

RETHINKING CLIMATE CHANGE

ADAPTATION POLICY

A DECISION-ORIENTED VULNERABILITY ASSESSMENT

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Climate change is unequivocal and evident. Millions of the world's most vulnerable people live in developing countries. How to tackle the climate change is the main issue. Based on the OECD DAC recipients list, we selected 53 countries and 26 indicators in 3 sectors by reviewing relevant literatures and PCA. In addition, we designed K-VRIM to asses the vulnerability of 53 developing countries.

" Whether or not major bilateral and multilateral donors are efficiently allocating their financial resources to reduce climate change vulnerability in developing countries?"

Climate Change Vulnerability

1. Research Objective

- Develop meaningful and fine climate change vulnerability index specified for climate change adaptation of developing countries → K-VRIM
- Examine whether international aid for climate change adaptation of developing countries (including Bilateral & Multilateral) are distributed effectively and fairly in accordance with climate change vulnerability
- Find out how to apply climate change vulnerability index as criteria in decision making process for allocating climate change adaptation fund.

2. Research Contributions

1) Methodological Contribution:

- Develop K-VRIM (KAIST Vulnerability-Resilience Indicators Model)
- Fine and robust VRIM model, reducing the range of variation of data by ranking only between Developing countries
- Show climate change vulnerability of developing countries (including only 53 DAC recipient countries; Low Income Countries and Least-Developed Countries)
- In comparison with prior studies which include all income level countries, not only developing countries but also developed and middle income countries when calculating index, we only include 53 DAC recipient countries(Low Income Countries and Least-Developed Countries Include new developed indicators which were not reflected in VRIM model [1]

2) Analytical Contribution:

- The first study combined quantitative data of VRIM with Adaptation fund to analyze fairness and effusiveness of aid distribution

Methodology

1. Scope of Research

- Country(53): Least Develop Countries(48), Low Income Countries(5) [2]
- Indicator: 26 indicators in 3 sectors
- Year: 2010

2. Research Process

PCA(Principal Component Analysis) analysis → Select meaningful indicators → Collect 26 indicators' data → Imputation of missing data → Scale the indicators against 53 countries value (standardization: Z-score) → Determine the value of each indicator → Calculate overall vulnerability

▪ VRIM Formula

$$VRIM = \frac{Avg(Sensitivity Index, Climate Exposure Index) + Adaptive Capacity Index}{2}$$

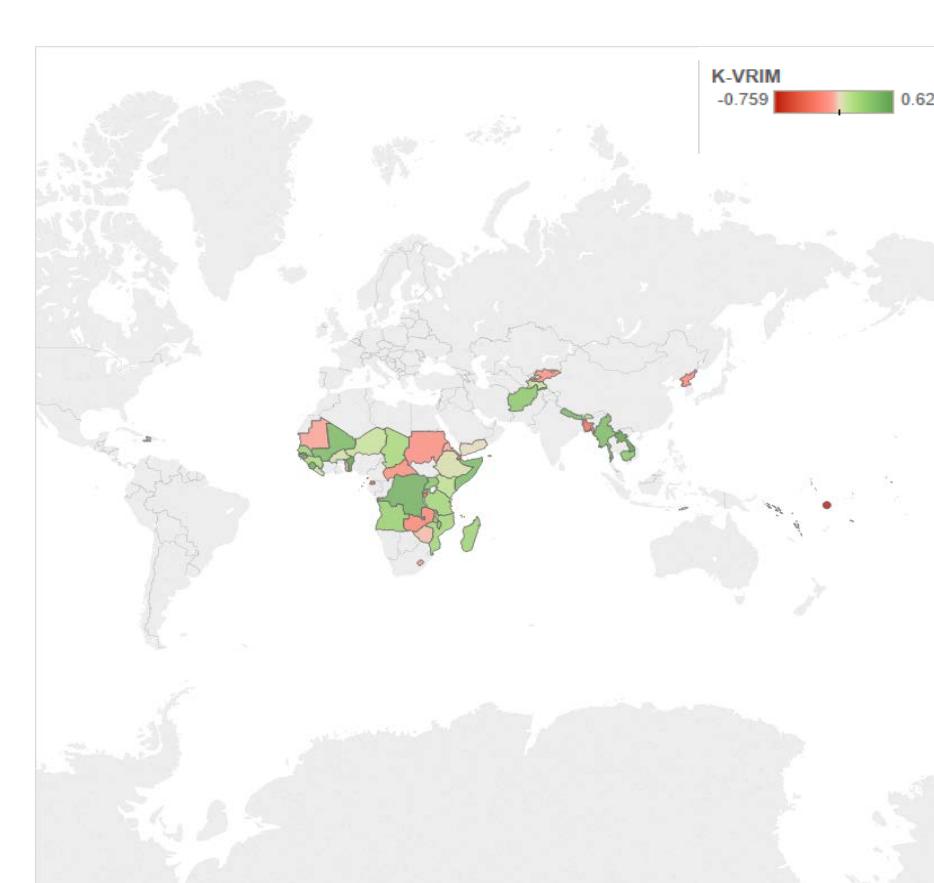
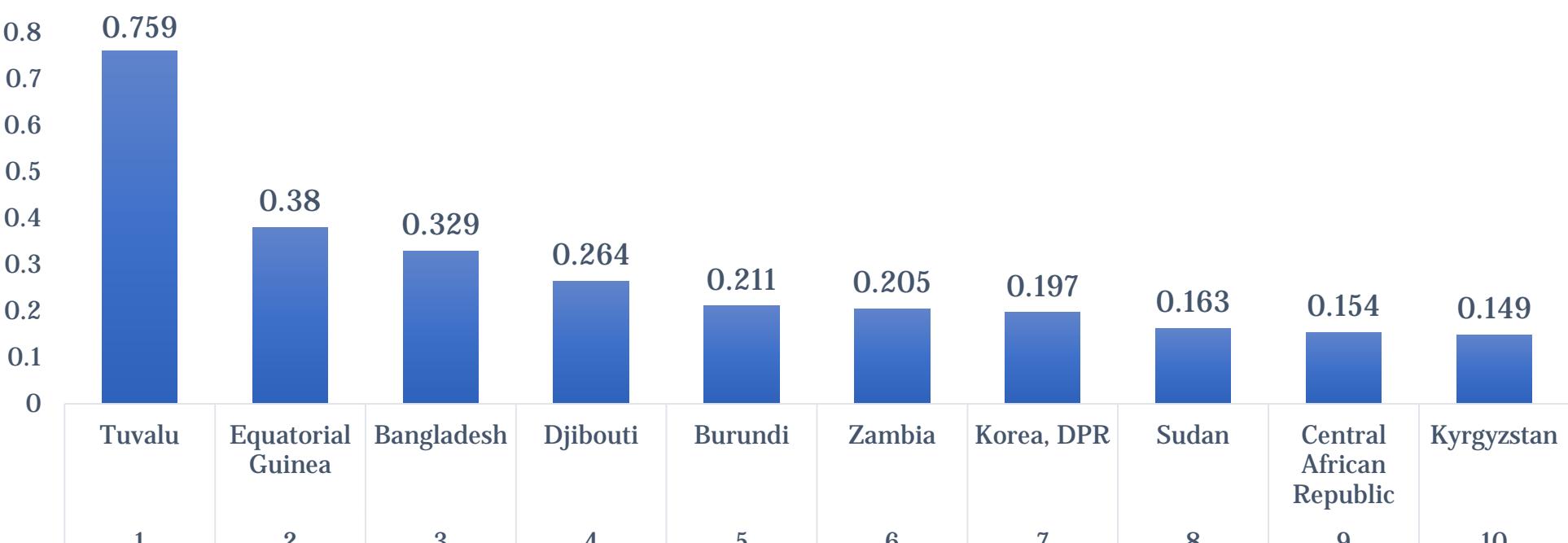
Results

1. K-VRIM Indicators (Total: 26 indicators)

	Sensitivity	Adaptive Capacity	Exposure
Variables (Proxy)	1) Ecological footprint	1) Access to improved sanitation facilities	1) Heatwave hazard
	2) Rural Population	2) Dam capacity	2) Annual groundwater runoff
	3) Population living under 5m above sea level	3) Engagement in international environmental conventions	3) Sea level rise impacts
	4) Urban Population	4) Paved roads	4) Malaria hazard
	5) Age dependency ratio	5) Improved Water Source	5) Population Growth
	6) Food import dependency	6) Population Density	6) Flood hazard
	7) Agriculture area % land	7) SO2/Land area	
	8) Cereals production/area	8) Literacy Rate	
	9) Under 5 mortality*	9) GDP per capita	
		10) Disaster preparedness	
TOTAL	9	10	6
		26	

* Under 5 mortality was not loaded as PC but it appears in many literatures as one of proxies for sensitivity. Therefore, we included it our research conducted.

2. K-VRIM Assessment



Rank	Country	K-VRIM
1	Tuvalu	0.759
2	Equatorial Guinea	0.380
3	Bangladesh	0.329
4	Djibouti	0.264
5	Burundi	0.211
6	Zambia	0.205
7	Korea, DPR	0.197
8	Sudan	0.163
9	Central African Republic	0.154
10	Kyrgyzstan	0.150

Conclusion

It is meaningful to develop credible vulnerability indicators to climate change which can be used to guide the development of adaptation policies. We choose the most vulnerable countries in terms of income and develop K-VRIM model to conduct our further researches—Bilateral & Multilateral aid for climate change adaptation of developing countries are allocated effectively and fairly in accordance with their vulnerability to climate change.

References

- [1] R. H. Moss, A. L. Brenkert, and E. L. Malone (2011). "Vulnerability to Climate Change-A Quantitative Approach." Pacific Northwest National Laboratory PNNL-SA-33642
[2] OECD DAC Recipients List, 2013