My Boss Told Me to Draw a Map: Mapping Best Practices

Marc Psaila, Lead Solution Engineer

THE WORLD
ON
MERCATOR'S PROJECTION.
PROJECTION 1858
FUJINON ASPHERICAL LENS
PEDESET KUNA
50
STO KUNA
100
DVJESTA KUNA
200
HRVATSKA NARODNA BANKA

Tableau - where i hav ebeen - Tableau license expires in 7 days

File Data Server Window Help

by number of weeks (visited countries)

Connection
Live Extract

Filters
0 | Add

Connections Add

visited countries
Microsoft Excel

by number of weeks

Sheets

Use Data Interpreter

Data Interpreter might be able to clean your Microsoft Excel workbook.

by number of trips

by number of weeks

New Union

Sort fields: Data source order

Show aliases Show hidden fields 58 rows

by number of weeks Country	by number of weeks Nature	by number of weeks Number of weeks
France	Vacation	5.00
France	Residence	1,824.00
Switzerland	Vacation	1.00
Switzerland	Work	6.00
Austria	Work	0.50
Austria	Vacation	1.00
Italy	Vacation	6.00
Italy	Work	6.00
United Kingdom	Work	2.00
United Kingdom	Vacation	3.00
Germany	Work	2.00
Germany	Vacation	0.50
Spain	Vacation	4.00
Spain	Work	5.00
Portugal	Vacation	4.00
Portugal	Work	5.00

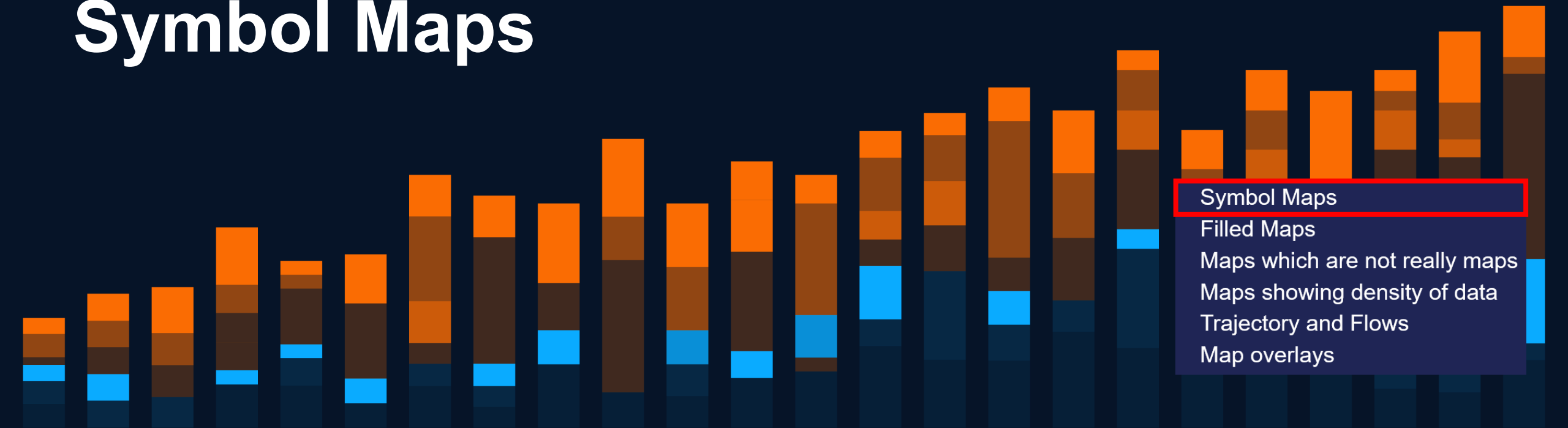
Data Source Sheet 2

Agenda

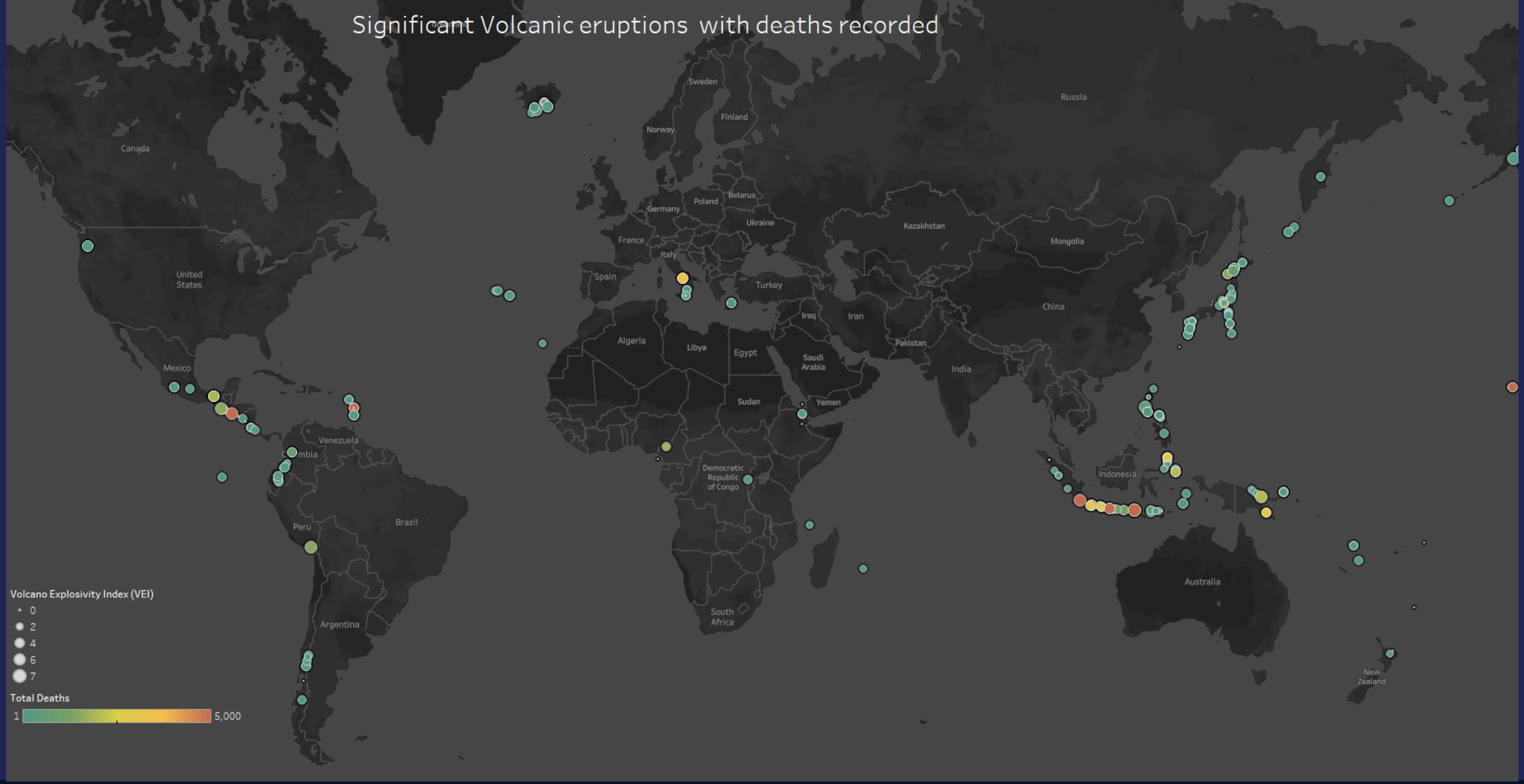
Symbol Maps
Filled Maps
Maps which are not really maps
Maps showing density of data
Trajectory and Flows
Map overlays

How to Show Information at a Given Location

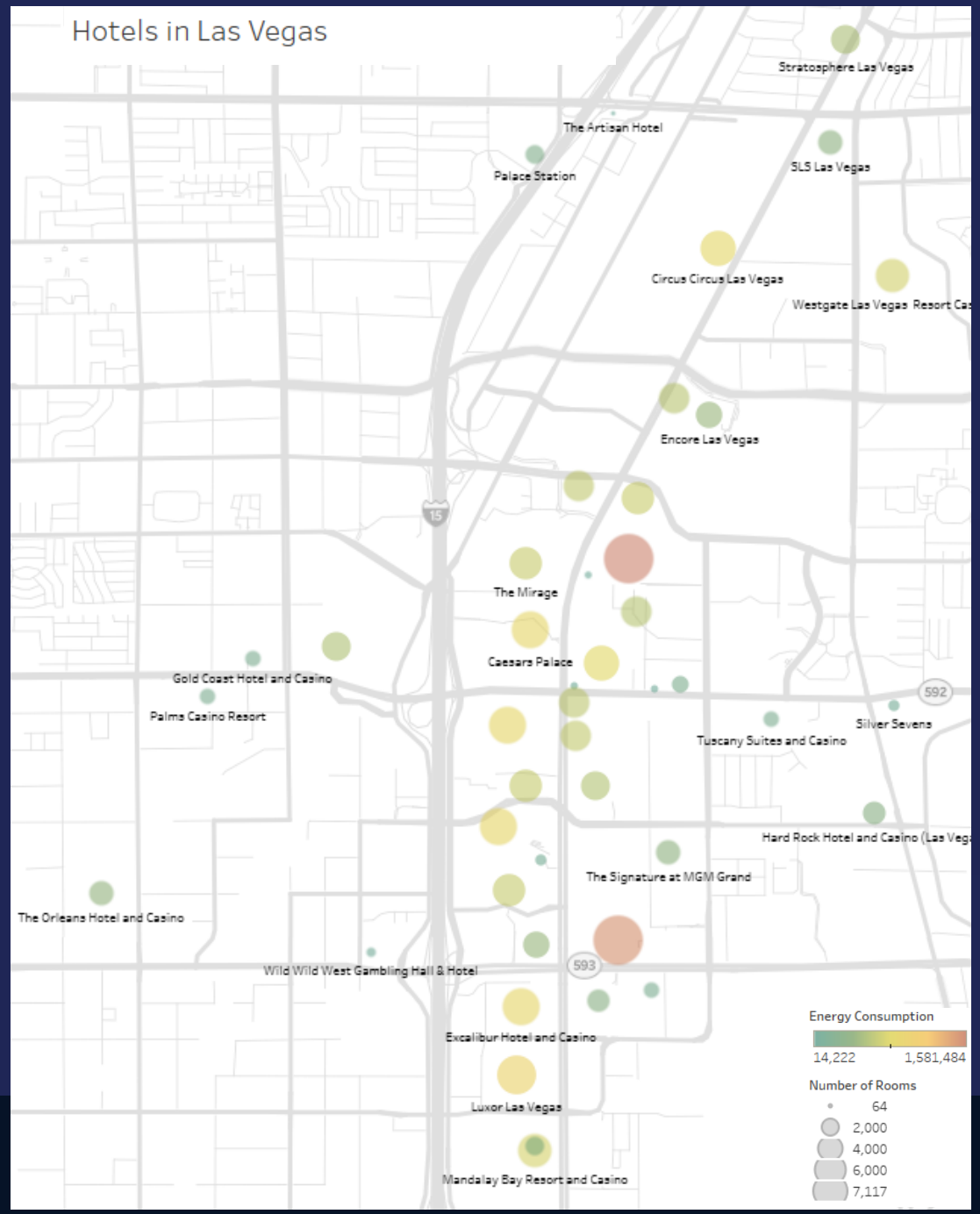
Symbol Maps

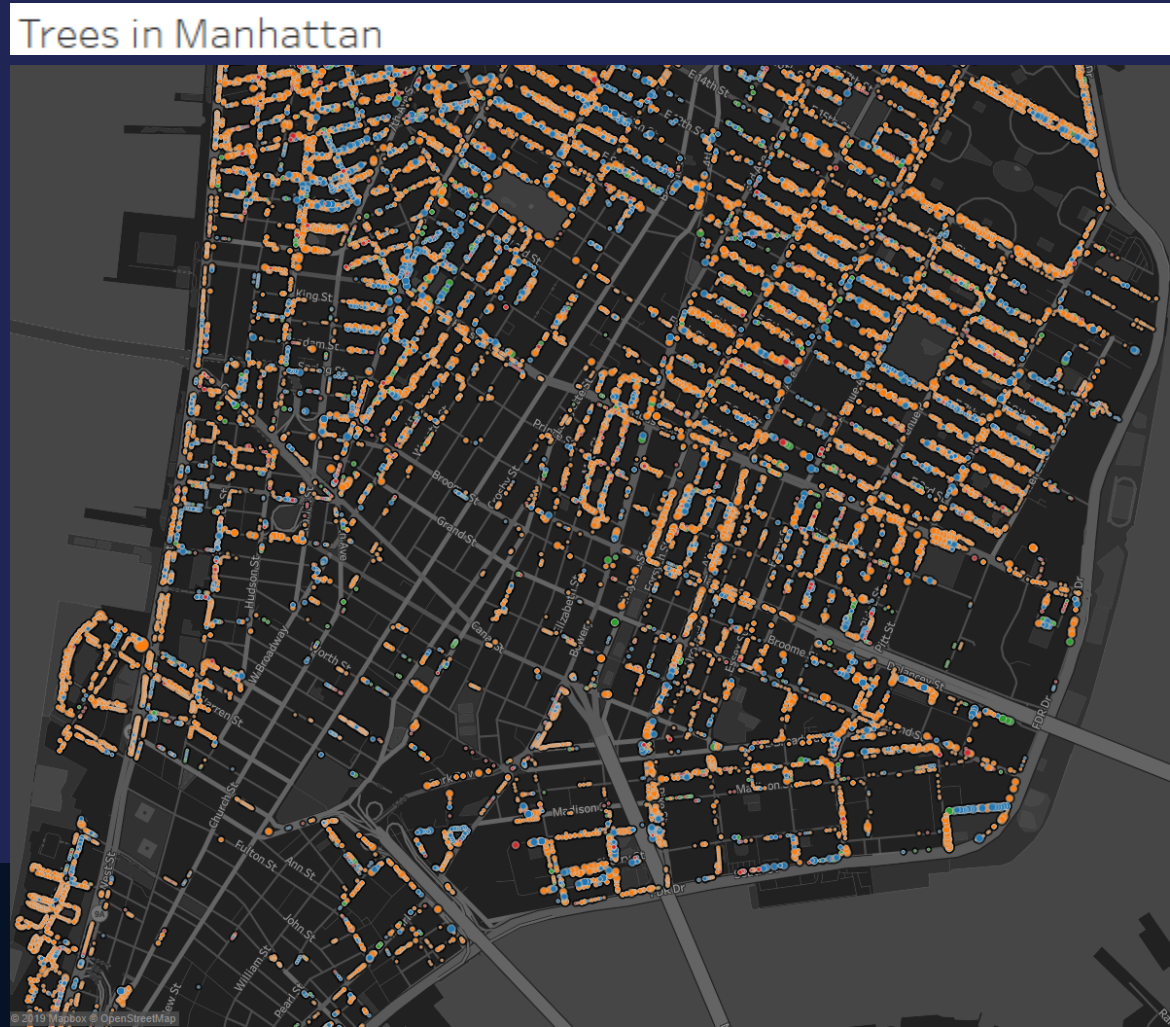


Significant Volcanic eruptions with deaths recorded



+ableau


Hotels in Las Vegas
Stratosphere Las Vegas
The Artisan Hotel
Palace Station
SLS Las Vegas
Circus Circus Las Vegas
Westgate Las Vegas Resort Cas
Encore Las Vegas
15
The Mirage
Caesars Palace
Gold Coast Hotel and Casino
Palms Casino Resort
592
Silver Sevens
Tuscany Suites and Casino
Hard Rock Hotel and Casino (Las Vega
The Signature at MGM Grand
The Orleans Hotel and Casino
593
Wild Wild West Gambling Hall & Hotel
Excalibur Hotel and Casino
Luxor Las Vegas
Mandalay Bay Resort and Casino
Energy Consumption
14,222
1,581,484
Number of Rooms
64
2,000
4,000
6,000
7,117

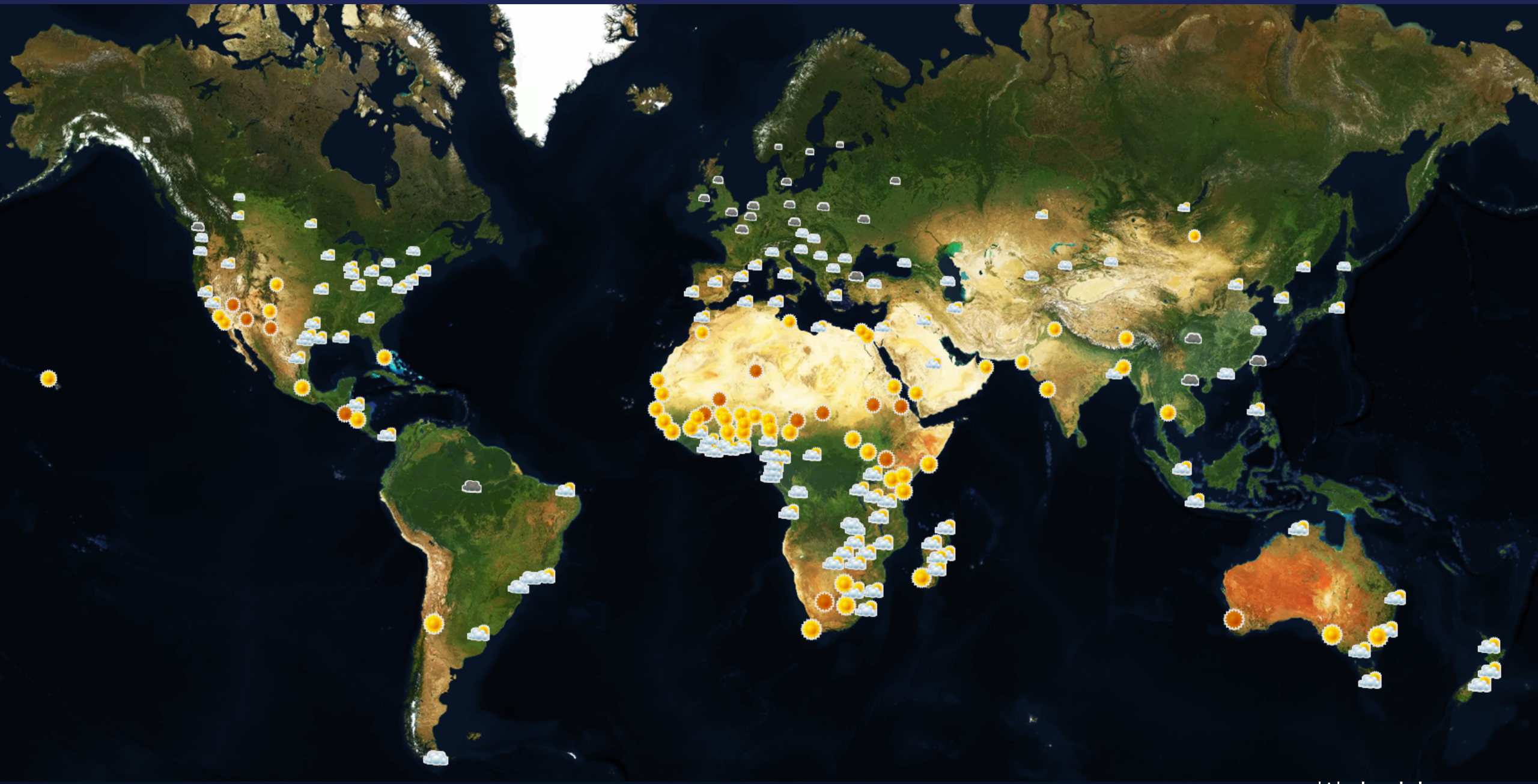

Trees in Manhattan
© 2019 Mapbox © OpenStreetMap

Advantages of Symbol Maps

- The size of the geographical zone does not matter
- Can be used for any kind of data: normalized and raw data
- Easy to create multi-variables symbol map

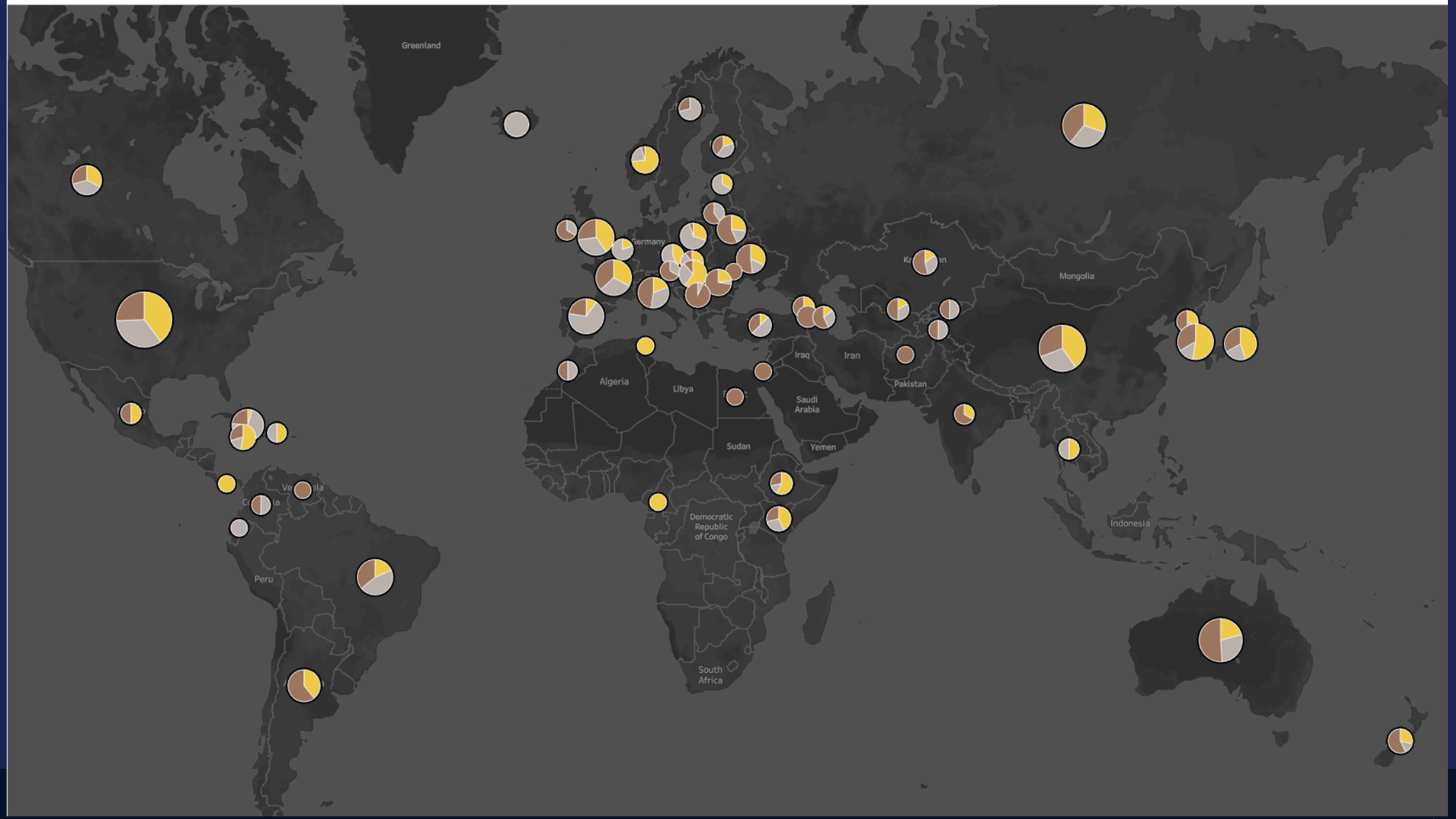
Mountains in the world

Where should I go if I want to maximize my suntan ?



tableau

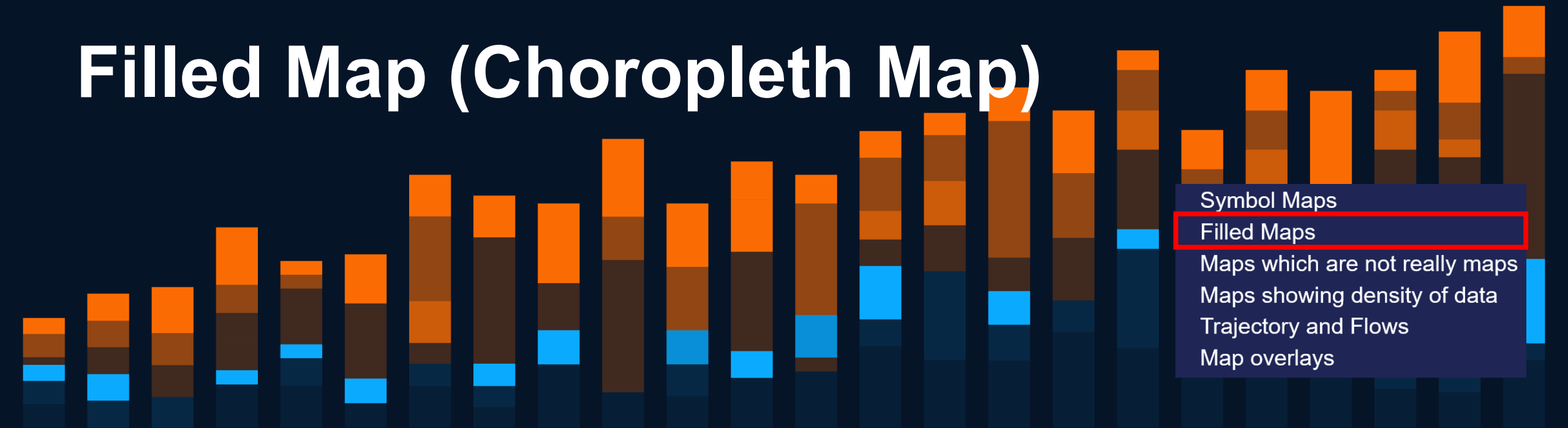
Olympic Medals won by Country

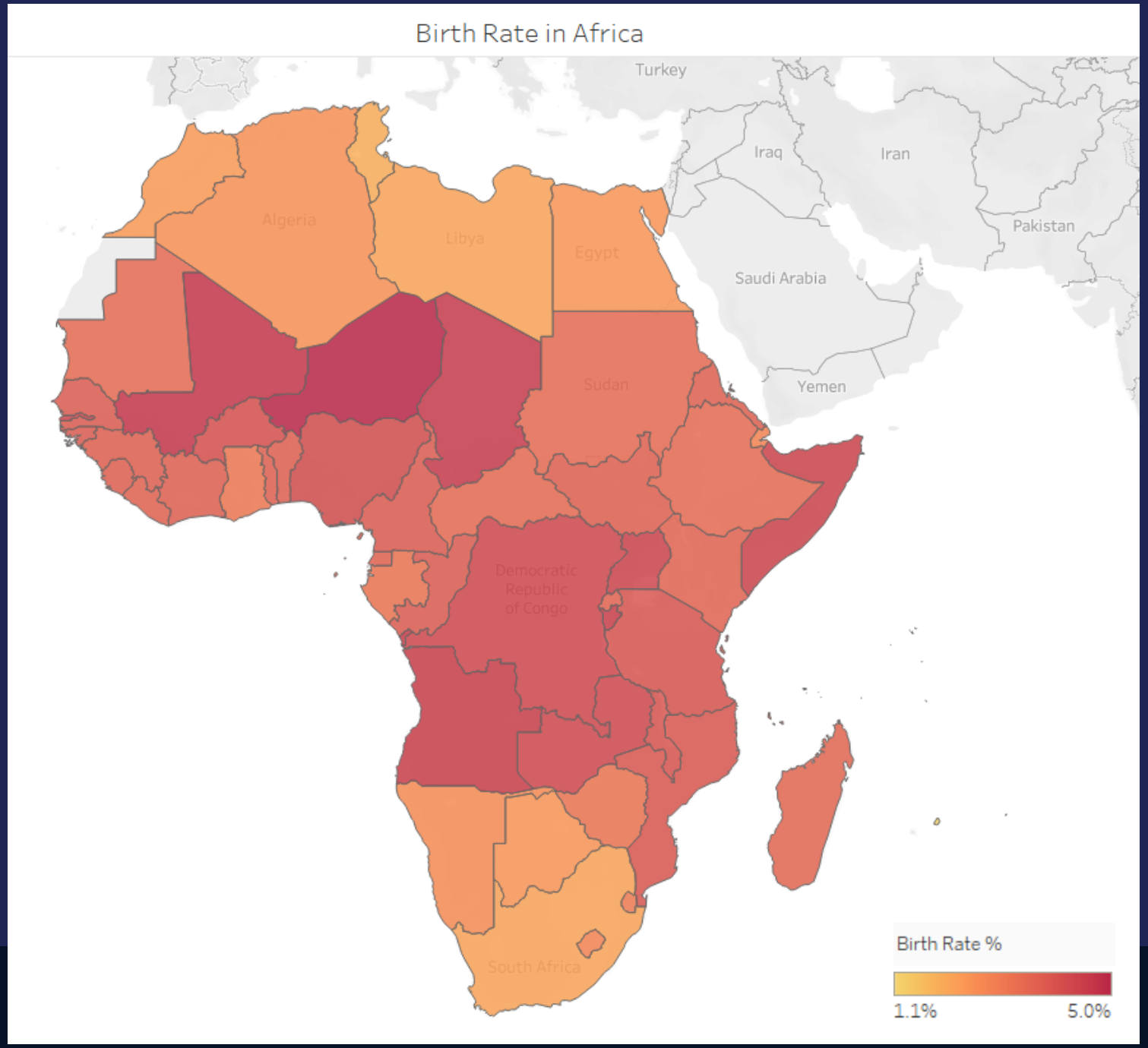


+ableau

How to Show Information on an actual Area

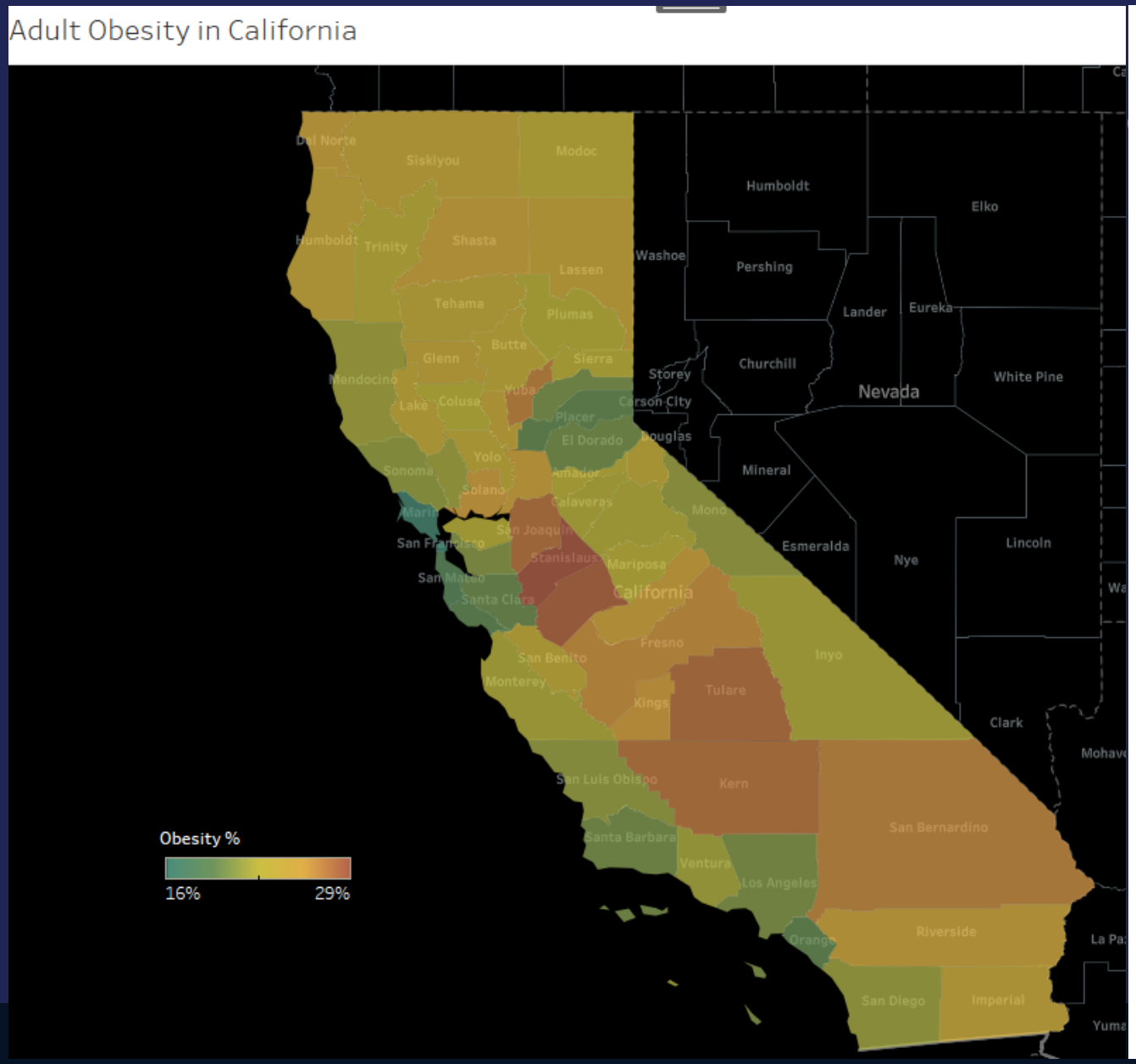
Filled Map (Choropleth Map)



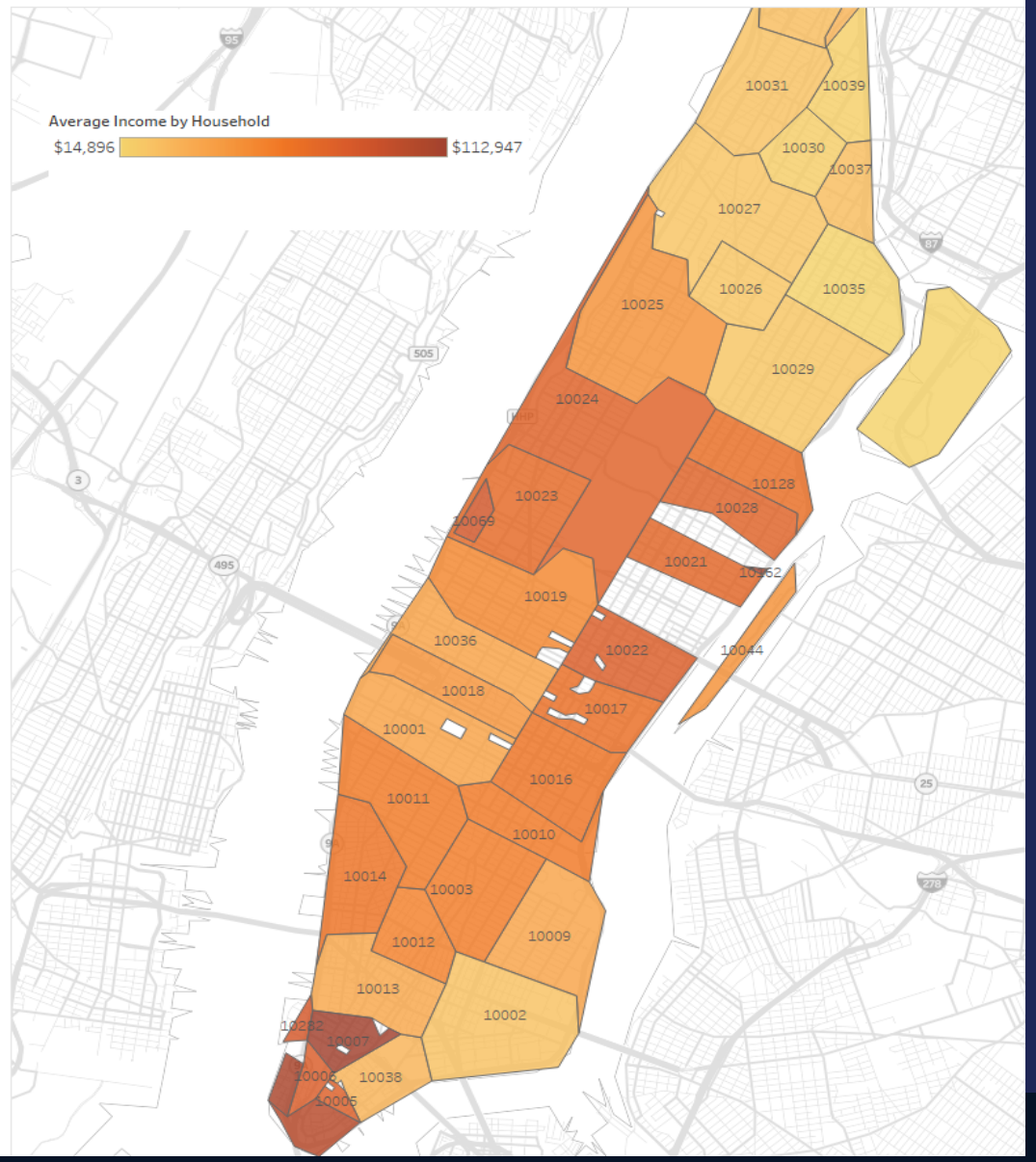

Birth Rate in Africa
Turkey
Iraq
Iran
Pakistan
Saudi Arabia
Yemen
Algeria
Libya
Egypt
Sudan
Democratic Republic of Congo
South Africa
Birth Rate %
1.1%
5.0%

+ableau

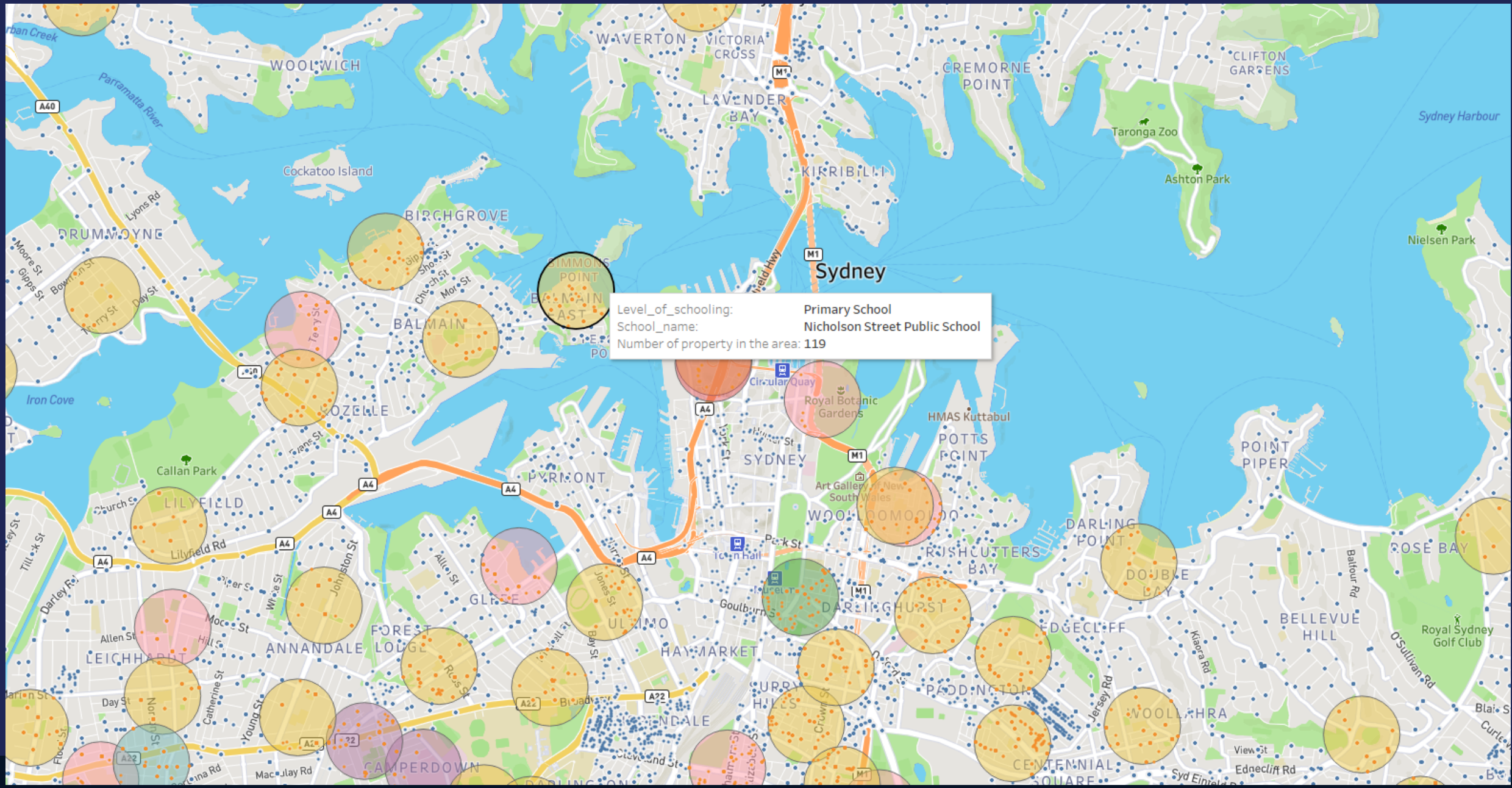
Adult Obesity in California



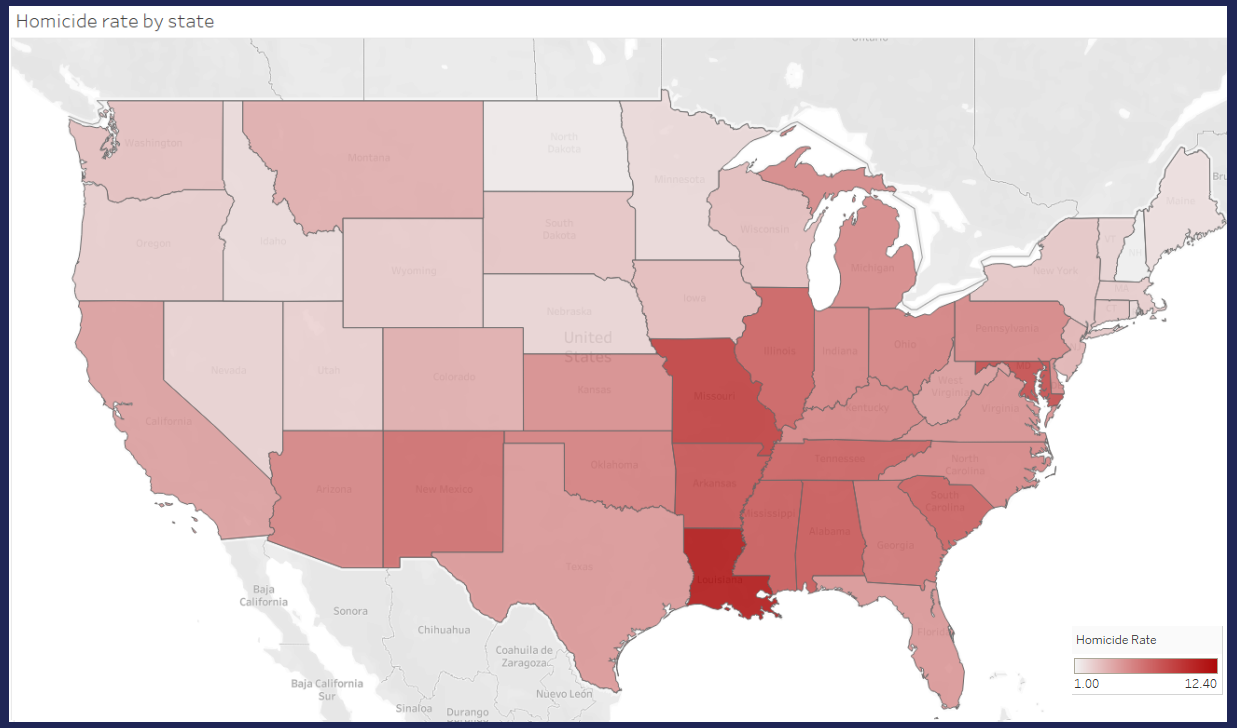
Which Zipcodes are the wealthiest ?



+ableau


Level_of_schooling: Primary School
School_name: Nicholson Street Public School
Number of property in the area: 119
Sydney
WOOLWICH
WAVERTON
VICTORIA CROSS
LAVENDER BAY
CREMORNE POINT
CLIFTON GARDENS
Taronga Zoo
Ashton Park
Sydney Harbour
Nielsen Park
Cockatoo Island
KIRRIBILLI
BIRCHGROVE
DRUMMOYNE
BALMAIN
BALMAIN EAST
ROZELLE
Iron Cove
Callan Park
LILYFIELD
PYRMONT
SYDNEY
Circular Quay
Royal Botanic Gardens
HMAS Kuttabul
POTTS POINT
POINT PIPER
Art Gallery of New South Wales
WOOLLOOMOOLOO
RUSHCUTTERS BAY
DARLING POINT
DOUBLE BAY
ROSE BAY
BELLEVUE HILL
Royal Sydney Golf Club
EDGECLIFF
DARLINGHURST
HAYMARKET
ULTIMO
GLEBE
FOREST LODGE
ANNANDALE
LEICHHARDT
SURRY HILLS
PADDINGTON
WOOLLAHRA
CENTENNIAL SQUARE
CAMPERDOWN
Parramatta River
Lilyfield Rd
Town Hall
Park St
Goulburn St
Bay St
Broadway
Macleay Rd
Edgecliff Rd
Jersey Rd
Kiaora Rd
Balfour Rd
O'Sullivan Rd
Darley Rd
Allen St
Day St
Young St
Catherine St
Johnston St
Moore St
Lyons Rd
Gipps St
Bowman St
Terry St
Shore St
Church St
Mort St
Evans St
Jones St
Allen St
Cleveland St
View St
M1
A4
A22
A40

Data Should be Normalized



Good examples

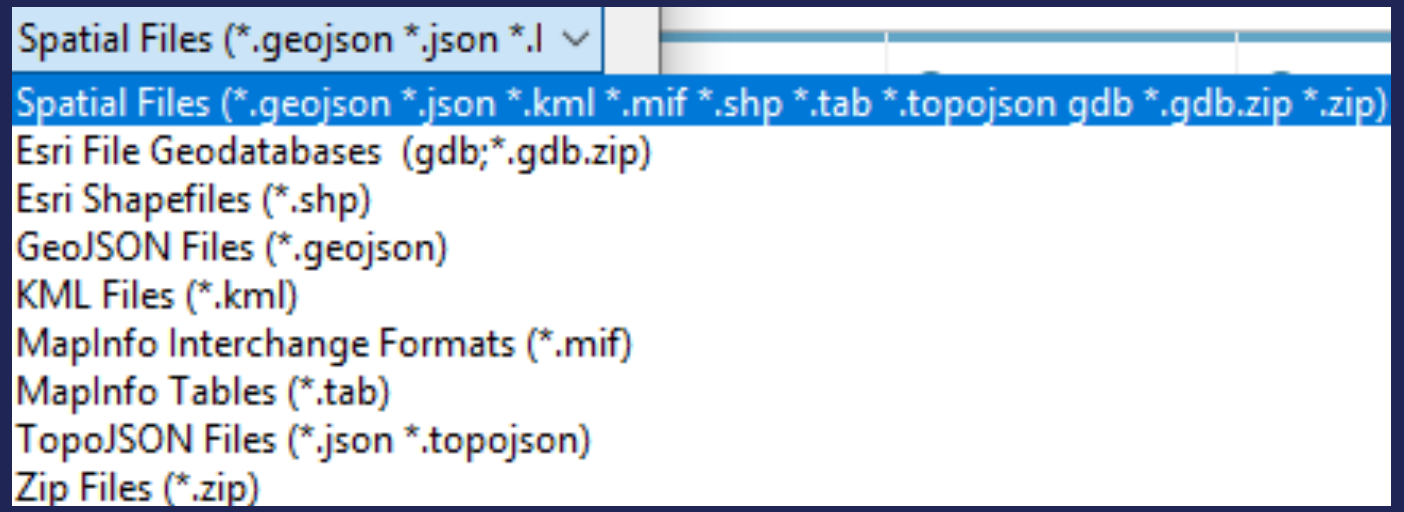
- Income tax rates by country
- Number of births per 100,000 people in a given year by Zipcode
- Percentage change in skin cancer from 1990 to 2010 by State
- Percentage of population under 18 years old, reported by country

How to build a choropleth map?

4 main options:

- **Using Tableau geocoding (Countries, States, Counties, etc.)**
- **Using a Shape file**
- **Using the Buffer function**
- **Using the “Polygon” mark type**

Using a Shape File



+ since 2020.2 you can directly connect to a Esri ArcGIS server

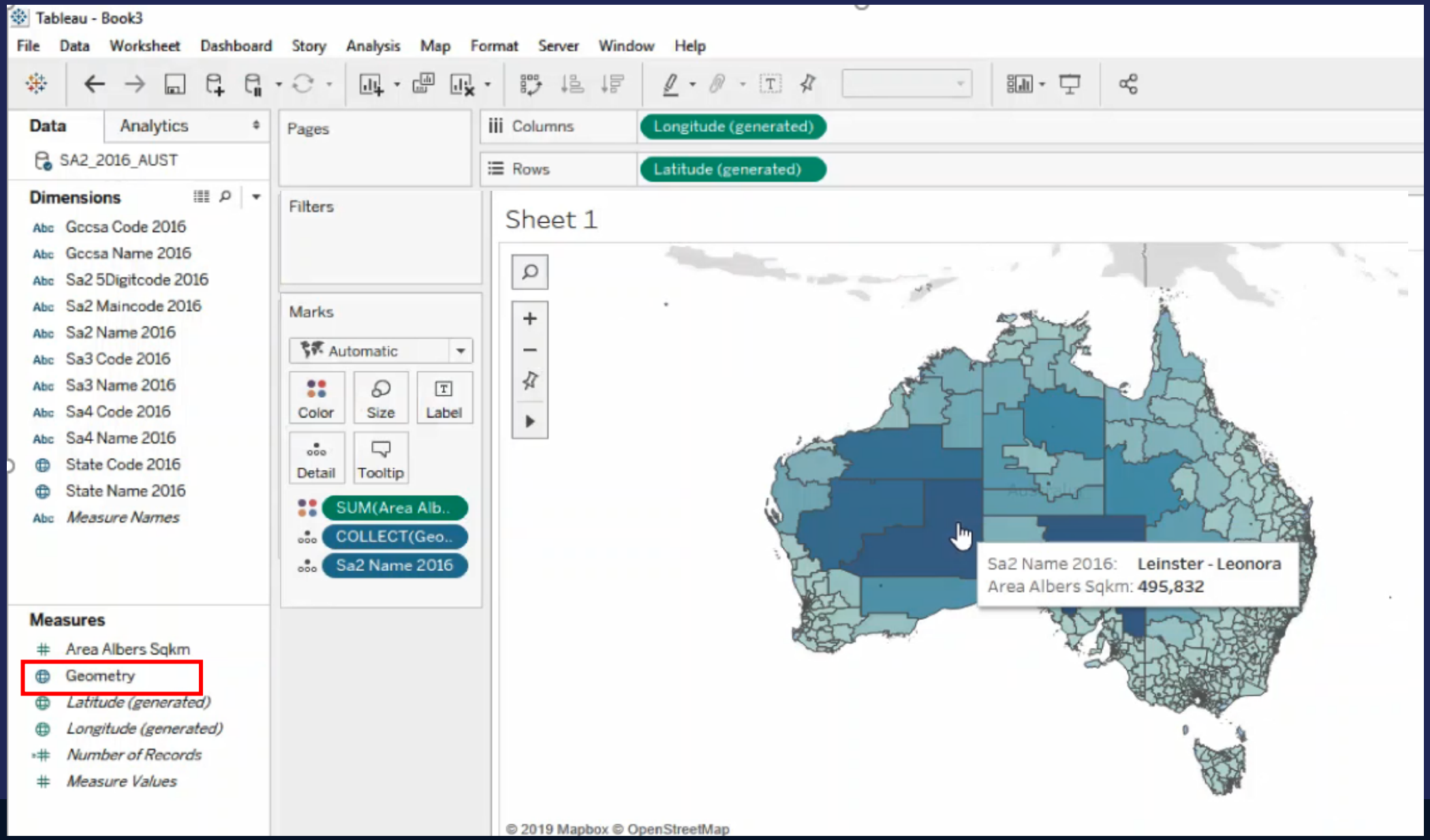


Tableau - Book3
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Data
Analytics
SA2_2016_AUST
Dimensions
Abc Gccsa Code 2016
Abc Gccsa Name 2016
Abc Sa2 5Digitcode 2016
Abc Sa2 Maincode 2016
Abc Sa2 Name 2016
Abc Sa3 Code 2016
Abc Sa3 Name 2016
Abc Sa4 Code 2016
Abc Sa4 Name 2016
State Code 2016
State Name 2016
Abc Measure Names
Measures
Area Albers Sqkm
Geometry
Latitude (generated)
Longitude (generated)
Number of Records
Measure Values
Pages
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Area Alb..
COLLECT(Geo..
Sa2 Name 2016
Columns
Longitude (generated)
Rows
Latitude (generated)
Sheet 1
Sa2 Name 2016: Leinster - Leonora
Area Albers Sqkm: 495,832
© 2019 Mapbox © OpenStreetMap

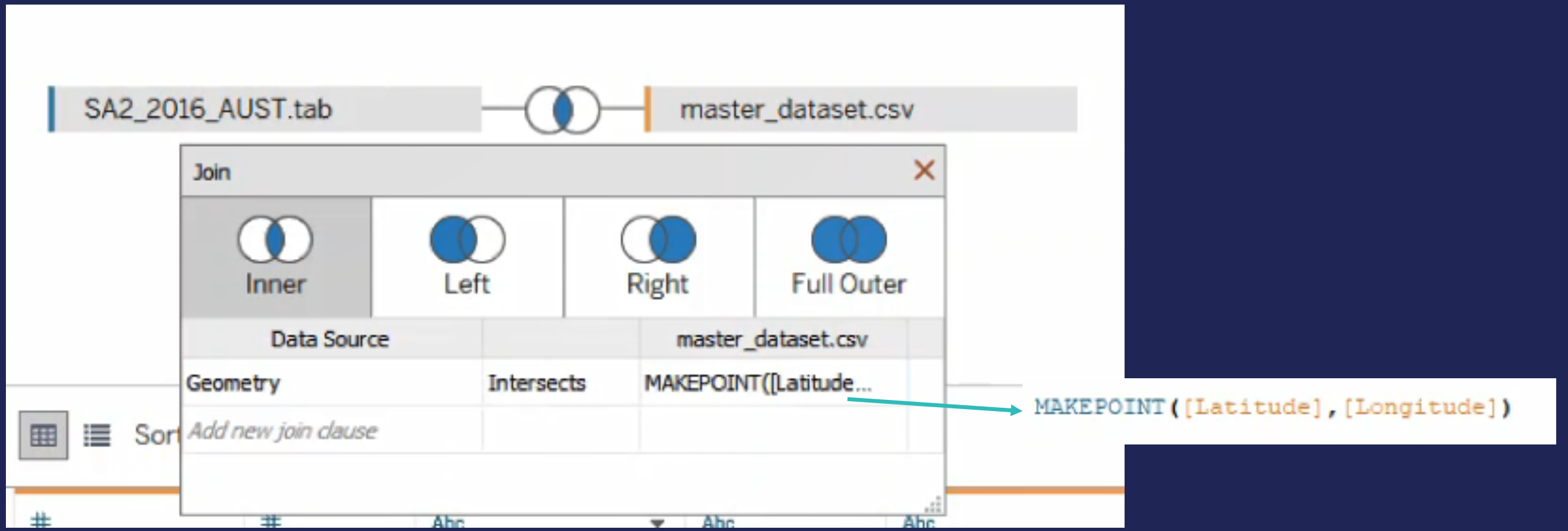
Mixing Shape Files with Some Other Data Sources

A	C	N	AM	AN
School_code	School_name	ICSEA_val	Latitude	Longitude
1001	Abbotsford Public School	1115	-33.8527	151.1312
1002	Aberdeen Public School	905	-32.1661	150.8881
1003	Abermain Public School	885	-32.8089	151.4265
1007	Adaminaby Public School	973	-35.9933	148.7767
1008	Adamstown Public School	1018	-32.9322	151.731
1009	Adelong Public School	954	-35.3123	148.0628
1015	Albion Park Public School	970	-34.5703	150.7726
1016	Timbumburi Public School	972	-31.2038	150.9156
1017	Albury Public School	1048	-36.0825	146.9193
1019	Albury West Public School	858	-36.0778	146.8955
1028	Alma Public School	848	-31.9822	141.4624
1030	Alstonville Public School	1014	-28.8385	153.4382
1040	Anna Bay Public School	954	-32.7764	152.0899
1041	Annandale Public School	1121	-33.8858	151.1696
1042	Annandale North Public School	1173	-33.8779	151.1718

ICSEA=Index of Community Socio-Educational Advantage

How to use this file to get the ICSEA for each statistical area 2 ?

Abc SA2_2016_AUST.tab Sa2 Maincode 2016	Abc SA2_2016_AUST.tab Sa2 5Digitcode 20...	Abc SA2_2016_AUST.tab Sa2 Name 2016	# SA2_2016_AUST.tab Area Albers Sqkm	SA2_2016_AUST.tab Geometry
101021007	11007	Braidwood	3,418.35	POLYGON
101021008	11008	Karabar	6.98	POLYGON
101021009	11009	Queanbeyan	4.76	POLYGON
101021010	11010	Queanbeyan - East	13.00	POLYGON
101021011	11011	Queanbeyan Region	3,054.41	POLYGON
101021012	11012	Queanbeyan West - Je..	13.68	POLYGON


SA2_2016_AUST.tab
master_dataset.csv
Join
Inner
Left
Right
Full Outer
Data Source
master_dataset.csv
Geometry
Intersects
MAKEPOINT([Latitude...
Add new join clause
Sort
MAKEPOINT([Latitude],[Longitude])

Pages

Filters

Marks

Automatic

Color | Size | Label | Detail | Tooltip

AGG(ICSEA (Weighted AVG))

COLLECT(Geometry)

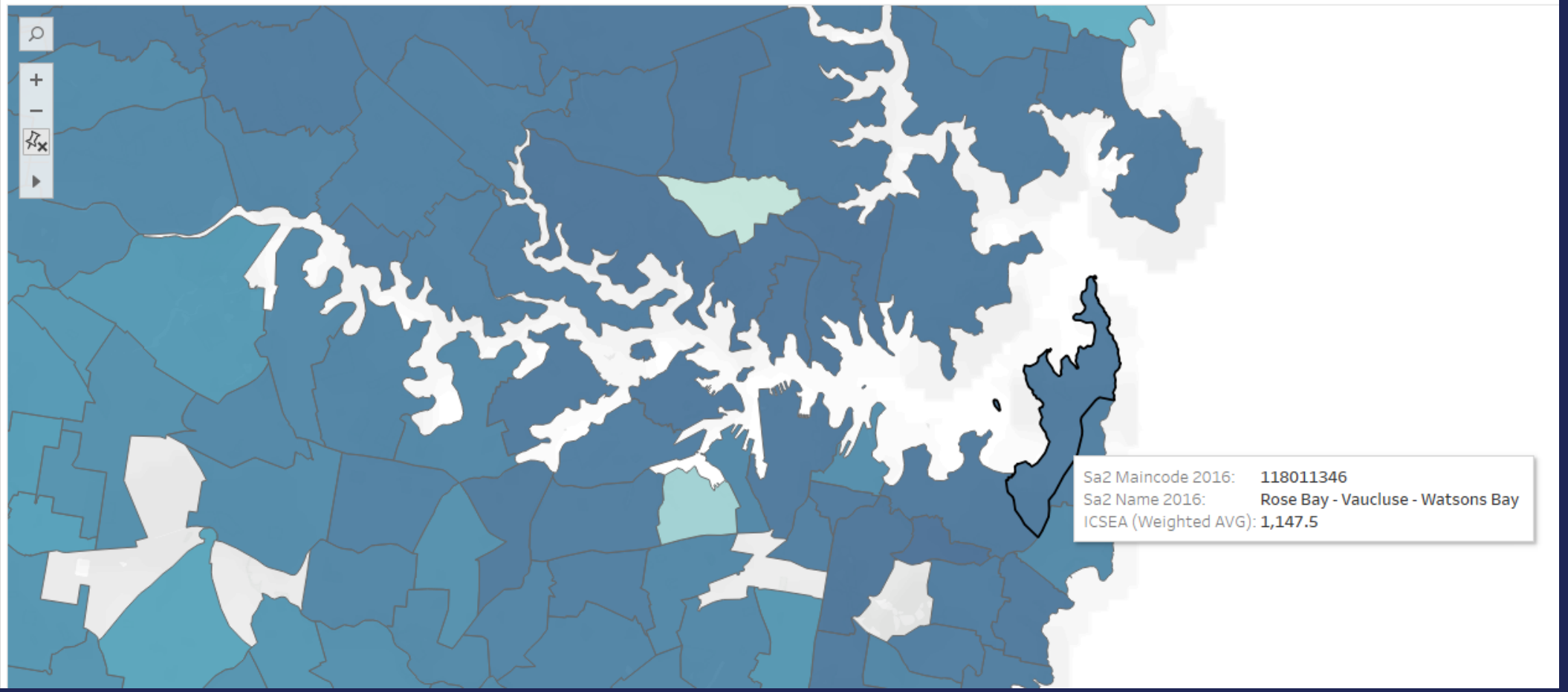
Sa2 Maincode 2016

Sa2 Name 2016

Columns: Longitude (generated)

Rows: Latitude (generated)

Spatial file with shapefile



+ableau

Use the Buffer function

Pages

Columns: Longitude (generated)

Rows: Latitude (generated)

Filters

LGA: Sydney

Marks

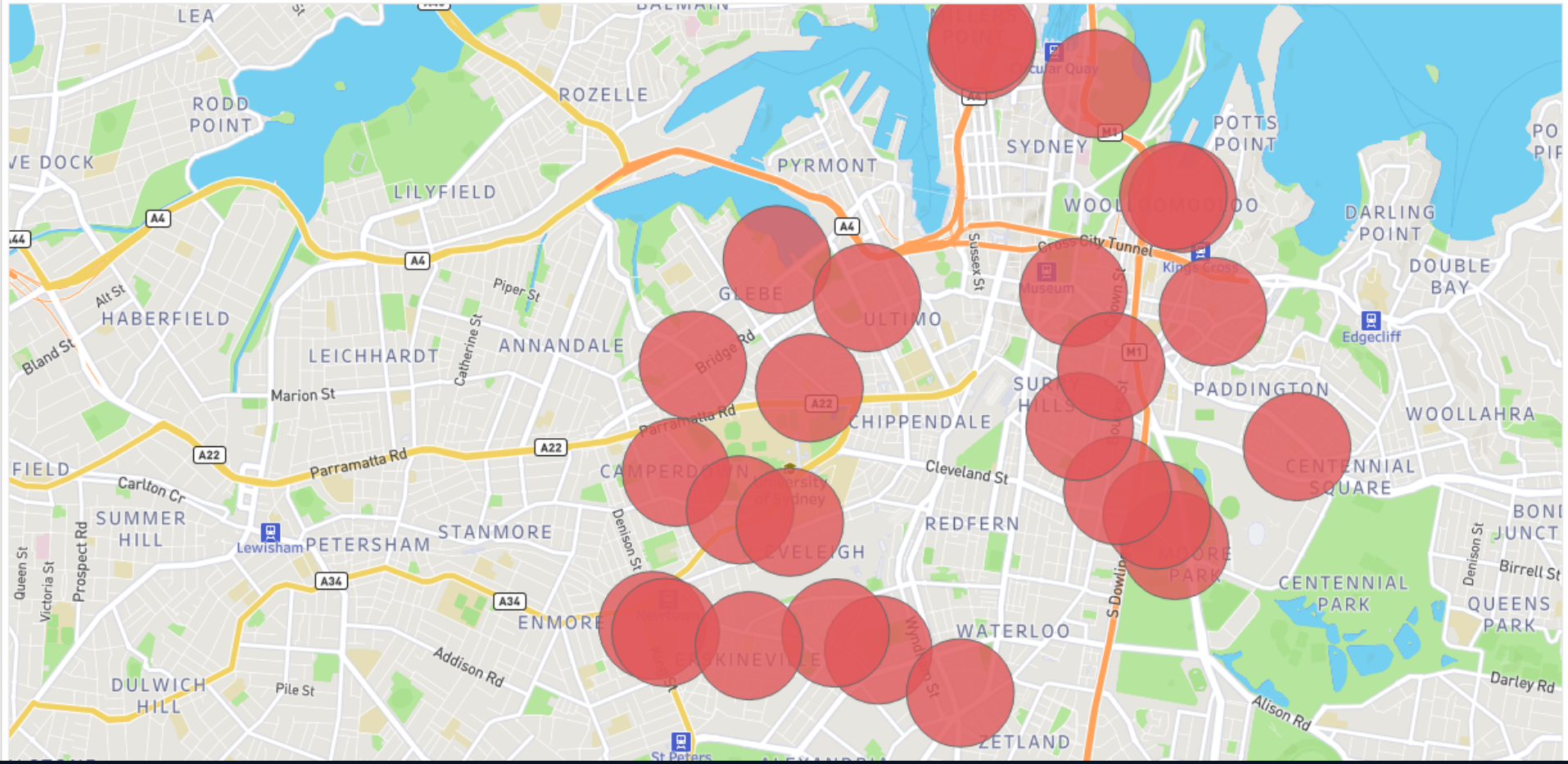
Map

Color | Size | Label | Detail | Tooltip

School_code

COLLECT(Buffer)

Buffer



Radius

0.4

+ableau

Using Polygon Mark Type

Mainly for non geographic maps

Example Store map with shelves

Pages

Columns SUM(X)

Rows SUM(Y)

Filters

Marks

Polygon

Color | Size | Label

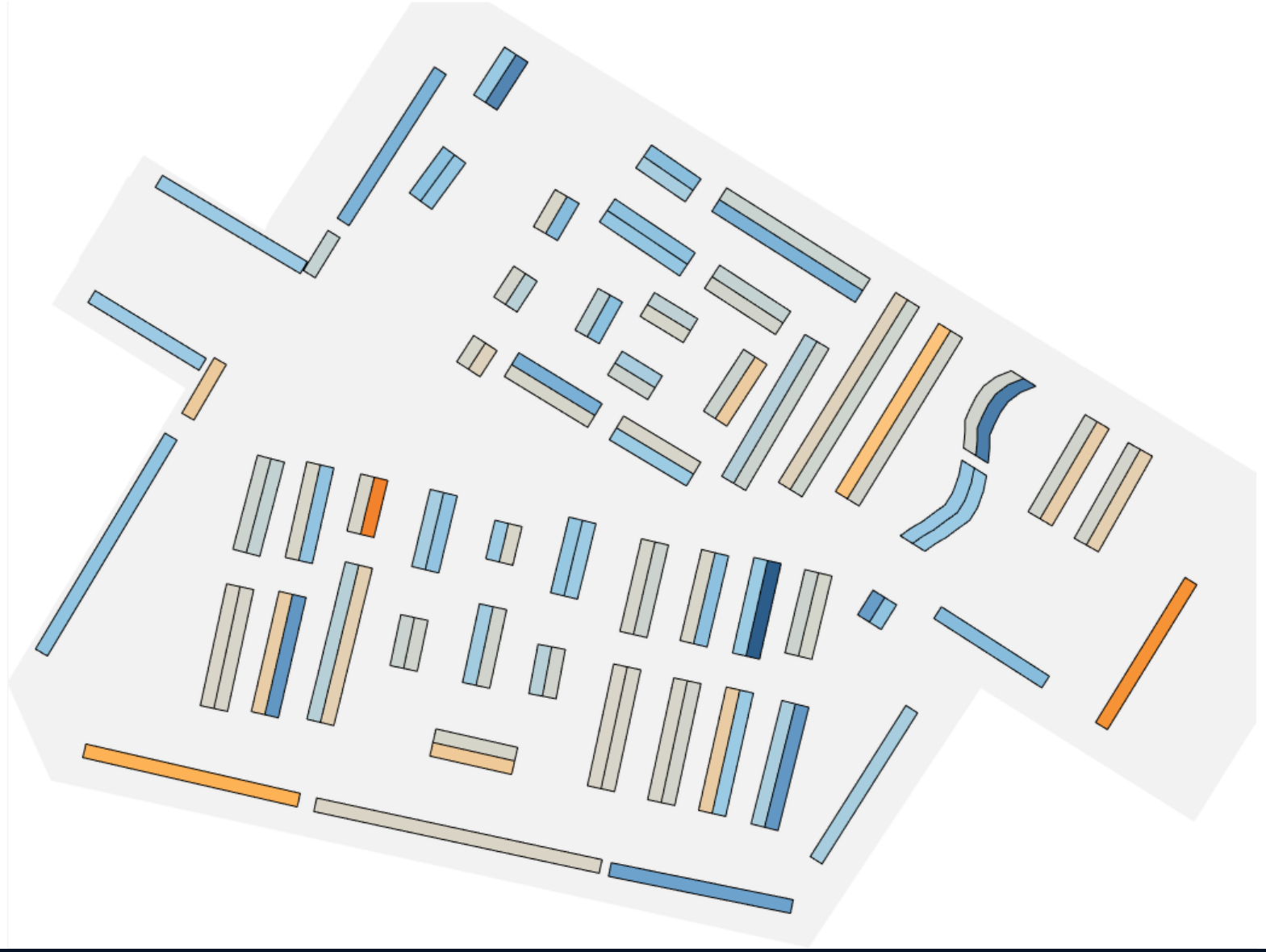
Detail | Tooltip | Path

SUM(Color)

Shelf

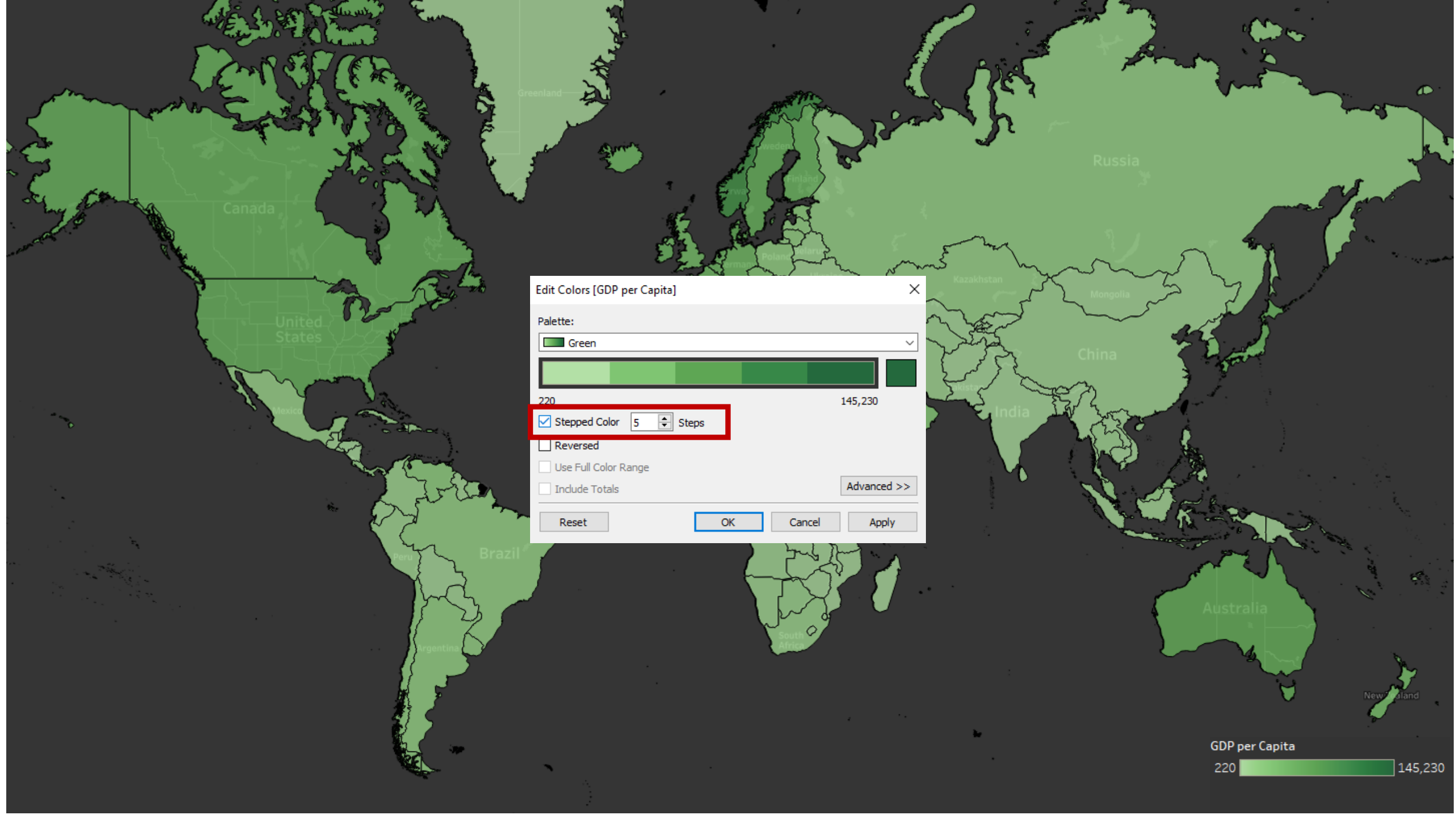
Point Id

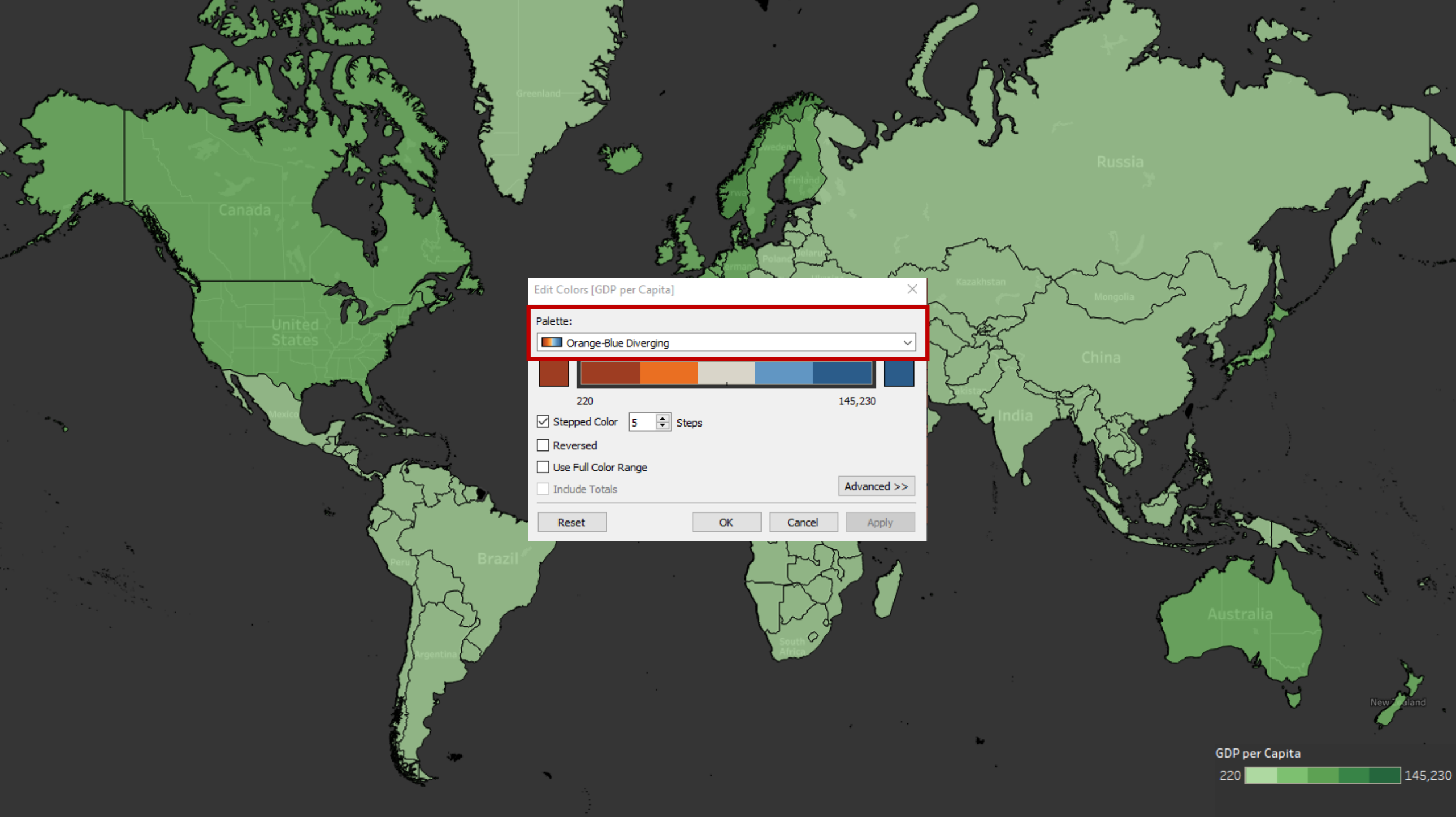
Superstore Floorplan Analysis

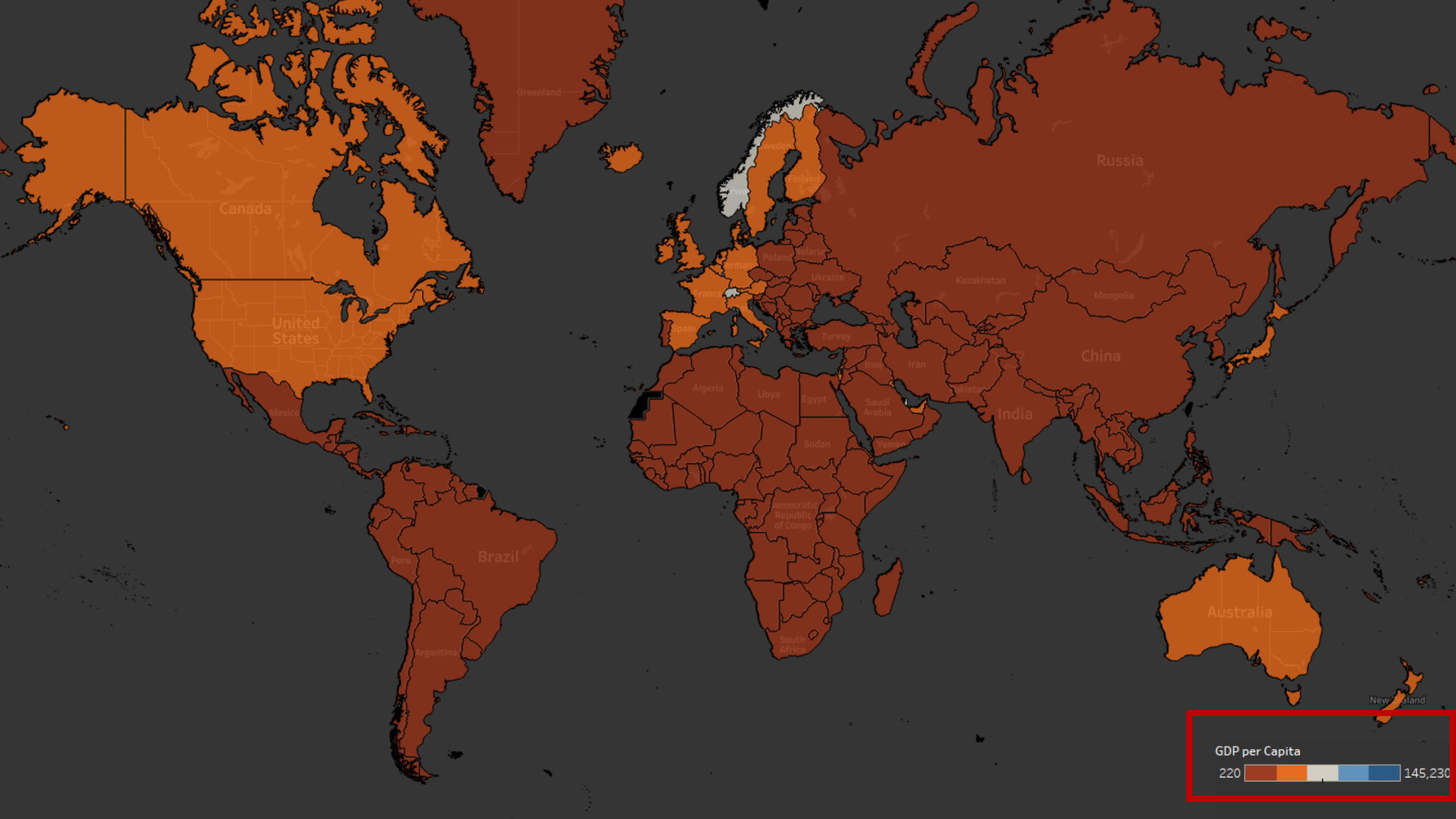


tableau

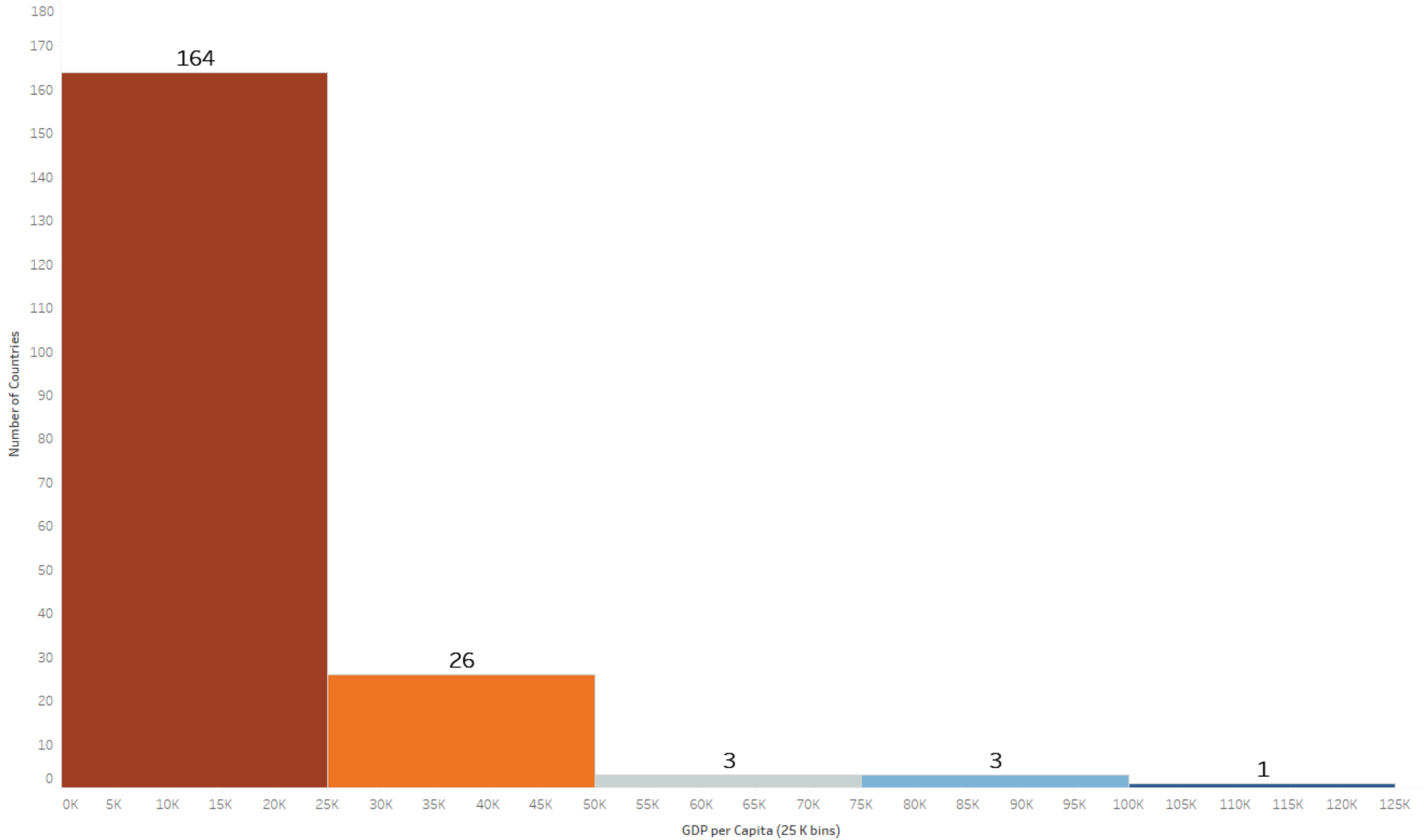
How to make the colors work?

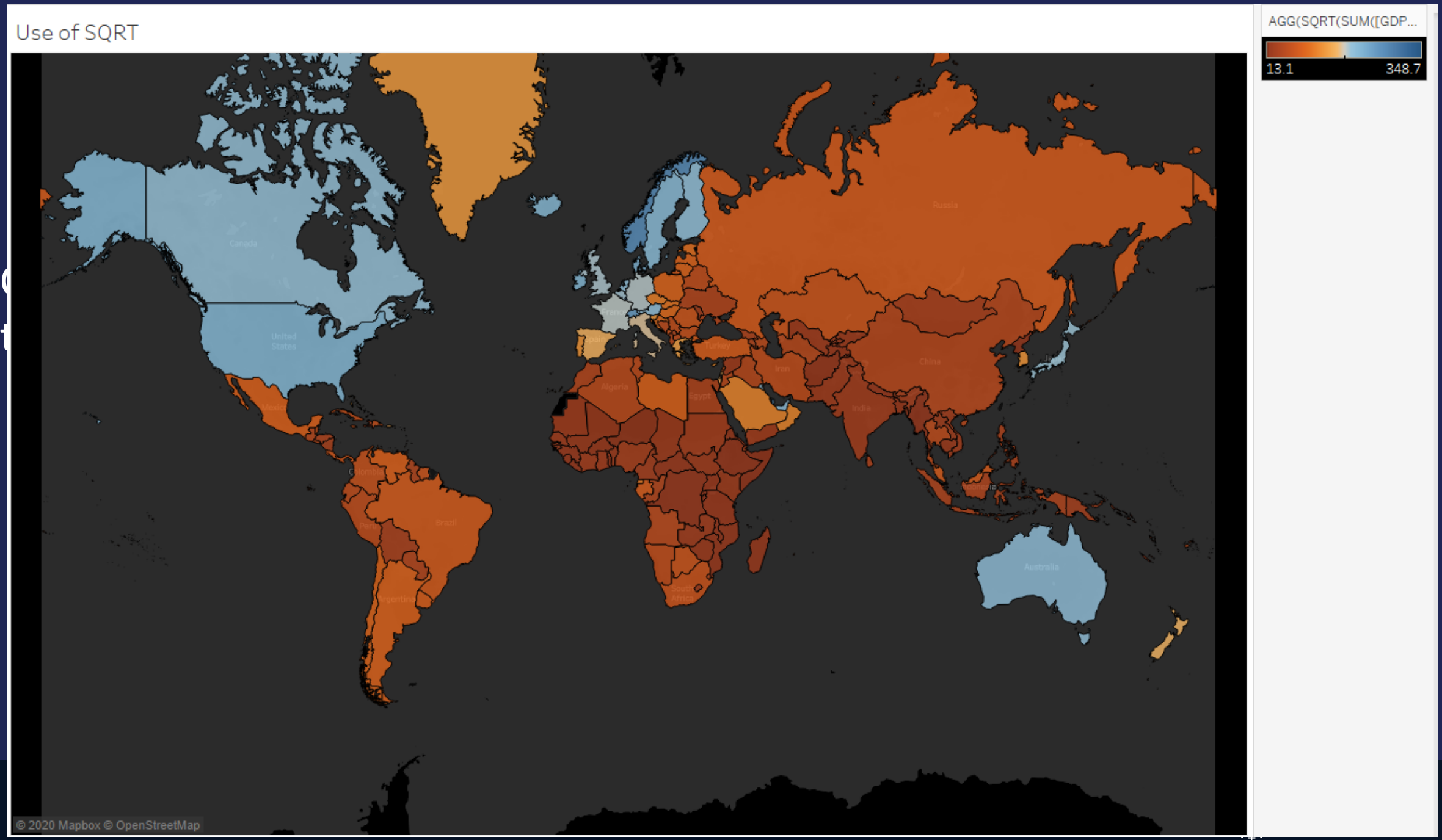

Edit Colors [GDP per Capita]
Palette:
Green
220
145,230
Stepped Color
5
Steps
Reversed
Use Full Color Range
Include Totals
Advanced >>
Reset
OK
Cancel
Apply
Canada
United States
Mexico
Brazil
Peru
Argentina
Greenland
Russia
Kazakhstan
Mongolia
China
India
Australia
GDP per Capita
220
145,230


Edit Colors [GDP per Capita]
Palette:
Orange-Blue Diverging
220
145,230
Stepped Color
5
Steps
Reversed
Use Full Color Range
Include Totals
Advanced >>
Reset
OK
Cancel
Apply
GDP per Capita
220
145,230
Canada
United States
Russia
China
India
Brazil
Australia
Greenland


Greenland
Canada
United States
Russia
Kazakhstan
Mongolia
China
India
Brazil
Australia
Algeria
Libya
Egypt
Saudi Arabia
Sudan
Turkey
Iran
Ukraine
Peru
Argentina
South Africa
GDP per Capita
220
145,230

Distribution of the GDP by Capita




Use of SQRT
AGG(SQRT(SUM([GDP...
13.1
348.7
Canada
United States
Mexico
Colombia
Brazil
Argentina
Algeria
Egypt
Turkey
Iran
India
China
Russia
Australia
© 2020 Mapbox © OpenStreetMap

You can color based on percentiles:

Red for the top 20% poorest countries

Orange for the following 20%

…

Dark Blue for the top 20% richest countries

Pages

Columns: Longitude (generated)

Rows: Latitude (generated)

Filters

YEAR(Year): 2010

AGG(GDP per Capita)

Marks

Map

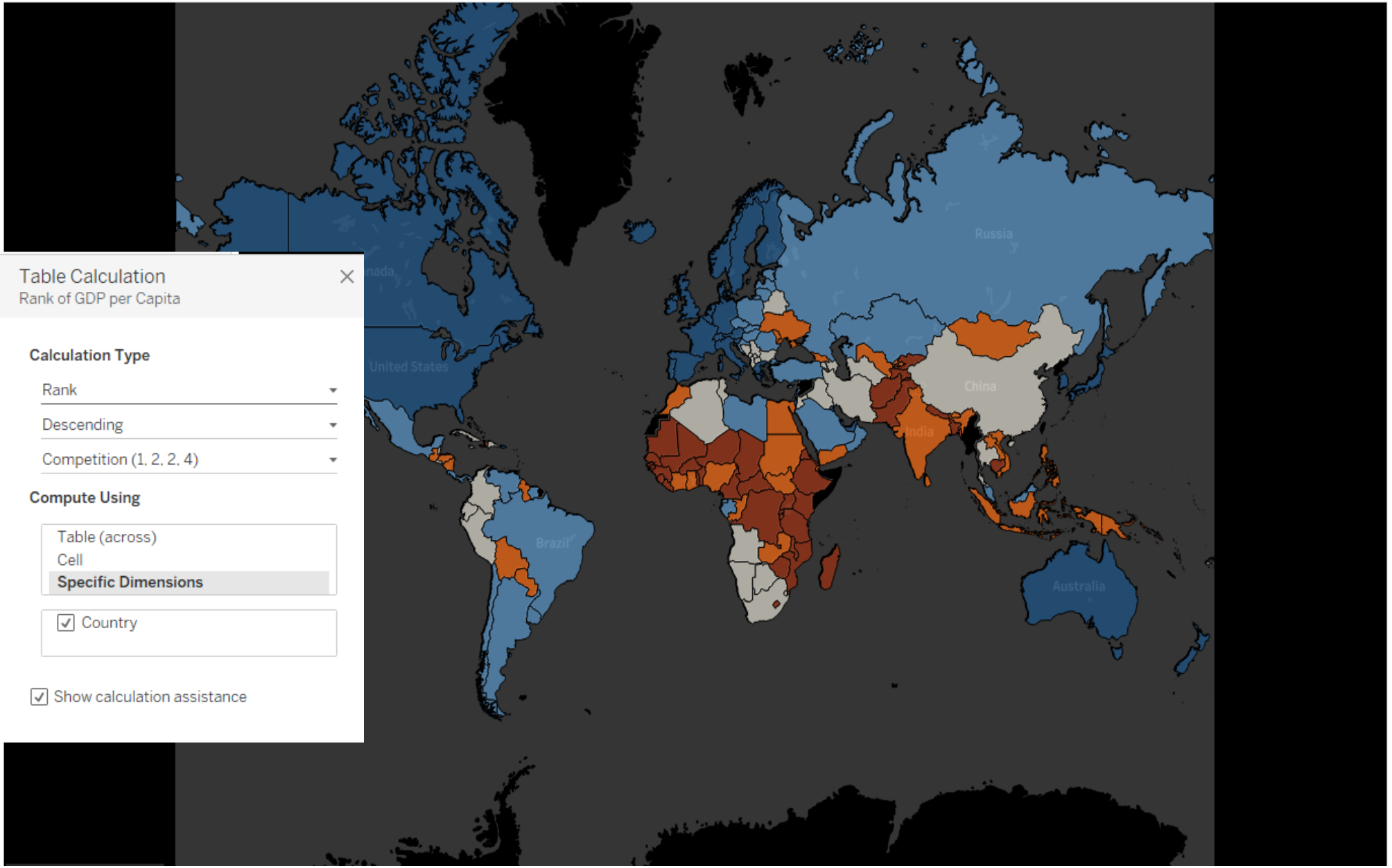
Color | Size | Label

Detail | Tooltip

AGG(GDP p.. Δ

Country

Classification - Ranking - Progressive



Rank of GDP per Capita

1.0 188.0

Table Calculation

Rank of GDP per Capita

Calculation Type

Rank

Descending

Competition (1, 2, 2, 4)

Compute Using

Table (across)

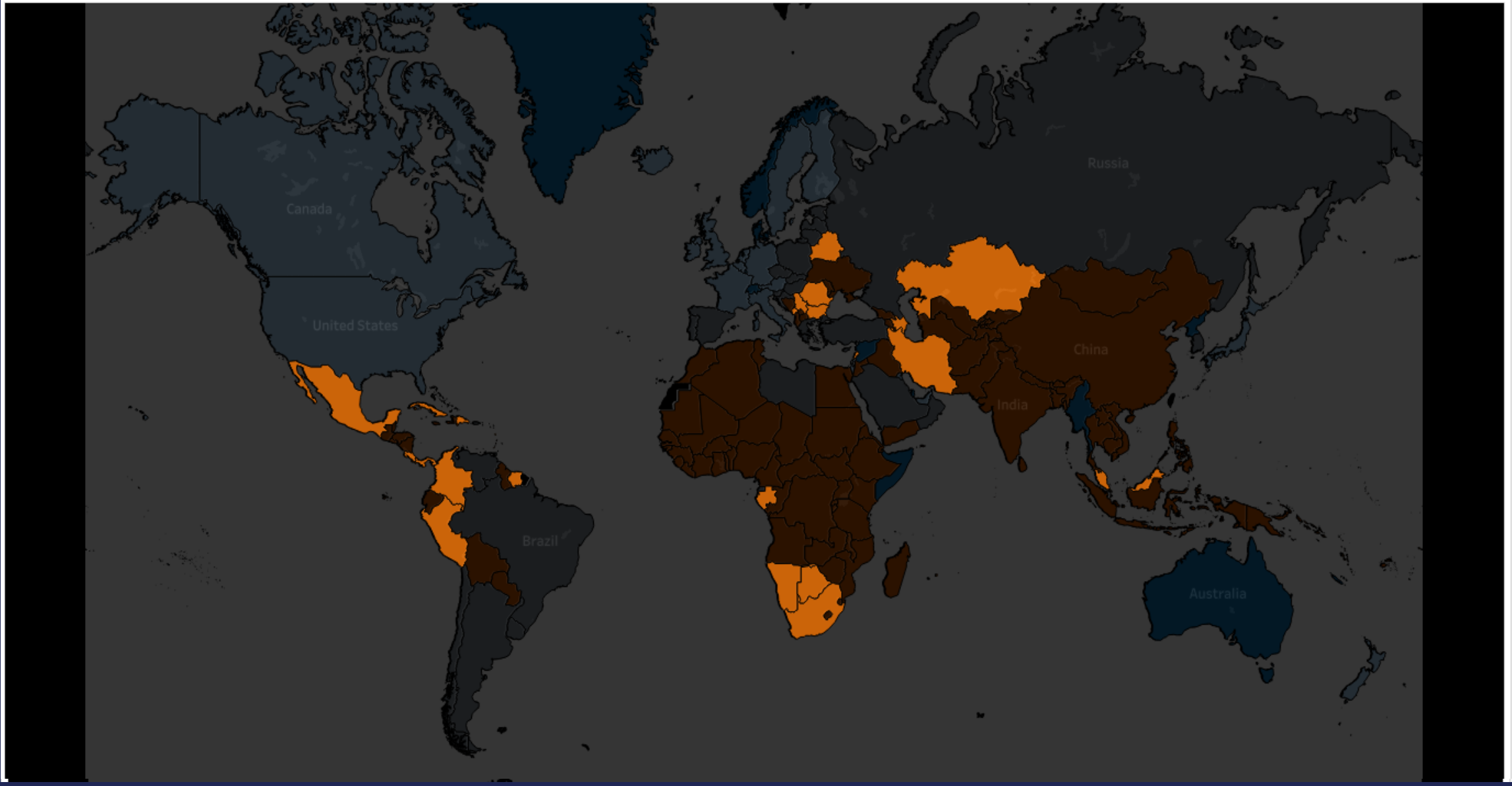
Cell

Specific Dimensions

☑ Country

☑ Show calculation assistance

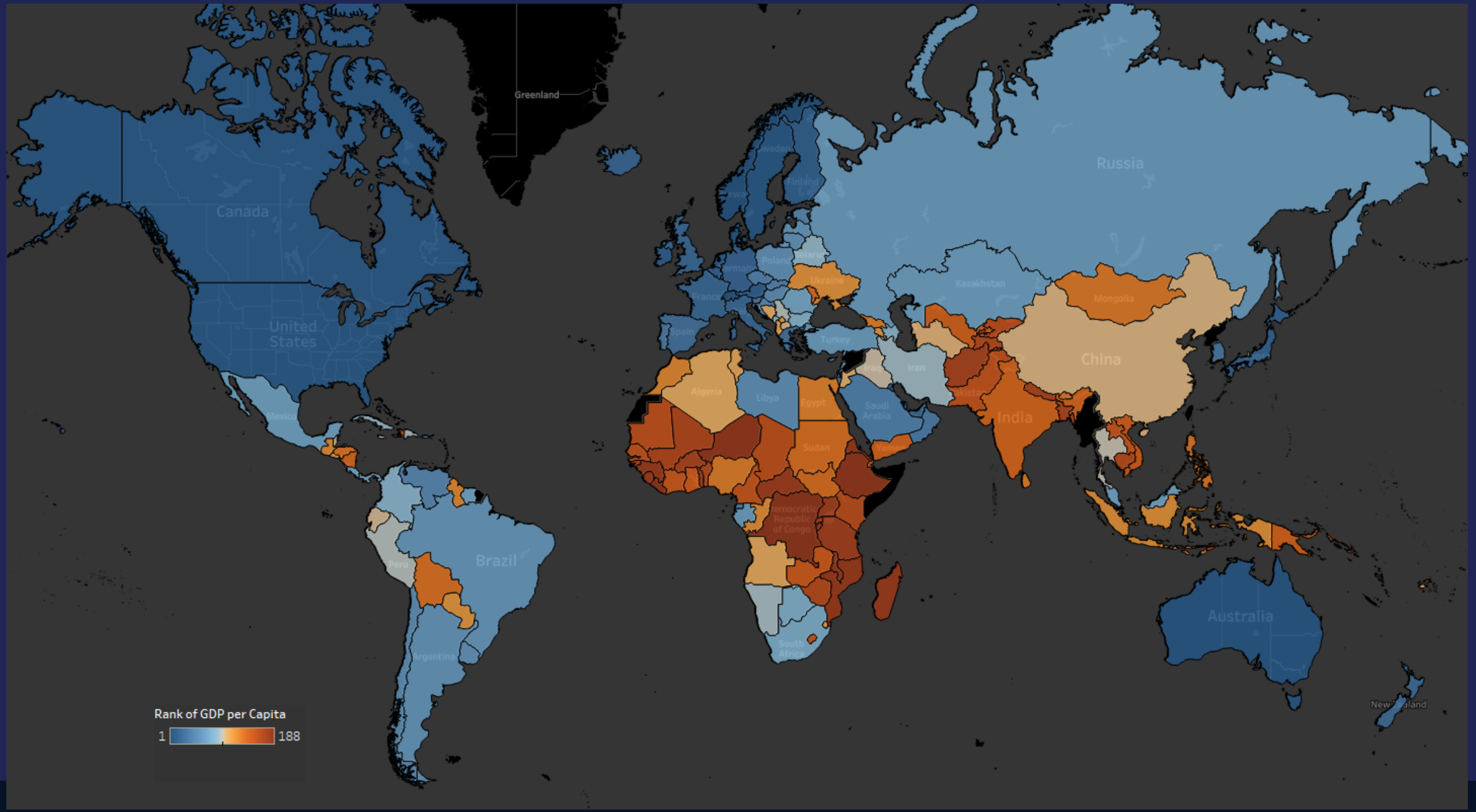
Classification - manual



AGG(GDP per Capita Cl...

- 1. Very Poor
- 2. Poor
- 3. Average
- 4. Rich
- 5. Very Rich

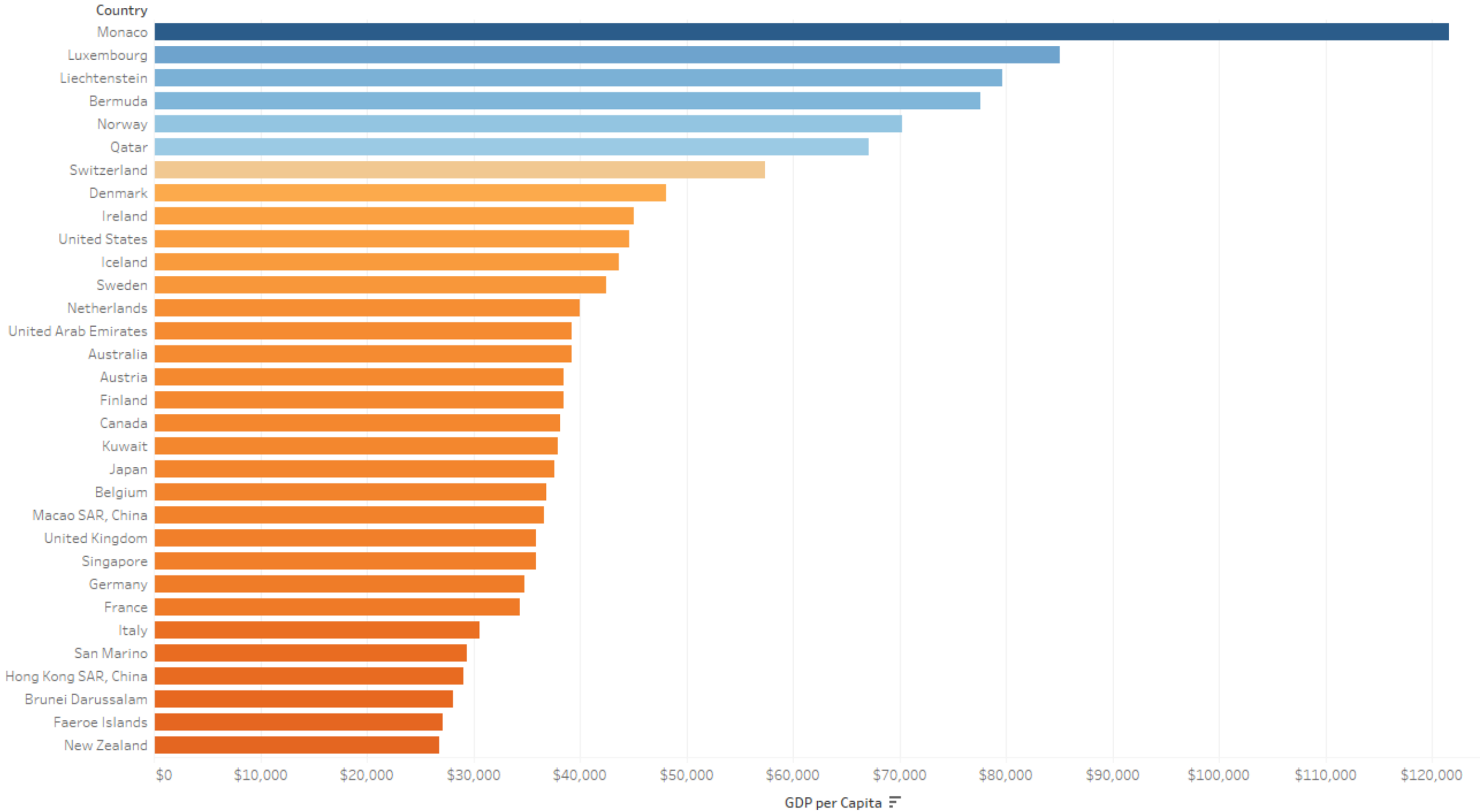
+ableau



Which is the richest country ?

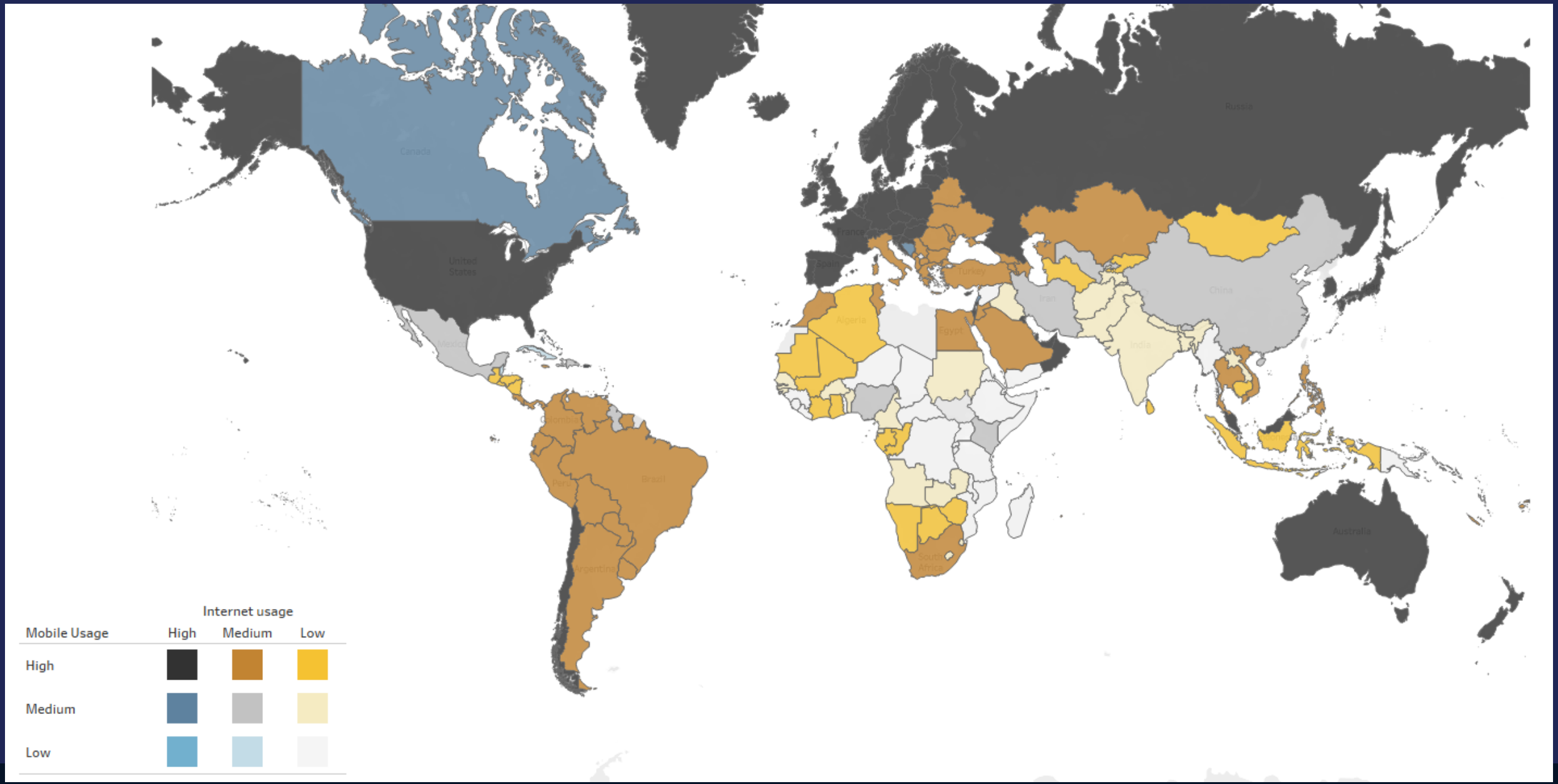
tableau

Which is the richest country - Bar

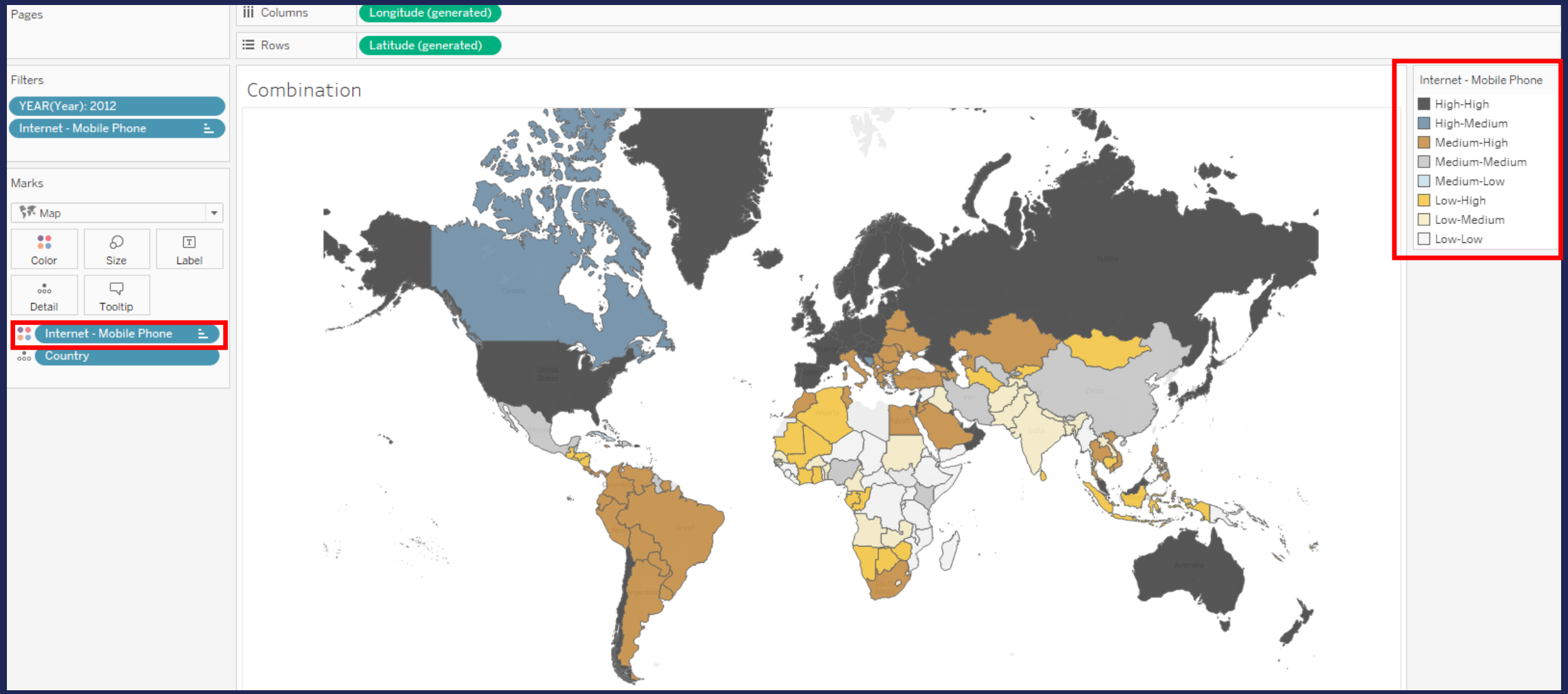


What if I want to show 2 measures at once ?

Bivariate choropleth maps


Canada
United States
Russia
France
Spain
Turkey
China
Iran
Algeria
Egypt
India
Mexico
Colombia
Peru
Brazil
Argentina
South Africa
Australia
Internet usage
Mobile Usage
High
Medium
Low
High
Medium
Low

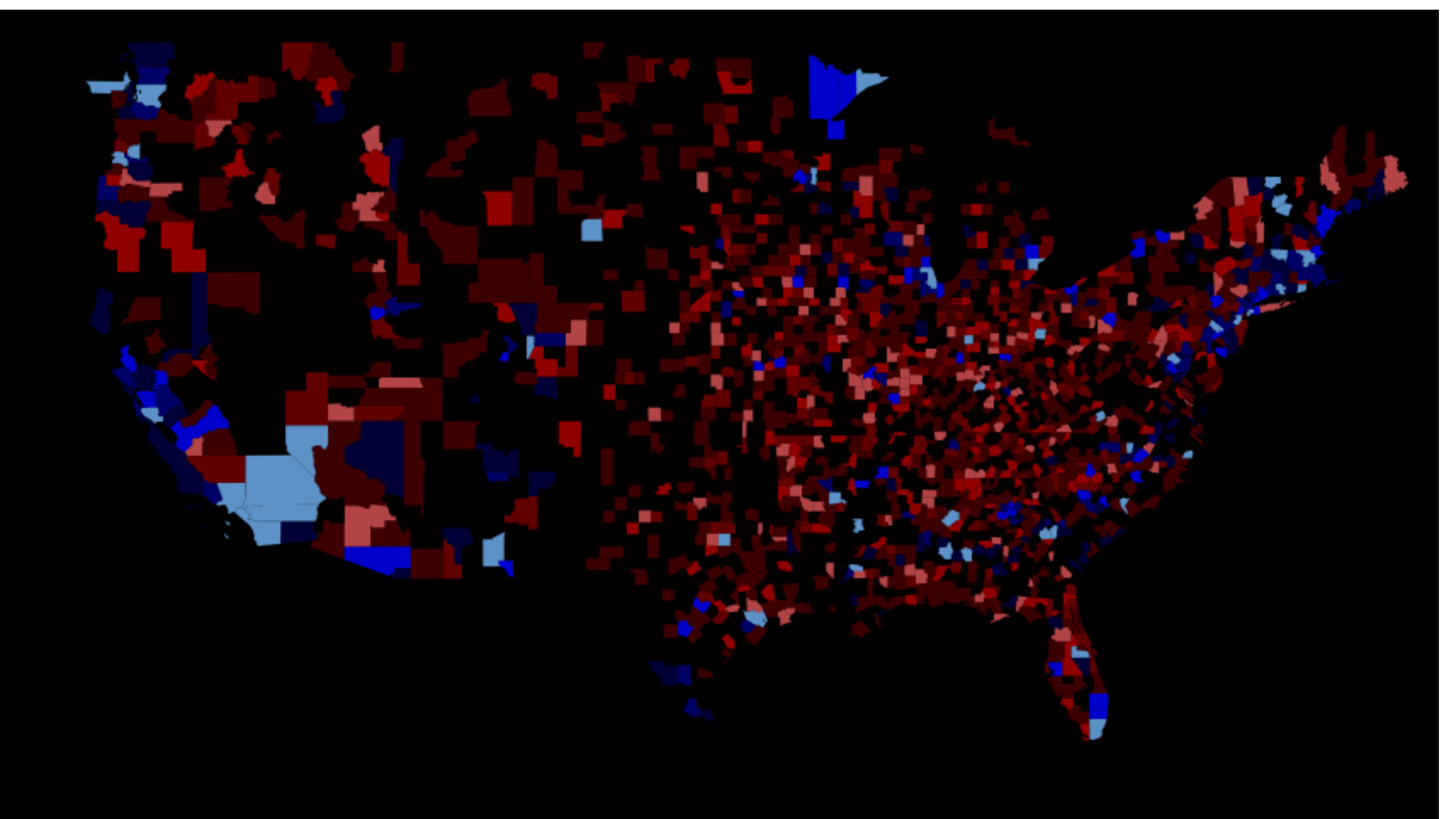
+ableau


Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
YEAR(Year): 2012
Internet - Mobile Phone
Marks
Map
Color
Size
Label
Detail
Tooltip
Internet - Mobile Phone
Country
Combination
Internet - Mobile Phone
High-High
High-Medium
Medium-High
Medium-Medium
Medium-Low
Low-High
Low-Medium
Low-Low

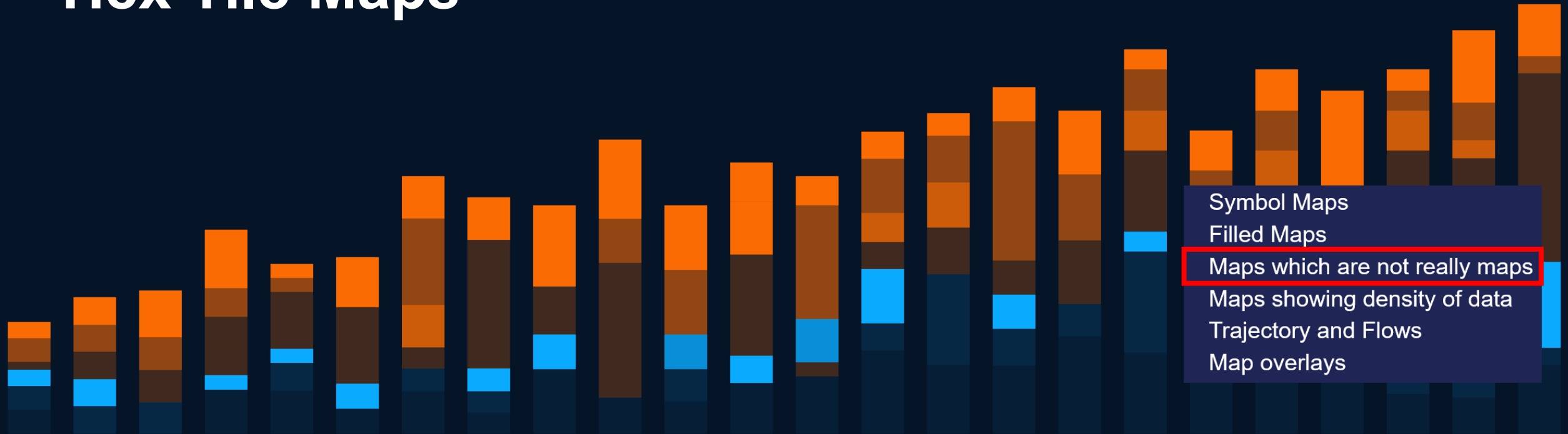
Value by alpha map

The second variable is used as an **opacity mask**

Good to factor in the population of the area



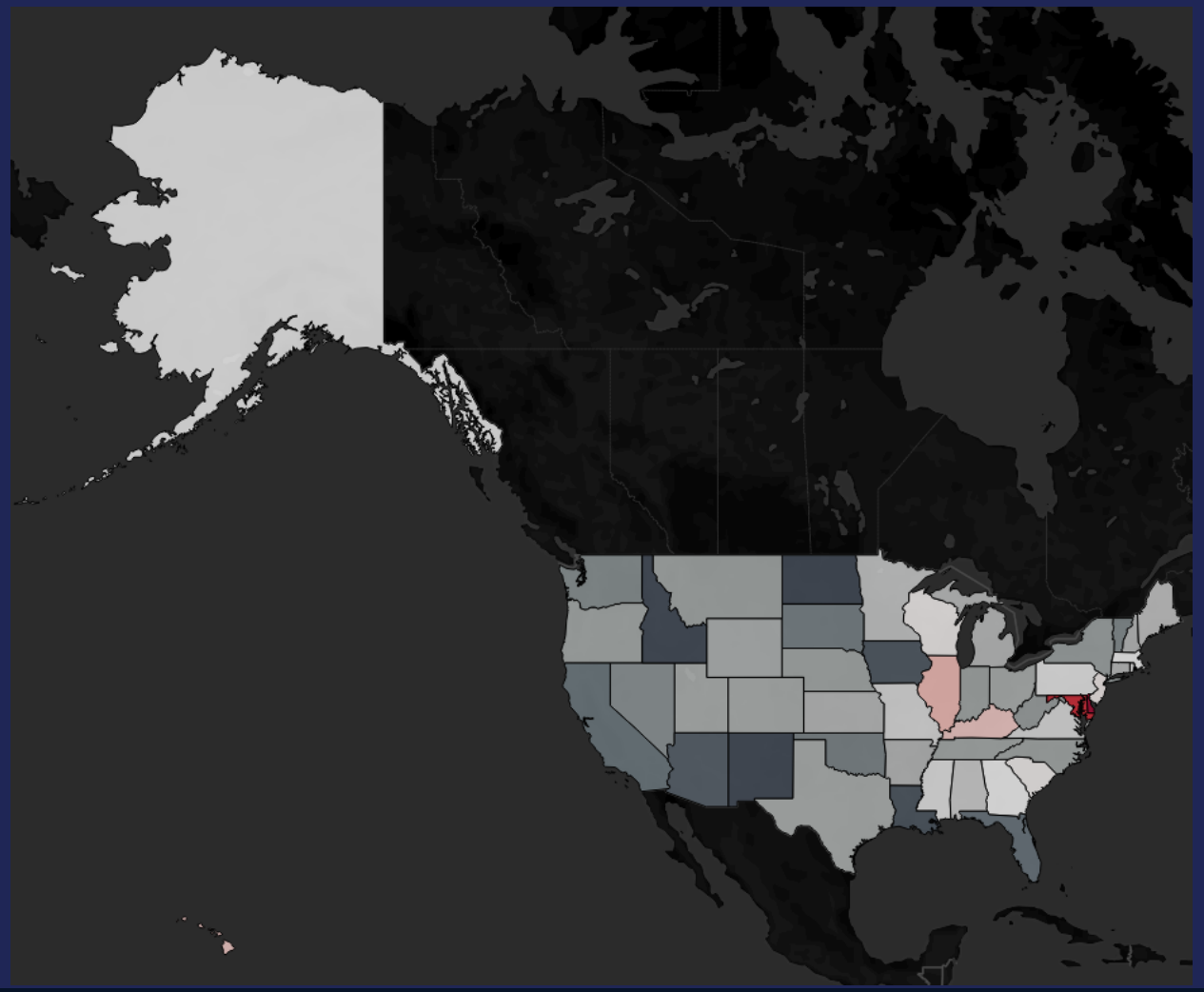
Maps Which are Not Really Maps !
Hex Tile Maps



Issues of Filled Maps

Easy to miss small areas

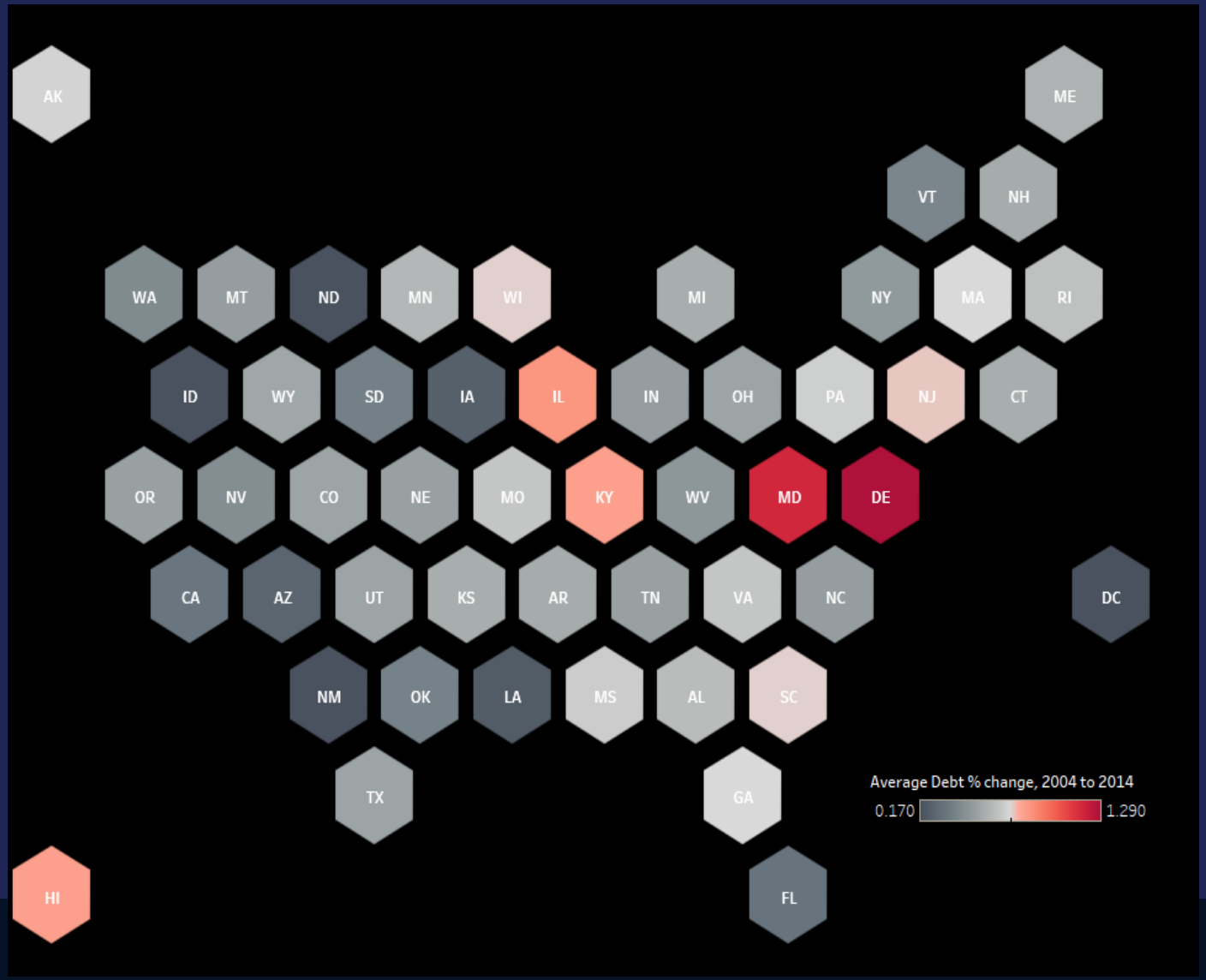
Make it hard to use small areas as a filter



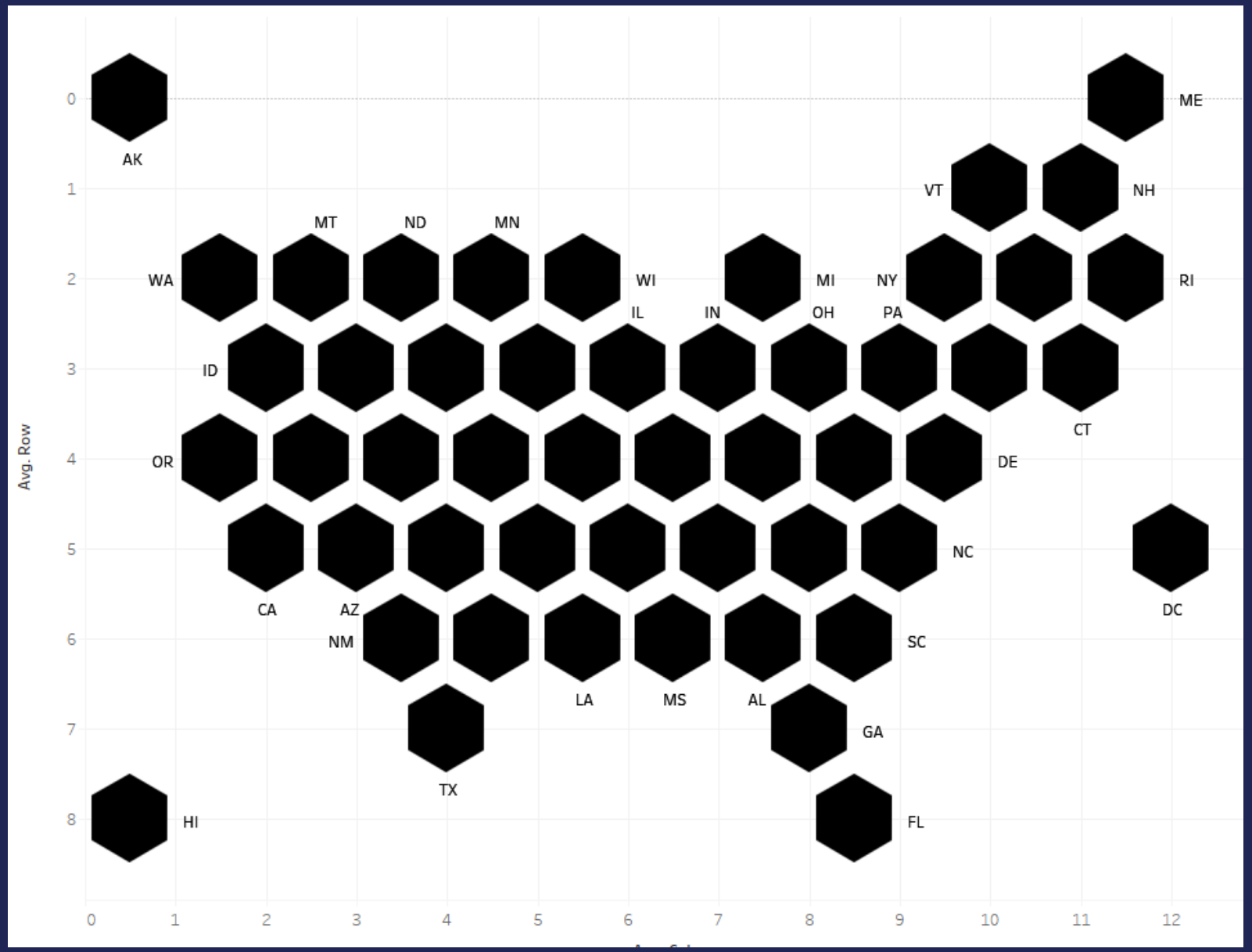
What if we could have all the states at the same size ?

+ableau

Hex Tile Maps



+ableau


Avg. Row
0
1
2
3
4
5
6
7
8
0
1
2
3
4
5
6
7
8
9
10
11
12
AK
ME
VT
NH
MT
ND
MN
WA
WI
MI
NY
RI
IL
IN
OH
PA
ID
CT
OR
DE
NC
DC
CA
AZ
NM
SC
LA
MS
AL
GA
TX
HI
FL

How to show Density of Data

Point distribution map – Density Maps – Square bins – Hexbins

Example: How to Visualize Density of Tornadoes in the US

L	Q	V	X	AA
Date	Fataliti	Injuries	Latitud	Longitu
22/06/1957	0	0	39	-94.58
22/06/1957	0	0	39.25	-94.4
31/05/1958	0	1	38.92	-90.65
31/05/1958	0	1	38.87	-90.53
21/06/1960	0	0	40.83	-102.38
24/05/1965	0	0	37.3	-103.33
23/08/1971	0	0	42.92	-78.7
23/08/1971	0	0	42.93	-78.65
27/08/1971	0	0	38.92	-74.93
27/08/1971	0	0	39.32	-74.78
17/06/1973	0	0	38.72	-90.13
29/06/1973	0	0	40.23	-75.03
29/06/1973	0	0	40.25	-74.98
10/07/1979	0	0	33.63	-96.58
11/02/1981	0	0	33.95	-80.85
6/03/1982	0	0	27.75	-82.68
6/03/1982	0	0	27.77	-82.63
18/06/1982	0	0	28.98	-81.32
18/06/1982	0	0	29.07	-81.27
4/06/1983	0	0	35.7	-85.27
4/06/1983	0	0	35.72	-85.38
1/07/1983	0	0	43.4	-97.13
21/03/1984	0	0	37.2	-79.3
23/04/1984	0	0	31.77	-82.48

Records of all tornadoes since 1950
120K records

+ableau

Point Distribution Map

tableau

Tableau - TC

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Show Me

Data | Analytics

PB2002_orogens
Plate_Boundaries
Plate_Boundaries.shp+ (Multiple Con...
Plate_Boundaries.shp+ (Multiple Con...
query (Mag6PlusEarthquakes_1900-...
Sheet1 (Prevalence)
Sheet2 (billionaires by country)
Sheet2 (crime in the US by State)
significantvolcanoeruptions
Storm
tornadoes_1950_2015
Train Load Data
World Indicators

Dimensions

Point ID (bin)
Round Latitude
Round Longitude
Show Date
State
State (group)
State Number
Time
Tornado ID
Year

Measures

1st County FIPS
2nd County FIPS
3rd County FIPS
4th County FIPS
Angle
Calculation2
Crop Loss
Ending Latitude
Ending Longitude
Fatalities

Parameters

Date Parameter
Health Exp Threshold
Hex Size
Measure
Number decimals

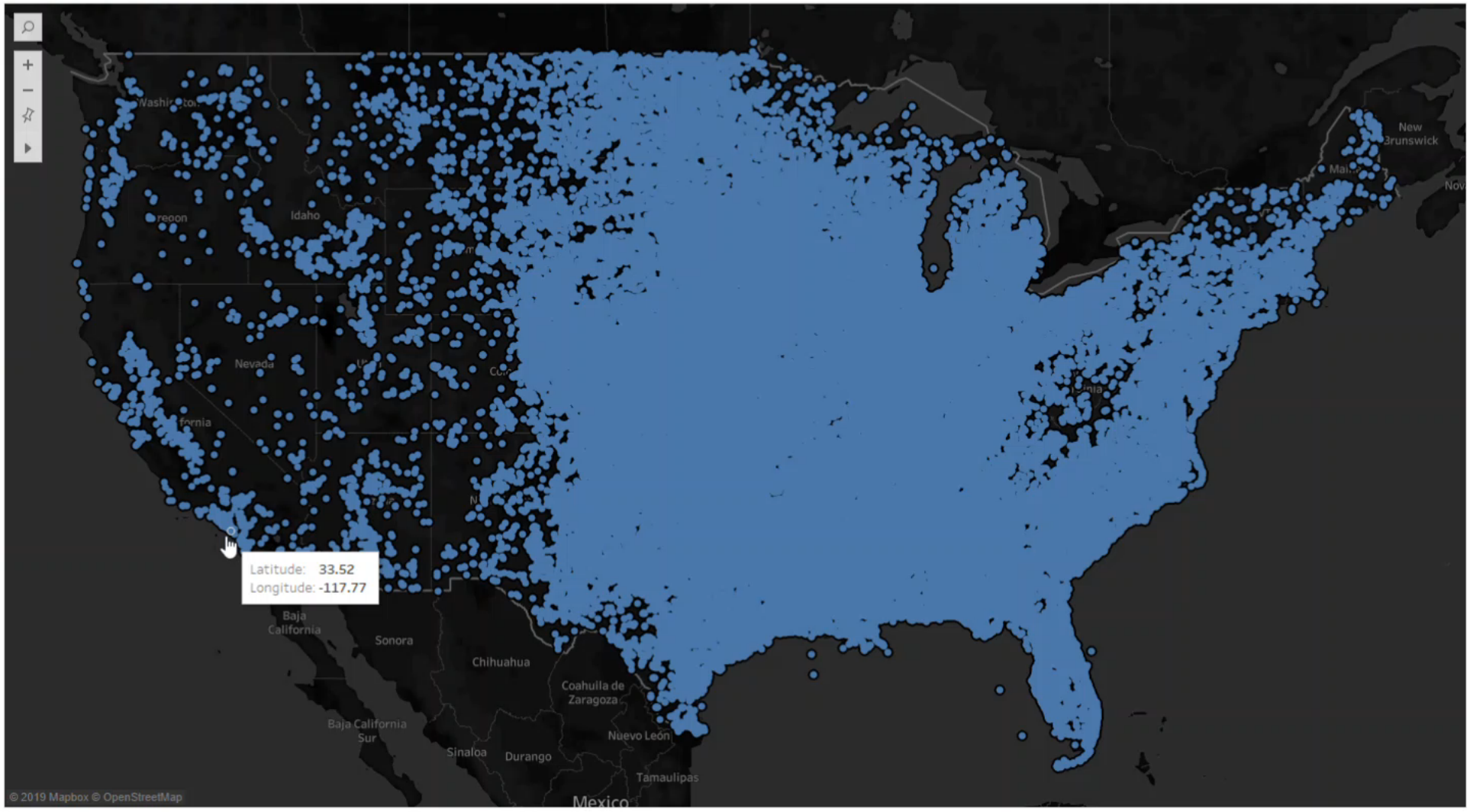
Pages

Filters
Exclusions (L...

Marks
Automatic
Color Size Label
Detail Tooltip

Columns: Longitude
Rows: Latitude

Point distribution map (4)



Data Source | Adult obesity in California | Dashboard 4 | Point distribution map (2) | Point distribution map (3) | Point distribution map | Point distribution map (4) | Density | Density injury | Roudning lat and long | Roudning lat and long (2) | Roudning lat and long (3) | Roudning lat and long (4) | Roud

77684 marks 1 row by 1 column

Heatmap (Density) Map

tableau

Tableau - TC

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Show Me

Data | Analytics

PB2002_orogens
Plate_Boundaries
Plate_Boundaries.shp+ (Multiple Con...
Plate_Boundaries.shp+ (Multiple Con...
query (Mag6PlusEarthquakes_1900-...
Sheet1 (Prevalence)
Sheet2 (billionaires by country)
Sheet2 (crime in the US by State)
significantvolcanoeruptions
Storm
tornadoes_1950_2015
Train Load Data
World Indicators

Dimensions

Point ID (bin)
Round Latitude
Round Longitude
Show Date
State
State (group)
State Number
Time
Tornado ID
Year

Measures

1st County FIPS
2nd County FIPS
3rd County FIPS
4th County FIPS
Angle
Calculation2
Crop Loss
Ending Latitude
Ending Longitude
Fatalities

Parameters

Date Parameter
Health Exp Threshold
Hex Size
Measure
Number decimals

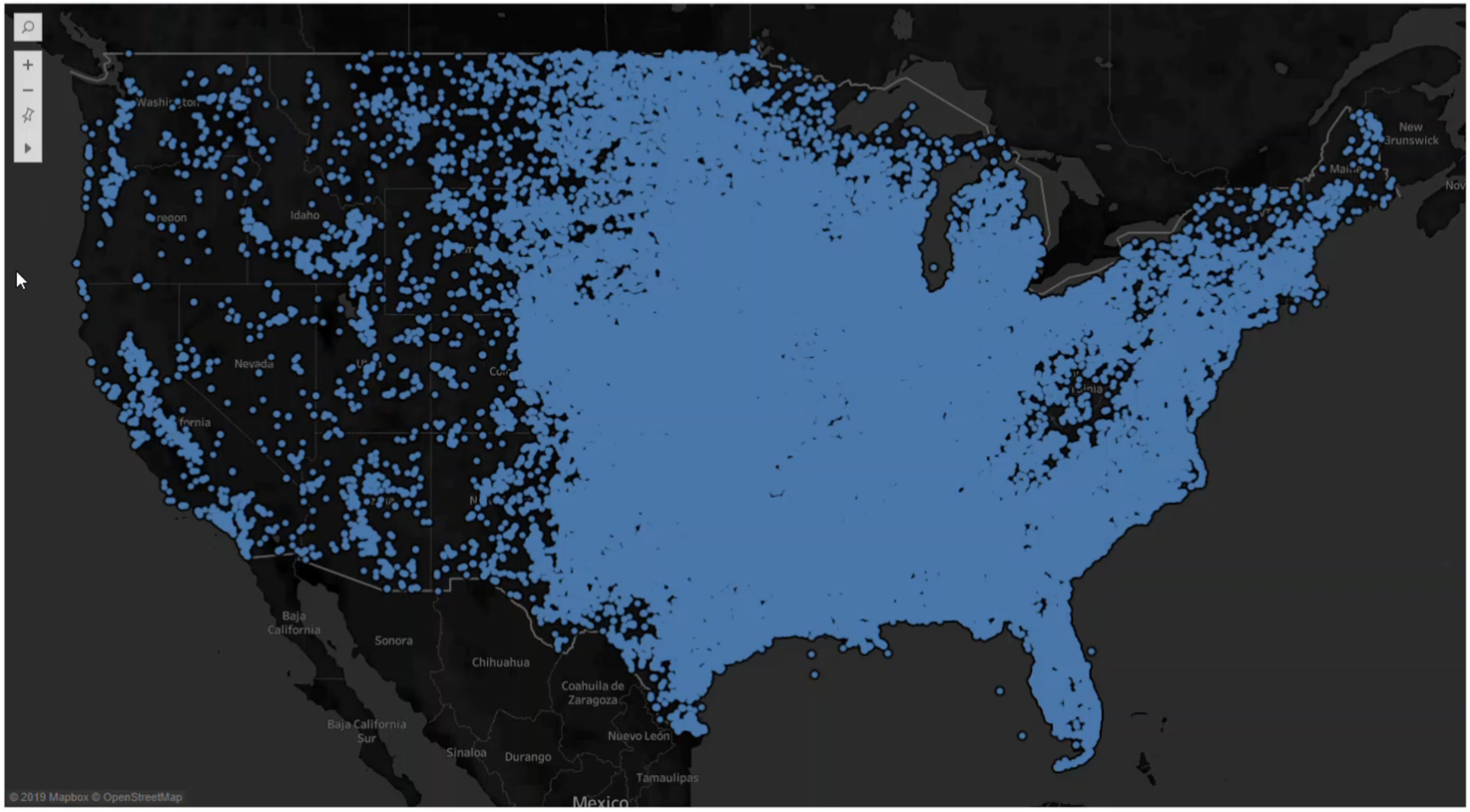
Pages

Filters
Exclusions (L...
Action (LatRo...
Action (HexL...

Marks
Automatic
Color Size Label
Detail Tooltip
Tornado ID

Columns: Longitude
Rows: Latitude

Point distribution map (2)

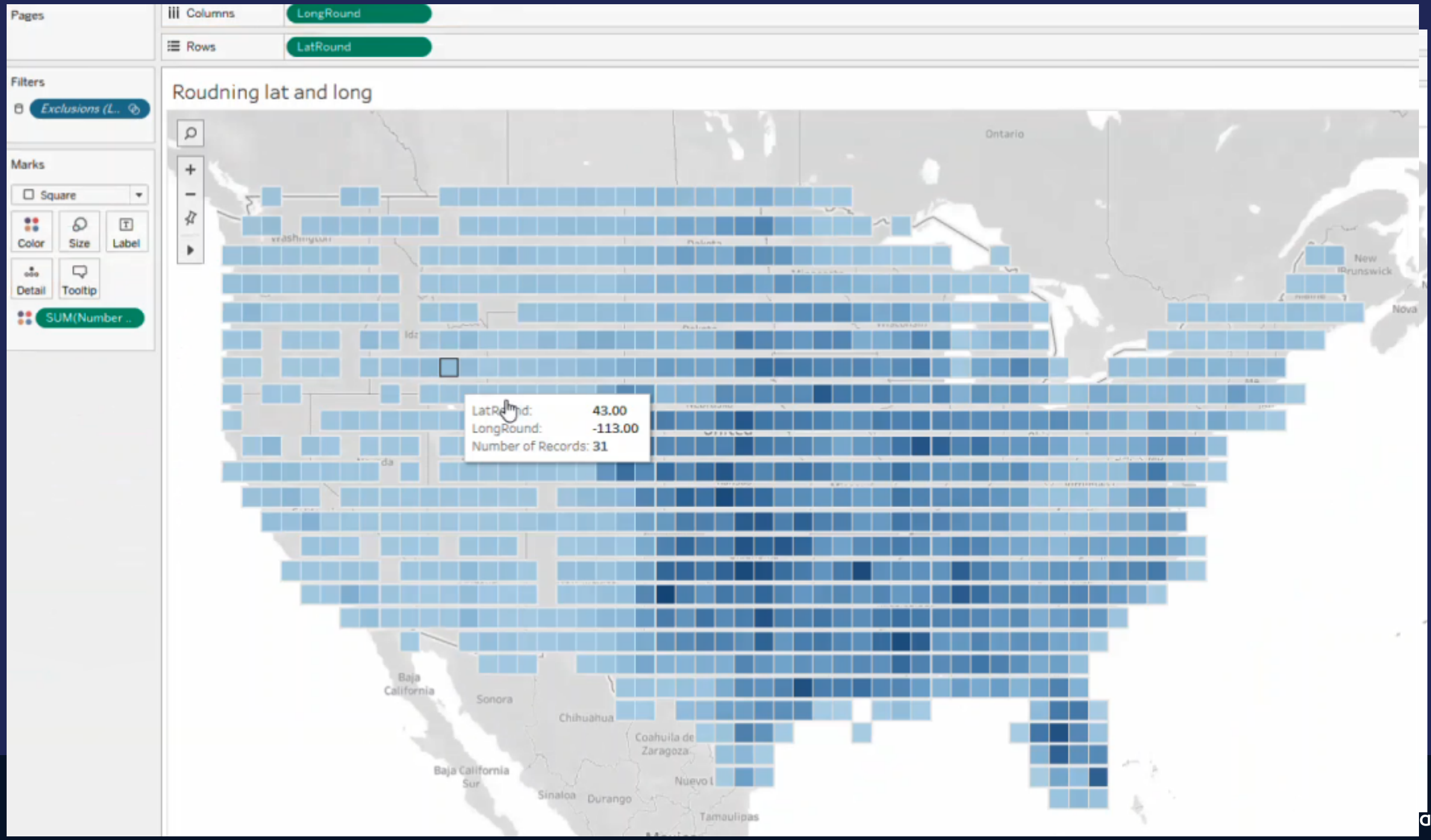


Data Source | Adult obesity in California | Dashboard 4 | Point distribution map (2) | Point distribution map (3) | Point distribution map | Point distribution map (4) | Density | Density injury | Roudning lat and long | Roudning lat and long (2) | Roudning lat and long (3) | Roudning lat and long (4) | Roud

84298 marks 1 row by 1 column

Square Bins

We want to count the number of tornadoes on a given area

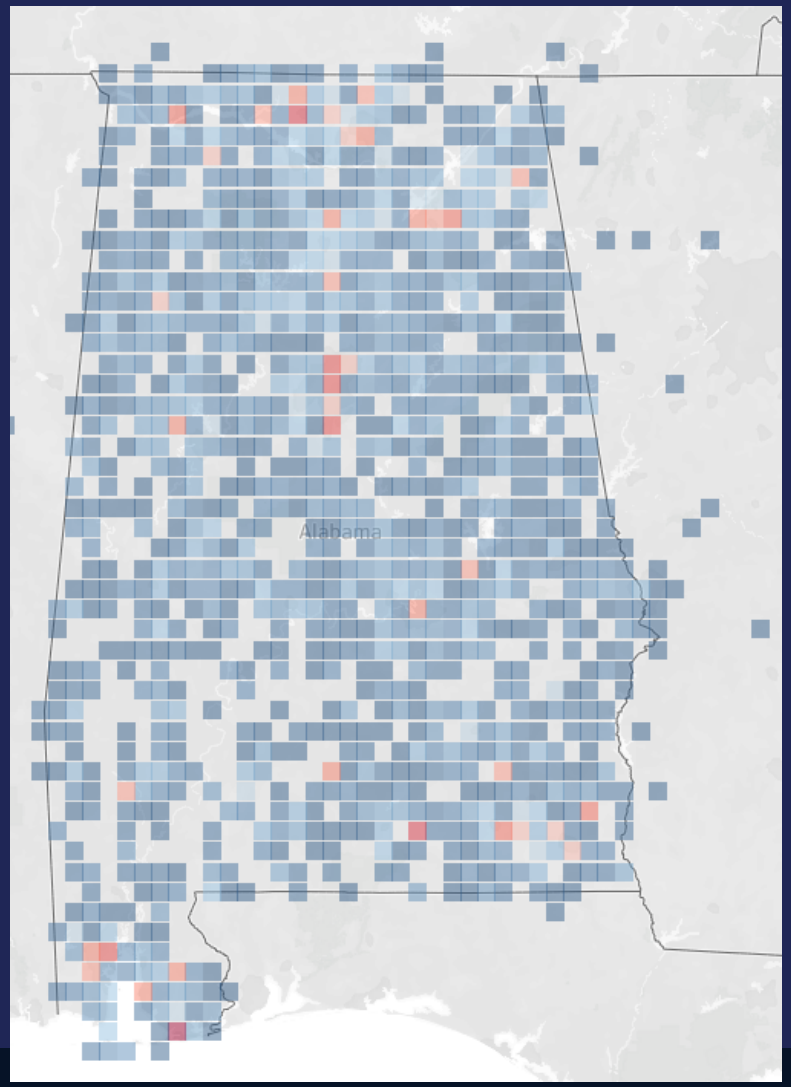

Pages
Columns
LongRound
Rows
LatRound
Filters
Exclusions (L...
Marks
Square
Color
Size
Label
Detail
Tooltip
SUM(Number ..
Roudning lat and long
Ontario
New Brunswick
Nova
LatRound: 43.00
LongRound: -113.00
Number of Records: 31
Baja California
Sonora
Chihuahua
Coahuila de Zaragoza
Baja California Sur
Sinaloa
Durango
Nuevo L
Tamaulipas

Rounding Lat and Long to Closest Integer Creates Square of 69x69 Miles (at equator)

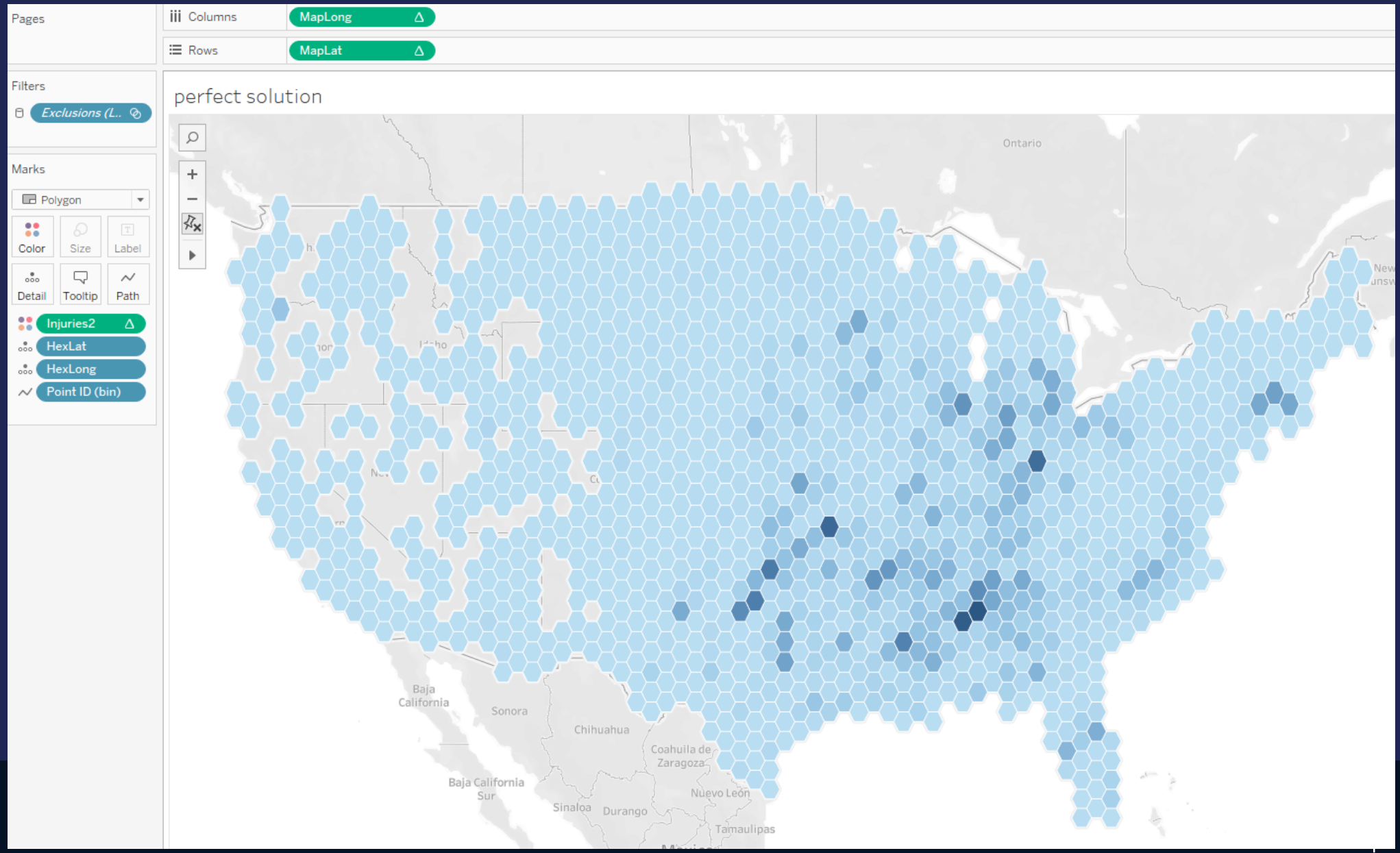
If need to be more precise than that…

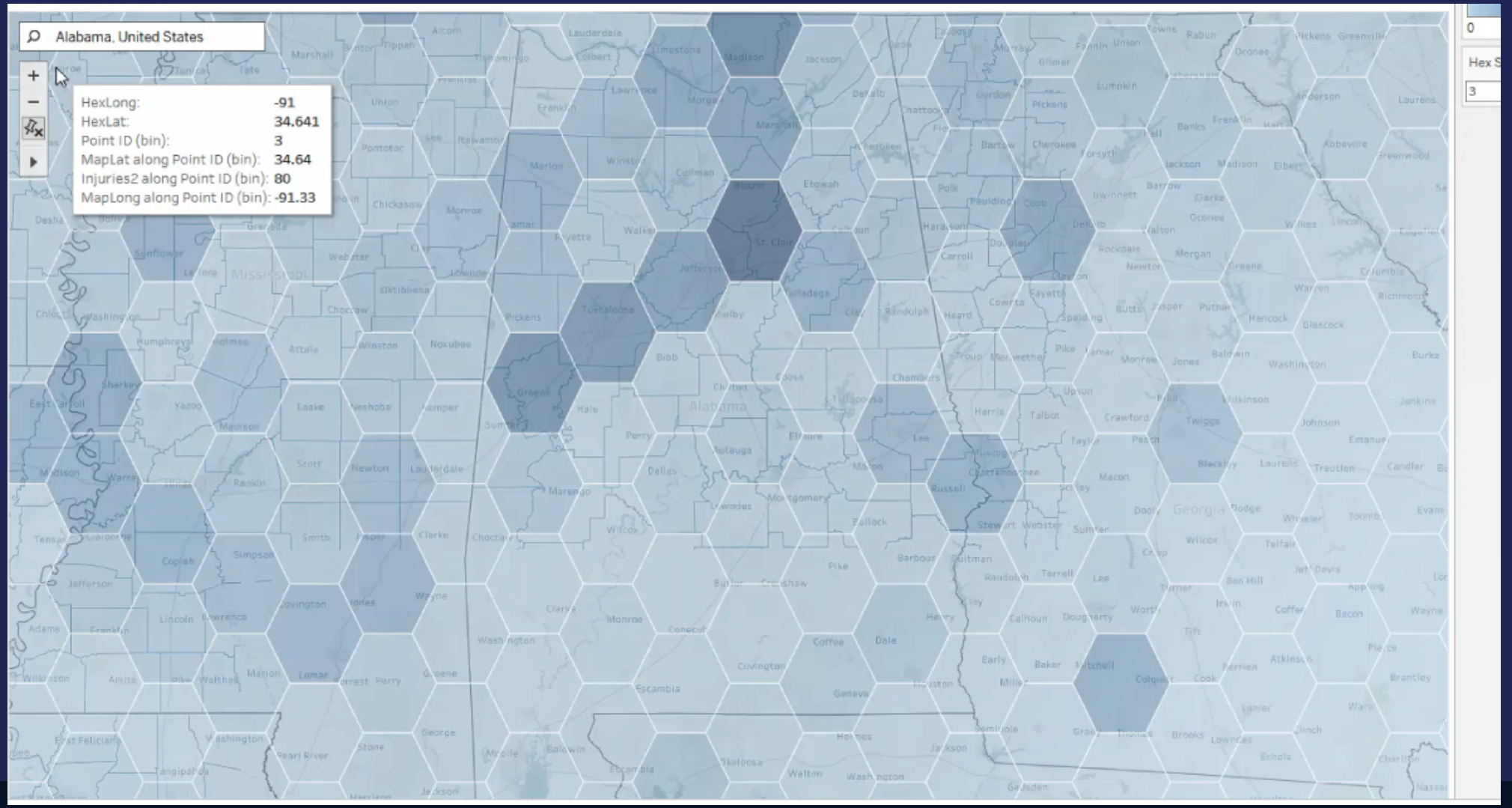
LatRound2 | tornadoes_1950_2015

```
round([Latitude],[Number decimals])
```



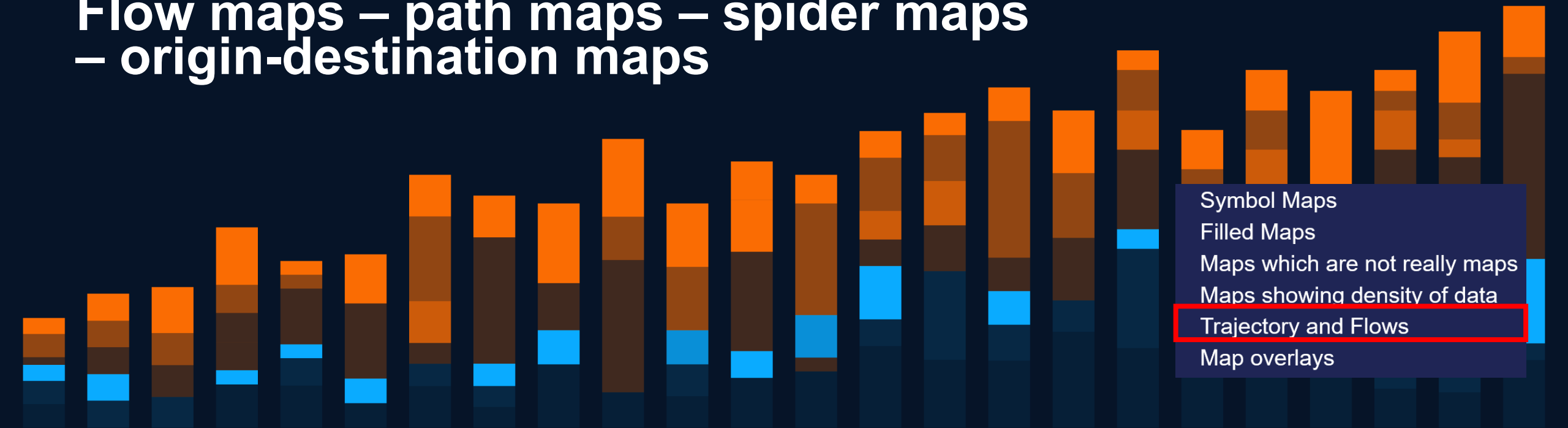
The Ultimate Solution: Hexabins




Alabama, United States
HexLong: -91
HexLat: 34.641
Point ID (bin): 3
MapLat along Point ID (bin): 34.64
Injuries2 along Point ID (bin): 80
MapLong along Point ID (bin): -91.33
Hex S
0
3

How to Show Trajectory or Flow Between Locations

Flow maps – path maps – spider maps – origin-destination maps



Case 1: Trajectory with a sequence of locations

One row by Location

Each row contains:

- Group: Hurricane, train line, etc.
- Sequence (or Time)
- Latitude
- Longitude

Hurricane	Type	Date	DateTime	Time	Lat	Long	Pressure	Wind
ALLISON	Tropical cyclone of tropical storm intensity (34-63 knots)	5/06/2001	5/06/2001 12:00:00 AM	1200	27.5000	-95.000	1,007	40
ALLISON	Tropical cyclone of tropical storm intensity (34-63 knots)	5/06/2001	5/06/2001 12:00:00 AM	1800	28.5000	-95.300	1,002	50
ALLISON	Tropical cyclone of tropical storm intensity (34-63 knots)	5/06/2001	5/06/2001 12:00:00 PM	2100	28.9000	-95.300	1,003	45
ALLISON	Tropical cyclone of tropical storm intensity (34-63 knots)	6/06/2001	6/06/2001 12:00:00 AM	0	29.3000	-95.300	1,003	45
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	6/06/2001	6/06/2001 12:00:00 AM	600	30.1000	-95.200	1,006	30
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	6/06/2001	6/06/2001 12:00:00 AM	1200	31.0000	-95.200	1,005	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	6/06/2001	6/06/2001 12:00:00 AM	1800	31.5000	-95.000	1,005	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	7/06/2001	7/06/2001 12:00:00 AM	0	31.6000	-95.000	1,005	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	7/06/2001	7/06/2001 12:00:00 AM	600	31.8000	-94.900	1,006	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	7/06/2001	7/06/2001 12:00:00 AM	1200	31.4000	-94.900	1,006	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	7/06/2001	7/06/2001 12:00:00 AM	1800	31.1000	-95.000	1,007	15
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	8/06/2001	8/06/2001 12:00:00 AM	0	30.9000	-95.600	1,002	15
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	8/06/2001	8/06/2001 12:00:00 AM	600	30.7000	-96.100	1,004	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	8/06/2001	8/06/2001 12:00:00 AM	1200	30.4000	-96.200	1,007	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	8/06/2001	8/06/2001 12:00:00 AM	1800	30.2000	-96.100	1,007	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	9/06/2001	9/06/2001 12:00:00 AM	0	29.9000	-95.900	1,007	20
ALLISON	Tropical cyclone of tropical depression intensity (< 34 knots)	9/06/2001	9/06/2001 12:00:00 AM	600	29.6000	-95.800	1,007	20

Pages

Columns AVG(Long)

Rows AVG(Lat)

Filters

YEAR(DateTime): 20..

Marks

Line

Color Size Label

Detail Tooltip Path

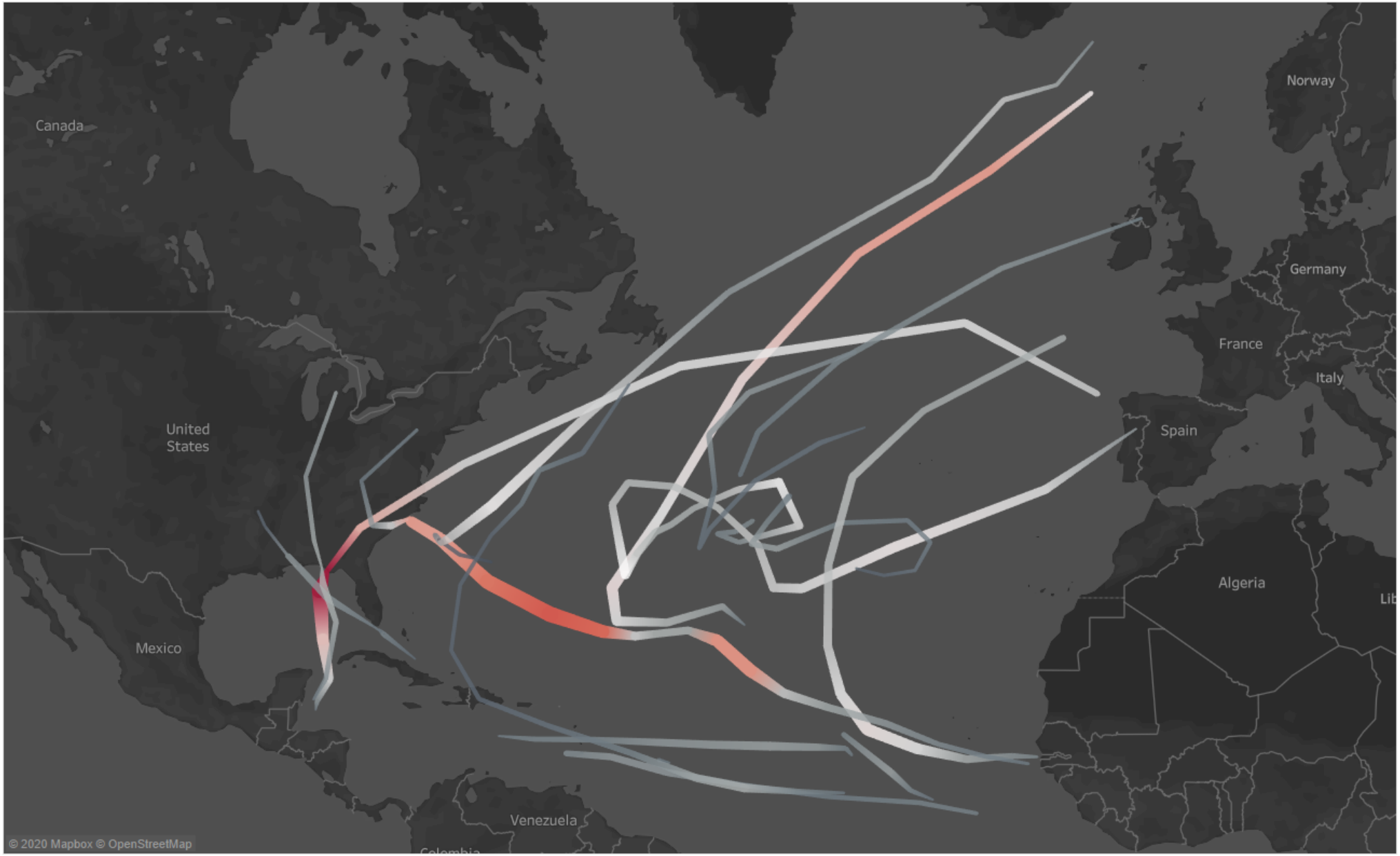
MIN(Pressu..

SUM(Wind)

Hurricane

DateTime

Wind Speed and Atmospheric Pressure



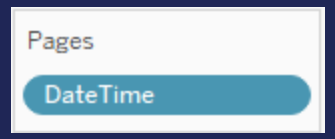
MIN(Pressure)

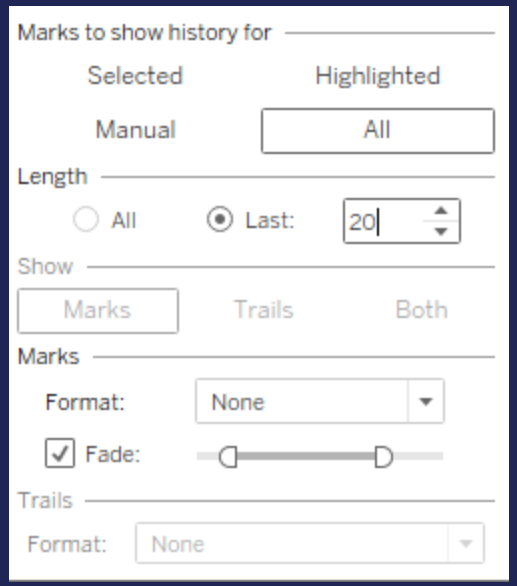
919 1,020

SUM(Wind)

25
100
200
300
400
490

Animations can be created by using the “Pages” shelf
It can help to understand the exact sequence of events





animation all years - 5/06/2001 12:00:00 AM

SUM(Wind)

10
200
400
615

Tornado

ALBERTO
ALEX
ALLISON
ALPHA
ANA
ANDREA
ARLENE
ARTHUR
BARRY
BERTHA
BERYL
BETA
BILL
BONNIE
BRET
CHANTAL
CHARLEY
CHRIS
CINDY
CLAUDETTE
COLIN
CRISTOBAL
DANIELLE
DANNY
DEAN
DEBBY
DELTA
DENNIS
DOLLY
DON
DORIAN
EARL
EDOUARD
EIGHT
EMILY
EPSILON
ERIKA
ERIN
ERNESTO

DateTime

5/06/2001 12...

Show history

Case 2: Source-Destination maps

One row by Flow / Path

Each row contains:

- **Location 1 (City, Country)**
- **Location 2 (City, Country)**
- **Measures. Ex: Number of Migrants**

OR

Each row contains:

- **Lat Location 1**
- **Long Location 1**
- **Lat Location 2**
- **Long Location 2**
- **Measures. Ex: Number of flights**

Country of destination	Country of origin	Number of Migrants
United States of America	Mexico	12,683,066
United Arab Emirates	India	3,310,419
Ukraine	Russian Federation	3,309,525
Russian Federation	Ukraine	3,272,304
Turkey	Syria	3,271,533
India	Bangladesh	3,139,311
Russian Federation	Kazakhstan	2,562,079
United States of America	China	2,422,998
Kazakhstan	Russian Federation	2,411,227
China, Hong Kong SAR	China	2,343,868
Iran (Islamic Republic of)	Afghanistan	2,324,884
United States of America	India	2,307,909
Saudi Arabia	India	2,266,216
United States of America	Philippines	2,076,253
Jordan	Palestinian Territories	2,046,650
Germany	Poland	1,936,653

Latitude City1	Longitude City1	Latitude City2	Longitude City2	Number of flights	Top carriers
3.141	101.686	1.289	103.85	29383	Malaysia Airlines, Singapore Airlines, AirAsia, SilkAir, Jetstar Asia
22.285	114.157	25.0486	121.5357	29494	Cathay Pacific, China Airlines, EVA Airlines, Hong Kong Airlines, C
22.285	114.157	25.0486	121.5357	29494	Cathay Pacific, China Airlines, EVA Airlines, Hong Kong Airlines, C
-6.214	106.845	1.289	103.85	26872	Singapore Airlines, Garuda, Lion Air, Jetstar Asia, Indonesia AirAs
22.285	114.157	31.1667	121.4667	20818	Cathay Dragon, China Eastern Airlines, Hong Kong Airlines, Cathay
22.285	114.157	31.1667	121.4667	20818	Cathay Dragon, China Eastern Airlines, Hong Kong Airlines, Cathay
-6.214	106.845	3.141	101.686	20890	Malaysia Airlines, AirAsia, Lion Air, Indonesia AirAsia, Malindo Ai
37.568	126.977	34.693	135.502	17488	Asiana Airlines, Korean Air, Jin Air, Jeju Airlines, Peach Aviation,
37.568	126.977	34.693	135.502	17488	Asiana Airlines, Korean Air, Jin Air, Jeju Airlines, Peach Aviation,
22.285	114.157	37.568	126.977	16366	Cathay Pacific, Korean Air, HK Express, Asiana Airlines, Jeju Airlin
22.285	114.157	37.568	126.977	16366	Cathay Pacific, Korean Air, HK Express, Asiana Airlines, Jeju Airlin
40.7648	-73.9808	43.6529	-79.3849	17116	Air Canada, Westjet, American Airlines
25.252	55.28	29.369	47.978	13297	Emirates, Flydubai, Kuwait Airways, Jazeera Airways
22.285	114.157	1.289	103.85	14162	Cathay Pacific Airways, Singapore Airlines, Scoot, Jetstar Asia

Method 1: Transform the Data to be Back to Case 1 (One Row by Location)

Tableau - Book1

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Show Me

Data | Analytics

Migrations.csv+ (Multipl...

Dimensions

- Country
- Country of destination
- Country of origin
- Path
- *Measure Names*

Measures

- **Migrations.csv**
  - Number of Migrants
- **Sheet1**
  - Order
- *Latitude (generated)*
- *Longitude (generated)*
- *Number of Records*
- *Measure Values*

Pages

Filters

Number of Migrants

Marks

Line

Color | Size | Label | Detail | Tooltip | Path

SUM(Number ..

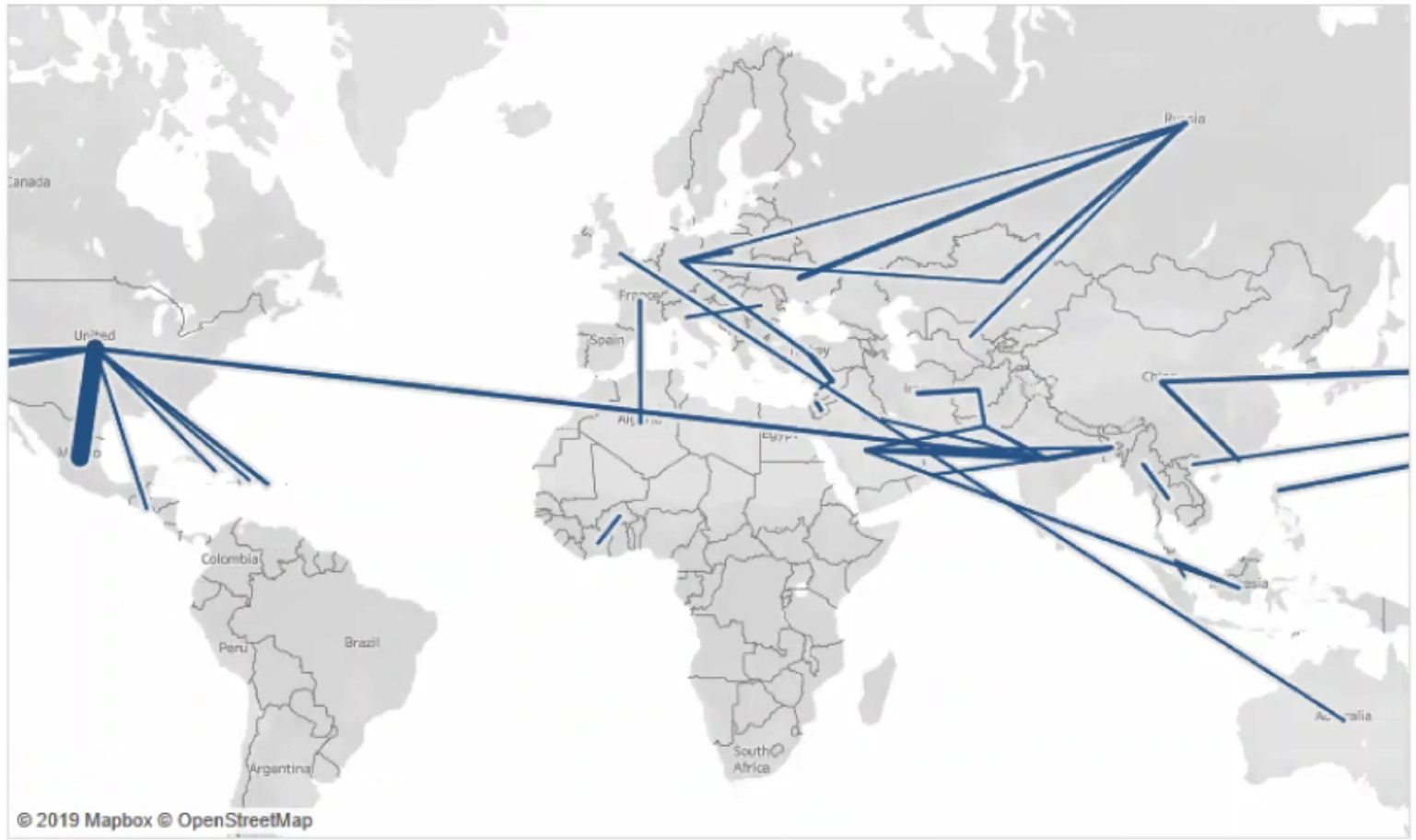
Path

Country

Columns: Longitude (generated)

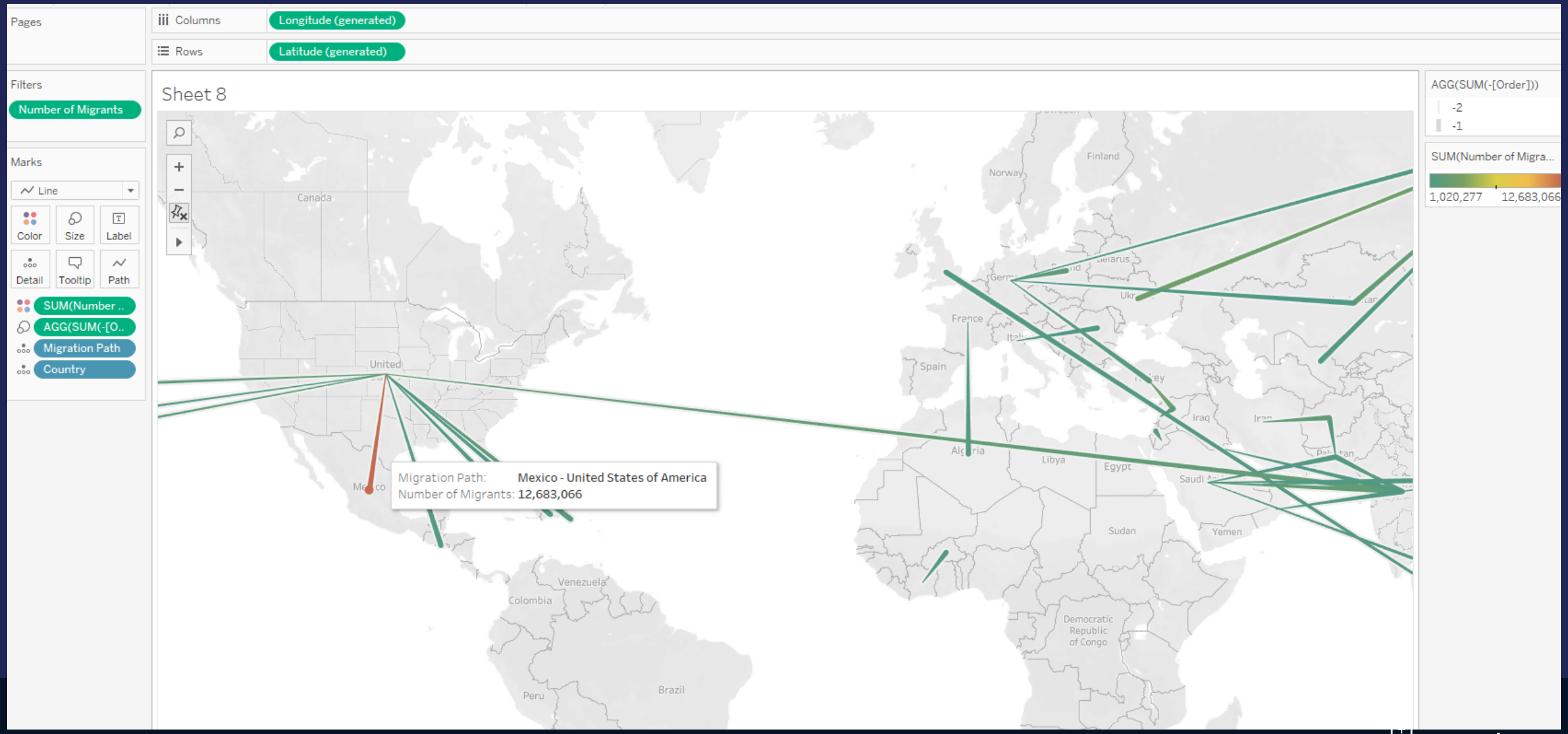
Rows: Latitude (generated)

Sheet 1



SUM(Number of Migra...

1,020,277
4,000,000
6,000,000
8,000,000
10,000,000
12,683,066


Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
Number of Migrants
Marks
Line
Color
Size
Label
Detail
Tooltip
Path
SUM(Number ..
AGG(SUM(-[O..
Migration Path
Country
Sheet 8
AGG(SUM(-[Order]))
-2
-1
SUM(Number of Migra...
1,020,277
12,683,066
Migration Path: Mexico - United States of America
Number of Migrants: 12,683,066
Canada
United
Finland
Norway
France
Spain
Libya
Egypt
Iraq
Sudan
Yemen
Venezuela
Colombia
Peru
Brazil
Democratic Republic of Congo

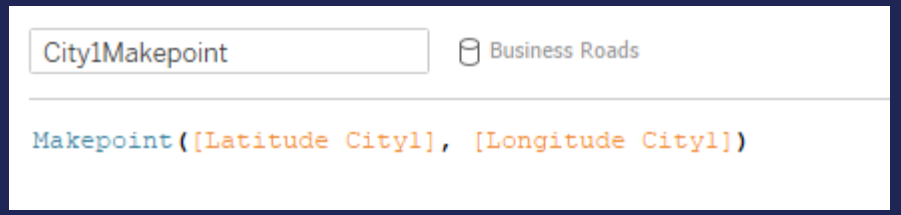
+ableau

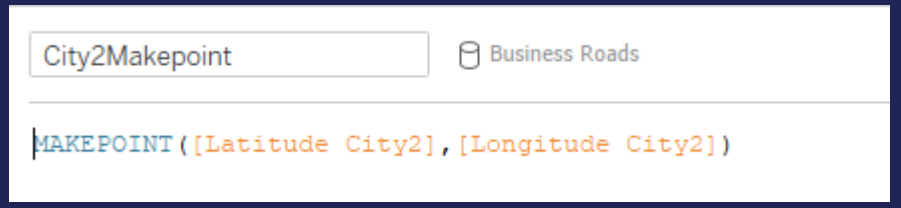
Method 2: Use MakePoint, MakeLine Functions

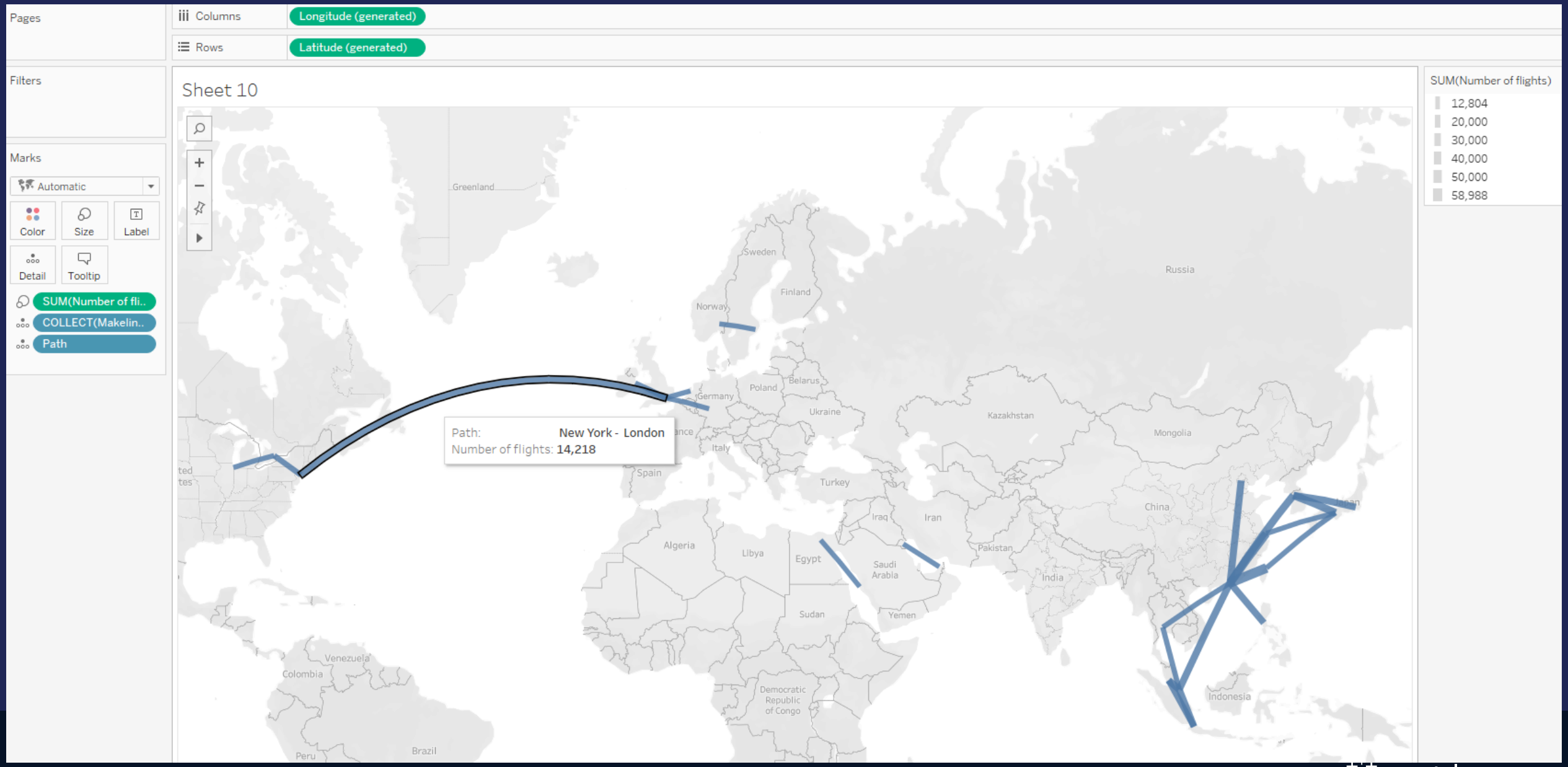
Constraints:

2019.2 +

Lat and Long of both locations

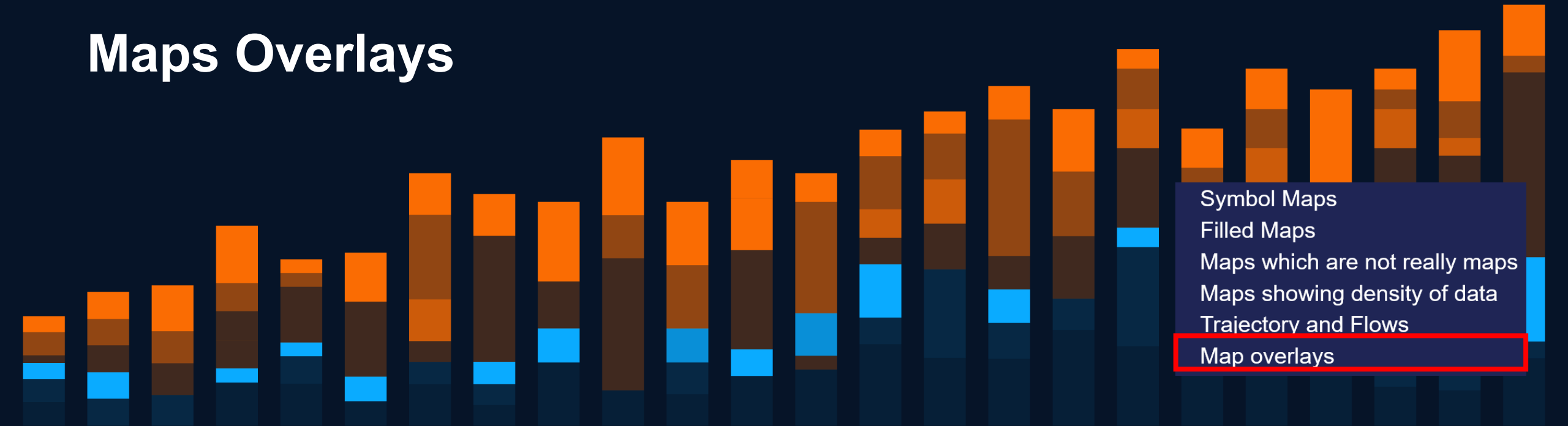




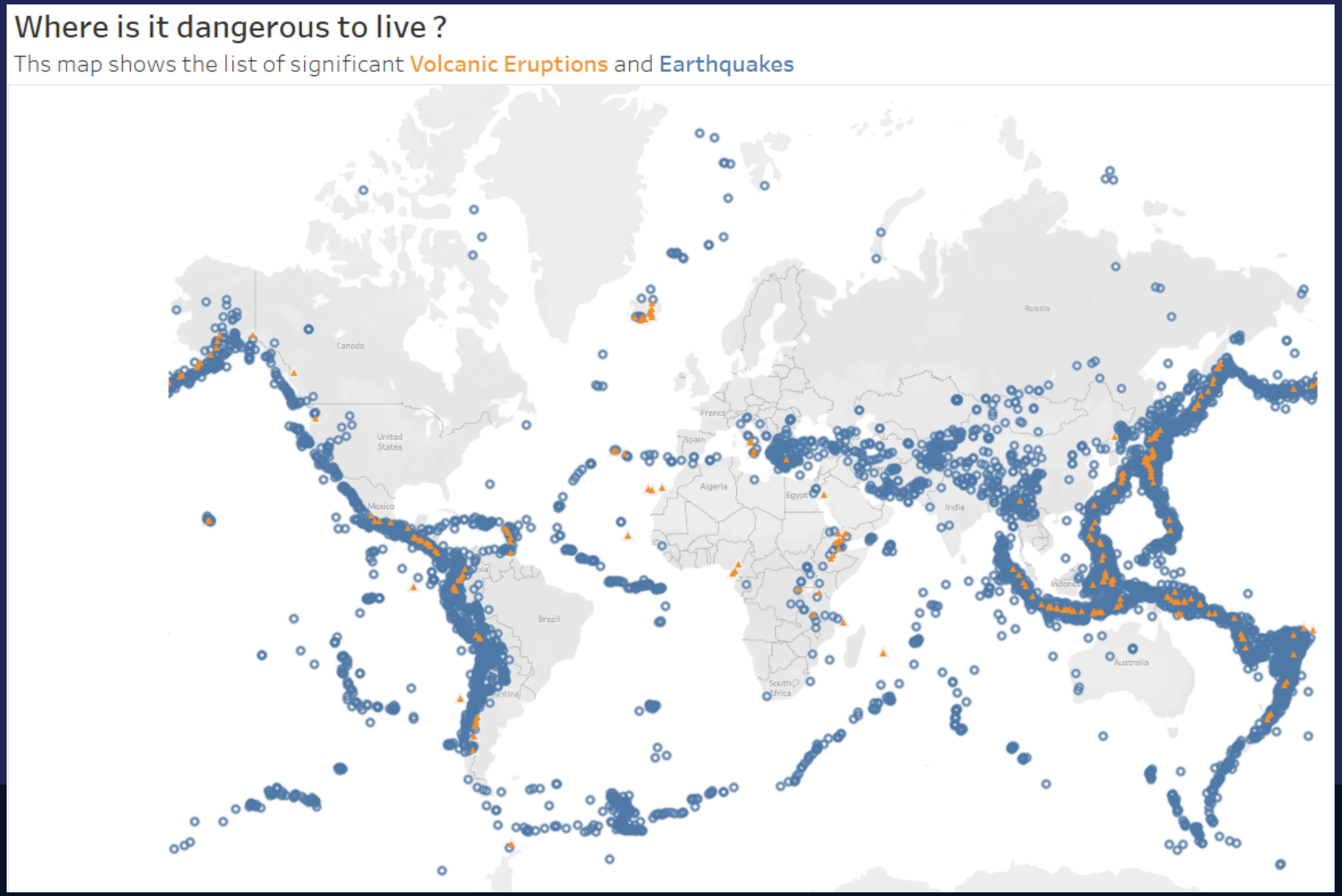

Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Number of fli..
COLLECT(Makelin..
Path
Sheet 10
Path: New York - London
Number of flights: 14,218
SUM(Number of flights)
12,804
20,000
30,000
40,000
50,000
58,988
Greenland
Sweden
Finland
Norway
Russia
Poland
Belarus
Germany
Ukraine
Kazakhstan
Mongolia
Italy
Spain
Turkey
China
Iraq
Iran
Algeria
Libya
Egypt
Saudi Arabia
Pakistan
India
Sudan
Yemen
Venezuela
Colombia
Democratic Republic of Congo
Indonesia
Peru
Brazil

How to Put Maps on the Top of Each Other

Maps Overlays

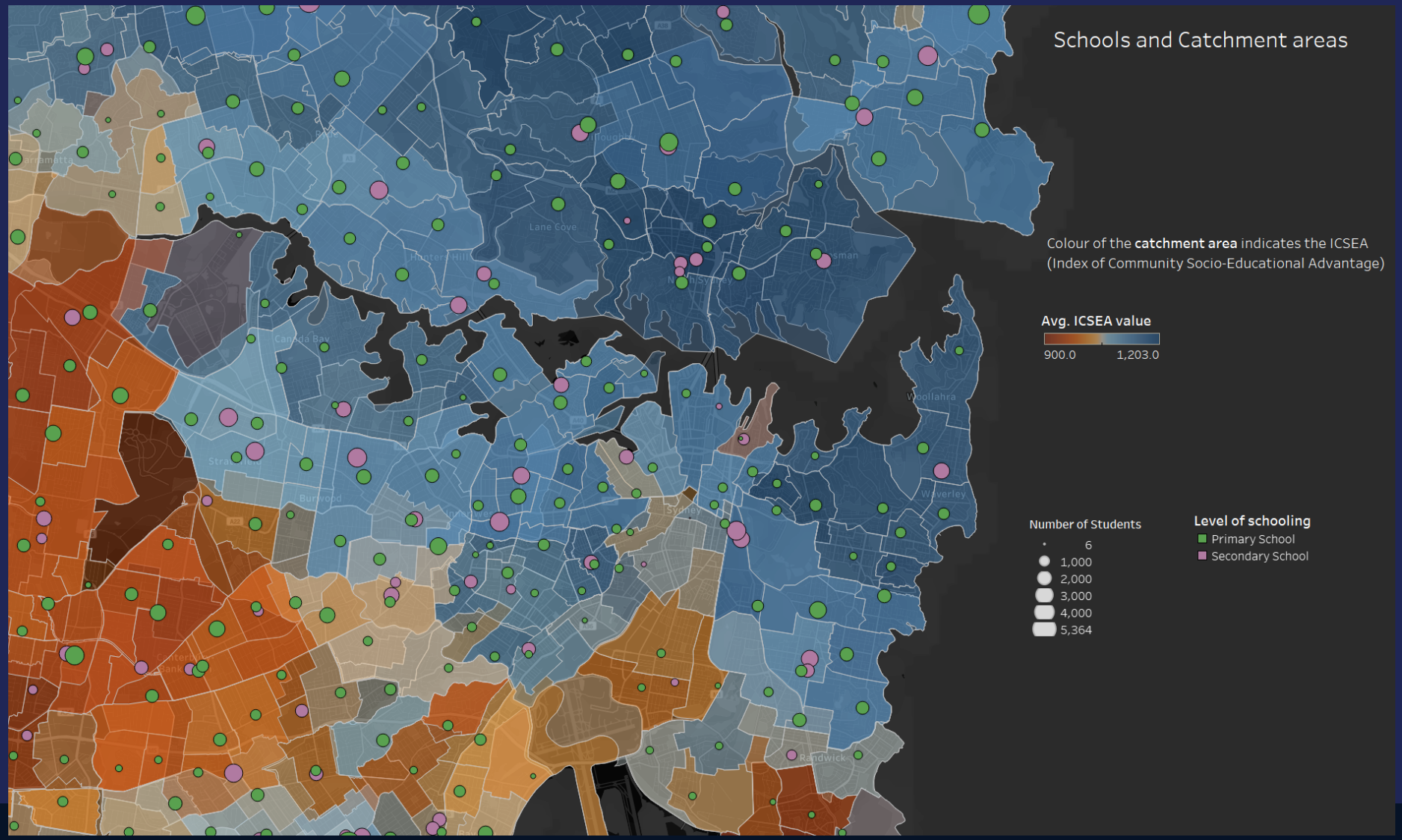


Overlay Symbols



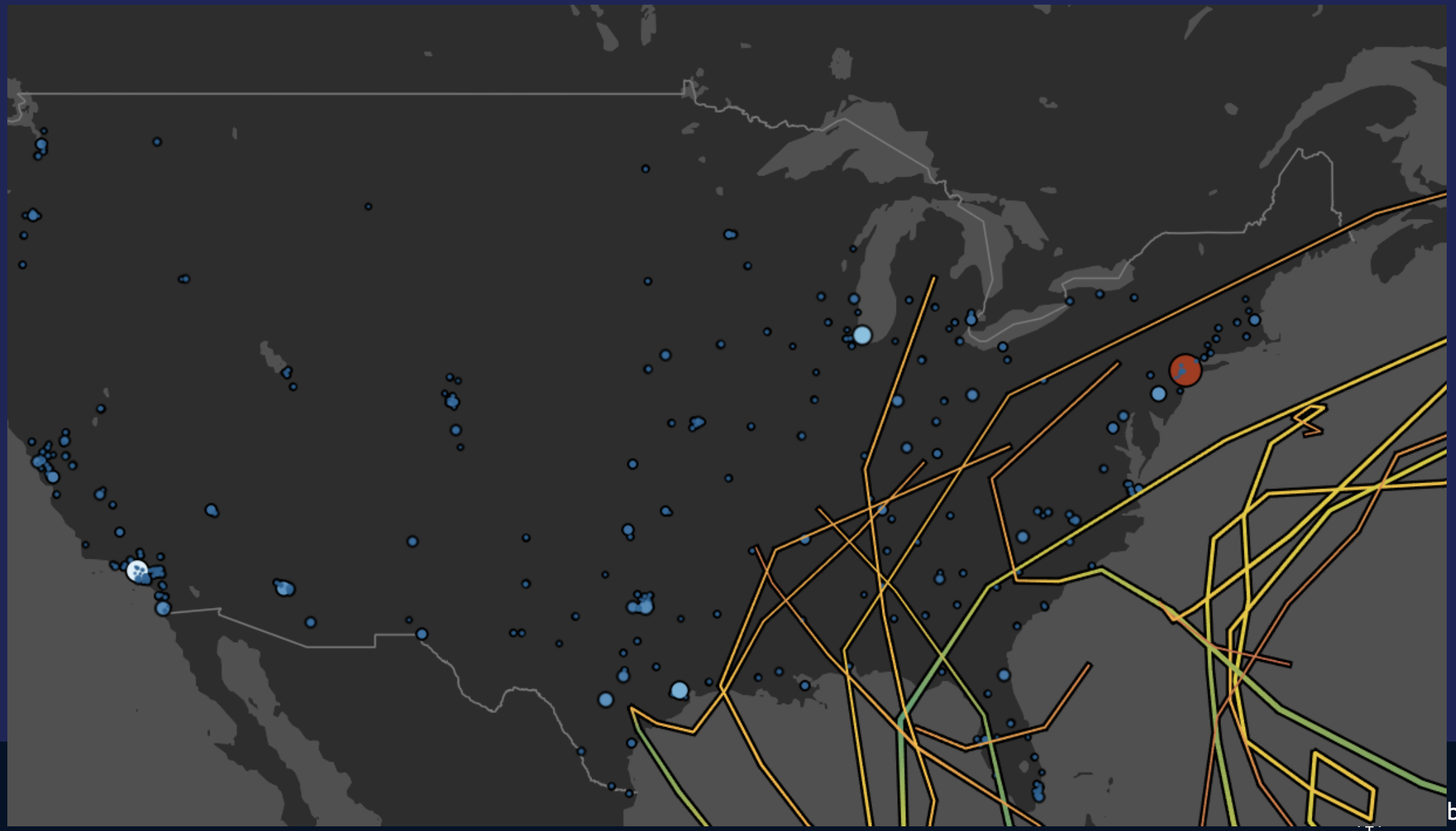
+ableau

Overlay Symbols on a Filled Map

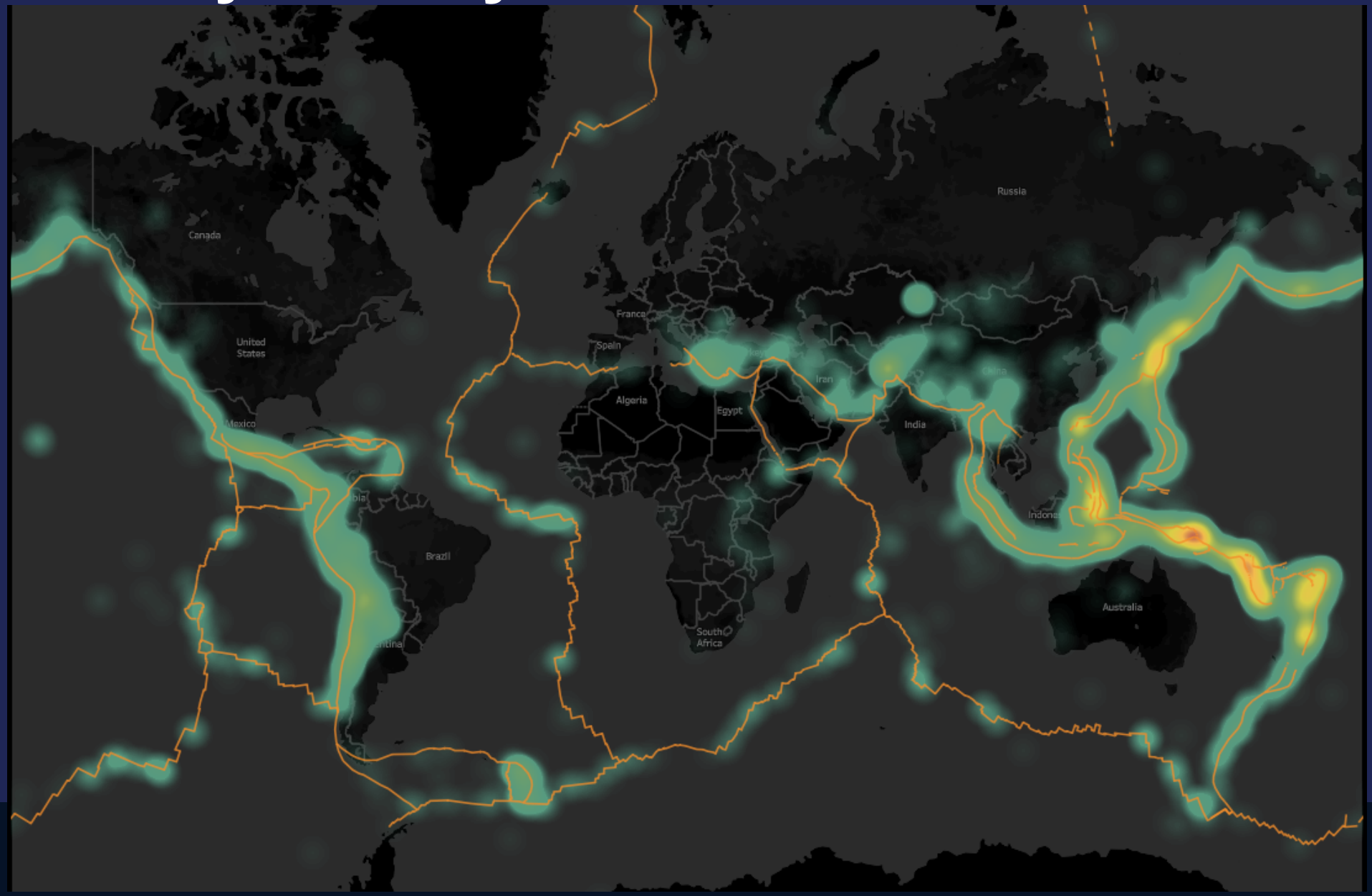


tableau

Overlay Symbols on Paths/Lines



Overlay Density Marks on Lines



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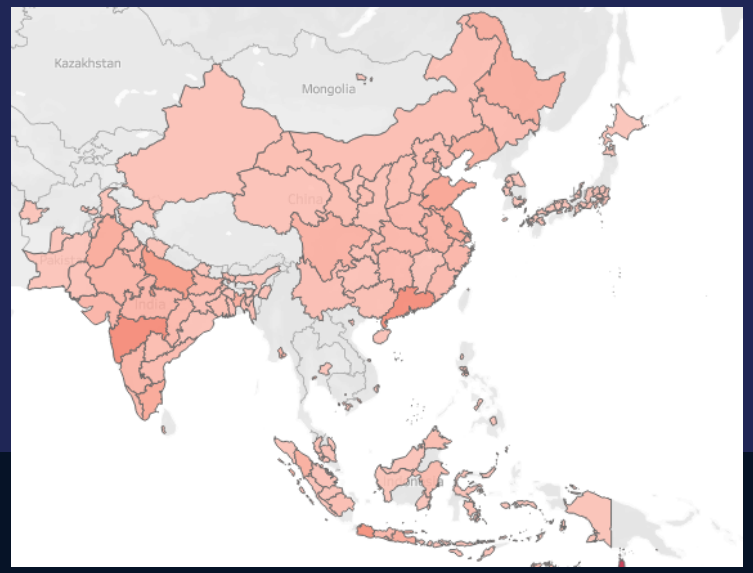
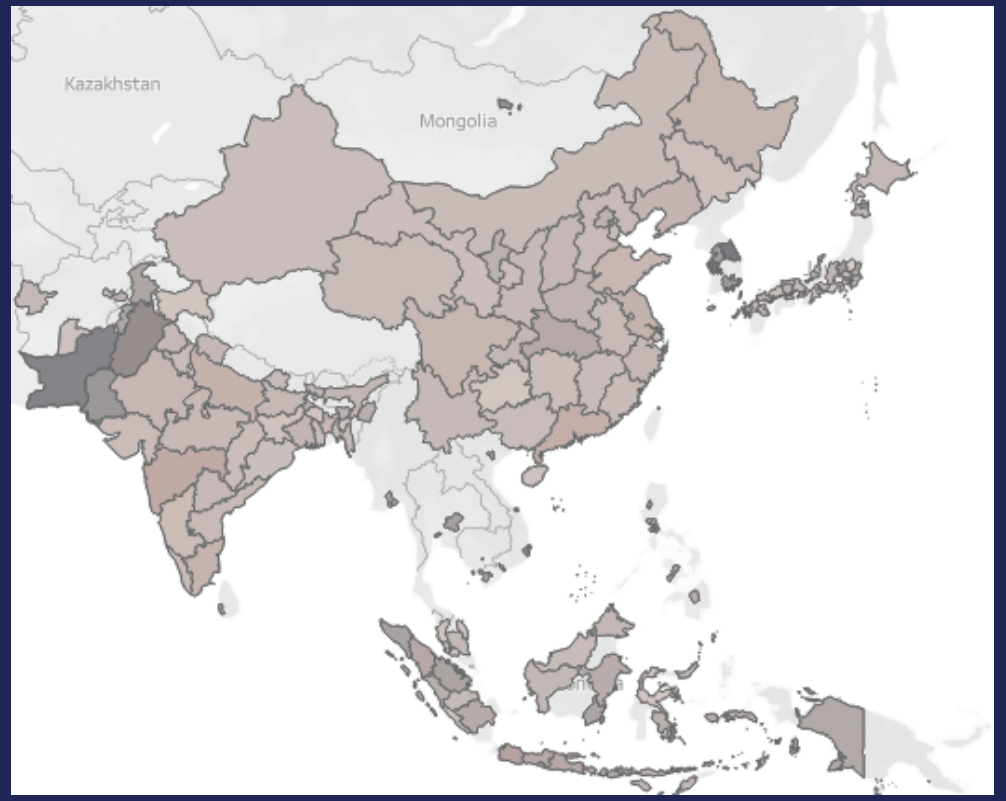
Overlay Filled Maps ?





- Technically possible
- But hard to read => Bivariate maps are better

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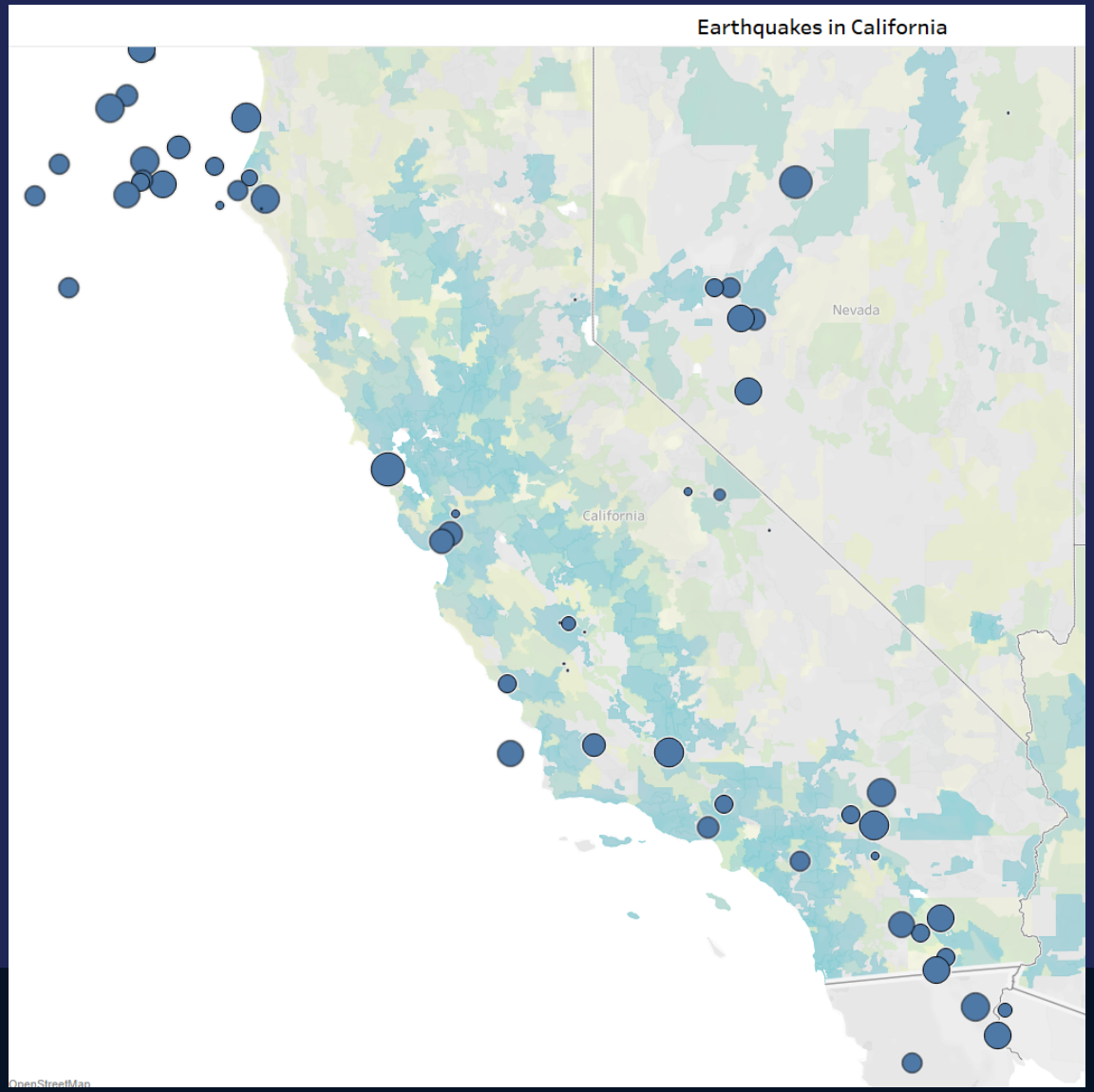
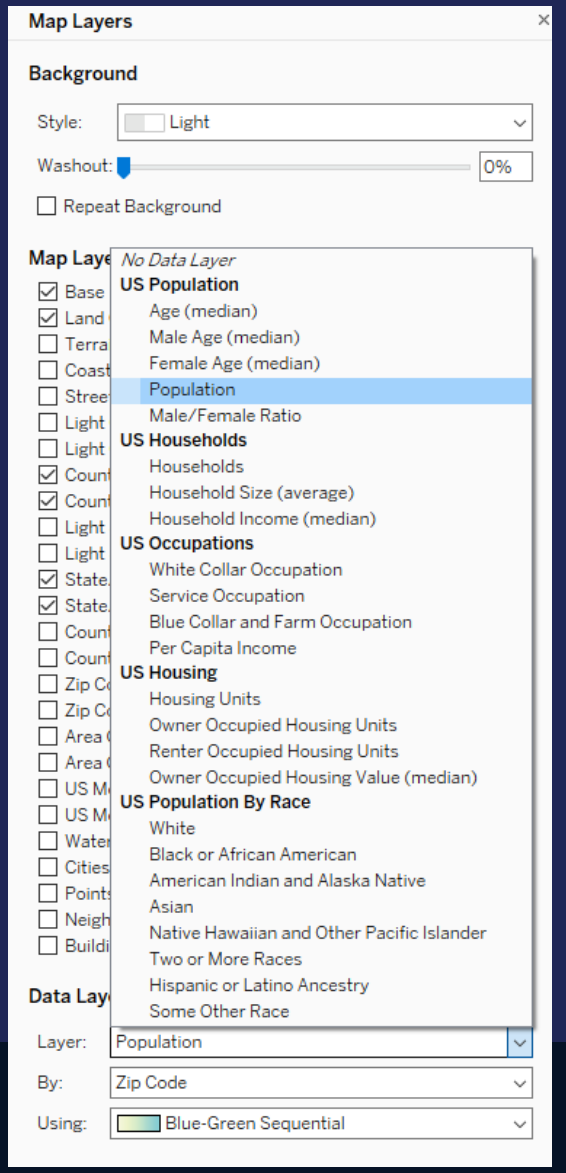
How to Build Those Maps ?

If Your Map is in the US Don't Forget that You Can Use the Data Layers!





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Goal: Having one single data source

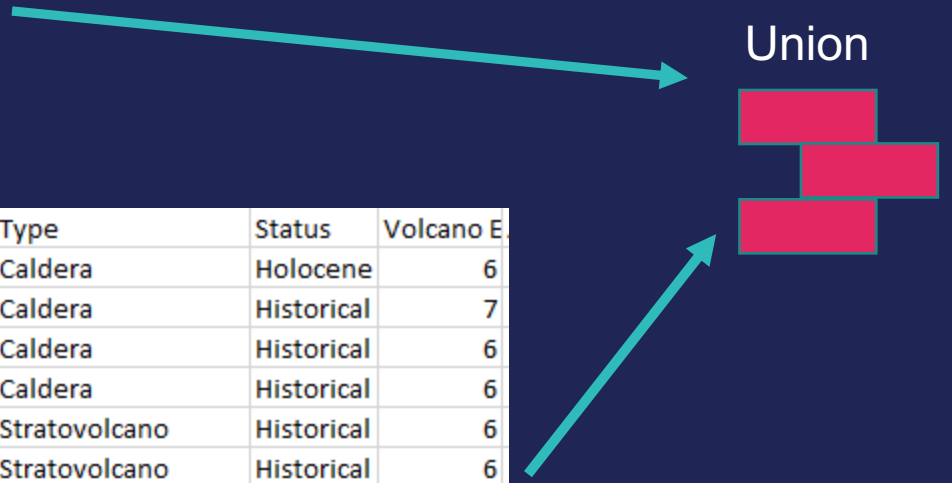
Options:

- Union
- Join

Overlay Symbols – How to ?

Date	latitude	longitude	depth	mag
17/03/2014	-20.003	-70.8741	17	6.2
16/03/2014	-19.9246	-70.6278	20	6.7
15/03/2014	-5.566	-80.879	9.8	6.3
15/03/2014	-14.0935	-76.2968	20	6.1
13/03/2014	33.6793	131.8197	79	6.3
11/03/2014	-3.1128	148.4774	10	6.1
11/03/2014	-60.8391	-19.9569	10	6.4

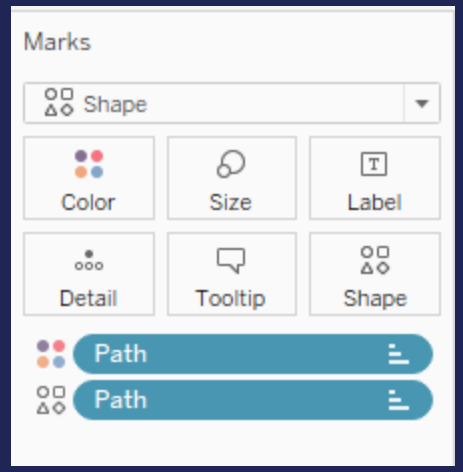
Year	Name	Latitude	Longitude	Elevation	Type	Status	Volcano E
-4360	Macauley Island	-30.2	-178.47	238	Caldera	Holocene	6
-4350	Kikai	30.78	130.28	717	Caldera	Historical	7
-4050	Masaya	11.984	-86.161	635	Caldera	Historical	6
-4000	Pago	-5.58	150.52	742	Caldera	Historical	6
-3580	Taal	14.002	120.993	400	Stratovolcano	Historical	6
-3550	Pinatubo	15.13	120.35	1486	Stratovolcano	Historical	6
-2040	Long Island	-5.358	147.12	1280	Complex volcano	Historical	6
-1900	Black Peak	56.53	-158.8	1032	Stratovolcano	Radiocarb	6
-1890	Hudson, Cerro	-45.9	-72.97	1905	Stratovolcano	Historical	6
-1860	St. Helens	46.2	-122.18	2549	Stratovolcano	Historical	6

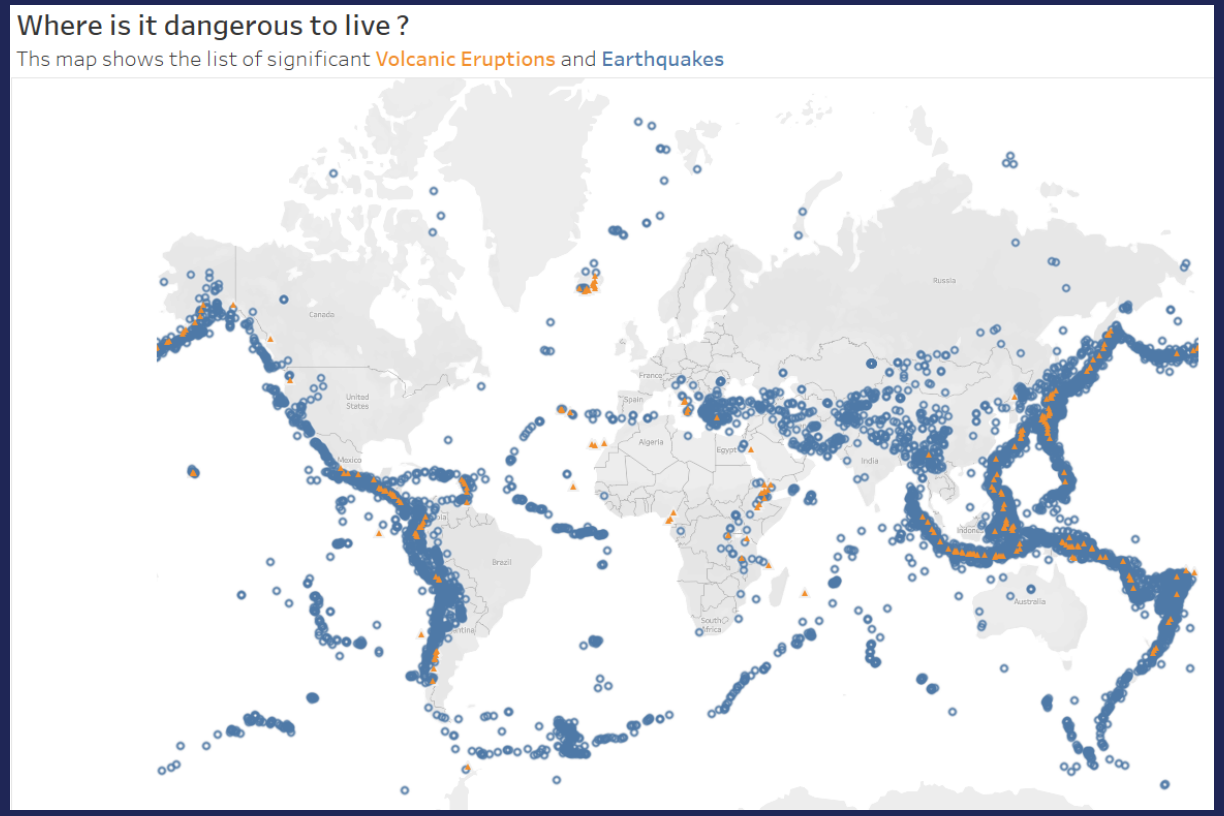


If same level of detail, you can create a union

Works also if sources contain **same Location attributes** such as Countries, State, Cities

You can then use the “Path” (automatically generated dimension that identifies the source of the information) to put on the “Marks” shelves





Note: With this technique, there is no **Technical** limit to the number of layers

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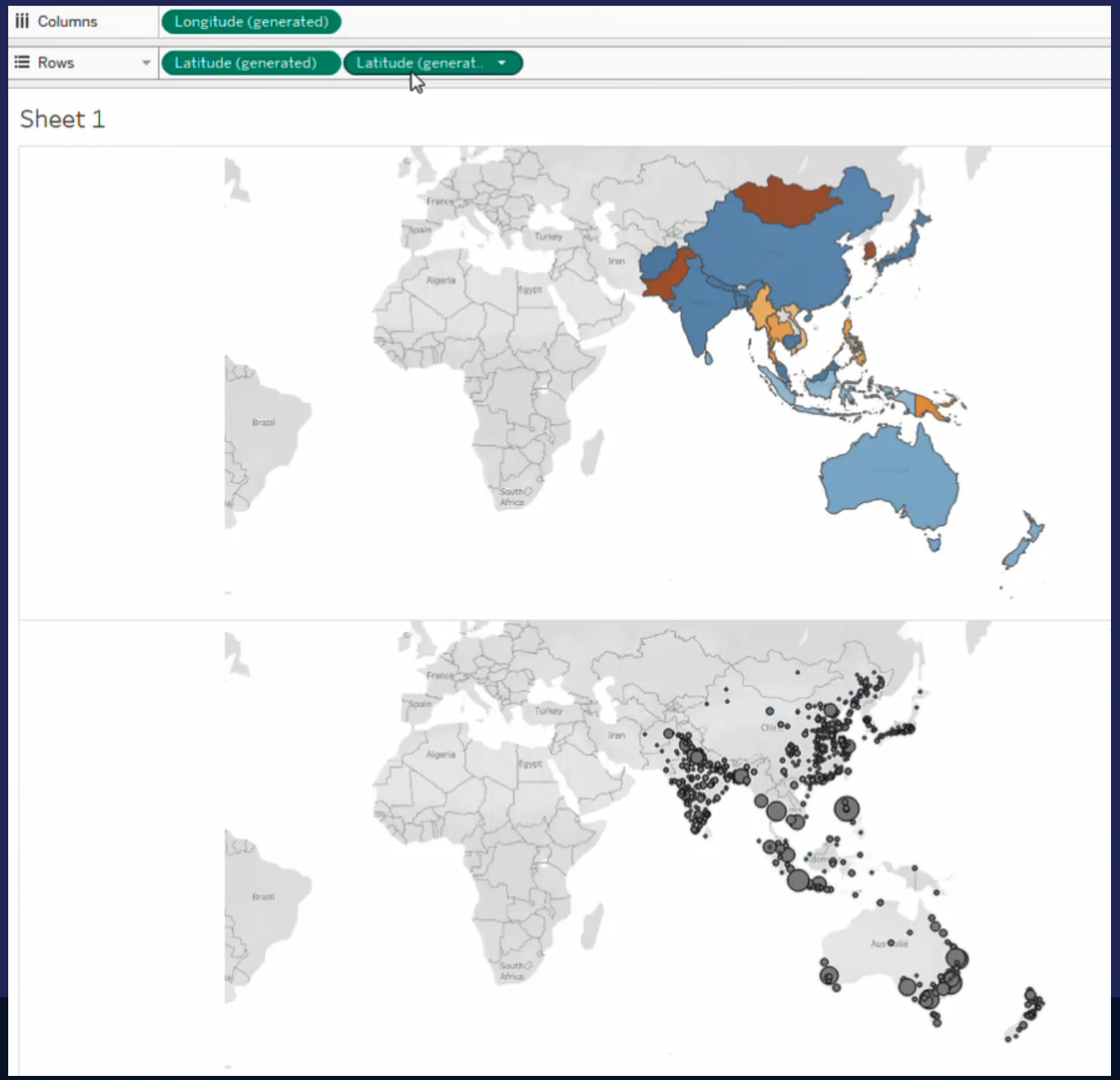
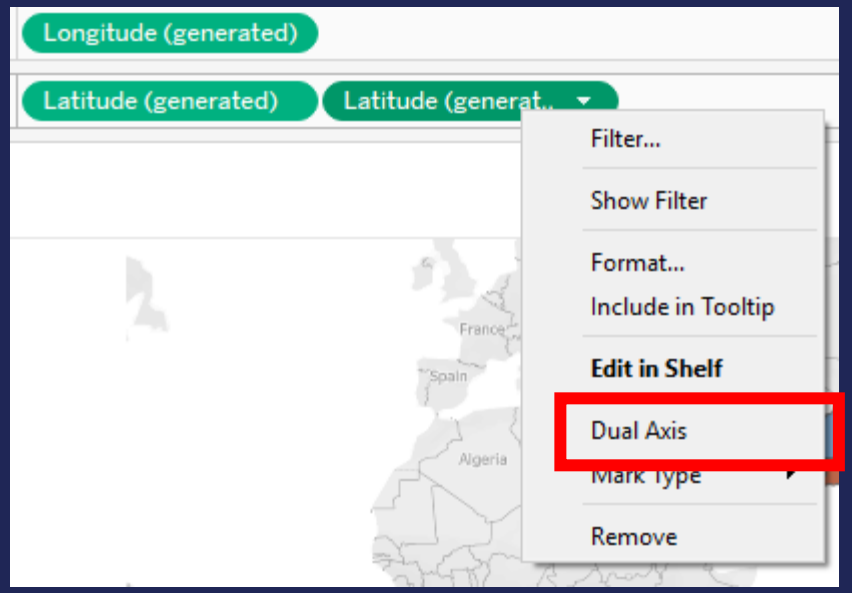
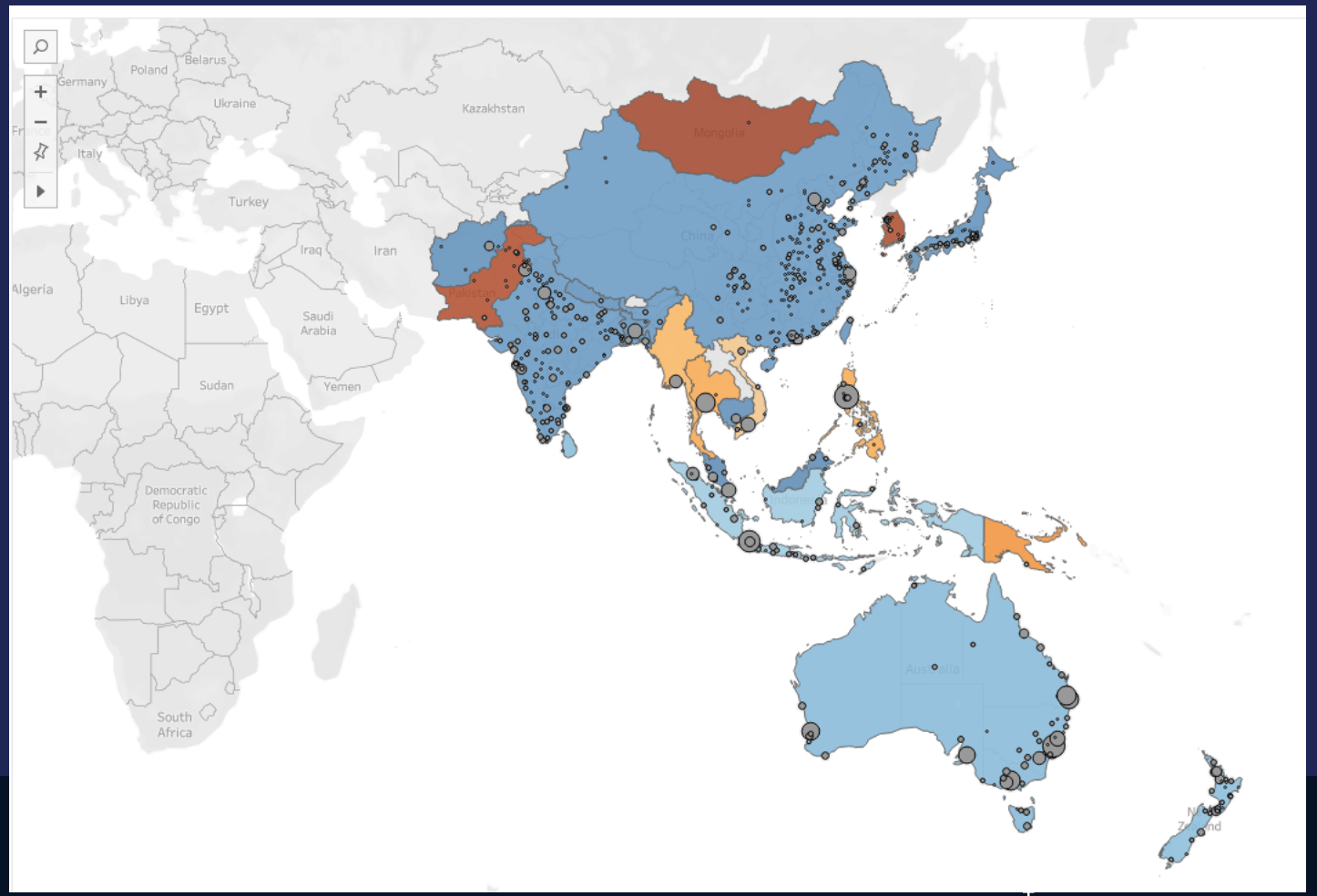
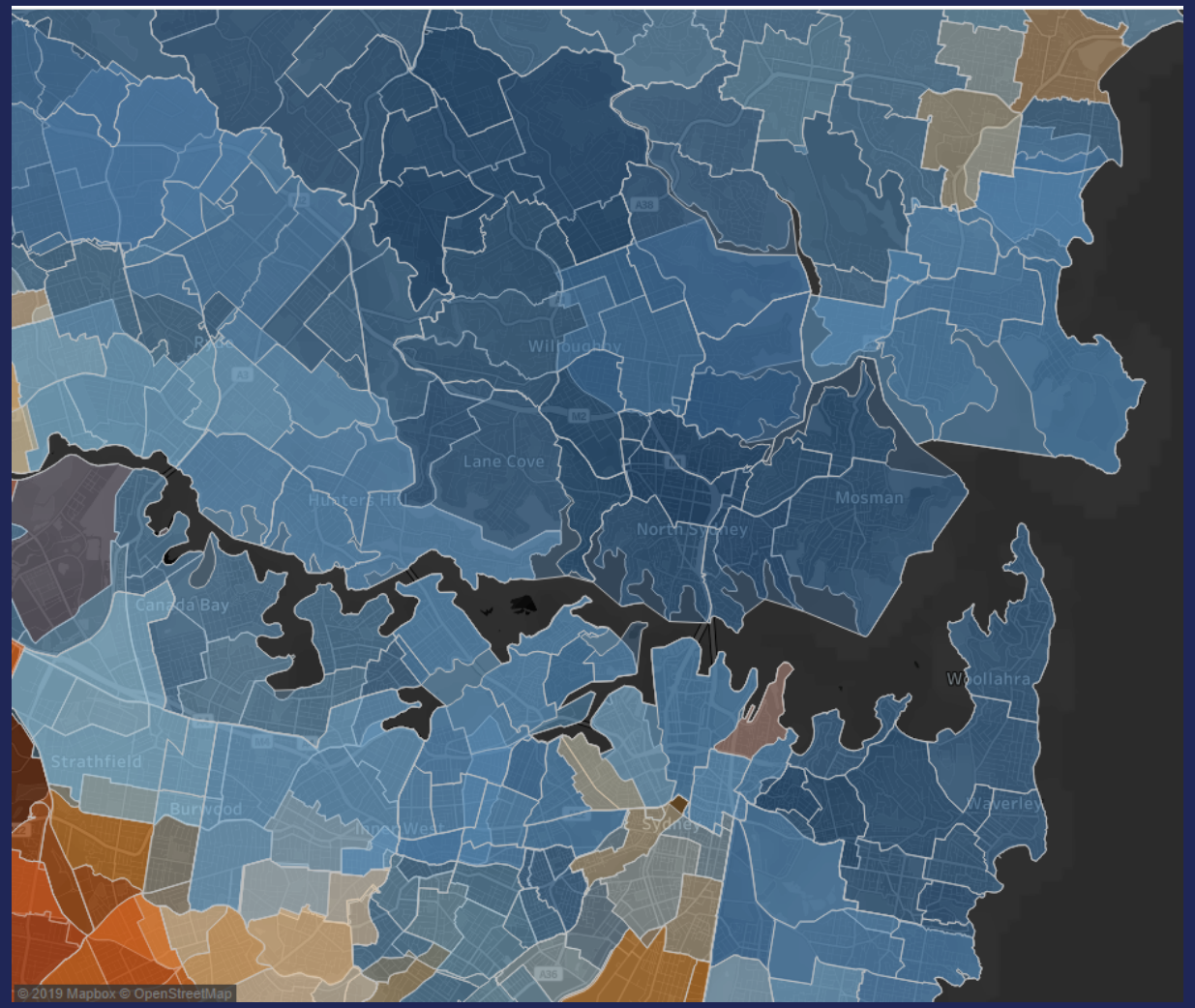
For All the Other Situations: Use Dual Axis


Columns
Longitude (generated)
Rows
Latitude (generated)
Latitude (generat..
Sheet 1
Automatic
Color
Size
Label
Detail
Tooltip
AGG(Profit Ra..
Country
Circle
Color
Size
Label
Detail
Tooltip
SUM(Sales)
Country
City

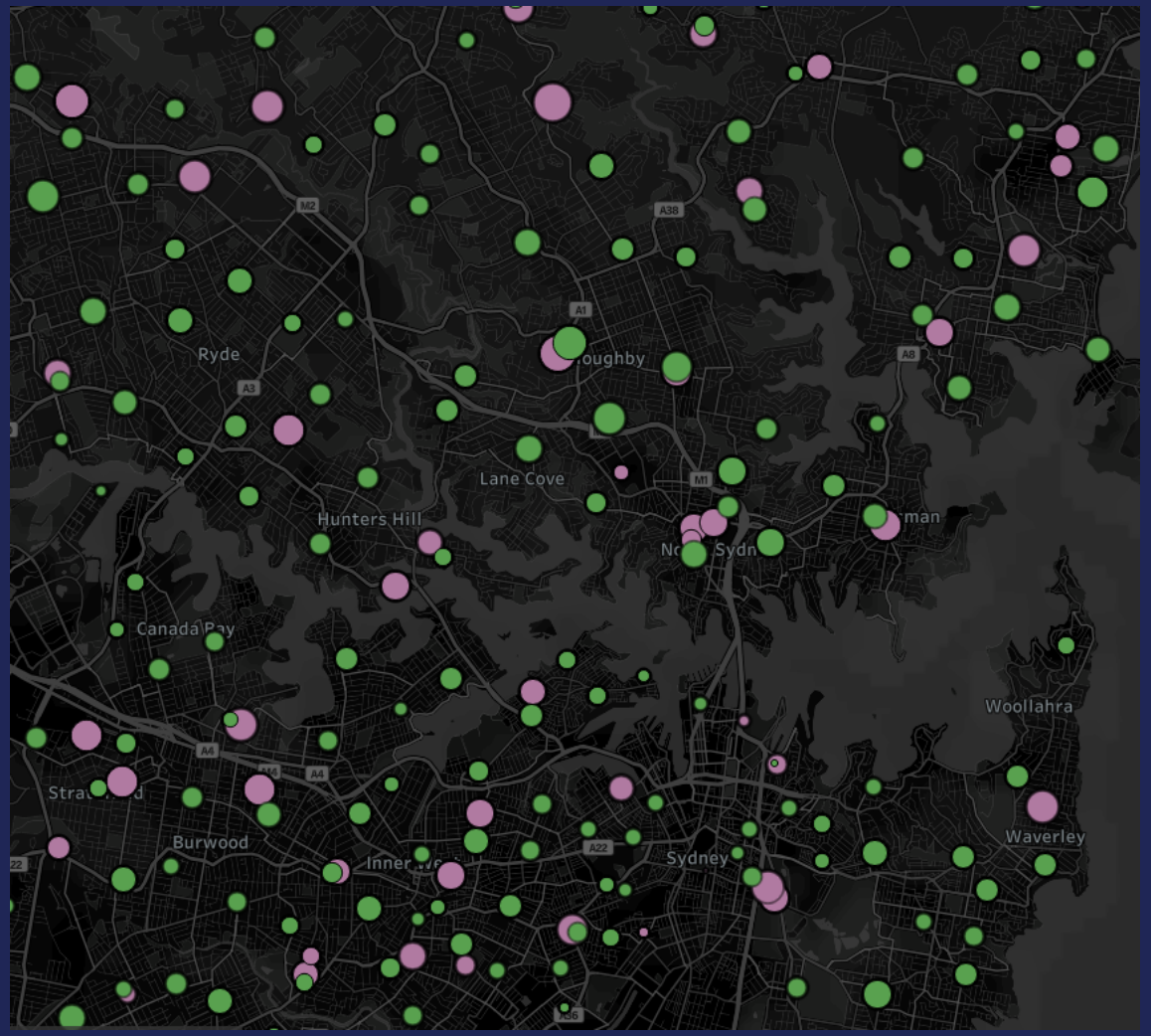

Longitude (generated)
Latitude (generated)
Latitude (generat...
Filter...
Show Filter
Format...
Include in Tooltip
Edit in Shelf
Dual Axis
Mark Type
Remove
France
Spain
Algeria


Germany
Poland
Belarus
Ukraine
Kazakhstan
Mongolia
Italy
Turkey
Iraq
Iran
Algeria
Libya
Egypt
Saudi Arabia
Sudan
Yemen
Democratic Republic of Congo
South Africa
China
Australia

What if We Want to Overlay…



?

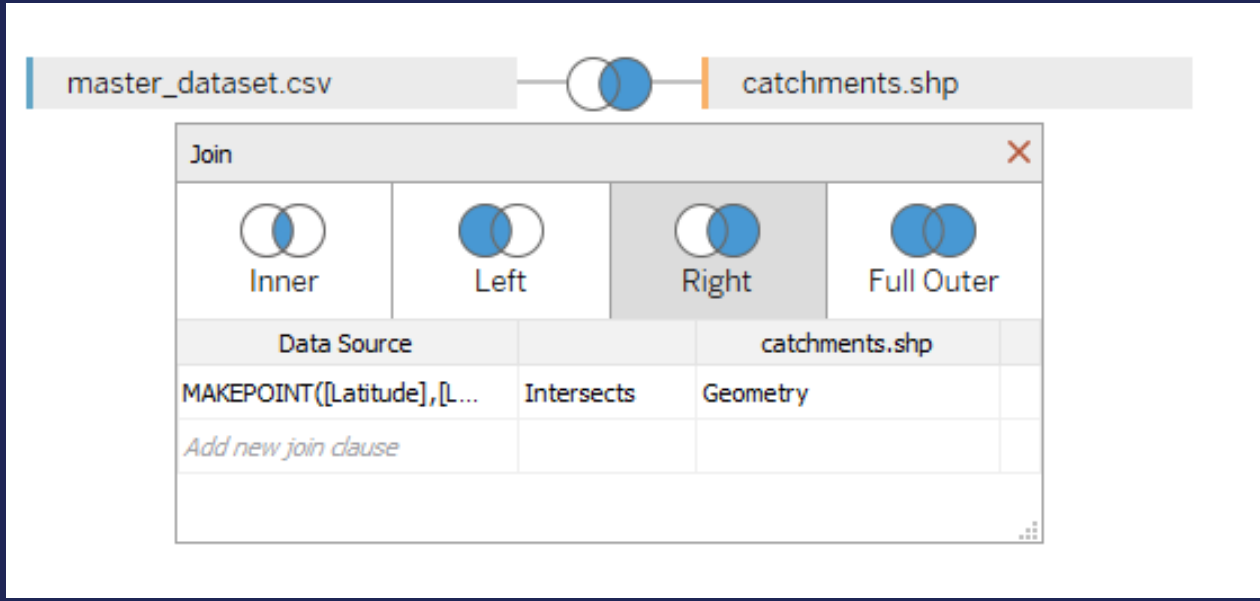


a shapefile with Polygons

Locations with Lat, Long

tableau

Use the MakePoint Function Along With “Intersect”



Intersect been introduced in 2018.2
Makepoint been introduced in 2019.2

Caution if polygons intersect => data duplication for the points => Use min/max on measures

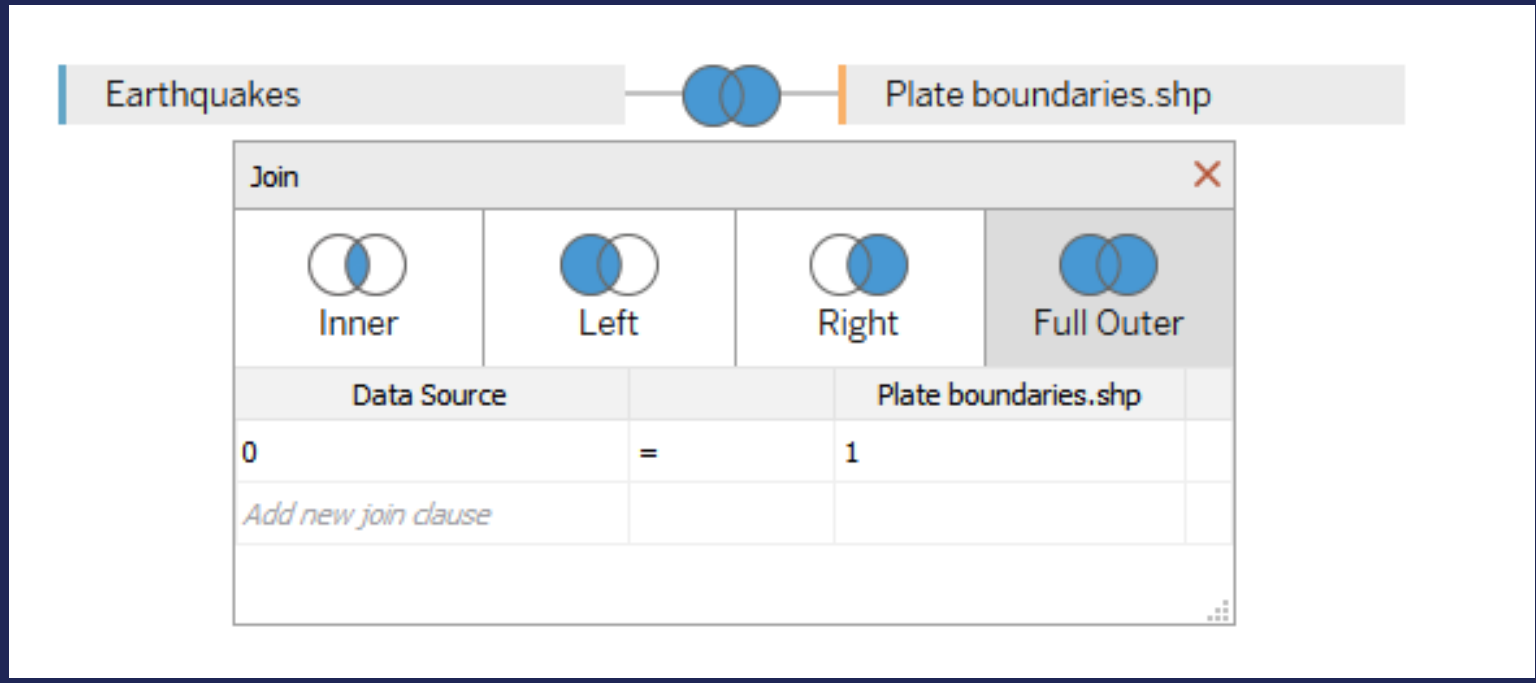
What if We Cannot Use the “Intersect” Function
(We can only create spatial joins between Points and Polygons)

Abc Plate_Boundaries.shp Haz Plat 1	# Plate_Boundaries.shp Haz Plat 2	# Plate_Boundaries.shp Shape Leng	🌐 Plate_Boundaries.shp Geometry
SERAM TROUGH (ACT...	6,722	5.84	LINESTRING
WETAR THRUST	6,722	1.83	LINESTRING
TRENCH WEST OF LUZ...	6,621	6.74	LINESTRING
BONIN TRENCH	9,821	8.33	LINESTRING
NEW GUINEA TRENCH	8,001	12.00	LINESTRING
MANOKWARI TROUG...	8,001	4.79	LINESTRING
MARIANA TRENCH	6,621	1.31	LINESTRING
MARIANA TRENCH	6,621	1.41	LINESTRING
MARIANA TRENCH	6,621	20.55	LINESTRING
TRENCH, SOUTH OF SI...	3,401	1.63	LINESTRING

?

🌐 query Latitude	🌐 query Longitude	# query Depth	# query Mag
-20.003	-70.874	17.000	6.20000
-19.925	-70.628	20.000	6.70000
-5.566	-80.879	9.800	6.30000
-14.094	-76.297	20.000	6.10000
33.679	131.820	79.000	6.30000
-3.113	148.477	10.000	6.10000
-60.839	-19.957	10.000	6.40000
40.829	-125.134	16.600	6.80000
-14.735	169.822	636.760	6.30000
27.405	127.335	111.180	6.50000

Solution: Create a Full Outer Join



What if We Want to Overlay…

Most Populous ... City	Most Populous cit... State	Most Populous cities Population 2018
Vacaville	California	100,154
Kenosha	Wisconsin	100,164
San Angelo	Texas	100,215
Woodbridge	New Jersey	100,450
Edison	New Jersey	100,693
Clinton	Michigan	100,800
Tuscaloosa	Alabama	101,113
Vista	California	101,224
South Bend	Indiana	101,860

?

Date	Hurricane	Lat	Long	Wind	pressure
20010605	ALLISON	27.5	-95	40	1007
20010605	ALLISON	28.5	-95.3	50	1002
20010605	ALLISON	28.9	-95.3	45	1003
20010606	ALLISON	29.3	-95.3	45	1003
20010606	ALLISON	30.1	-95.2	30	1006
20010606	ALLISON	31	-95.2	20	1005
20010606	ALLISON	31.5	-95	20	1005
20010607	ALLISON	31.6	-95	20	1005
20010607	ALLISON	31.8	-94.9	20	1006

Data geocoded by Tableau

Data with Lat, Long

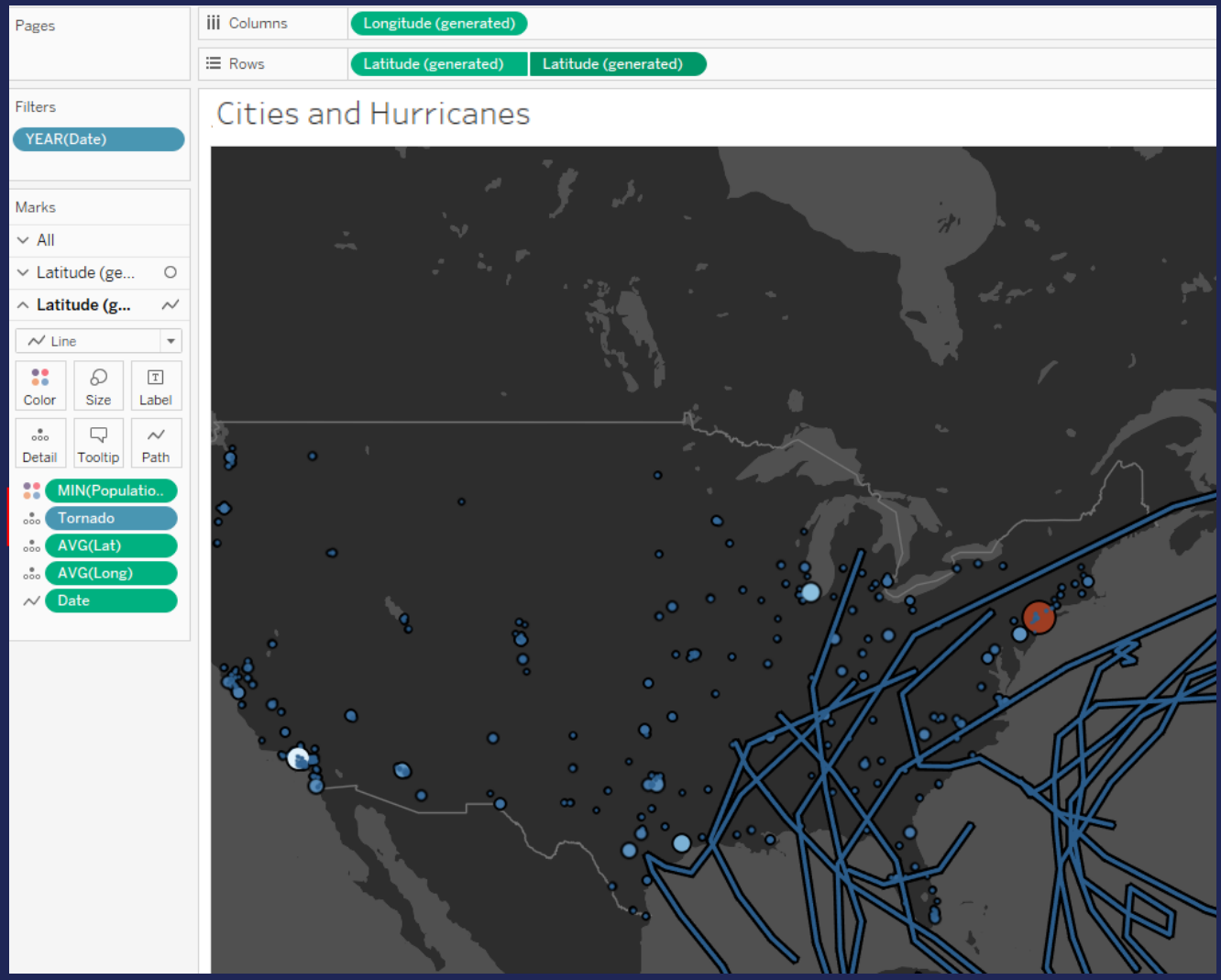
1. Create a Full outer join

2. Create the map with the cities

3. Duplicate “Latitude (generated)”

4. For the second “Latitude(generated)”
   - Change the “Mark Type” to “Line”
   - Bring Latitude and Longitude to “Detail”

5. Select Dual Axis option



What if We Need More Than 2 Layers ?

You can put maps on the top of each other on a dashboard using “Floating” option and transparency

- Extremely tedious to have maps aligning perfectly
- Zoom cannot be used

Symbol Map

Filled Map

Hex tile maps

Bivariate choropleth maps

Value by alpha maps

Point distribution maps

Density Map

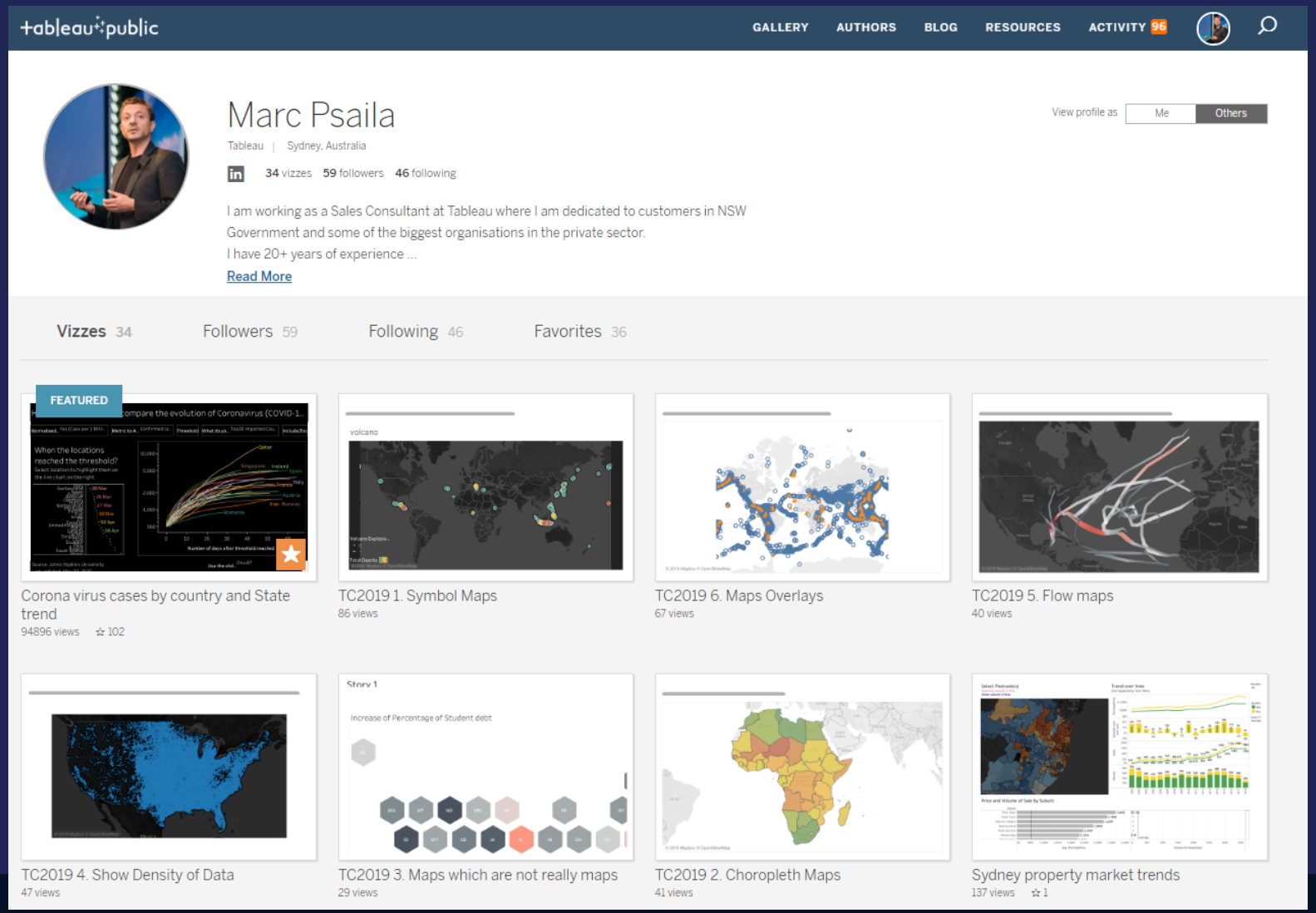
Hexbin Map

Origin Destination

Path

Dual axis

https://public.tableau.com/profile/marc.psaila#!/



4 Keys Takeaways

- Think about the question you want to answer
- Maps are not always the best visualisation type
- Technical possibilities are (nearly) endless
- Spend time to choose the map style and layers