

“FROM DISPARITY TO PROGRESS”: MAPPING GENDER INEQUALITY ACROSS THE WORLD

Team Details:

Team Number: 6

Course Name: DS612 - Interactive Data Visualization

Prof. Bhaskar Chaudhury

Team Members:

Naman Gandhi – 202418038

Anujit Nair – 202418036

Dhruv Jain – 202418020

Meet Panchal – 202418042

Introduction:

The Story Behind Gender Inequality

In a world striving for equality and progress, the lived experiences of women and men still differ drastically across regions and countries. These differences are not just anecdotal—they are measurable. To track these disparities, the United Nations Development Programme (UNDP) introduced a metric known as the Gender Inequality Index (GII).

What is GII?

The Gender Inequality Index (GII) is a composite measure introduced to reflect gender-based disadvantage in three key dimensions:

- **Reproductive Health:** Measured by maternal mortality ratio and adolescent birth rate
- **Empowerment:** Measured by female representation in parliament and attainment in secondary education
- **Labor Market Participation:** Measured by female and male participation in the labour force

The GII does not just show where inequality exists—it explains how and why it persists. These are not just numbers—they reflect whether a woman survives childbirth in Sub-Saharan Africa, whether a girl completes high school in South Asia, or whether women can access stable employment in the Middle East.

Take a glimpse at the contrast in 2021 GII values from our dataset:

- Norway has a GII of just 0.035, highlighting high educational equality and nearly universal maternal healthcare access.
- Meanwhile, Niger stands at a GII of 0.645, where adolescent birth rates exceed 170 per 1,000 women, and maternal mortality remains alarmingly high.

After looking at such disparities in our datapoints from our dataset, there are numerous questions that comes to our mind:

- Which regions are improving fastest?
- What dimensions of inequality are most persistent?
- Have developing nations been able to close the gender gap?

Along this Report, we aimed to successfully answer a lot of questions that have arisen along with proving some important Hypotheses.

Our Aim:

Turning Data into Direction

Gender inequality is not just a social issue—it's a developmental challenge that affects health, education, economics, and governance. While the GII provides a quantitative lens, our mission is to transform this data into a visual, interactive, and comprehensible story that highlights both progress and persisting disparities.

For this we have used TOP-DOWN approach wherein we begin at the Macro level and then dive into the Micro aspects of the problem and answer the arising questions.

Our Top-Down Approach consists of 4 Major Parts:

1. Global Gender Inequality Landscape
Top-level: Macro view of the entire world
2. Gender Inequality Progress & Time Series Drill-Down
Time-focused: Explore how GII has evolved
3. GII Dimensions Breakdown
Component-focused: Analyse the internal drivers of inequality
4. Country-Level Deep Dive & Profiles
Micro-level: Country-specific dashboards for granular exploration

In short, our mission is to use data to inform, engage, and empower. Through rich visual storytelling, we transform decades of data into a clear roadmap of where gender inequality stands—and where it is headed.

Problem Statement:

Despite global efforts to promote gender equality, disparities between men and women persist across multiple domains—particularly in education, labour participation, political empowerment, and reproductive health. While aggregate measures like the Gender Inequality Index (GII) provide an overview of progress, they often obscure regional imbalances, country-level anomalies, and the individual factors that drive inequality.

This project seeks to analyse gender inequality through a multi-level lens—from global and regional trends to individual country profiles—using data from 1990 to 2021. Specifically, we aim to:

- Understand how gender inequality has evolved over time, and whether countries in different continents, hemispheres, or developmental groups have experienced faster or slower progress;
- Identify which dimensions of inequality (e.g., maternal mortality, education gaps, labour force participation) are most impactful in driving GII scores;
- Detect outlier countries that have defied regional trends—either by rapidly improving or stagnating;
- Assess whether countries are converging toward equality, or if global progress hides widening gaps in certain regions or indicators.

By addressing these questions, the project aims to inform policy interventions, resource allocation, and international collaboration efforts toward reducing gender disparities in a data-driven and targeted manner.

Dataset Overview:

Our Primary Dataset consisted of the following columns:

- Country: Name of the Country
- Human_Development: HDI category- Very High, High, Medium Low
- GII: Gender Inequality Index value (range 0 to 1, lower the better)
- Rank: GII ranking among the countries
- Maternal_Mortality: Number of maternal deaths per 100,000 live births
- Adolescent_Birth_Rate: Births per 1,00 women aged between 15-19
- F_secondary_edu: % of women with at least secondary education
- M_secondary_edu: % of men with at least secondary education
- F_labour_force: % of women in the labour force
- M_labour_force: % of men in the labour force
- Seats_Parliament: % of parliamentary seats held by women

Along with our Primary Dataset we have also added a Secondary dataset which contained the Historical GII values of the countries. The Secondary Dataset consists of the following columns:

- ISO3: ISO Alpha-3 country code
- Country: Country name
- Continent: Continent to which the country belongs
- Hemisphere: Hemisphere: Northern or Southern
- Human Development Groups UN classification: Very High, High, Medium, Low
- UNDP Developing Regions: UNDP regional classification
- HDI Rank (2021): Country's HDI rank in 2021
- GII Rank (2021): GII rank in 2021 (repeated for consistency)
- GII-1990 to GII-2021: GII values for each year

Our Original Data Source in the Tableau included the two sources mentioned above. To enable rich visual analysis, we have performed certain transformations mentioned below:

- **Firstly**, the two datasets have been JOINED in Tableau using the Country field to link the first one with the second dataset which contains the GII Time Series Data. The Table Contains 194 rows & 49 Columns.

IDV

Filters 0 Add

OG 49 fields 194 rows 100 rows

OG	OG	OG	OG	OG	OG	OG	OG
Country	Human development	Rank	Maternal mortality	Adolescent birth rate	Seats parliament	F secondary educ	M second:
Bahamas	Very high	78	70	25.700	20.0000	87.0000	
Bahrain	Very high	46	14	8.700	18.8000	79.9000	
Bangladesh	Medium	131	173	75.500	20.9000	50.6000	
Barbados	High	64	27	42.300	29.4000	95.4000	
Belarus	Very high	29	2	11.900	34.7000	97.5000	
Belgium	Very high	10	5	5.300	42.9000	87.2000	
Belize	Medium	86	36	57.100	19.6000	54.5000	
Benin	Low	152	397	92.300	8.4000	21.1000	
Bhutan	Medium	98	183	19.000	16.7000	23.6000	
Bolivia	Medium	99	155	63.800	48.2000	60.1000	

- **Secondly**, a Pivoted version of the joined data is also visible in the Data Source. This was done to create a tidy YEAR V/S GII structure for Time Series Analysis. The new dimensions after performing Pivot are 6208 rows & 20 fields.

IDV (Pivoted)

Filters

0 | Add

OG

20 fields 6208 rows

100 → rows

<div>Table Details</div> <div>></div>	<div>OG</div> <div>F Labour force</div>	<div>OG</div> <div>M Labour force</div>	<div>ABC COMBINE</div> <div>Continent</div>	<div>ABC COMBINE</div> <div>Hemisphere</div>	<div>COMBINE</div> <div>Hdi 2021</div>	<div>COMBINE</div> <div>GII Rank 2021</div>	<div>ABC Pivot</div> <div>Year</div>	<div>COMBINE</div> <div>GII Values</div>	<div>Analyl</div> <div>Analyl</div>
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1990	0.700000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1991	0.698000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1992	0.694000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1993	0.689000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1994	0.685000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1995	0.675000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1996	0.662000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1997	0.648000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1998	0.624000	
56.9000	15.7000	64.50000	Africa	Northern Hemisphere	91	126	1999	0.611000	

The new pivoted columns under the name YEAR & GII Values clearly help us to perform Time Series Analysis.

- **Thirdly**, Another Excel File Named Correlation Matrix has also been uploaded which contains the Correlation values between the Components of GII. 49 rows & 3 columns.

Correlation Matrix			Filters 0 Add
Sheet2 3 fields 49 rows			49 → rows ⚙️
Table Details	Variable1	Variable2	Correlatio
	Maternal_mortality	Adolescent birth rate	0.74180
	Maternal_mortality	F Labour force	0.18601
	Maternal_mortality	F secondary educ	-0.69435
	Maternal_mortality	M Labour force	0.05044
	Maternal_mortality	M secondary educ	-0.63756
	Maternal_mortality	Maternal mortality	1.00000
	Maternal_mortality	Seats parliament	-0.14150
	Adolescent_birth_rate	Adolescent birth rate	1.00000
	Adolescent_birth_rate	F Labour force	0.22205
	Adolescent_birth_rate	F secondary educ	-0.71864
	Adolescent_birth_rate	M Labour force	0.20392

Table contains the Pearson’s Correlation coefficient value of each Variable with another.

- Calculated Fields:**
 - Global Average GII: Shows the Average GII values of each Year.
 - GII % Change: Shows the % change in GII value from year 1990 to 2021

$$\frac{((\text{GII}-2021) - (\text{GII } 2021))}{(\text{GII}-1990)}$$
 - GII Improvement: Shows the absolute change in GII value from the year 1990 to 2021 $(\text{GII } -1990 - \text{GII } -2021)$
 - GII 2021 Bin: Bifurcates the values based on the step size 0.05 provided.

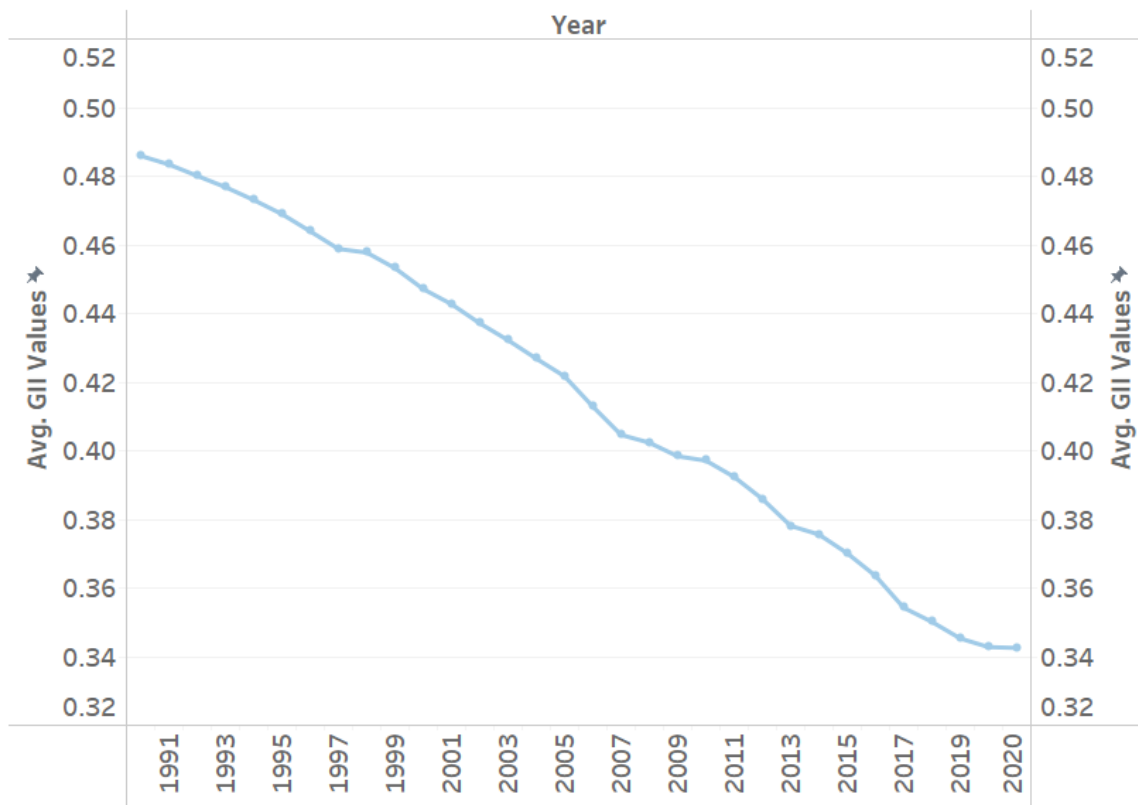
Hypotheses & Key Questions:

Part I: Global Gender Inequality Landscape

Aim: Our aim in this part is to build a Macro Level understanding of How GII varies across regions and countries.

Hypothesis 1: There has been a significant reduction in the Average Global GII values from 1990 to 2021

Global GII Trend



Variables	Data Type	Sub Type
Year	Quantitative	Interval
GII Values	Quantitative	Ratio
Country	Categorical	Nominal

Marks:

- This visualization uses OD marks.
- Points(OD): Represents Average GII values for a specific year.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Year
Vertical Position (Y-axis)	Average GII values

Visualization Summary:

Why this Plot?

This single-line chart was chosen to depict the average global Gender Inequality Index (GII) over time (1990–2021). A line chart is ideal for showing continuous temporal trends, making it easy to observe the overall trajectory and rate of change in inequality globally. Trend Identification is the Key reason this plot is chosen.

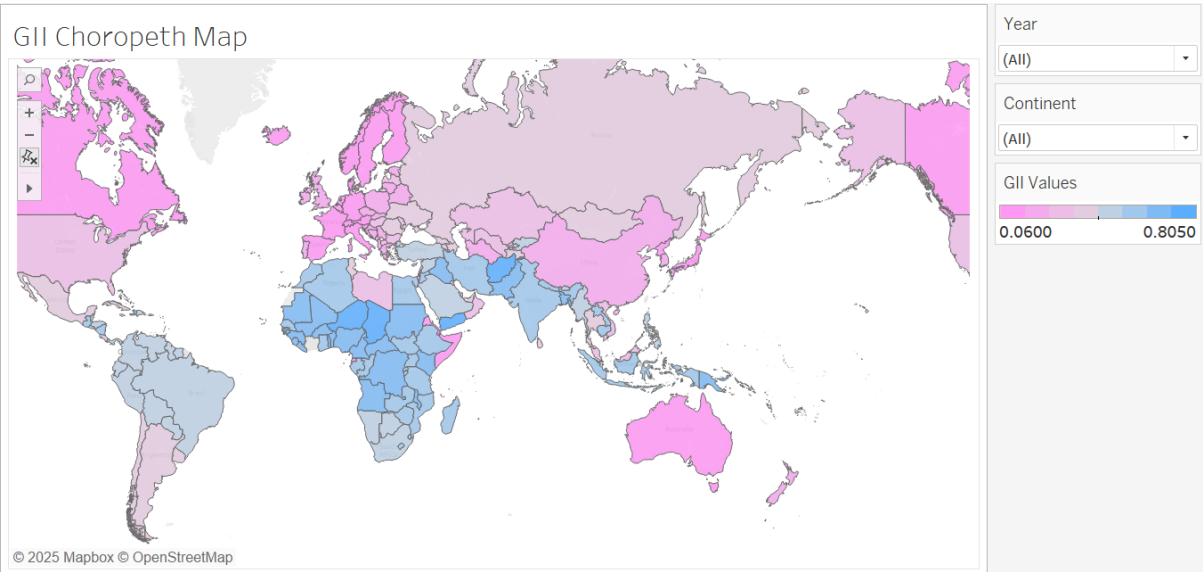
Why the Colour Scheme?

Our colour scheme is based on Gender Equality. The lower the GII value the lighter the Shade of Pink & The higher the GII value, the darker the shade of Blue.

Observations:

From the Chart, there is a clear indication about the decline in Average GII Value over the period. It clearly demonstrates the gradual decline in GII, signalling overall global improvement. It supports the key hypothesis: “That there is a significant reduction in the average GII Value over the Period.”

Hypothesis 2: Is there a geographic pattern in gender inequality based on hemisphere and continents.



Variables	Data Type	Sub Type
Year	Quantitative	Interval
GII Values	Quantitative	Ratio
Country	Categorical	Nominal
Continent	Qualitative	Nominal

Marks:

- This visualization uses 2D marks.
- Area(2D): Represents GII values through colour pattern for specific country.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Latitude
Vertical Position (Y-axis)	Longitude
Colour (Saturation)	Diverging values where pink for low GII values and blue for high GII values

Visualization Summary:

Why this Plot?

A choropleth map was selected to present GII data across countries in a visually intuitive and geographically contextualized way. This chart helps identify regional trends in inequality, Identifying countries with extreme values (low or high GII), Filtering by year and continent to study temporal and regional changes.

Why this colour scheme?

A diverging colour scale (Pink → Blue) was used:

- Pink (low GII values) = less gender inequality.
- Blue (high GII values) = greater gender inequality.

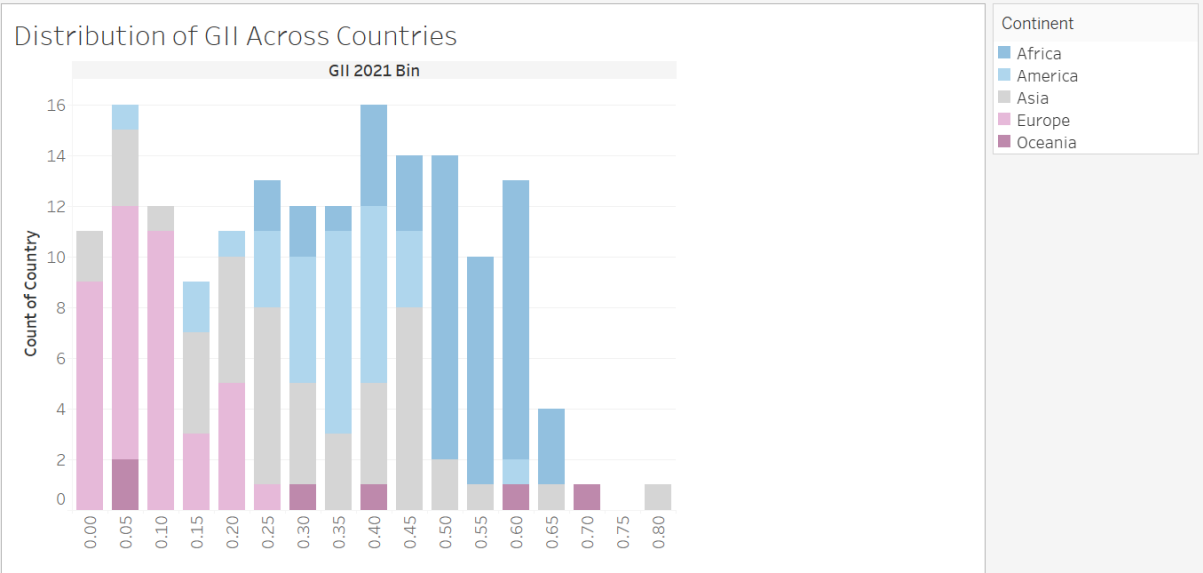
This diverging colour scheme aligns with the Aim of Gender Equality.

Observations:

From the Chart, it is clearly visible that certain continents performed well. Europe and Oceania show clear distinction with countries in that continent having the lowest GII Values.

African Continent is cover in Blue showing that the GII Values is very High. Hence, this map helps identify clear distinction between continents and hemispheres.

Question 1: What is the Global Distribution of Gender Inequality?



Variables	Data Type	Sub Type
GII Values Binned	Quantitative	Ordinal
Count of Country	Quantitative	Nominal
Continent	Qualitative	Nominal

Marks:

- This visualization uses 1D marks.
- Line(1D): Represents number of countries for specific GII values and divided in continents

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	GII values
Vertical Position (Y-axis)	Number of countries
Colour(Hue)	Specific colours for each continent

Visualization Summary:

Why this Plot?

A histogram with stacked bars was chosen because of the following:

- Show the distribution of Gender Inequality Index (GII) values across all countries for a specific year (2021).
- Compare concentration and spread of countries by GII score bins.
- Allow viewers to see which continents dominate specific ranges of inequality.

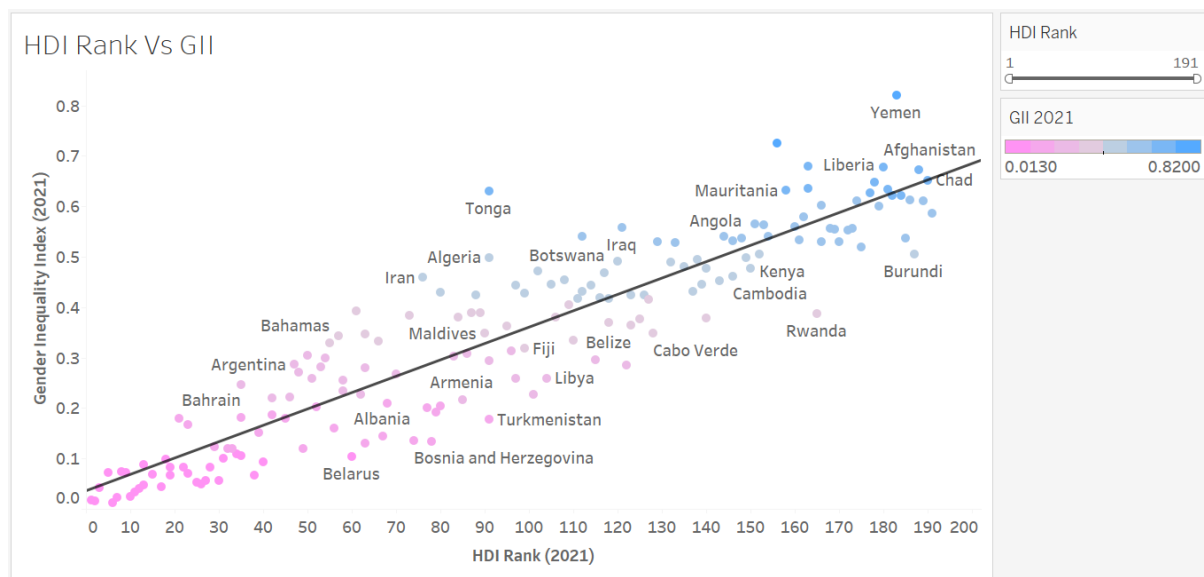
Why this colour scheme?

Each continent is color-coded with a unique but subtle pastel tone. Consistent colour use with other charts in the dashboard (Africa = blue, Europe = pink, etc.) aids in recognition. Legend on the right makes decoding fast and intuitive.

Observations:

- Most countries fall in the mid-range GII bins between 0.30 and 0.55, indicating a moderate level of gender inequality globally.
- Lower GII bins (0.00–0.20) are predominantly occupied by European countries, reflecting lower gender inequality.
- In contrast, African countries dominate the higher GII ranges (0.45–0.65), suggesting greater gender inequality in the region.

Hypothesis 3: Is there a relation between GII Value and HDI Rank?



Variables	Data Type	Sub Type
HDI Rank	Quantitative	Ordinal
GII 2021	Quantitative	Ratio
Country	Categorical	Nominal

Marks:

- This visualization uses 0D marks.
- Points(0D): Represents GII values for a given HDI rank.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	HDI rank
Vertical Position (Y-axis)	GII values
colour (Saturation)	Diverging colours based on GII values

Visualization Summary:

Why this Plot?

This scatter plot is used to:

- Visualize the correlation between HDI Rank and GII.
- See how countries with different HDI ranks fare in terms of gender inequality.
- Detect clusters, outliers, and trend direction.

Why this colour scheme?

The colour encoding uses a sequential gradient from light pink (lower GII values) to deep blue (higher GII values):

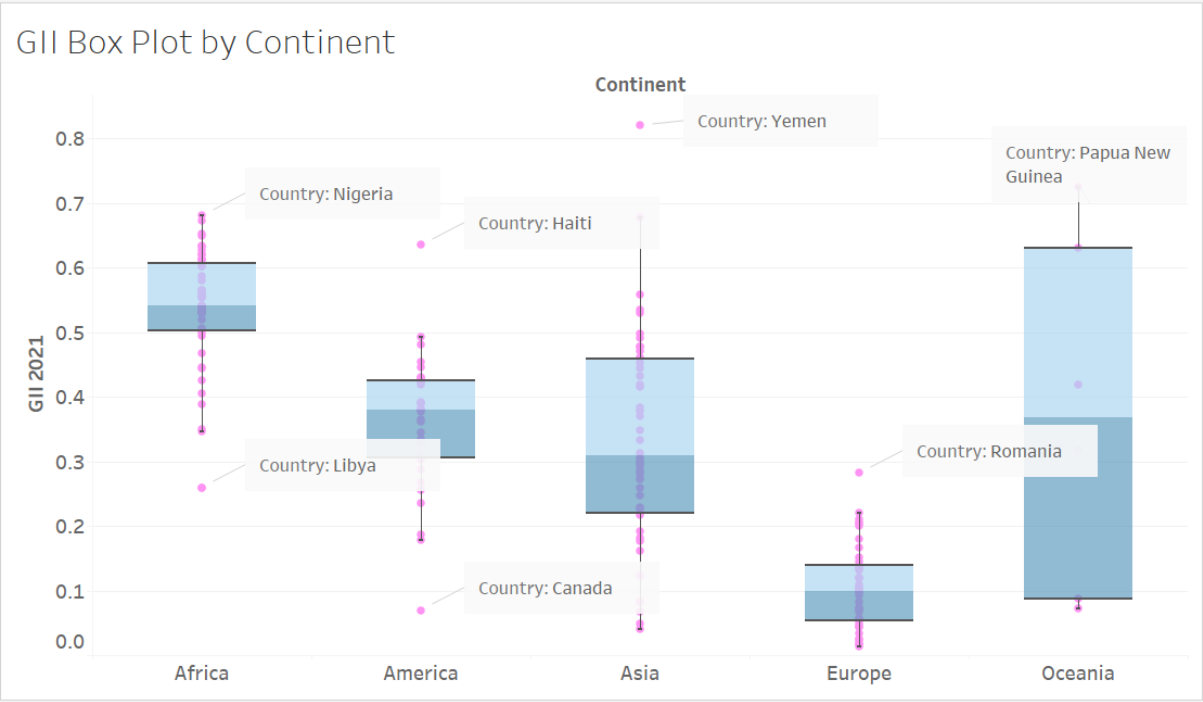
- Helps differentiate the degree of gender inequality.
- Adds an extra dimension to the plot for visual comparison.
- Intuitively, lighter = less inequality, darker = more inequality.

Observations:

- Positive Correlation: The trend line shows a positive relationship between HDI Rank and GII. Countries with lower HDI ranks (i.e., worse human development) tend to have higher gender inequality.

- Low-GII High-HDI Cluster: Countries like Belarus, Bahrain, Argentina, Albania, Bosnia appear in the lower-left quadrant (low GII and high HDI).
- High-GII Low-HDI Outliers: Countries like Chad, Yemen, Afghanistan, Liberia is in the upper-right quadrant, indicating both low human development and high gender inequality.

Question 2: Which countries are outliers in each of the continents?



Variables	Data Type	Sub Type
Country	Qualitative	Nominal
GII 2021	Quantitative	Ratio
Continent	Categorical	Nominal

Marks:

- This visualization uses 1D marks.
- Lines(1D): The box plots use lines to represent key statistical measures (e.g., whiskers, median line, box boundaries) in GII values for each continent.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Represents categorical variables (continent name)
Vertical Position (Y-axis)	Quantitative GII values for each continent
Length	For distribution spread

Visualization Summary:

Why this Plot?

The box plot is used to:

- Summarize distribution of GII (2021) across different continents.
- Show central tendency (median) and spread (IQR) of GII per continent.
- Identify outliers visually (the pink dots outside whiskers).
- Compare variation and inequality across continents.

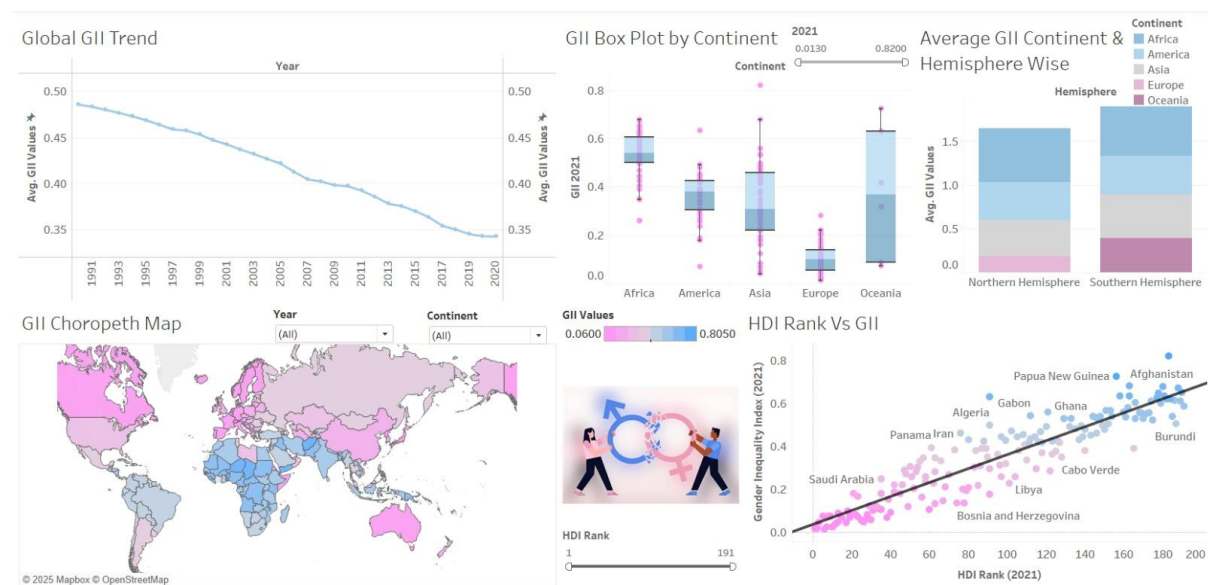
Why this colour scheme?

- Blue box: Represents the Interquartile Range (IQR) – middle 50% of values.
- Black line inside: Median GII per continent.
- Whiskers: Show typical range (excluding outliers).
- Pink dots: Outliers or individual country data points, for deeper insight into variation.

Observations:

- Europe has the lowest GII values and also the tightest spread, indicating low gender inequality and consistent performance across countries.
- Africa and Oceania have higher GII values with wide spread, indicating greater gender inequality and variability across countries.
- Asia shows a wide spread of GII values, ranging from very low to very high. Suggests diverse gender outcomes within the continent.
- America (North, Central & South) lies in the middle, with moderate inequality and fewer extreme outliers.
- Oceania has a very high interquartile range, indicating large variability among the few countries it includes.

DASHBOARD 1: GLOBAL LEVEL VIEW



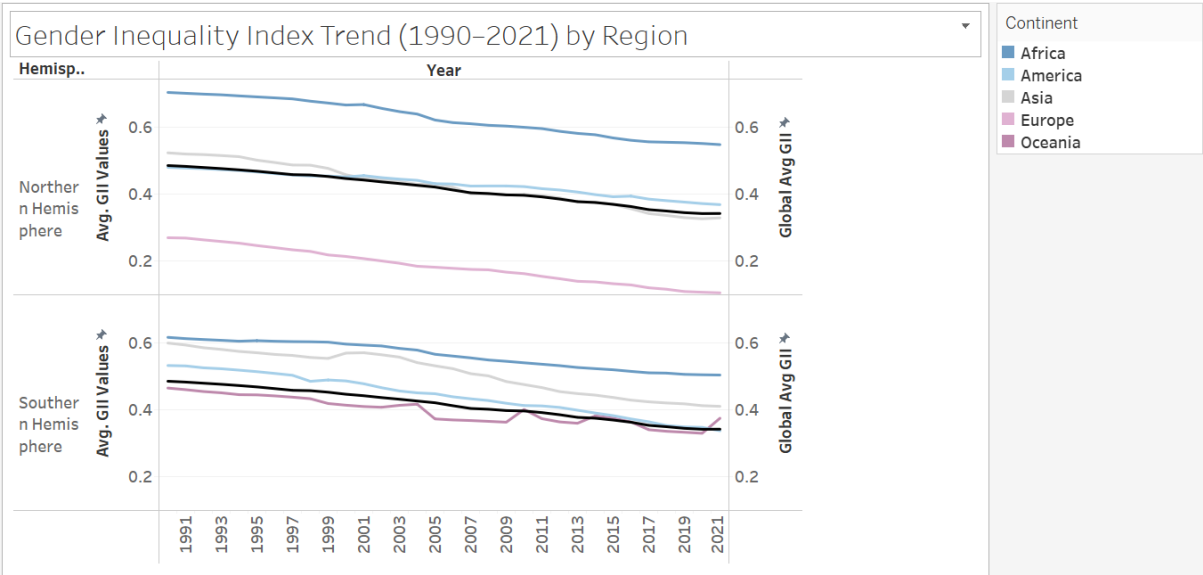
Key Insights from the Dashboard:

- **Global Improvement:** GII has declined globally over the last 30 years.
- **Regional Differences:** Europe has the lowest inequality; Oceania and Africa the highest.
- **Hemispheric Gap:** Gender inequality is worse in the Southern Hemisphere.
- **Development Link:** Strong correlation between human development and gender equality.
- **Geospatial Trends:** GII varies significantly across countries and regions, with visual hotspots.

Part II: Gender Inequality Progress & Time Series Drill-Down

Aim: For this part, Our Aim is to analyse how gender inequality has evolved from 1990 to 2021.

Question 3: Which Continents have performed well over the year?



Variables	Data Type	Sub Type
Year	Quantitative	Interval
Avg. GII	Quantitative	Ratio
Continent	Categorical	Nominal
Hemisphere	Qualitative	Nominal

Marks:

- This visualization uses OD marks.
- Points(OD): Represent individual GII values i.e annual values for each hemisphere.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Year
Vertical Position (Y-axis)	Quantitative GII values
colour (Hue)	Specific colours assigned to each continent

Visualization Summary:

Why this Plot?

This line chart is used because:

- It allows clear time-series analysis from 1990 to 2021.
- By splitting into two panels (small multiples) for Northern vs. Southern Hemispheres, the viewer can:
- Compare trends within each hemisphere.
- Detect regional inequalities over time.

Why this colour scheme?

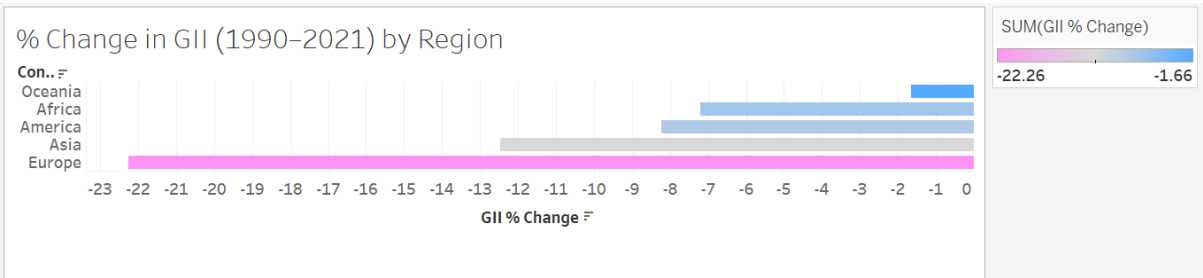
Coloured lines represent each continent:

- Blue (Africa), Gray (America), Light Gray (Asia), Pink (Oceania), etc.
- The black line represents the Global Average GII, acting as a benchmark:
- Helps evaluate whether a continent's GII is above (worse) or below (better) than the global average.
- Serves as a powerful reference line for comparative regional analysis.

Observations:

- **Global Observations:** The black global average line shows a steady decline from ~0.48 in 1990 to ~0.36 in 2021. This downward trend indicates global progress in reducing gender inequality.
- **Northern Hemisphere:** Europe consistently remains below the global average, demonstrating strong gender equality performance. Asia and Africa remain above the global average, though their GII values are slowly decreasing. America trends closely around the global average, slightly better in later years.
- **Southern Hemisphere:** Africa in the Southern Hemisphere remains well above the global average throughout the period. Oceania shows volatile trends but overall performance hovers around or slightly below the global average. All continents demonstrate improvement, but Africa lags the most behind the global benchmark.
- **Rate of Improvement:** Europe and Oceania show the fastest improvement, consistently staying below the global average line. Africa, both North and South, continues to experience the highest inequality with slowest rate of decline.

Hypothesis 4: Most regions have shown improvement over time, but at uneven rates.



Variables	Data Type	Sub Type
% GII Change	Quantitative	Ratio
Continent	Categorical	Nominal

Marks:

- This visualization uses 1D marks.
- Line(1D): Represent %change in GII for each continent.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	% change in GII
Vertical Position (Y-axis)	Region or continent name
colour(saturation)	Diverging colours based on changing GII values

Visualization Summary:

Why this Plot?

This horizontal bar chart is effective for:

- Comparing percentage change in Gender Inequality Index (GII) over time (1990–2021).
- Highlighting the magnitude of improvement or lack thereof by region.
- Displaying ranking from least to most improved clearly along the horizontal axis.

Why this colour scheme?

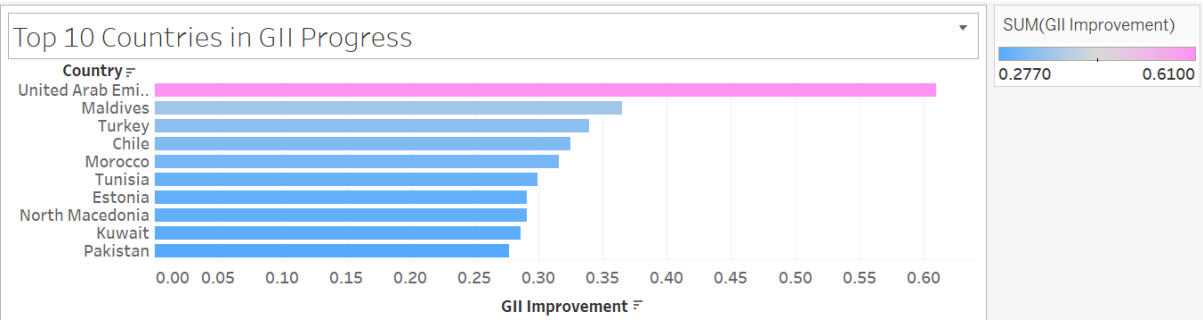
- Each continent is represented using a distinct colour (Europe in pink, Africa in blue, etc.).
- Gradient legend shows the range of % GII change, from least negative (light shades) to most negative (darker shades), indicating stronger reduction.

- The visual contrast emphasizes which region made the largest improvement in reducing gender inequality.

Observations:

- Europe shows the highest percentage reduction in GII at -22.26%, leading all continents in improving gender equality.
- Asia, America, and Africa show moderate improvements ranging from -12% to -6%.
- Oceania shows the least reduction, with GII improving by only -1.66% over 31 years.
- All regions show a negative % change, confirming that gender inequality has decreased globally, though at varying rates.

Question 4: Which Country has shown the Highest progress over the period?



Variables	Data Type	Sub Type
GII Improvement	Quantitative	Ratio
Country	Categorical	Nominal

Marks:

- This visualization uses 1D marks.
- Line (1D): Represent GII improvement for top 10 countries.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	GII improvement value
Vertical Position (Y-axis)	country name
colour(saturation)	Diverging colours based on changing GII values

Visualization Summary:

Why this Plot?

This horizontal bar chart is effective for:

- Ranking the top 10 countries that made the most progress in reducing Gender Inequality Index (GII).
- Showing magnitude of improvement side-by-side for easy comparison.
- Making the leader(s) visually stand out.

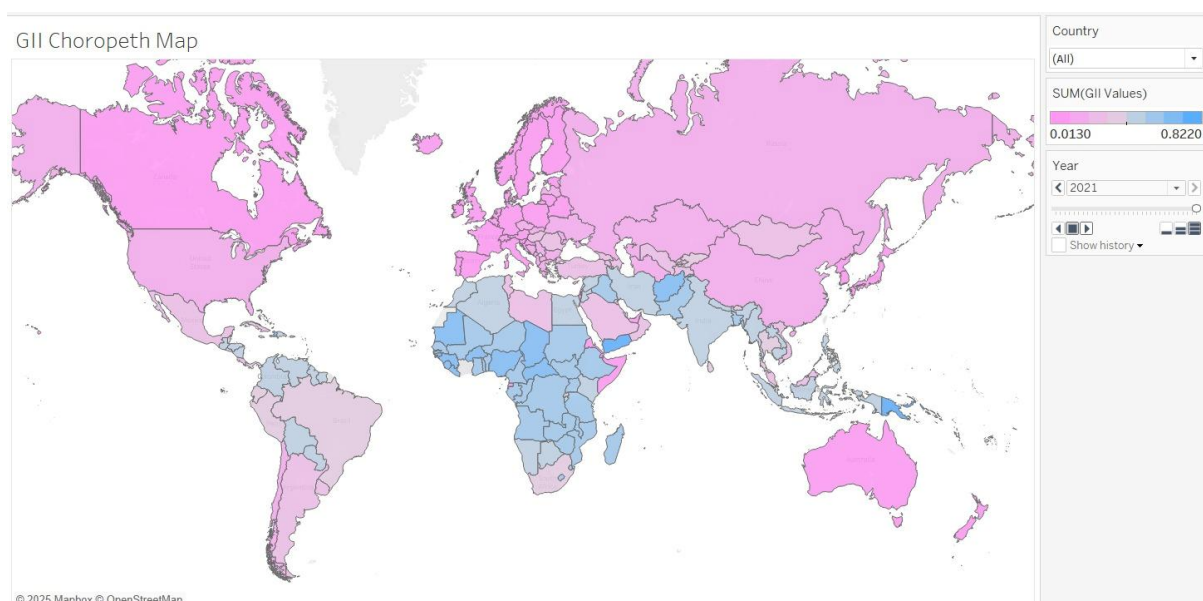
Why this colour scheme?

- Most countries are shaded in blue, representing increasing GII improvement.
- The top-performing country (United Arab Emirates) is highlighted in pink, making it immediately identifiable.
- The colour gradient also matches the range legend on the right (0.2770 to 0.6100), enhancing visual encoding of improvement values.

Observations:

- United Arab Emirates is the top performer, with the largest GII improvement (~ 0.61) from 1990 to 2021.
- Maldives, Turkey, Chile, and Morocco follow closely, showing significant progress between ~ 0.30 and 0.40 .
- The list reflects diverse regions — including the Middle East, South Asia, North Africa, and Europe — indicating broad global participation in gender reform.
- All listed countries have GII improvement > 0.27 , indicating substantial structural change in gender-related development.

Question 5: How has GII changed for different countries over the span of 30 years?



Variables	Data Type	Sub Type
GII Value	Quantitative	Ratio
Country	Categorical	Nominal
Year	Quantitative	Interval

Marks:

- This visualization uses 2D marks.
- Area(2D): Represents GII values through colour pattern for specific country.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Latitude
Vertical Position (Y-axis)	Longitude
colour (Saturation)	Diverging values where pink for low GII values and blue for high GII values

Visualization Summary:

Why this Plot?

The choropleth map is the best choice when visualizing data by geography, especially when:

- Exploring country-wise inequality levels.
- Comparing patterns across continents.
- Identifying clusters of high or low GII values.

Why this colour scheme?

- Light pink represents low GII values (less gender inequality).
- Darker blue represents high GII values (more gender inequality).
- The colour scale bar on the right provides the exact GII value range (0.0130 to 0.8220).

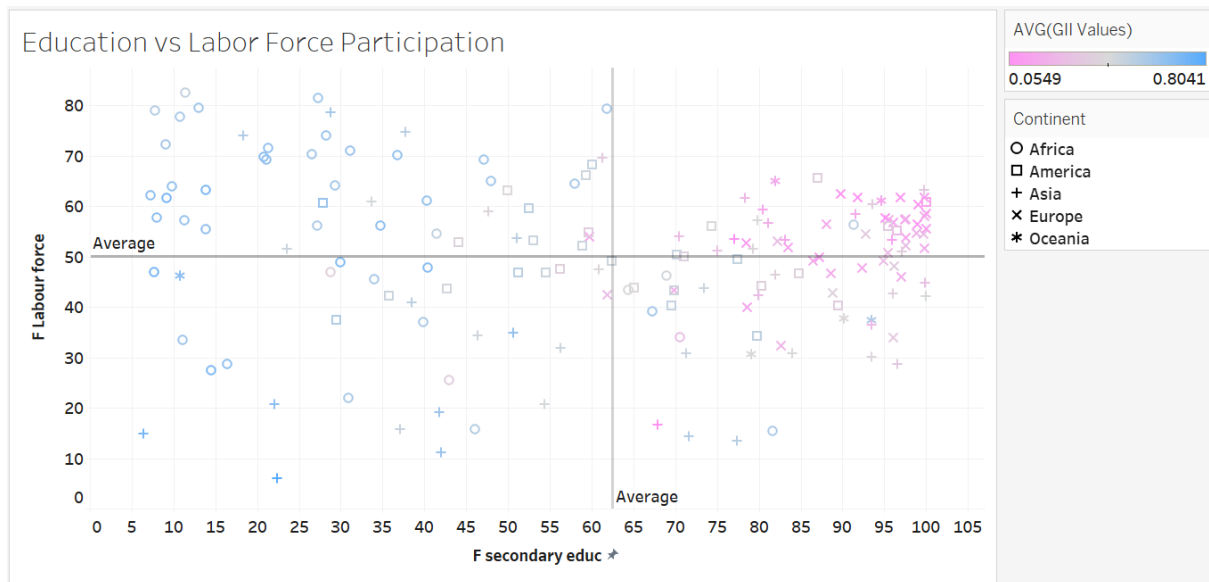
Observations:

- Low GII Regions (Light Pink): Europe, North America, and parts of East Asia show lower GII values, indicating greater gender equality.
- Countries like Norway, Germany, Canada, Japan fall in this zone.
- High GII Regions (Blue): Sub-Saharan Africa, parts of the Middle East, and South Asia show higher GII values. Countries like Chad, Niger, Somalia, Papua New Guinea appear in dark blue, signifying severe gender inequality.
- Moderate Zones: Nations in South America, North Africa, and Central Asia show mixed GII values, leaning toward moderate inequality.

Part III: GII Dimensions Breakdown

Aim: Deconstruct the GII into its underlying components to understand what drives inequality.

Hypothesis 5: Female education and labour force participation are the strongest predictors of GII



Variables	Data Type	Sub Type
GI Value	Quantitative	Ratio
Continent	Categorical	Nominal
F-Secondary Edu	Quantitative	Ratio
F-Labour Force	Quantitative	Ratio

Marks:

- This visualization uses 0D marks.
- Points(0D): Represents female education and female labour force values in shape assigned to each continent.

Channels:

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	Values for female secondary education
Vertical Position (Y-axis)	Values for female labour force
colour (Saturation)	Diverging values where pink for low GII values and blue for high GII values
shape	Different shapes assigned for each continent

Visualization Summary:

Why this Plot?

- This scatter plot is ideal for examining the relationship between female education and workforce participation.
- Helps in identifying clusters, correlations, and regional differences.
- Divides the data using average reference lines, creating four analytical quadrants for interpretation.

Why this colour scheme?

- Colour: GII values are color-coded from pink (low inequality) to blue (high inequality).
- Shape: Each continent is symbolized uniquely:
 - ○ Africa, □ America, + Asia, × Europe, * Oceania
- This dual encoding enhances clarity: Viewers can detect both regional patterns and inequality levels in one view.

Observations:

General Trends:

A positive correlation exists: as female secondary education increases, female labour participation also tends to increase, though not perfectly linear. Countries in the top-right quadrant (above average in both education and labour) are mostly European and American — indicating strong gender equality indicators.

Colour Insights (GII-Based):

- Pink points (lower GII) are concentrated in the top-right — high education and high labour force participation = greater gender equality.
- Blue points (higher GII) dominate the bottom-left, especially from Africa and some Asia — indicating low education and low workforce access for women.

Continental Patterns:

- Africa: Mostly in the bottom-left – both education and labour force participation are below average, with high GII.
- Europe: Clusters in the top-right, showing low GII, high education, and high workforce inclusion.
- Asia and America: Scattered across quadrants, indicating mixed progress.
- Oceania: Sparse but leaning toward the upper-left, meaning good labour participation but variable education levels.

Question 6: Which inequality dimension is most sensitive to development level?



Variables	Data Type	Sub Type
Human Development Group	Categorical	Ordinal
Indicators	Quantitative	Ratio
Measure Values	Quantitative	Ratio

Visualization Summary:

Why this Plot?

- A heat map is ideal when you want to:
- Compare multiple indicators across categorical groups (here: HDI categories).
- Spot intensity levels or anomalies across combinations of development level and gender-related metrics.
- Visually identify where inequality dimensions are more severe or favourable.

Why this colour scheme?

- The light to dark blue scale reflects the value intensity of each measure.
- Lighter colours = lower values (better in some contexts like maternal mortality).
- Darker colours = higher values (could be good or bad depending on the indicator).
- The colour range (12.9 to 521.5) allows for quick visual comparison of extremes — especially helpful for outlier values like maternal mortality.

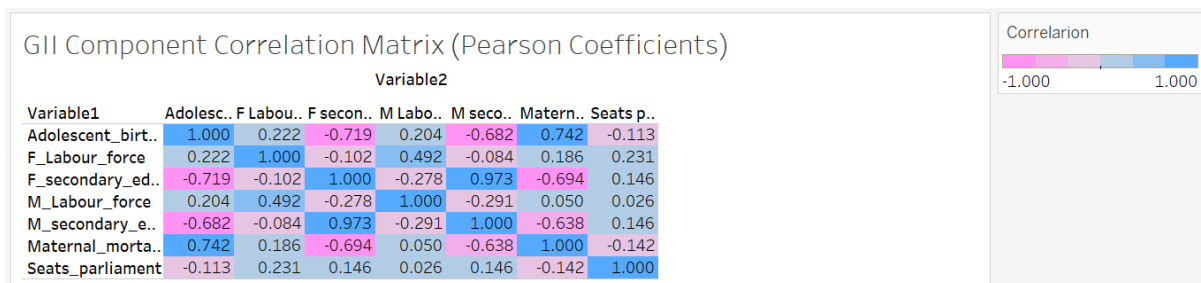
Observations:

- **Maternal Mortality:** Darkest blue cell in the “Low” development group shows extremely high maternal mortality (~521.5), marking it as the most critical issue in

low-HDI countries. As HDI level increases, maternal mortality decreases visibly, showing a clear inverse relationship.

- **Education (F & M Secondary Educ):** Female secondary education levels increase from low to very high HDI. Male education remains relatively stable, suggesting gender gaps in education close in higher HDI countries.
- **Labour Force Participation:** Female labour force participation does not increase linearly with development: It's relatively consistent across HDI groups. Suggests that cultural, societal, or policy factors might influence female workforce entry beyond development level alone. Male labour force values are stable across all categories.
- **Adolescent Birth Rate:** Slightly higher in Low HDI countries, though not as visually extreme as maternal mortality.

Hypothesis 6: Do the Components of GII show Correlation with each other?



This is a Pearson correlation matrix showing the strength and direction of linear relationships between various components of Gender Inequality Index (GII). It uses a color gradient:

- Blue: Strong positive correlation (near +1)
- Pink: Strong negative correlation (near -1)
- White/light: Weak or no correlation (around 0)

Each value ranges between -1 to +1, where:

- +1 → perfect positive correlation
- -1 → perfect negative correlation
- 0 → no correlation

Observations:

Strong Negative Correlation:

- Adolescent birth rate vs. F secondary education: -0.719
As girls' education increases, adolescent births decrease — a strong inverse relationship.
- M secondary education vs. F secondary education: +0.973

Indicates that in most countries, male and female education levels rise together, suggesting overall better access to education.

- Maternal mortality vs. F secondary education: -0.694
Better education = lower maternal mortality, education plays a crucial role in maternal health outcomes.
- M secondary education vs. Adolescent birth rate: -0.682
Similar inverse pattern to female education — implies overall literacy and awareness reduces early births.

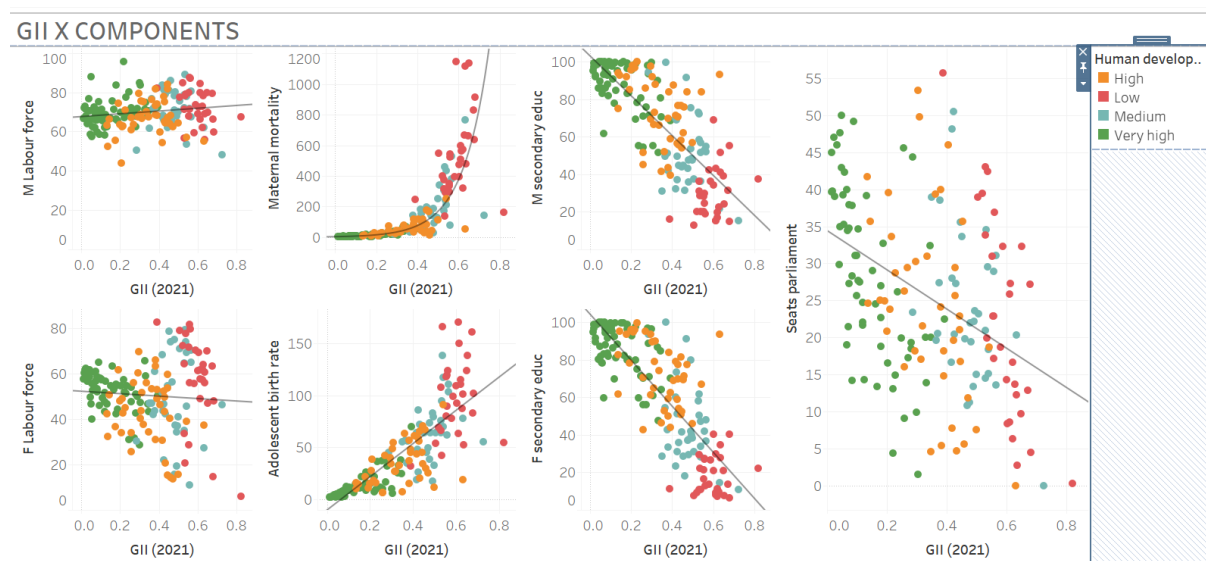
Strong Positive Correlation:

- Maternal mortality vs. Adolescent birth rate: +0.742
Countries with higher adolescent births tend to also have higher maternal mortality → indicates shared structural challenges.
- F Labour force vs. M Labour force: +0.492
In many countries, higher male participation is somewhat linked to higher female participation, but not strongly.

Weak or Negligible Correlation:

- Seats in Parliament with almost every other variable:
- Correlation with F Labour: 0.231
- With adolescent birth rate: -0.113
- Suggests that female political representation does not strongly correlate with education, labour, or health outcomes in this dataset.

Question 7: Which individual indicators are most strongly correlated with overall GII?



Marks:

- This visualization uses OD marks.
- Points(OD): Represents GII values through each value of male secondary education.

Channels

Channel Type	Purpose and Mapping
Horizontal Position(X-axis)	GII values for 2021
Vertical Position (Y-axis)	Male Secondary Education, Male Labour force, Female Secondary Education, Adolescent birth rate, Number of seats in parliament, Maternal Mortality, Female Labour Force
colour (Hue)	colours assigned to specific values based on development

Observations:

1. GII vs. Male Labour Force Participation:

- Very weak positive trend.
- Male participation remains high and stable, regardless of GII, indicating that gender inequality does not greatly affect male labour force involvement.

2. GII vs. Maternal Mortality

- Strong nonlinear positive correlation.
- As GII increases, maternal mortality rises steeply — especially in low HDI (red) countries.
- Highlights severe health inequality in less developed nations.

3. GII vs. Male Secondary Education

- Strong negative correlation.
- Higher gender inequality correlates with lower male education levels.
- Reflects that education infrastructure is poor in high-inequality countries, affecting both genders.

4. GII vs. Female Labour Force Participation

- Weak negative trend.
- Suggests that GII has limited impact on female labor force participation, possibly due to cultural and economic complexities.
- Scattered pattern, especially among medium and high HDI groups.

5. GII vs. Adolescent Birth Rate

- Strong positive correlation.
- Higher GII strongly aligns with higher adolescent birth rates, emphasizing reproductive health and education deficits in high-inequality nations.

6. GII vs. Female Secondary Education

- Strong negative correlation.
- As GII increases, female education levels drop sharply.
- Countries with low GII (more gender equality) show near-universal female secondary education.

7. GII vs. Seats in Parliament (Female Representation)

- Moderate negative trend.
- Higher GII tends to correlate with fewer women in parliament, but with some exceptions/outliers.
- Political inclusion is often policy-driven, so variance exists even at similar GII levels.

Summary Table:

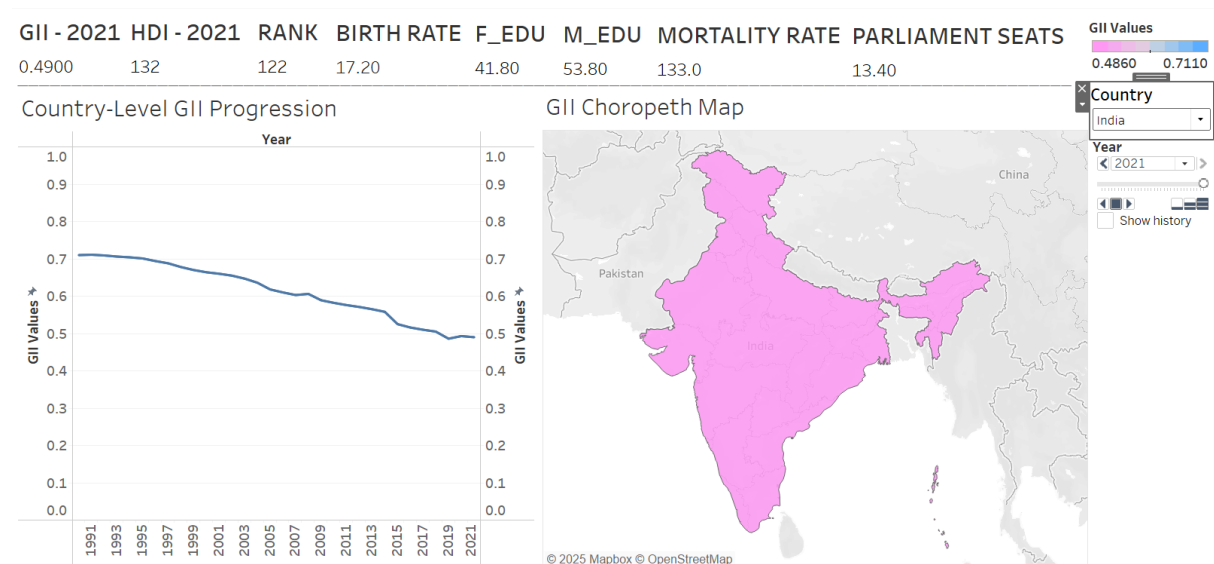
Component	Trend with GII	Correlation Strength	Key Insight
Male Labour Force	Slight upward trend	Weak positive	Male participation is high and stable across GII levels.
Maternal Mortality	Sharp upward curve	Strong positive (nonlinear)	Higher GII correlates with drastically higher maternal mortality.
Male Secondary Education	Downward linear trend	Strong negative	Lower male education in high-GII (inequality) countries.
Female Labour Force	Slight downward trend	Weak negative	Labour participation doesn't directly follow GII; cultural/economic factors play a role.
Adolescent Birth Rate	Upward linear trend	Strong positive	High GII strongly aligns with high adolescent birth rates.
Female Secondary Education	Downward linear trend	Strong negative	Education drops sharply as gender inequality rises.
Seats in Parliament (Women)	Downward trend	Moderate negative	Higher GII usually means lower female political representation.

Part IV: Country-Level Deep Dive & Profiles

Aim: Explore individual countries' GII journeys and create profile dashboards.

Question 8: How has the trend and the KPI of Each country changed over the time?

(For India)



Summary Table:

Indicator	Trend (1991-2021)	Insight
GII Value	0.70 to 0.49	Gender inequality has declined over time
Adolescent Birth Rate	Likely Decrease (17.2 is moderate and has declined over decades)	Suggests improved reproductive health and education
Female Education	Likely Increase (currently 41.8%)	Steady progress in education access, though gap with males remains
Maternal Mortality	Reduced (currently 133)	Significant improvement in maternal healthcare
Parliamentary Seats	Low at 13.4%, trend unclear without time series	Indicates underrepresentation of women in politics
HDI & GII Ranks	Mid-range, though changes over years likely exist	India remains in the medium development tier, with gradual gender progress

The dashboard reveals that India has made steady and consistent progress in reducing gender inequality over the last 30 years, as indicated by the downward GII trend from ~ 0.70 to 0.49. Improvements in maternal health, education access, and adolescent birth rates are evident. However, areas like female political representation and the female-male education gap still need attention. This pattern of progress may vary by country, and similar dashboards could be used to track other nations' trajectories.

Similar can be found by changing the country in the filter section to obtain KPI's and Trends in GII Values over time.

Actionable Insights:

1) Invest in Female Secondary Education:

- Strong negative correlation between GII and female education shows that enhancing girls' access to education significantly reduces inequality.
- Policies that promote school retention, skill development, and gender-sensitive curricula are critical, especially in low and medium HDI countries.

2) Improve Maternal Health Infrastructure:

- The sharp increase in maternal mortality with rising GII highlights the need for targeted investments in maternal healthcare, particularly in low-HDI countries.
- Countries should strengthen access to prenatal care, skilled birth attendance, and emergency obstetric services

3) Reduce Adolescent Birth Rates Through Awareness:

- High correlation between adolescent birth rates and GII suggests a need for comprehensive sex education, youth health services, and community engagement to delay early pregnancies.

4) Promote Women's Economic Participation:

- Despite gains in education, female labour force participation remains uneven across HDI groups.
- Policies should focus on economic empowerment, such as equal pay, safe work environments, and childcare support to bridge the employment gap.

5) Increase Female Political Representation:

- Low and inconsistent correlation with other indicators shows that political inclusion requires deliberate intervention, like gender quotas, leadership training, and inclusive party systems.

6) Target Regions with Persistently High GII:

- Choropleth maps and trend analyses show that Sub-Saharan Africa, parts of South Asia, and Oceania still face consistently high GII.
- International development programs should prioritize these regions with localized strategies.

7) Leverage Success Stories:

- Countries like the UAE, Maldives, Turkey, and Chile showed the highest improvement in GII.
- Their policy frameworks and socio-cultural shifts can serve as models for other developing nations.

Conclusion:

Over the past three decades, the world has made commendable strides in reducing gender inequality, as evidenced by the declining Global GII trend. However, progress is uneven across regions and development levels. Our multi-dimensional analysis shows that education, health, economic participation, and political inclusion remain crucial levers for gender parity. To accelerate this progress, countries must adopt evidence-based, intersectional, and inclusive policies, particularly in underperforming regions. This project not only maps where inequality persists but also lights the path toward equity, empowerment, and sustainable human development.