B9DA106 Data Visualization
CA_ONE

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1. Introduction

This analysis uses Tableau to explore the Social Progress Index 2022 dataset, which measures how well countries translate economic growth into improved quality of life for their citizens.

The dataset is available for free on [Kaggle](#). It contains data of 169 countries that are assessed across 12 variables grouped into three main dimensions –
- Basic Human Needs
    - Nutrition and Basic Medical Care
    - Water and Sanitation
    - Shelter
    - Personal Safety
- Foundation of Wellbeing
    - Access to Basic Knowledge
    - Access to Information and Communications
    - Health and Wellness
    - Environmental Quality
- Opportunity
    - Personal Rights
    - Personal Freedom and Choice
    - Inclusiveness
    - Access to Advanced Education

The dataset doesn't just focus on GDP to assess a country's growth. It doesn't just ask how wealthy a nation is, but how effectively they use these resources to actually improve people's lives. Each country receives scores from 0-100 across twelve components mentioned above along with average scores for the 3 main dimensions they come under.

My analytical approach focuses only on the world's most struggling nations while maintaining global context. Rather than simply ranking countries, I wanted to understand the specific areas holding back development and whether universal patterns exist in how societies fail or succeed to progress.

2. Design Justifications

Dashboard Design

The dashboard follows an intentional narration arc, moving from broader patterns to specific issues.

The monochromatic green palette was decided after testing various different colour schemes. Rainbow palettes were too distracting and red-green combinations seemed too judgemental. I settled on shades of green as this created visual coherence while also avoiding the bias of "red equals bad". The green suggests growth which I felt would be appropriate when discussing development potential rather than just pointing out failures.

In visualisations showing all country data, dark green highlights the bottom N countries against the light green backgrounds. This helps provide contrast without making the struggling nations appear as outcasts. For the bottom country only views I decided to just go with different shades of green to have uniformity across all visualisations.

The adjustable parameter (10-30 countries) is to help with different analytic needs, like researchers might only want bottom 10 for case studies, but policy makers might need more than that to check for any regional patterns. To create a natural reading flow, the layout is set so to have the problem identification on top and cause analysis in the bottom.

Individual Visualisation Justifications

Distribution Analysis – Box Plots

Initially I went with a histogram but it was too overwhelming and there were 12 different charts coming up, I then went with a violin plot but again there were too many different shapes so I finally decided on using a box plot. It helped me in doing exactly what I needed, showing the spread and outliers efficiently. The decision to keep all countries was important as filtering just the bottom 10 would just show the score, but including all others showed how poorly they scored, like how some of the bottom countries are outliers even among the struggling countries.

Opportunity Gap - Scatter Plot

I briefly considered using a slope chart but it made it really difficult to make out anything . Scatter plots were more clearer and individual points were more distinguishable. Using shapes to show development patterns (triangles for basic needs focused, circles for balanced) adds a layer without cluttering. Keeping all countries visible was crucial to show that bottom countries are not outliers but just behind other countries.

Weakest Components - Horizontal Bar Chart

This visualisation went through the most iterations. My initial heat map (all components for all countries) created an overwhelming grid. Radar charts seemed like a unique idea and looked sleek but made comparison impossible. I decided to use bar chart as they would accurately reveal what's dragging each country down relative to their own development level. Sorting by overall social progress score (rather than by deviation size) shows an interesting pattern. The worst-off countries don't always have the largest deviations, suggesting some maintain unfortunate balance in their struggles.

Environment vs Development - Dual Axis

The dual axis despite its complexity best shows both values and their relationships. The light green bars show the basic needs scores, while the dark green line depicts the environmental quality. Sorting by basic needs score rather than alphabetically or by gap size was a deliberate choice to show that environmental protection doesn't follow a clear development gradient.

Interactive Design Evaluation

The bottom N parameter (10-30, steps of 5) provides meaningful control without overwhelming choice. I tested increments of 1 but found no analytical value, the difference between bottom 17 and 18 countries reveals nothing new while cluttering the interface.

The highlighting actions across views helped in a connected discovery. E.g.- Hovering over Yemen in the bar chart would light it up everywhere, helping track specific countries across the views.

Dynamic title for the filter was a late addition. Instead of wondering if views updated, users see "Bottom 10 Countries" change to "Bottom 20 Countries" immediately.

With highlighting already enabling country tracking, filtering by country felt redundant. But some people might want to remove clutter and focus on specific nations so the filter was added.

I consciously limited interactive (to remove cognitive load) elements to these four, rejecting any component filters, sliders, and regional groupings etc.

3. Key Findings

Distribution Analysis Sheet

The distribution analysis revealed how some aspects are far more unequal than others. Access to advanced education and Personal Rights have the longest box plots, this means there is high variance in how countries perform. The best countries have almost perfect scores, the worst barely register. This could be due to different social priorities and capabilities and not just down to resource availability.

Components like Water and Sanitation are much more clustered. Even the world's poorest countries have score above 25, which suggest some basic infrastructure is available all around the world. Most of the issues seem to lie with components like higher education, political freedom, social inclusion.

Bottom 10 countries rarely appear as outliers in these distributions. They all cluster mostly between lower quartile and the lower hinge of the boxes. We could say from this that they are not really failing but simply behind other countries and the normal variation. There are few exceptions however, like South Sudan being an outlier in Information Access. Chad and Central African Republic are outliers in water provision, performing much worse than the other struggling countries.

Weakest Components Sheet

The weakest component analysis was very interesting. Among the bottom 10 countries Inclusion was the most common weakness. 50% of the countries were affected by this. I expected that development issues could be due to water, food, shelter or healthcare, but the relative failure of these countries lie in not being socially acceptable regardless of the gender, religion or ethnicity.

Yemen shows the biggest gap with -33 points below the SP (Social Progress) score of 39. Followed by South Sudan to Somalia ranging from -22 to -18 points. Even the smallest deviations (-13 to -15) show big failures given these countries' already low SP Scores.

8 out of the 10 countries are Sub-Saharan African, with only Yemen and Afghanistan from other regions. The African countries all faced colonialism which could be the reason of the inclusion problems. The other non-African countries are also from active conflict zones which can cause similar inclusion problems.

What's also surprising is despite having huge poverty numbers, no South Asian country appears in the bottom 10. Bangladesh, India, Pakistan all have lots of poverty but they still have higher progress scores. This suggests it's not just poverty but other factors also affect social progress.

Opportunity Gap Sheet

The opportunity gap scatter plot confirms the trend that basic needs and opportunity have some correlation (R^2 = 0.5). The bottom 10 countries are not too varied. 7 fall below the trend line confirming they focus more on the basic needs than opportunity.

The 3 countries that are above the line are Chad, Democratic Republic of Congo and Central African Republic. This suggests despite having poor basic needs they still somehow provide a bit more opportunity which is not expected. This is not however good news as the scores for both components are very low. Some countries may focus on keeping people alive and some may focus on more on education while the people starve.

The gaps between the basic human needs and opportunity all varies differently from almost 0 to over 20 points in some cases. This is important for creating strategies as we can understand who need help across the board and who needs more help with either basic needs or opportunity.

Environment vs. Development Sheet

The environment vs development visualisation shows some unexpected results. 8 of the bottom 10 countries have higher environment quality than basic human needs score. This is opposite to normal thinking that poor countries may be sacrificing the environment to grow. Yemen and Afghanistan are exceptions to this, they show poor environment along with human misery which is likely due to war and conflicts.

The gaps typically range from 7-10 points, but the extremes are the ones that we need to look at. Yemen (-23) and Afghanistan (-22) show how war destroys both human and environment. Central African Republic (+19) maintains a good environment score which is more than of some developed countries, but has a basic needs score of only 28.

Many bottom countries like Somalia, Sudan, Democratic Republic of Congo, Guinea all have environmental score above 50 which again outperform many of the middle-income or developed countries like India, Egypt, Saudi Arabia and Qatar. This could suggest that they are not looking after the environment but it is a lack of industrialisation. These countries are not developed enough to pollute and environmental degradation might just be a choice during development.

This does raise questions like if poverty helps preserving environment and development destroys them, how do we help them develop sustainably. Just like some of the top countries that have very good score for both components.

Individual Charts vs Integrated Insights

Viewing the visualisations individually tells important but limited information. The distribution analysis alone revealed bottom countries are extreme cases of normal variation. The weakest component sheet suggests inclusion being one of the most common issues and the scatter plot shows correlation without the causation. The environment comparison also seems paradoxical.

Together however these visualisations answer some of the questions, or suggest some reasons. The bottom countries are not all following different paths, but they are stuck and don't stray too far away from what the other countries have been doing. For example the inclusion issues are mostly due to the countries being either colonised or just conflict/war ridden. The environmental success is also not a policy choice but just development delays.

The integrated view reveals the failures of Sub-Saharan Africa. No single country excels in a single component while failing a lot in others. We could say that social progress rises or falls together.

The dashboard confirms that no bottom country has achieved high opportunity without focusing on basic needs, most of them struggle with inclusion especially with all the conflicts. Most of the top countries show balanced economic development with environmental quality. The progress paths for all countries does remain the same which is improvement across all the components equally but some areas might need lot more focus than some others.

4. Conclusion

The analysis started with a simple question, how do societies fail? The answer is mixed. It is a bit complex to understand failures as they can be due to different reasons. Like Yemen who suffer due to the war or democratic issues of Democratic Republic of Congo. The data does suggest a clear path forward, secure basic needs, build wellbeing foundations, then expand opportunity.

The visualisations revealed many unexpected patterns and the dashboards interactivity helped convert static data into an exploration tool, letting users create development pathways.

There are limitations also, mainly that these numbers don't always prove correlation is causation. Future research could compare countries progress over time.

Ultimately, this dashboard does completes its goal of showing the issues and suggesting paths forward.