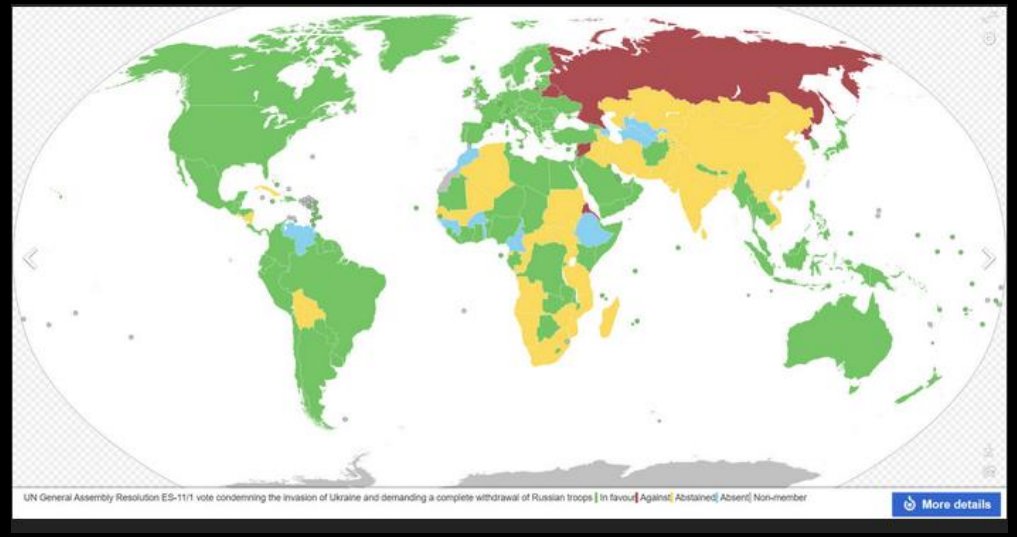
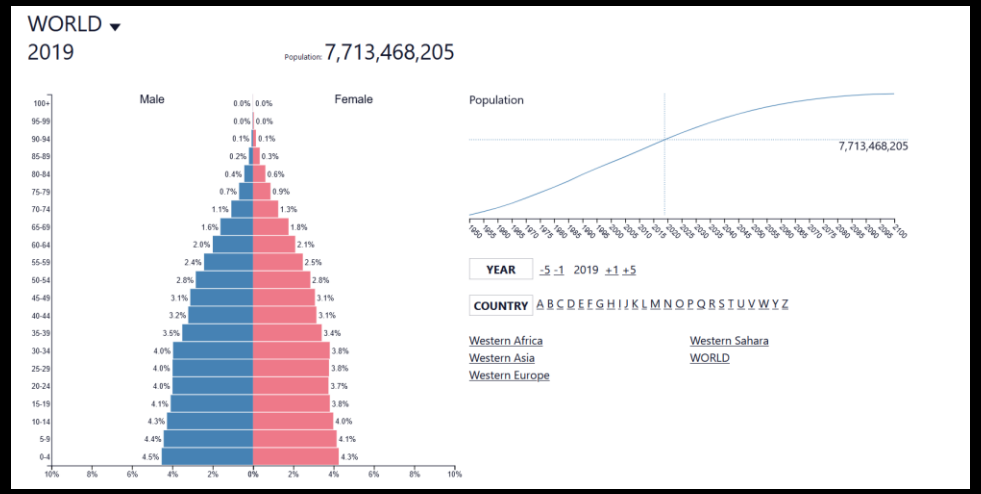
Predicting Geopolitical Instability

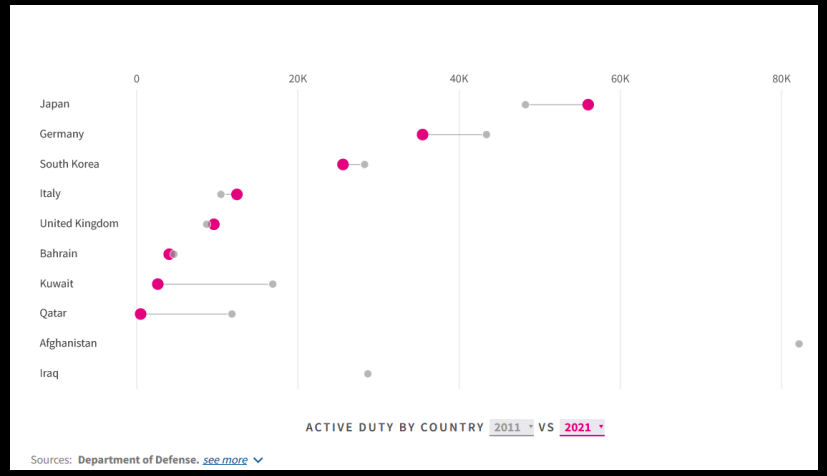
Machine Learning Techniques
Applied to Geoeconomic Data

The End of Globalization?



- https://usafacts.org/state-of-the-union/defense/



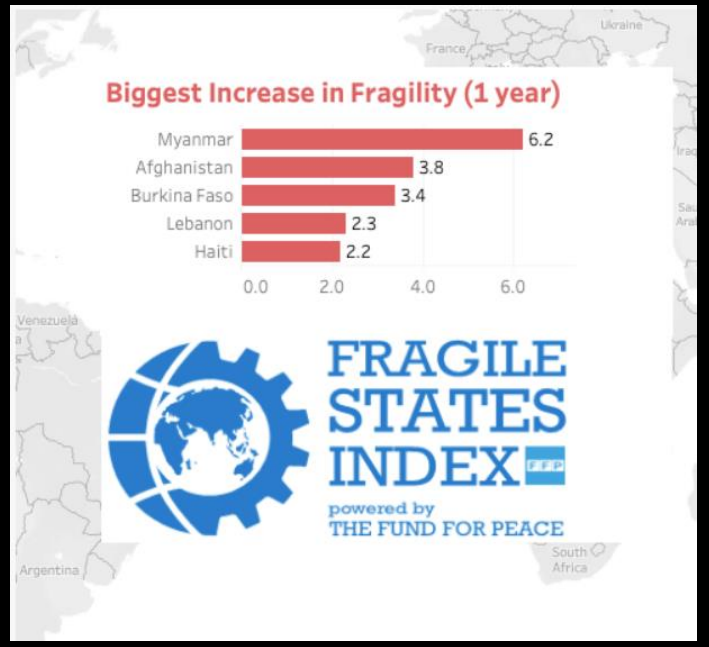


Hypothesis

- Geopolitical instability poses a substantial and growing risk
- Accurately modeling political instability has utility for macroeconomic investment in sectors such as:
  - Industrials
  - Materials
  - Real Estate
  - Energy
  - Consumer Good
- It should be possible predict instability quantitatively based in material conditions

Methods

- Fragile States index, broken into quintiles serves as the target variable
  - Classified as Highly Unstable, Unstable, Somewhat Unstable, Stable, and Highly Stable
- Classification:
  - After preliminary testing of SVM and Neural Net it was determined that discretized regression was the more accurate
  - K-Fold cross validation was used to determine optimal alpha for Ridge (0.037) and LASSO (0.037)
  - Ridge was selected due to higher R-Squared



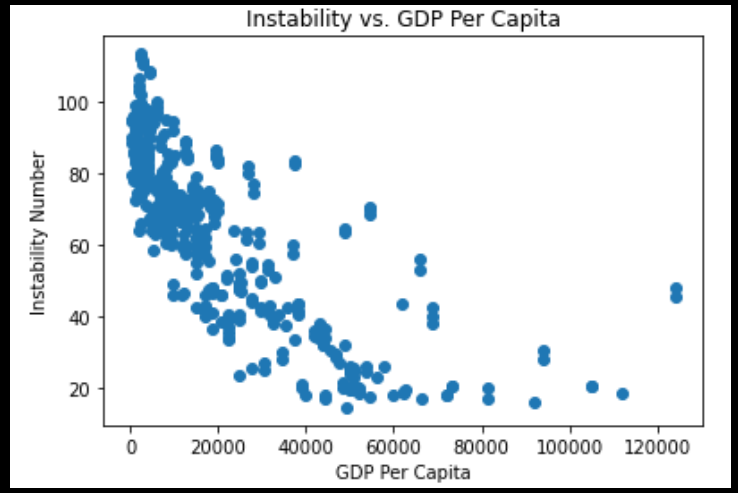

```
# K-fold Ridge

#data = df_1.values
X, y = df_3.iloc[:, 3:61] , df_3["Instability"]
# define model
model = Ridge(normalize=True)
# define model evaluation method
cv = RepeatedKFold(n_splits=10, n_repeats=3, random_state=1)
# define grid
grid = dict()
grid['alpha'] = arange(0, 1, 0.001)
# define search
search = GridSearchCV(model, grid, scoring='r2', cv=cv, n_jobs=-1)
# perform the search
results = search.fit(X, y)
# summarize
print('R -Squared: %.3f' % results.best_score_)
print('Config: %s' % results.best_params_)
```

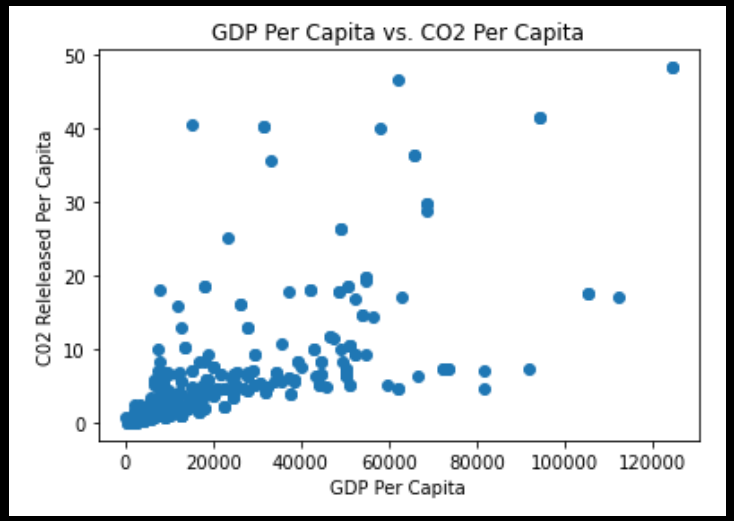
```
R -Squared: 0.768
Config: {'alpha': 0.037}
```

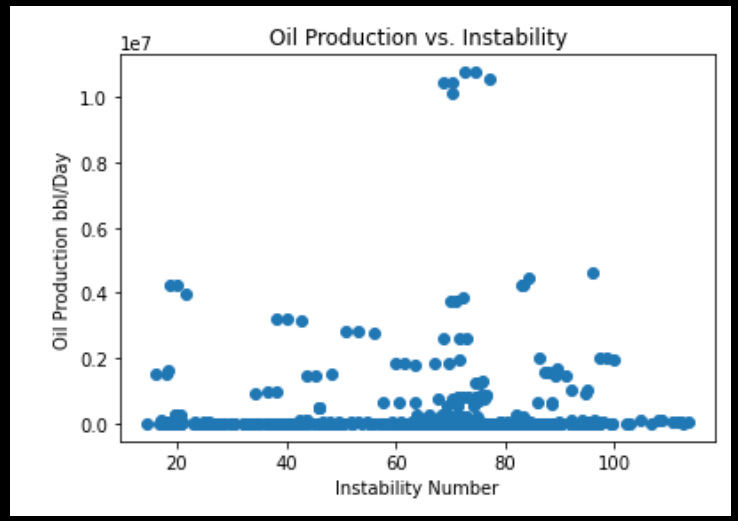
Results and Data

```
cm = multilabel_confusion_matrix(main_map["Instability"],main_map["Predict"], labels=[5, 4, 3,2,1])
cm
```

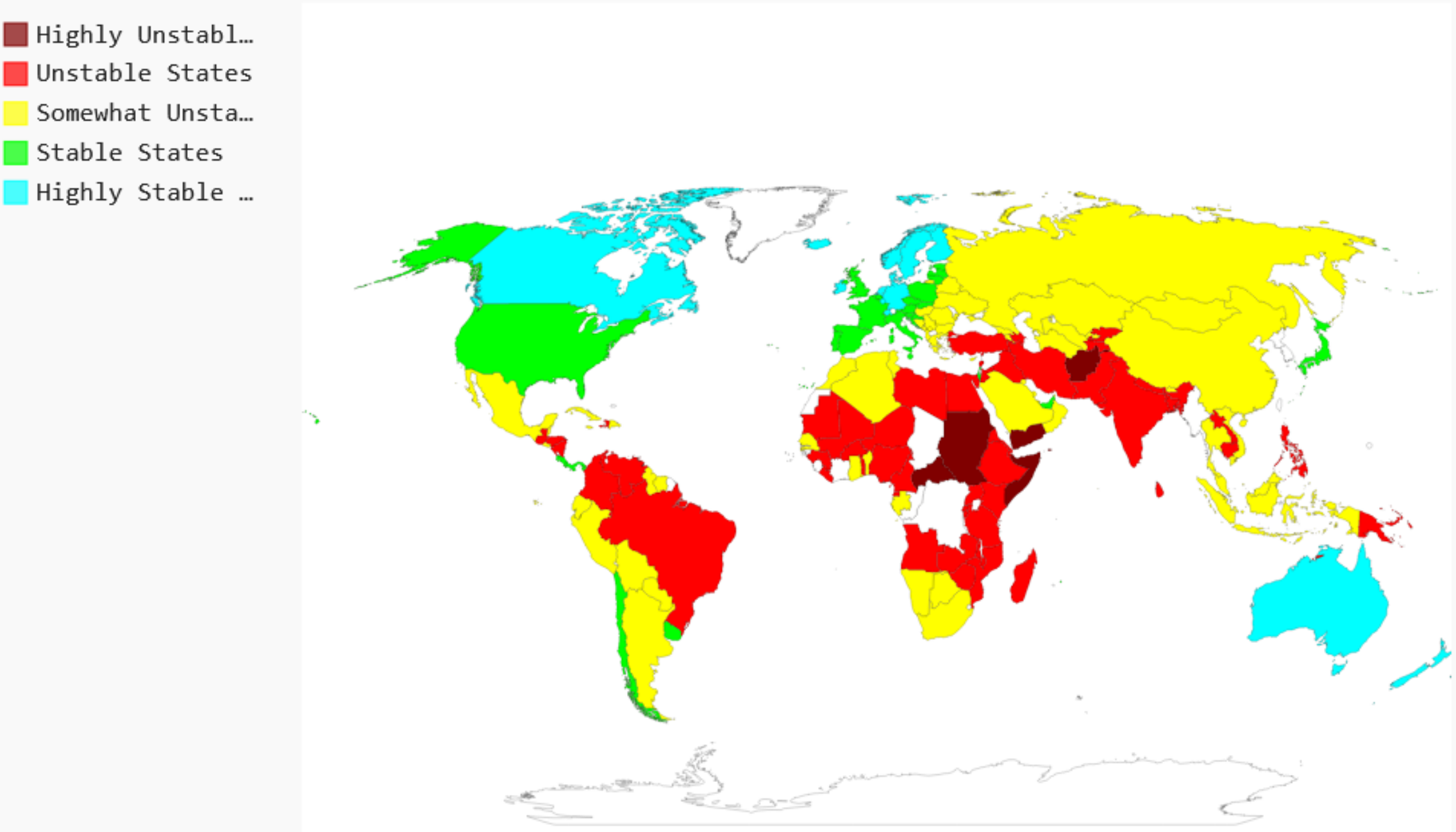
```
array([[[144,   1],
        [  3,   2]],

       [[ 77,  21],
        [  9,  43]],

       [[ 79,  17],
        [ 20,  34]],

       [[110,  14],
        [ 11,  15]],

       [[136,   1],
        [ 12,   1]]], dtype=int64)
```



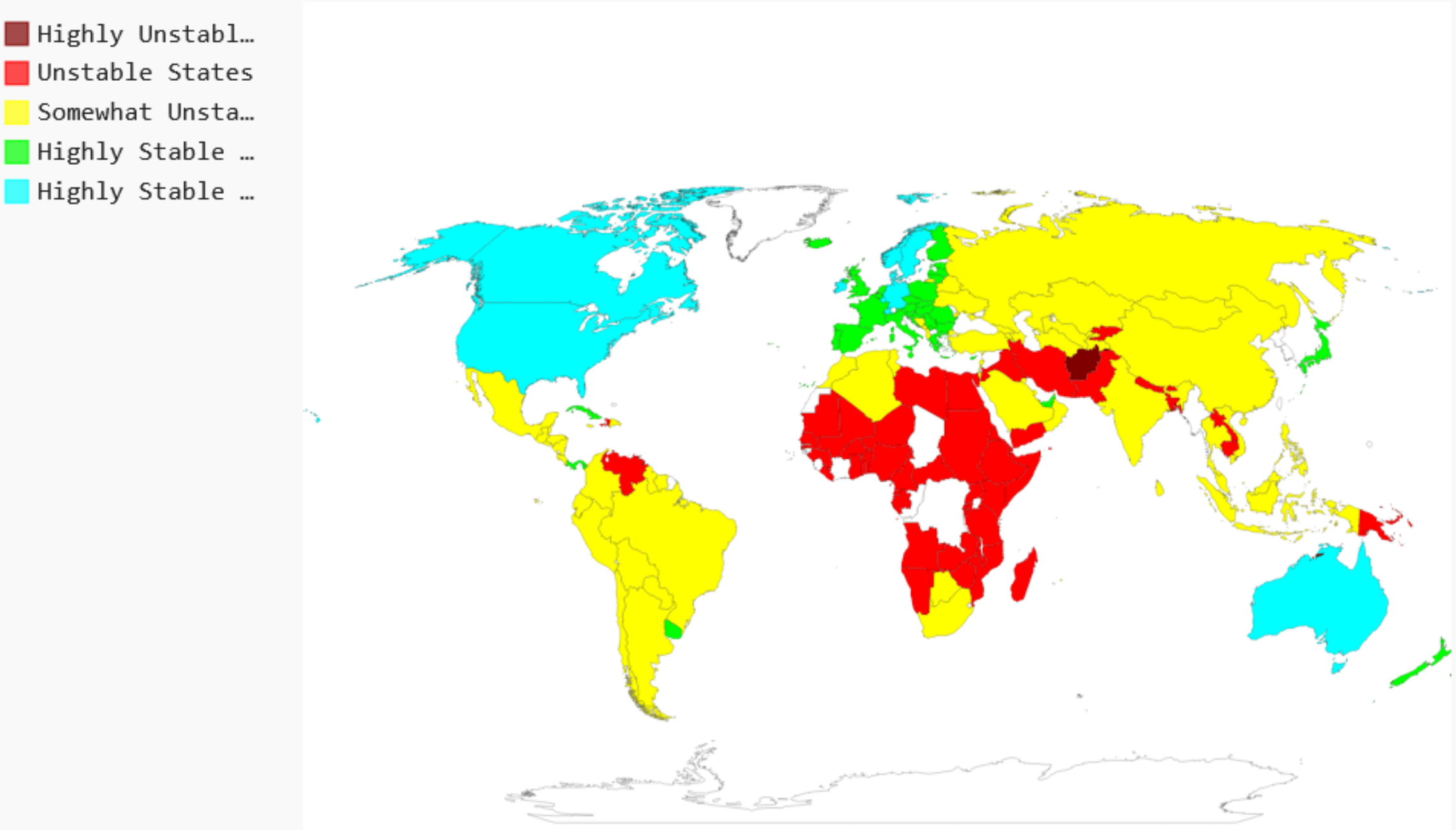




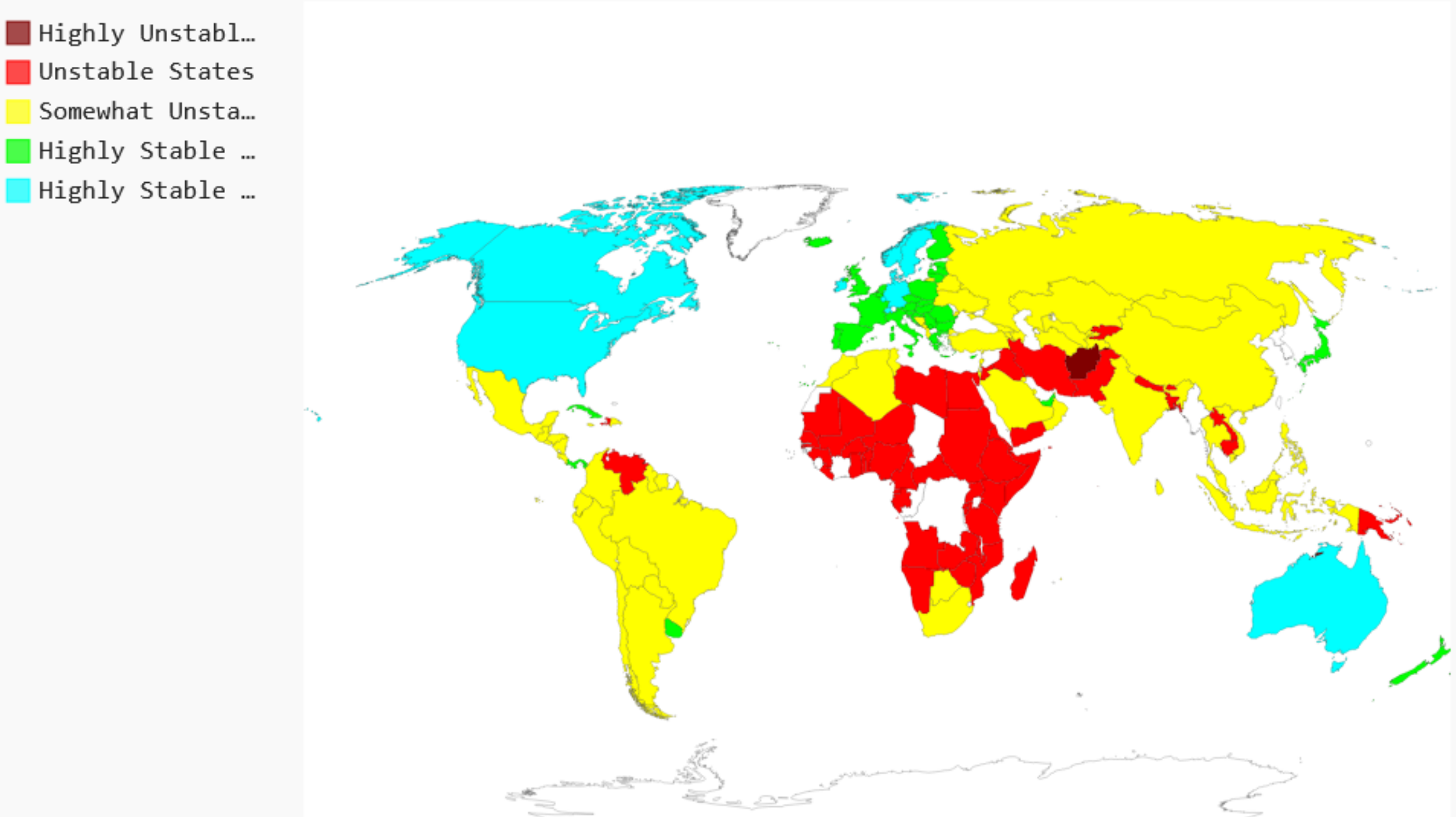
Stability 2021



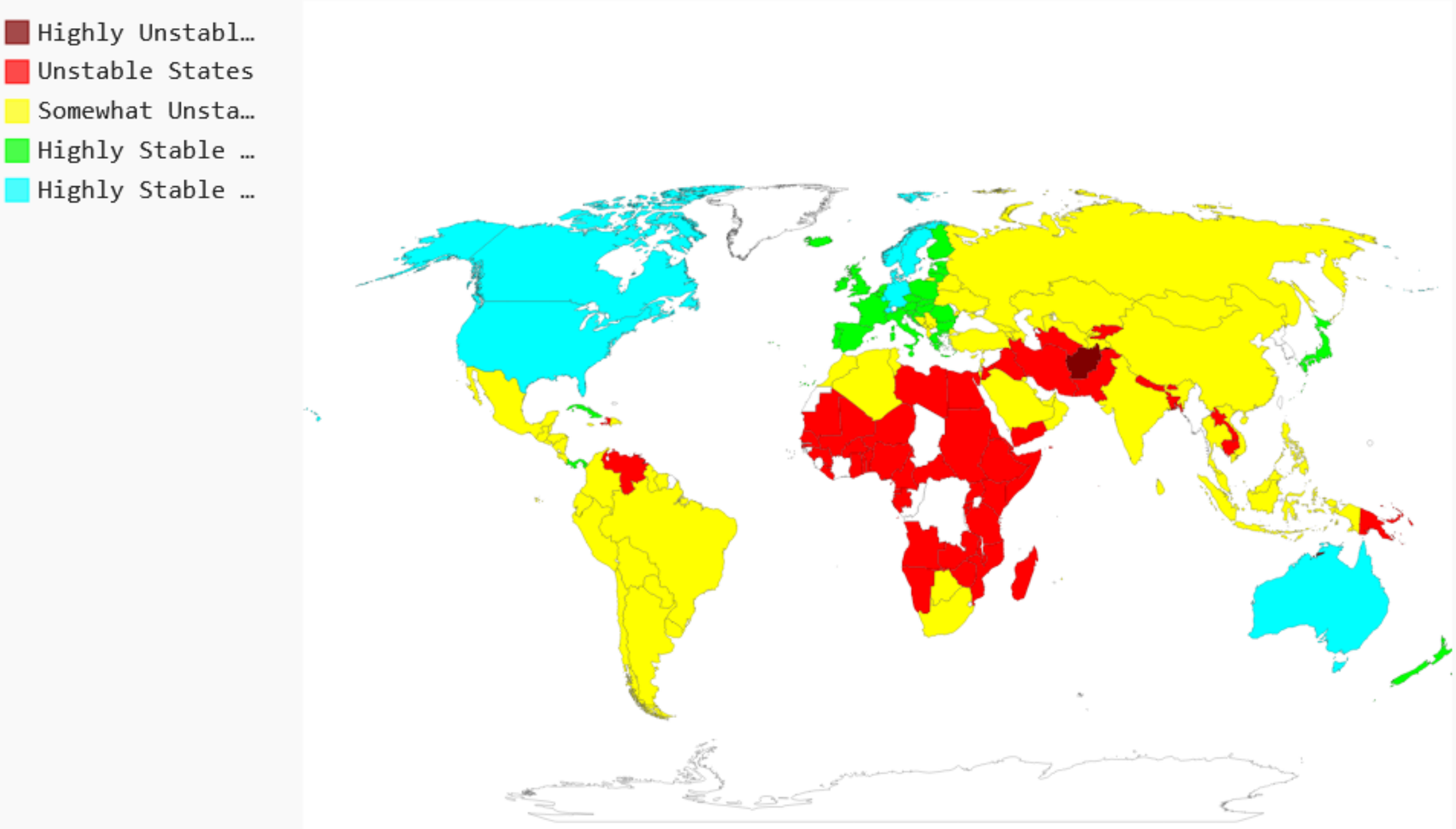
Predicted Stability 2021



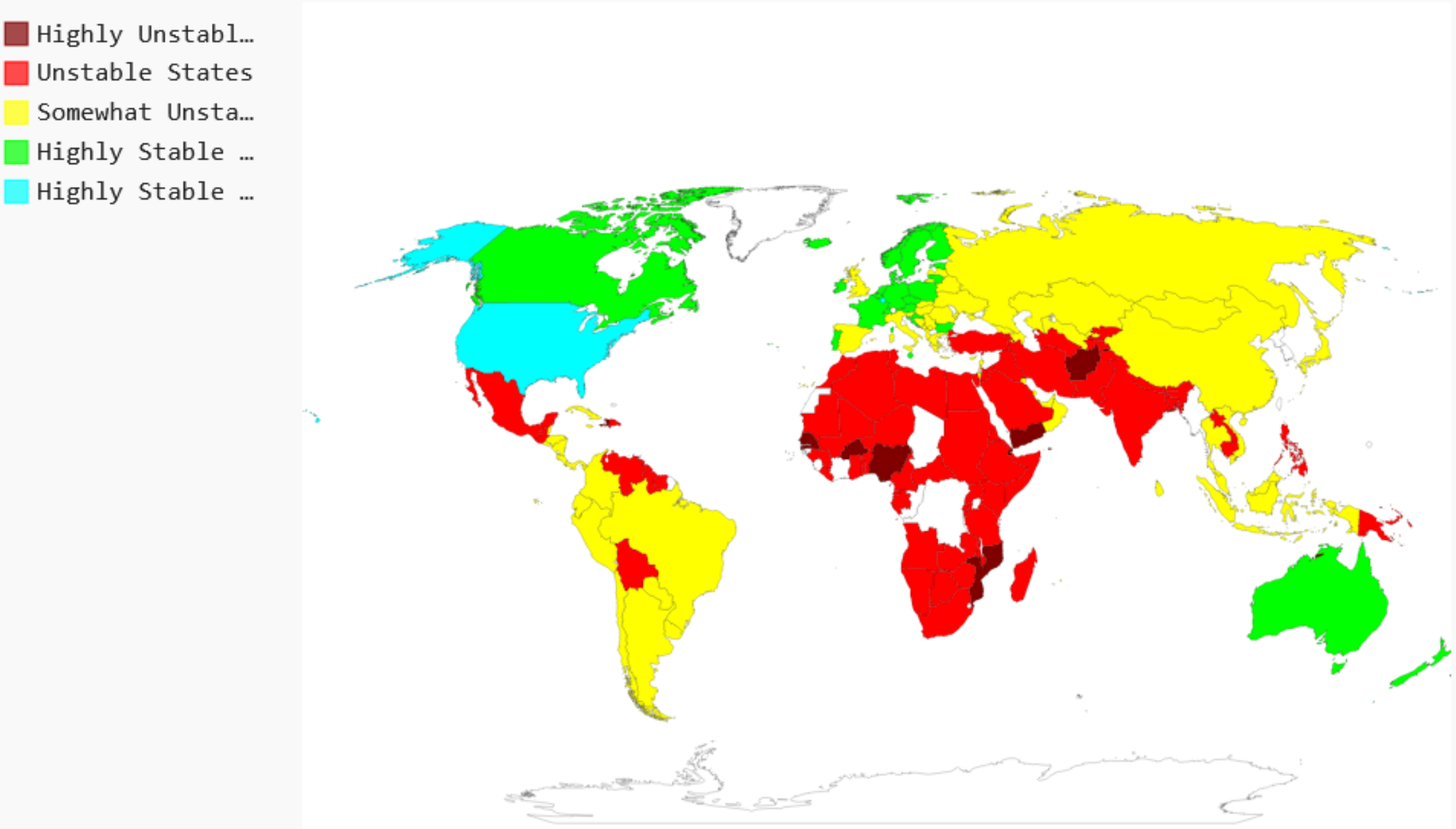
Predicted Stability 2021 After 10% GDP Drop



Predicted Stability 2021 After 30% GDP Drop



Predicted Stability 2021 (Second Great Depression)



Conclusion

Potential issues with model

- Skewed towards Resource Producers
- Insufficient Social/Governmental data
- Lack of feedback loops
- Data drawn exclusively from last five years
- No accounting for vulnerability to shipping

Means to improve predictive power

- Expand data set to include:
  - Include alliances/economic unions as dummy variables
  - Governmental Systems
  - Interaction of existing features
  - Climate/Aridity and agricultural output

Sources

Central Intelligence Agency

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USAFACTS

PopulationPyramid.net

WORLD MAP
everything about the world