

**Lecture 3**

**DD 324:**  
**Data Visualisation**

**Ways to visualise**

# Course Website

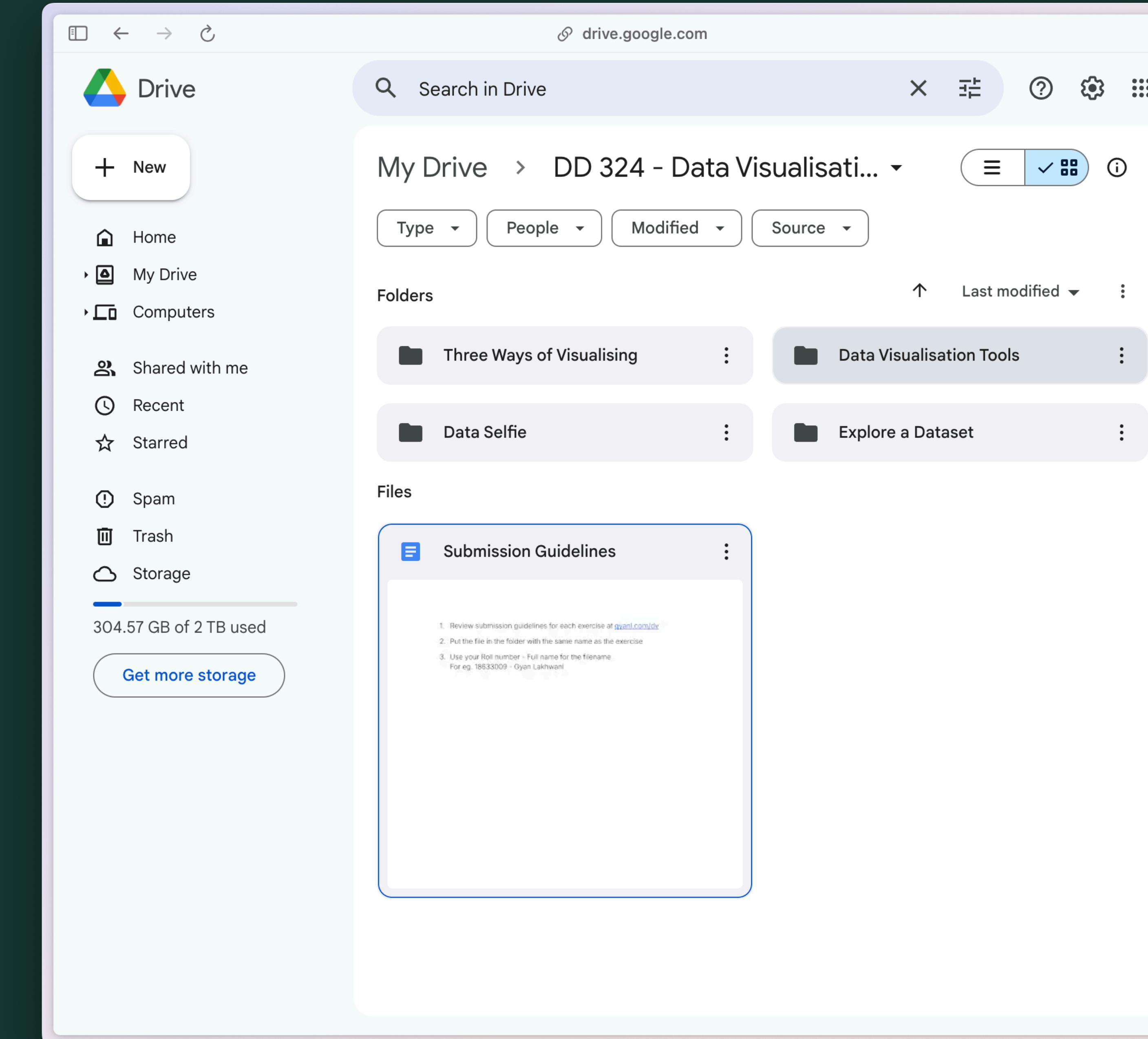
# gyanl.com/dv



**DD 324**

# Grading & Submissions

- Submissions on Google Drive
- Use your roll number + name as the filename
- There is a folder for each exercise



# What can we do with data?

## Exhibit

Show raw data

List, Table, Infographic

## Explain

Answer Questions

Data journalism, report

## Explore

Finding what to ask

Dashboards, simulations

## Experience

Finding meaning in data

Data art piece, New media  
installation

## Enable

Building tools to visualise  
specific use cases

Software for data viz

**Data** —————→ **Visuals**

**Data** ————— **ENCODING** ————— **Visuals**

# 1 dataset 100 visualizations



# 1 dataset 100 visualizations



HOW COULD WE ENCODE THIS DATA?

Number of World Heritage Sites

Country

Year

# 1 dataset 100 visualizations



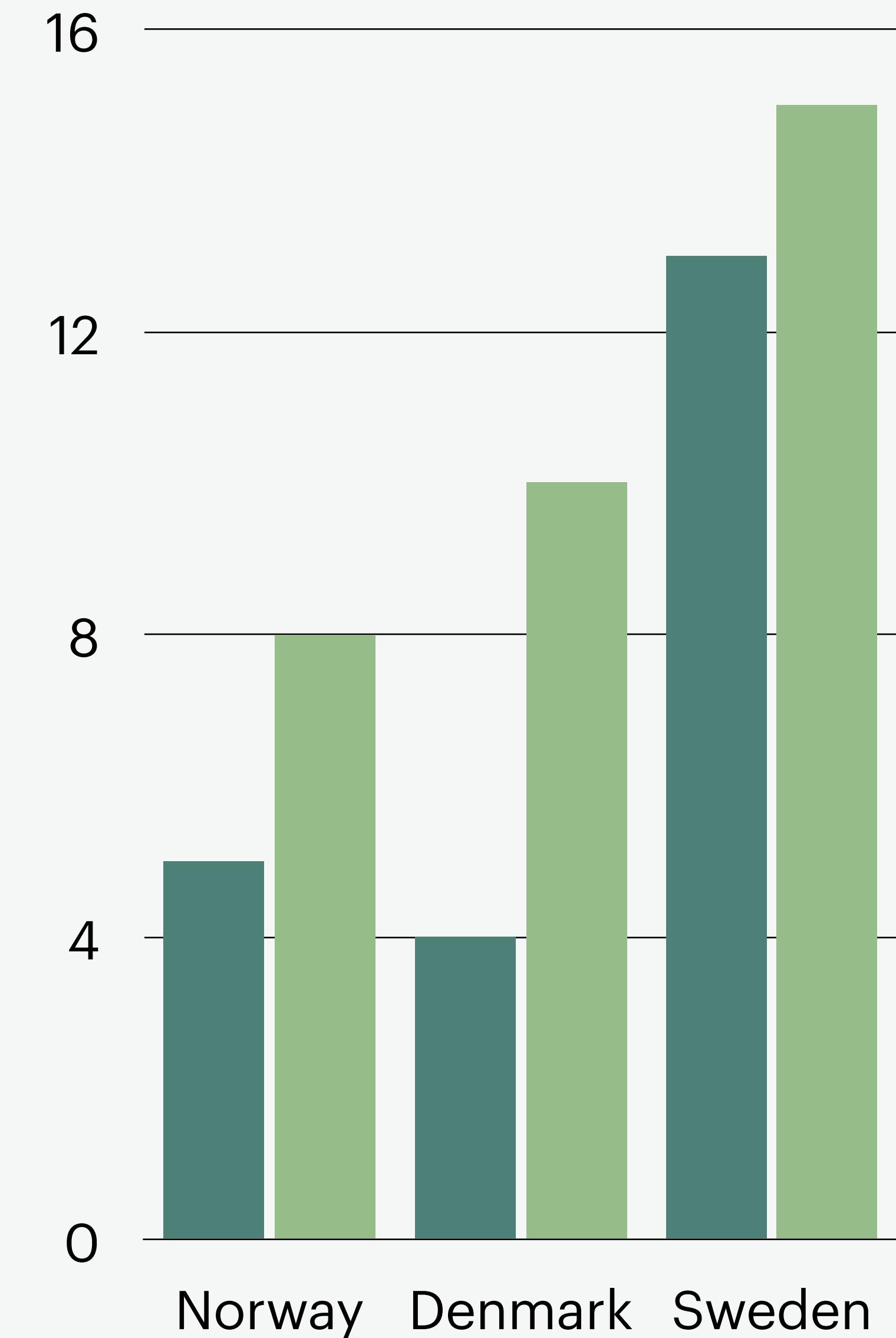
HOW COULD WE ENCODE THIS DATA?

Number of World Heritage Sites (Ratio)

Country (Nominal)

Year (Interval)

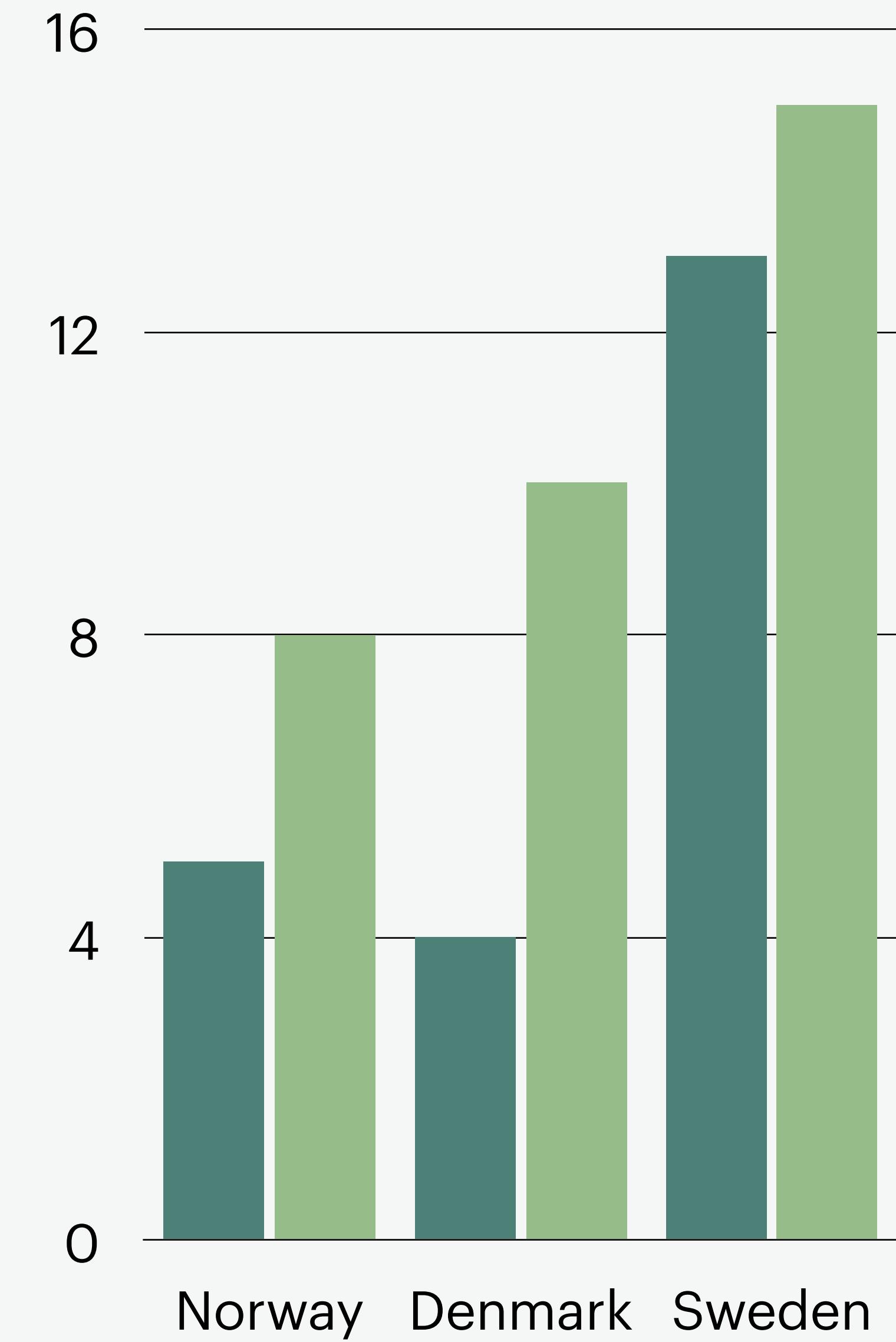
# 1 dataset 100 visualizations



# 1 dataset 100 visualizations



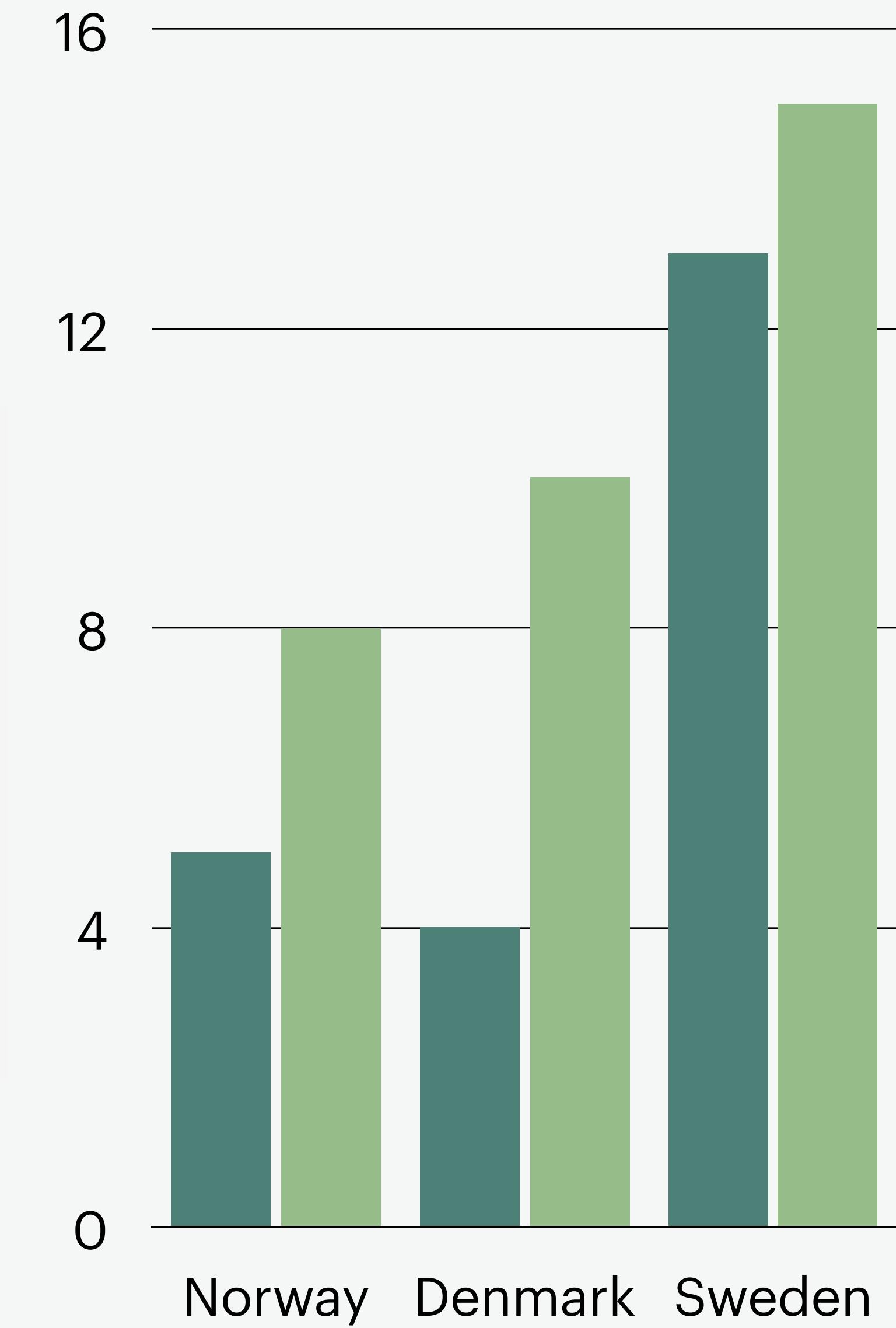
What is this?



# 1 dataset 100 visualizations

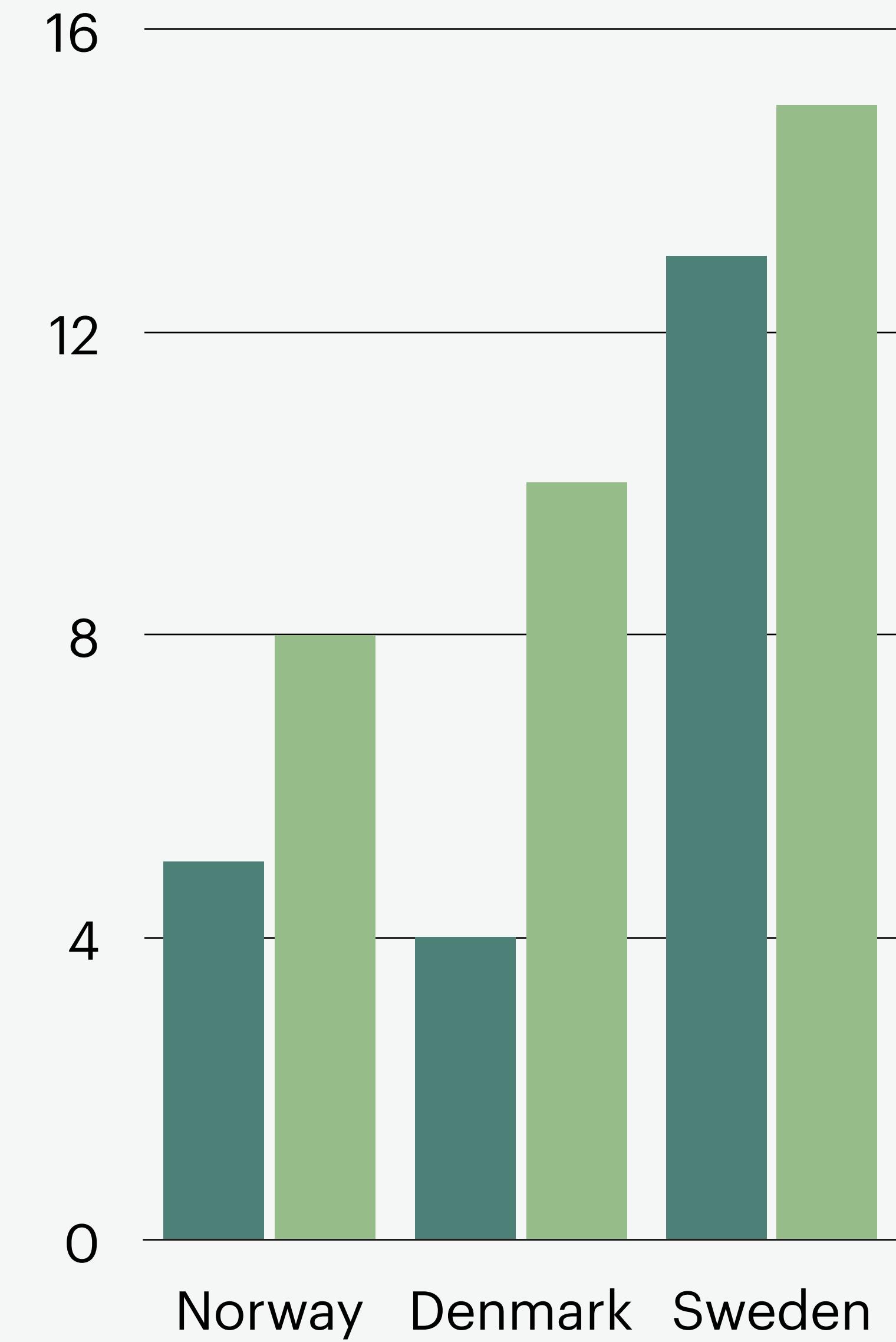


**Bar Chart**



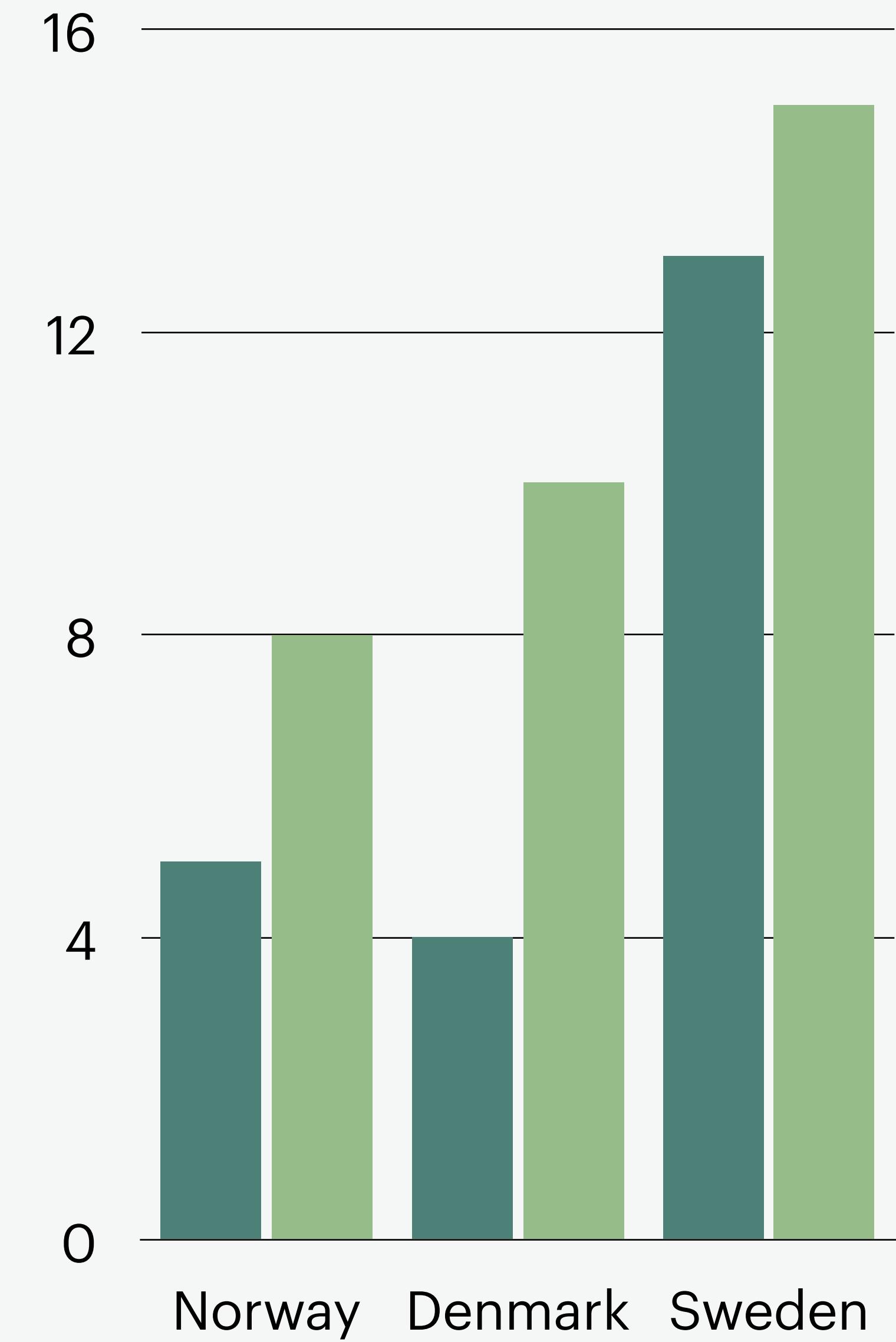
**What can a viewer  
understand from  
this chart?**

**Bar Chart**



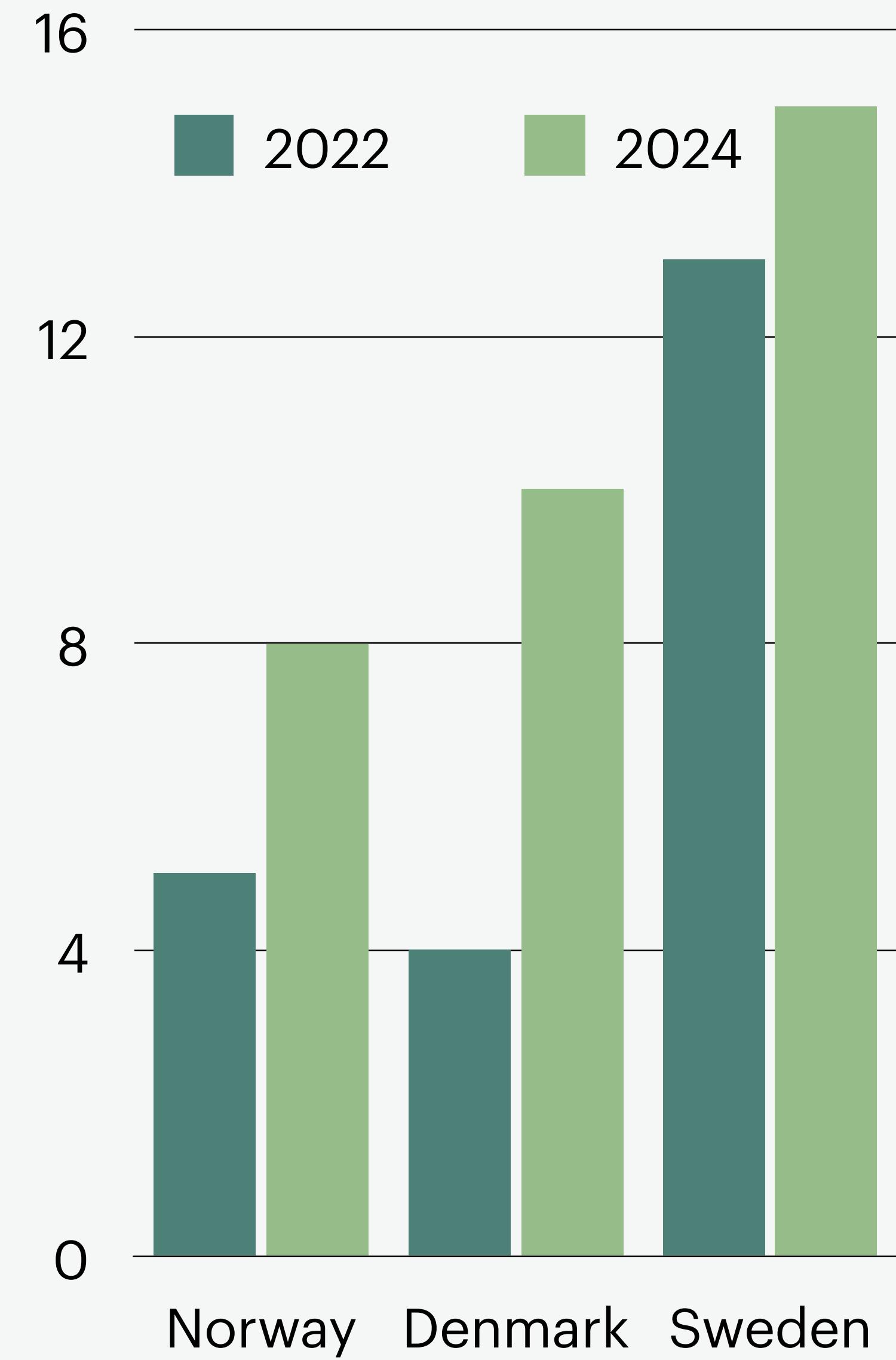
Is there anything  
missing?

Bar Chart



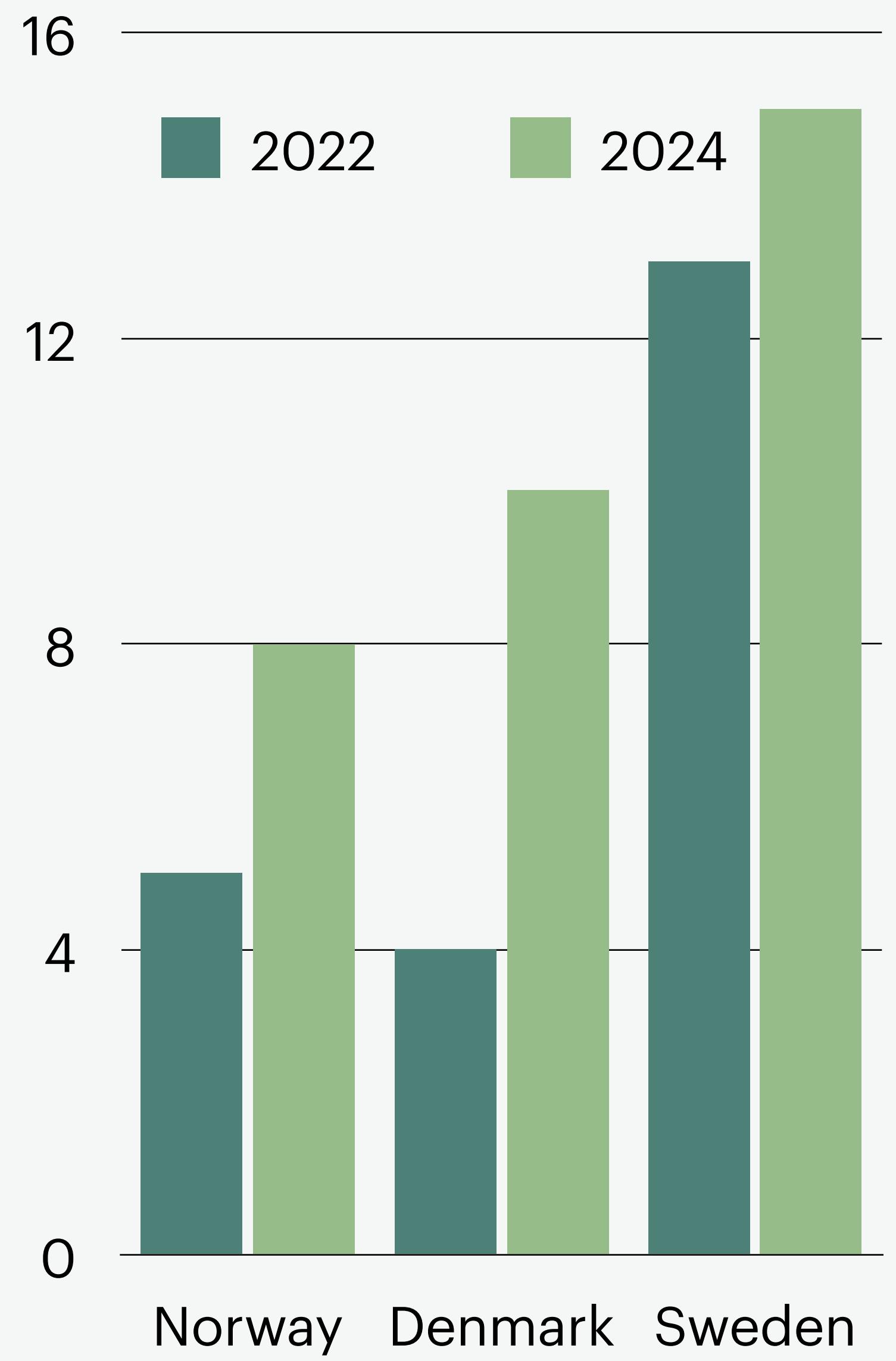
# What's this?

## Bar Chart



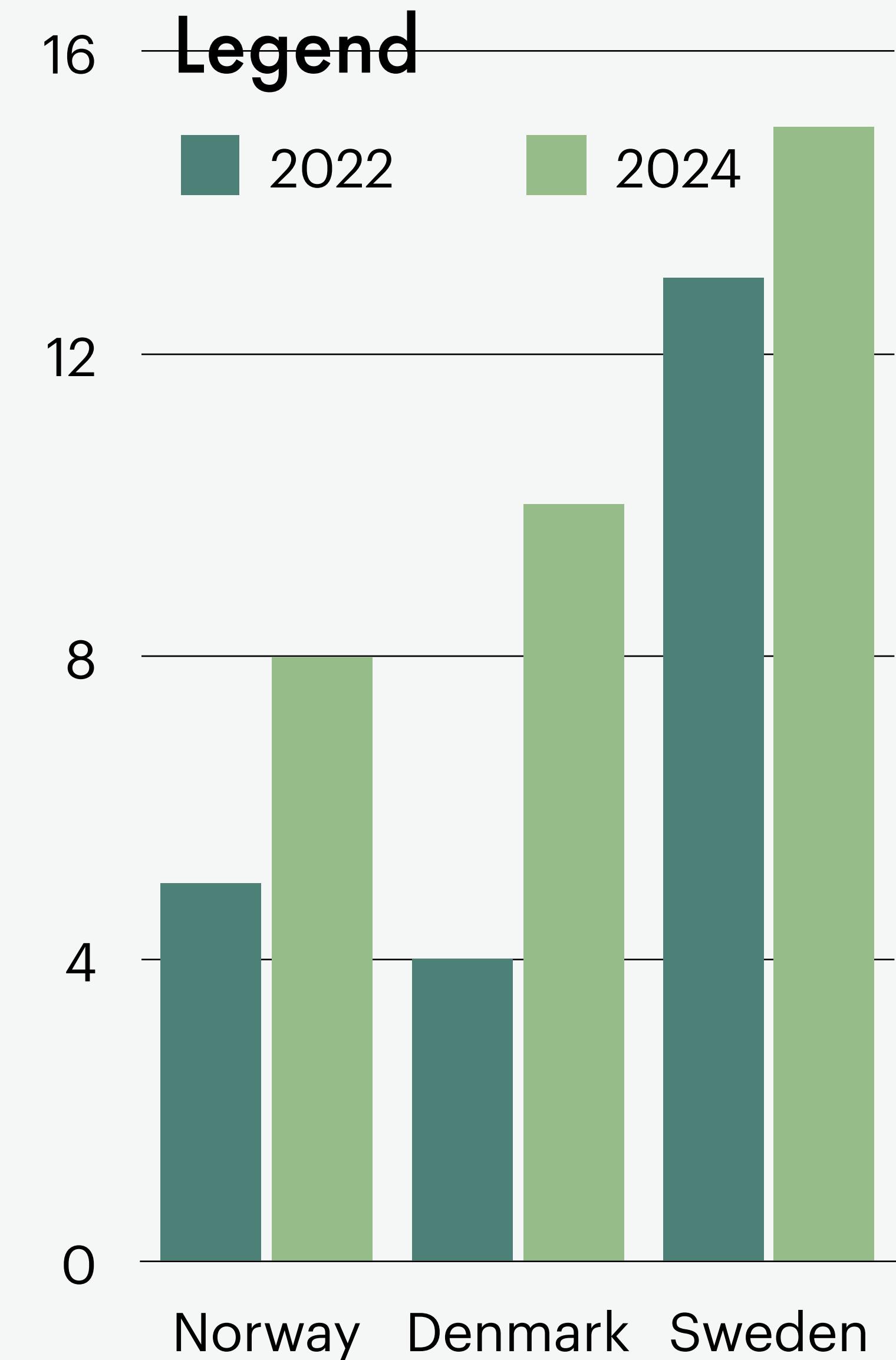


(Hint)



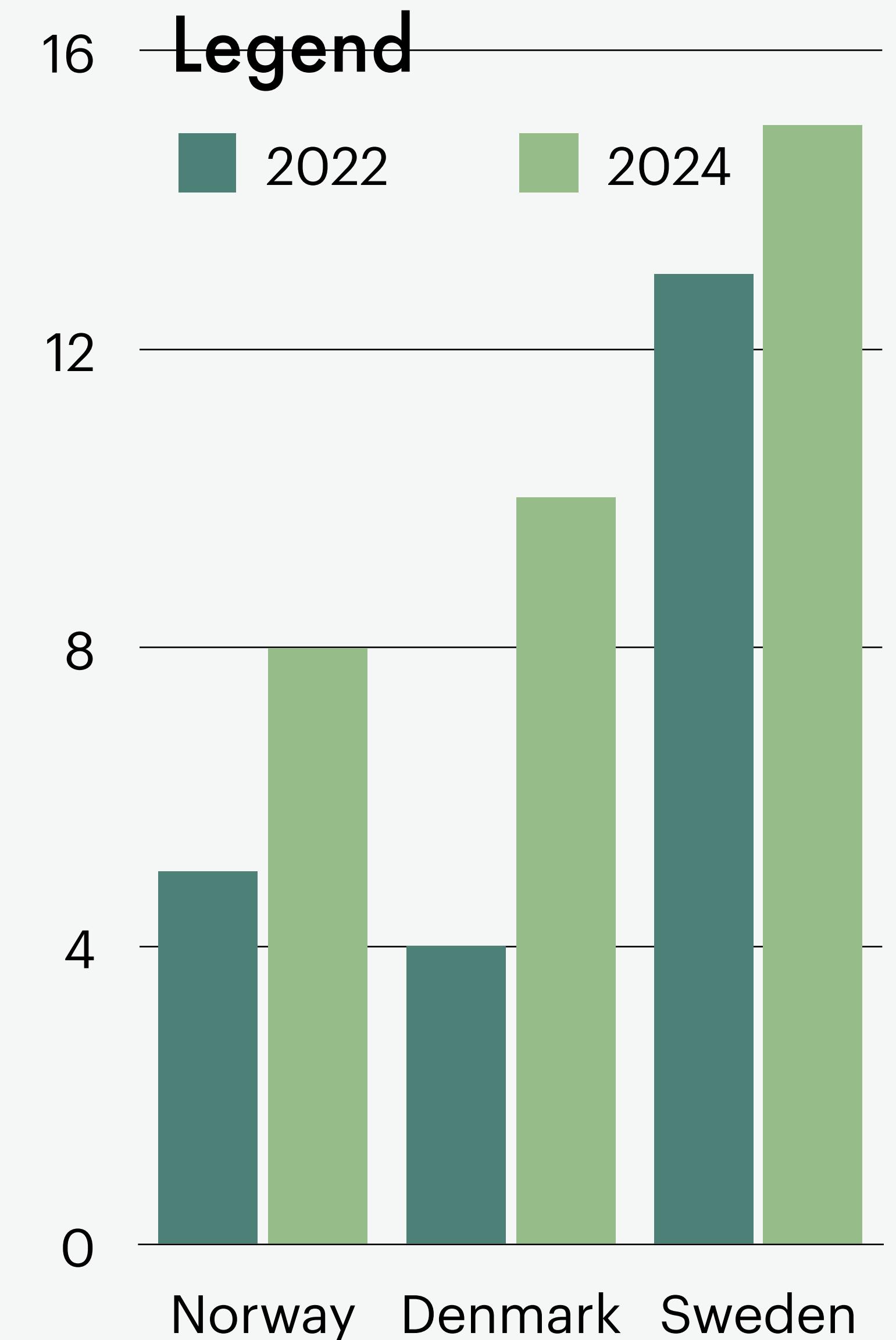
# Legend

Tells you something about  
how data is encoded

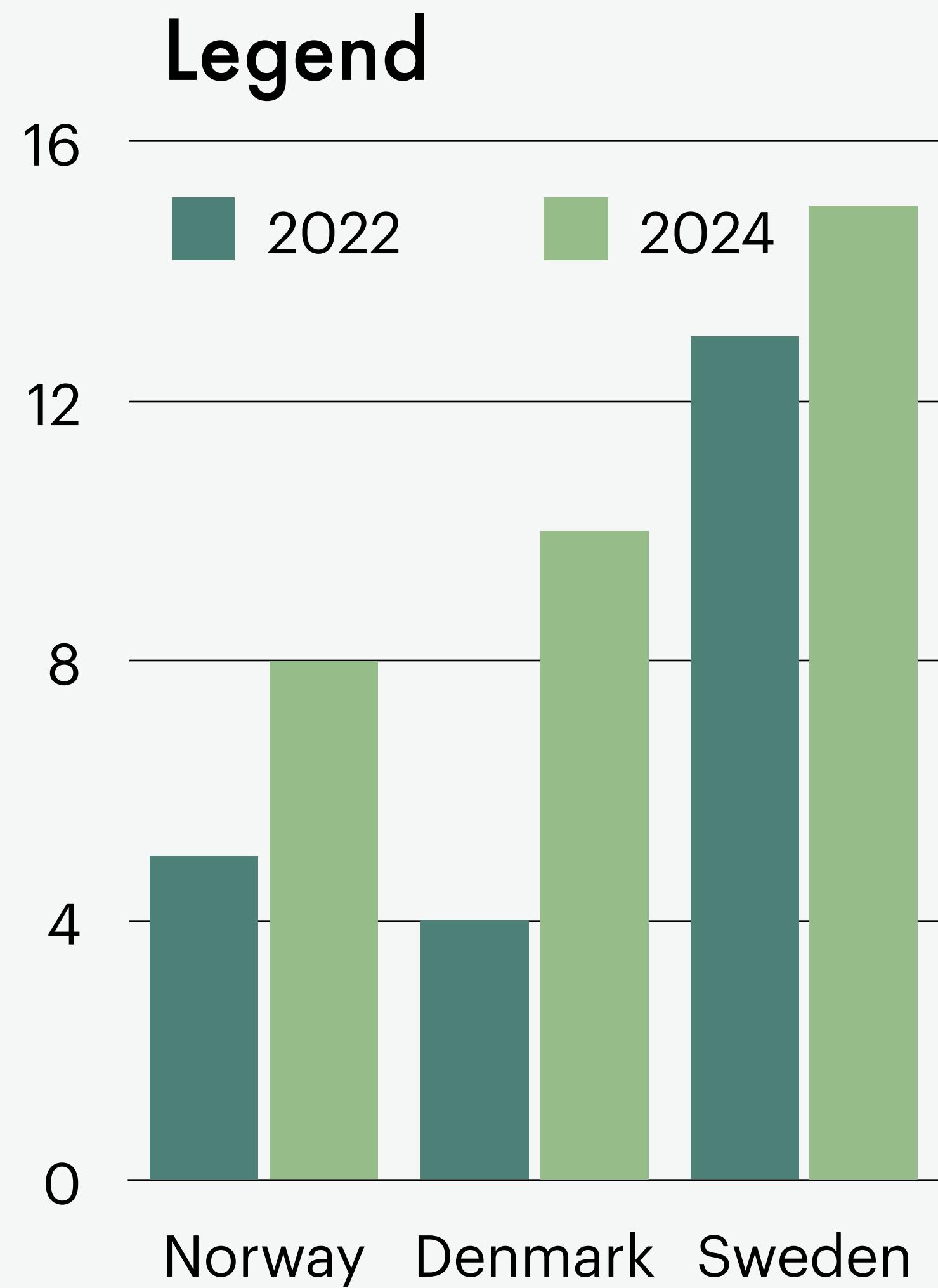


# Legend

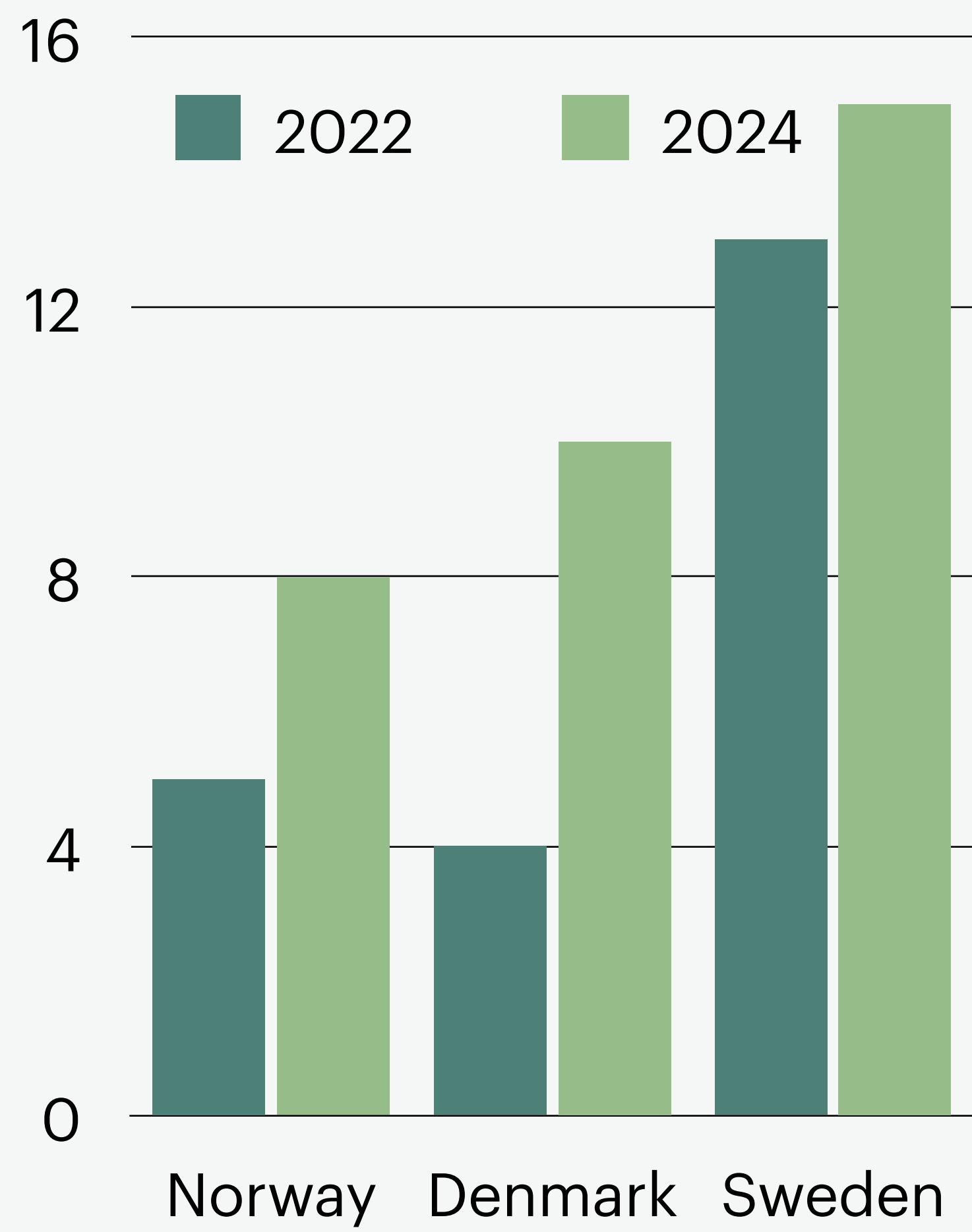
Tells you something about  
how data is encoded



# Anything else?



## Legend



## Legend

2022

2024

Y Axis Label

Number of World Heritage Sites

16

12

8

4

0

Norway Denmark Sweden



## Legend

2022

2024

Y Axis Label

Number of World Heritage Sites

16

12

8

4

0

Norway Denmark Sweden

Country



## Legend

2022

2024

Y Axis Label

Number of World Heritage Sites

16

12

8

4

0

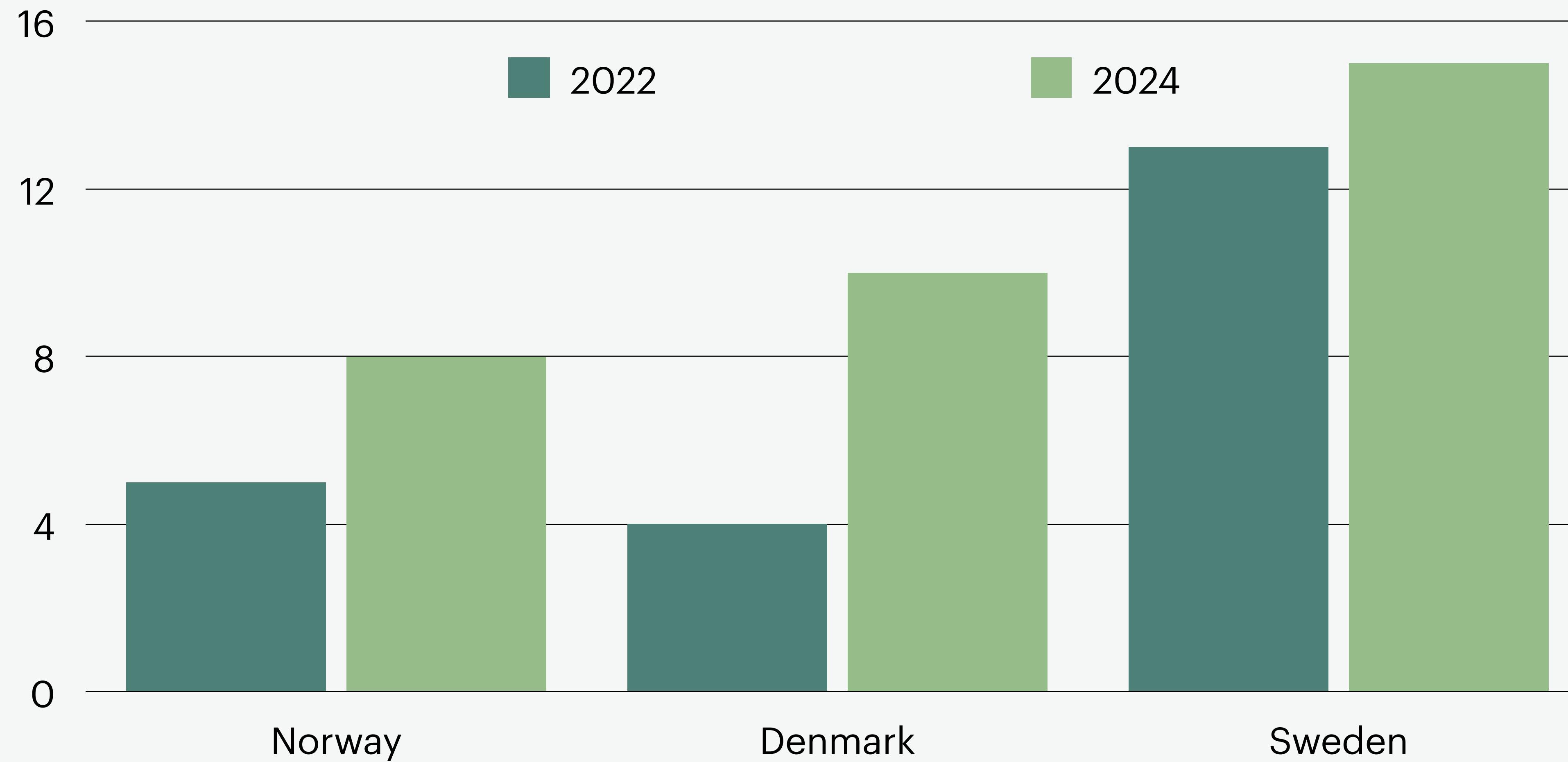
Norway Denmark Sweden

Country

X Axis Label

Placeholder Text

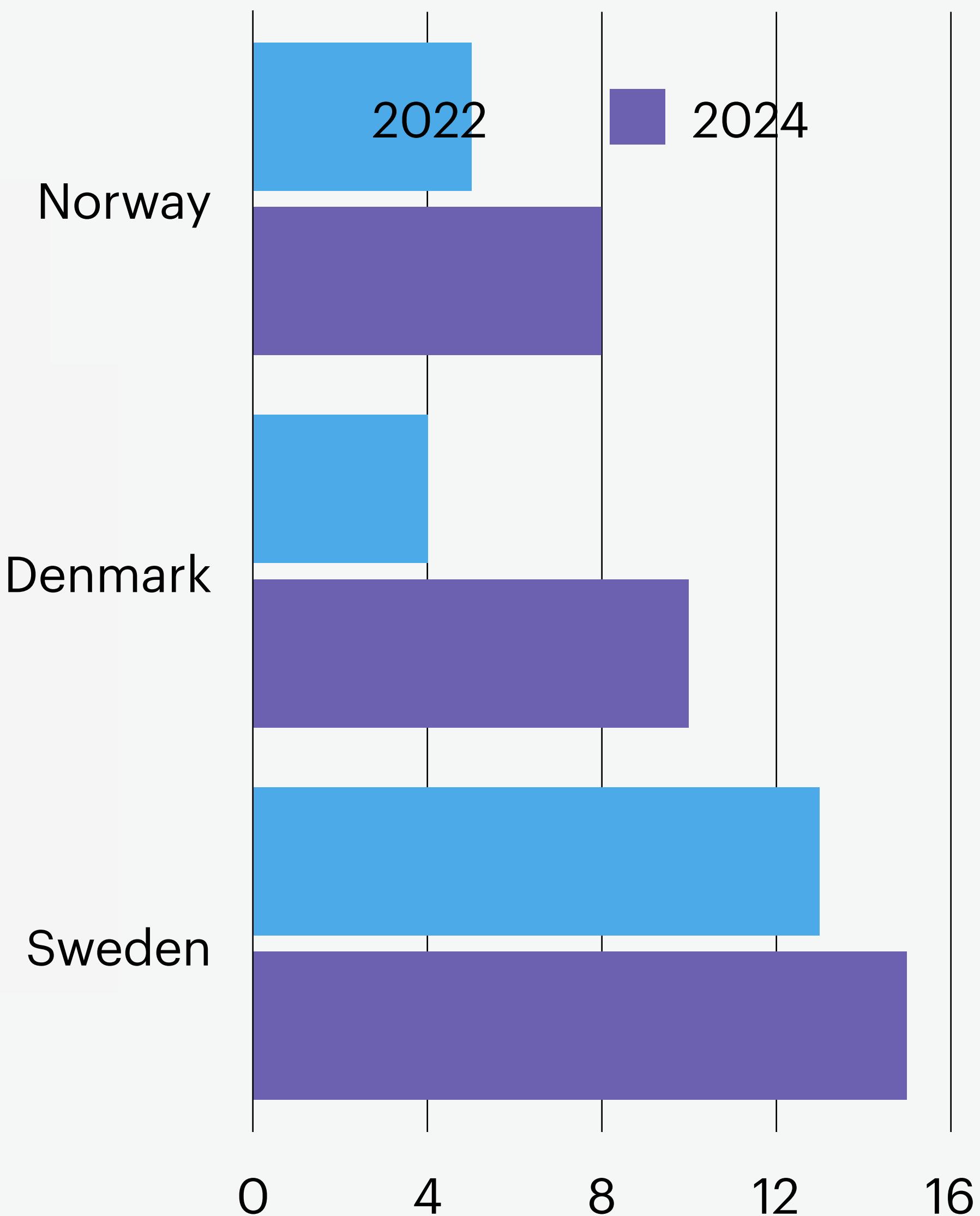
# Number of World Heritage Sites by Country and Year



# 1 dataset 100 visualizations



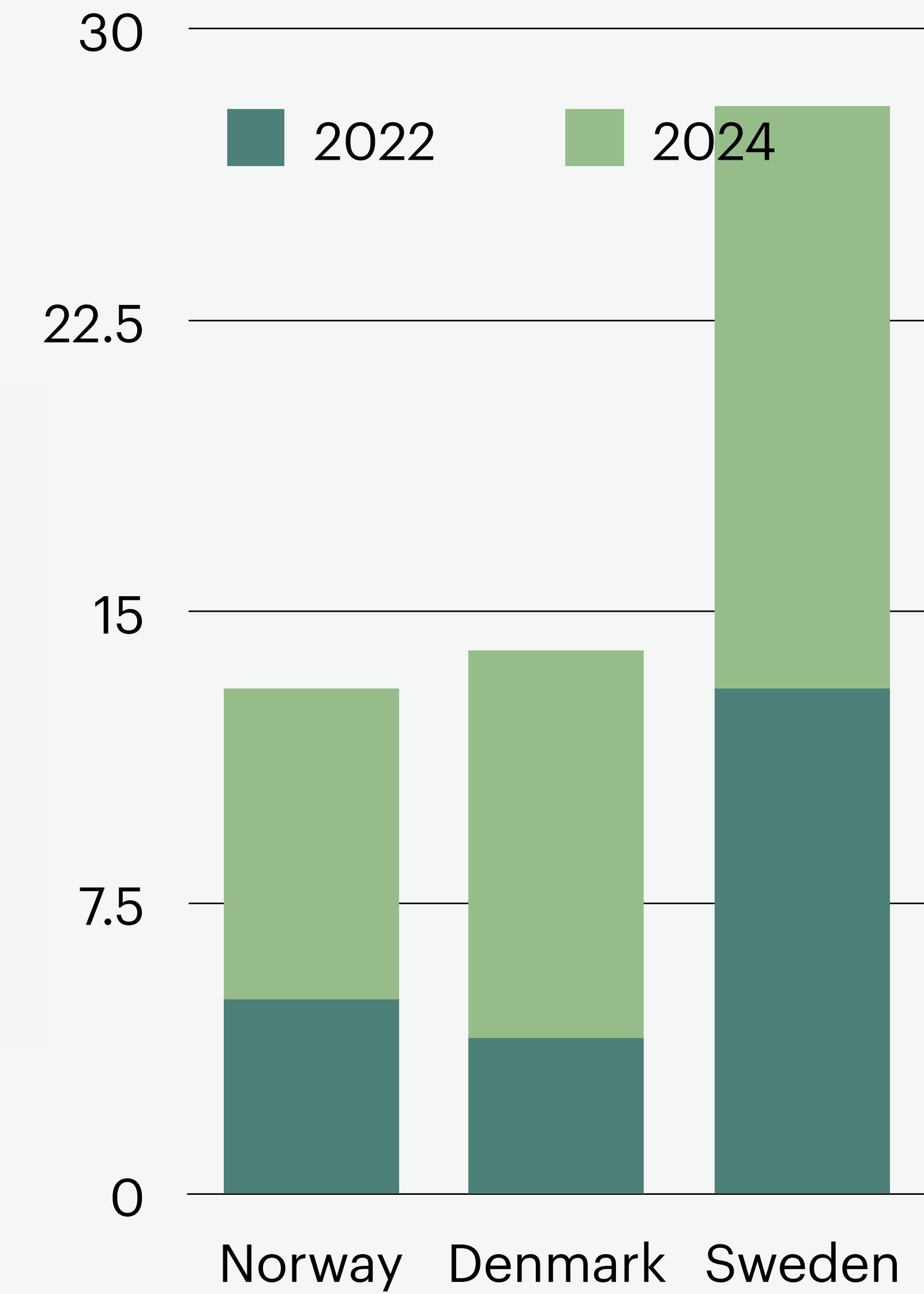
Bar Chart



# 1 dataset 100 visualizations



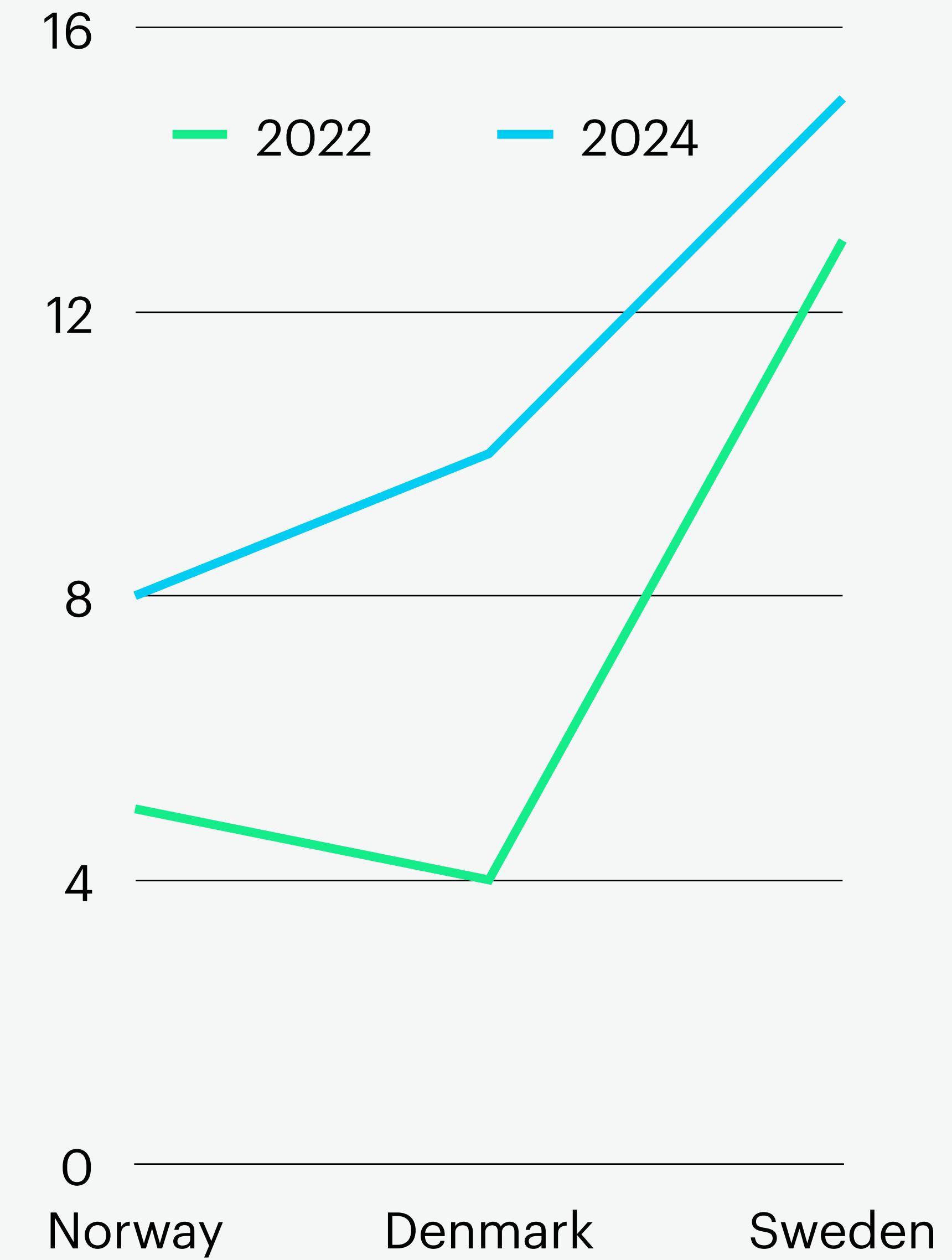
## Stacked Columns



# 1 dataset 100 visualizations



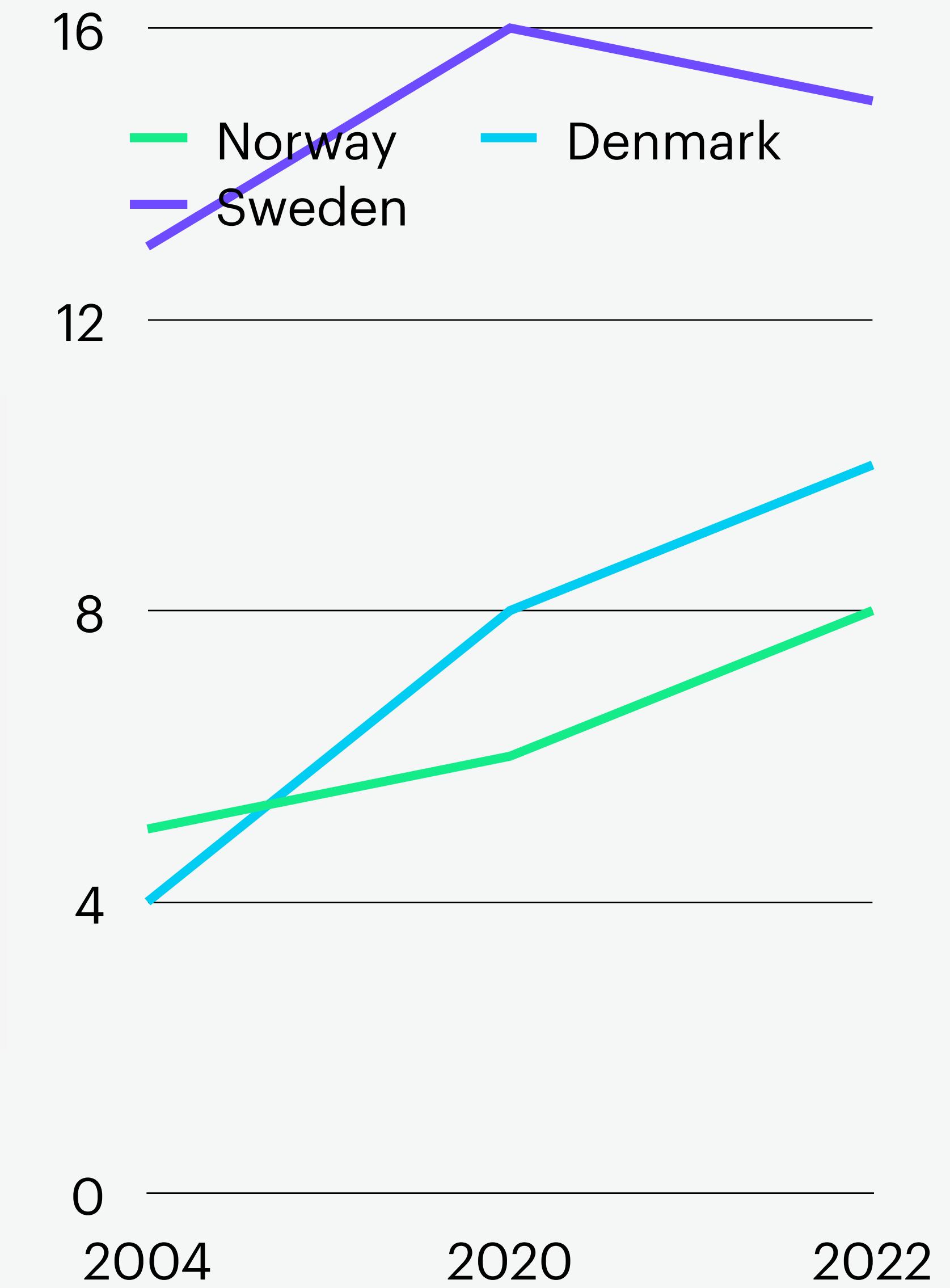
## Line Chart



# 1 dataset 100 visualizations



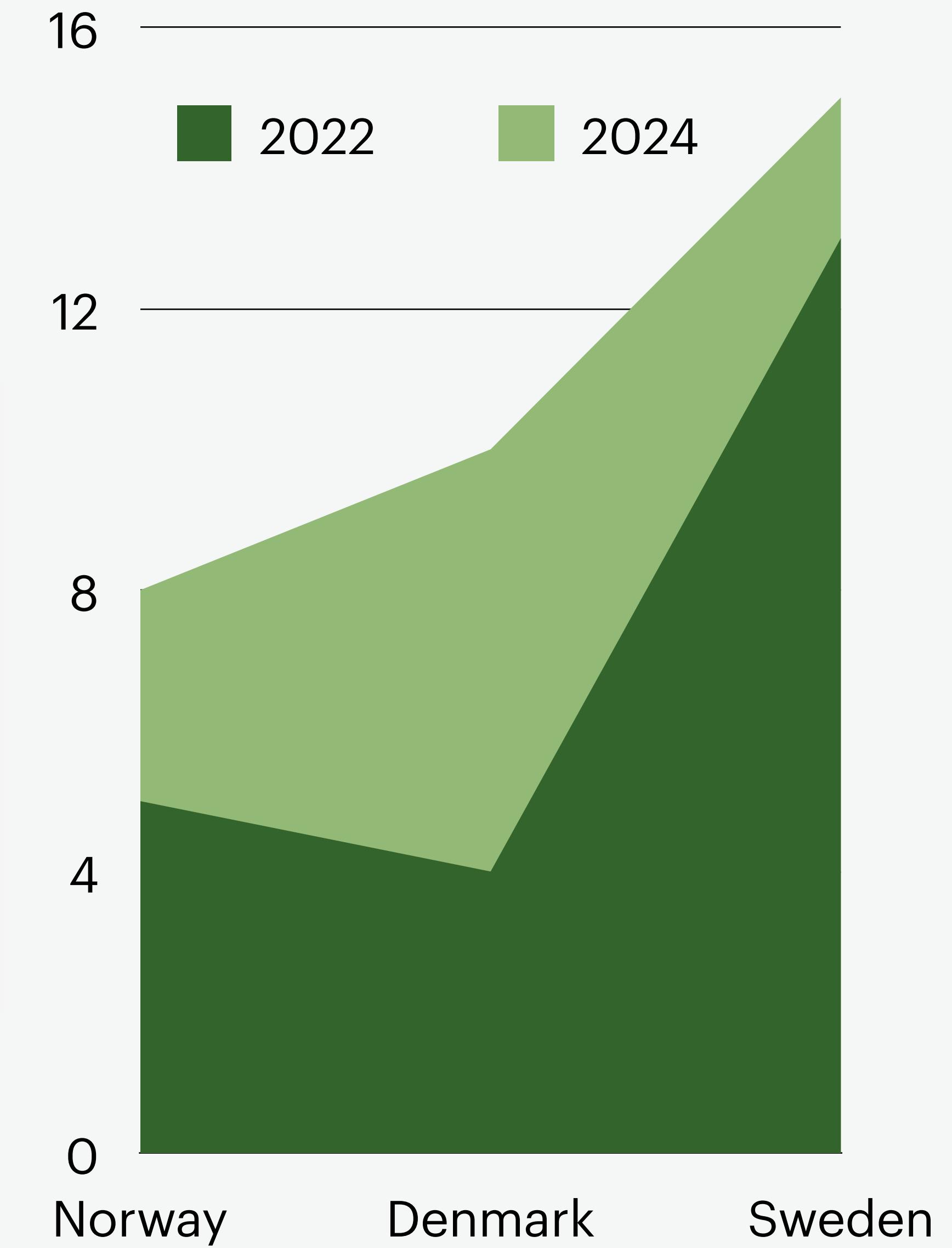
Line Chart



# 1 dataset 100 visualizations



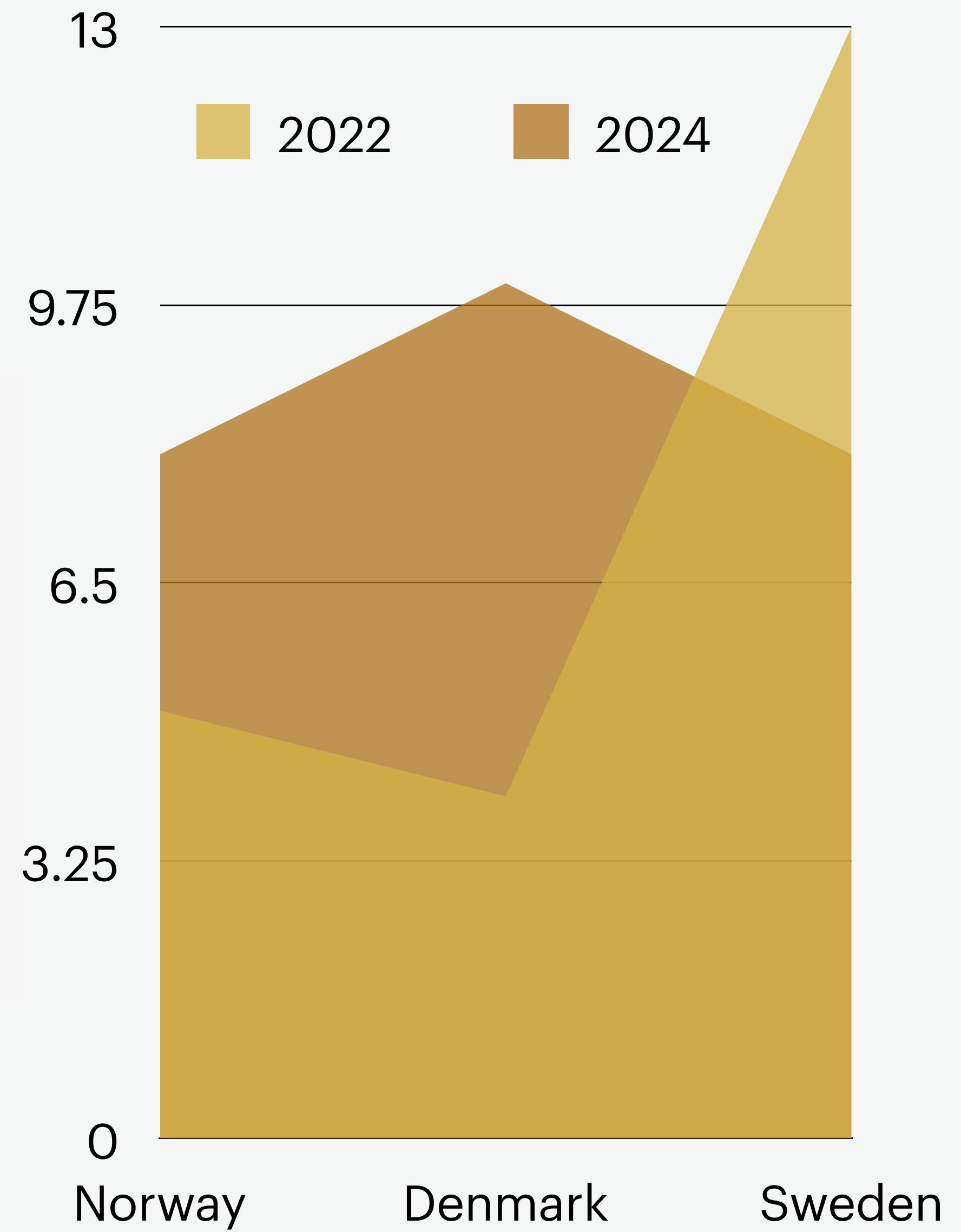
**Area Chart**



# 1 dataset 100 visualizations



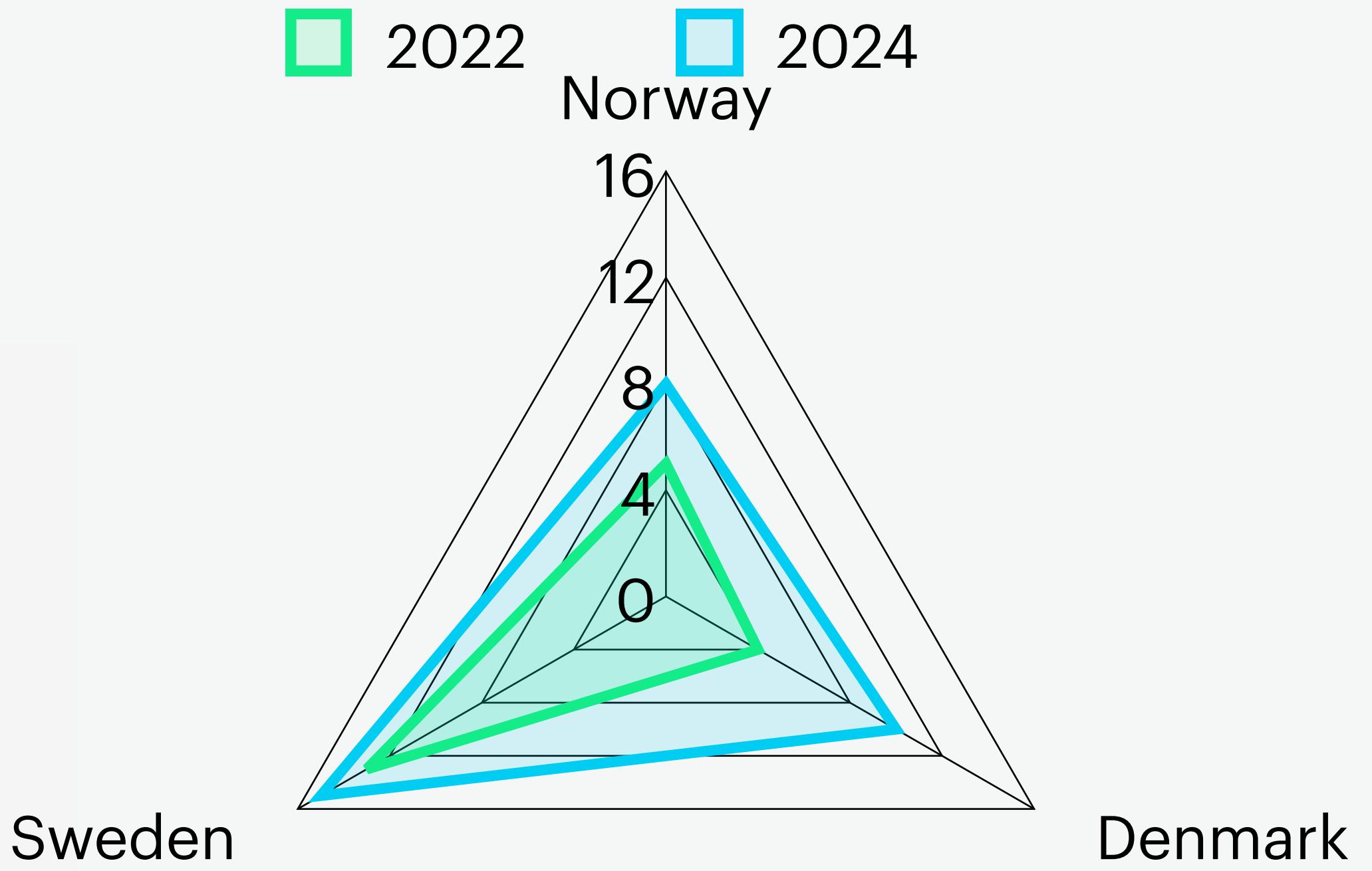
**Area Chart**



# 1 dataset 100 visualizations



Radar



# 1 dataset 100 visualizations



● 2022      ● 2024



Pie

# 1 dataset 100 visualizations



2022 2024

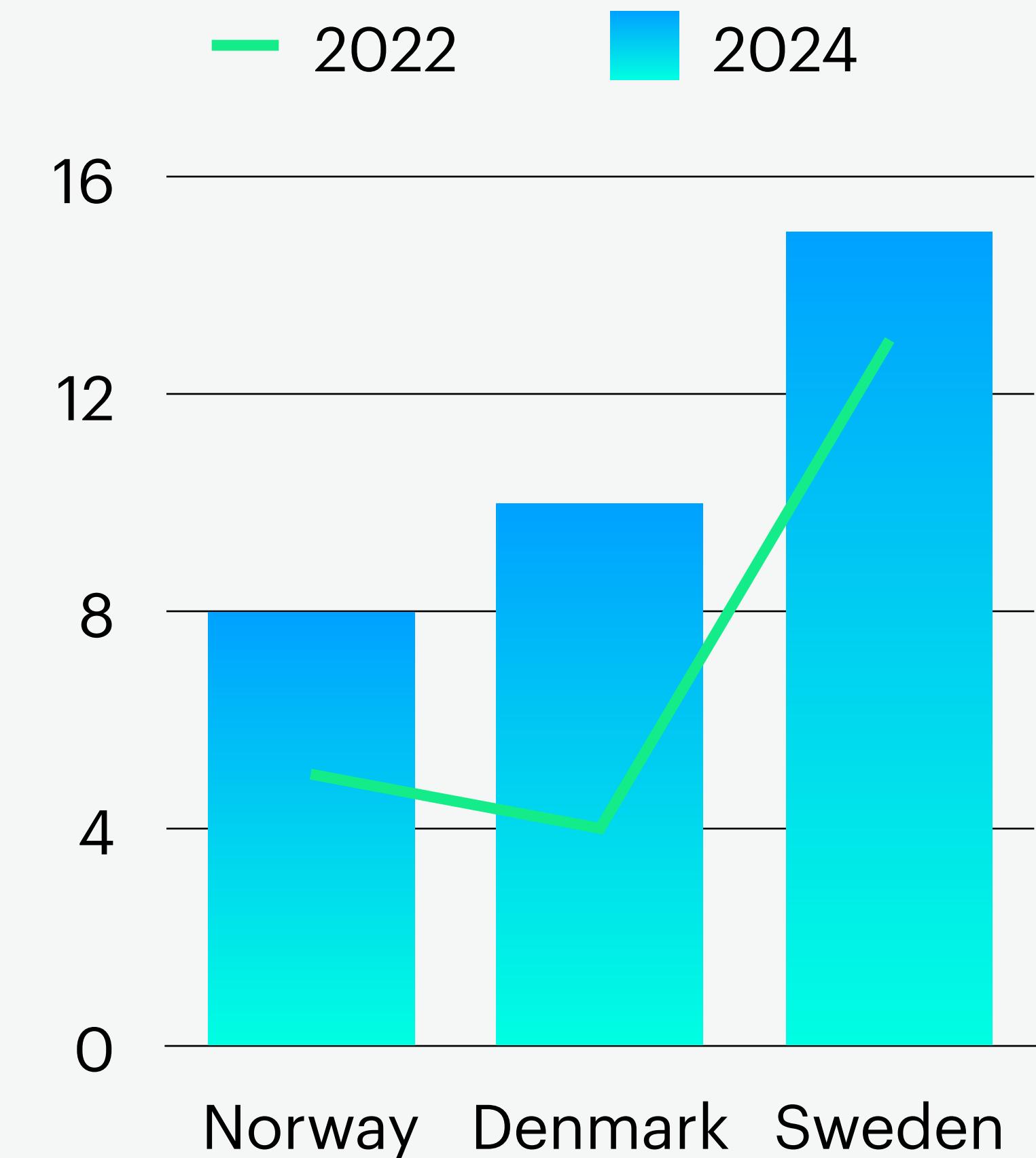


Doughnut

# 1 dataset 100 visualizations



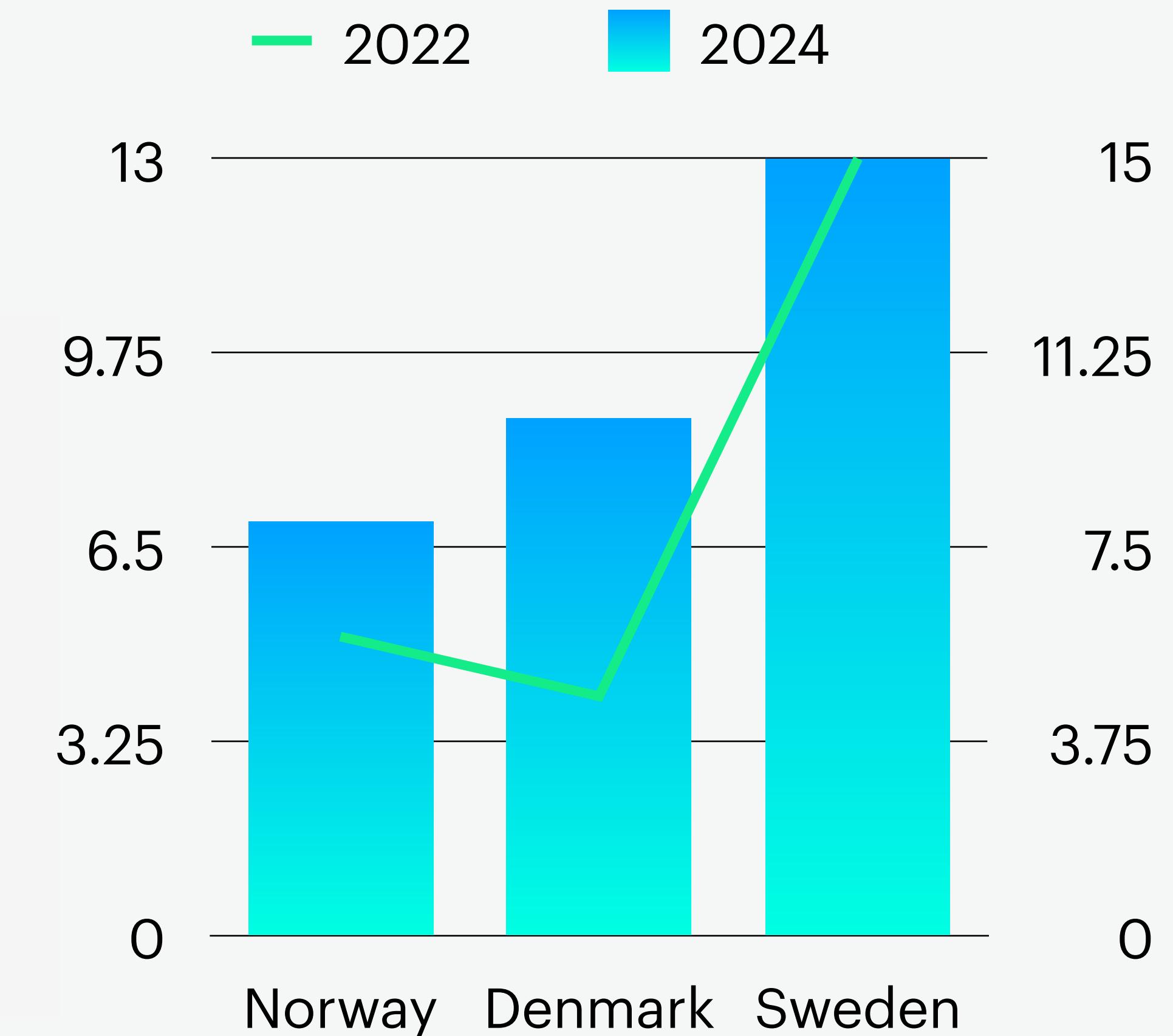
Mixed



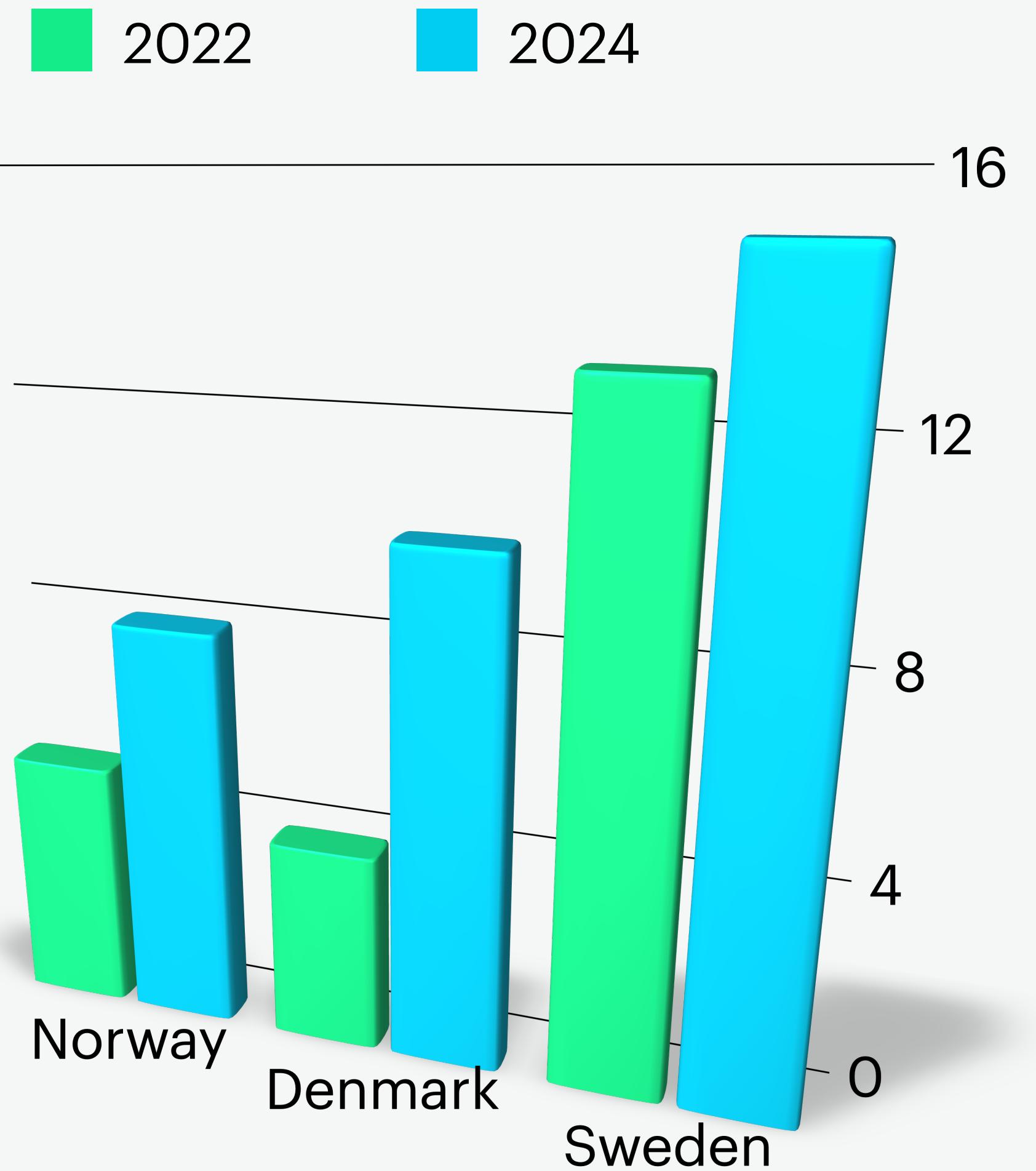
# 1 dataset 100 visualizations



Different Y axis



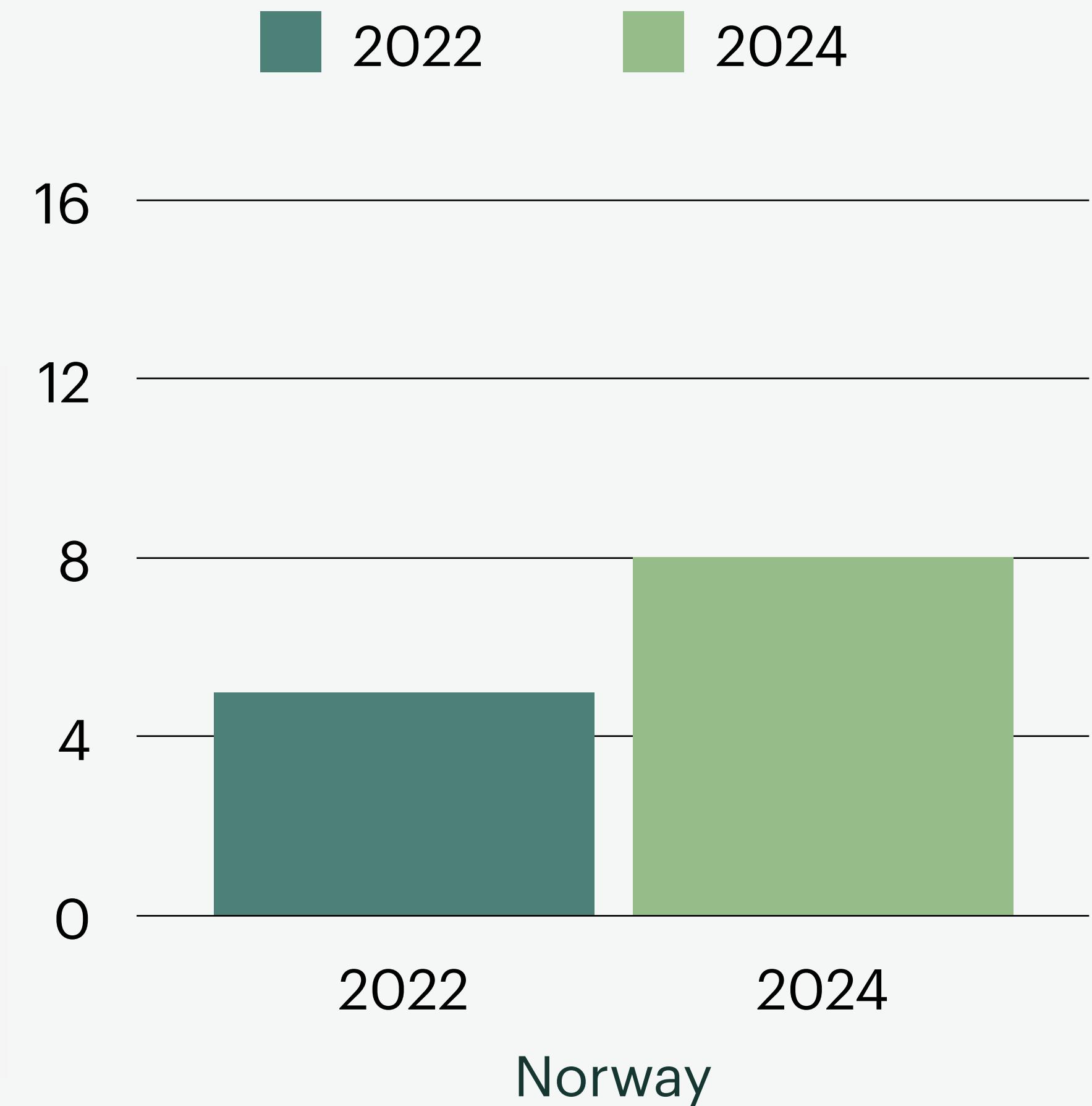
# 1 dataset 100 visualizations



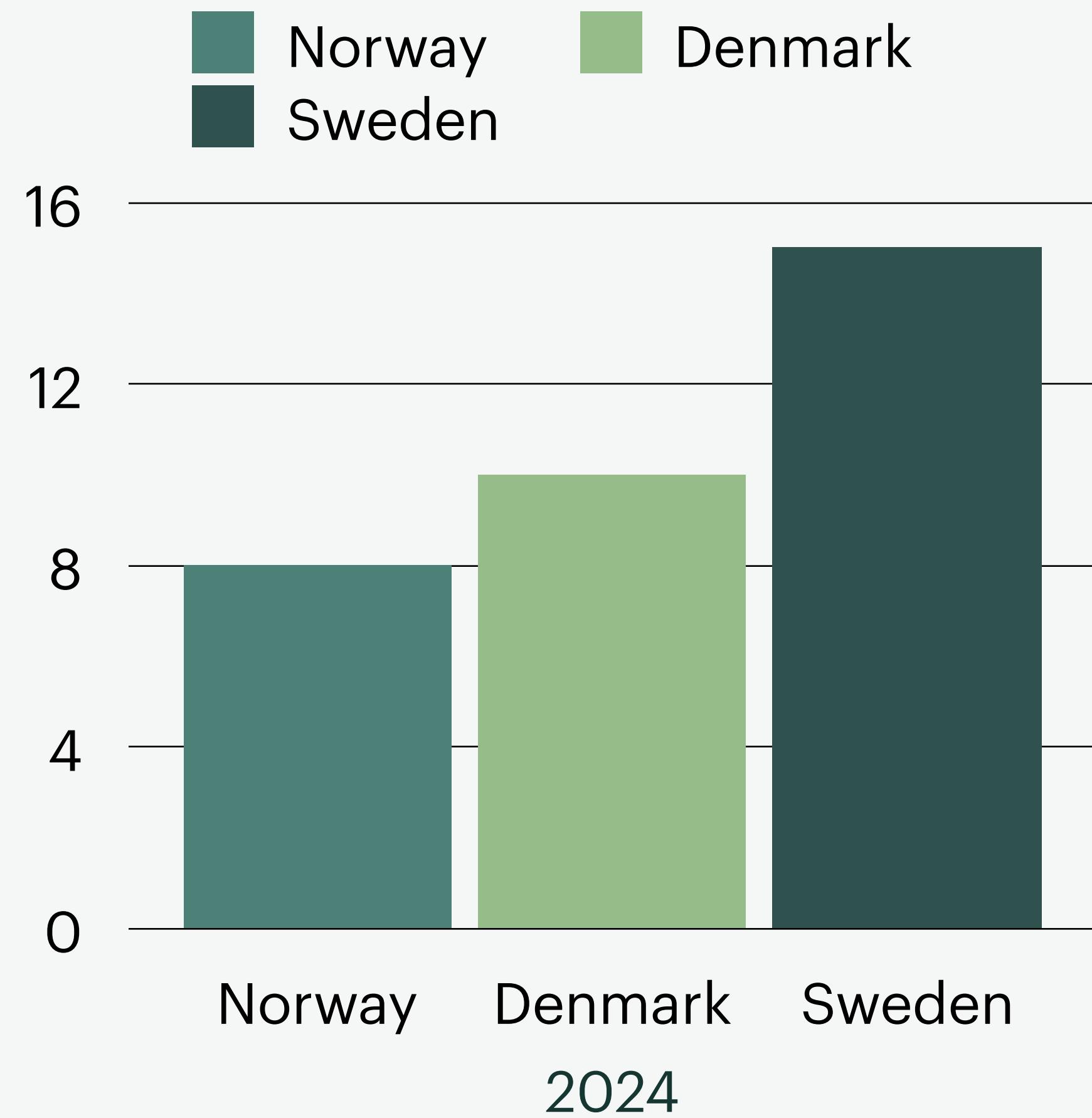
# 1 dataset 100 visualizations



Interactive



# 1 dataset 100 visualizations



Interactive

# Visual Implantations & Retinal Variables

Visual perception operates according to rules that can be followed to express information visually in intuitive, accurate and efficient ways.

# Jacques Bertin Semiology of Graphics [1967]

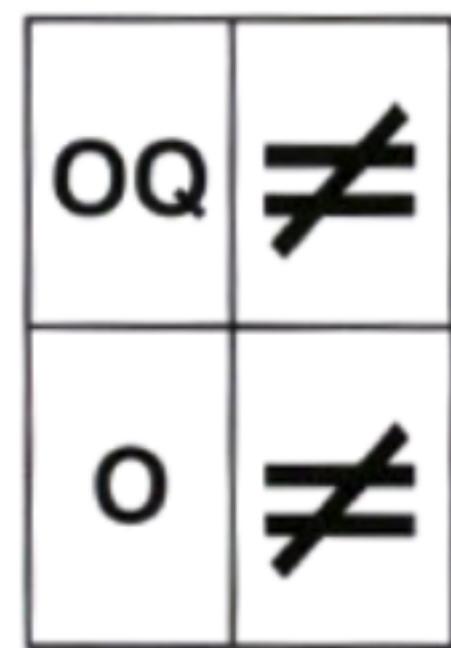
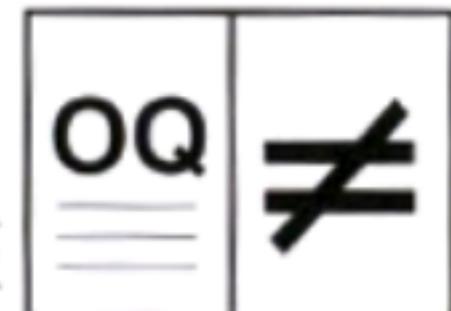
## VARIABLES OF THE IMAGE

**XY** 2 DIMENSIONS OF THE PLANE

**Z**

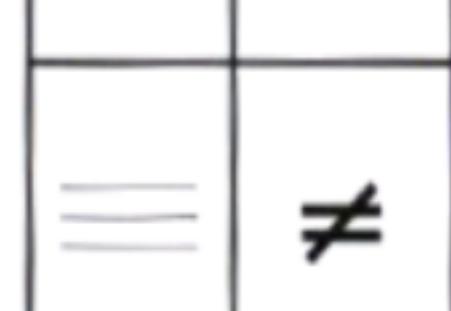
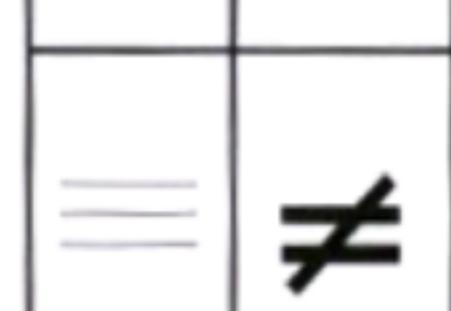
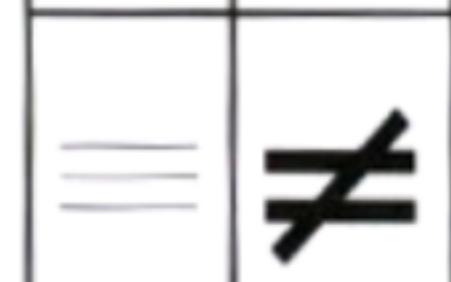
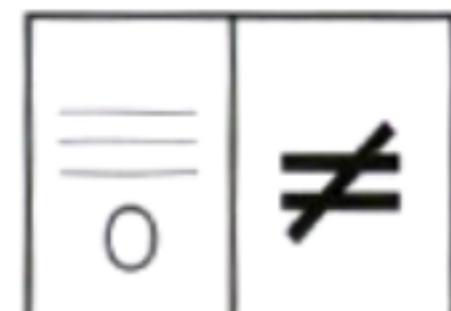
SIZE

VALUE

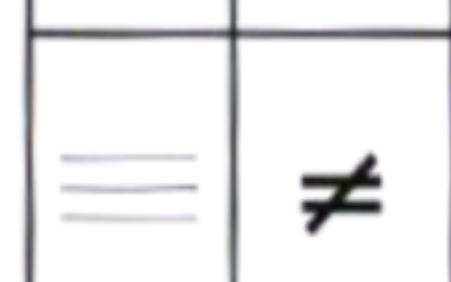
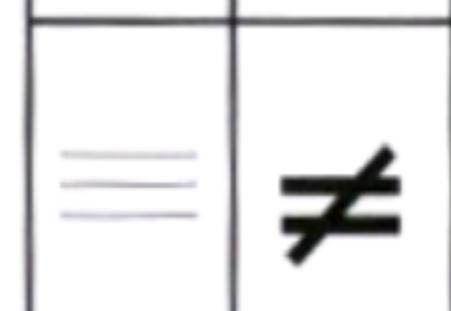


## DIFFERENTIAL VARIABLES

TEXTURE



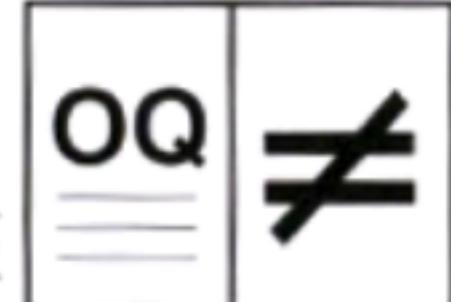
COLOR



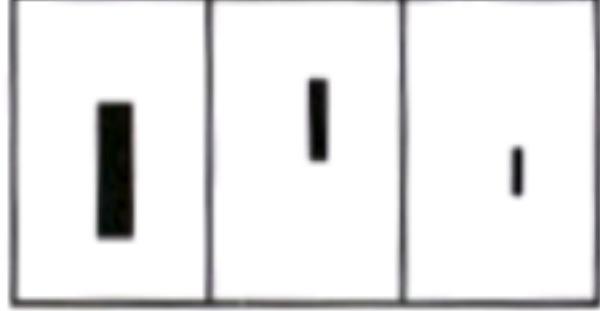
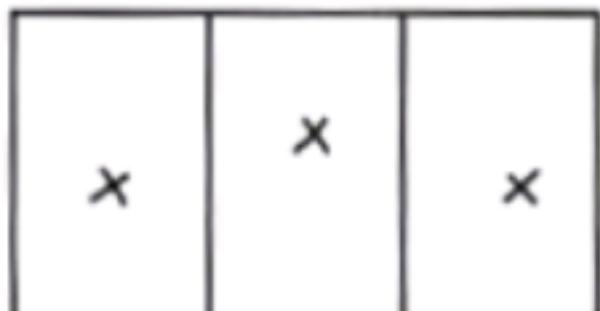
ORIENTATION



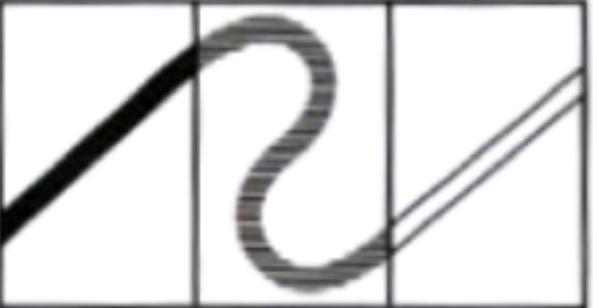
SHAPE



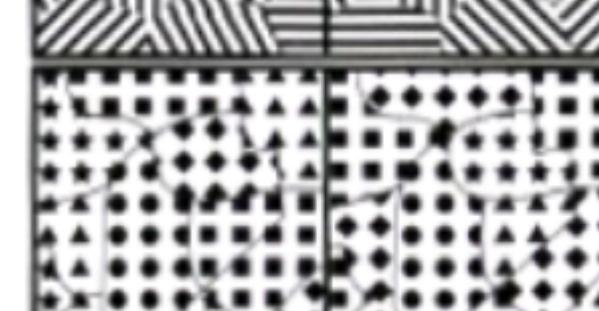
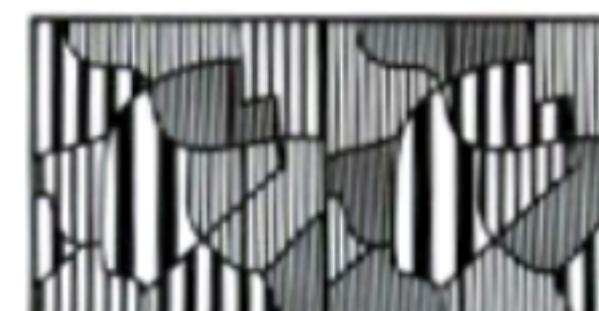
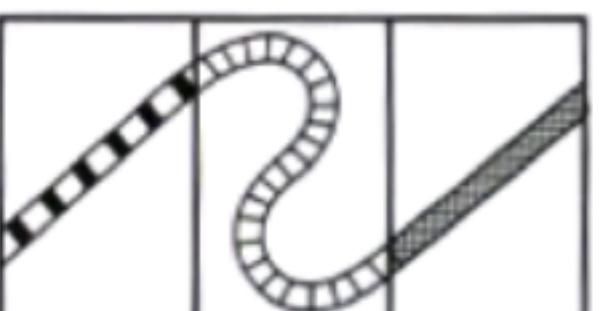
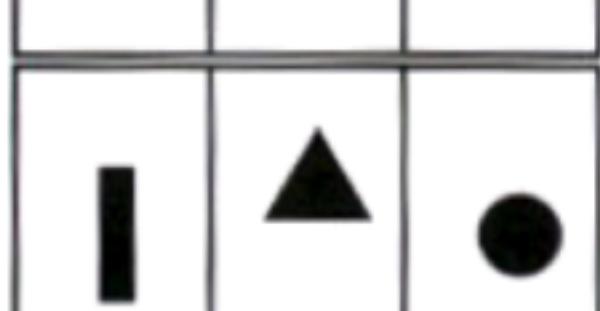
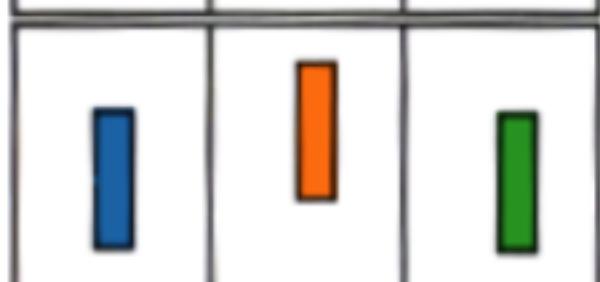
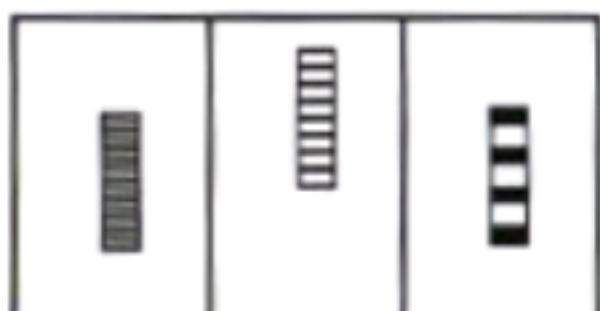
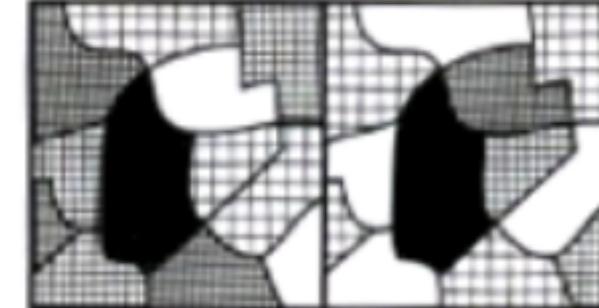
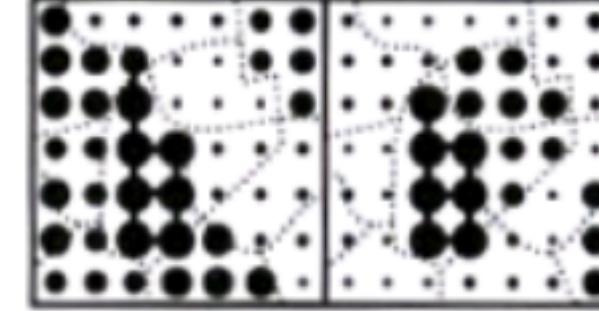
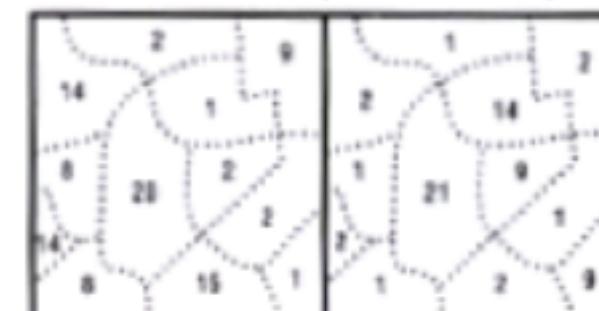
POINT



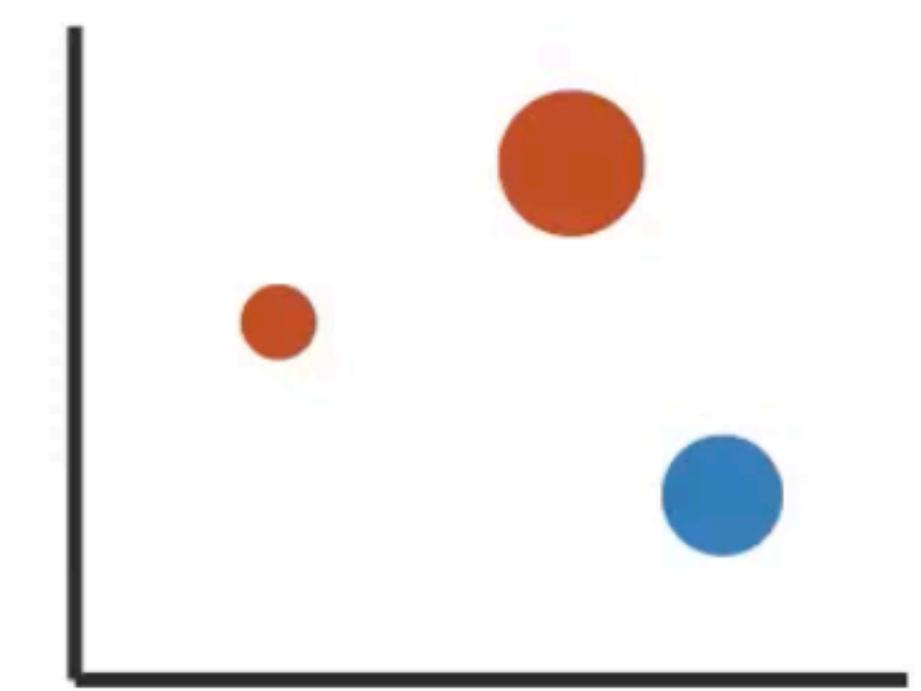
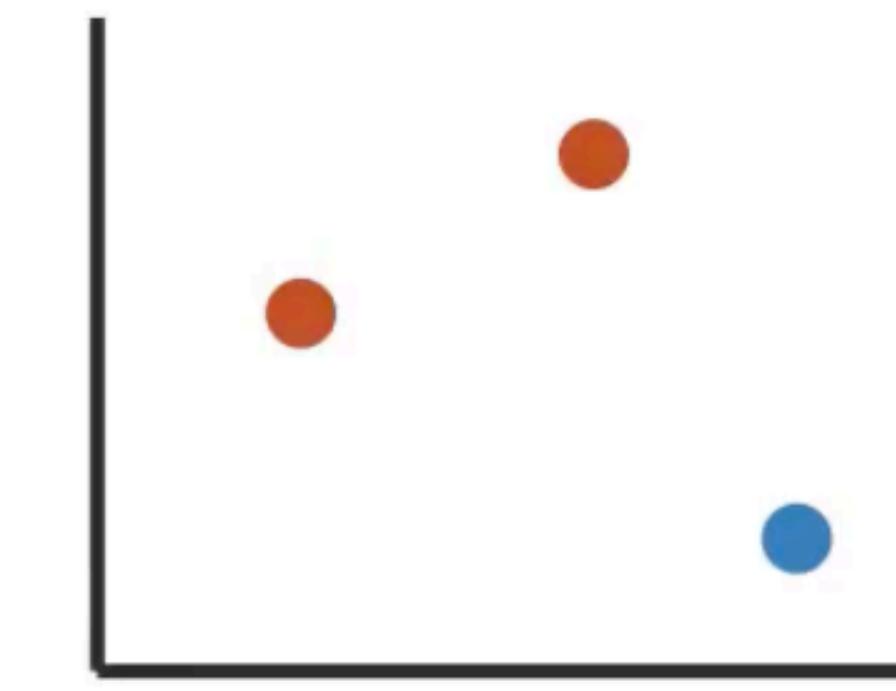
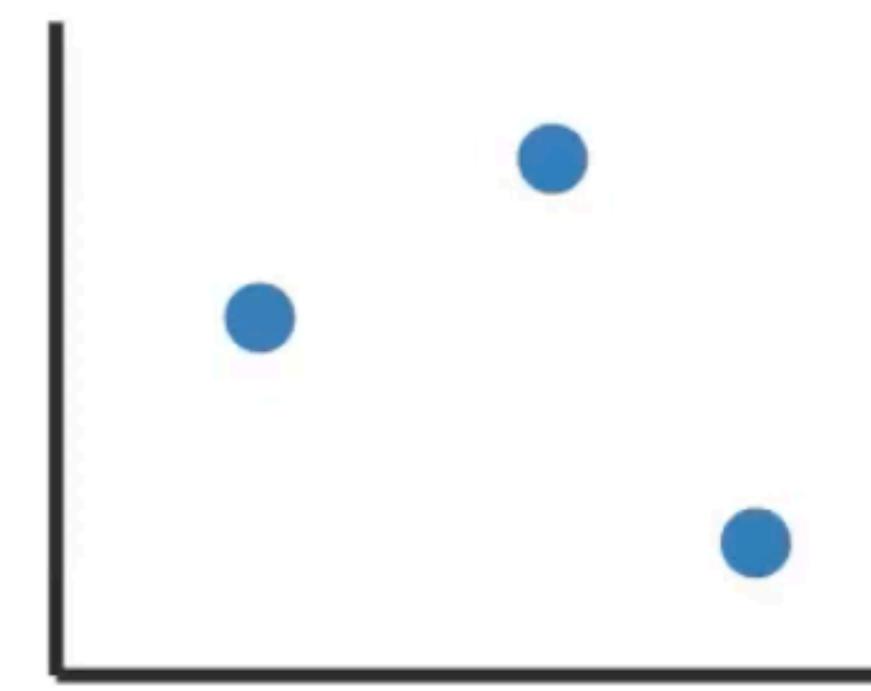
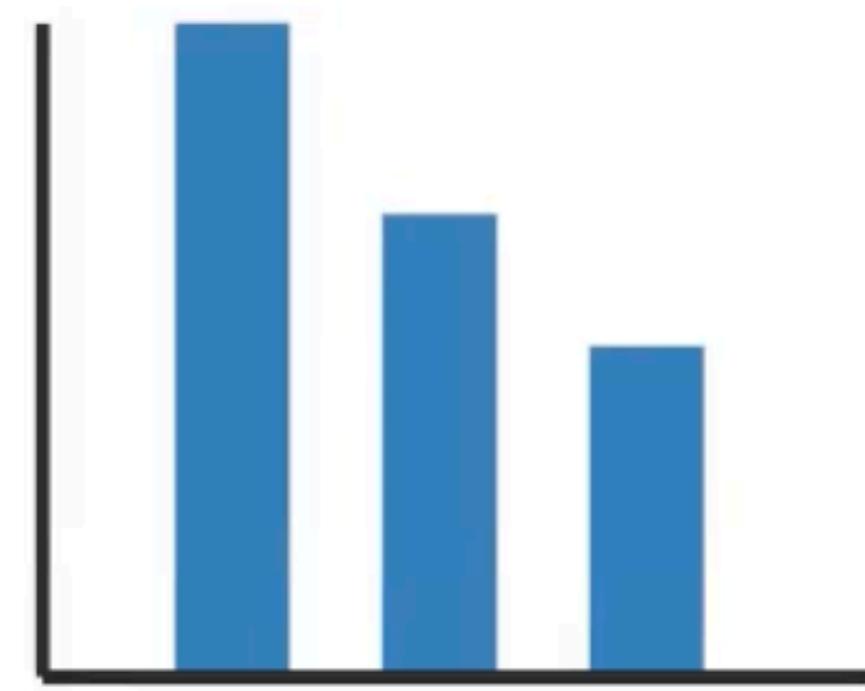
LINE

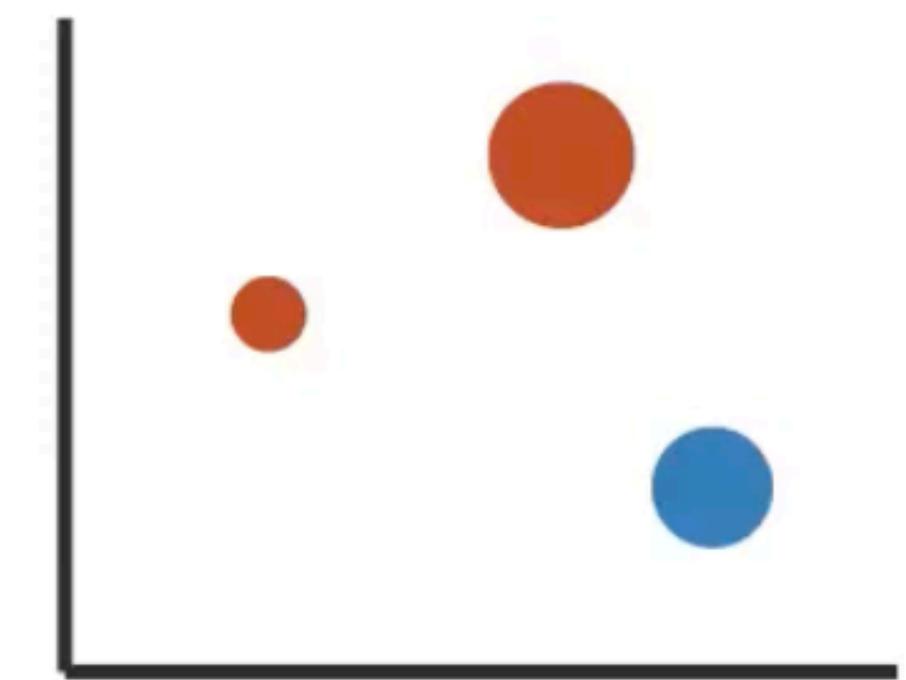
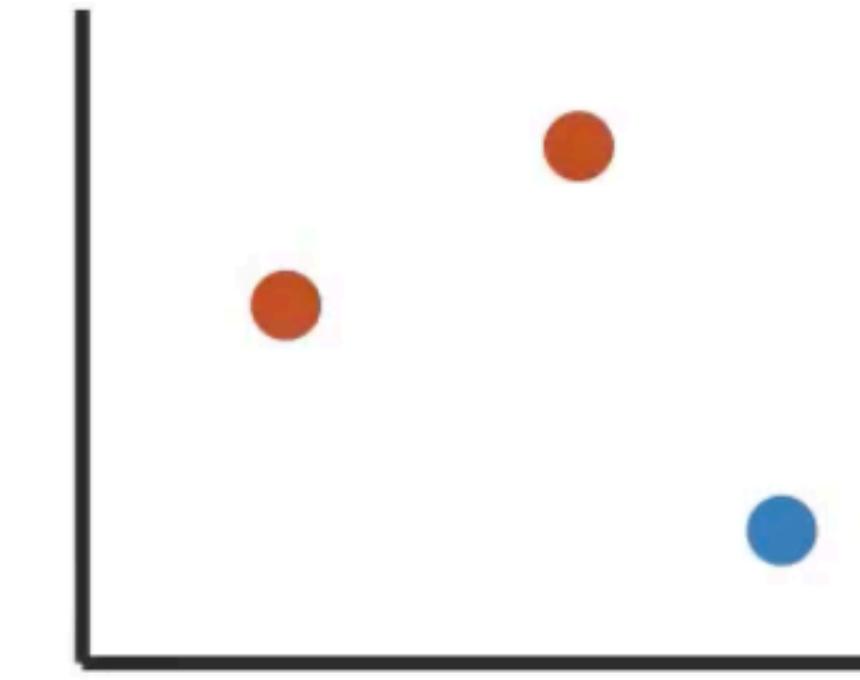
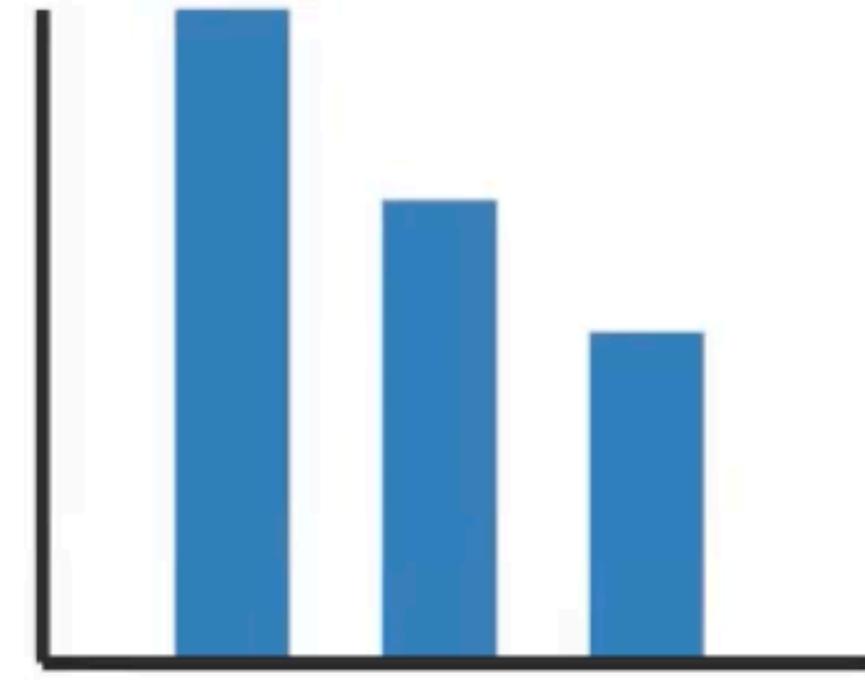


AREA (ZONE)



# Marks & channels





**What's being represented here?**



# Marks & channels

Represent items or links

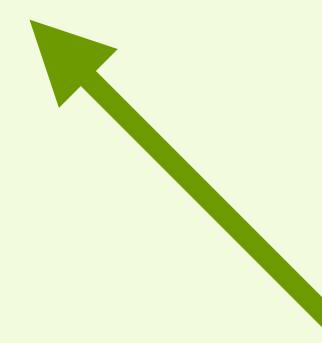
Change appearance of marks  
based on attributes

# Marks & channels



Represent items or links

Change appearance of marks  
based on attributes



# Marks & channels

Change appearance of marks  
based on attributes

# Marks & channels

Represent items or links

# Marks

Represent items or links

**0D - Points**



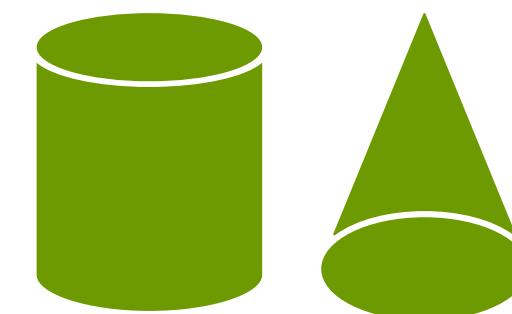
**1D - Lines**



**2D - Area**



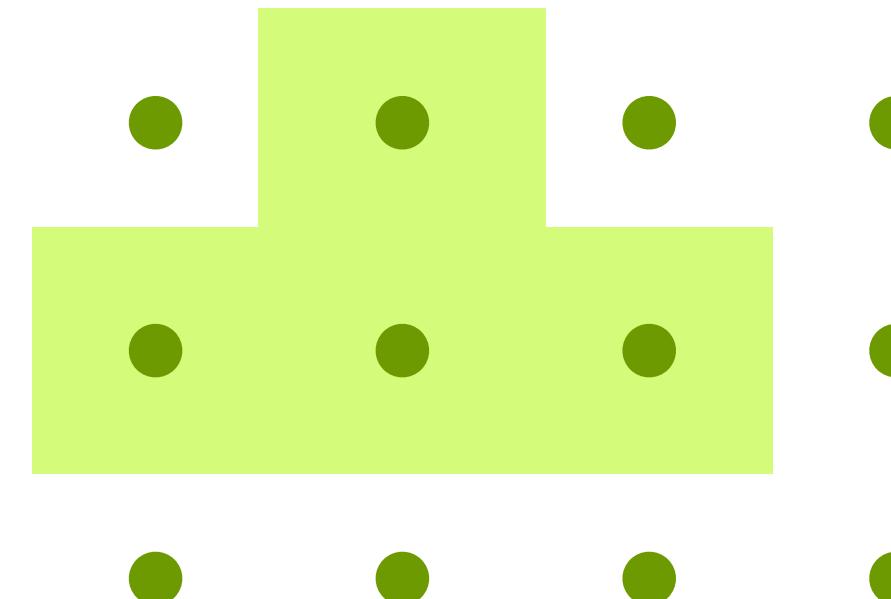
**3D - Volume**



# Marks

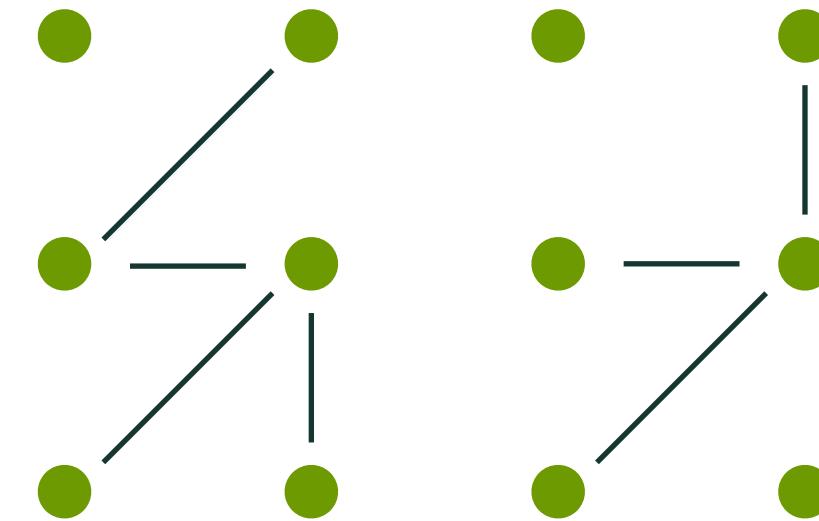
Represent items or links

## Containment



Represent items or  
links

## Connection



# Channels

Change appearance of marks based on attributes

Nominal Ordinal Interval Ratio  
Categorical

## ④ Identity Channels: Categorical Attributes

Spatial region



Color hue



Motion



Shape



Most ▲

Effectiveness

▼ Least

# Channels

Change appearance of marks based on attributes

Nominal Ordinal Interval Ratio

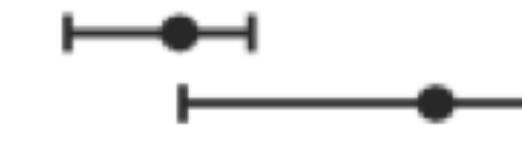
Magnitude

## ④ Magnitude Channels: Ordered Attributes

Position on common scale



Position on unaligned scale



Length (1D size)



Tilt/angle



Area (2D size)



Depth (3D position)



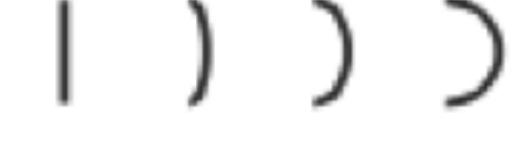
Color luminance



Color saturation



Curvature



Volume (3D size)



Effectiveness ▲ Least ▼ Same ▲ Most

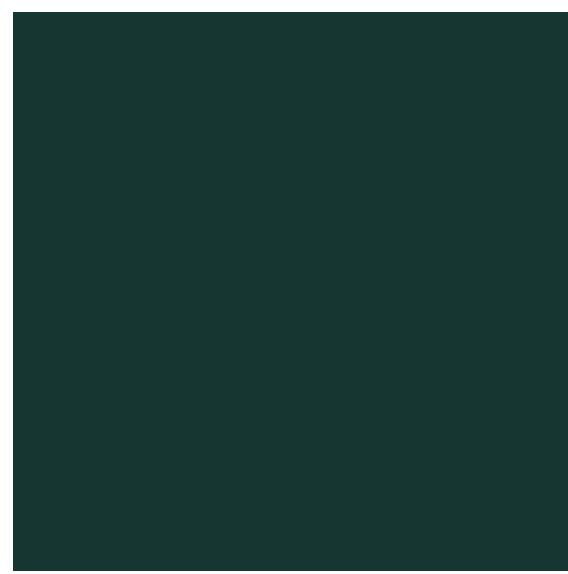


Area

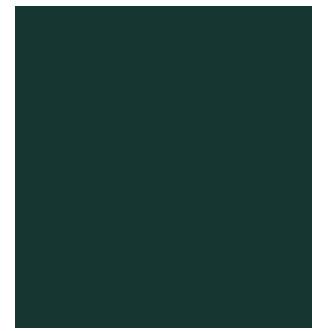
More than 1 channel  
can be used at the same  
time

Area (2D size)





Area



Color Saturation

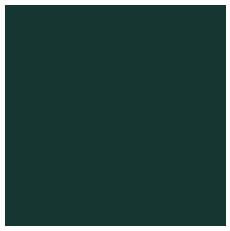
More than 1 channel  
can be used at the same  
time

Area (2D size)



Color saturation





Area

More than 1 channel  
can be used at the same  
time

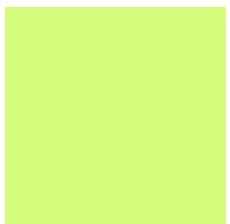


Color Saturation

Area (2D size)



Color saturation

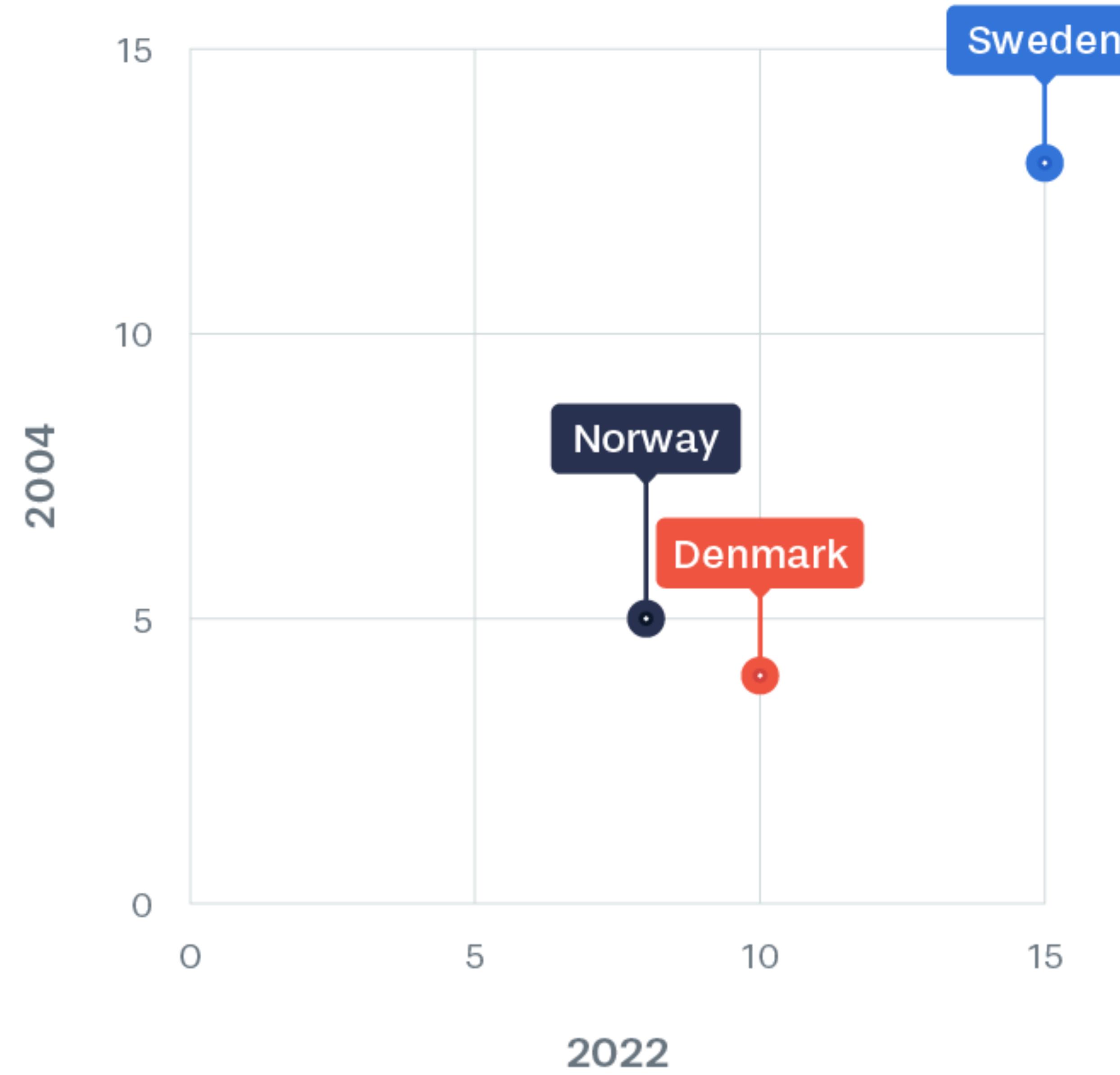


Area and Color Saturation

Identify the  
**Marks and Channels**  
...and what they represent

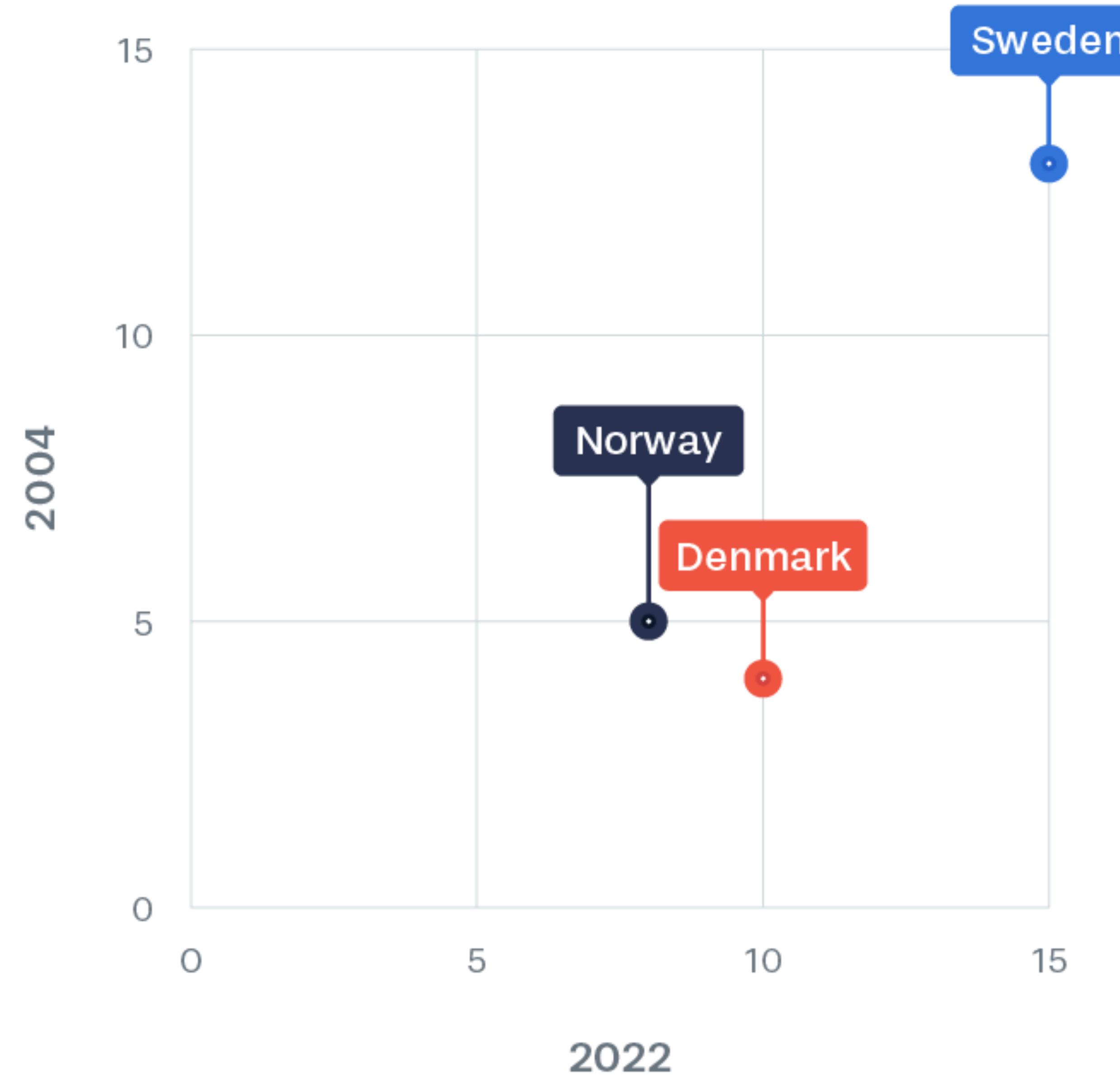
# 1 dataset 100 visualizations





**Marks**

**Channels**



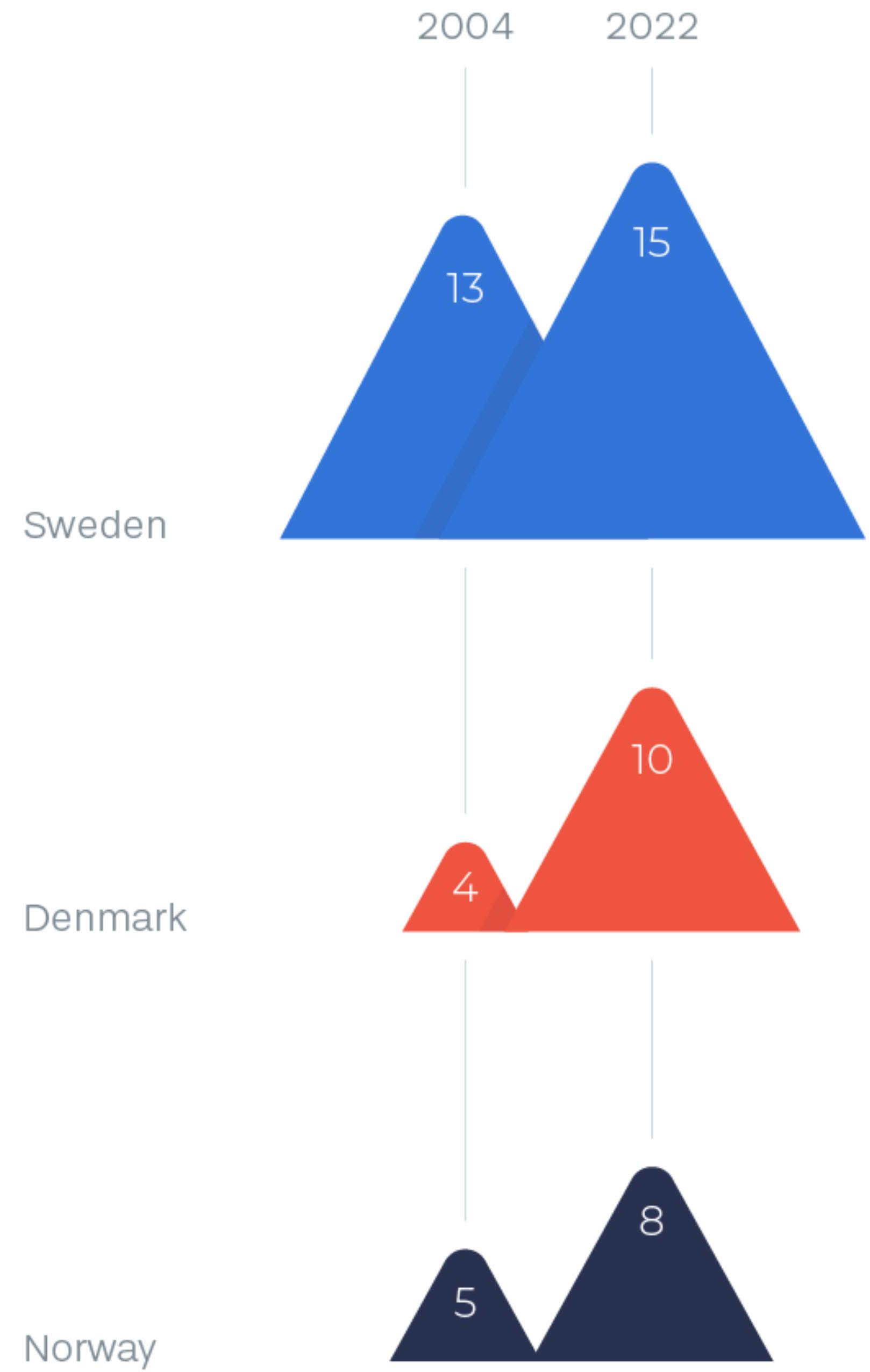
**Marks**

**Shape**

**Channels**

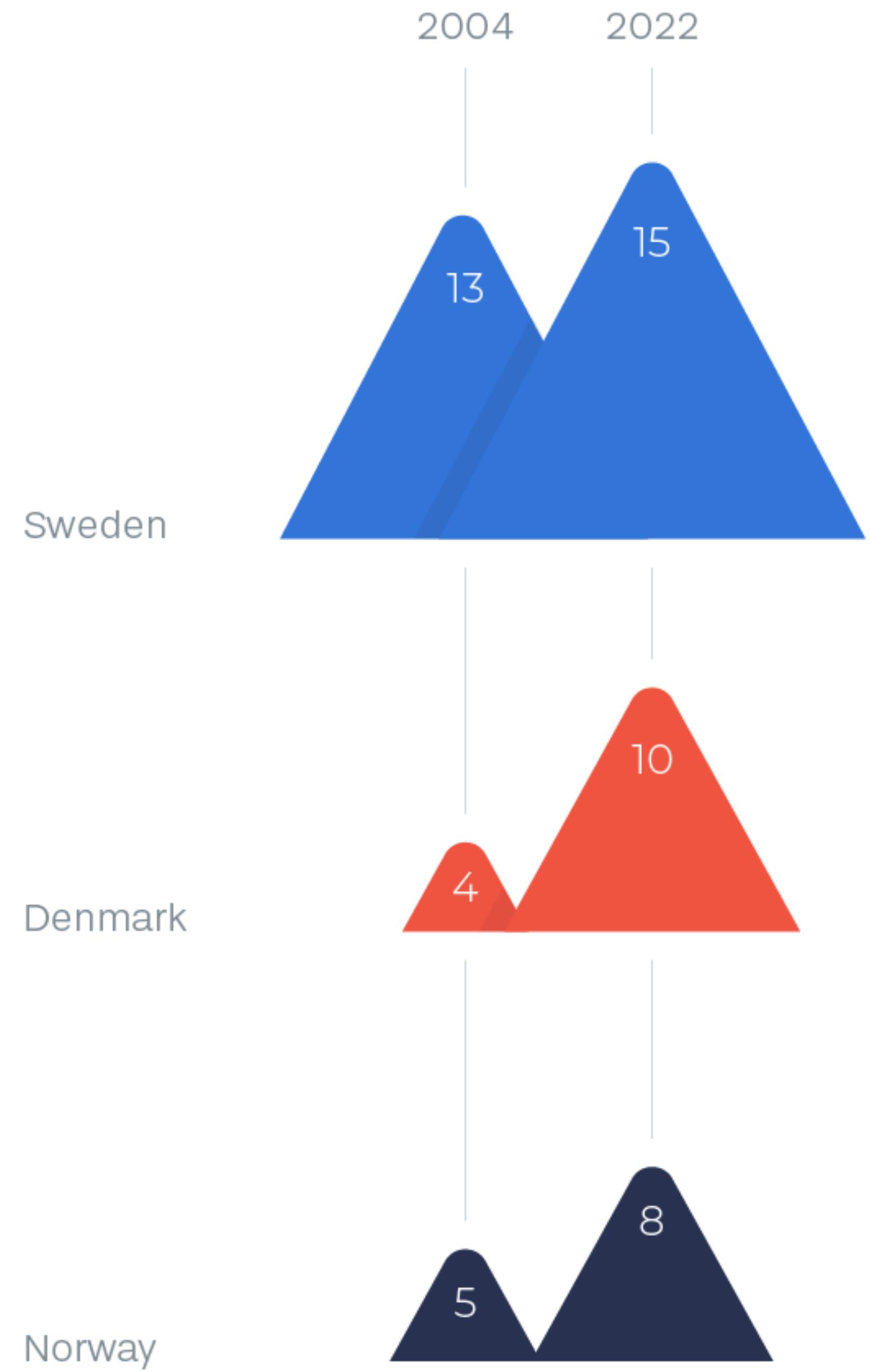
**Position on common  
scale (magnitude)**

**Color (Categorical)**



**Marks**

**Channels**



**Marks**

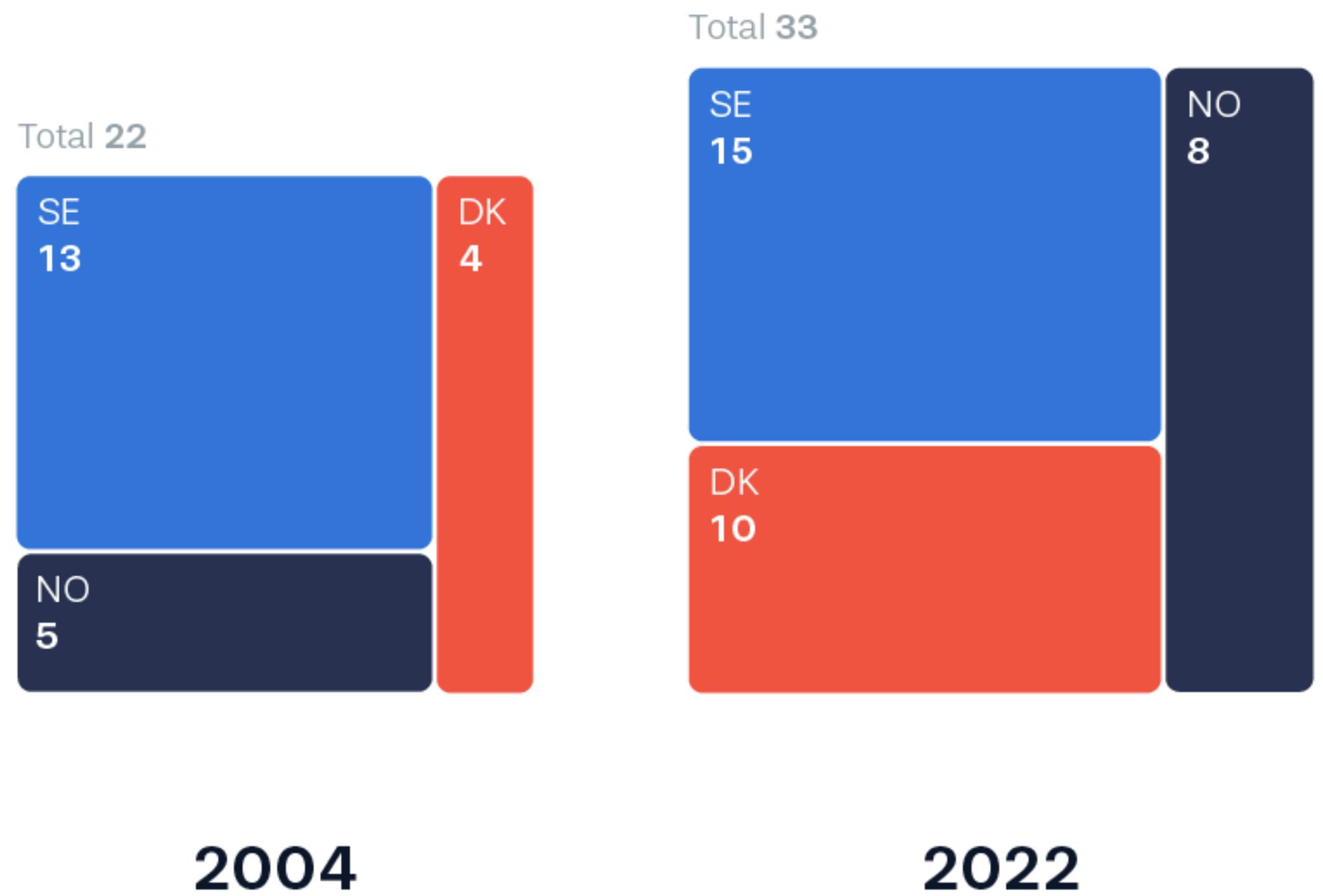


**Channels**

**Size (Magnitude)**

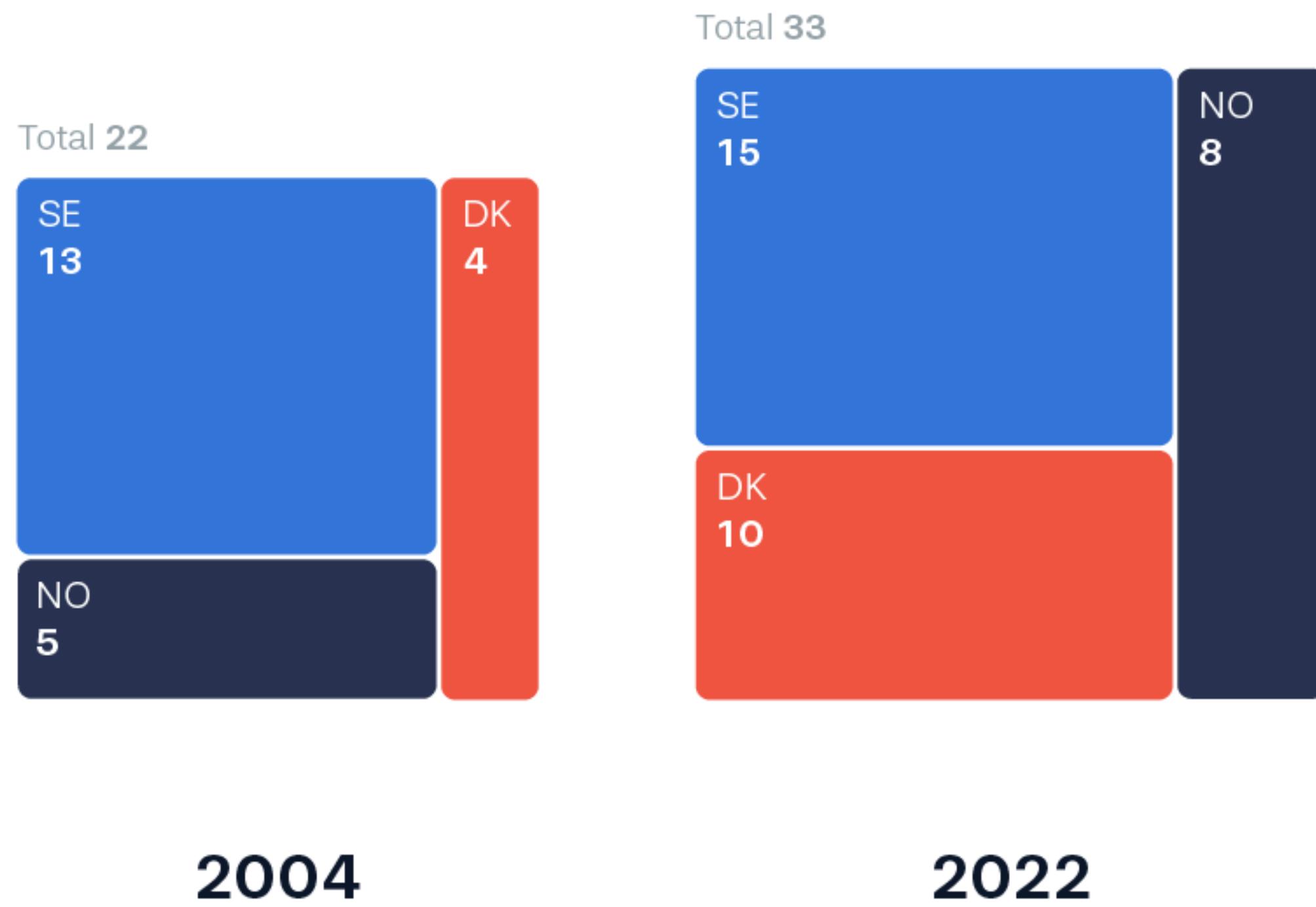
**Color (Categorical)**

# Marks



# Channels

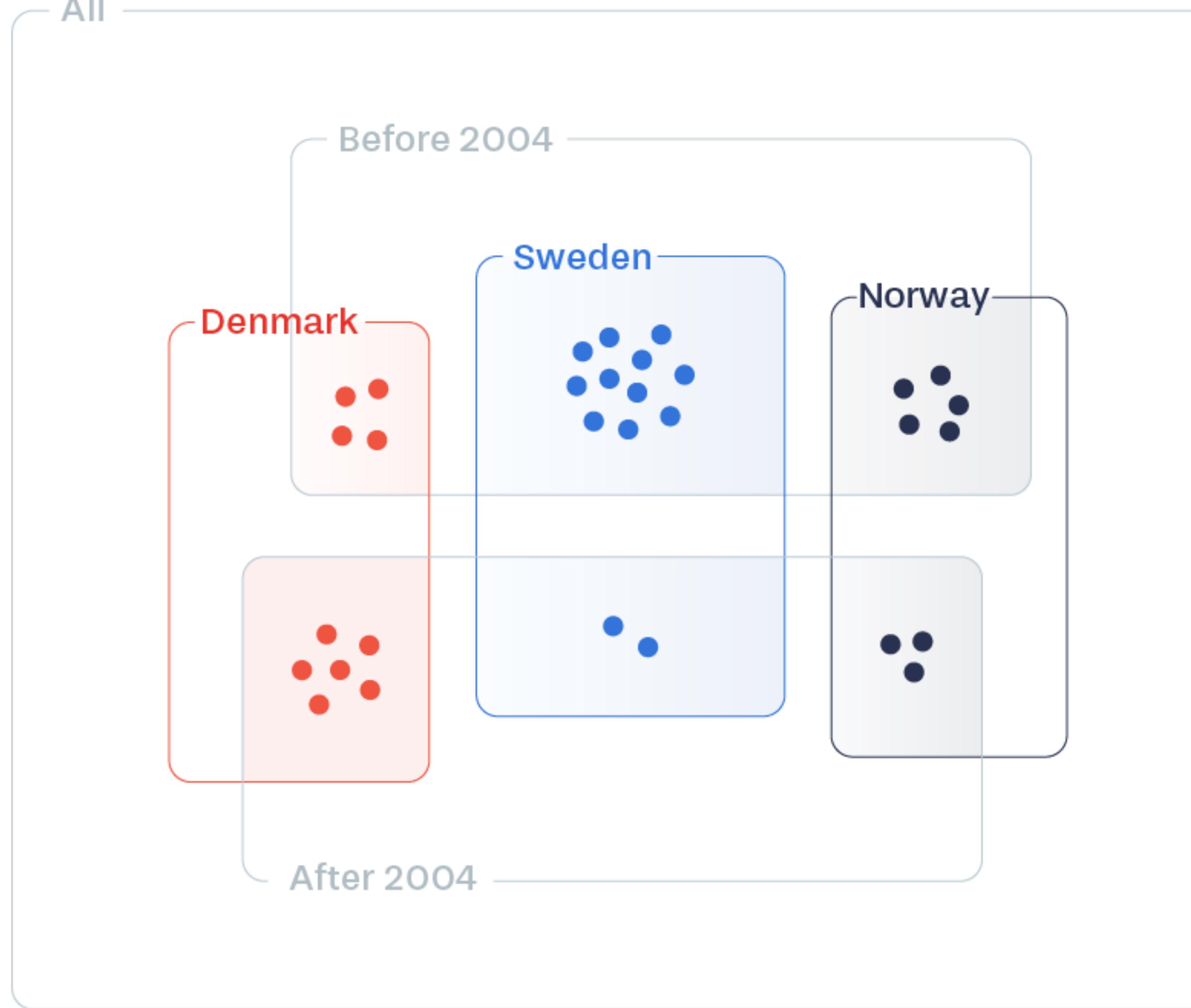
# Marks



## Channels

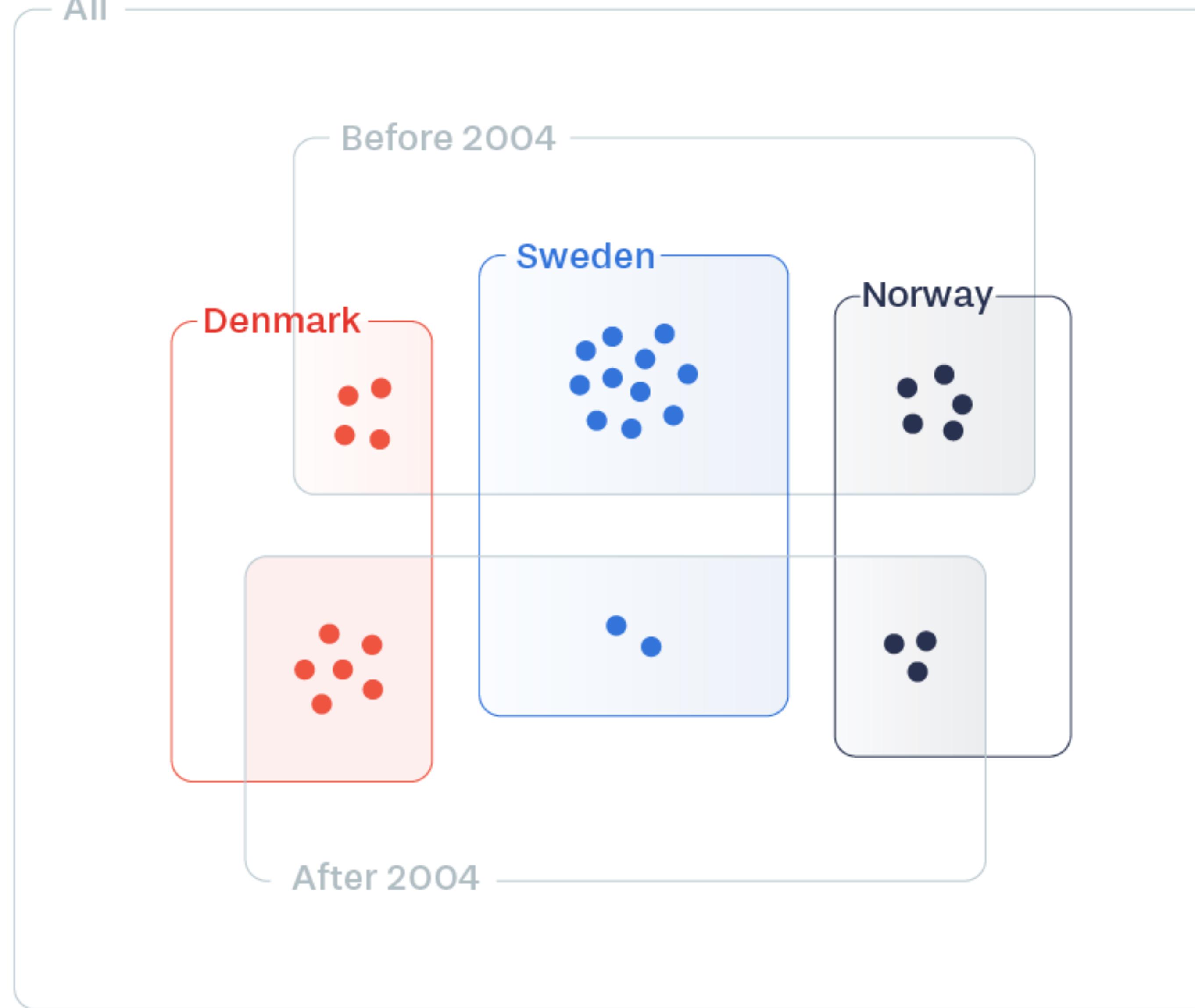
2D Area size  
(Magnitude)

Color (Categorical)

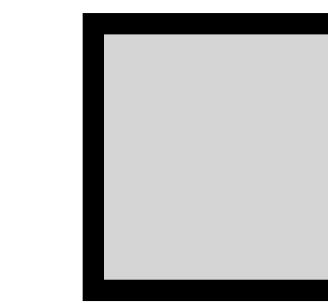


# Marks

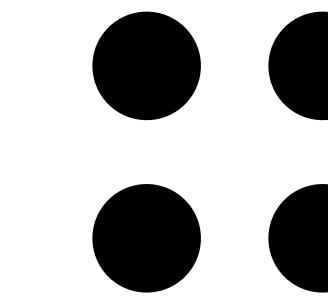
# Channels



## Marks



Containment



Shape

## Channels

Color (Categorical)

**It's very easy to make  
Bad Charts**

# Visualizations that make no sense

viz.wtf

The screenshot shows a web browser window displaying the [viz.wtf](http://viz.wtf) website. The main content area features a large, abstract visualization composed of numerous small, colored segments (predominantly blue, green, yellow, and red) arranged in a complex, undulating pattern. A circular logo with overlapping colored rings is centered over the visualization. At the top of the page, there is a header bar with a search icon and the text "Search wtf-viz". To the right of the search bar are buttons for "Follow wtf-viz" and the "tumblr" logo. Below the visualization, the page title "WTF Visualizations" is displayed in a large, bold, dark font. Underneath the title, a subtitle reads "Visualizations that make no sense." and a note says "For a discussion of what is wrong with a particular visualization, tweet at us [@WTFViz](#). [Submit a WTFViz you found.](#)" At the bottom of the page, there are links for "SUBMIT A POST" and "ARCHIVE". The footer contains a logo for BetMGM and social media handles for Twitter (@BetMGM).

# Visualisation Caveats

data-to-viz.com

The screenshot shows a web browser window with the URL [data-to-viz.com/cafeats](https://data-to-viz.com/cafeats) in the address bar. The page title is "CAVEATS" in large bold letters, with a subtitle "A collection of dataviz caveats by [data-to-viz.com](https://data-to-viz.com)". Below the title is a row of six buttons: "Show all", "Top 10", "Improvement", "Misleading", "Map", and "Bar". The main content area features four cards, each with a purple circular icon and a caption:

- Order your data**  
When displaying the value
- To cut or not to cut?**  
Cutting the Y-axis is one of
- The spaghetti chart**  
A line graph with too many
- Pie chart**  
The human eye is bad at

# Exercise

# 3 Visualisations

The screenshot shows a web browser window with the URL [gyanl.com](https://gyanl.com) in the address bar. The page content is as follows:

**Data Visualization**

## Exercise - 3 Visualisations

### Reference

The [Data Viz Project](#) has a collection of data visualizations to get inspired and find the right type for your use case.

They also have a project called [1 dataset. 100 visualizations.](#) which visualises a small table in 100 different ways.

Year	Norway	Denmark	Sweden
2004	5	4	13
2022	8	10	15

### Instructions

Find a small table of data that has at least 2x3 cells of data. Use the types of visualisations listed in the Data Viz Project to find 3 different ways to visualise this data. Try and use unusual ways to represent the data. If you can come up with something that's not in the website that's a

## Exercise

# 3 Visualisations

- Find a small table of data that has at least 2x3 cells of data.
- Use the types of visualisations listed in the Data Viz Project to find 3 different ways to visualise this data.
- Try and use unusual ways to represent the data, if you can come up with something that's not in the website that's a bonus.
- Present it to the class. Also, put your slides into the Google Drive folder shared on the WhatsApp group in PDF or Google Slides.

# Visual Perception and Encoding

- Using special properties of the visual system to help us think.
- Your visual system is good at specific tasks.
- All visualizations are made from a series of compromises.

**Lecture 4**

**DD 324:**  
**Data Visualisation**

**Visual Perception**