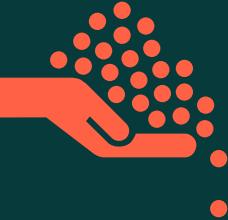


# TESPH PROSPERITY REPORT



TESPH

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# DEFINING PROSPERITY

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**True prosperity is when all people have the ability to thrive.**

Prosperity often produces bounteous wealth both monetary as well as in other factors such as happiness and health.

The debate about the true essence of prosperity still rages on.

Capitalistic notions of prosperity often correspond to greed and materialism. This perspective can be at odds with others which view prosperity with an emphasis on spiritualism and collectivism.

The former often interacts negatively or competes with the latter.

For example, longer working hours might relate positively to certain measures of economic prosperity, but at the expense of driving people away from their preferences for shorter work hours.

Hence, with this index we aim to present a balanced outlook on prosperity that does justice with all its aspects and is free of any contradiction and prejudice.



**Prosperity is driven by an open economy and fostered by an inclusive society where people lead productive, secure and stable lives.**

# TESPH

'TESPH' which stands for Technology, Economy and Environment, Social, Population, and Health is a comprehensive rating created from analysing a large proportion of data which shows a country's overall wellbeing over a certain period of time.

As mentioned above it would be biased to measure a country's prosperity in just one standpoint and leave the rest. So we approached prosperity in two distinct ways:

## Red TESPH

Measure of a country's economic strength reflected in its economic growth, diversity, and stability.

## Green TESPH

Measure of a country's standard of living in terms of sustainable development and health.

# TESPH IN NUMBERS



**16**  
**16 Years**

**7**  
**Regions**

**06**  
**Pillars**

**25**  
**Indicators**

**227**  
**Countries**

# PILLARS

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There are 5 pillars in our ranking. Each pillar has a number of relative indicators and together they give us a glimpse into a country's prosperity. These pillars are briefly explained below:



## 01 — Technology

The technological progress of a country which represents the influence of technology on its macroeconomic growth.



## 02 — Economic

Insights into a country's economy size, currency valuation, economic growth trends, and manufacturing.



## 03 — Environment

An assessment of the condition and trends of a country's environment in relation to its development and growth.



## 04 — Social

A measure of inclusiveness of a country's societies and communities. Freedom of speech, security from violence and crime, and equal access to opportunities.



## 05 — Population

A country's total population and population growth trends in relation to its resources and economic advancement.



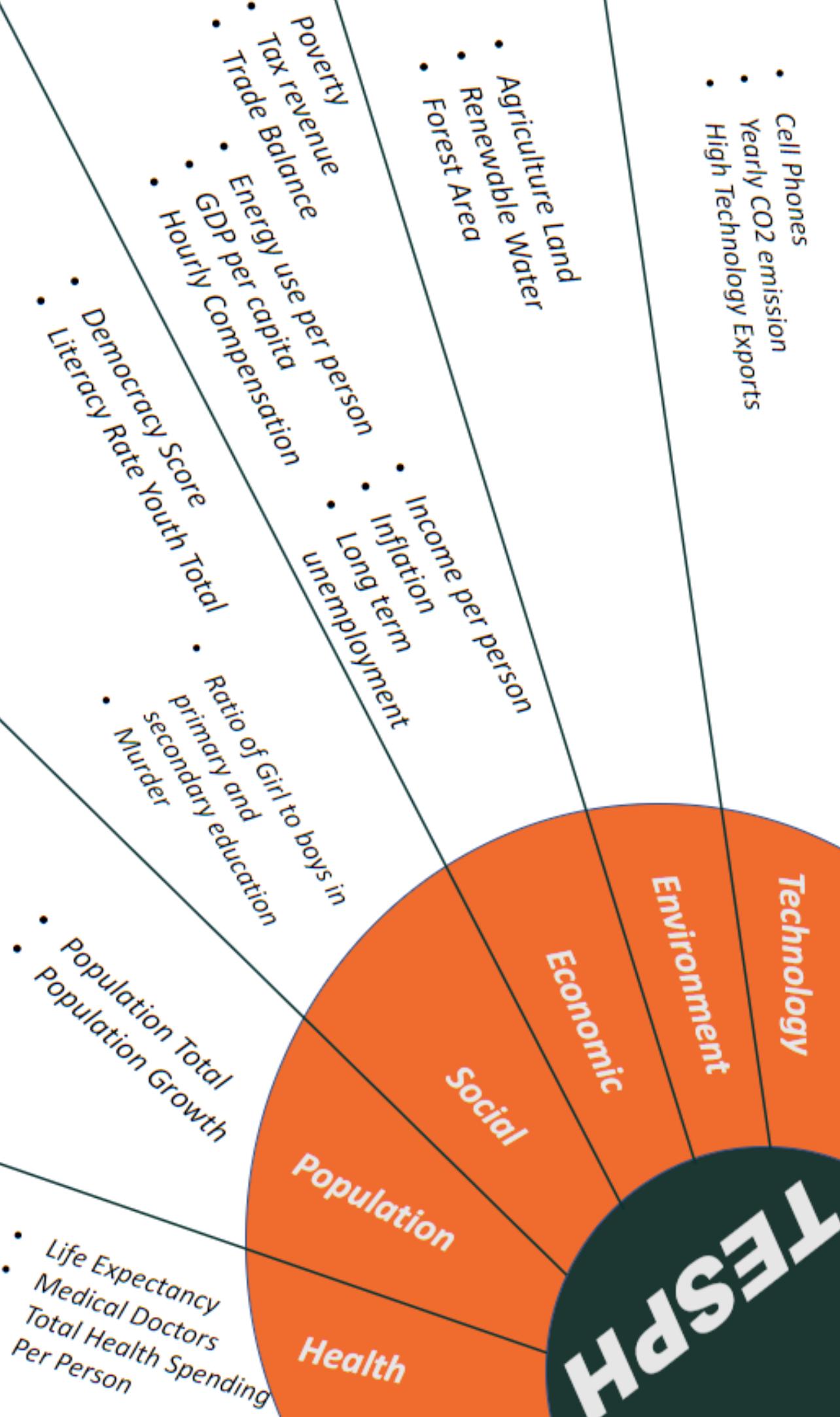
## 06 — Health

A country's initiatives for ensuring the health and well-being of all its citizens, eradicating poverty, and providing healthcare.



# THESE ARE THE

# PILARs



# METHODOLOGY

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## • HOW WE CREATED TESPH?

It can be hard to derive meaningful insights from a large number of discreet and diverse data points about various aspects of a country. Given such data we wanted to arrive at a position that would enable us to represent a country's overall condition over a time period by just one number with maximum accuracy and precision. After doing extensive research, data analyzing and number crunching by utilizing some python dataframes we were able to create TESPH. An index that ranks a country's performance in all the important domains.

Our report will look at two models of TESPH, each model representing a country's position in two distinct scenarios. A country's economic stability will be shown in RED TESPH and a country's health and environmental condition in the GREEN TESPH. You'll observe that a country performing good in one model will not necessarily be on top in the other ranking.

But there are some exceptional countries which are scoring well in both models. Ideally, those countries are the ones which can act as a role model for both their economic and sustainable development.

We'll put emphasis on Pakistan's rankings throughout our report and our primary goal will be to generate a data-driven answer to why Pakistan is the way it is? You'll see a comparison of Pakistan with top performing and under performing countries, countries sharing near similar ranks to Pakistan, and India liberated at the same time as Pakistan.

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## **1. Tools:**

Pandas and Numpy Libraries for data analysis. Matplotlib and Plotly Express Libraries for data visualization.

## **2. Data Cleaning:**

The first step in data analysis is to clean the given data. In our data file, we had a lot of missing values which are commonly represented as NaN values. NaN (Not a Number) are special floating point values which can't be converted to any other data type and are a big hurdle in data analysis. Deleting all the rows or columns containing NaN values isn't an optimal solution because we will also lose a lot of valuable information.

So, we replaced the missing values in each column with the column's average.

## **3. Data Normalization:**

Our data contained values having varied units. Normalizing data is important in that it produces consistency and harmony in the data and ensures the accuracy of operations carried out on it. We normalized our data by dividing all the values of each column by the column maximum value of that column.

This changed the values of numeric columns in the dataset to a common scale, without distorting differences in the values.

## **4. Indicator Selection:**

We began by doing EDA (Exploratory Data Analysis) to determine the main characteristics of our dataset. Data given to us corresponded to a vast number of indicators many of which appeared closely interlinked.

After doing research from many external sources, we chose indicators that were important for our models and represented distinct datasets for example, we had a column for Trade Balance which depends on the difference between the value of exports and imports.

The notion of the balance of trade does not mean that exports and imports are "in balance" with each other.

If a country exports a greater value than it imports, it has a trade surplus or positive trade balance, and

conversely, if a country imports a greater value than it exports, it has a trade deficit or negative trade balance.

We also had two columns for exports and imports so we only chose to include trade balance as an indicator to prevent data duplication.

After initial selection, we had 31 indicators out of the total number of indicators which were 49.

We created 6 pillars and grouped similar indicators into each pillar.

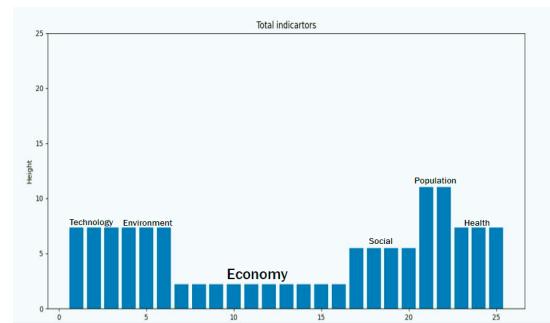
## 5. Average Calculation:

After finding the indexes or row numbers of each country, we calculated the average for the selected indicators over the years.

## 6. Weight Distribution:

We gave each pillar an equal weight of 1 (same area) and each indicator inside the pillar shared an equal weight out of that. Setting area as a constant 1, and since we know the width (number of indicators inside each pillar), we can determine the height or the weight of each indicator inside the pillar.

Look at the graph below for further understanding:



## **7. Weighted Averages:**

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After determining the weight of each indicator, we multiplied the determined weights with the calculated averages above to get weighted averages for each.

## **8. Aggregate Averages of Pillars:**

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To calculate the aggregate average for a pillar, we had to add or subtract the weighted averages of the indicators inside it. The decision to add or subtract an indicator's average was made on the basis of its impact on our model either positive or negative.

### **Determining Indicators' Impact based on Correlation:**

Understanding that manually

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deciding the impact of an indicator could produce inaccurate or even false results because by doing so incorrect assumptions and distorted viewpoints could come into play, we determined the impact of each indicator based on its correlation with the most important metric of our current model.

For RED TESPH, we found the correlation of indicators with Total GDP US because GDP is the most comprehensive measure of economic performance.

In simple terms, GDP is the total monetary value of final goods and services—that is, those that are bought by the final user—produced in a country in a given period of time (say a quarter or a year).

Averages of indicators which correlated positively with GDP were added while of those which correlated negatively were subtracted to get the final averages for pillars.

For GREEN TESPH, we used

Life Expectancy as the benchmark. Life expectancy of a country is a hypothetical measure which represents the average number of years a person can expect to live. Hence, it determines the overall health status of a country across all ages. There can be no better indicator of a country's social and sustainable development than having a long and healthy life.

As for the previous model, averages of indicators were added or subtracted based on their correlation with the life expectancy to get the final pillar average for each country.

## Data Anomalies:

While most of the correlation results were in accordance with reputable external sources, we did observe a few oddities. Like the Pearson correlation coefficient between Life Expectancy and Yearly CO<sub>2</sub> Emission came out to be positive suggesting a positive correlation (x increases with the increase of y)

whereas, most research suggests that increased CO<sub>2</sub> emissions significantly lower life expectancy. For our GREEN TESPH we took Yearly CO<sub>2</sub> Emission as a negative indicator and our final rankings were very consistent with various international rankings as you'll observe in the later section of our report.

## 8. Final Rankings:

After finding the aggregated averages of all pillars, we add all those to get the final ranking for each country.

The countries are then sorted in descending order with the countries having the highest TESPH score being on top.

### Side Note:

We used Pearson Correlation Coefficient to find the pairwise correlation of all the columns in the dataframe. We dropped one of those columns or Indicators having a very strong correlation ( $> +0.70$  or  $> -0.70$ ) to further reduce data redundancy. This brought our indicator count from 31 to 25.

# Key Findings | RED TESPH

No.	Ranks	Countries	TESPH Value
1	1	USA	<b>0.7604315</b>
2	2	China	<b>0.3992278</b>
3	3	Japan	<b>0.2615955</b>
4	4	Germany	<b>0.2512477</b>
5	5	UK	<b>0.1934048</b>
6	109	Georgia	<b>0.0889878</b>
7	110	Uzbekistan	<b>0.0886772</b>
8	111	Pakistan	<b>0.0883954</b>
9	112	Western Sahara	<b>0.0882850</b>
10	113	Cook Islands	<b>0.0882694</b>
11	10	India	<b>0.1573821</b>
12	223	Lao	<b>0.0369298</b>
13	224	Qatar	<b>0.0263739</b>
14	225	Aland Islands	<b>0.0245112</b>
15	226	Pitcrain	<b>0.0183834</b>
16	227	Norfolk Island	<b>0.0183834</b>

# Key Findings | RED TESPH

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- The results of the RED TESPH Ranking weren't much surprising as you've observed above. The top position was occupied by United States of America followed by China, Japan, Germany, and UK.
- Monaco also found its way into top ten countries. Being one of the smallest independent states in the world, Monaco's economy is almost entirely urban and is geared towards finance, commerce, and tourism. This, along with low taxes attracting foreign investment has made Monaco a very rich country.
- Liechtenstein, which ranked on 8th position, is considered world's richest country per capita. It has a strong economy based on industry, a small but significant agricultural sector, services, and low corporate taxes.
- Norfolk performed the worst out of all countries on our index. According to external research, the poverty rate in Norfolk is 21.0%. One out of every 4.8 citizens live in poverty. Norfolk is suffering from severe economic downturn.

## Pakistan's RED TESPH Ranking:

- Pakistan didn't make it into the top 100 countries. It ranked 111th out of 227 countries in our index. We'll see detailed comparison of Pakistan's ranking with others in later part of our report.
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# Key Findings | GREEN TESPH

No.	Ranks	Countries	TESPH Value
1	1	USA	<b>0.4987304</b>
2	2	Japan	<b>0.2413749</b>
3	3	Norway	<b>0.2355486</b>
4	4	UAE	<b>0.2294646</b>
5	5	Canada	<b>0.2292492</b>
6	<b>146</b>	Mauritania	<b>-0.0220373</b>
7	<b>147</b>	Denmark	<b>-0.0235004</b>
8	<b>148</b>	Pakistan	<b>-0.0241228</b>
9	<b>149</b>	Czech Republic	<b>-0.0261914</b>
10	<b>150</b>	Saint Kitts	<b>-0.0271117</b>
11	<b>191</b>	India	<b>-0.0797211</b>
12	<b>223</b>	Bangladesh	<b>-0.1896852</b>
13	<b>224</b>	Nigeria	<b>-0.1964350</b>
14	<b>225</b>	Mongolia	<b>-0.1972338</b>
15	<b>226</b>	Burundi	<b>-0.1992553</b>
16	<b>227</b>	Uruguay	<b>-0.2067222</b>

# Key Findings | GREEN TESPH

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- The results of the GREEN TESPH Ranking showed significant difference from those of the RED TESPH. The top position was again occupied by United States of America followed by Japan, Norway, UAE, and Canada.
- Despite having some environmental issues, Japan is one of the cleanest places to live in. Japan also has one of the best healthcare systems in the world with free and quality healthcare being provided to its citizens.
- Norway's commitment to renewable energy has remained steadfast over the years. Norway's environmental policies are considered one of the best in the world.
- On the lower end spectrum of our rankings, we find countries like Burundi. The population of Burundi lives in conditions of extreme poverty and government spendings on healthcare infrastructure are scarce.

## Pakistan's GREEN TESPH Ranking:

- Pakistan ranked 148th in the GREEN TESPH Ranking even lower than in the RED TESPH Ranking.
  - It is to be noted that we only had data until 2012, so the economic or healthcare conditions of countries might have improved or worsened in the preceding years.
-

# COMPARISON BETWEEN RED AND GREEN TESPH

You can clearly observe that those countries which are winning the race of economy are not necessarily scoring well in terms of health care and sustainable development. This shows us that it is not possible to determine a country's prosperity on purely economic bases. True prosperity goes beyond just GDP and encompasses many other factors like happiness and well being of a country's citizens. We tried to capture both of these notions of prosperity in our models. Looking at the results, you can observe that in RED TESPH India ranks on the 10th position given India has one of the largest economies in the world. However, India landed 191th spot in the GREEN TESPH Ranking as India's healthcare system is considered one of the worst in the world and India also doesn't have a health-friendly environment. However, there were some exceptions in the results. Japan ranked 3rd on the economic front and 2nd in the GREEN TESPH Ranking showing that Japan has an inclusive prosperity ratio.

# PAKISTAN AISA KYUN HAI?

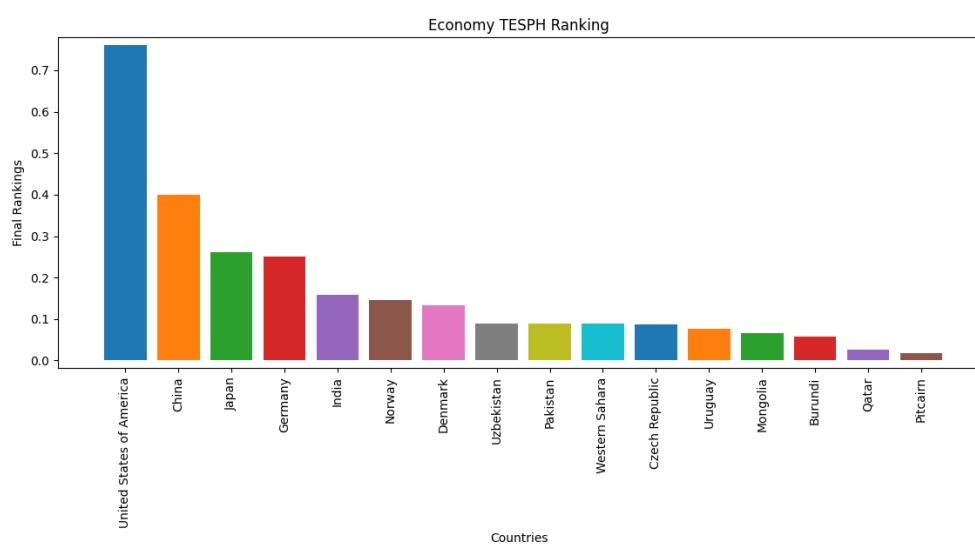
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Pakistan, our beloved country, has stayed true to its commitment of economic stagnation and social deterioration since its liberation in 1947. The results of both of our models showed Pakistan's position in the below average range. It means over the time period of 1952-2012 Pakistan's conditions weren't much different if not worse from what we have today. Let's try to explain these results for both of our models.

## Economic Conditions:

Pakistan ranked 111th in our RED TESPH Ranking which means Pakistan was 110 positions below the top scoring country.

Below is the graph showing the RED TESPH values of top performing, under performing, and Pakistan's neighbouring countries in rank along with Pakistan's own:



The overall economic ranking of Pakistan over the given years reveals a slow economic growth, decline in both public and private sector investments, greater debt and fiscal deficit, low income per person and as a consequence long term unemployment and increased tax.

Pakistan has a median age of 21.5 years, which means a large proportion of its population belongs to the working age group and requires active participation in the economic sectors. On top of that Pakistan's population is growing steadily, but due to slow economic growth all these young citizens can't be fully absorbed by the slowly expanding or even shrinking market size.

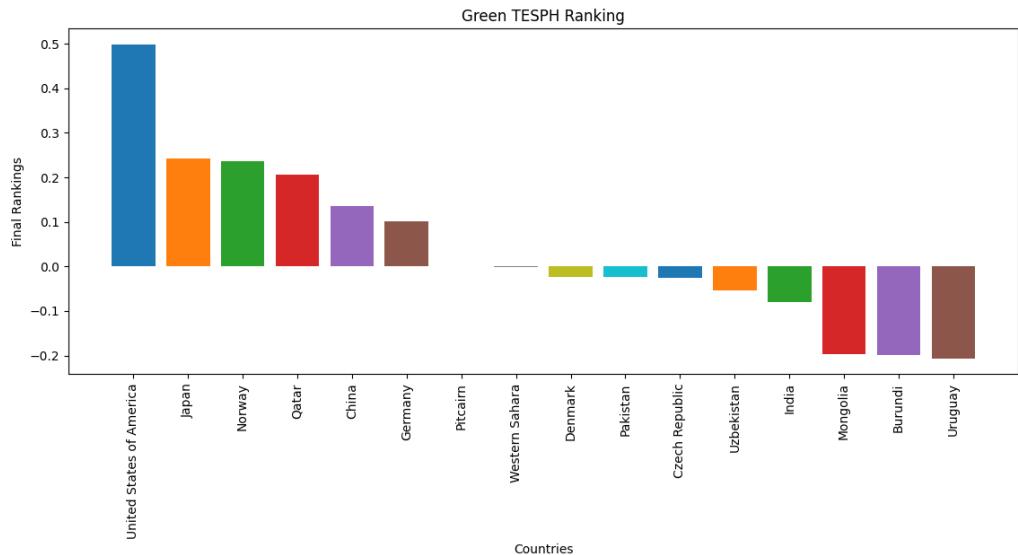
Negative economic trends also lead to an increased threat of violence and the overall crime rate.

Economic success tends to go with political freedom. The countries that democratized first were also mostly the first countries that achieved sustained economic growth. Economic strength of a country is closely correlated with its democracy score.

## **Health and Environmental Conditions:**

Pakistan ranked 148th in our GREEN TESPH Ranking even lower than the economic ranking which means Pakistan was 147 positions below the top scoring country.

Below is the graph showing the GREEN TESPH values of top performing, under performing, and Pakistan's neighbouring countries in rank along with Pakistan's own:



Pakistan's average life expectancy in 2012 was 65.85 years, 1.69 points below India and 18.45 points below Japan, which had the highest life expectancy of 84.3 years. As mentioned earlier, life expectancy is arguably the best measure to determine a country's health and environmental conditions.

Pakistan's low score indicates marginal governmental expenditure on health care system, resulting in poor health care facilities and a decrease in its overall health status. It also shows the deteriorating environmental conditions in Pakistan.

## Pakistan performance as compared to other countries:

As we have discussed before Pakistan was on 111th position in RED TESPH and on 148th position in Green TESPH. Pakistan had many countries ahead of it in 2012 in both models. For example, the countries like Western Sahra which was behind Pakistan in RED TESPH by one rank landed 34 position ahead in GREEN TESPH.

If we compare Pakistan to the countries that were on the bottom in RED TESPH, many positions below Pakistan, crossed Pakistan in

GREEN TESPH in an astonishing way like Pitcairn was ranked 226th in RED TESPH but in GREEN TESPH it scored 110 position. Similarly, Norfolk which was proven the worst country in the RED TESPH even crossed Pakistan with 37 positions in GREEN TESPH.

The difference between Pakistan and top scoring country The United States Of America almost seems unreachable. The United States Of America is scoring 0.7604315532527168 in RED TESPH while Pakistan 0.08839542438261855. USA is also at the top in GREEN TESPH with the score of 0.4987304454603257 while Pakistan scored -0.024122846441818974. Again the difference is undeniably huge. You can clearly see there is a huge difference in both values in both models. Pakistan will have to do major restructuring and improve at an exponential rate to get that high TESPH score.

## Conclusion:

As determined from our models, a country performing well in one model may not necessarily do so in the other. Economic measures of prosperity often seem to relate negatively to prosperity in terms of health and environment. Like CO<sub>2</sub> emissions which represent a country's overall economic activity have negative impact in the perspective of our health and environment based model. Hence, a country lacking in industrial manufacturing and development will get a low position in the RED TESPH but will score higher in the GREEN TESPH. In light of this, we can conclude that a truly prosperous country will score high in both RED and GREEN TESPH. True prosperity is inclusive which means it does justice with both its prevailing notions as an evaluation of economic as well as overall wellness of a country.

Pakistan will have to improve its position on both indexes to become prosperous in the truest sense.

# **Our Journey:**

Creating TESPH was not just about programming it was a novel learning experience. Learning to do research, learning to think outside the box, learning how to work with others and learning to learn a lot of things very fast. It was not a smooth road to follow though. We faced a lot of bumps along the way but we also learned to find our way around them. But what remained constant throughout this process was our determination to realize TESPH.

We want to Thank Dr. Junaid Akhtar for helping us throughout.

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