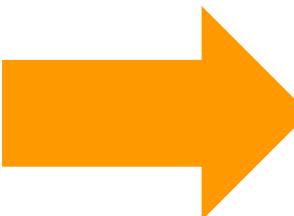
creating visualisations in Tableau



some advice

- Don't let the tool drive your visualization design
 - Come up with visualization ideas and THEN try to implement them in Tableau
- Think critically about the design solutions that Tableau is offering
 - Colour schemes
 - Spatial layout
 - Labelling
 - Legends
 - ...
- Explore different possible design solutions
- If you have an idea, and you don't know how to do it
 - There are lots of tutorials and “how-tos” online
 - Ask here in the class

getting started



https://datavis-online.github.io/course_content_2022/session-4#tutorial-tools1

Friday 10th June 1-3pm - Tableau & RawGraphs:

(Click to join meeting)

(Tableau slides available [here](#))

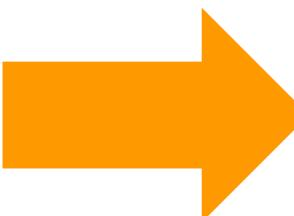
Data Visualization in Tableau Desktop: This tutorial provides a basic introduction to Tableau Desktop, and how it can be used to create interactive data visualizations. This tutorial does not involve any coding. Participants will get an overview on how to load data into Tableau Desktop, how to do basic data manipulations, how to create and customize basic graphs, and how to create more complex interlinked dashboards. The tutorial will include a hands-on demo that participants can directly follow on their own computers.

Participants should install Tableau Desktop on their computer prior to the tutorial (see links below). Please note that Tableau is only supported on Windows and Mac computers.

Skills required: None

Software installed: Tableau Desktop. There are two options:

- [Install the student version of Tableau \(valid for 1 year\)](#). Use your University of Edinburgh email address to sign up!
- [Install the free trial version of Tableau \(valid for 2 weeks\)](#) Other tools: None



Files for tutorial: [Download](#)

Site: <https://www.tableau.com/>

creating visualizations in Tableau

- Download the tutorial data sets to your computer
 - https://datavis-online.github.io/course_content_2022/files/tutorials/tableaudata.zip Download/open these slides
 - Unzip the file
 - Find the ecofootprint.csv data file – we will use this for this tutorial
- Open the slides for this tutorial
- Open Tableau Desktop on your computer
- Two ways to follow this tutorial
 - Try to follow-along on your own computer
 - Watch the tutorial now and try it yourself later using the tutorial slides

Tableau overview

Specifying the
data source(s)

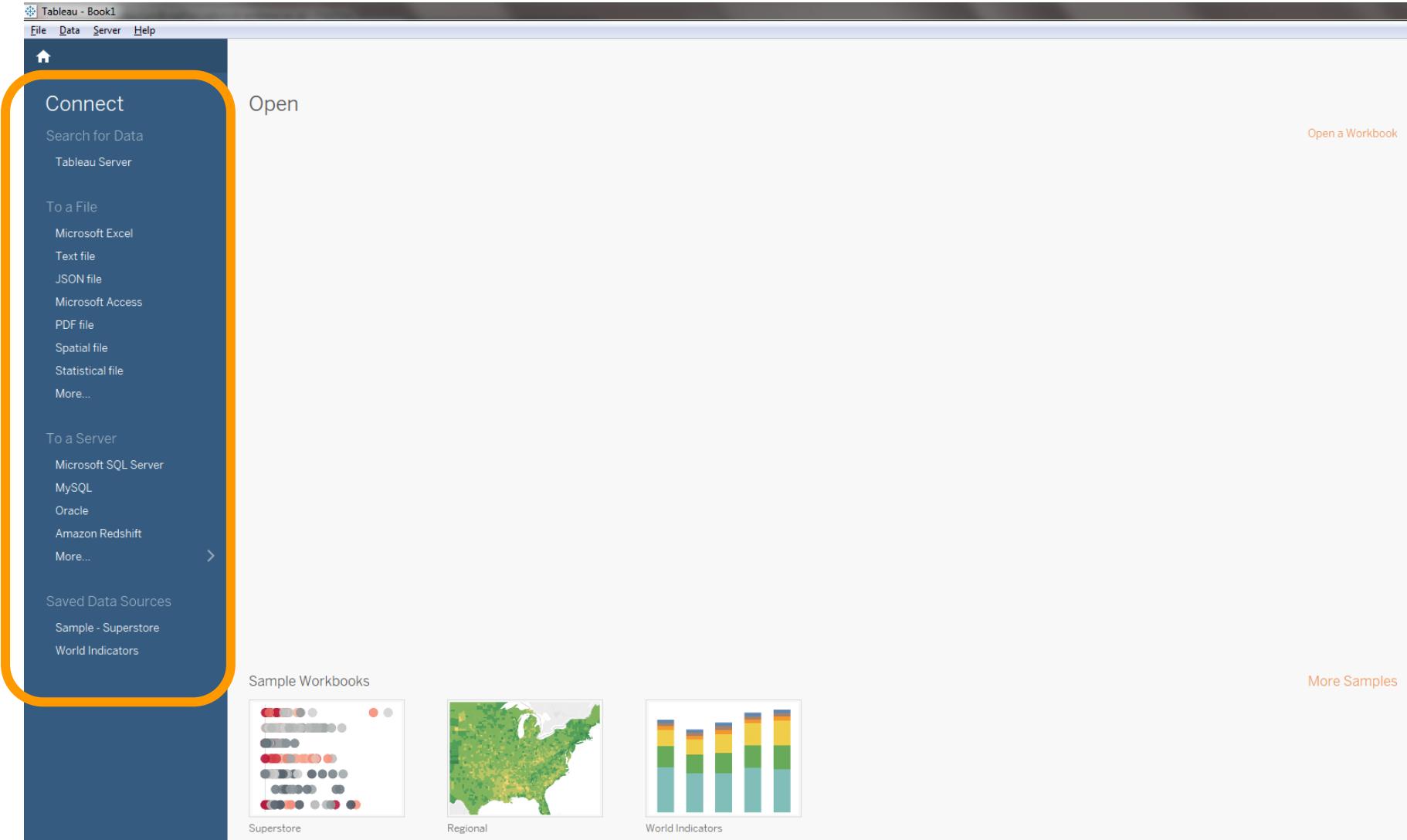


Tableau overview

Tableau - Book1

File Data Server Window Help

Connections Add

ecoFootprint Text file

Files

Use Data Interpreter
Data Interpreter might be able to clean your Text file workbook.

ecoFootprint.csv
HousingData.csv
migration_wit...l_noTotal.csv
OilData.csv

New Union

Sort fields Data source order

Country	Ecological Footpri...	Biocapacity (per p...	CO2 emission (2...	Population	Region
United States	8.22000	3.7600	16.4000	317.50	America
Saudi Arabia	5.61000	0.5000	17.9000	28.29	Asia
Russia	5.69000	6.7900	12.5000	143.17	Asia
China	3.38000	0.9400	7.6000	1,408.04	Asia
Canada	8.17000	16.0100	13.5000	34.84	America
United Kingdom	7.93000	0.5600	7.1000	65.65	Europe
Italy	4.61000	1.0800	5.7000	60.92	Europe
France	5.14000	3.1100	5.0000	63.98	Europe
Sweden	7.25000	10.6200	4.6000	9.51	Europe
Denmark	5.51000	4.7800	6.8000	5.60	Europe
Netherlands	5.28000	1.1700	10.1000	16.71	Europe
Brazil	3.11000	9.0800	2.5000	198.66	Southamerica
Argentina	3.14000	6.9200	4.5000	41.09	Southamerica
Germany	5.30000	2.2700	9.2000	82.80	Europe
Nigeria	1.16000	0.7000	0.6000	168.83	Africa
Costa Rica	2.21000	1.1500	0.0000	53.20	Africa

Data Source Panel

Data Source

Sheet 1

18

Tableau overview

Sheet 1

Drop field here

Drop field here

Drop field here

Filters

Marks

Tables

Search

ecoFootprint

Country

Region

Measure Names

BIOCAPACITY (per person)

Co2 Emission (2013)

ECOLOGICAL FOOTPRIN...

Population

ecoFootprint.csv (Count)

Latitude (generated)

Longitude (generated)

Measure Values

Color

Size

Text

Detail

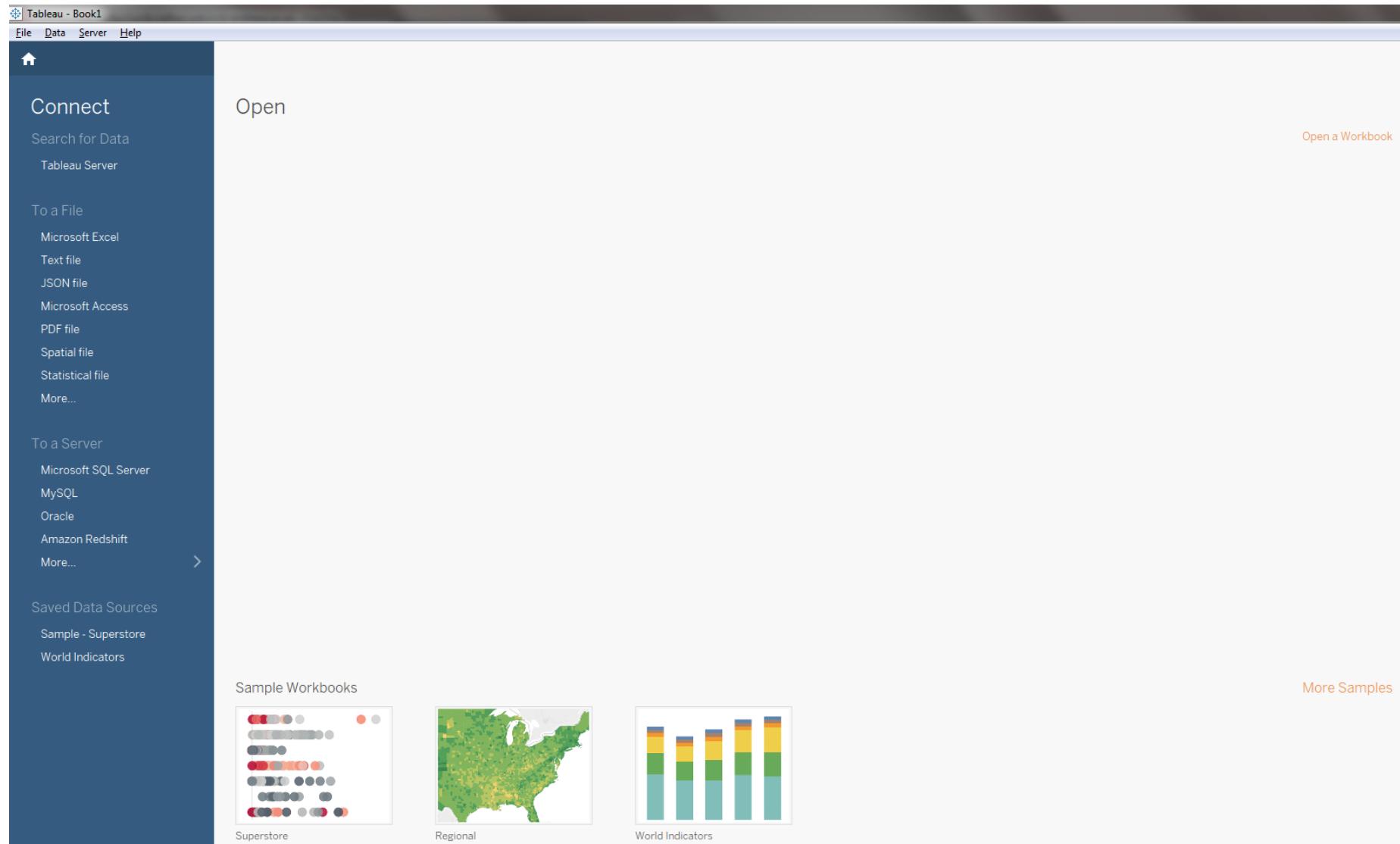
Tooltip

Show Me

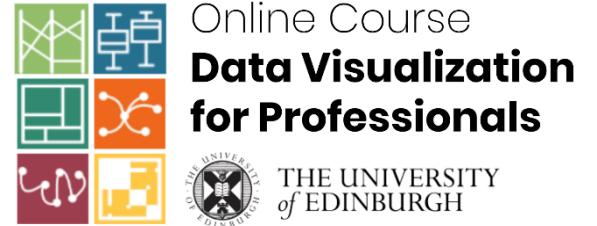
Select or drag data
Use the Shift or Ctrl key to select multiple fields

19

Does everybody have Tableau open?



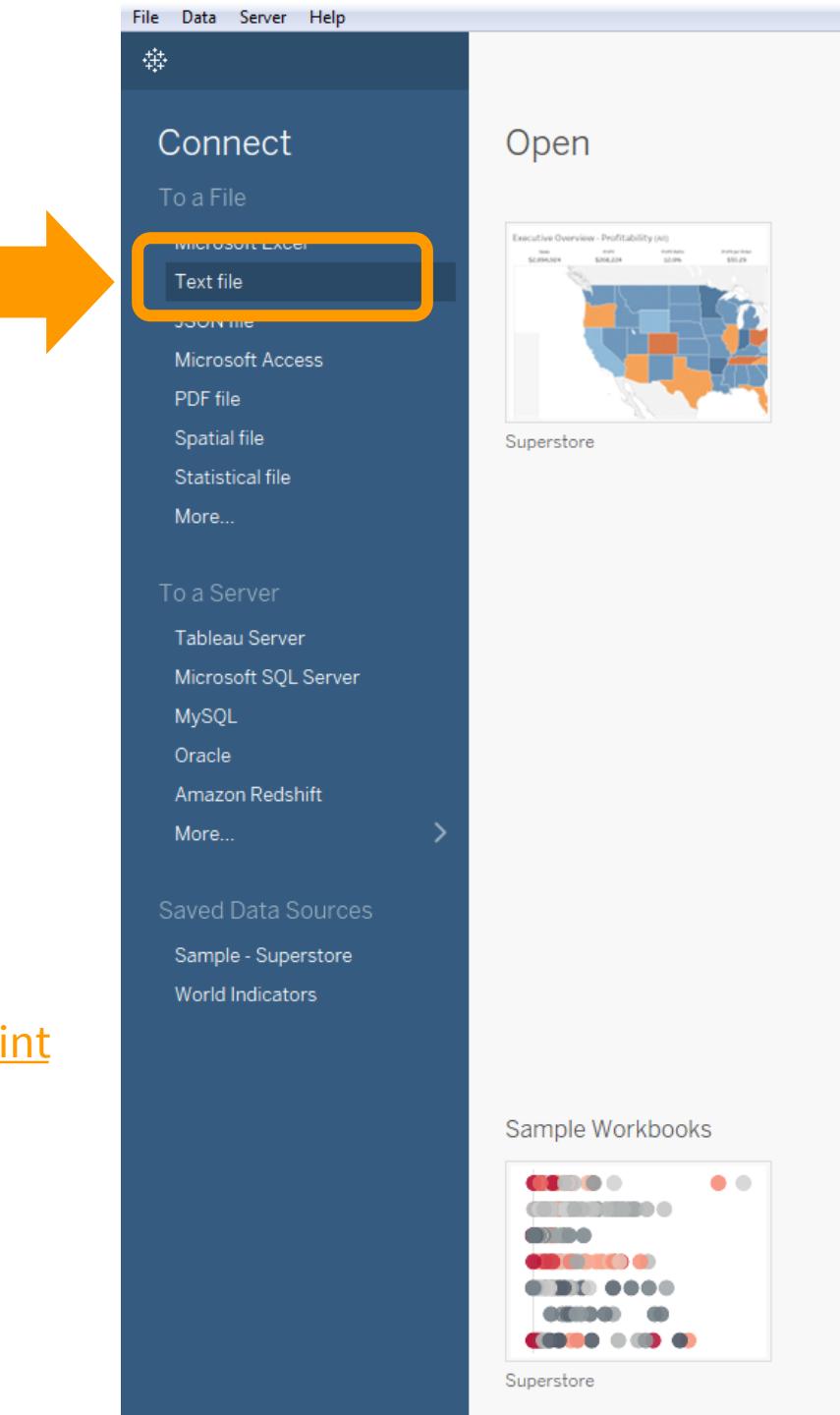
loading data



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loading data

- Let's load **ecofootprint.csv**
- Load this data as “Text File”



- More info about the data:

https://en.wikipedia.org/wiki/List_of_countries_by_ecological_footprint



Connections

Add

ecoFootprint
Text file

Files

- Use Data Interpreter
Data Interpreter might be able to clean your Text file workbook.
- ecoFootprint.csv
- HousingData.csv
- migration_wit...l_noTotal.csv
- OilData.csv
- New Union

ecoFootprint

ecoFootprint.csv

Connectio
Live

loading data

- The “Data Source” view will open
- The “Table Details” (left) shows all data attributes and their attribute types



ecoFootprint.csv 6 fields 21 rows

Name	ecoFootprint.csv	Country	# ecoFootprint.csv	BIOCAPACITY (per pers...)	# ecoFootprint.csv	Co2 Emission (2013)	# ecoFootprint.csv	Population	# ecoFootprint.csv	Abc ecoFootprint.csv
Type	Field Name	Physical Ta...	Rem...							Region
geo	Country	ecoFootprint...	COUN...							America
meas	ECOLOGICAL FOOTPRI...	ecoFootprint...	ECOL...							Asia
meas	BIOCAPACITY (per per...	ecoFootprint...	BIOC...							Asia
meas	Co2 Emission (2013)	ecoFootprint...	CO2 E...							Europe
meas	Population	ecoFootprint...	POPU...							Europe
cat	Region	ecoFootprint...	REGION							Europe



Connections

Add

ecoFootprint
Text file

Files

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- OilData.csv

New Union

ecoFootprint

ecoFootprint.csv

Connectio
Live

loading data

- The table to the right shows the first couple of rows of your data



Need more data?

Drag tables here to relate them. [Learn more](#)

ecoFootprint.csv 6 fields 21 rows

Name: ecoFootprint.csv

Fields:

Type	Field Name	Physical Ta...	Rem...	#	ecoFootprint.csv	#	ecoFootprint.csv	#	ecoFootprint.csv	#	ecoFootprint.csv	Abc	ecoFootprint.csv	
					Country		ECOLOGICAL FOOTPRI...		BIOCAPACITY (per pers...		Co2 Emission (2013)		Population	Region
					United States		8.22000		3.7600		16.4000		317.50	America
					Saudi Arabia		5.61000		0.5000		17.9000		28.29	Asia
					Russia		5.69000		6.7900		12.5000		143.17	Asia
					China		3.38000		0.9400		7.6000		1,408.04	Asia
					Canada		8.17000		16.0100		13.5000		34.84	America
					United Kingdom		7.93000		0.5600		7.1000		65.65	Europe
					Italy		4.61000		1.0800		5.7000		60.92	Europe
					France		5.14000		3.1100		5.0000		63.98	Europe
					Sweden		7.25000		10.6200		4.6000		9.51	Europe
					Denmark		5.51000		4.7800		6.8000		5.60	Europe



Connections

Add

ecoFootprint
Text file

Files

 Use Data Interpreter

Data Interpreter might be able to clean your Text file workbook.

ecoFootprint.csv

HousingData.csv

migration_wit...l_noTotal.csv

OilData.csv

New Union

ecoFootprint

ecoFootprint.csv

Connectio
Live

loading data

- The “Table Details” (left) can be hidden



Need more data?

Drag tables here to relate them. [Learn more](#)

ecoFootprint.csv 6 fields 21 rows

Name	Country	ECOLOGICAL FOOTPRI...	BIOCAPACITY (per pers...	Co2 Emission (2013)	Population	Region
ecoFootprint.csv	United States	8.22000	3.7600	16.4000	317.50	America
	Saudi Arabia	5.61000	0.5000	17.9000	28.29	Asia
	Russia	5.69000	6.7900	12.5000	143.17	Asia
	China	3.38000	0.9400	7.6000	1,408.04	Asia
	Canada	8.17000	16.0100	13.5000	34.84	America
	United Kingdom	7.93000	0.5600	7.1000	65.65	Europe
	Italy	4.61000	1.0800	5.7000	60.92	Europe
	France	5.14000	3.1100	5.0000	63.98	Europe
	Sweden	7.25000	10.6200	4.6000	9.51	Europe
	Denmark	5.51000	4.7800	6.8000	5.60	Europe

loading data

- Note the icons above each column
- Tableau tries to recognize the type of the data attributes
 - Country → Geographical attribute (world icon)
 - Ecological footprint, biocapacity... → quantitative attributes/measures #
 - Region → categorical/nominal attribute/dimension Abc

ecoFootprint.csv 6 fields 21 rows

Country	ECOLOGICAL FOOTPRI...	BIOCAPACITY (per pers...	Co2 Emission (2013)	Population	Region
United States	8.22000	3.7600	16.4000	317.50	America
Saudi Arabia	5.61000	0.5000	17.9000	28.29	Asia
Russia	5.69000	6.7900	12.5000	143.17	Asia

loading data

- You can also modify attribute types

ecoFootprint.csv 6 fields 21 rows

Country	Geographic Role	Co2 Emission (kg/person)
United Kingdom	None	3.7600
Italy	Airport	0.5000
France	Area Code (U.S.)	6.7900
Sweden	CBSA/MSA (U.S.)	0.9400
Denmark	City	16.0100
	Congressional District (U.S.)	0.17000
	✓ Country/Region	0.5600
	County	4.61000
	NUTS Europe	3.1100
	State/Province	7.25000
	ZIP Code/Postcode	10.6200
		4.7800

Table Details

Country

- Number (decimal)
- Number (whole)
- Date & Time
- Date
- ✓ String
- Boolean
- ✓ Default

Geographic Role

- None
- Airport
- Area Code (U.S.)
- CBSA/MSA (U.S.)
- City
- Congressional District (U.S.)
- ✓ Country/Region
- County
- NUTS Europe
- State/Province
- ZIP Code/Postcode

ecoFootprint.csv

Co2 Emission

creating a first visualisation worksheet

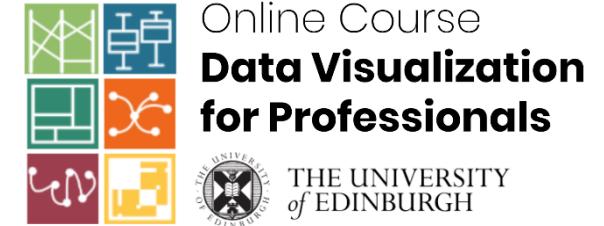


Tableau worksheets

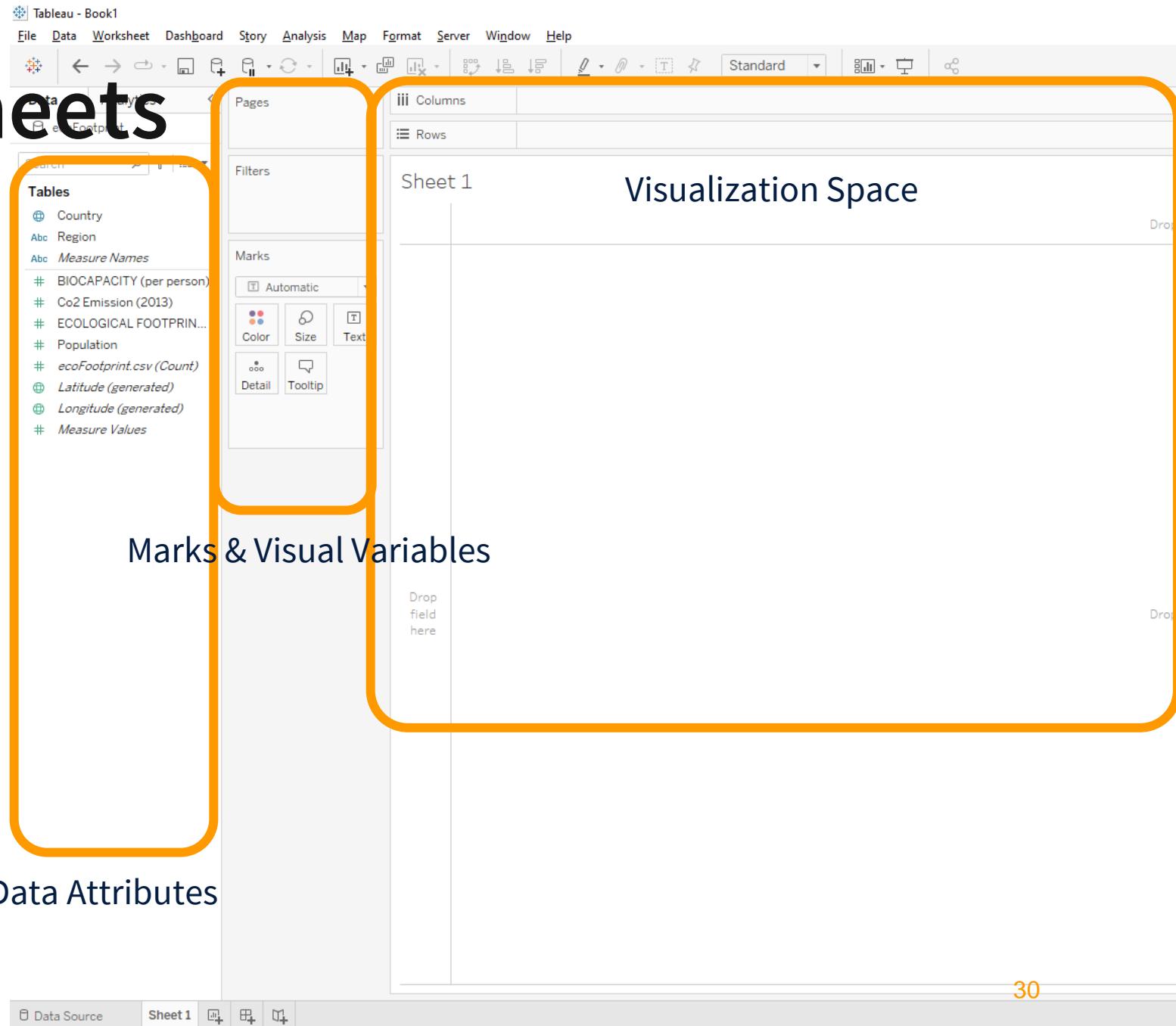
- Navigate to “Sheet1” to open your first visualization worksheet

The screenshot shows the Tableau software interface. In the top navigation bar, the title 'Tableau - Book2' is visible along with 'File', 'Data', 'Server', 'Window', and 'Help'. Below the navigation bar, the 'Connections' pane shows a single connection named 'ecoFootprint' (Text file). The 'Files' pane contains three files: 'ecoFootprint.csv', 'OilData.csv', and 'WillOckenden.csv'. A checkbox labeled 'Use Data Interpreter' is checked, with a note below stating 'Data Interpreter might be able to clean your Text file workbook.' A 'New Union' option is also present. At the bottom of the interface, there is a preview of the 'ecoFootprint.csv' data, which includes columns for Country, Ecological Footprint, Biocapacity (per person), CO2 emission (t per year), and Population. The preview shows data for various countries like United States, Saudi Arabia, Russia, China, Canada, United Kingdom, Italy, France, Sweden, Denmark, Netherlands, Brazil, Argentina, Germany, and Nigeria. An orange arrow points to a small 'Go to Worksheet' button with a bar chart icon located in the bottom right corner of the preview area.

Country	Ecological Footprint	Biocapacity (per person)	CO2 emmission (t per year)	Population
United States	8.22000	3.7600	16.4000	
Saudi Arabia	5.61000	0.5000	17.9000	
Russia	5.69000	6.7900	12.5000	
China	3.38000	0.9400	7.6000	
Canada	8.17000	16.0100	13.5000	
United Kingdom	7.93000	0.5600	7.1000	
Italy	4.61000	1.0800	5.7000	
France	5.14000	3.1100	5.0000	
Sweden	7.25000	10.6200	4.6000	
Denmark	5.51000	4.7800	6.8000	
Netherlands	5.28000	1.1700	10.1000	
Brazil	3.11000	9.0800	2.5000	
Argentina	3.14000	6.9200	4.5000	
Germany	5.30000	2.2700	9.2000	
Nigeria	1.16000	0.7000	0.6000	
	5.51000	1.1500	0.0000	

Tableau worksheets

- Left: list of data attributes
- Middle: choices for marks and visual variables
- Right: visualization space structured into rows and columns



visualizing countries

- Drag “Country” into the “Rows” pane
- All values of “Country” will be distributed by row

The screenshot shows the Tableau interface with the following components:

- Top Bar:** File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help.
- Data Pane:** Shows the "ecoFootprint" data source with tables: Country, Region, Measure Names, and various measures like BIOCAPACITY (per person), Co2 Emission (2013), ECOLOGICAL FOOTPRIN..., Population, ecoFootprint.csv (Count), Latitude (generated), Longitude (generated), and Measure Values.
- Rows Pane:** Shows the "Country" field selected and highlighted with an orange border.
- Marks Card:** Marks are set to "Automatic". Options include Color, Size, Text, Detail, and Tooltip.
- Sheet 1:** A data table titled "Sheet 1" showing the "Country" field. The data consists of 19 rows, each with a value from the "Country" field followed by "Abc".

An orange arrow points from the "Country" field in the Rows pane to the "Country" field in the Sheet 1 data table.

Country	Value
Null	Abc
Argentina	Abc
Brazil	Abc
Canada	Abc
China	Abc
Denmark	Abc
France	Abc
Germany	Abc
Italy	Abc
Netherlands	Abc
Nigeria	Abc
Russia	Abc
Saudi Arabia	Abc
South Africa	Abc
Sweden	Abc
United Kingdom	Abc
United States	Abc

choosing marks

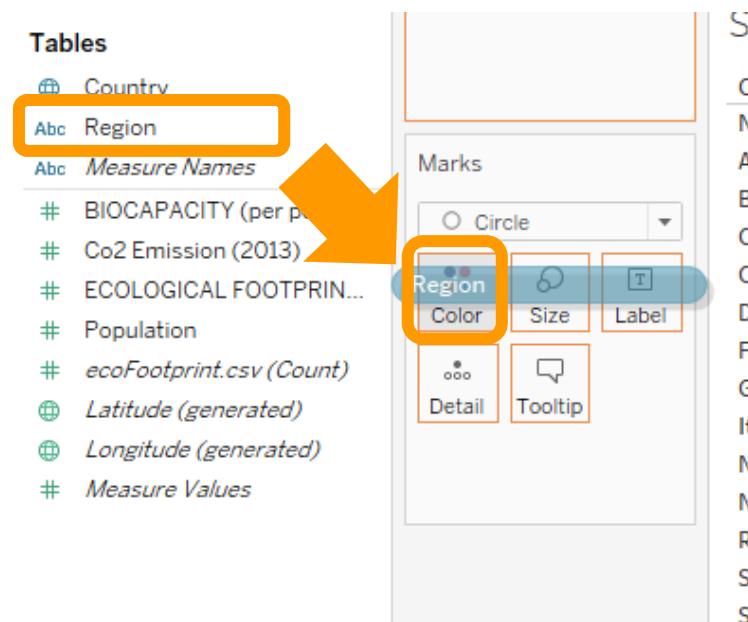
- You can choose the type of marks to represent countries

The screenshot shows the Tableau interface with the following details:

- Top Bar:** Tableau - Book1, File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help.
- Data Panel:** ecoFootprint, Search, Tables section: Country, Region, Measure Names, BIOCAPACITY (per person), Co2 Emission (2013), ECOLOGICAL FOOTPRIN..., Population, ecoFootprint.csv (Count), Latitude (generated), Longitude (generated), Measure Values.
- Marks Shelf:** Marks dropdown is open, showing options: Circle (selected and highlighted with an orange box), Automatic, Bar, Line, Area, Square, Shape, Text, Map, Pie, Gantt Bar, Polygon, Density. The "Circle" option is highlighted with an orange box.
- Sheet 1:** A list of countries: Null, Argentina, Brazil, Canada, China, Denmark, France, Germany, Italy, Netherlands, Nigeria, Russia, Saudi Arabia, South Africa, Sweden, United Kingdom, United States. The list is partially obscured by a vertical orange rectangle.

choosing visual variables

- You can also choose visual variables to change the characteristics of marks according to the data.
- Here we choose colour (hue) to represent the countries by region.



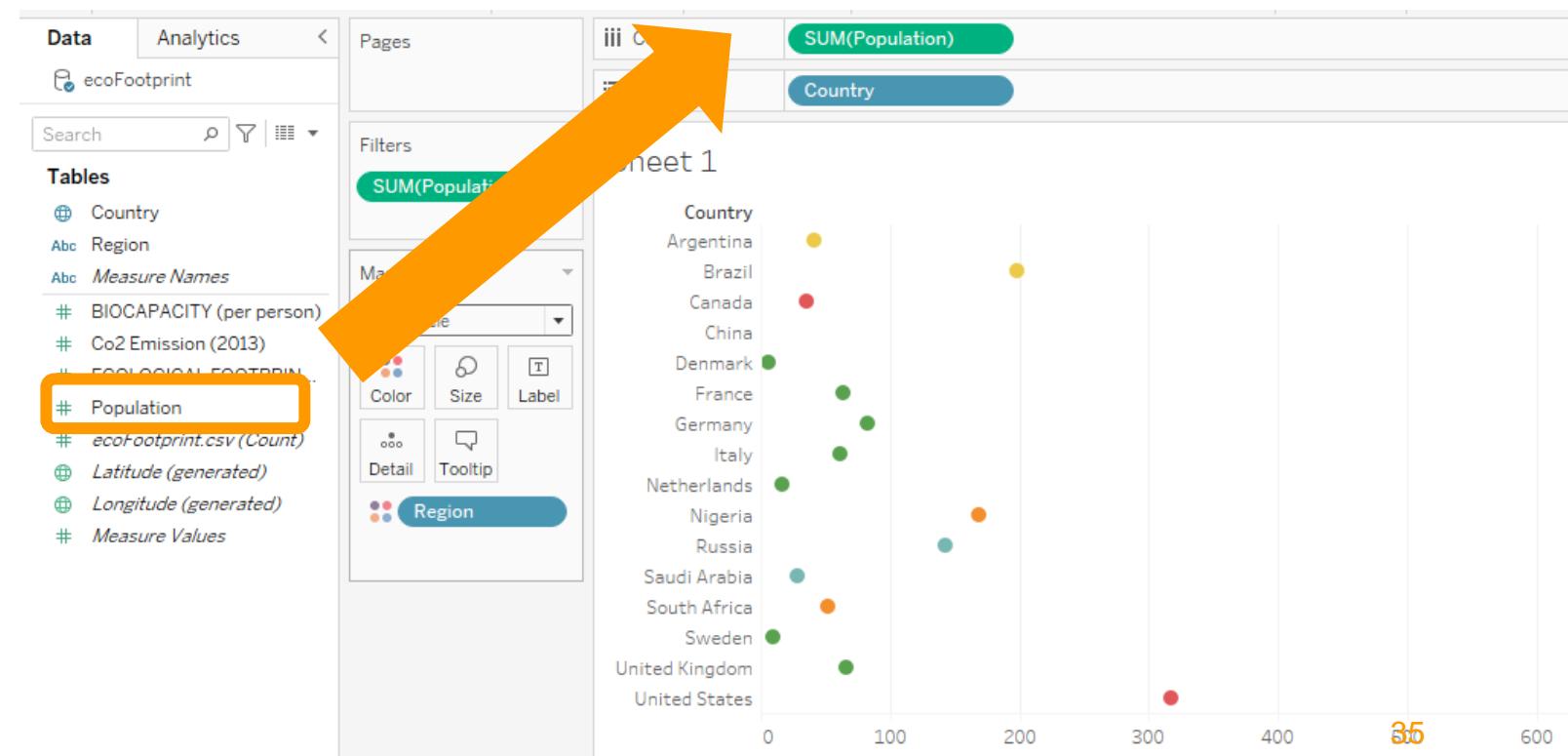
choosing visual variables

The screenshot shows the Tableau interface with the following details:

- Top Bar:** Tableau - Book1, File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help.
- Data Source:** ecoFootprint, selected under Data.
- Sheet 1:** A list of countries: Null, Argentina, Brazil, Canada, China, Denmark, France, Germany, Italy, Netherlands, Nigeria, Russia, Saudi Arabia, South Africa, Sweden, United Kingdom, United States.
- Marks Card:** Marks type is set to Circle. Encoding for Region is selected for both Color and Size.
- Legend:** A legend titled "Region" maps colors to regions: Null (blue), Africa (orange), America (red), Asia (teal), Europe (green), and Southamerica (yellow).
- Annotations:** Both the legend and the list of countries are highlighted with orange rectangles.

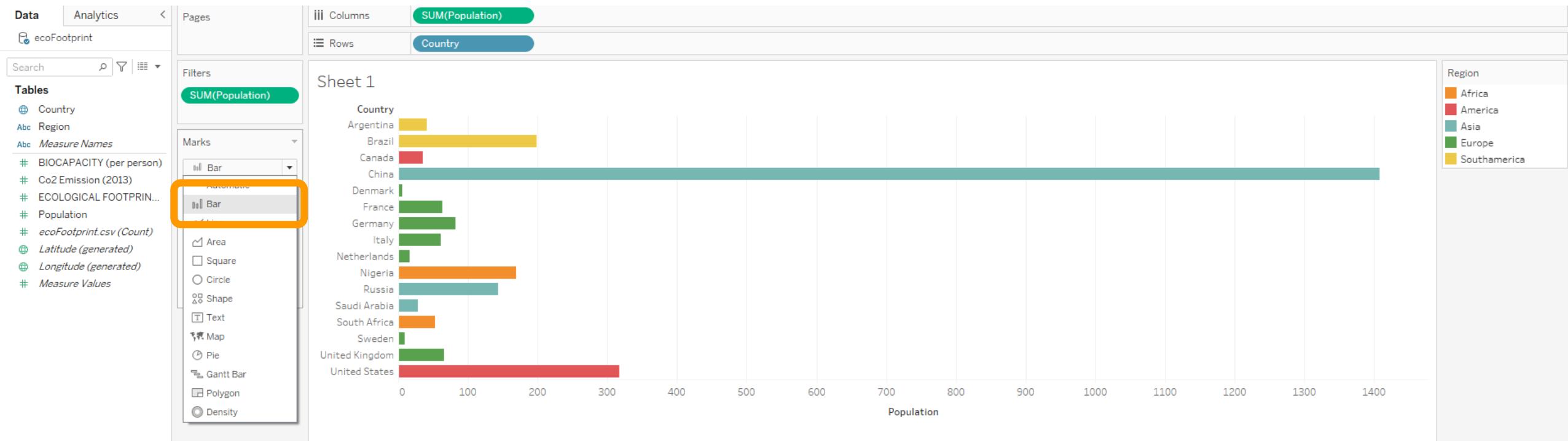
country by population

- We can now bring in the “Population” attribute to show the population per country.
- Drag the “Population” into the “columns” pane



country by population

- Not happy with the visualization? Try a different type of marks.



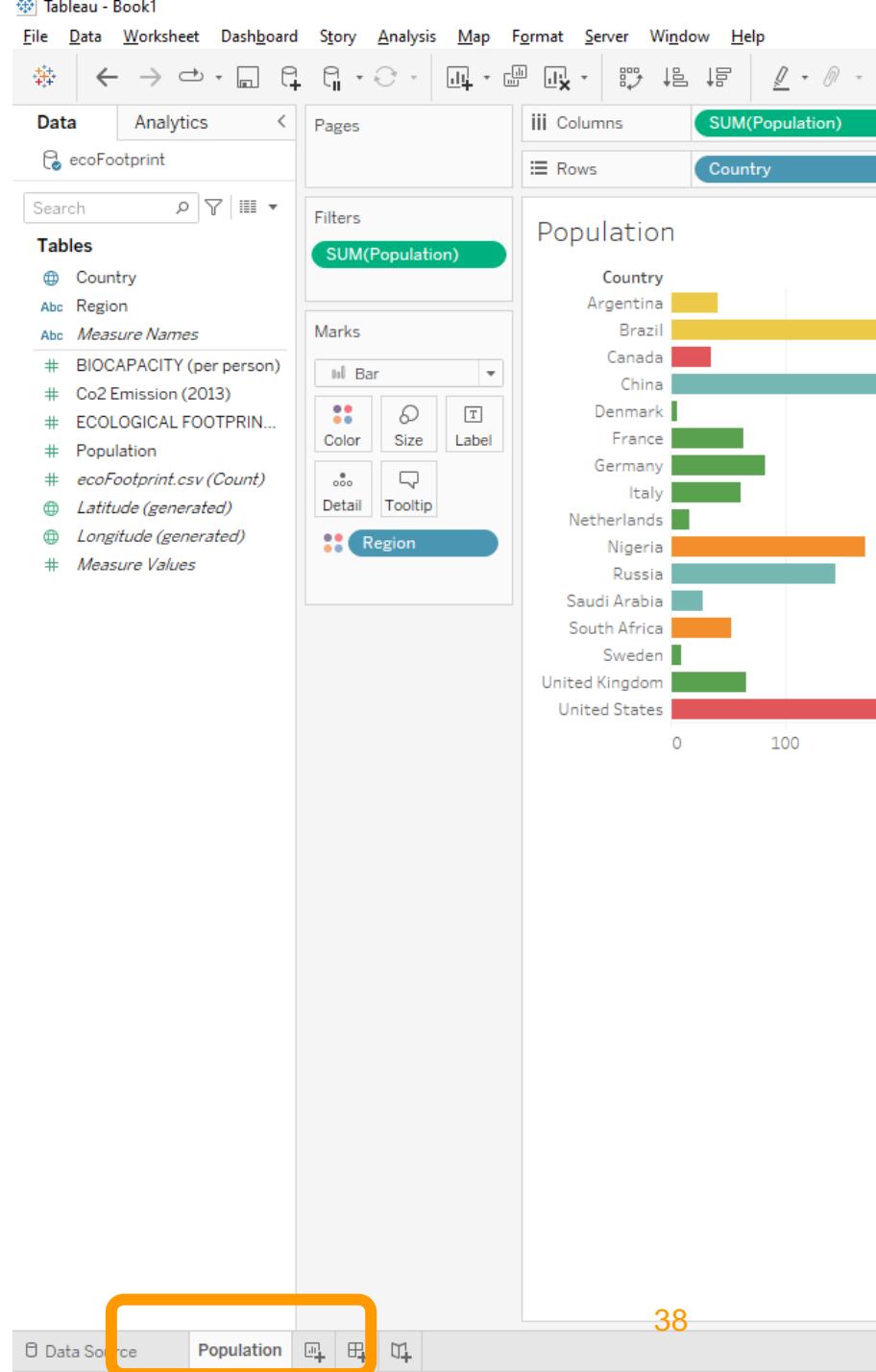
tooltips

- Interactive tooltips and legends are provided automatically
- You can customize them via the tooltip button in the “marks” pane or by double-clicking the legend.



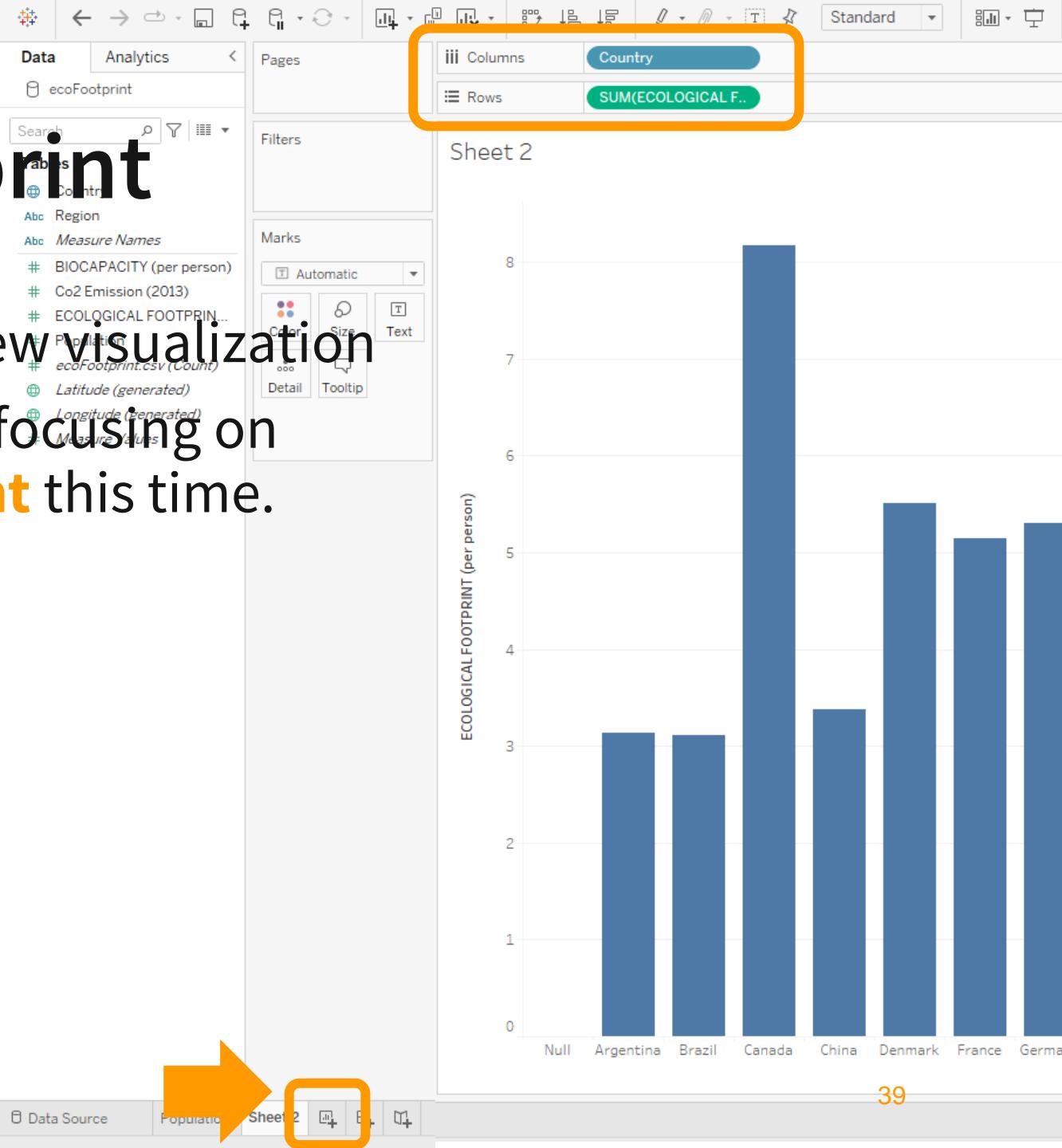
sheet labeling

- Always label your sheets, so you can easily distinguish them.
- Double-click on the tab of your sheet to rename it.



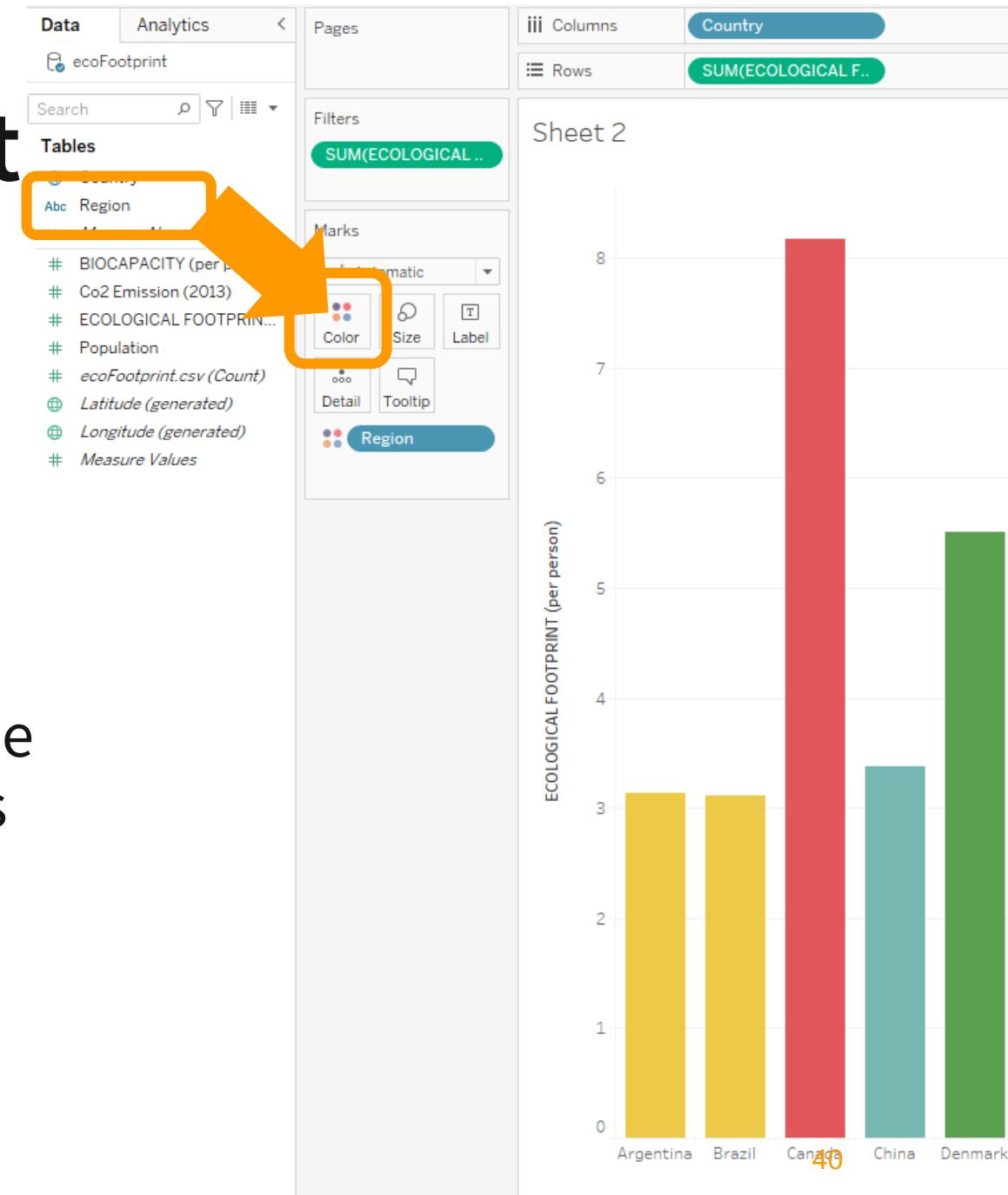
country by eco footprint

- Let's create a new sheet for a new visualization
- Let's create a similar bar chart, focusing on **country** vs. **ecological footprint** this time.



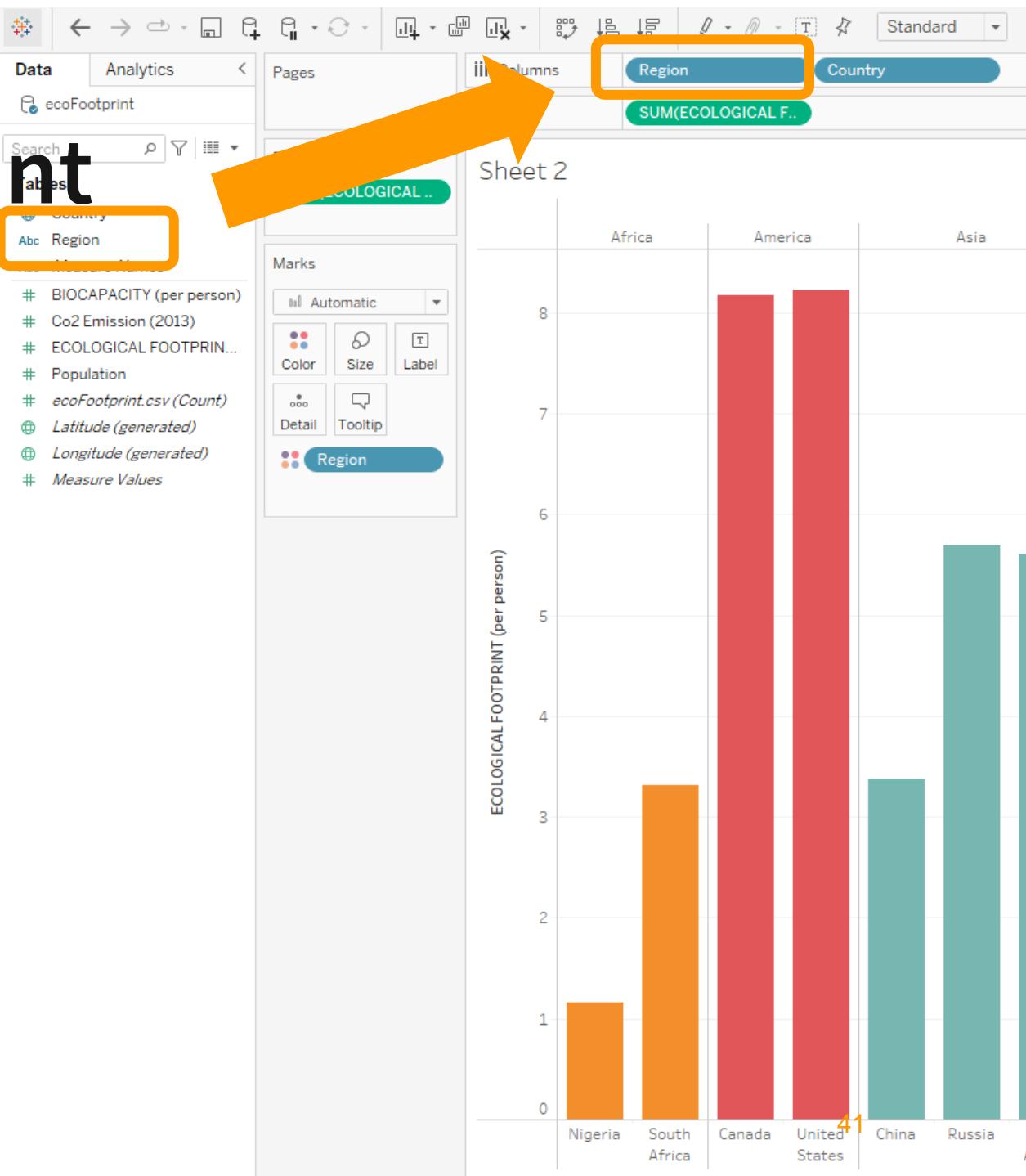
country by eco footprint

- Again, we choose colour (hue) to distinguish between regions.
- Note: if you change the colours of individual regions (double-click the legend), the colour scheme will still be consistent across the different sheets
→ Compare “Population” worksheet

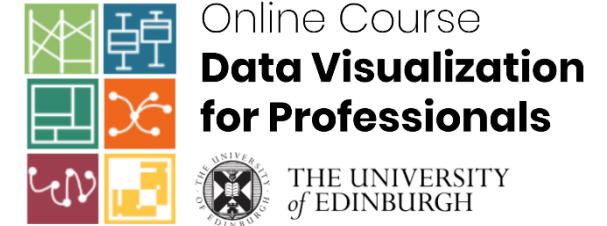


country by eco footprint

- Ordering by region



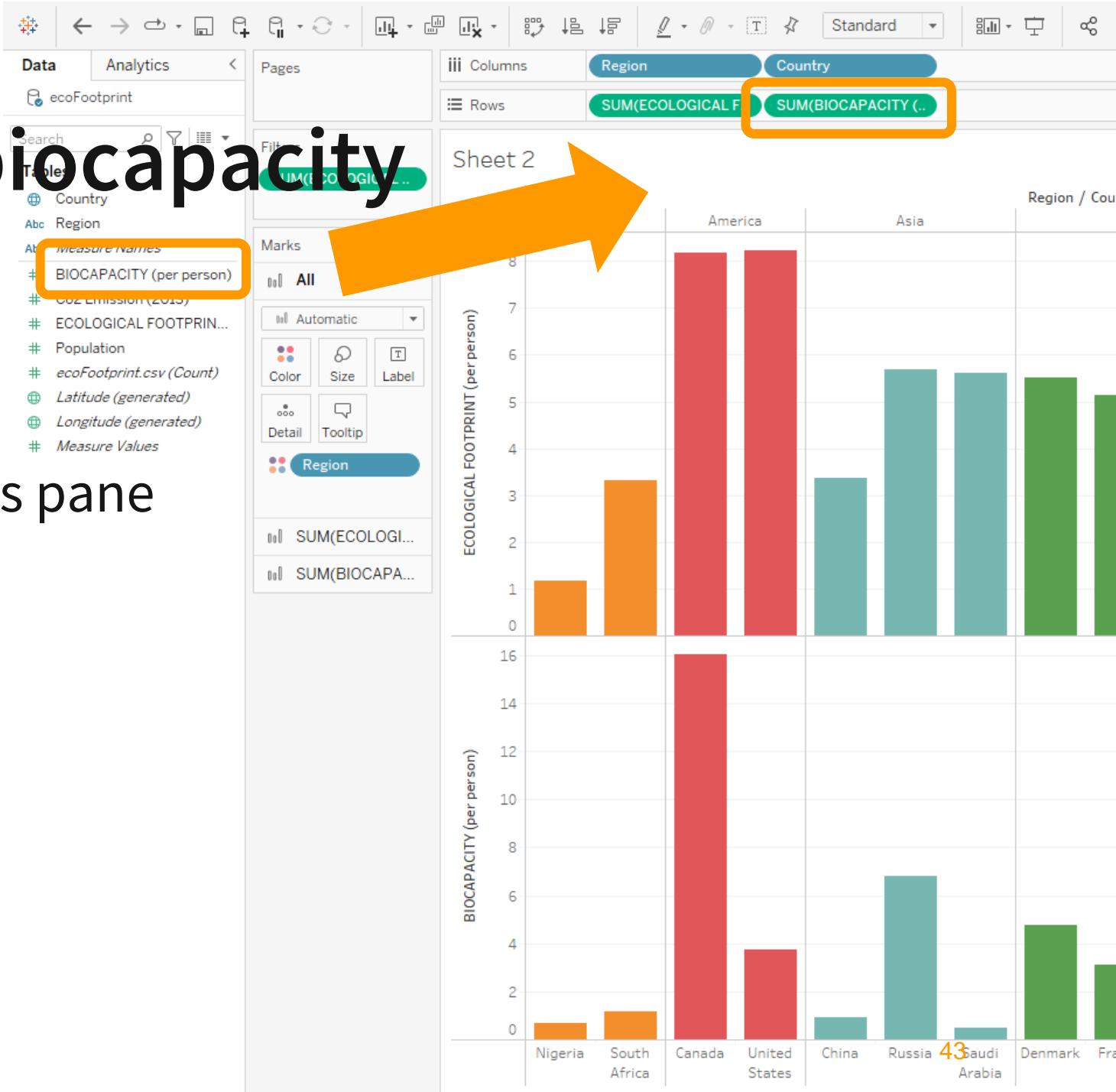
bringing in more attributes



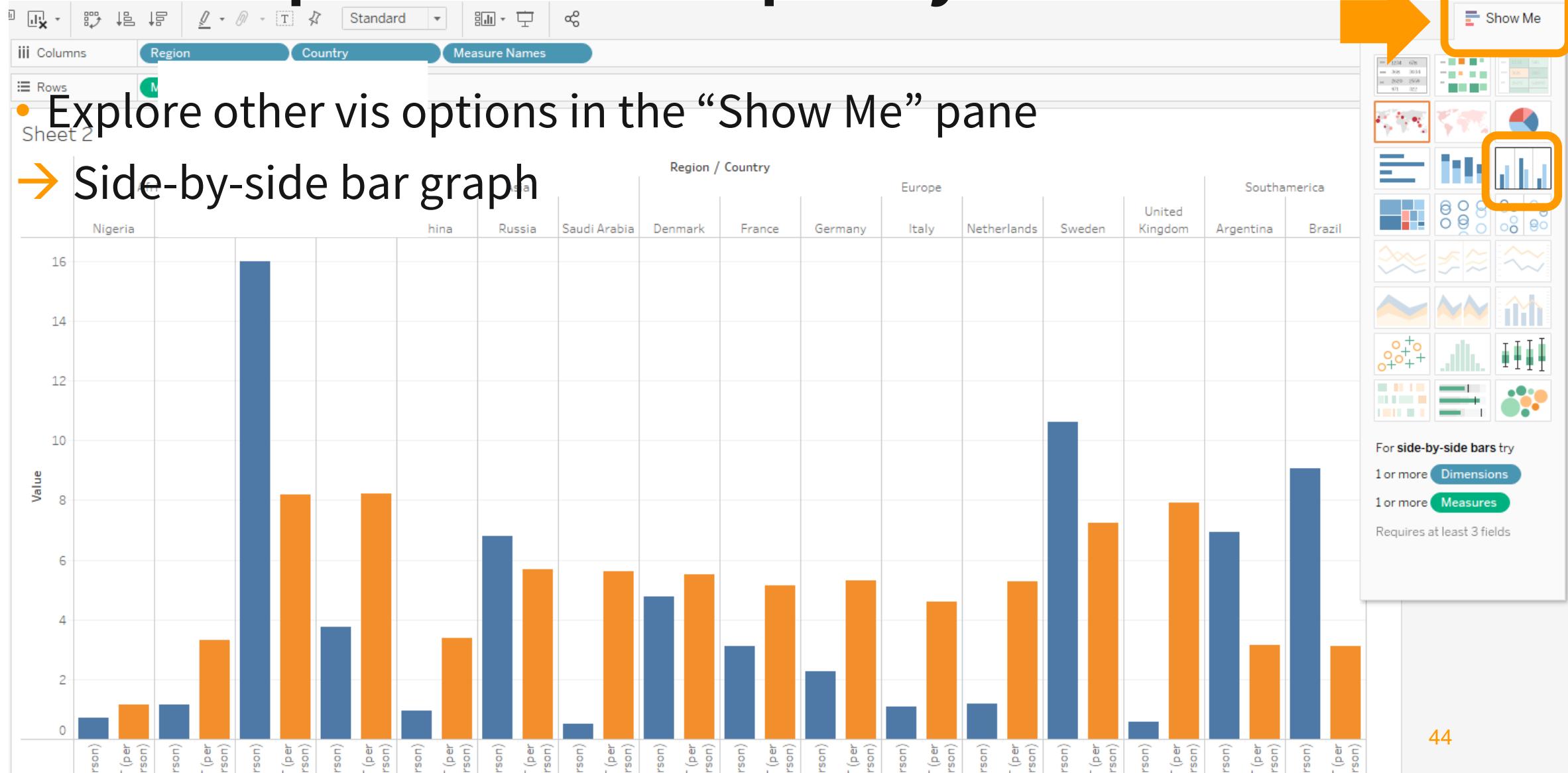
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eco footprint vs. biocapacity

- Add **biocapacity** to the rows pane
- Two bar graphs?



eco footprint vs. biocapacity



updating tooltips in “Population” vis

The screenshot shows the Tableau interface with a bar chart visualization. The chart displays population data for various countries, with China having the highest population (approx. 1400) and Saudi Arabia the lowest (approx. 10). The tooltip for the United States is being edited.

The tooltip configuration window is open, showing the following fields:

- Country: <Country>
- Region: <Region>
- Population: <SUM(Population)>

Checkboxes at the bottom of the window are checked for "Show tooltips" (set to "Responsive - Show tooltips instantly") and "Include command buttons".

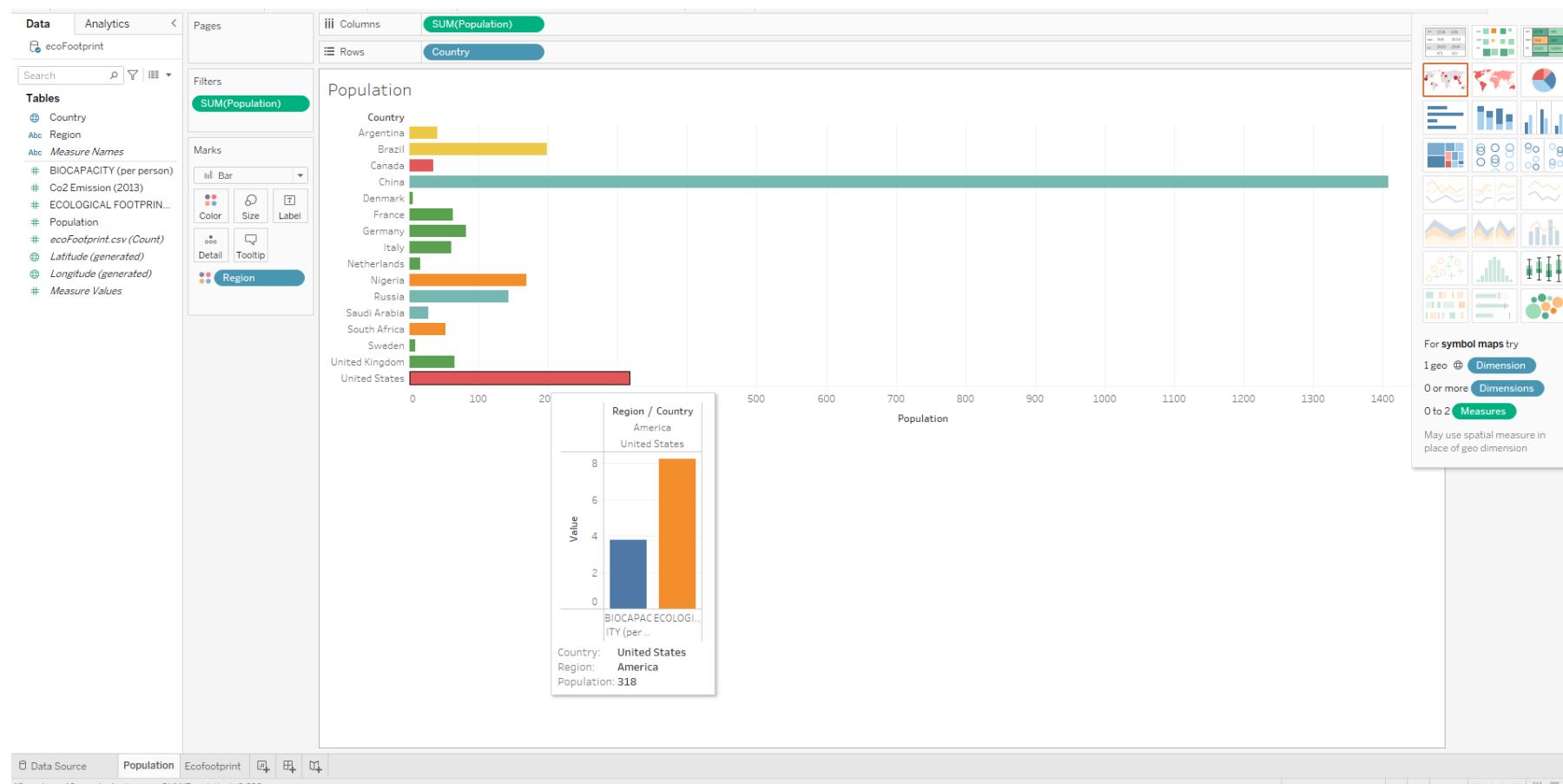
On the right side of the interface, a context menu is open under the heading "Edit Tooltip". The "Insert" tab is selected, and the "Sheets" option is highlighted. A tooltip entry for "Ecofootprint" is visible in the list.

At the bottom of the screen, the worksheet tabs are labeled "Population" and "Ecofootprint".

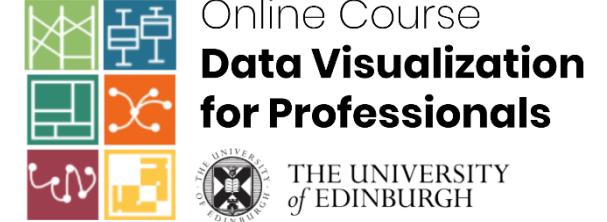
- Label current worksheet as “Ecofootprint”
- Go back to the “Population” worksheet
- Update the tooltip to integrate a mini tooltip visualization of eco footprint vs. biocapacity.

updating tooltips in “Population” vis

- Make sure to avoid inconsistencies in colouring (here, orange is used for different attributes, which is NOT good).



creating calculated fields in Tableau



biocapacity “deficit/surplus”

- In the “Ecofootprint” chart we can see that some countries have less biocapacity (by person) compared to their eco footprint (by person).
- Let’s highlight this more by calculating a country’s biocapacity deficit/surplus.
- Go back to the “**Data Source**” view
- Let’s create a **calculated field** that shows the biocapacity surplus
 - Biocapacity minus Ecological Footprint
 - See next slide how to do this

creating a calculated filed (attribute)

The screenshot shows a data visualization interface with a table titled "ecoFootprint.csv". The table has 6 fields and 21 rows. The columns are labeled: Country, ECOLOGICAL FOOTPRI..., BIOCAPACITY (per pers...), Population, and Region. A context menu is open over the "BIOCAPACITY (per pers...)" column, specifically over the last row (Denmark). The menu items are: Rename, Copy Values, Hide, Create Calculated Field..., Create Group..., Create Bins..., Pivot (select multiple fields), and Describe... . An orange arrow points from the "Create Calculated Field..." option to the "Data Source" button at the bottom left of the interface. A large orange arrow also points upwards from the "Data Source" button towards the "Create Calculated Field..." option.

Table Details		ecoFootprint.csv				
		Country	ECOLOGICAL FOOTPRI...	BIOCAPACITY (per pers...)	Population	Region
>		United States	8.22000	0.00000	317.50	America
		Saudi Arabia	5.61000	0.00000	28.29	Asia
		Russia	5.69000	6.79000	143.17	Asia
		China	3.38000	0.94000	1,408.04	Asia
		Canada	8.17000	16.01000	34.84	America
		United Kingdom	7.93000	0.56000	65.65	Europe
		Italy	4.61000	1.08000	60.92	Europe
		France	5.14000	3.11000	63.98	Europe
		Sweden	7.25000	10.62000	9.51	Europe
		Denmark	5.51000	4.78000	5.60	Europe

Data Source

Population Ecofootprint

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creating a calculated field/attribute

- Biocapacity Surplus

[Biocapacity (per person)] - [Ecological Footprint (per person)]

The screenshot shows a data analysis interface with a large orange arrow pointing from the text above to a modal dialog box. The dialog box has a title bar 'Biocapacity Surplus' and a subtitle '[BIOCAPACITY (per person)] - [ECOLOGICAL FOOTPRINT (per person)]'. Below the subtitle, the text 'The calculation is valid.' is displayed. At the bottom right of the dialog are 'Apply' and 'OK' buttons. The background shows a data grid with columns labeled 'v' (dropdown), '6 fields 21 rows', 'it.csv', 'ecoFootprint.csv', 'ECOLOGICAL FOOTPRI...', 'BIOCAPACITY (per pers...', 'Co2 Emission (2013)', 'ecoFootprint.csv', 'Population', 'Region'. The data grid contains several rows of numerical values for different regions.

v	6 fields 21 rows	it.csv	ecoFootprint.csv	ECOLOGICAL FOOTPRI...	BIOCAPACITY (per pers...	Co2 Emission (2013)	ecoFootprint.csv	Population	Region
ates		8.22000	3.7600	8.22000	3.7600	16.4000	317.50	America	
Ibia		5.61000	0.5000	5.61000	0.5000	17.9000	28.29	Asia	
		5.69000	6.7900	5.69000	6.7900	12.5000	143.17	Asia	
		3.38000	0.9400	3.38000	0.9400	7.6000	1,408.04	Asia	
		8.17000	16.0100	8.17000	16.0100	13.5000	34.84	America	
ngdom		7.93000	0.5600	7.93000	0.5600	7.1000	65.65	Europe	
		4.61000	1.0800	4.61000	1.0800	5.7000	60.92	Europe	
		5.14000	3.1100	5.14000	3.1100	5.0000	63.98	Europe	
		7.25000	10.6200	7.25000	10.6200	4.6000	9.51	Europe	
		5.51000	4.7800	5.51000	4.7800	6.8000	5.60	Europe	

creating a calculated field/attribute

- Total Biocapacity Surplus
[Biocapacity deficit/surplus] * [Population]

The screenshot shows a data analysis interface with a table of 7 fields and 21 rows. A modal window is open for creating a new calculated field named "Total Biocapacity Surplus". The formula entered is "[Biocapacity Surplus] * [# Population]". The "source" dropdown is set to "ecoFootprint". An orange arrow points from the list item to the modal window. A large orange circle highlights the formula input area and the "OK" button. A red error message "The calculation contains errors" is visible at the bottom of the modal.

7 fields 21 rows						
tpoint.csv	# ecoFootprint.csv	BIOCAPACITY (per pers...)	Calculation	ecoFootprint.csv	ecoFootprint.csv	Abc
OGICAL FOOTPRI...			Biocapacity Surplus	Co2 Emission (2013)	Population	ecoFootprint.csv
	8.22000	3.7600	-4.4600	16.4000	317.50	America
	5.61000	0.5000	-5.1100	17.9000	28.29	Asia
	5.69000	6.7900	1.1000	12.5000	143.17	Asia
	3.38000	0.9400	-2.4400	7.6000	1,408.04	Asia
	8.17000	16.0100	7.8400	13.5000	34.84	America
	7.93000	0.5600	-7.3700	7.1000	65.65	Europe
	4.61000	1.0800	-3.5300	5.7000	60.92	Europe
	5.14000	3.1100	-2.0300	5.0000	63.98	Europe
	7.25000	10.6200	3.3700	4.6000	9.51	Europe
	5.51000	4.7800	-0.7300	6.8000	5.60	Europe

the new data table

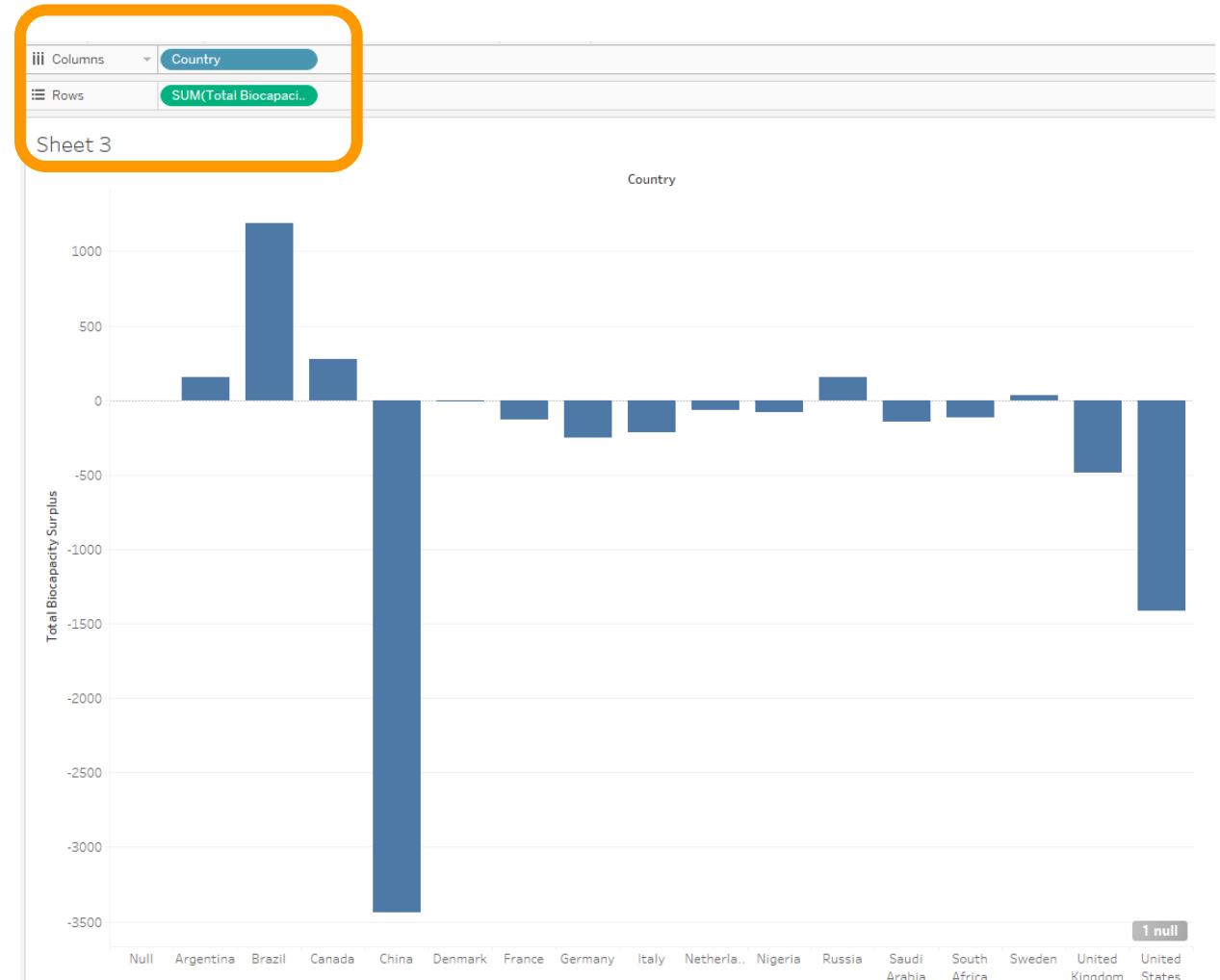
ecoFootprint.csv ▾ 8 fields 21 rows

Table Details >

Country	ECOLOGICAL FOOTPRI...	BIOCAPACITY (per pers...)	Calculation	Biocapacity Surplus	Calculation	Total Biocapacity Surplus	Co2 Emission (2013)	Population	Region
United States	8.22000	3.7600		-4.4600		-1,416.05	16.4000	317.50	America
Saudi Arabia	5.61000	0.5000		-5.1100		-144.56	17.9000	28.29	Asia
Russia	5.69000	6.7900		1.1000		157.49	12.5000	143.17	Asia
China	3.38000	0.9400		-2.4400		-3,435.62	7.6000	1,408.04	Asia
Canada	8.17000	16.0100		7.8400		273.15	13.5000	34.84	America
United Kingdom	7.93000	0.5600		-7.3700		-483.83	7.1000	65.65	Europe
Italy	4.61000	1.0800		-3.5300		-215.05	5.7000	60.92	Europe
France	5.14000	3.1100		-2.0300		-129.88	5.0000	63.98	Europe
Sweden	7.25000	10.6200		3.3700		32.05	4.6000	9.51	Europe
Denmark	5.51000	4.7900		0.7200		4.00	6.9000	5.60	Europe

showing total biocapacity surplus/deficit

- Create a new worksheet
- Create simple bar chart showing
“Total Biocapacity Surplus” by Country.

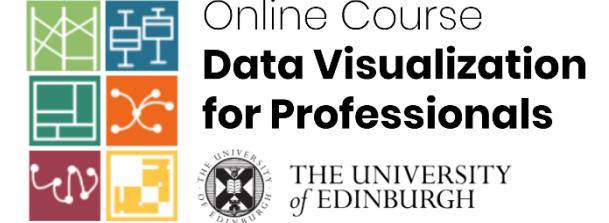


showing total biocapacity surplus/deficit

- Now map “**Biocapacity Surplus**” to colour
- A diverging colour scale further highlights surplus and deficit.

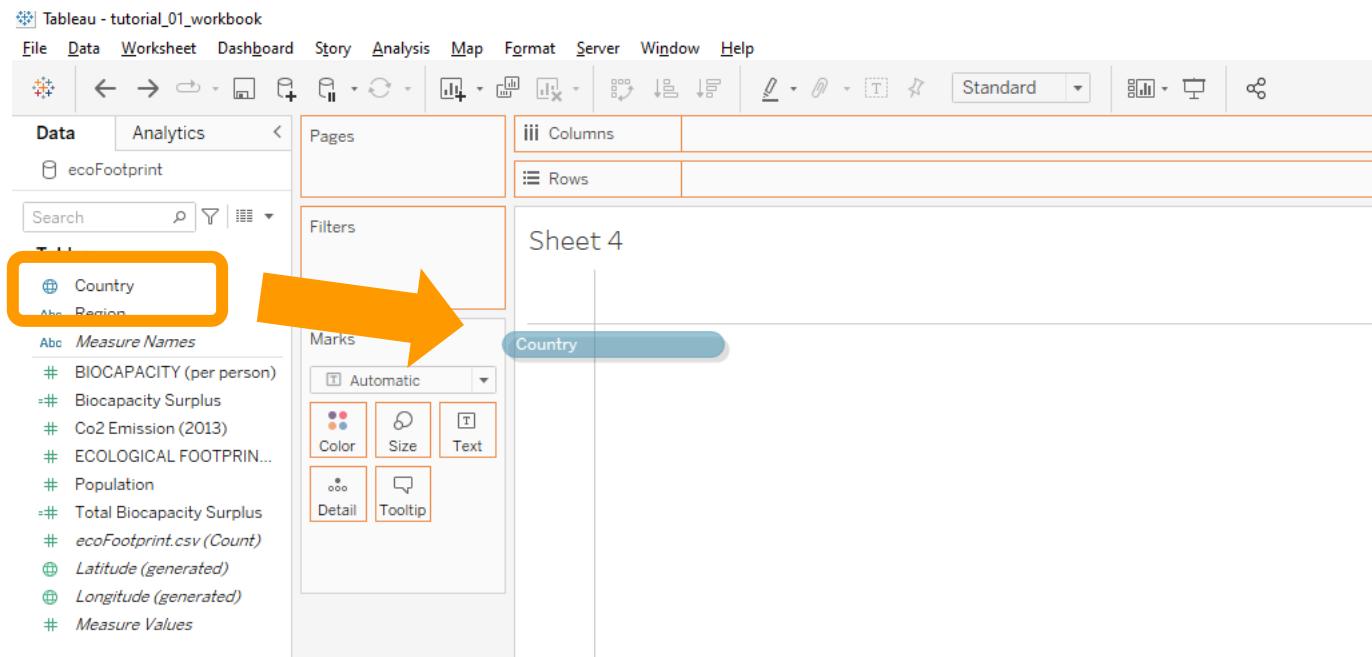


creating maps in Tableau



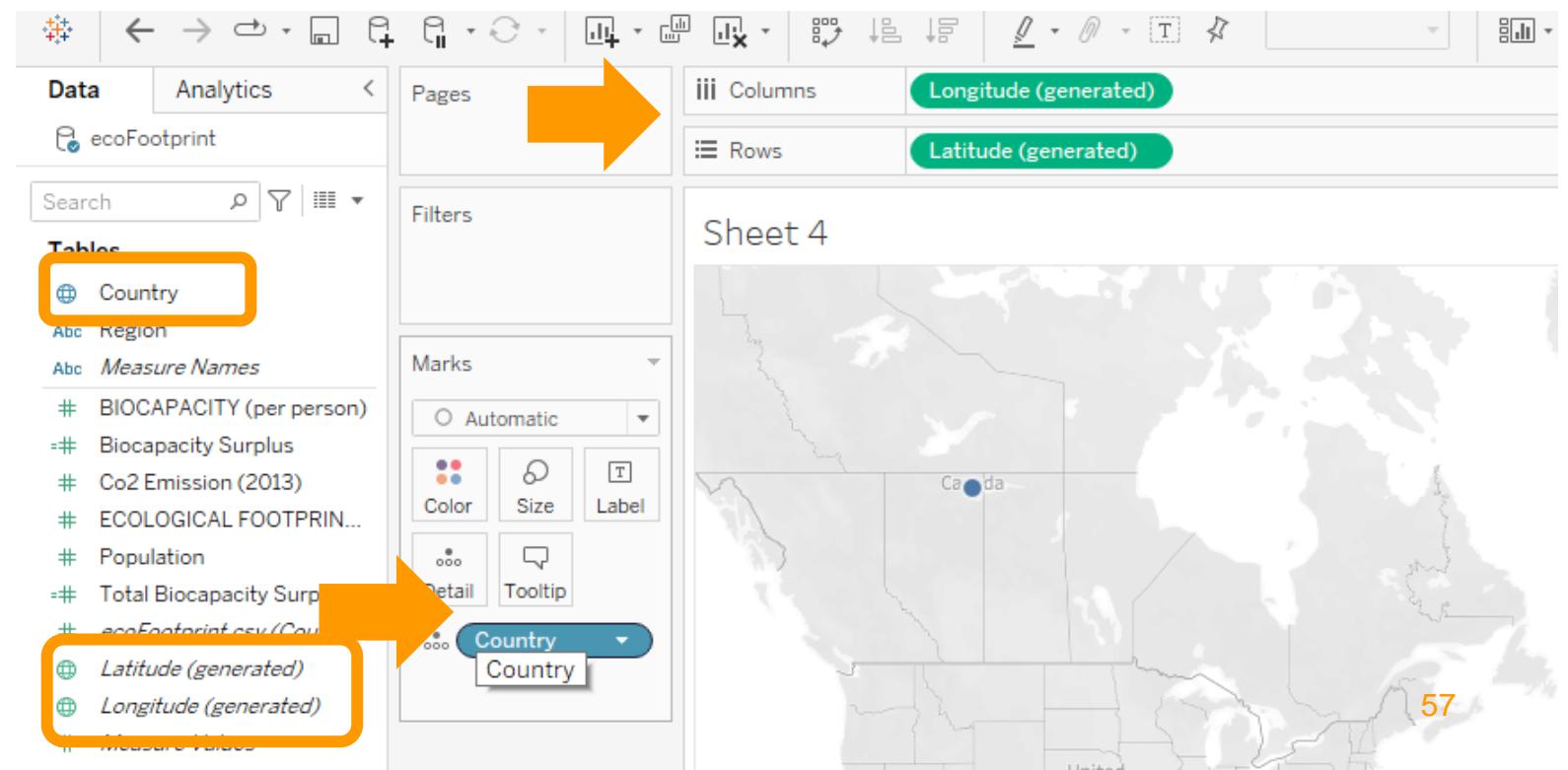
plotting data on a map

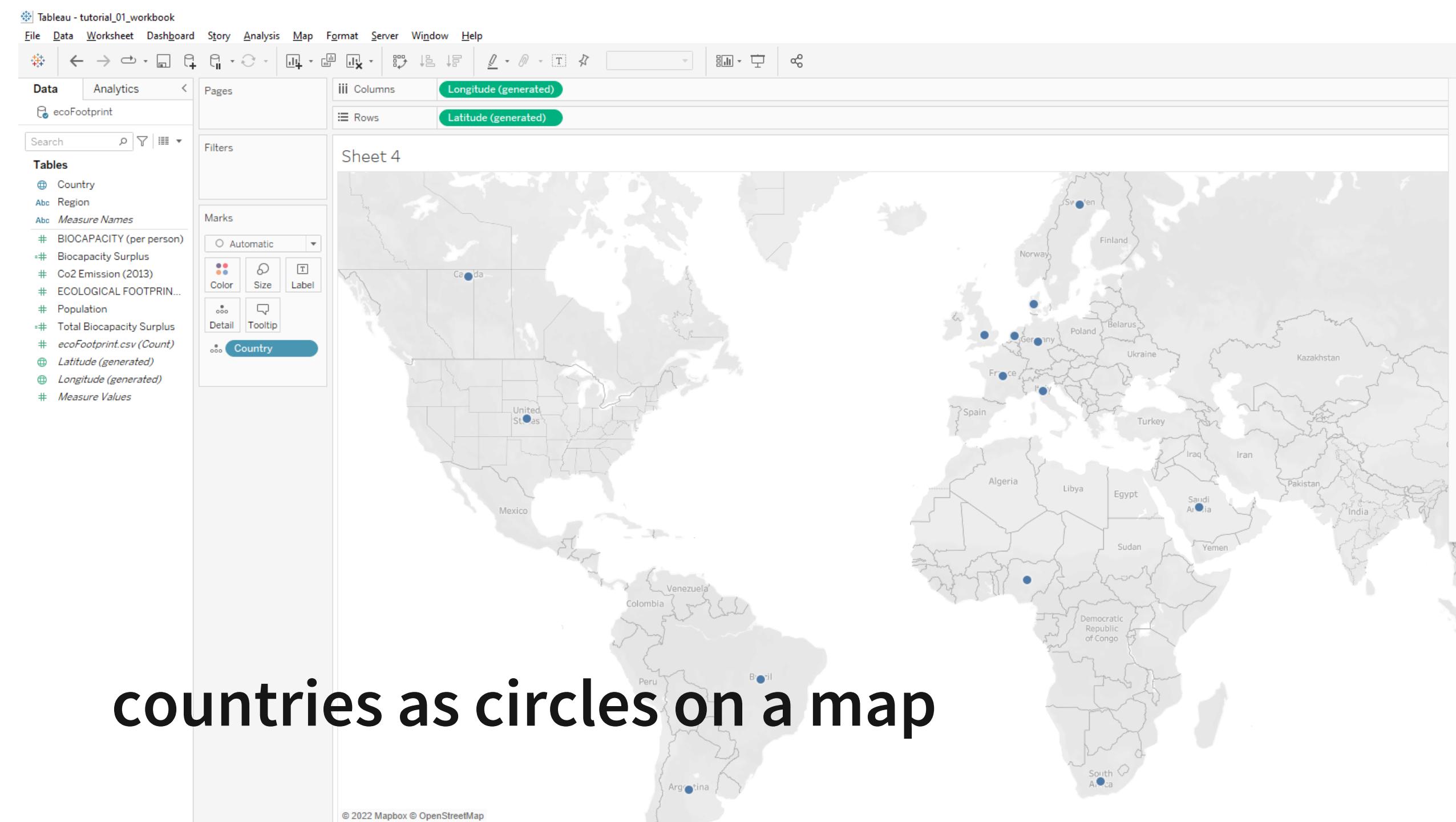
- We will create a geographic map, showing countries and their population
- Create a new worksheet
- Drag the “**Country**” attribute into the visualization canvas



geographic map (alternative)

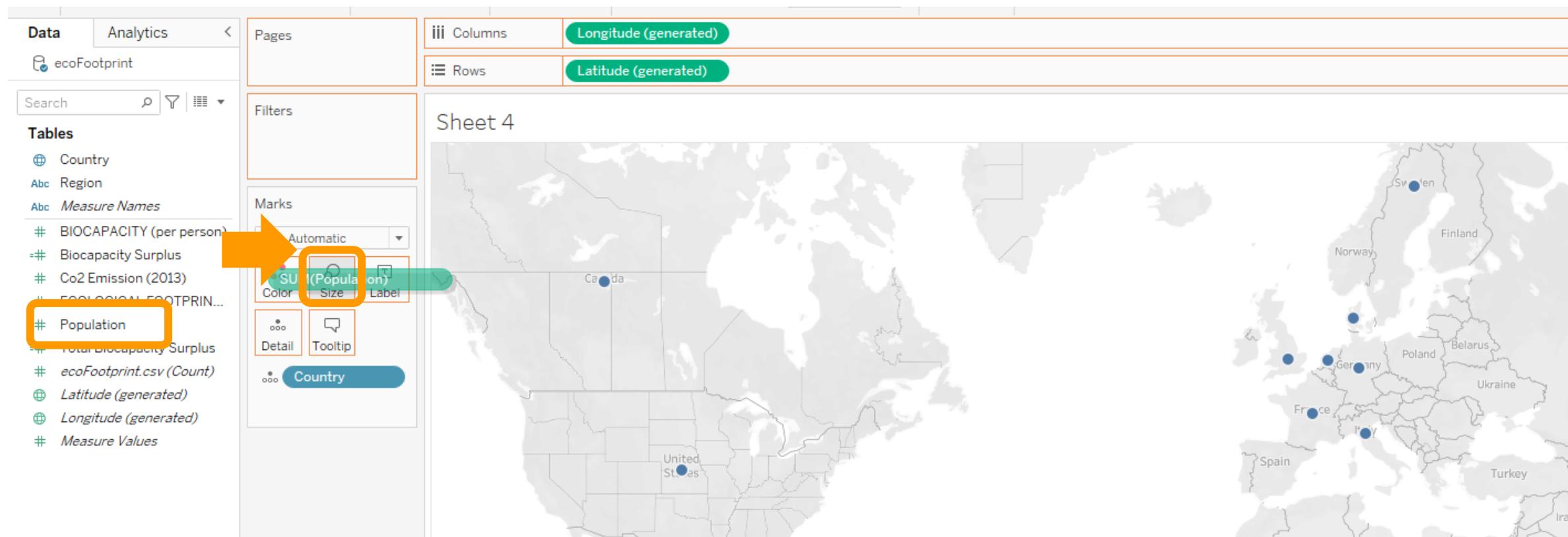
- You can also work directly with the “**latitude**” and “**longitude**” measures, which are automatically generated by Tableau.
- Drag “**Country**” into the “Marks” pane to show countries as circles.





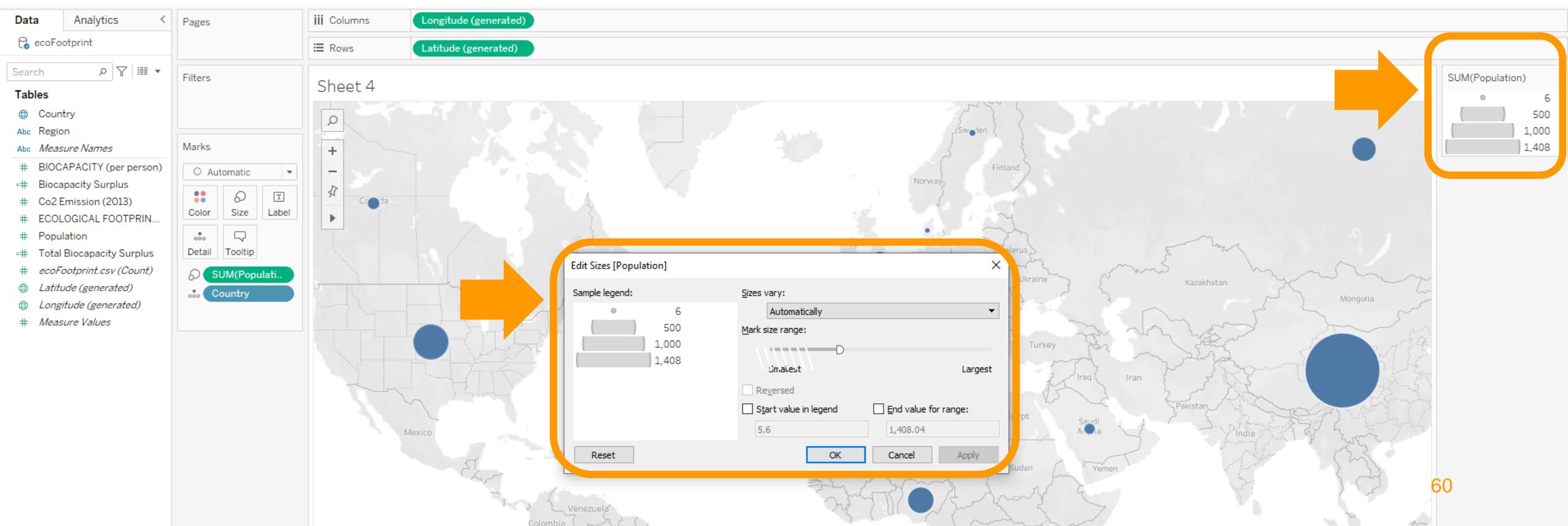
geographic map

- Now show population as circle size.



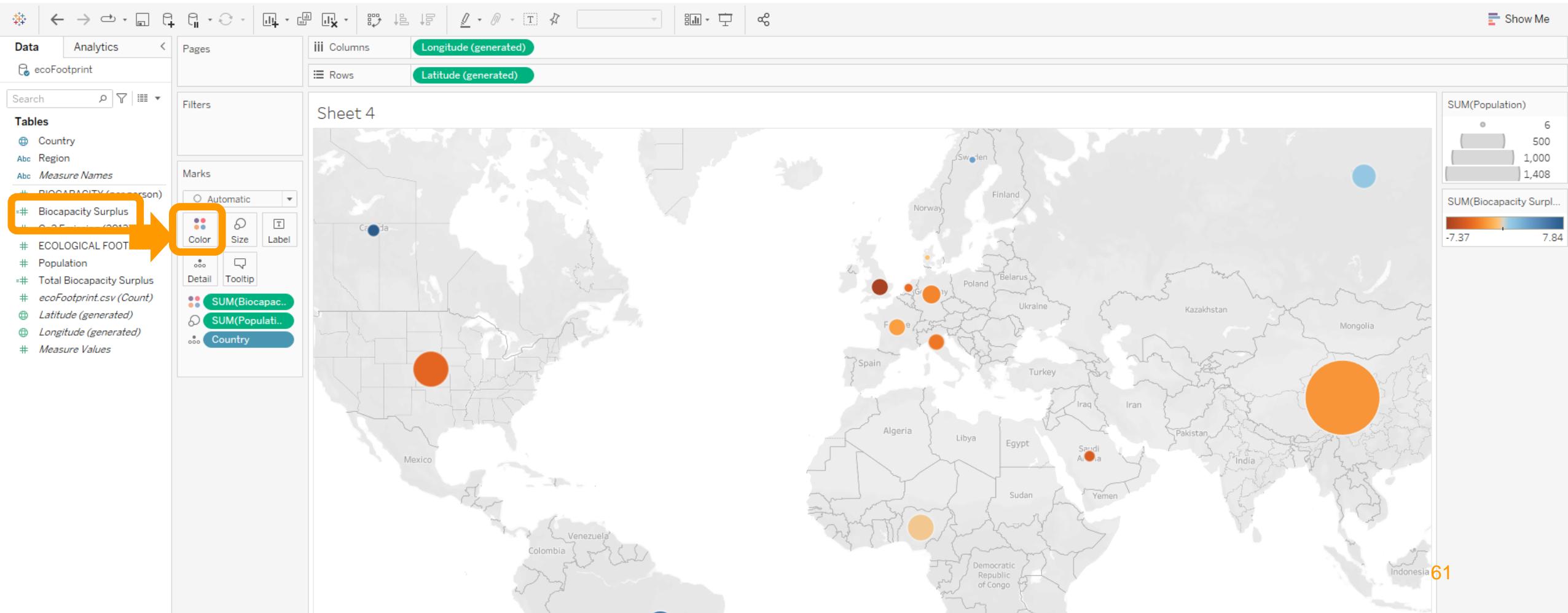
geographic map

- Double-clicking the legend allows you to adjust the circle sizes relative to the data.

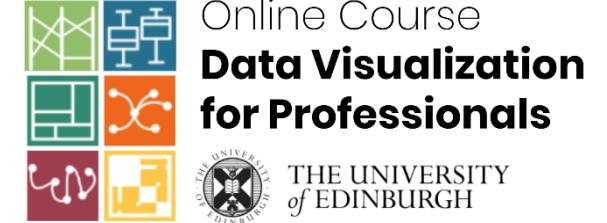


geographic map

- We apply colour to also show the “**“Biocapacity surplus”**

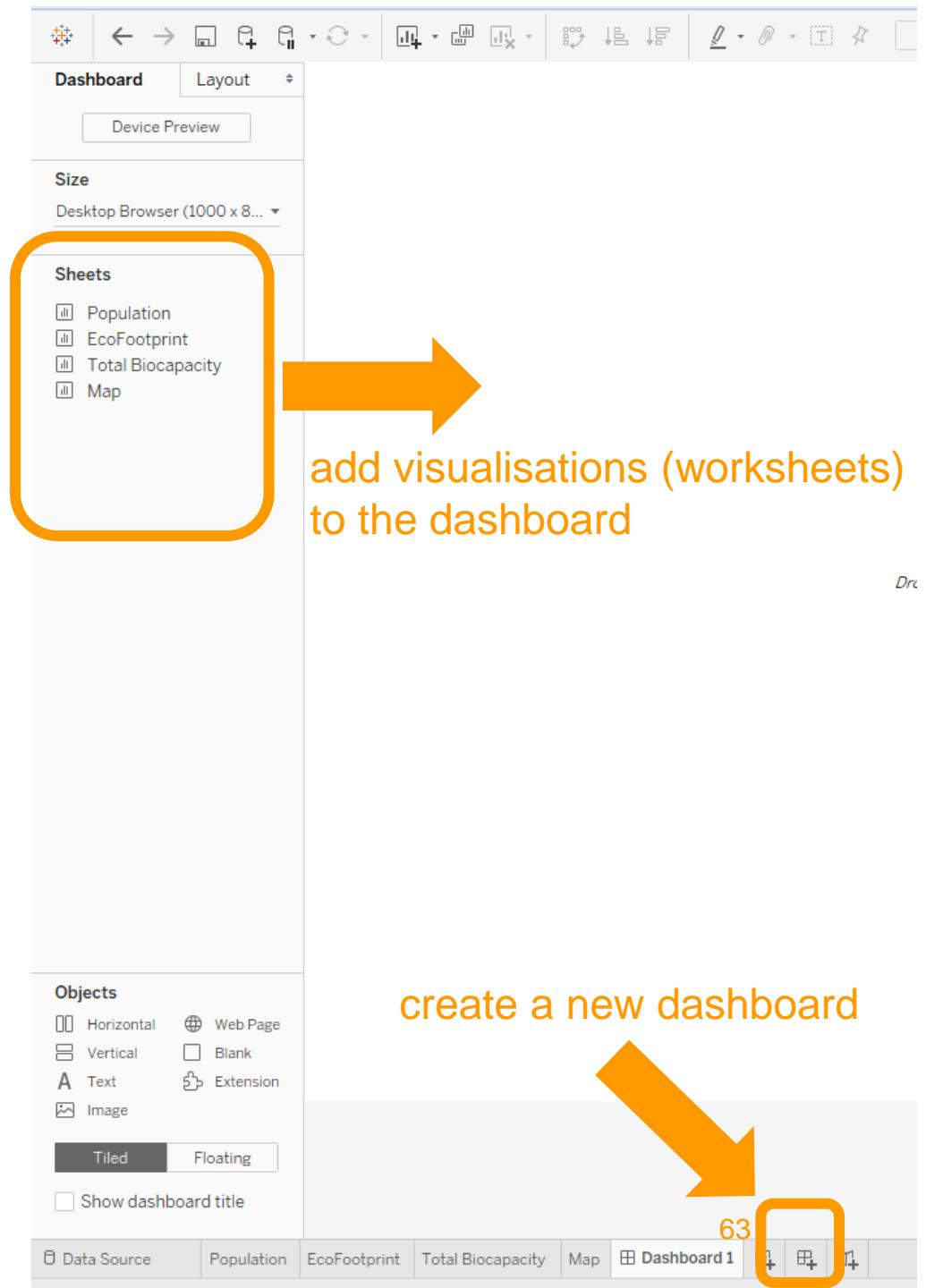


creating a dashboard in Tableau



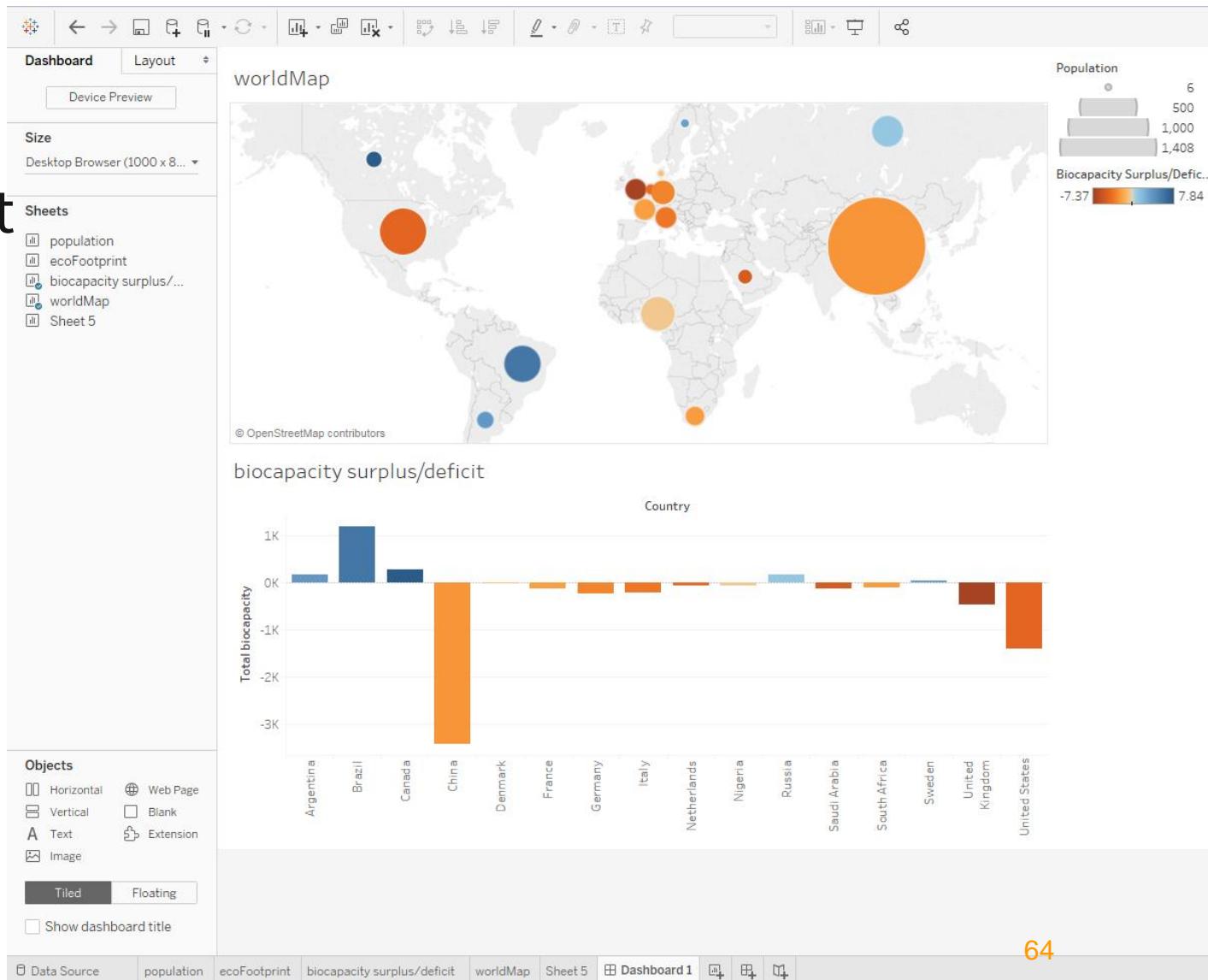
creating a dashboard

- We can add multiple visualizations into a dashboard.
- To the left we can see the different visualization worksheets we have created.
- We can drag them into the dashboard canvas.



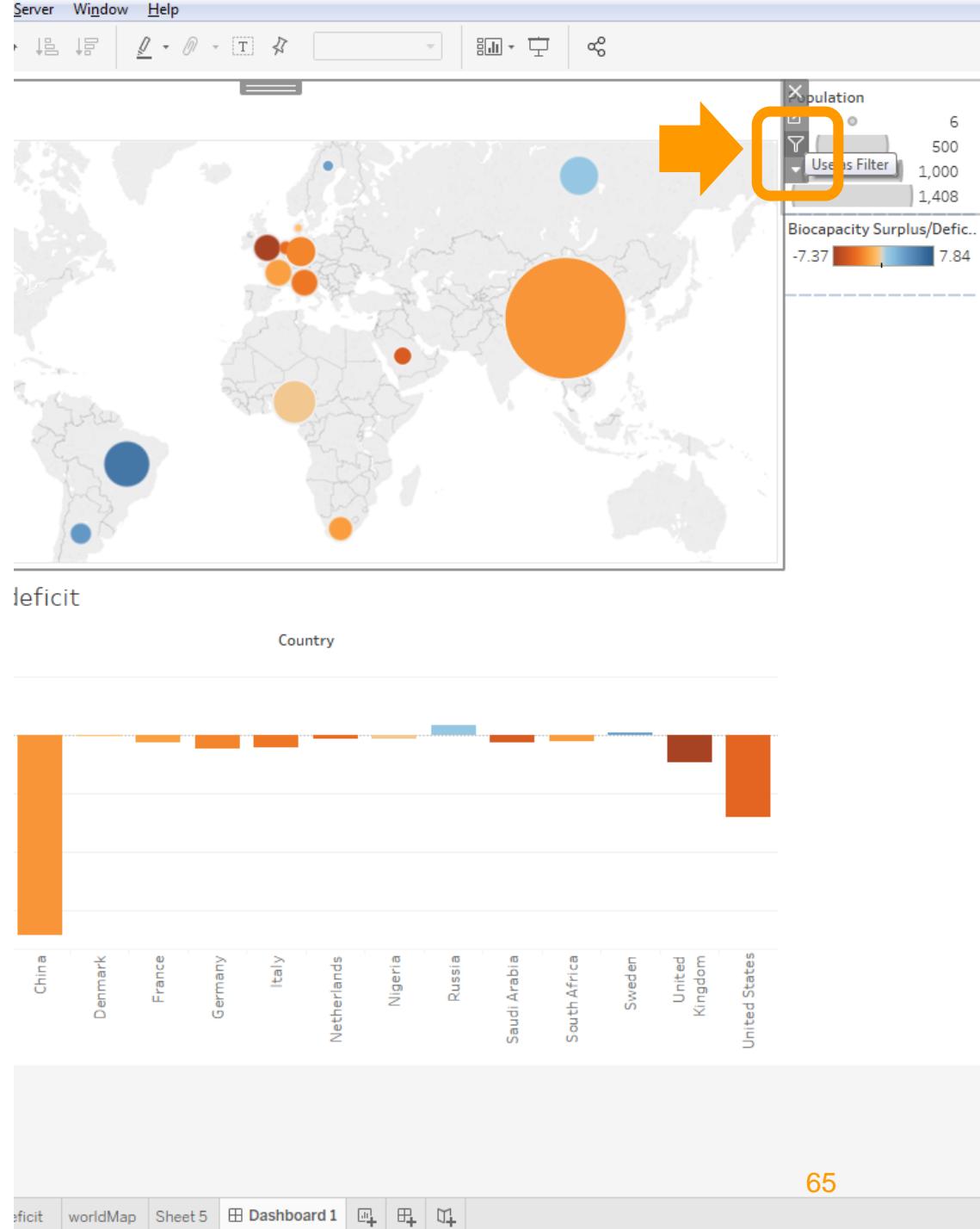
creating a dashboard

- Drag the **map** and the **“Biocapacity surplus” chart** into the dashboard canvas.



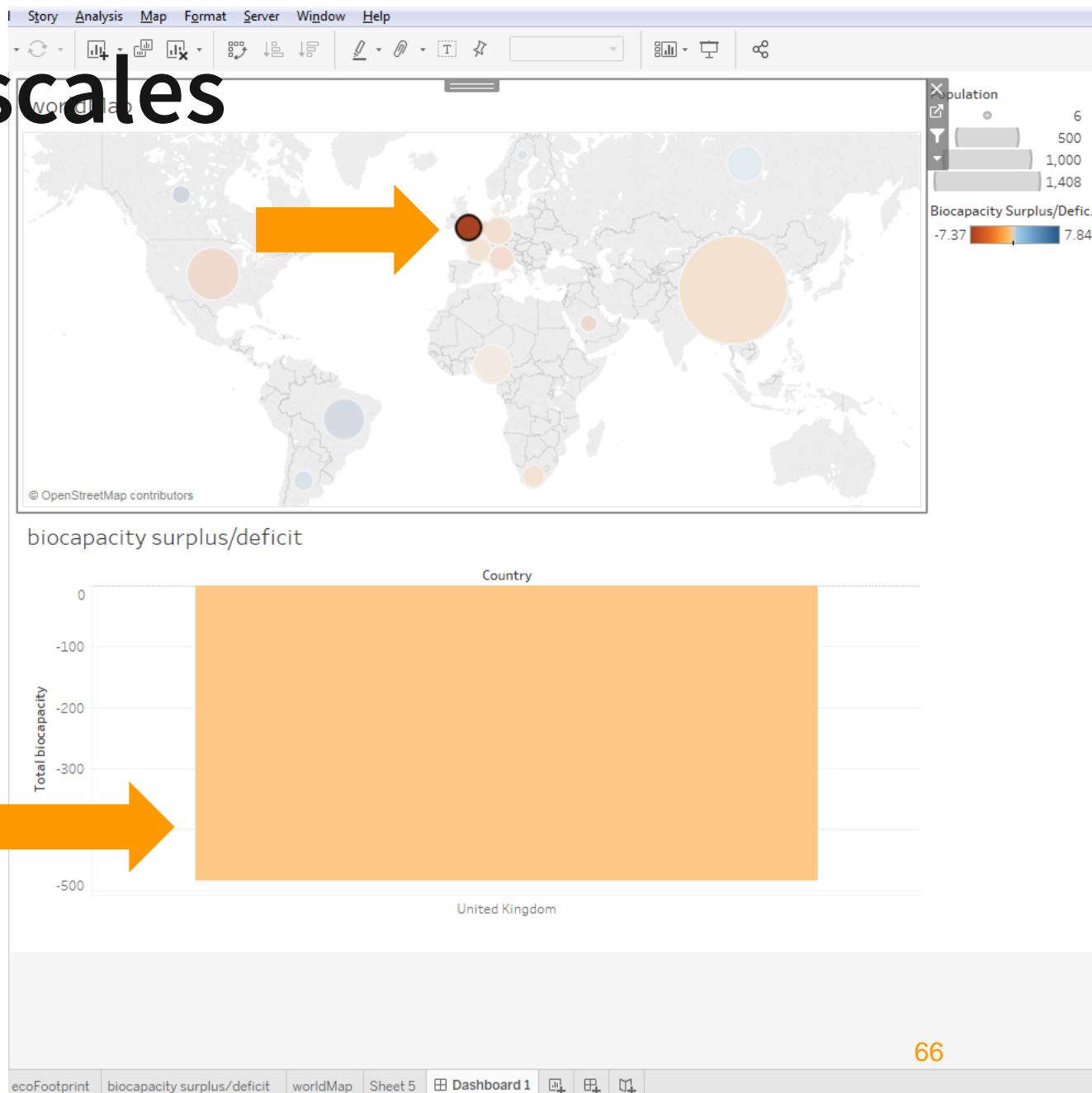
interactive filters

- Let's make the map an interactive filter for the bar chart.
- If we select a country in the map, the “Biocapacity” chart will be automatically filtered to only show this country.



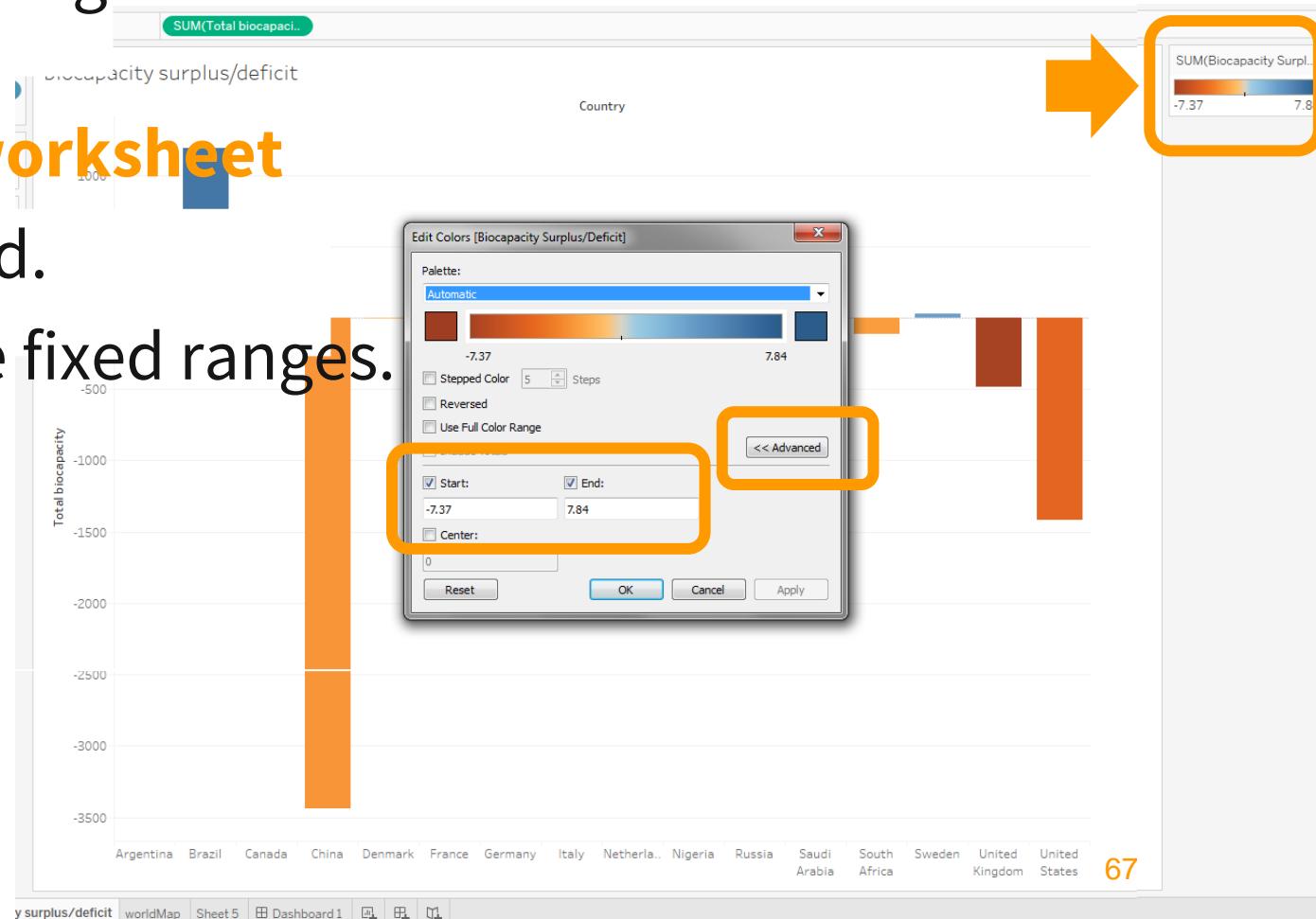
inconsistent colour scales

- However, this changes the colour scale in the Biocapacity chart, as only the selected value is considered.
- The value ranges in both visualizations are inconsistent, although both show the same values.



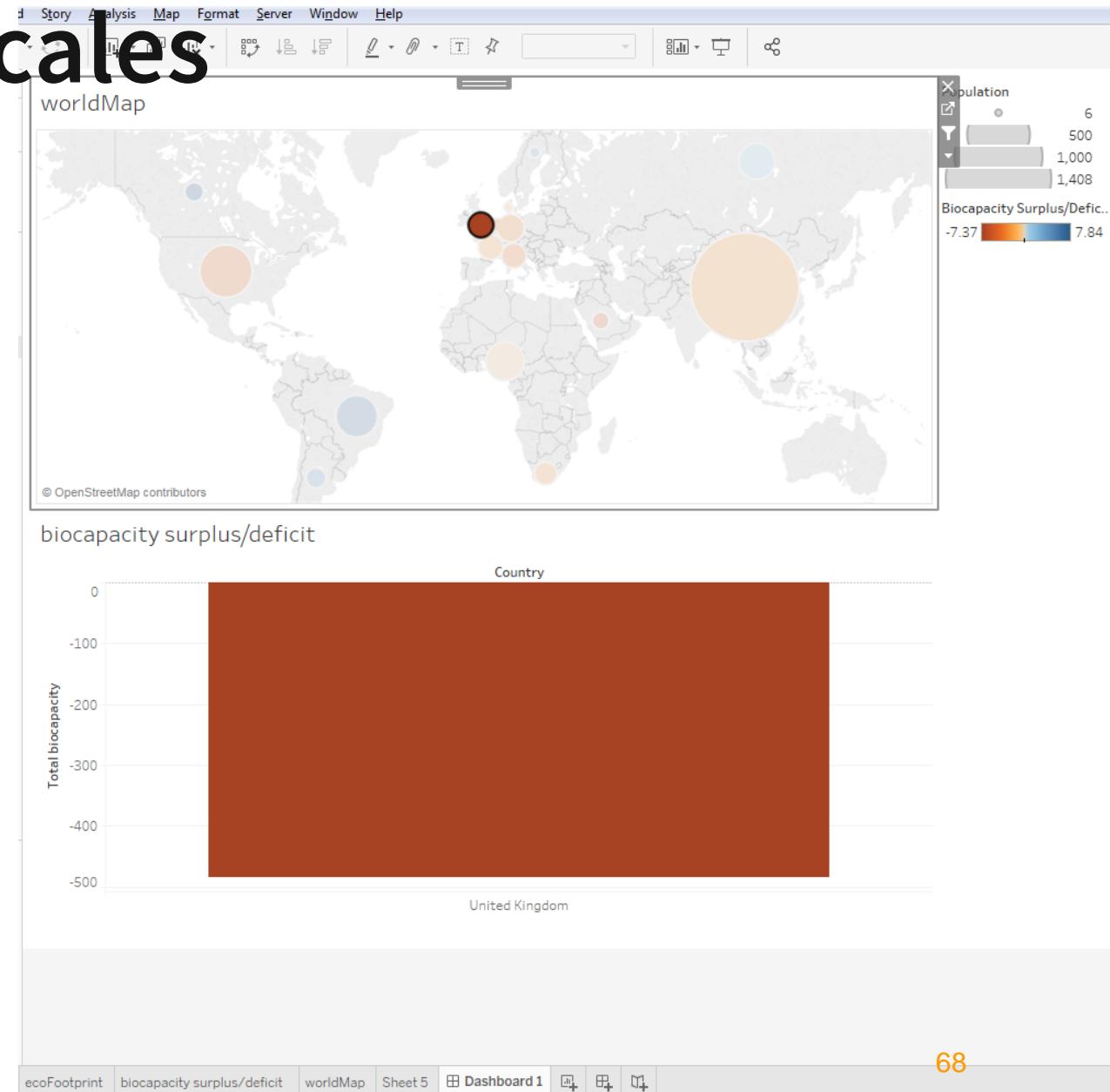
inconsistent colour scales

- To fix this, we have to fix the range of values in the colour scale of the Biocapacity chart.
- Go back to the **Biocapacity worksheet**
- Double-click the colour legend.
- Under “**Advanced**” check the fixed ranges.
- Click “Apply”

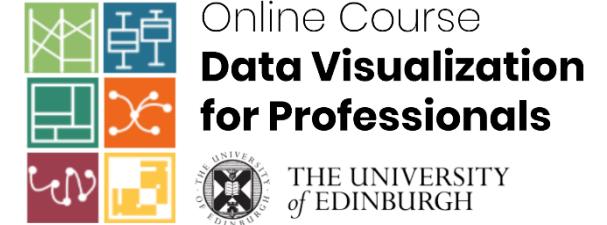


inconsistent colour scales

- In the dashboard, the colours between map and Biocapacity chart should now be consistent when filtering for particular countries
- Apply the same “fixed” colour scale to the map and make the Biocapacity chart a filter of the map.

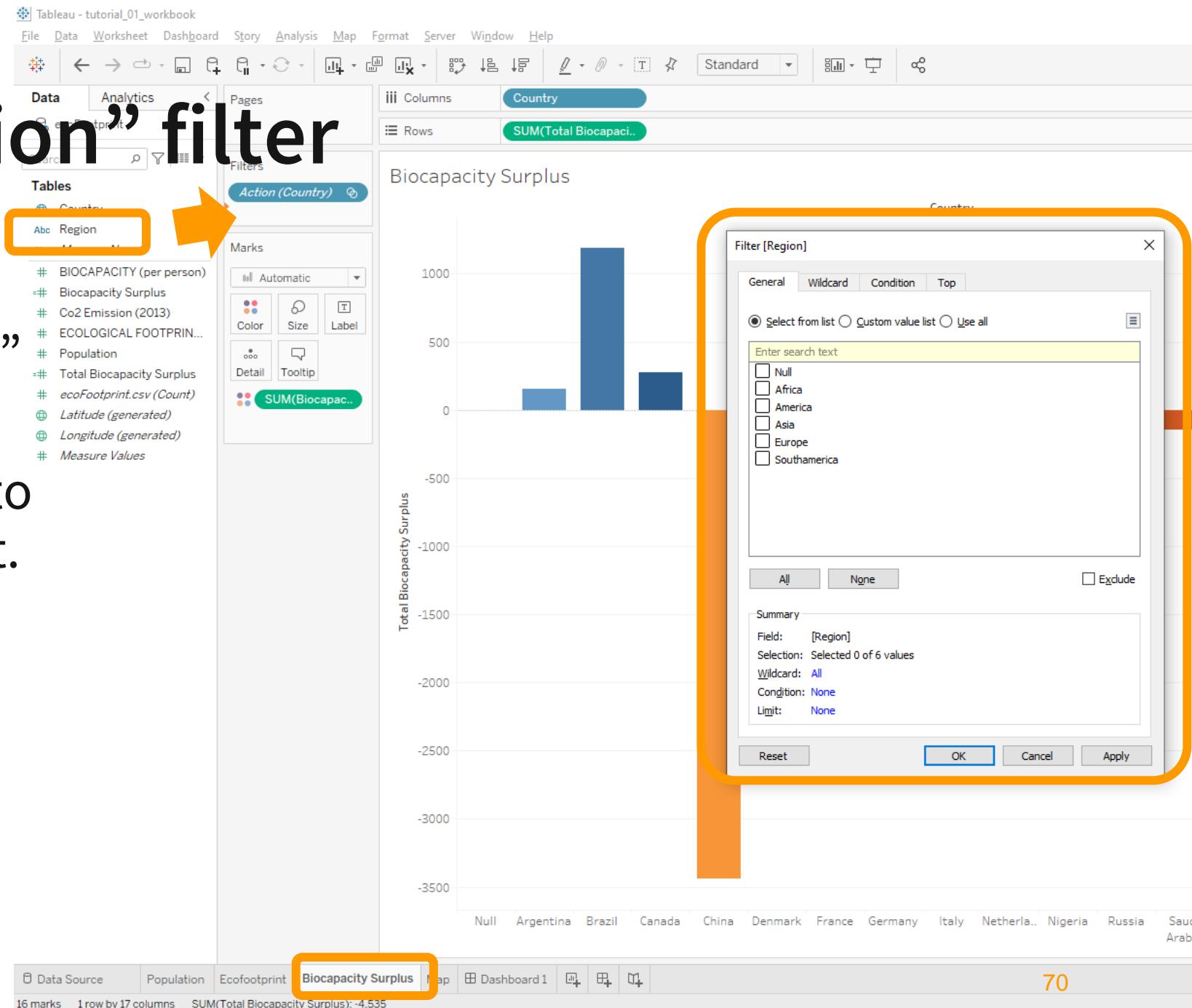


creating filters



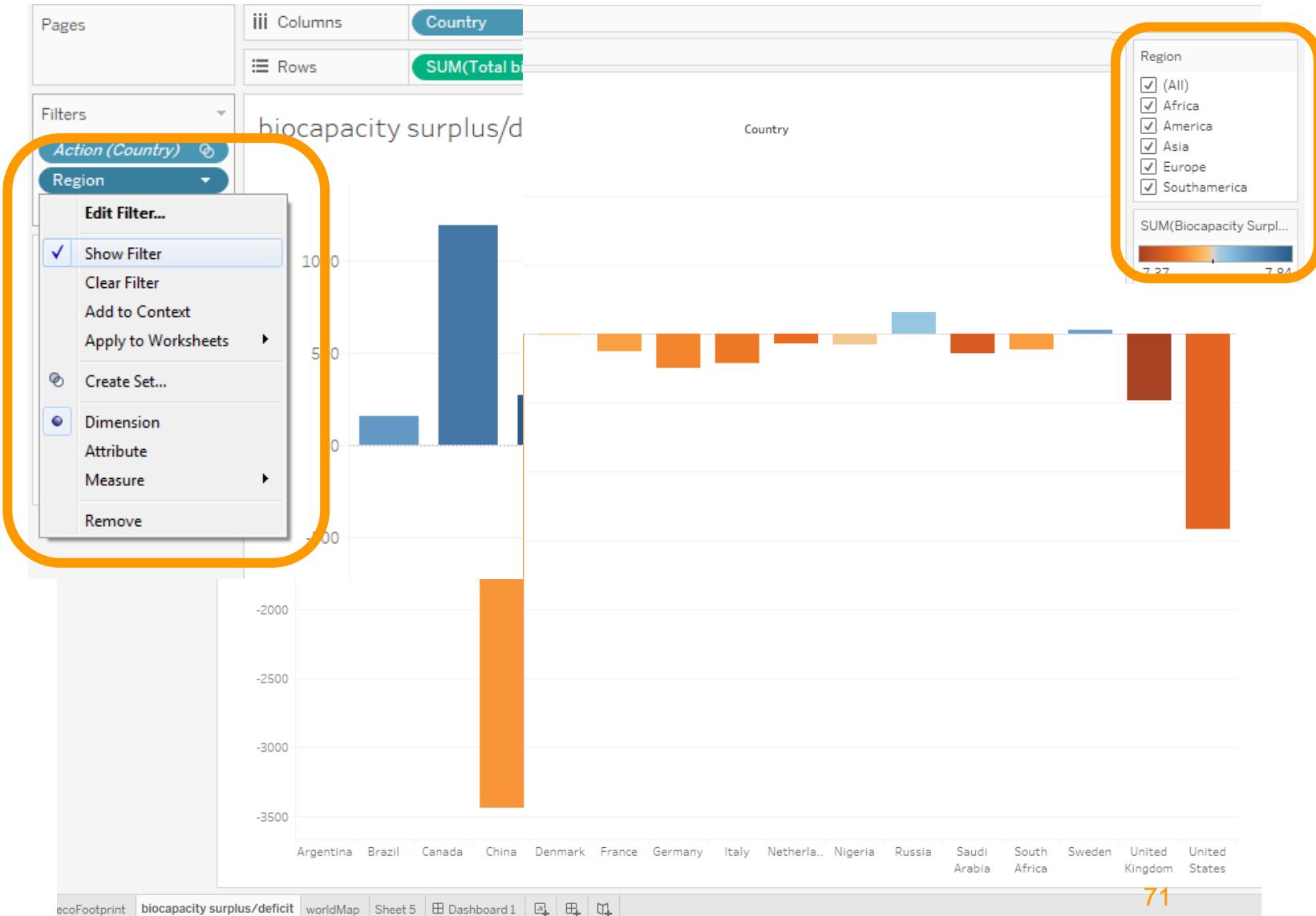
adding a “region” filter

- Go back to the “Biocapacity Surplus” worksheet
- Add a “region” filter to the Biocapacity chart.



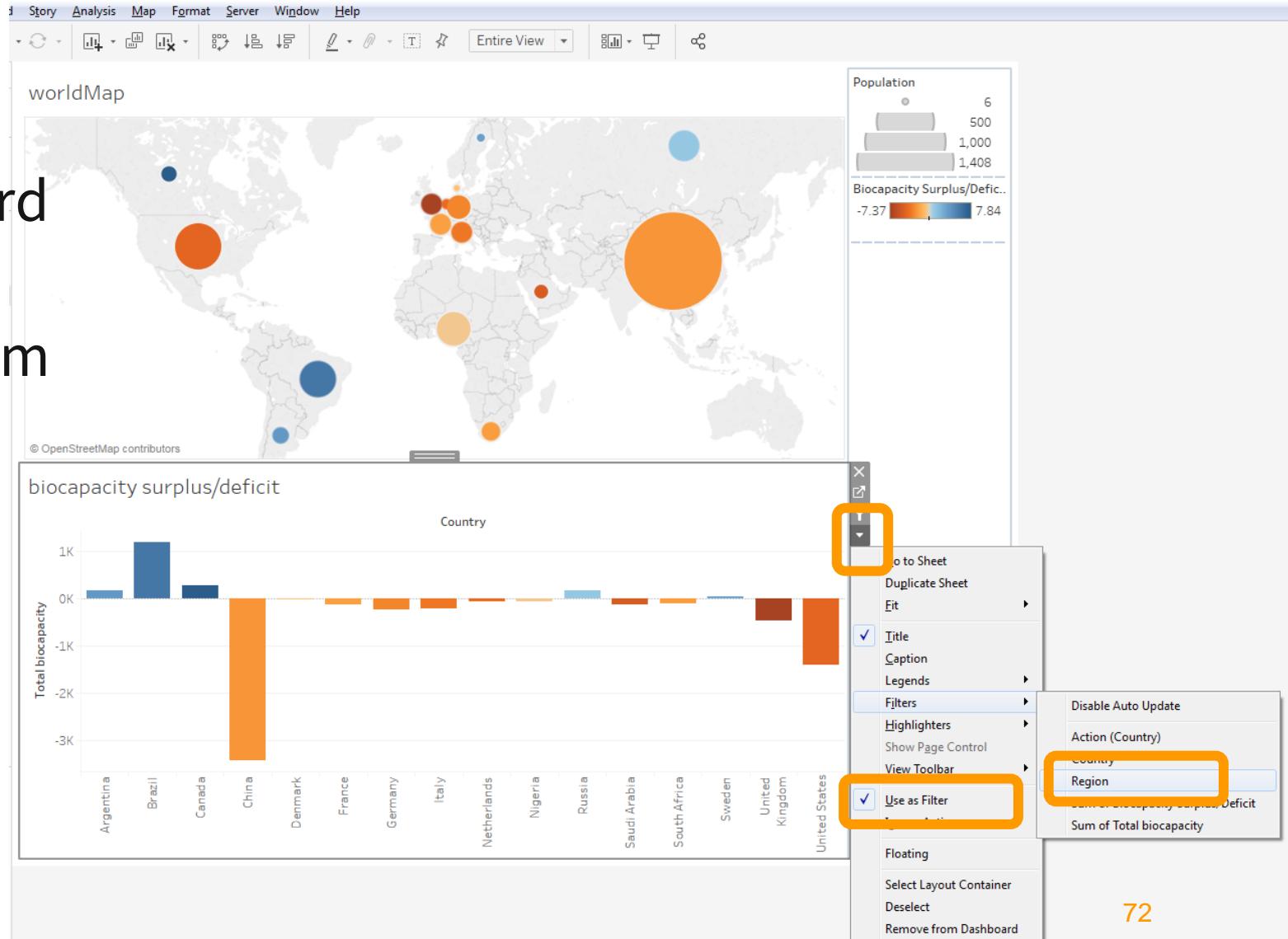
applying additional filters

- Make the filter visible as an interactive element, press the small arrow to the right and select “Show Filter”



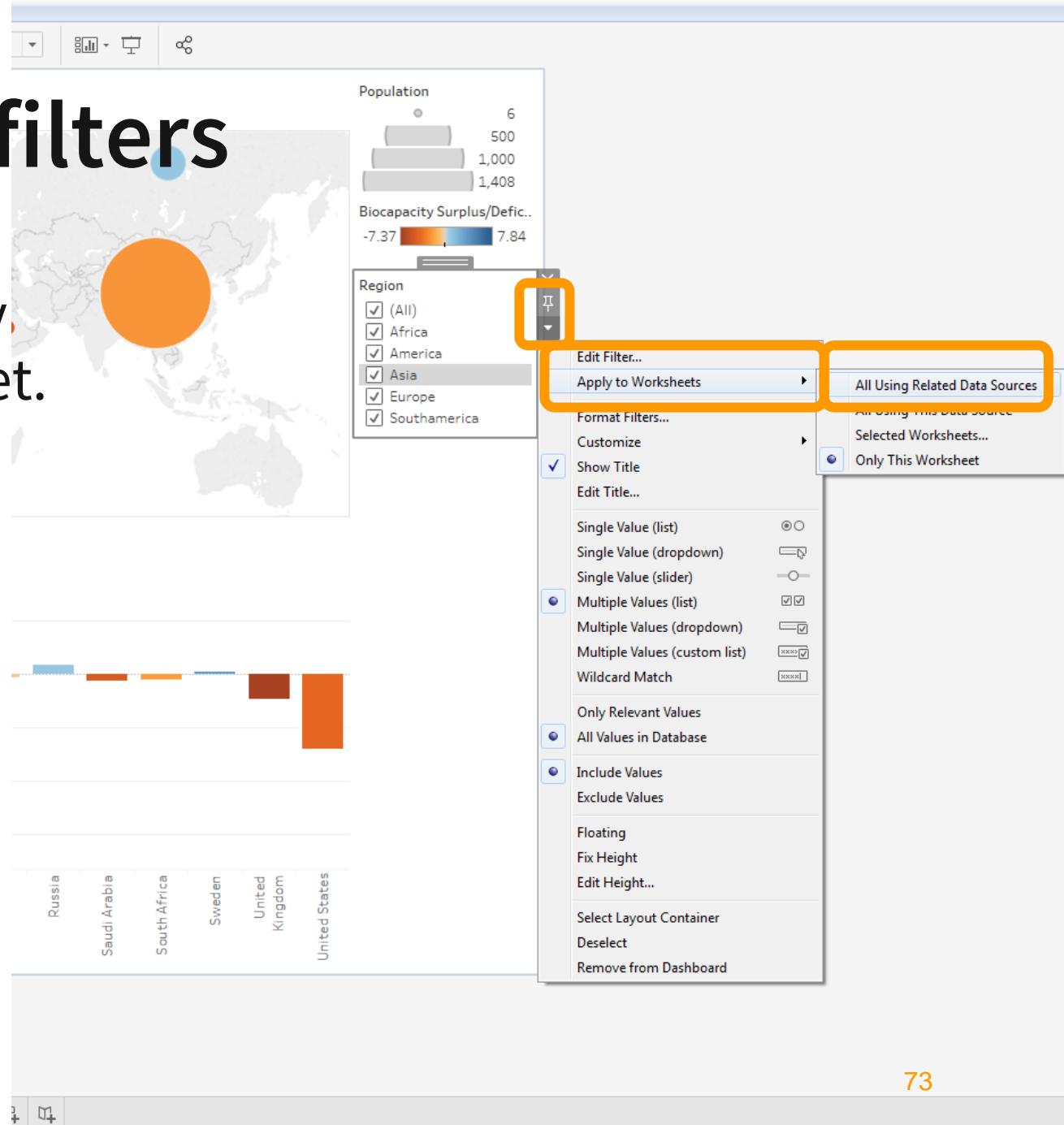
applying additional filters

- The filter will not be visible in your dashboard yet.
- You have to select it from the “Filters” options of the Biocapacity worksheet.

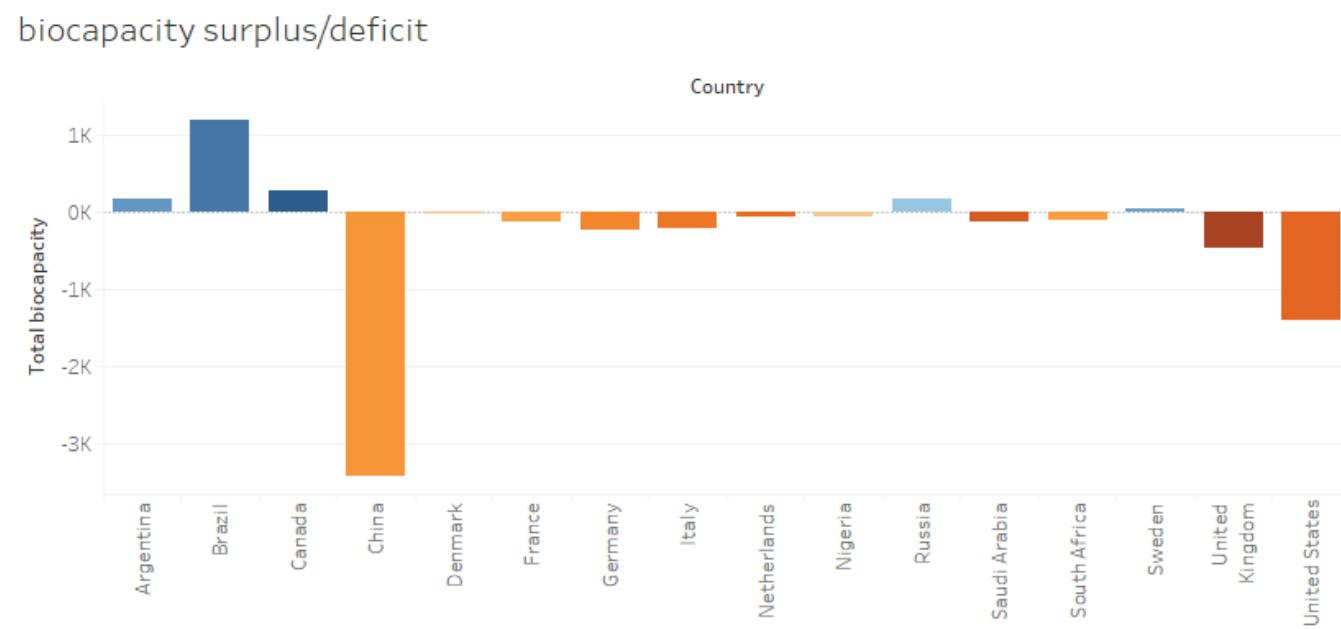
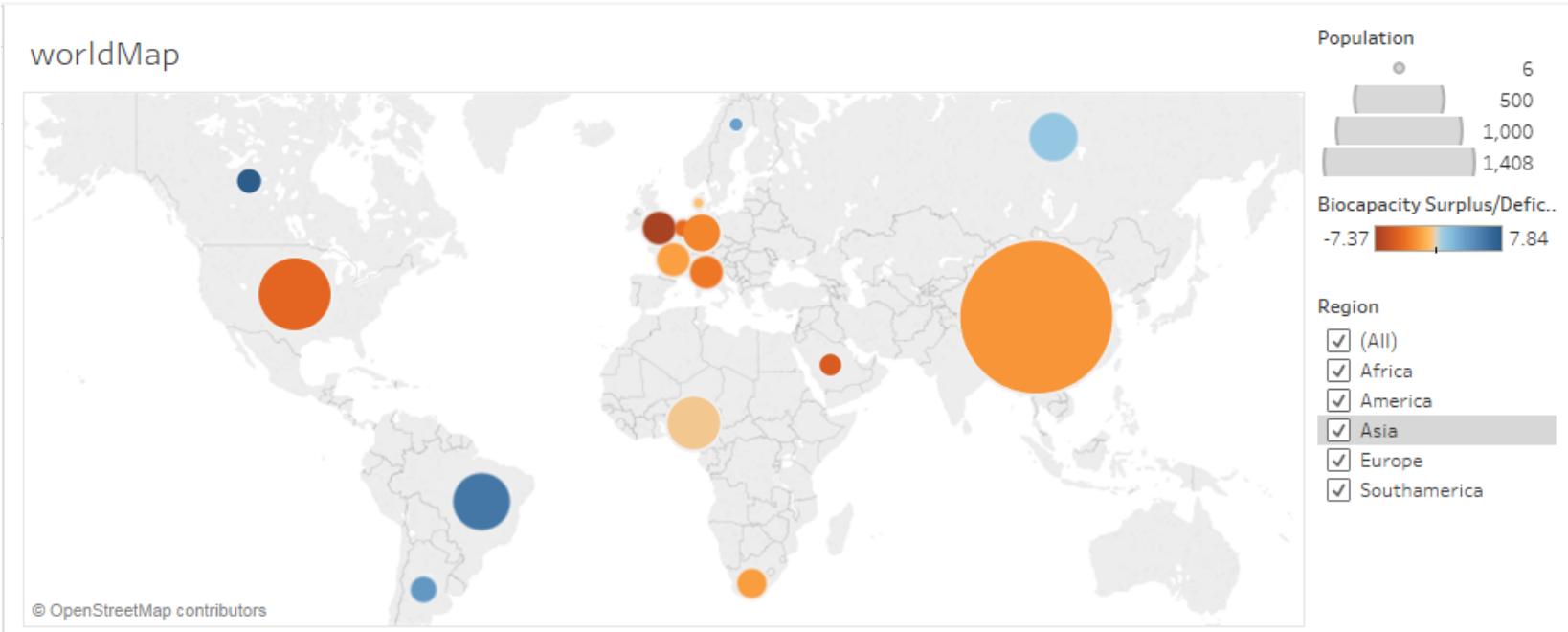


applying additional filters

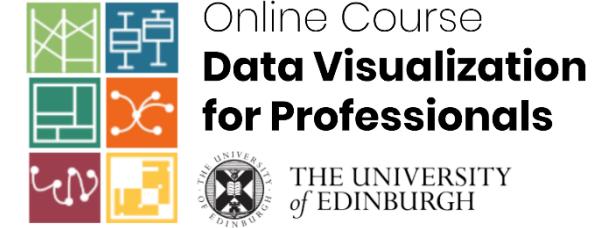
- The filter is now visible but only applies to the surplus worksheet.
- In the filter options select
 - “Apply to Worksheets”
 - “All Using Related Data Sources”



all done



additional material and exercises



additional material and exercises

- Additional tutorial on how to visualize temporal data in Tableau plus more interactive features
 - See Tableau Section on the course site
 - https://datavis-online.github.io/course_content_2022/session-4#tutorial-tools1
- Additional resources
 - Official free tutorials by Tableau: <https://www.tableau.com/learn/training>