World Development Indicators

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Team 9 Introduction

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Overview and Motivation

Exploring World Development Indicators

- As part of our Viz of the Day we looked at GDP as a development indicator and we suggested for a better viz, we should look at other indicators as well!
  - Continuation of our Viz of the day
  - Learn more about other World Development Indicators

A compilation of relevant, high-quality, and internationally comparable statistics about global development and the fight against poverty.

- World Development Indicators (WDI) -

Business Context

IF NOT NOW? WHEN?

- The United Nations sets goals ranging from eradicating poverty and zero hunger, to gender equality and climate action

- We face big challenges in today's world: poverty, hunger, inequality and climate change are issues we need to address urgently.

We can quantify these challenges through World Development Indicators.

Business Problem

How can we identify where a country stands in their sustainable development goals (SDGs)?

- SDGs is a list of 17 goals to achieve a better and more sustainable future for all by 2030.

Understanding the Data

Data was obtained from The World Bank where they measure how developed a country or region is compared with others through:

- All Numerical Data
- 51 World Development Indicators
- 6 Data Themes
- 217 Countries
- 10 Years (2012 - 2021)

Data Source: https://databank.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/1ff4a498/Popular-Indicators#

Data Themes

Poverty and Inequality

poverty, prosperity, consumption, income distribution

People

population dynamics, education, labor, health, gender

Environment

agriculture, climate change, energy, biodiversity, water, sanitation

Economy

Growth, economic structure, income and savings, trade, labor productivity

States and Markets

Business, stock markets, military, communications, transport, technology

Global Links

debt, trade, aid dependency, refugee, tourism, migration

Data Preprocessing

Before we start exploring and visualizing the data we had to clean and preprocess the shape and indicators data:

- When we got the data it was in a short data shape where all the indicators were in rows and year was in column
    - We had to pivot the data through python due to the size of the data to put year on the row and each indicator as a column
- The data was not grouped by continent
    - We had to map the data by continent to allowed us to further explore
- Clean out null values and recognize which indicators were useful
    - Using domain knowledge and additional research we had to understand each indicators and if it would be useful to our business problem

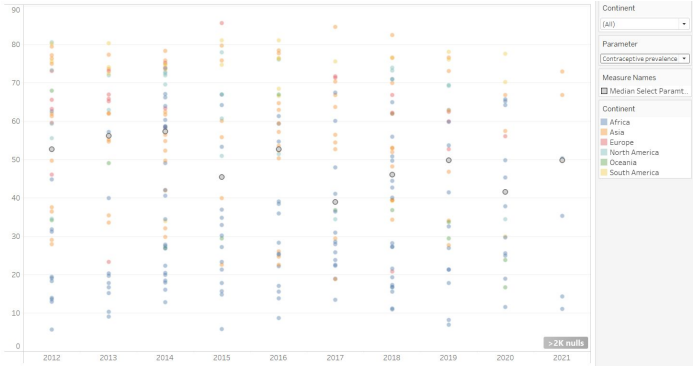
Exploratory Data Analysis

Used parameters and time series to identify missing values

- Contraceptive prevalence
- Net migration (2017-2021)

Leveraged domain knowledge to identify:

- Similar Indicators
  - GNI vs GDP
  - GNI calculation methodology
    - Atlas, PPP
  - Inflation definition
  - School Enrollment
- Hard to understand indicators
  - Industry



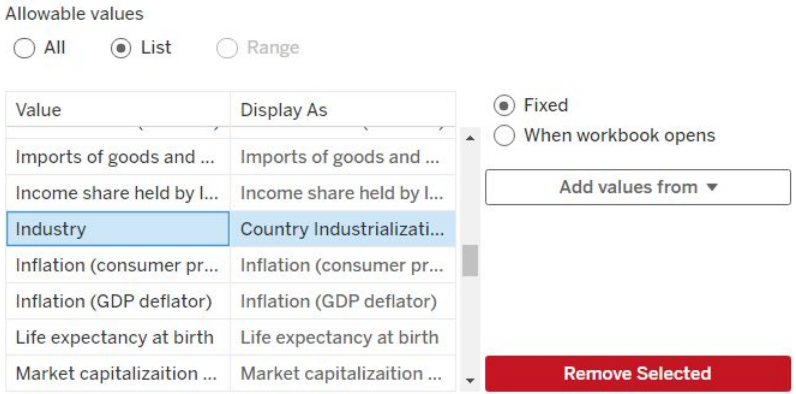
Data Cleaning

Remove null indicators

- Net migration
- Water productivity
- Contraceptive prevalence

Remove repetitive indicators

- All GNI Indicators
- Inflation GDP Deflator
- School enrollment secondary



Rename indicators

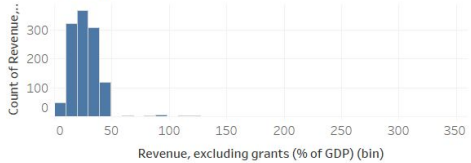
- Industry → Country Industrialization (% of GDP)

Visualization Experimentation - Scatterplot with distribution

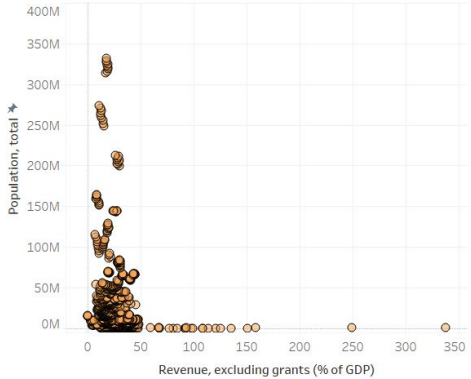
Before diving into our dashboard we wanted to show a couple visualizations we experimented with that were not used in the final dashboard:

- Scatterplot of an indicator with the barplot on the side to show the indicator count
- The bar plot could be turn into histogram to show distribution
- We wanted to show the relationship and distribution of an indicators but we were able to use other visualizations instead

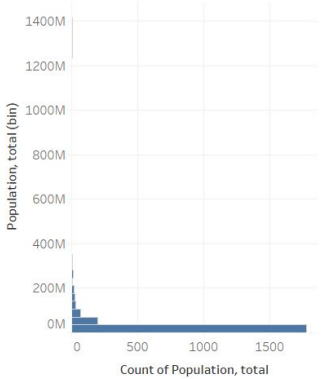
X- axis Barplot



scatter plot



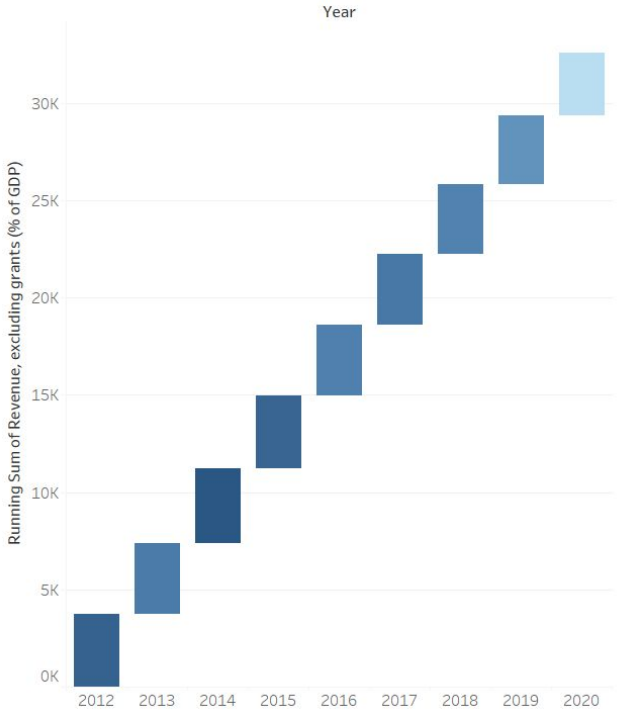
Y Axis Barplot



Visualization Experimentation - Waterfall Chart

Waterfall chart to show net change

- We hoped to show the the net change in of the indicators over time, however we quickly found that our data was not suitable for this type of chart
- We ended up showing the change using:
  - Line plot time series
  - Empirical Cumulative Distribution Function Charts



Dashboard Design

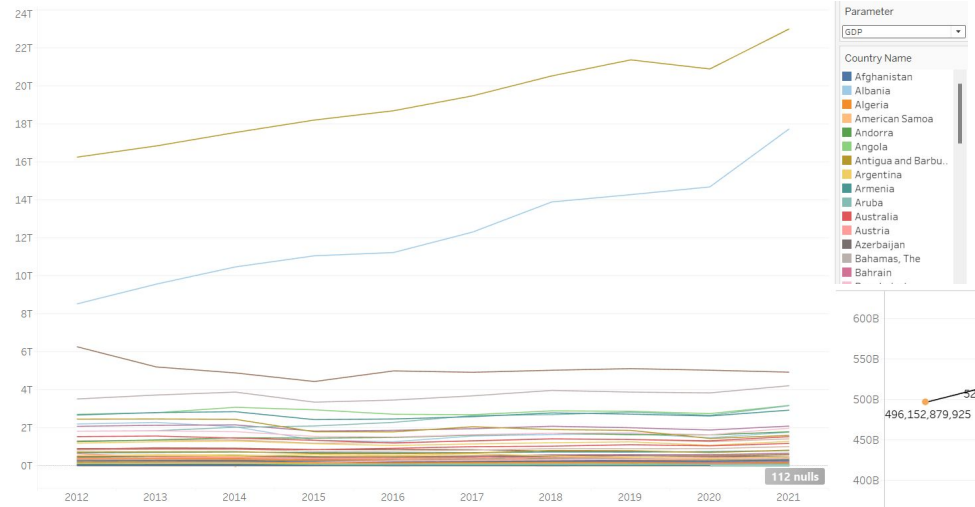
The Dashboard should identify:

- Which countries are behind in what challenges
- Which countries need the most help in what area

The Design Evolution

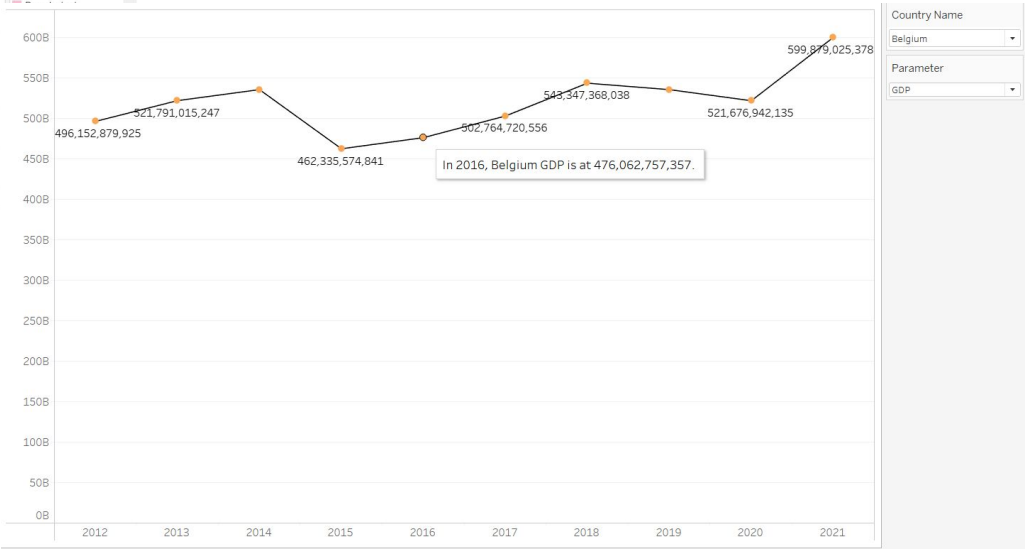
- We wanted to tell a story about World Development Indicators globally, continentally and nationally; while providing more information about each indicator
    - Through mapping, continent and country filtering, time series

Dashboard Design

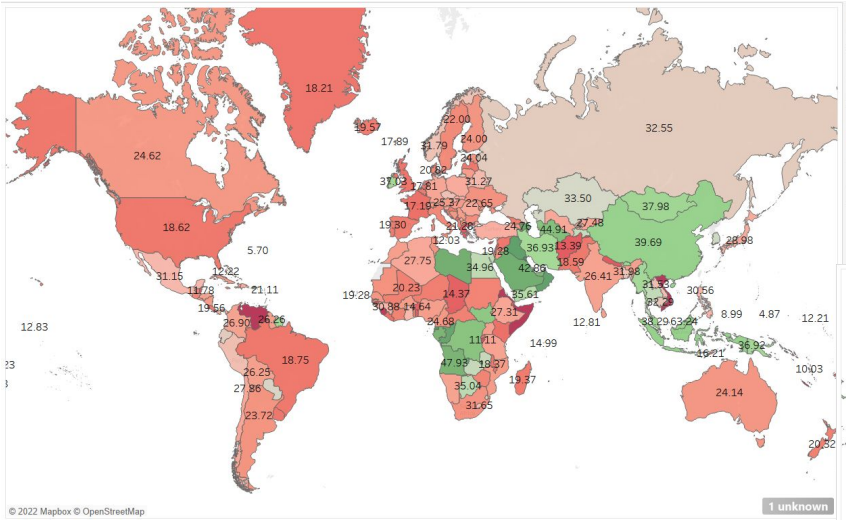


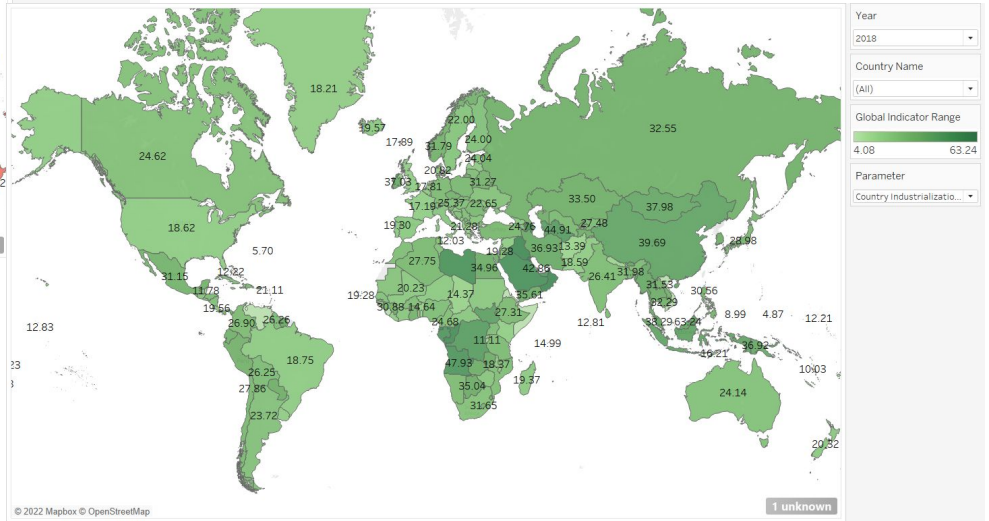
Time Series Line Chart

- Exploring by showing each country is hard to read
- Added filtering by indicators and countries
- Added tooltips and data labels for ease of readability



Dashboard Design

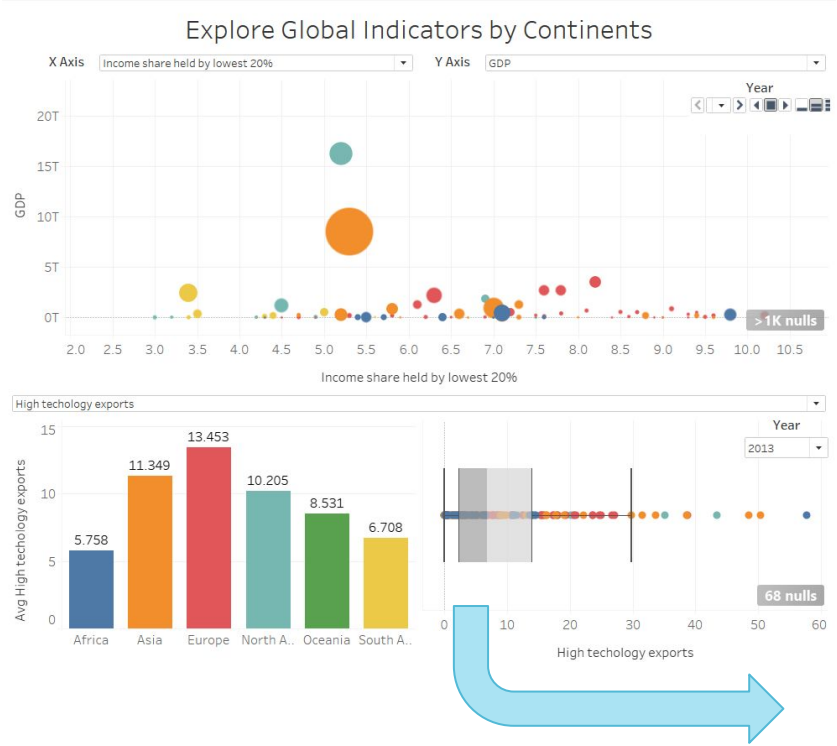




Map Colour

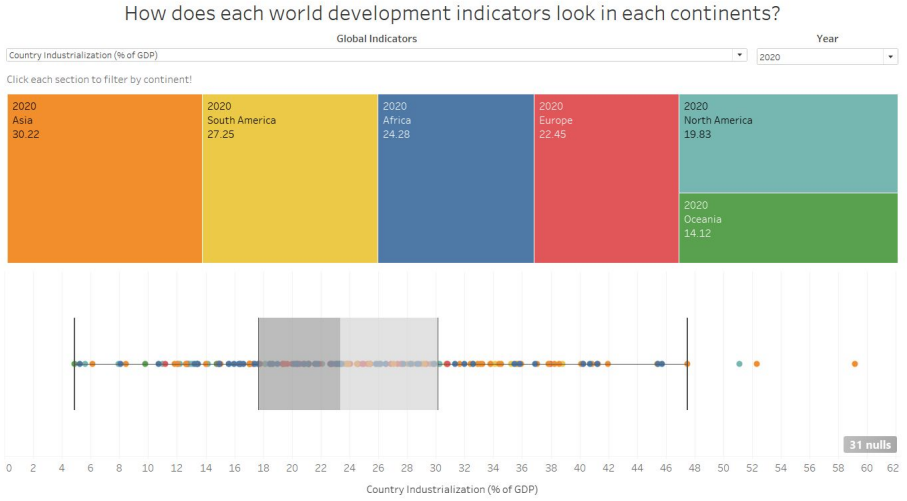
- Started with hue from red to green but our indicators does not show negative values
- Settled on one colour hue to show small to large by darkness
- Chose green to indicate land

Dashboard Design

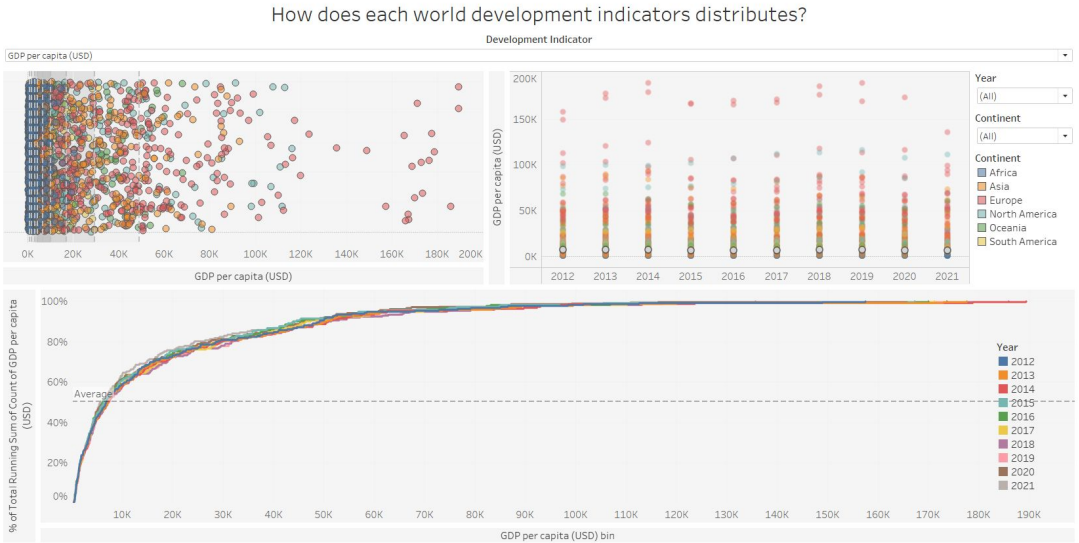


Continent Dashboard

- Started with continent as a bar chart but for navigation and interaction using a treemap is easier to read and interact
- Remove indicator v indicator scatter since its not related to the dashboard



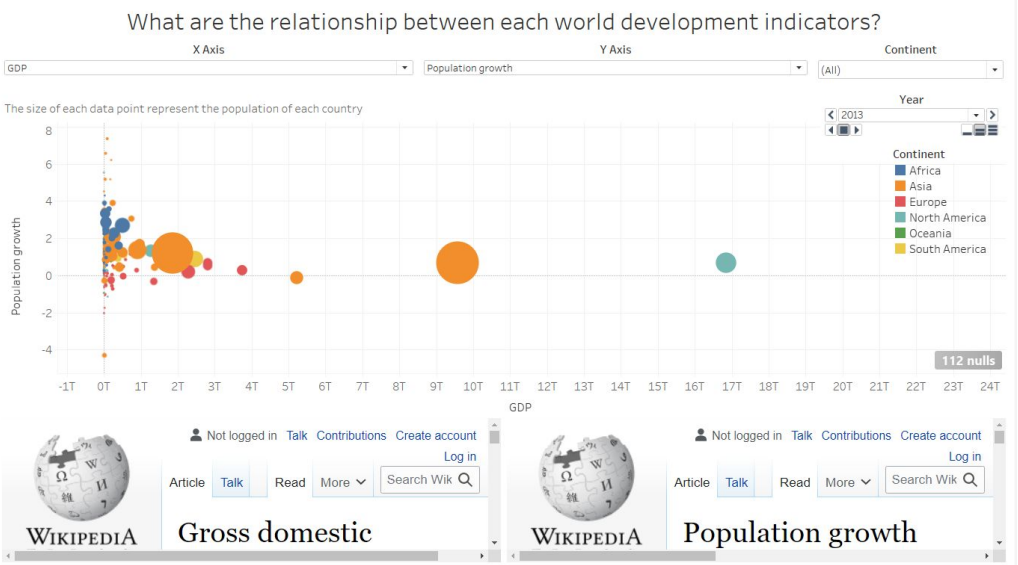
Dashboard Design



Indicator Distribution Dashboard

- Separate dashboard to look at indicator distributions
- Created a decile plot to look at overall distribution
- Showed a dot to show the distribution by year and indicate the median
- Plotted a Empirical Cumulative Distribution Function Charts which show a step line for each year for each indicator
- Able to be filter by the indicator, year and continent

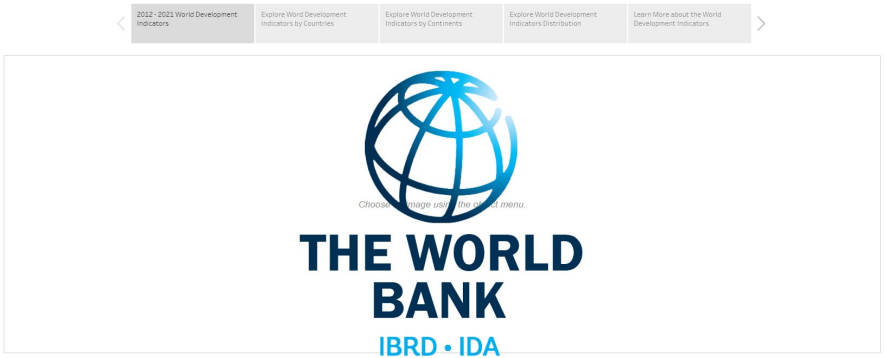
Dashboard Design



Learn more about the indicator

- Created a separate dashboard dedicated to exploring the indicators
- Compare relationships using scatter plot
- URL linked to explain more of what each indicators are
- Colour coded by continent
- Size data point to show population in each country
- Playback option to see the movement of the relationship over 10 years

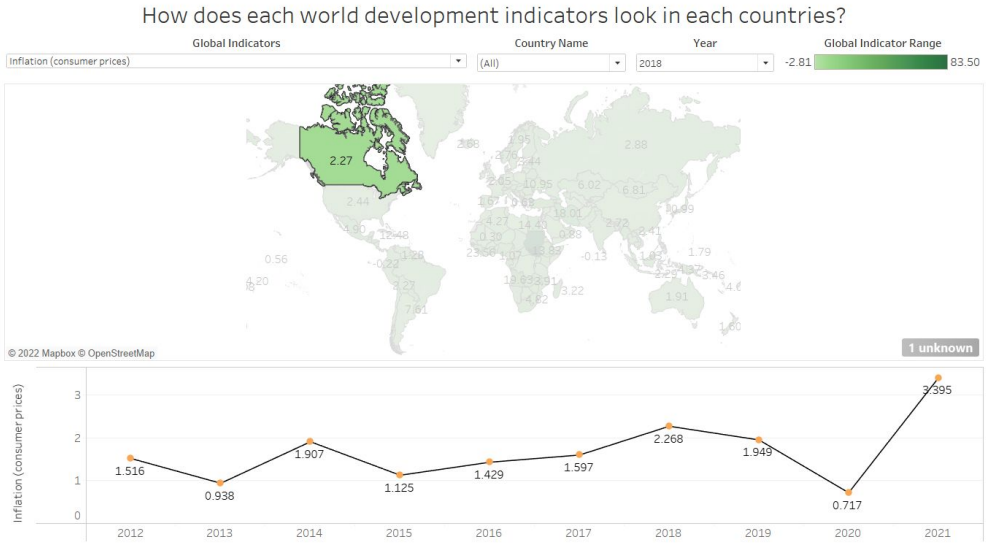
Implementation



Tell a Story

- We wanted the user to explore the indicators from a global, continental and national level
- The first page introduce the data source and where it comes from
- We decided to use the story function where the user can navigate through the different levels to learn about the indicator
- At the end the user can learn and explore how each indicator interacts with each other

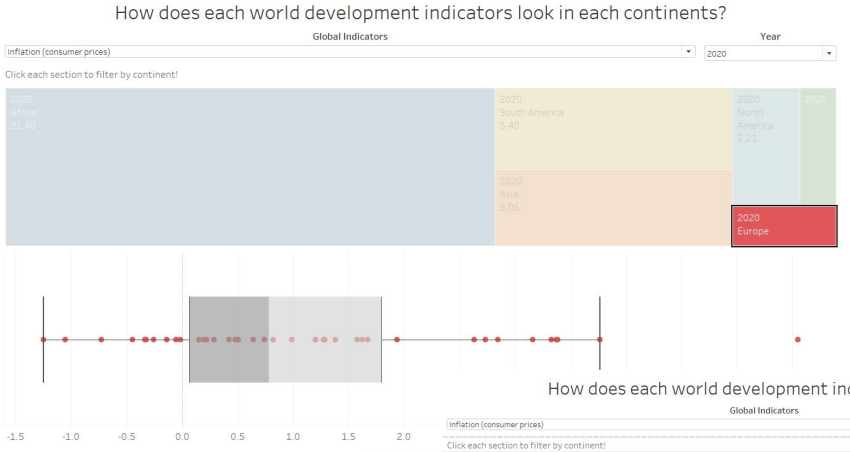
Implementation



Explore by Country

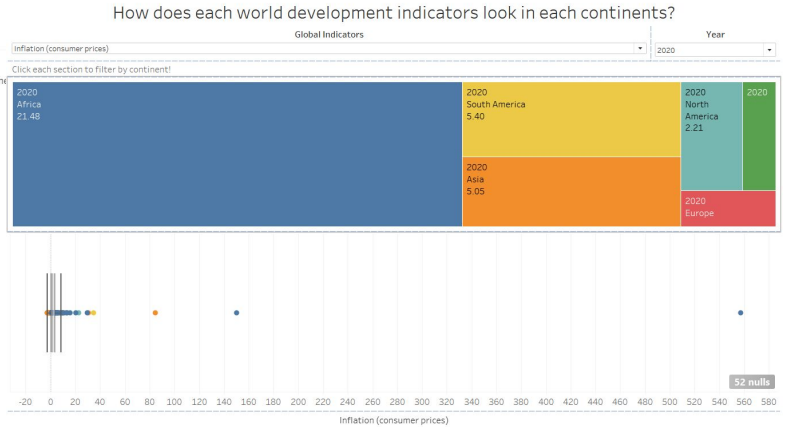
- The user gets to select a parameter, country and year to explore on the map
- When a country is selected on the map or filtered, it shows the time series of that indicator for that country
- When all the countries are shown, the time series shows the global average for the selected indicator

Implementation



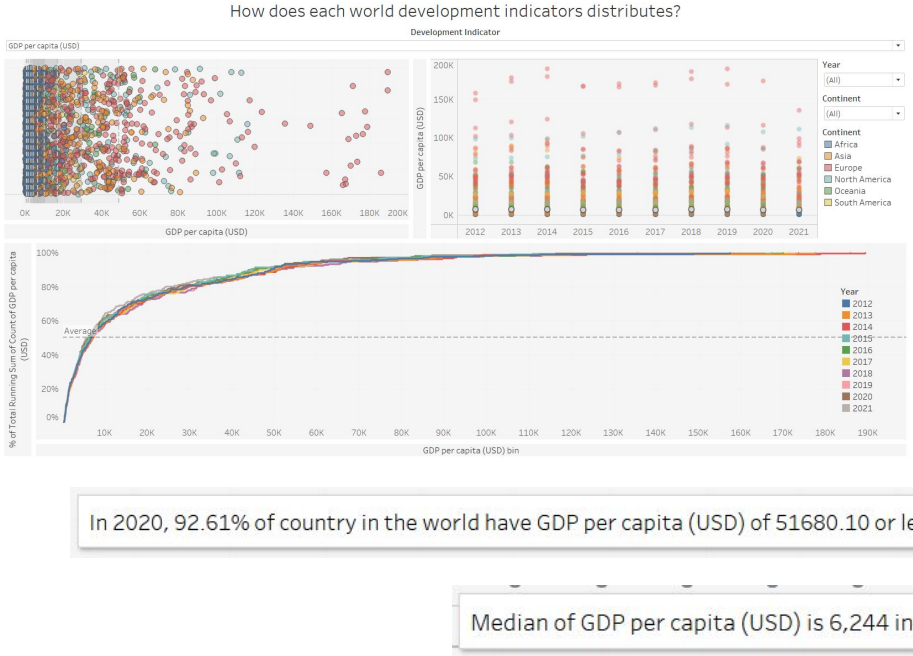
Explore by Continent

- The user can filter by the indicator and select the continent from the treemap to show each country in the continent indicator data distribution
- The box and whisker plot shows the distribution of max, min and median, colour coded by continent, and changes with the selection of continent



- When no continent is selected, the box and whisker plot show the distribution of all data of the selected indicator

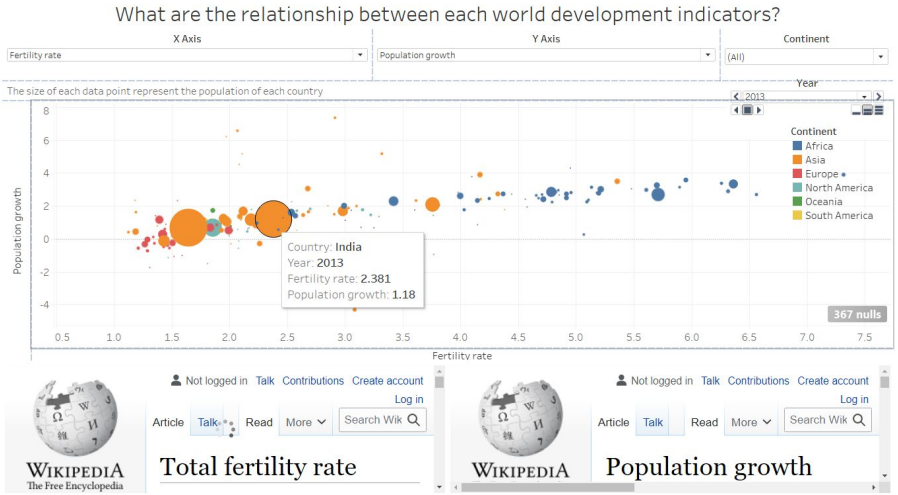
Implementation



Explore the Indicators Distribution

- The user can play around and adjust any indicators that they would like to see
- They can also filter by year to see how each year looks in different distribution format
- The legend indicates the color for year for the step chart and the color for continent in the two top charts
- Since this dashboard visualizations are not as intuitive, we included clear tooltips that the user can hover to understand what each visualizations are showing

Implementation



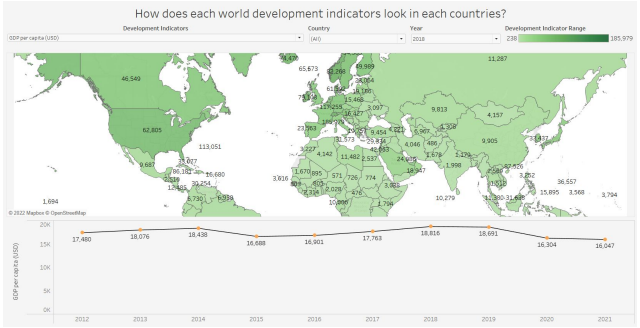
Explore the Indicators

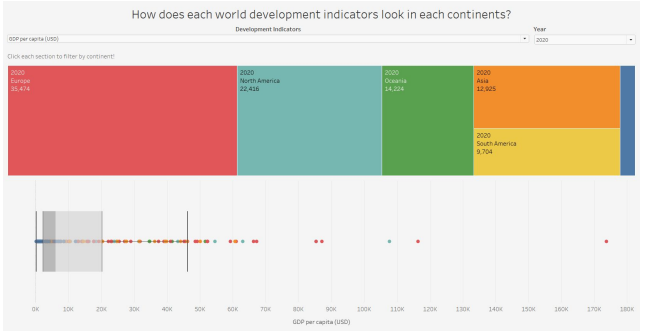
- The user can play around and adjust any indicators that they would like to see
- When the axes change, the webpage changes to show more information about the selected indicators
- The graph can be filtered by year and continent, which is colour coded
- Hovering over each point, there is text that describes the country and indicator selected

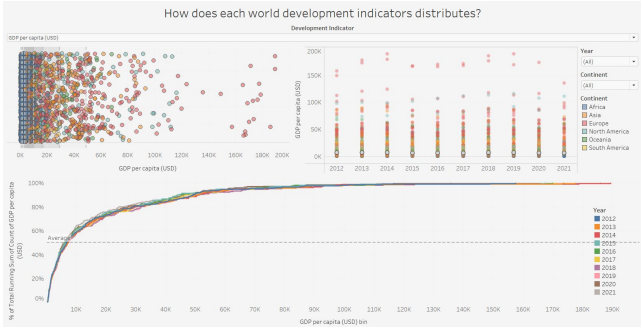
Implementation

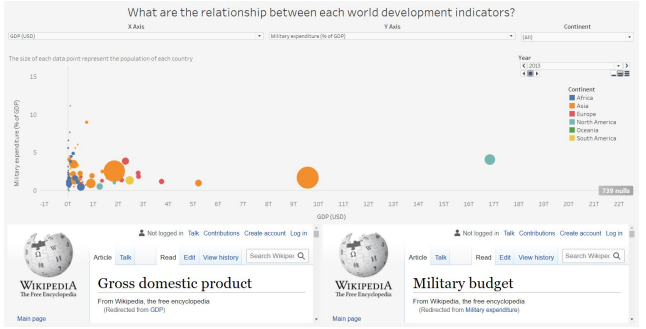
Off White Colors

After putting all the visualizations together, we realized that white is too stark so we opted for an off white color scheme for the background to draw focus on our visualizations and easy legibility.





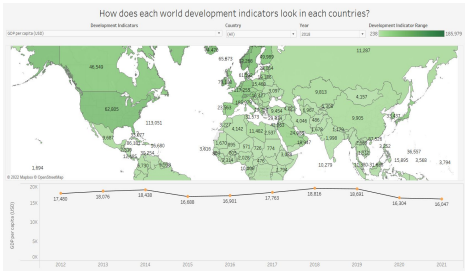


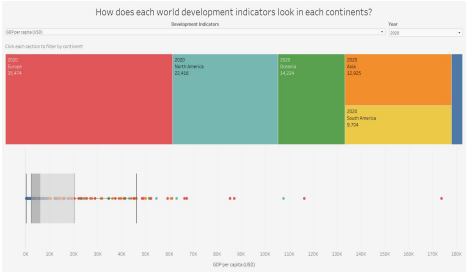


The Dashboard

Pulled data from 2012 - 2021 to create the dashboard showing the indicators:

- Metrics overlaid on world map
- Line plot to see the change in global indicators over time
- Treemap to see global indicators by continent
- Box and whisker plot showing global indicators distribution by country
- Scatter plot comparing indicators
- Step chart and decile plot showing data distribution
- Linked website for more information about global indicators





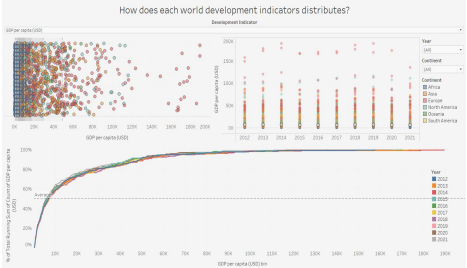


Tableau Viz: https://public.tableau.com/views/Team9FinalProject/Story1?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link

Key Insights from the Viz

- Key World Indicators
  - GDP, birth rate, death rate, life expectancy, mortality rate, and inflation
- GDP has been on the rise globally
  - North America had the largest average GDP in 2021 at 1.1 trillion USD
- Life expectancy has remained constant at around 72 globally
  - Highest life expectancy is 85.39 years in Hong Kong
  - Lowest life expectancy is 53.68 years in Central African Republic
- Mortality rate has been decreasing globally
  - In 2012 mortality rate was 34.5%, in 2021 mortality rate was 26.7% globally. This means the total number of deaths in a population, expressed per 100,000 people is decreasing globally
- Inflation has been on the rise globally
  - Africa had the highest inflation in 2021 at 21.43%

Deployment

From the finish product, we believe that the dashboard we created answer our business problem and will be useful for many stakeholders:

- Country leaders will be able to compare themselves to similar country and explore their standing in the global development indicators
- Government will be able to understand their countries and identify improvements that are needed to develop their nation
- United Nation will be able to track data and indicators to see if we have reach our sustainable development goals
- NGOs can focus on individual indicators that they are advocating for and be able to explore different countries that are succeeding to learn more and implement it into their initiative to create a better world for us

What we Learn...

After the process of gathering data, exploring visualizations and completing the dashboard, we wanted to reflect on what we learned

- We thought that having many indicators would benefit us and allowed us to explore a variety of visualizations
  - We found that all numerical data of similar theme makes it harder to create different visualizations since they all deliver the same message
  - Finding data with categorical values and varying numerical data would have been more beneficial
- We thought the data topic was interesting and there is more to explore
  - Finding interesting data does not mean there are more available data that is related to the topic making it hard to find supplemental datasets

Future Viz Recommendations

Make a dynamic dashboard
- Where the data can be updated and the dashboard updates with it

Show country rankings over the years
- Represented through a bump chart

Normalized data by population
- Divide each data point by the country population

Try to get categorical data
- Like country classification (LIC,NIC, HIC)

Longer time frame
- Hard to see movement over 10 years

Thank You