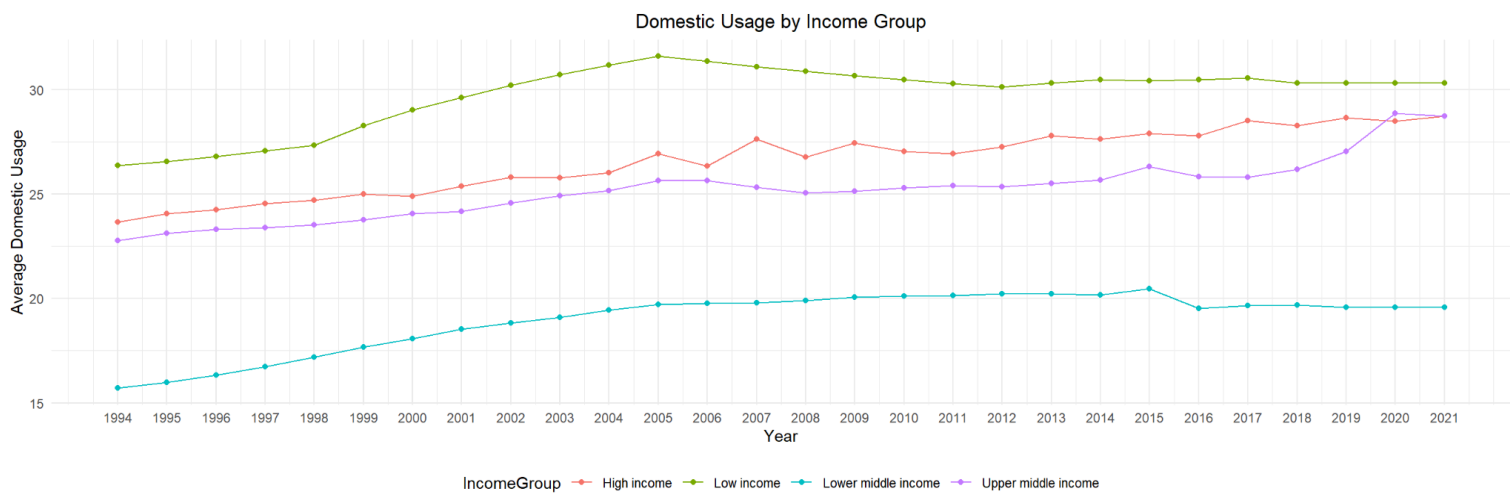


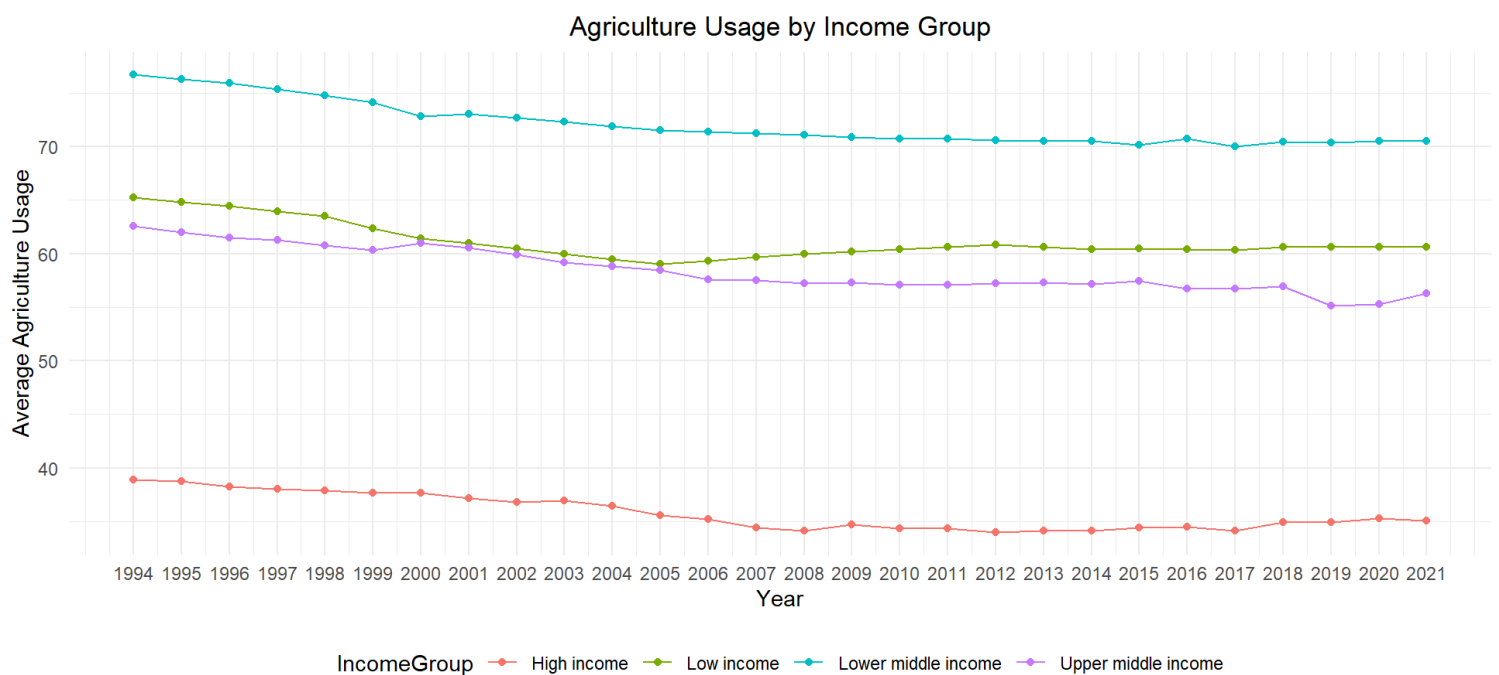
[Relationship between water usage by income group and sectors]

1. Domestic Usage



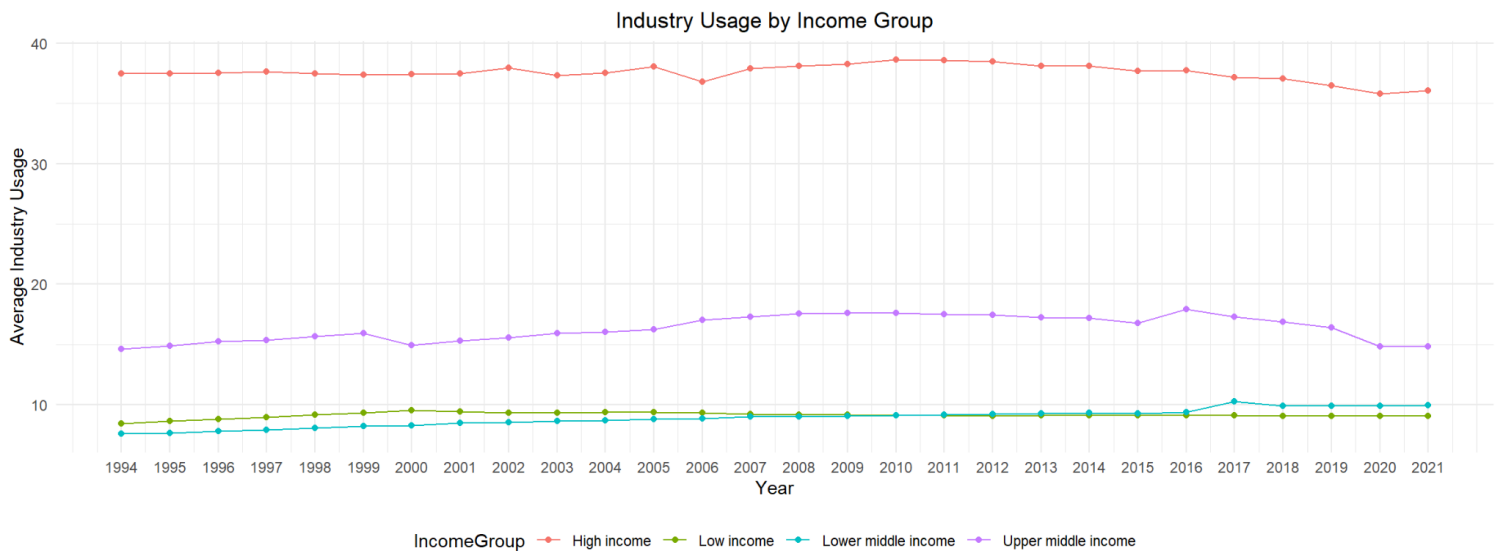
- Overall trend : From 1994 to 2021, household water usage generally increased across all income groups.
- High income : Maintains the highest household water usage, with a gradual increase since 2010.
- Low income : Maintains the lowest household water usage, but shows a relatively steeper increase compared to other groups.
- Middle income (Lower middle income, Upper middle income) : Maintains similar usage, but maintains a lower level than the high income group and a higher level than the low income group.

2. Agriculture Usage



- Overall trend : From 1994 to 2021, agricultural water use has been decreasing across all income groups.
- High income : The highest agricultural water use, with a larger decrease than other groups.
- Low income : The lowest agricultural water use, with a relatively stable level.
- Middle income (Lower middle income, Upper middle income) :
Similar levels of use, with a gradual decreasing trend.

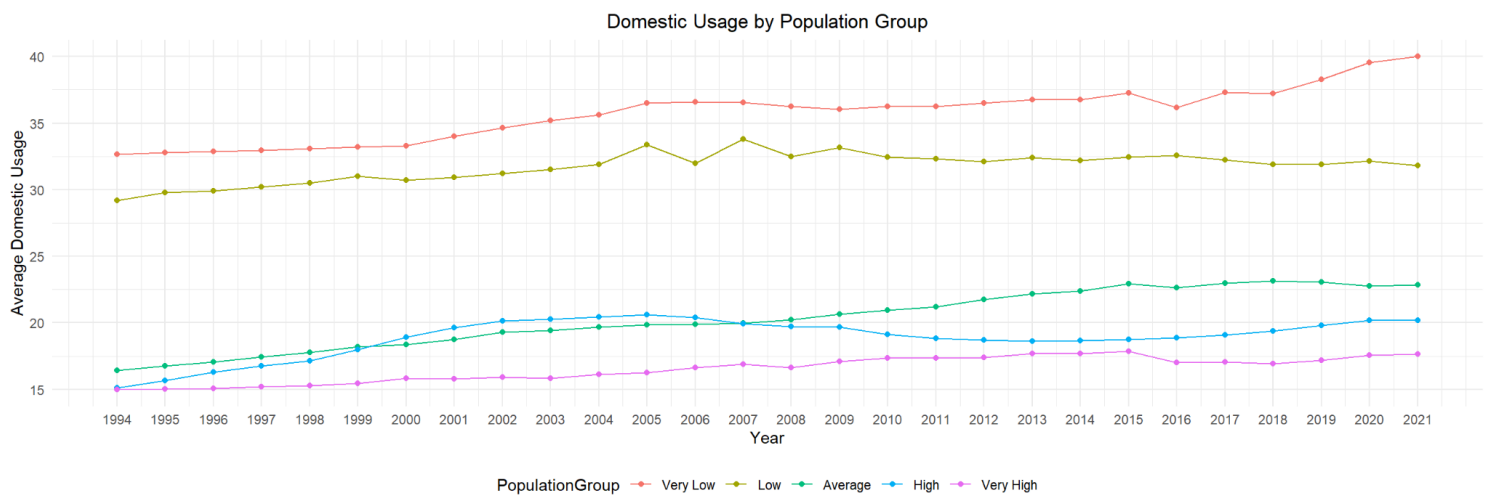
3. Industry Usage



- Overall trend : From 1994 to 2021, industrial water use is generally decreasing across all income groups.
- High income: The highest industrial water use, but has been declining significantly since the early 2000s.
- Low income : The lowest industrial water use, and appears to be relatively stable.
- Middle income (Lower middle income, Upper middle income) :
Similar levels of use, with a gradual downward trend.

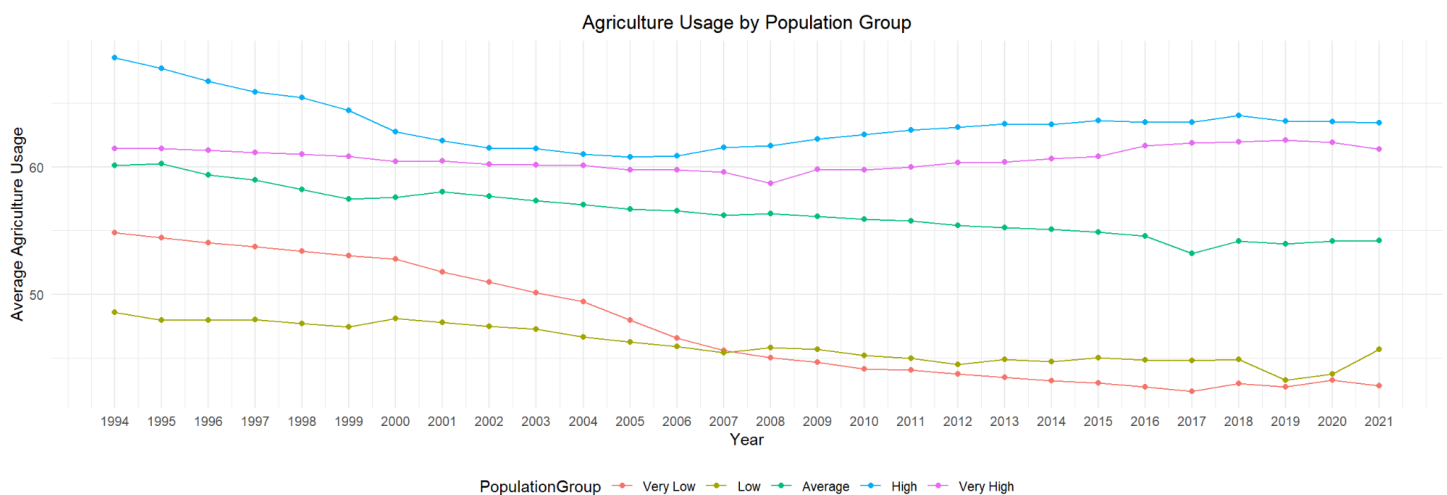
[Relationship between water usage by population group and sectors]

1. Domestic Usage



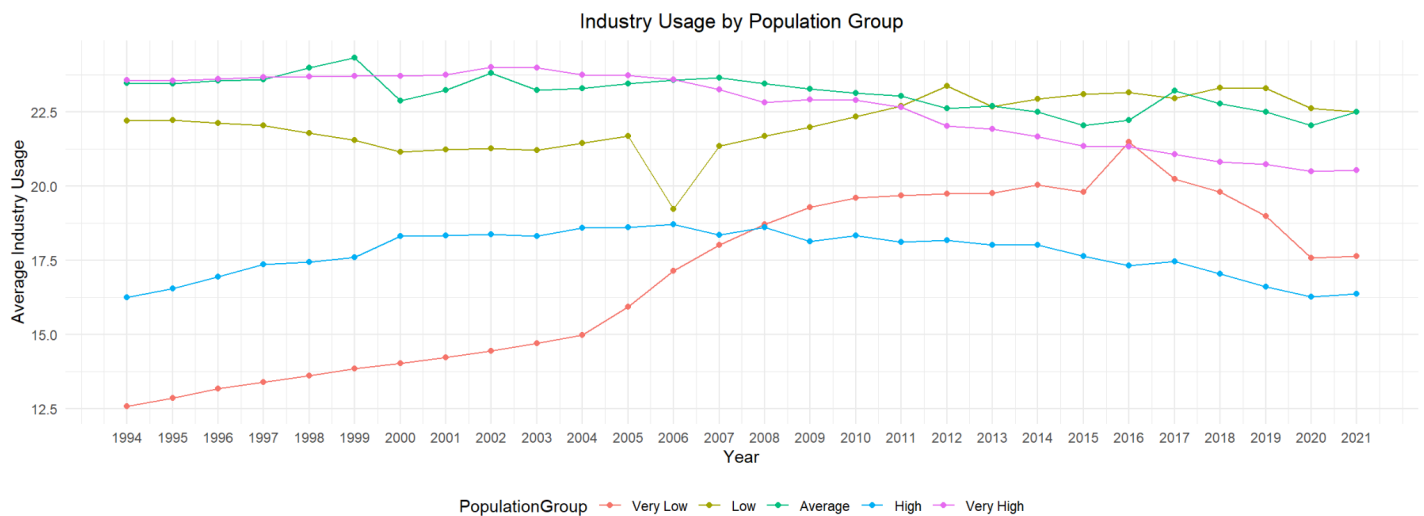
- Overall Trend : The graph shows an overall trend of increasing household water use across all population groups.
- While all groups have increasing use, the rate of increase can vary by group. In particular, the Low group tends to see a larger increase than the other groups.

2. Agriculture Usage



- Overall Trend : Average population group consistently has the highest average agriculture usage throughout the period
- There doesn't appear to be a consistent strong trend of increase or decrease in agriculture usage across all population groups over this period. The usage fluctuates, but generally stays within a certain range for each group.

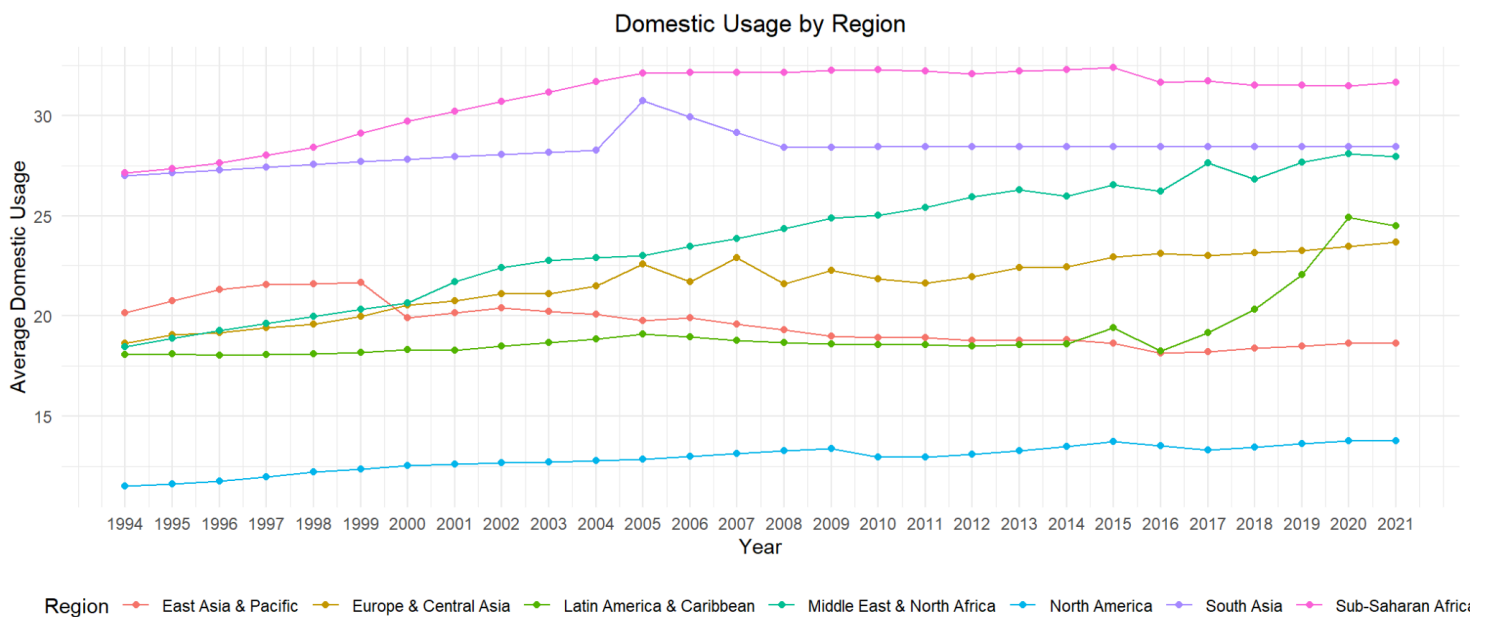
3. Industry Usage



- Overall, industrial water use by population group has shown a trend of fluctuation without a significant decrease from 1994 to 2021. There are sections of increase or decrease in certain groups, but overall, it is at a stable level or shows small changes.
- The Average population group consistently shows the highest industrial water use over the analysis period.
- The Very High population group shows greater fluctuations in industrial water use compared to other groups.
- Overall, there is a trend of decreasing industrial water use in some groups since the mid-2000s.

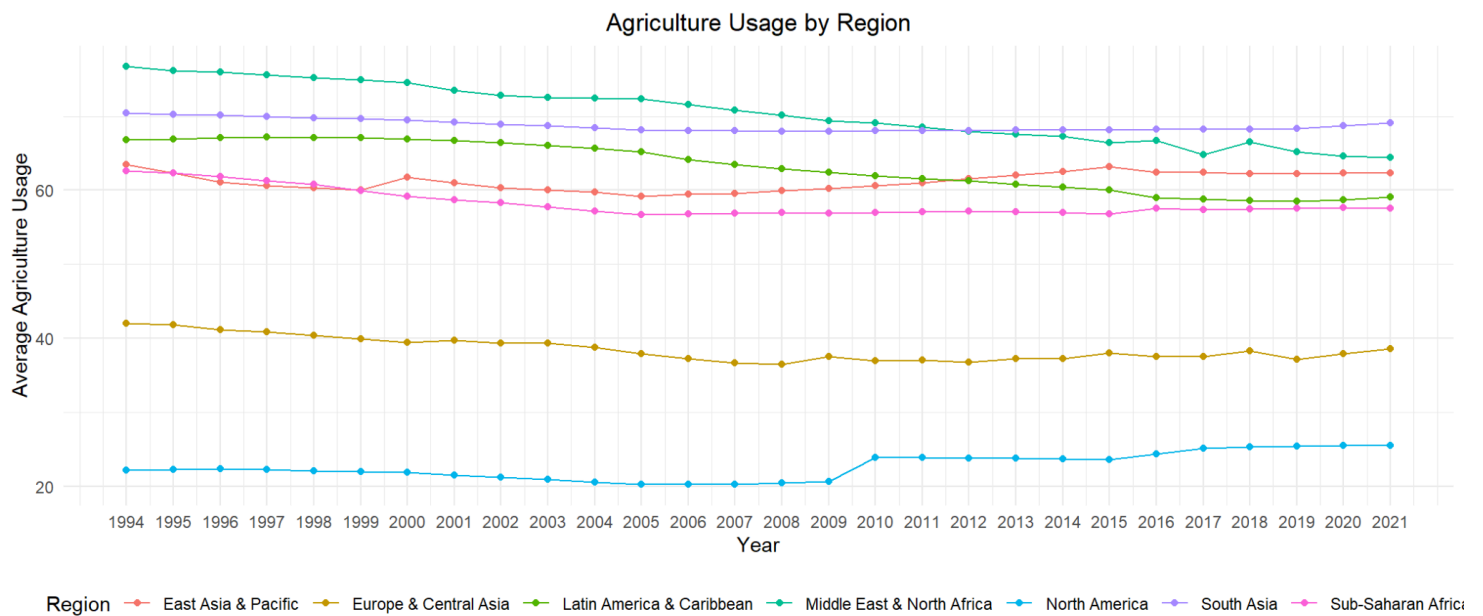
[Relationship between water usage by region and sectors]

1. Domestic



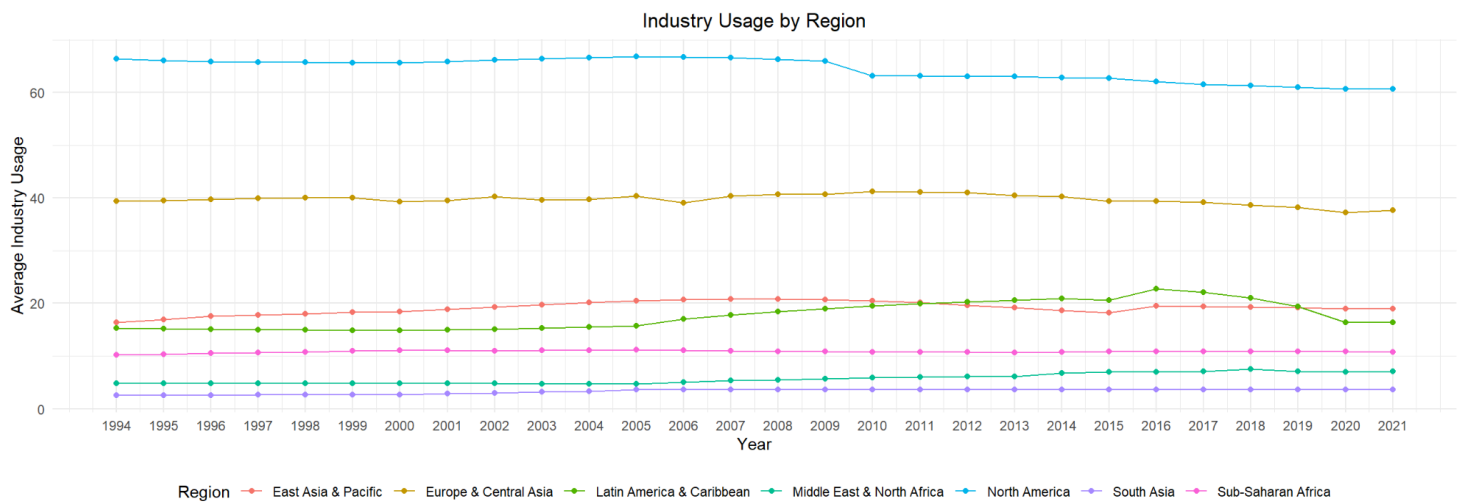
- Overall Trend : From 1994 to 2021, most regions show an increasing trend in domestic water use.
- Regional Comparison :
 - North America : Highest domestic water use, increasing gradually until the mid-2010s, then decreasing slightly thereafter.
 - Europe & Central Asia : Relatively high use, steadily increasing.
 - Latin America & Caribbean : Moderate use, gradually increasing.
 - East Asia & Pacific : Moderate use, steadily increasing.
 - Middle East & North Africa : Low use, then relatively rapidly increasing since the mid-2000s.
 - Sub-Saharan Africa : Low use, but the increase is larger than other regions.
 - South Asia : Lowest domestic water use, but gradually increasing.

2. Agriculture Usage



- Overall Trends : Agricultural water use is declining in most regions from 1994 to 2021.
- Regional Comparisons :
 - East Asia & Pacific : Highest agricultural water use, steadily decreasing.
 - Europe & Central Asia : Relatively high use, gradually decreasing.
 - Latin America & Caribbean : Moderate use, relatively stable.
 - North America : High use, but clearly decreasing since the early 2000s.
 - Middle East & North Africa : Low use, stable without significant changes.
 - South Asia : Low use, with some fluctuations but overall stable.
 - Sub-Saharan Africa : Lowest use, stable without significant changes.

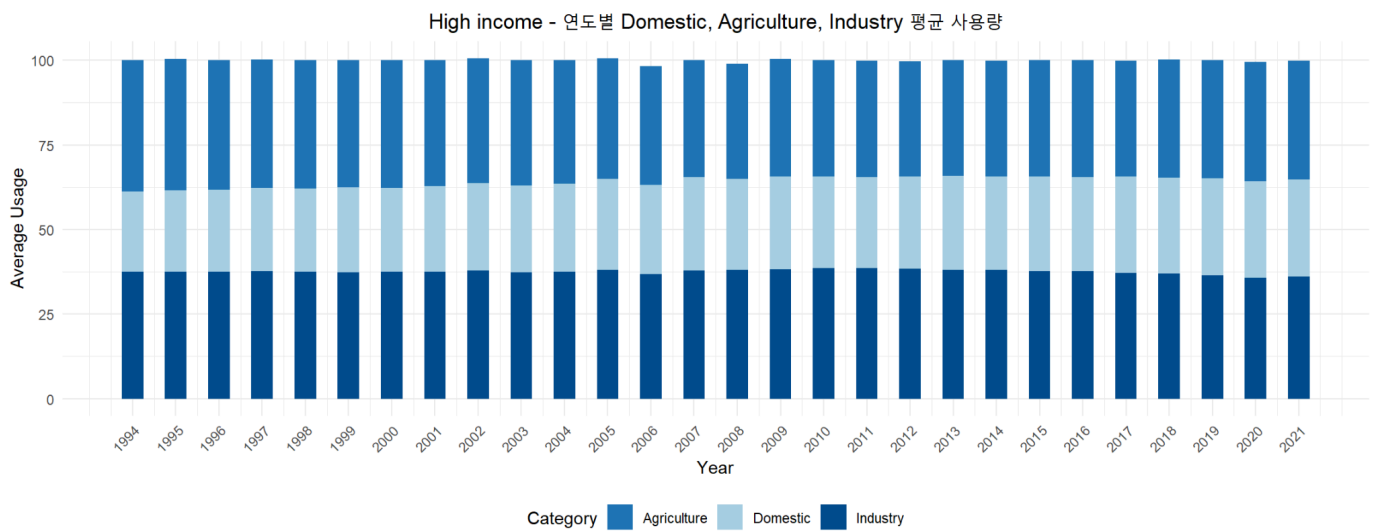
3. Industry



- Overall Trends : From 1994 to 2021, industrial water use tends to decrease or remain at similar levels in most regions.
- Regional Comparisons :
 - East Asia & Pacific : Highest industrial water use, maintained at high levels until the mid-2000s and then decreasing.
 - Europe & Central Asia : Relatively high use, with a gradual decrease.
 - North America : High use, but a marked decrease since the early 2000s.
 - Latin America & Caribbean : Medium use, relatively stable without significant changes.
 - Middle East & North Africa : Low use, with a trend of increasing since the mid-2000s.
 - South Asia : Low use, stable without significant changes.
 - Sub-Saharan Africa : Lowest use, with a gradual increase.

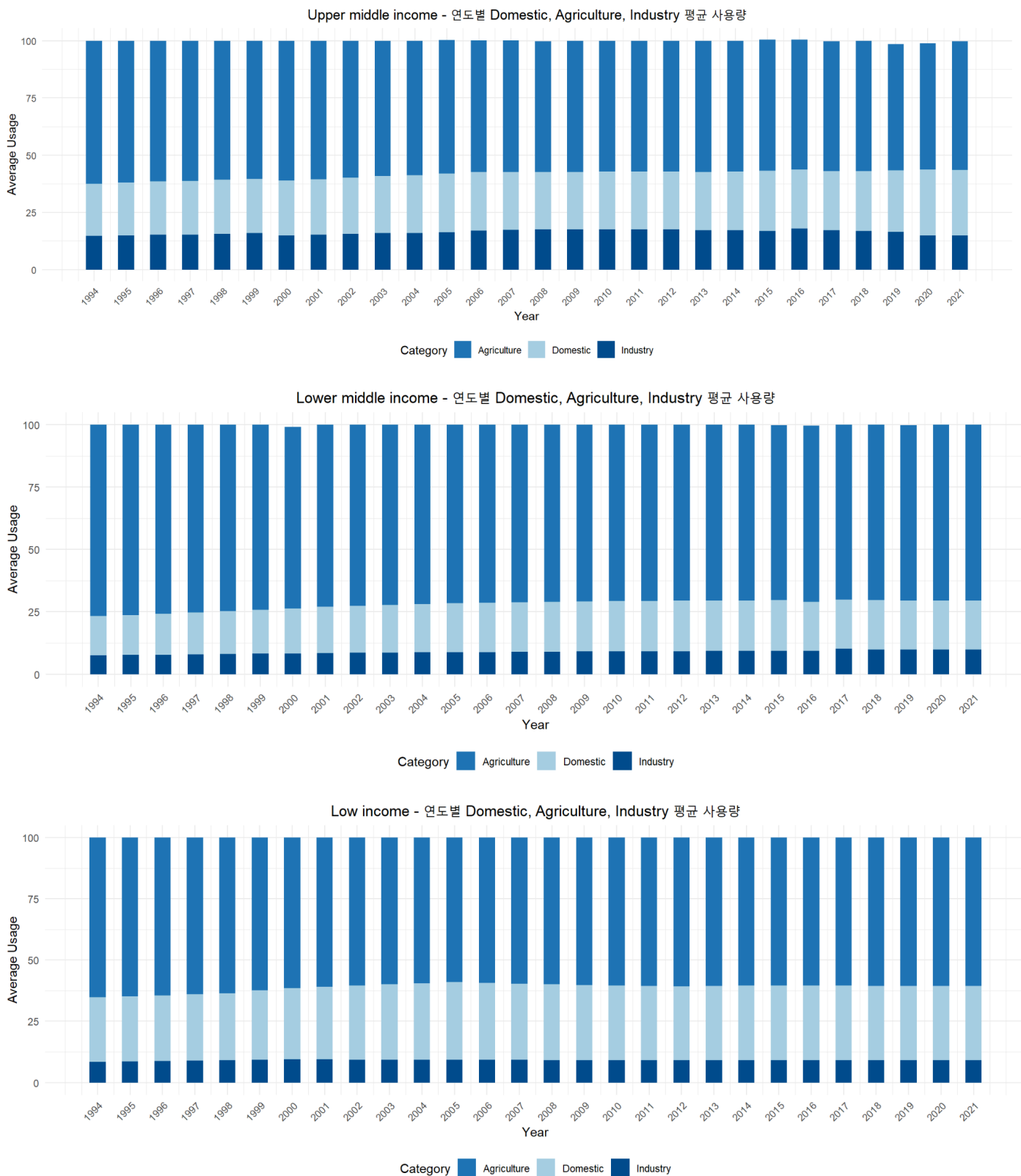
[Relationship of water usage rates by income group and area]

1. High Income



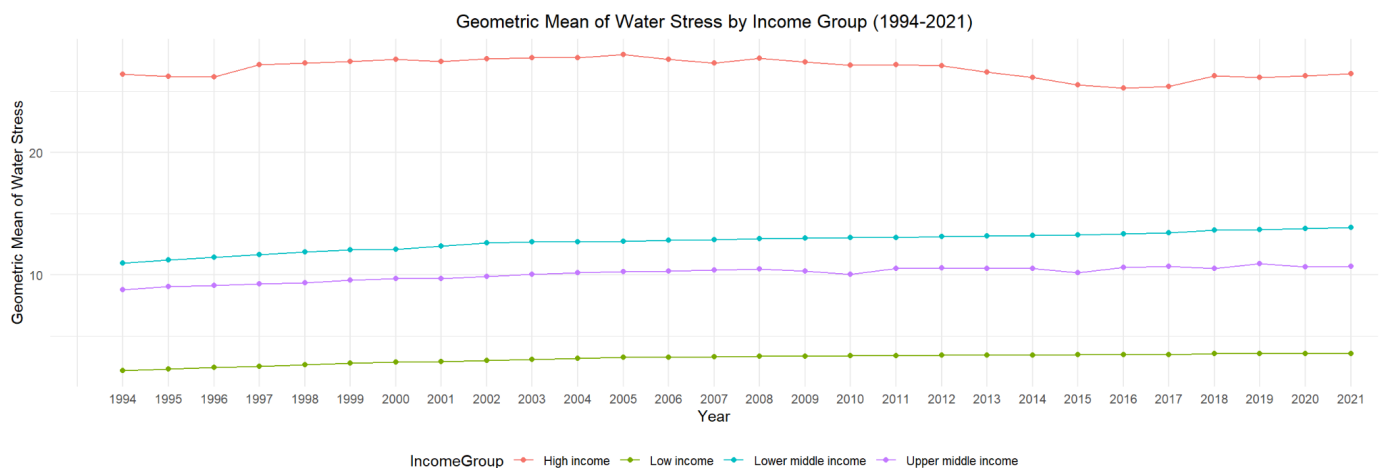
- The share of industrial water use is the highest.
- The decrease in industrial water use is notable.

2. Middle-Income Group



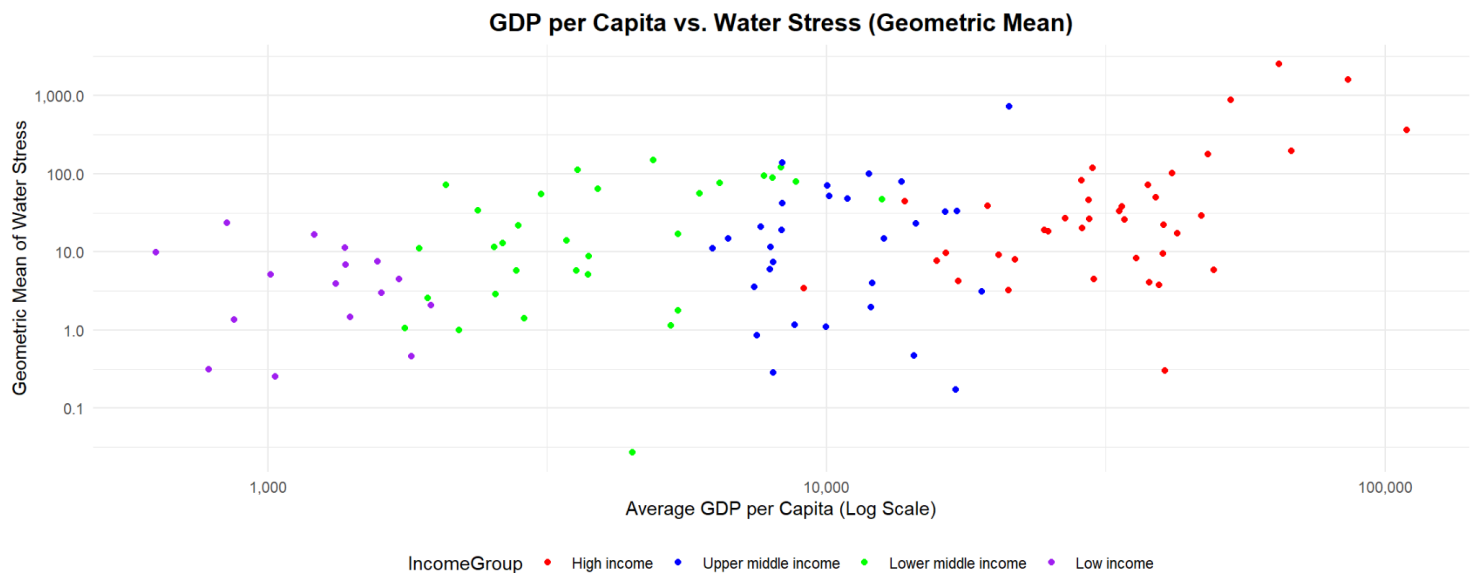
- Except for the high-income group, all other income groups show the highest rate of agricultural water use, and there appears to be no significant change from year to year.

[Relationship between Geometric Mean of Water Stress and Income Group]



- The higher the water stress index, the greater the risk of water shortage.
- Overall, the water stress index shows an increasing trend across all income classes.
- The water stress index of the low-income class is the highest, and the increase is also the largest.
- The water stress index of the high-income class is the lowest, but it shows a gradual increasing trend.
- The middle-income class and the middle-high-income class show similar levels of water stress index, and the trend is gradual increasing.

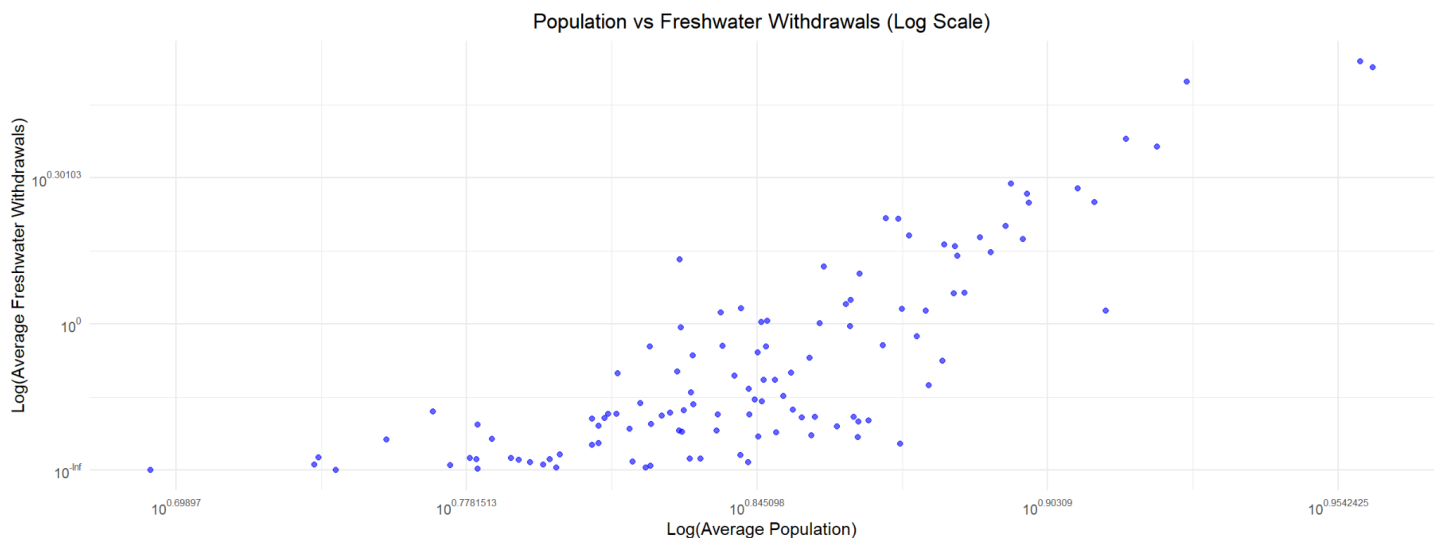
[Relationship between GDP and water_Stress]



- Water stress is relatively low in low-income countries, but this may be because economic activity is low and water use is low.
- A pattern of increasing water stress is observed in middle-income countries as GDP increases.

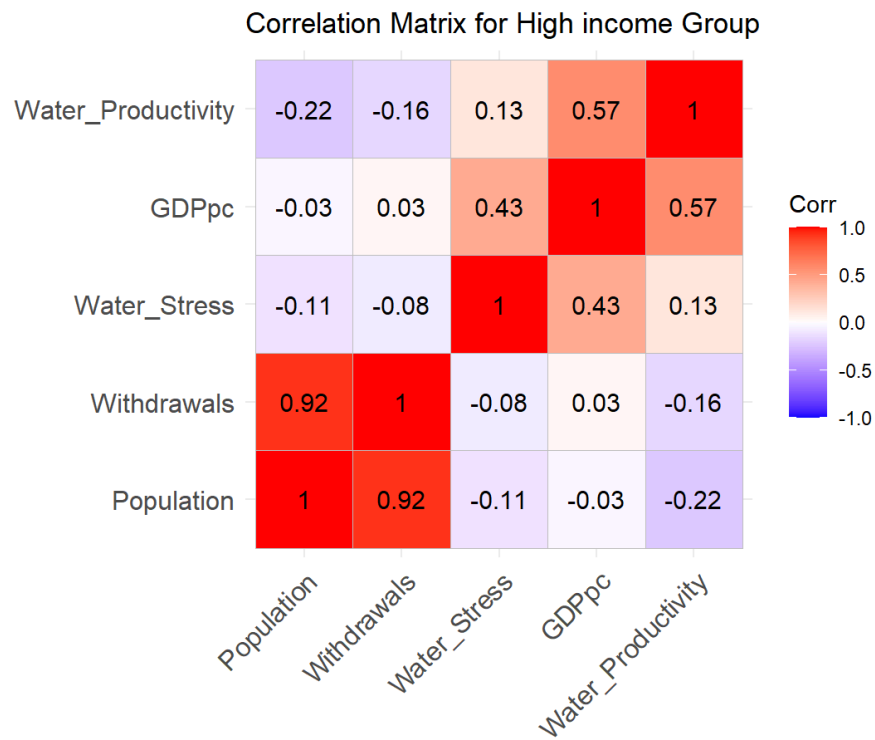
- Water stress is often considerably high in high-income countries, and this may be due to high water demand caused by industrialization and urbanization.
- Economic development and water stress are somewhat related, and water stress problems tend to be more serious in high-income countries.
- Efficient management of water resources and sustainable economic development are important.

[Relationship between Population and freshwater withdrawals]

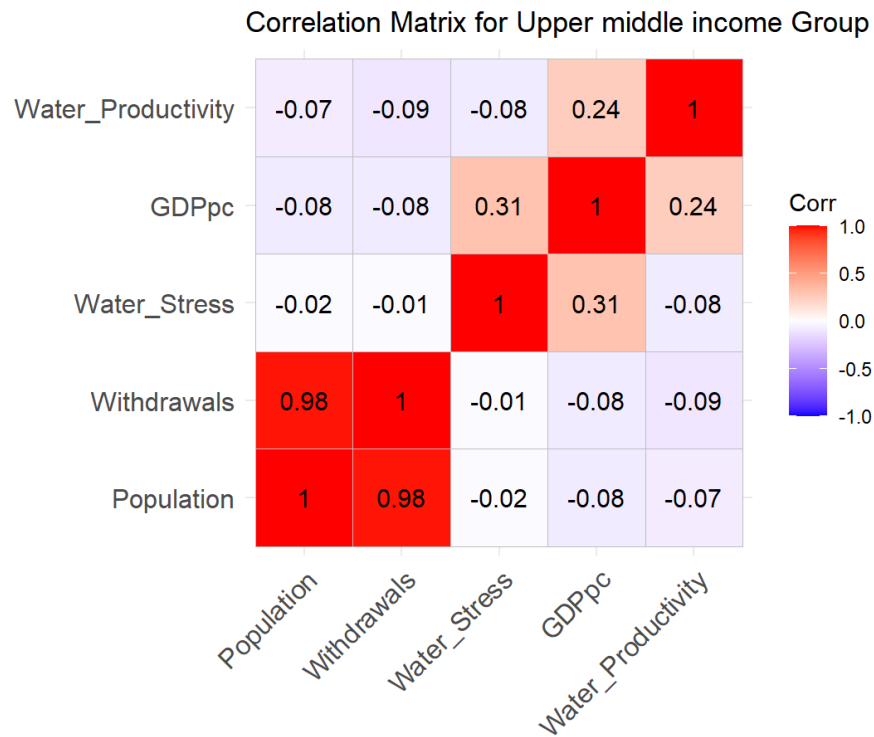


- There is a positive correlation between population and freshwater withdrawals. That is, as population increases, freshwater withdrawals tend to increase.
- The relationship is roughly linear, but the data points are more widely distributed, especially in areas with large populations (right side of the graph).
- The most populous areas (top right) have significantly higher freshwater withdrawals.
- The data points are widely distributed, showing that there is considerable variation in freshwater use even among areas with similar population sizes.
- There is particularly high variability in freshwater withdrawals in areas with medium-sized populations.

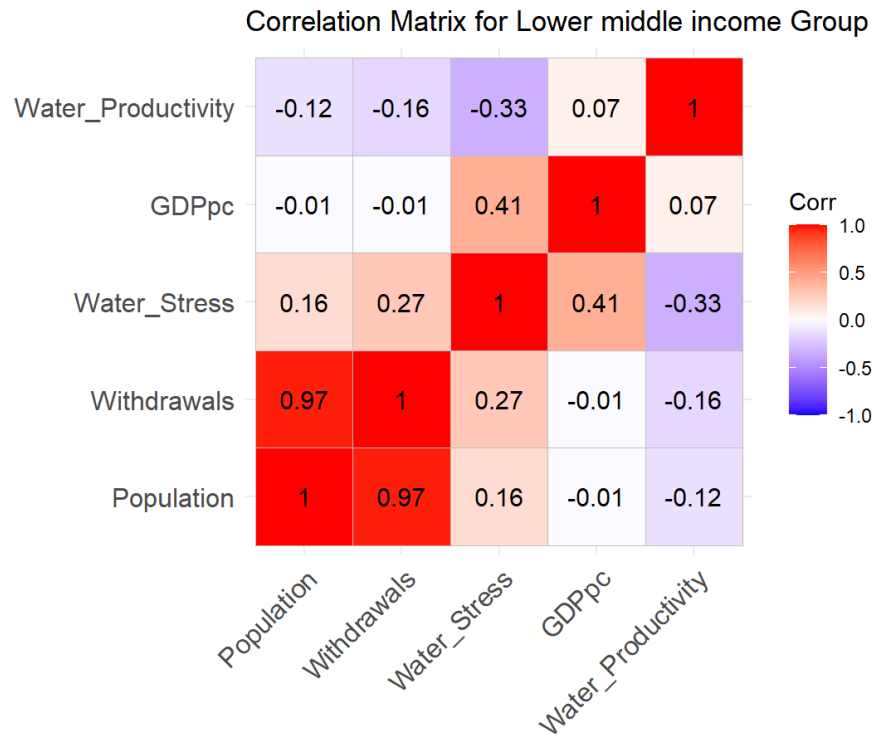
[Correlation Matrix for High Income Group]



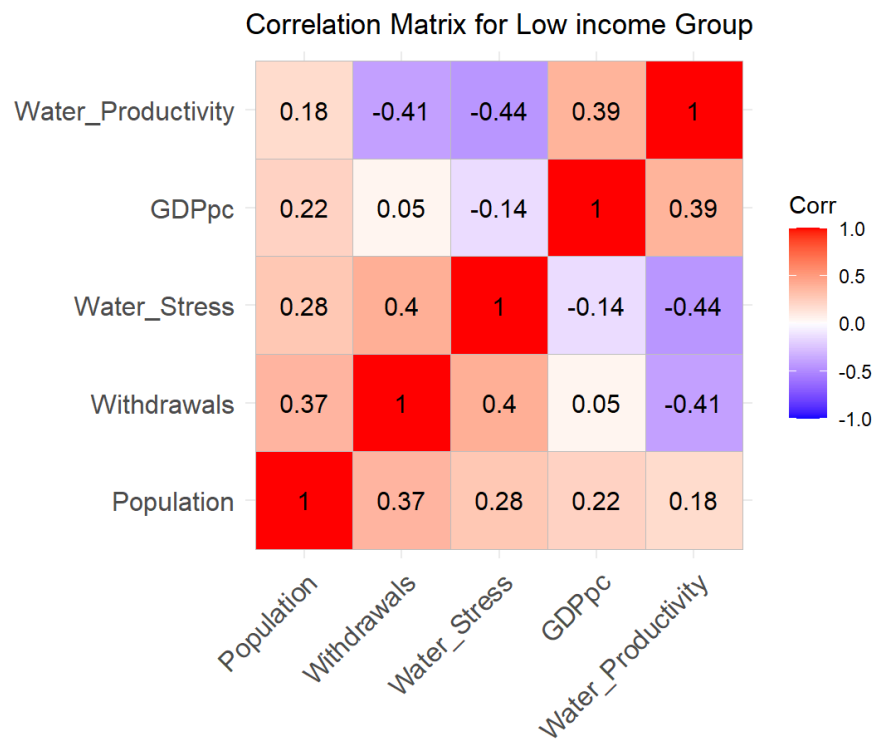
[Correlation Matrix for Upper middle Income Group]



[Correlation Matrix for Lower middle Income Group]

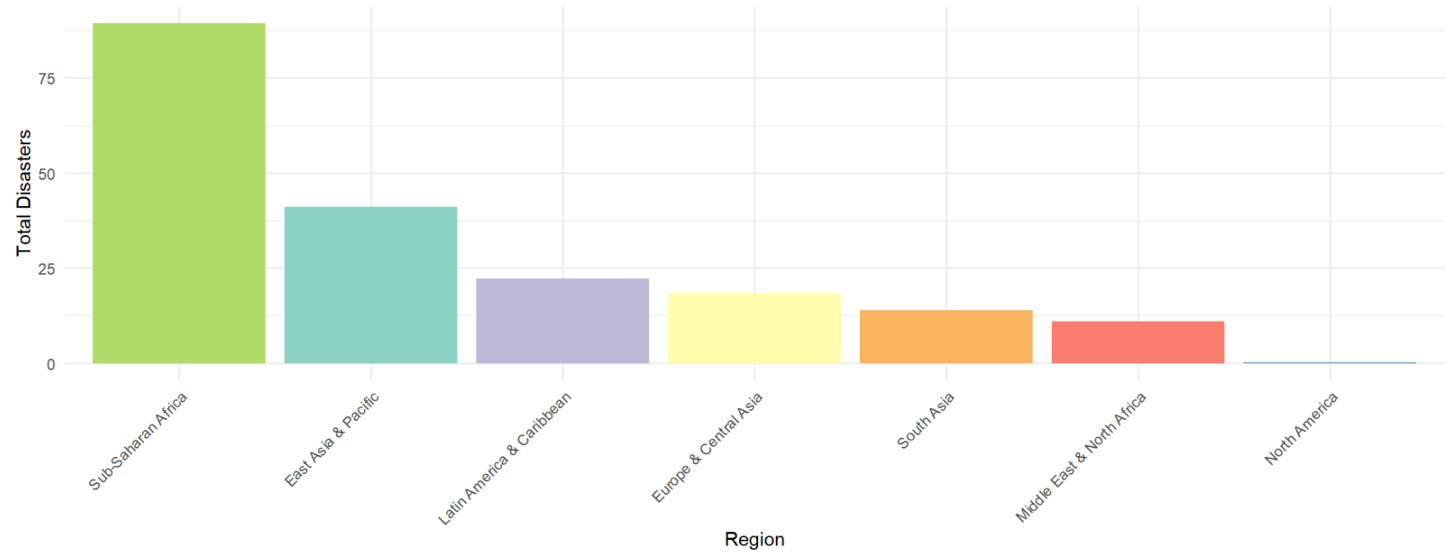


[Correlation Matrix for Low Income Group]



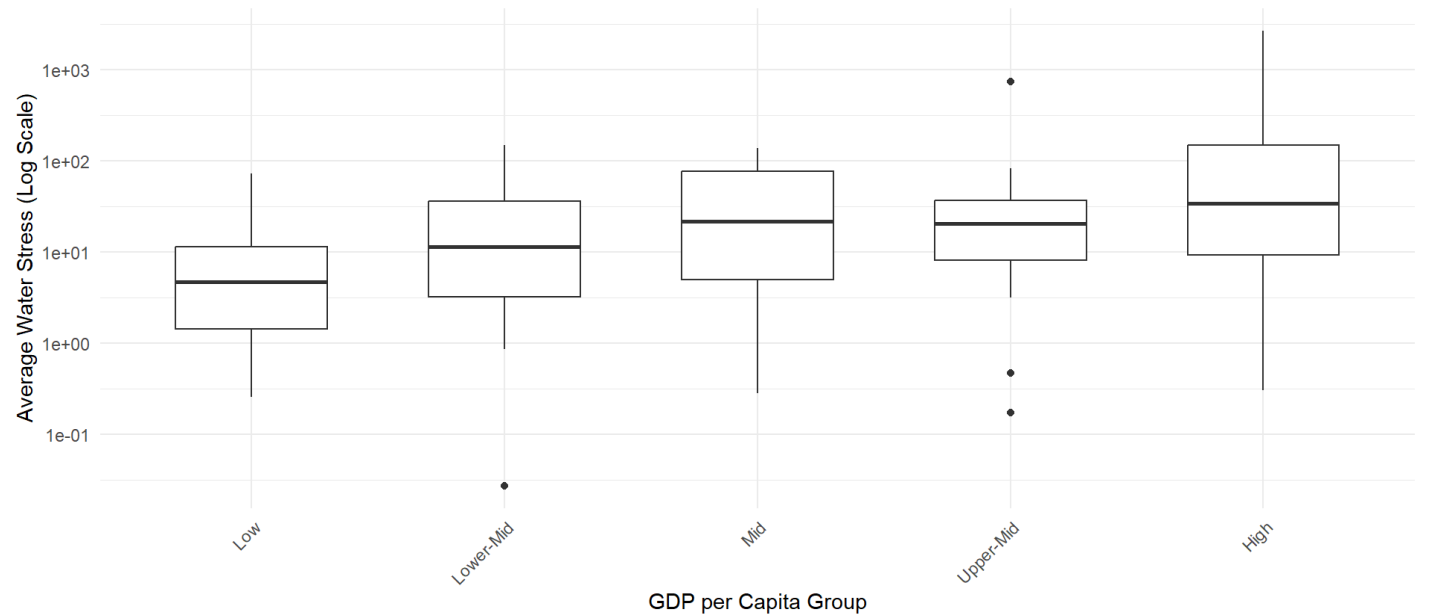
[Natural disasters by Region]

Natural Disasters by Region



[water Stress by GDP Group]

Water Stress by GDP per Capita Group (Log Scale)



[Hypothesis Test]

- Null hypothesis (H_0) :
There is no correlation between the number of natural disasters and the water stress
- Alternative hypothesis (H_1) :
There is a correlation between the number of natural disasters and the water stress.

1. Pearson's correlation

Pearson's product-moment correlation

```
data: merged_data$X2000 and merged_data$water_stress_avg
t = -0.91178, df = 103, p-value = 0.364
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.2764044  0.1039688
sample estimates:
      cor
-0.08947951
```

2. Analysis

- p-value : The p-value is 0.364, which is greater than the conventional threshold of 0.05.
This suggests that there is insufficient evidence to reject the null hypothesis, meaning the correlation between natural disasters (X2000) and water stress (water_stress_avg) is not statistically significant.
- Confidence Interval : The 95% confidence interval for the correlation coefficient is between -0.276 and 0.104. Since the interval includes 0. There is no significant correlation between the two variables.
- Correlation Coefficient : The sample correlation coefficient is approximately -0.0895, indicating a very weak negative correlation between the two variables.
- Conclusion:
Given the p-value of 0.364 and the confidence interval that includes zero, we fail to reject the null hypothesis. There is no significant linear relationship between natural disasters and water stress. The correlation is weak and statistically insignificant.

3. Graph

