

Global Ecological Footprint Analysis

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Ecological Footprint



Ecological Footprint measures the *demand* on and *supply* of nature.

On the demand side, the **Ecological Footprint** adds up all the productive areas for which a population, a person or a product competes. It measures the ecological assets that a given population or product requires to produce the natural resources it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure) and to absorb its waste, especially carbon emissions.

On the supply side, a city, state or nation's **biocapacity** represents the productivity of its ecological assets (including cropland, grazing land, forest land, fishing grounds, and built-up land). These areas, especially if left unharvested, can also serve to absorb the waste we generate, especially our carbon emissions from burning fossil fuel.

The most prominent calculations are those for countries by National Footprint Accounts

Understanding the Data

The National Footprint Accounts (NFA) are an annual production from Global Footprint Network (www.footprintnetwork.org). Each year, they combine and synthesize over 30 datasets to calculate the Ecological Footprint and biocapacity of countries across the world in over 50 years.

The goal of this undertaking is to produce accounts of how much area is required to provide the ecological services (resource regeneration and waste assimilation) consumed by humanity ("Ecological Footprint"), and how much biologically productive area exists to provide these ecological services ("biocapacity") in each year. With both values in hand, we can assess the overall sustainability of countries around the world and better understand the collective need for humanity to reduce its impact on nature.

This dataset was filed in 2018 and contains data till 2014(the most recent year with complete data.) of 196 countries across the globe.

Rows : 87020 ; Columns : 15

Each country contains ten records per year (1961-2014), which are :

['BiocapPerCap', 'BiocapTotGHA', 'EFConsPerCap', 'EFConsTotGHA', 'EFExportsPerCap', 'EFExportsTotGHA', 'EFImportsPerCap', 'EFImportsTotGHA', 'EFProdPerCap', 'EFProdTotGHA']

Project objective:

To analyze , visualize and derive meaningful insights from the data which can help Organisations to provide and develop the ecological balance in our world and figure out relations which can help reducing our ecological problems.

Inspiration :

“ At Global Footprint Network we spend a lot of time calculating Ecological Footprint, and not as much time investigating and researching the trends we see. We are looking for cool stories, trends, interpretations, or visualizations that are meaningful to you or that you think would be meaningful to others ” - Global Footprint Network (www.footprintnetwork.org)



Visualization Techniques used

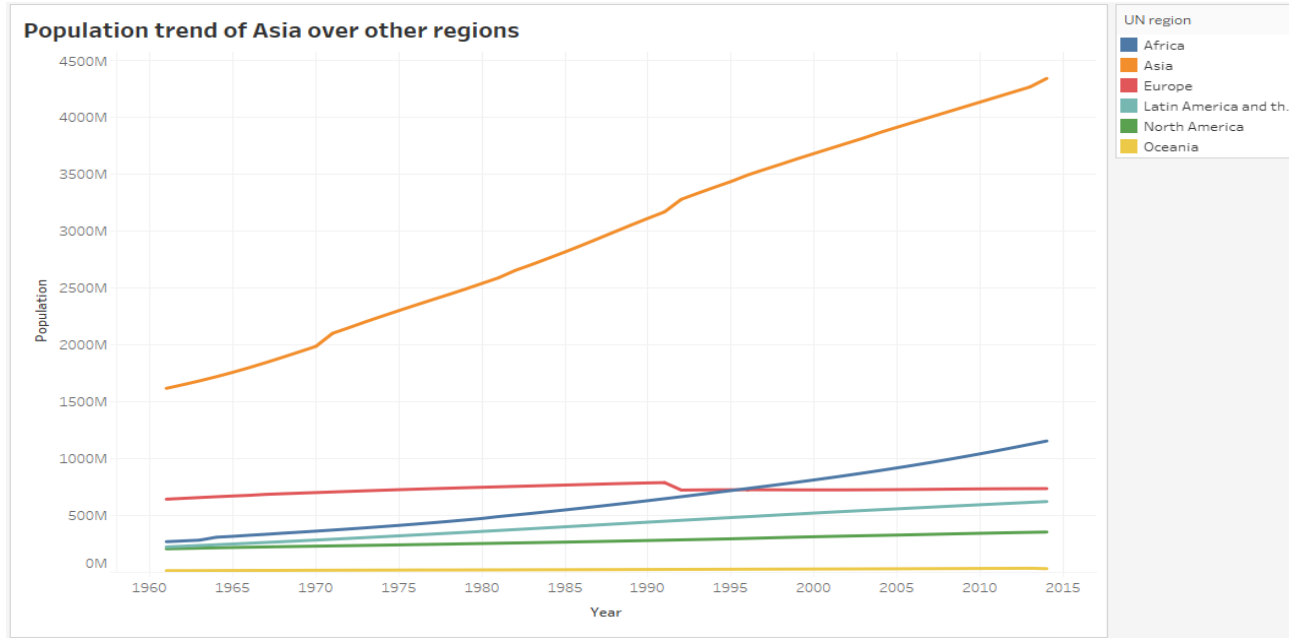
Platforms : Google Colab(Python 3) , Tableau

Libraries : Plotly , Matplotlib.pyplot , seaborn.

- Bar plots
- Line plots
- Area plot
- Pie chart
- Box-violin plots
- scatter plots
- Map based visualizations
- Parallel coordinates

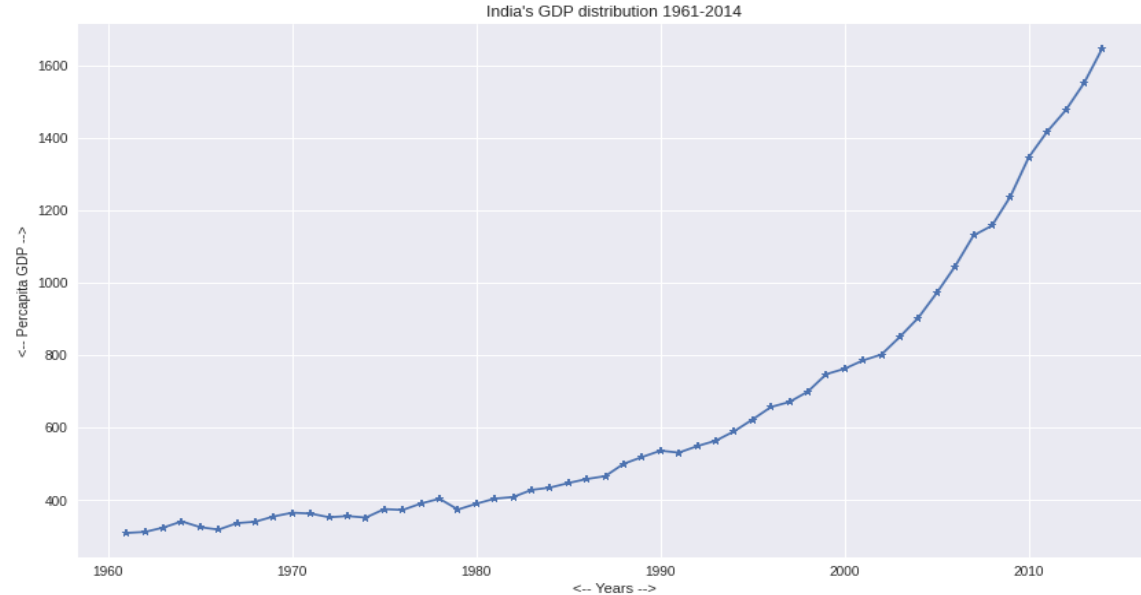
Analytical objectives

1. Population trend in Asian countries



As we have seen in the recent years also, the population growth in Asian countries have been in a steady increase starting from the year 1961, Asia when compared to other UN regions is having a high margin. The next closest regions are Europe and Africa where they stand is not an exponential growth but a steady or slight increase. (plot : Tableau)

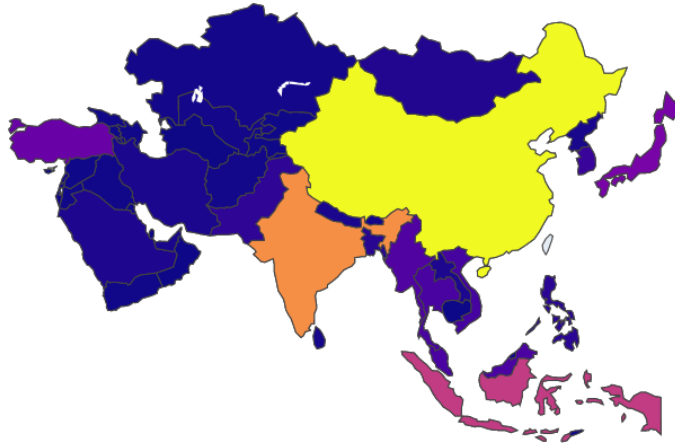
2. India's GDP from 1961 to 2014



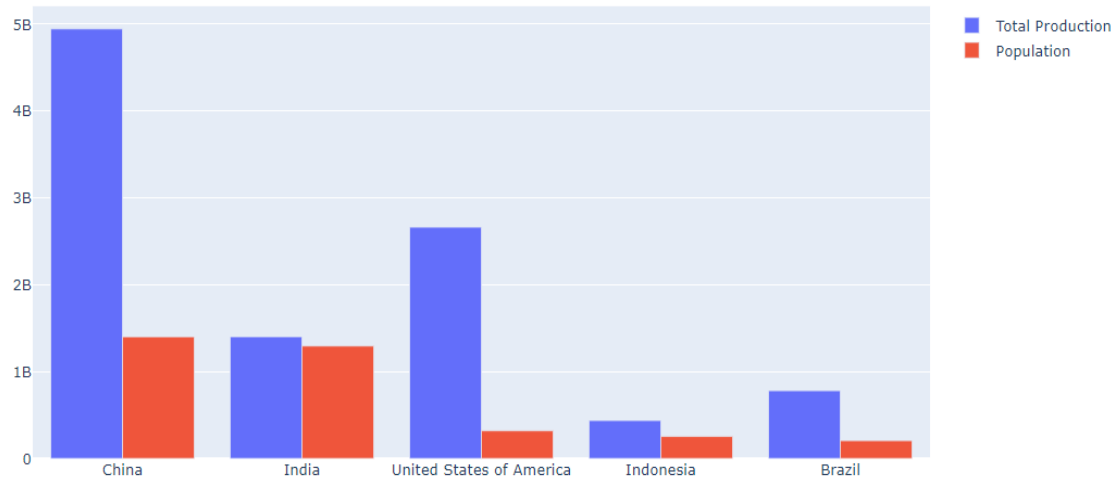
We can see that in the years after the Indian independence India's Per Capita GDP has been an increasing curve, there has been some decrease near the end of the 1970's and 80's but managed to develop in a more faster rate after the beginning of the 21st century.

3. Contributions of major asian countries in forest land

According to the values of the year 2014, We can clearly understand by the low values of forest land in most asian parts are mostly because of the desert like regions and high mountains. comparatively india and china are the countries in asia which have a good amount of forest land



4 . Countries with high population and high production

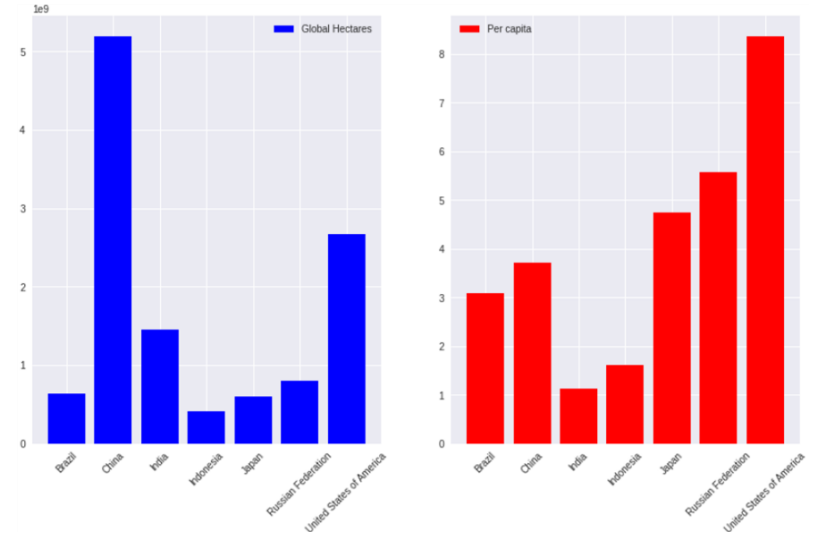


There is an indicator that countries like china and india do have high production because of the high population and we can also see that USA in spite of having lesser population seems to beat developing country like india.

5. Countries which have the highest EF consumption in terms of Global Hectares

When we compare the countries with the globally accepted scale we can see china leading the EF consumption,

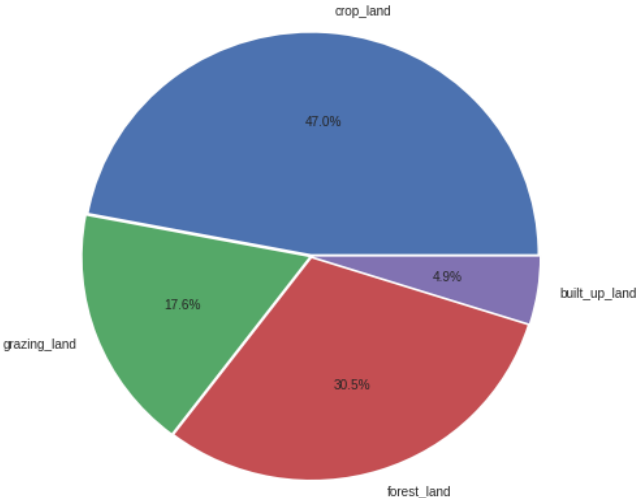
Another insight we get from this is the calculations done by the countries that is the per capita shows higher values for some countries which are actually lower in the global hectares scale. This shows the necessity of a global scale for measuring these quantities also



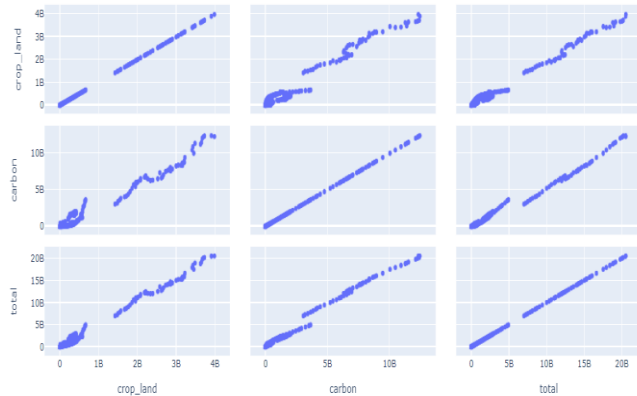


6. Contributions of land types on total production

This chart clearly gives us the insight that crop land is a major factor influencing in the total production footprint, closely followed by the forest land.



Influence of carbon footprint and crop_land measures on total footprint

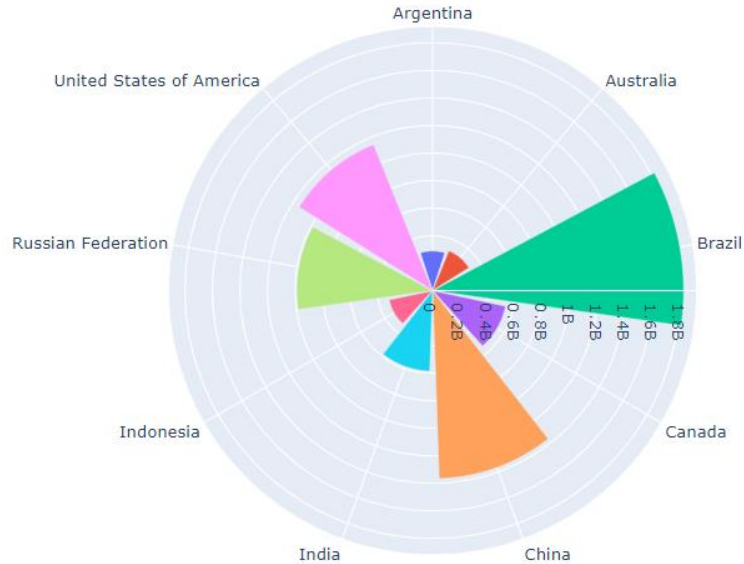


7 . Indicators which are closely tied with footprint values

From the scatter matrix we were able to filter out some features and come to the conclusion that the most closely tied features are carbon emission and crop land (as we saw earlier also).



8 .The countries with high Biocapacity (Biocapacity = Footprint of production because all biocapacity is used for production.)



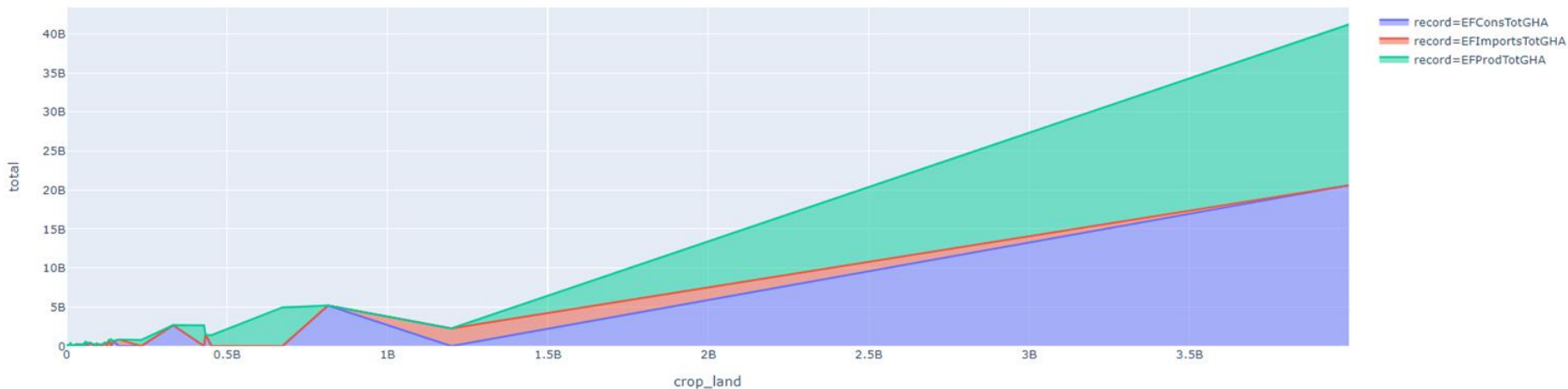
The plot easily conveys to us how each country stands relative to other countries and

we can see the clear domination of Brazil. Even without looking at the numerical value with the radius we can visually perceive the quantity.

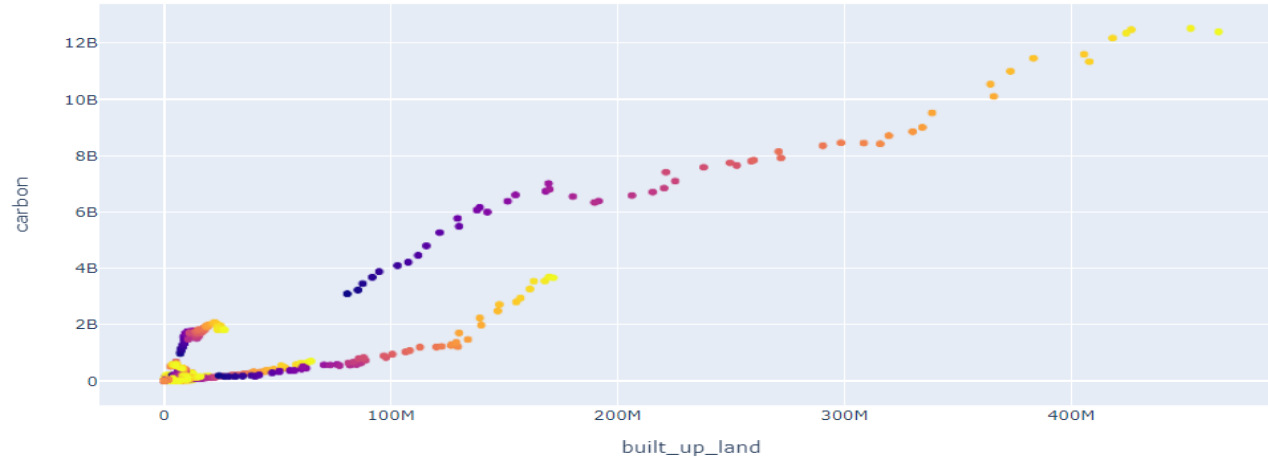


9 . Contribution of some records on crop lands importance in total value.

The area plot of the 3 selected gives us the domination of production record when it comes to crop land and the imports and consumption follows it. In the overall population we can also see some places where all three come almost equal so we cannot conclude the clear domination of a specific record here , when we add more records to comparison this may vary.



10 . Relation between human land cover and carbon footprint values



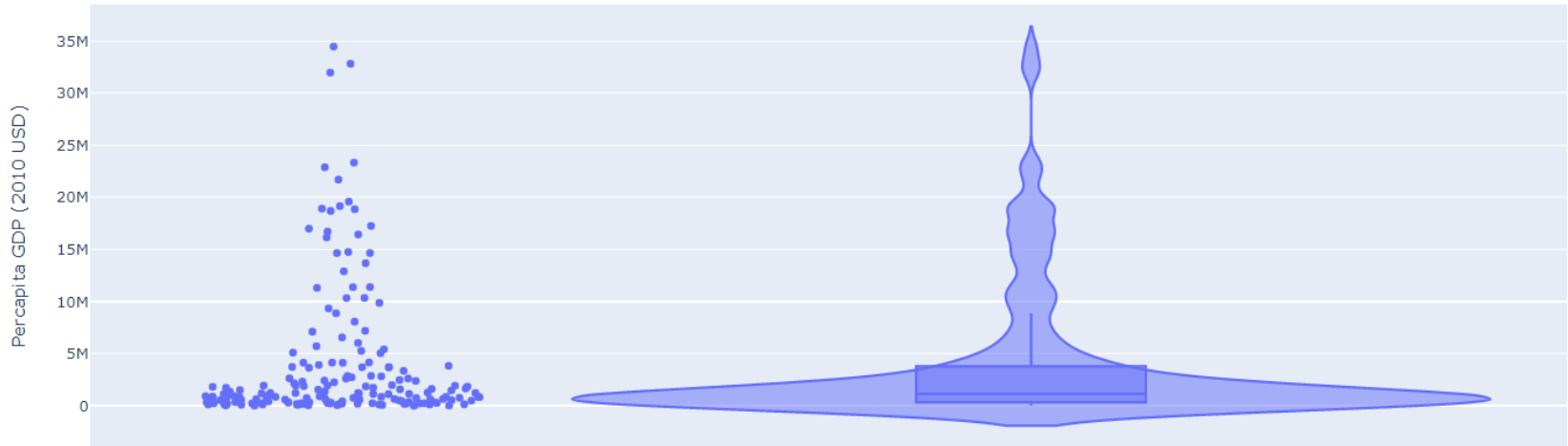
The plot shows us how much human inhabitation has affected the carbon emissions over the year. The more the human land cover the higher the carbon emission.

But we can still see some places in the recent years which has kept the carbon emission and built-up land less

11 . Per capita GDP distribution

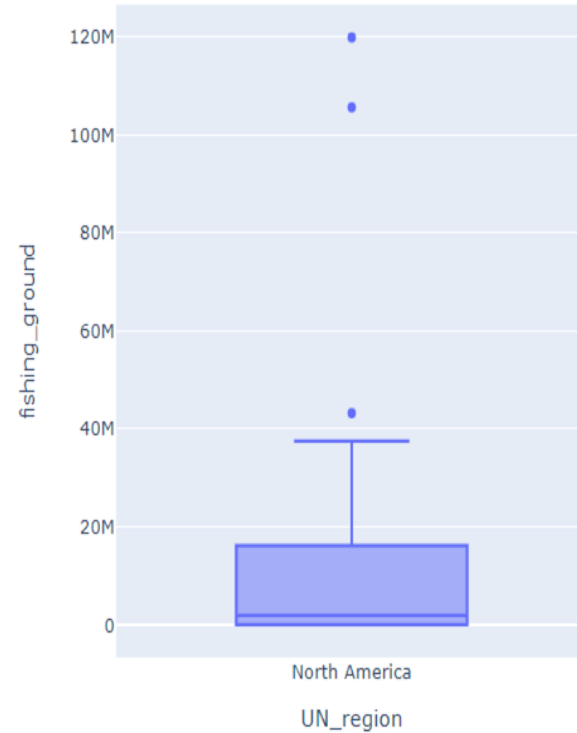
The Plot gives us a idea about the distribution of the attribute. We can see that it is a very much skewed attribute. Gives us the information that there are many countries across the globe which are standing in the lower side of the value range. And we get the information about max,min,different quantiles,etc.

Per Capita GDP distribution



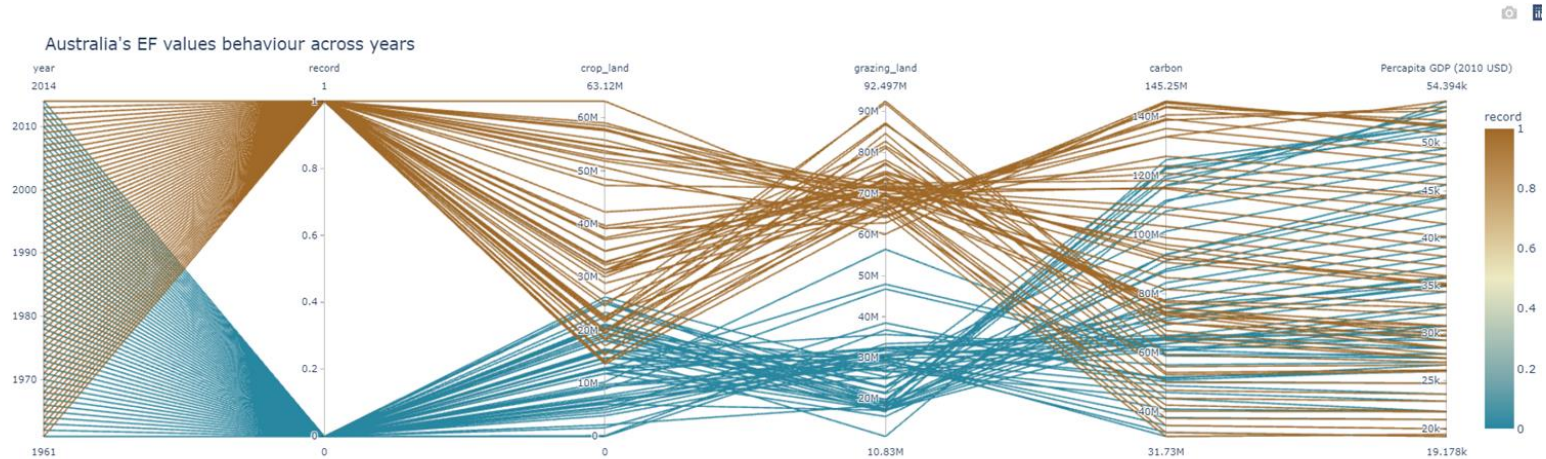
12 . Fishing ground distribution of north america

The box-plot also gives us some statistics about the attributes distribution ,
the skewness , IQR,min,max,range,quantiles ,etc
and this also gives us the outlier in the dataset
. And from the shape of the box plot we can infer the skewness here and the outlier datapoint can also be found.



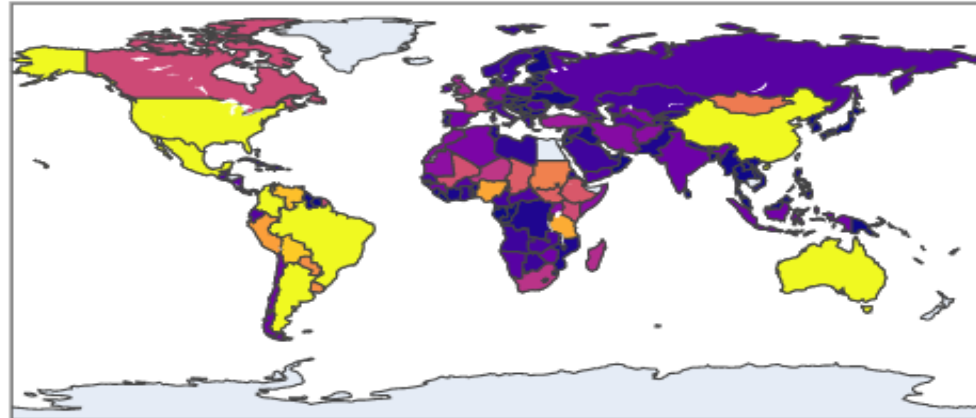
13 . Show the range in Australia's footprint values across years

The parallel coordinate plot gives us the information about the importance of cropland and grazing land in the production field, these are clear indicators that over the years australia's crop land has increased and more used to produce than consume and the carbon emission in both sectors seems to be almost equal but still production sector has seen some high amounts in the recent years.

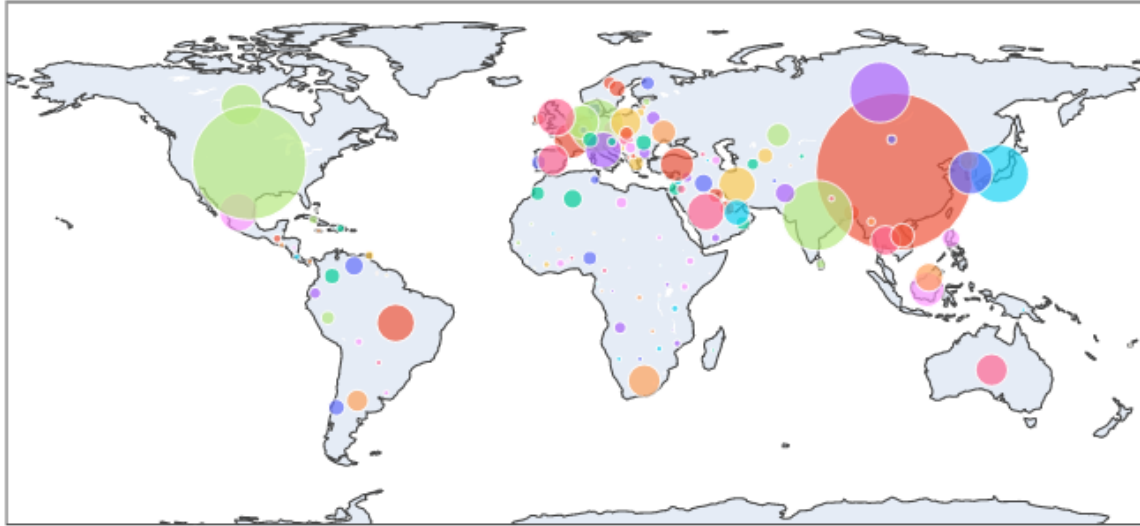


14 . Countries which use/have high amount of Grazing lands for production

The colors in the choropleth ranges from low(dark blue) to high (yellow)
,this clearly classifies some countries which have high amount of grazing land
provided the vastness of those countries , but for some countries like
france,germany
even though their vastness is low they have a good amount of land.
On the other side in countries like russia which is large in area
we can see a pretty low amount of grazing land.



15 . Countries which are in need of reducing carbon emissions



The bubble map gives us the clear image of how each country stands when it comes to carbon emission . The carbon emission depends upon many factors and this is the calculation done in 2014 and we can see china is having high rate of carbon emission and regions in africa are having the lowest. We can see a huge amount in USA,India, and European countries which are small but having high rates.



Thank
you!