

Linking Disaster Risk and Environmental Sustainability

JONNEL S. ACOBA, THE MAXWELL SCHOOL OF CITIZENSHIP AND PUBLIC AFFAIRS

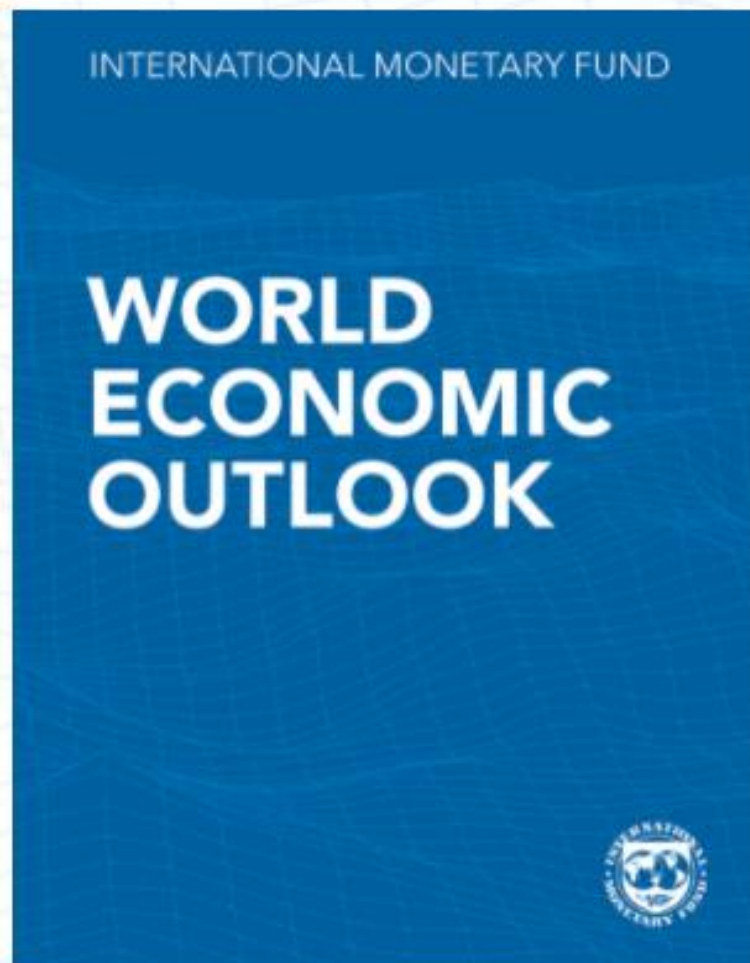
MOTIVATION

Over the years, destructive natural disasters have adversely impacted economies, claimed lives, and damaged properties. Various literatures posit that aside from inherent [exposure] risk of countries, the prevalence of devastating natural disasters is predicated by the worsening state of the environment (climate change).

Research Questions:

- Is there a relationship between EPI and WRI?
- What does EPI tell about the exposure and vulnerability of countries to natural disasters?
- What does the location and/or economic development status of a country tell about its WRI and EPI?

DATA



- The **World Risk Index (WRI) Report from 2016 to 2020**. The 2020 WRI Report ranked 181 countries around the world according to their risk of becoming a victim of extreme natural event. WRI is a function of Exposure and Vulnerability. Exposure refers to inherent risk of a country and Vulnerability pertains to the mean of Susceptibility, Lack of Coping Capacities, and Lack of Adaptive Capacities.
- The **2020 Environmental Performance Index (EPI) Report** ranked 180 countries according to their performance in addressing environmental sustainability issues. The EPI assessment uses 32 metrics or indicators summed up in two components: Environmental Health and Ecosystem Vitality.
- Utilized economic and socio-demographic data from the **2020 World Economic Outlook Report** downloaded from the International Monetary Fund (IMF) website.

ANALYSIS

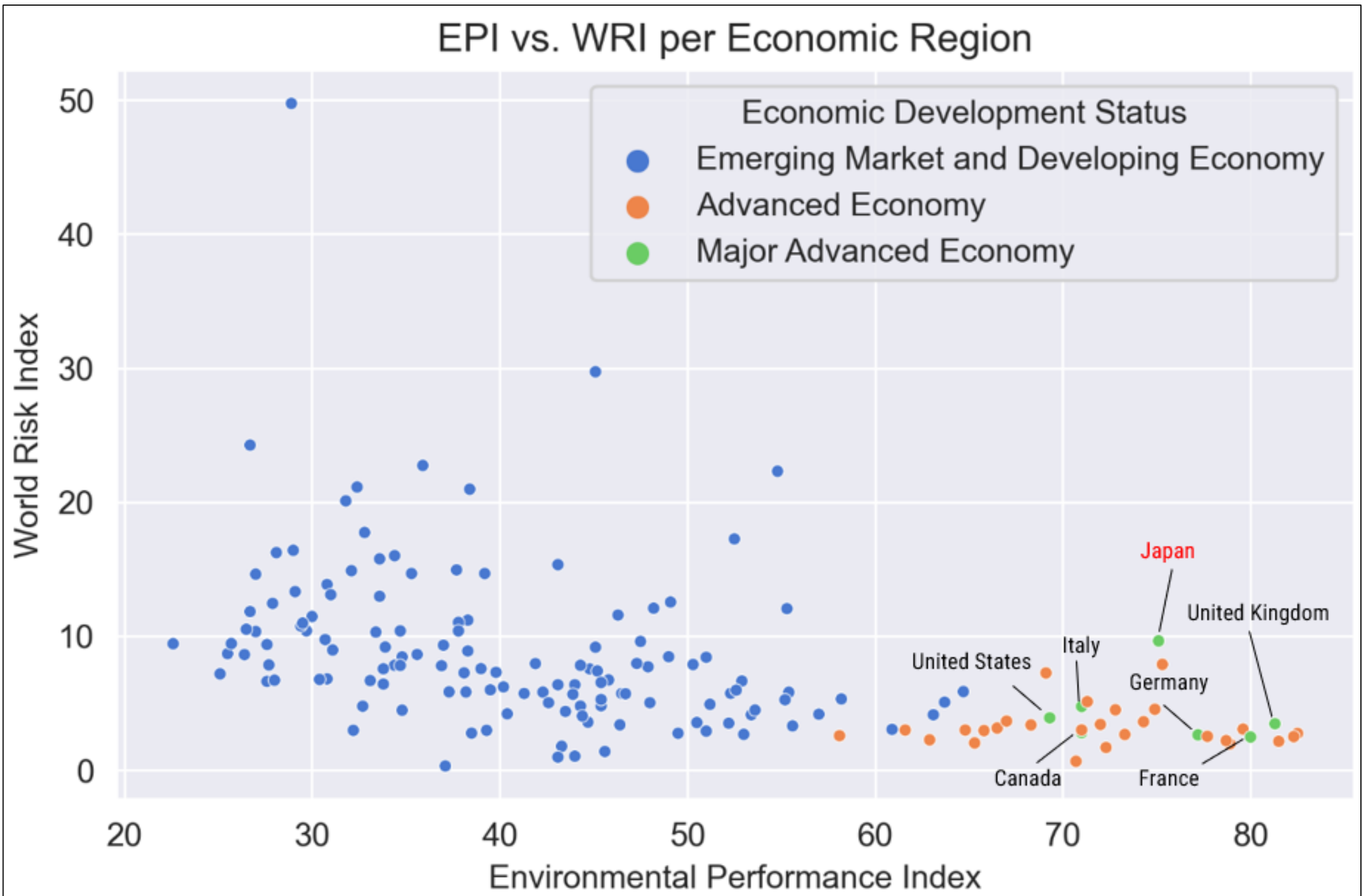
- Performance in environmental sustainability management (EPI) is negatively correlated with the risk of natural disaster (WRI).

| | Correlation, r | R-squared | Constant | Estimate |
|---------------|----------------|-----------|----------|----------|
| EPI | -0.477 | 0.228 | 16.411 | -0.1826 |
| Exposure | -0.188 | 0.035 | 22.4667 | -0.1306 |
| Vulnerability | -0.892 | 0.796 | 83.7742 | -0.7941 |

- EPI has a stronger correlation with a country's risk vulnerability than its exposure.

| ISO3 | Country | Economic Region | Risk Level | WRI | Exposure | Vulnerability | Susceptibility | Lack of Coping Capacities | Lack of Adaptive Capacities | EPI |
|------|--------------------------------|---------------------------|------------|-------|----------|---------------|----------------|---------------------------|-----------------------------|-------|
| JAM | Jamaica | Latin America & Caribbean | Very High | 12.08 | 26.05 | 46.39 | 25.14 | 39.50 | 74.52 | 48.20 |
| KIR | Kiribati | Asia-Pacific | Very High | 14.94 | 26.05 | 57.36 | 39.27 | 50.04 | 82.77 | 37.70 |
| DZA | Algeria | Greater Middle East | Medium | 7.55 | 16.51 | 45.75 | 20.97 | 39.30 | 76.97 | 44.80 |
| SEN | Senegal | Sub-Saharan Africa | High | 9.74 | 16.51 | 58.97 | 44.37 | 54.45 | 78.09 | 30.70 |
| ROU | Romania | Eastern Europe | Medium | 5.86 | 15.41 | 38.03 | 19.49 | 30.00 | 64.60 | 64.70 |
| SUR | Suriname | Latin America & Caribbean | Medium | 7.40 | 15.41 | 48.04 | 28.66 | 42.50 | 72.96 | 45.20 |
| AFG | Afghanistan | Southern Asia | High | 8.69 | 12.99 | 66.93 | 49.10 | 59.61 | 92.09 | 25.50 |
| USA | United States of America | Global West | Low | 3.90 | 12.99 | 30.06 | 15.97 | 21.67 | 52.54 | 69.30 |
| ESP | Spain | Global West | Low | 3.61 | 11.74 | 30.77 | 16.07 | 18.82 | 57.42 | 74.30 |
| PAK | Pakistan | Southern Asia | Medium | 6.68 | 11.74 | 56.89 | 33.13 | 52.73 | 84.81 | 33.10 |
| MDA | Republic of Moldova | Former Soviet States | Low | 4.04 | 9.59 | 42.10 | 22.96 | 34.36 | 68.98 | 44.40 |
| RUS | Russian Federation | Former Soviet States | Low | 3.55 | 9.59 | 37.04 | 18.43 | 27.80 | 64.88 | 50.50 |
| BOL | Plurinational State of Bolivia | Latin America & Caribbean | Low | 4.78 | 9.56 | 50.01 | 32.36 | 37.71 | 79.97 | 44.30 |
| LUX | Luxembourg | Global West | Very Low | 2.50 | 9.56 | 26.18 | 12.40 | 20.03 | 46.10 | 82.30 |
| BWA | Botswana | Sub-Saharan Africa | Low | 4.20 | 8.82 | 47.59 | 31.46 | 39.35 | 71.97 | 40.40 |
| SWE | Sweden | Global West | Very Low | 2.20 | 8.82 | 24.96 | 15.60 | 18.08 | 41.19 | 78.70 |

| ISO3 | Country | Economic Region | Economic Development Status | GDP | Risk Level | EPI | WRI | Exposure | Vulnerability | Susceptibility | Lack of Coping Capacities | Lack of Adaptive Capacities |
|------|--------------------------|-----------------|-----------------------------|-----------|------------|-------|------|----------|---------------|----------------|---------------------------|-----------------------------|
| JPN | Japan | Asia-Pacific | Major Advanced Economy | 39,391.14 | High | 75.10 | 9.64 | 38.67 | 24.93 | 17.76 | 17.83 | 39.20 |
| ITA | Italy | Global West | Major Advanced Economy | 37,904.74 | Low | 71.00 | 4.75 | 15.17 | 31.29 | 17.25 | 17.41 | 59.22 |
| USA | United States of America | Global West | Major Advanced Economy | 59,651.00 | Low | 69.30 | 3.90 | 12.99 | 30.06 | 15.97 | 21.67 | 52.54 |
| GBR | United Kingdom | Global West | Major Advanced Economy | 41,899.45 | Low | 81.30 | 3.46 | 12.58 | 27.53 | 16.42 | 19.09 | 47.07 |
| CAN | Canada | Global West | Major Advanced Economy | 45,003.36 | Very Low | 71.00 | 2.79 | 10.36 | 26.89 | 15.17 | 18.77 | 46.73 |
| DEU | Germany | Global West | Major Advanced Economy | 50,682.06 | Very Low | 77.20 | 2.63 | 11.52 | 22.81 | 14.98 | 16.08 | 37.36 |
| FRA | France | Global West | Major Advanced Economy | 43,002.82 | Very Low | 80.00 | 2.47 | 9.62 | 25.66 | 16.61 | 16.22 | 44.14 |



ANALYSIS

- Advanced economies perform better in addressing environmental sustainability issues, hence with lower risk of natural disaster*.

| ISO3 | Country | Risk Level | Economic Development Status | GDP | EPI | WRI | Exposure | Vulnerability | Susceptibility | Lack of Coping Capacities | Lack of Adaptive Capacities |
|------|--------------------------|------------|--|------------|-------|-------|----------|---------------|----------------|---------------------------|-----------------------------|
| LUX | Luxembourg | Very Low | Advanced Economy | 106,787.70 | 82.30 | 2.50 | 9.56 | 26.18 | 12.40 | 20.03 | 46.10 |
| SGP | Singapore | Very Low | Advanced Economy | 90,447.36 | 58.10 | 2.57 | 8.87 | 28.97 | 11.29 | 21.60 | 54.03 |
| QAT | Qatar | Very Low | Emerging Market and Developing Economy | 86,941.04 | 37.10 | 0.31 | 0.91 | 34.33 | 8.32 | 30.08 | 64.58 |
| IRL | Ireland | Low | Advanced Economy | 84,562.32 | 72.80 | 4.50 | 16.68 | 26.96 | 15.74 | 17.64 | 47.49 |
| CHE | Switzerland | Very Low | Advanced Economy | 64,654.10 | 81.50 | 2.15 | 9.01 | 23.90 | 13.91 | 19.32 | 38.46 |
| NOR | Norway | Very Low | Advanced Economy | 61,358.71 | 77.70 | 2.52 | 10.83 | 23.25 | 13.92 | 17.34 | 38.49 |
| USA | United States of America | Low | Major Advanced Economy | 59,651.00 | 69.30 | 3.90 | 12.99 | 30.06 | 15.97 | 21.67 | 52.54 |
| BRN | Brunei Darussalam | Very High | Emerging Market and Developing Economy | 58,482.21 | 54.80 | 22.30 | 57.61 | 38.70 | 14.75 | 33.35 | 67.99 |
| ARE | United Arab Emirates | Low | Emerging Market and Developing Economy | 55,312.90 | 55.60 | 3.30 | 10.99 | 30.01 | 9.55 | 25.86 | 54.61 |
| DNK | Denmark | Very Low | Advanced Economy | 54,665.18 | 82.50 | 2.74 | 11.85 | 23.12 | 14.91 | 15.31 | 39.13 |
| SLE | Sierra Leone | High | Emerging Market and Developing Economy | 1,618.58 | 25.70 | 9.44 | 13.69 | 68.99 | 55.80 | 65.60 | 85.57 |
| MDG | Madagascar | High | Emerging Market and Developing Economy | 1,558.32 | 26.50 | 10.51 | 15.12 | 69.48 | 65.68 | 56.21 | 86.55 |
| TGO | Togo | Very High | Emerging Market and Developing Economy | 1,551.15 | 29.50 | 10.97 | 16.59 | 66.11 | 55.74 | 56.25 | 86.34 |
| TCD | Chad | Very High | Emerging Market and Developing Economy | 1,530.53 | 26.70 | 11.83 | 15.71 | 75.32 | 64.54 | 68.94 | 92.49 |
| LBR | Liberia | High | Emerging Market and Developing Economy | 1,452.90 | 22.60 | 9.43 | 13.56 | 69.52 | 56.27 | 65.02 | 87.26 |
| MOZ | Mozambique | High | Emerging Market and Developing Economy | 1,210.15 | 33.90 | 9.18 | 13.31 | 68.97 | 62.61 | 56.44 | 87.85 |
| NER | Niger | Very High | Emerging Market and Developing Economy | 1,185.08 | 30.80 | 13.85 | 19.26 | 71.90 | 60.64 | 67.19 | 87.87 |
| MWI | Malawi | High | Emerging Market and Developing Economy | 941.60 | 38.30 | 8.89 | 13.22 | 67.24 | 59.28 | 57.80 | 84.65 |
| CAF | Central African Republic | High | Emerging Market and Developing Economy | 919.67 | 36.90 | 7.79 | 10.20 | 76.34 | 70.83 | 67.32 | 90.88 |
| BDI | Burundi | High | Emerging Market and Developing Economy | 740.32 | 27.00 | 10.34 | 14.74 | 70.14 | 62.20 | 57.53 | 90.68 |

POLICY SIGNIFICANCE

- Potential study focus [new dimension of public sector performance audits] in reevaluating environmental sustainability management efforts, especially for inherently risky countries (many developing countries)
- Benchmarking for best practices around the world but limited to initiatives addressing susceptibility, coping and adaptation (institutions and management).
- May guide policy decisions on reallocation of humanitarian and other development aids from regional development partners and other agencies.

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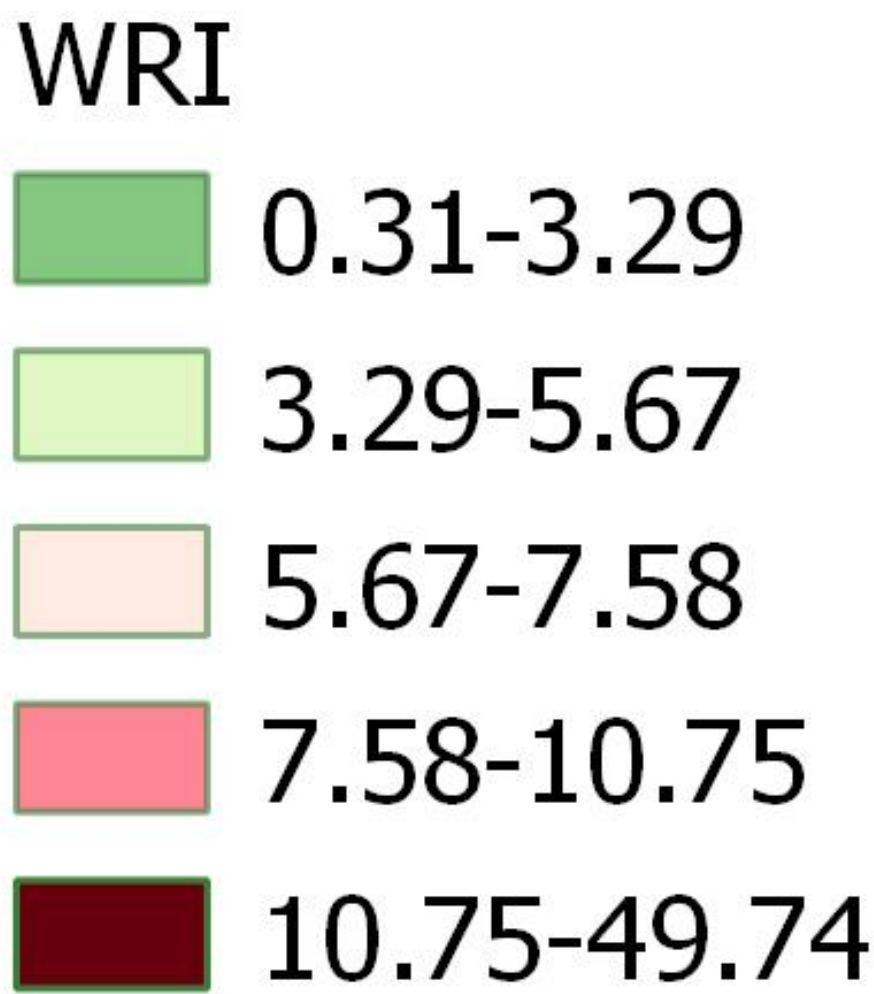
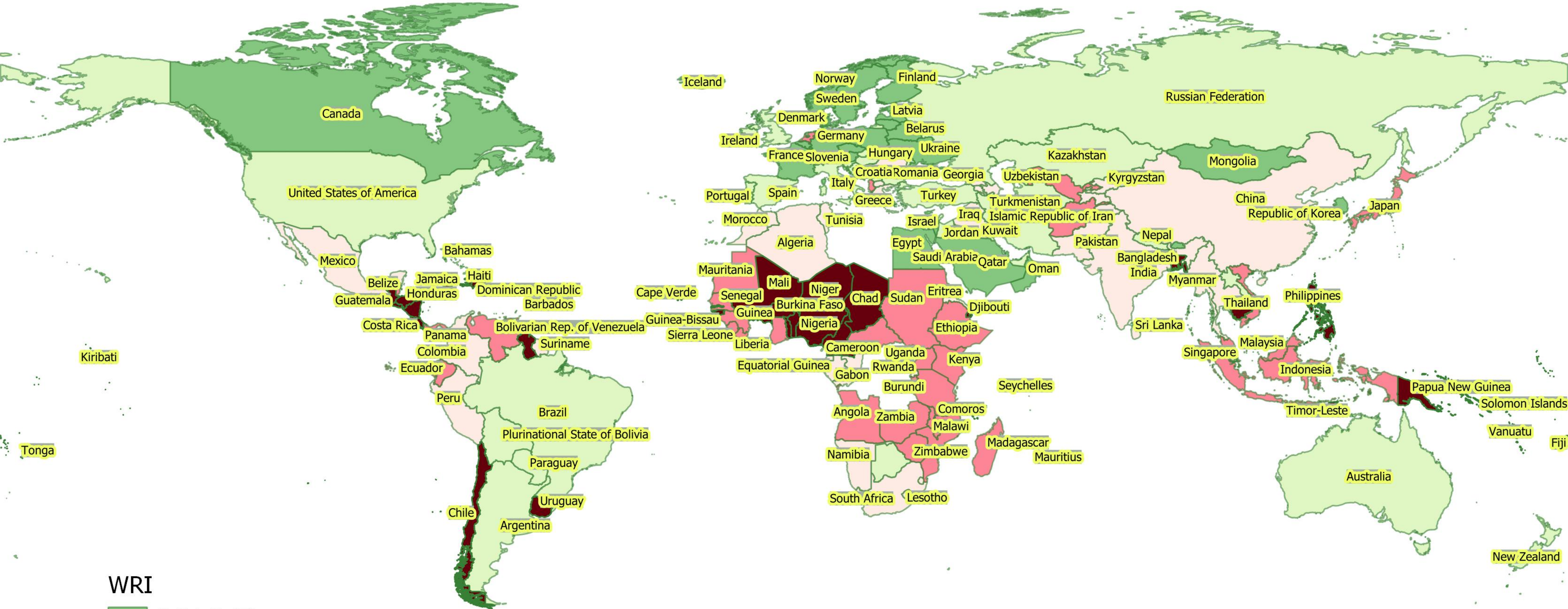
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