

# The Impact of Climate Change on Regional Instability

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**Abstract:** With the vigorous social and economic development, the impact of climate change on people's lifestyles in various countries has become an important factor that caused country disability. As a result, more and more vulnerable countries appeared. This papers aims to determine how climate change increases national vulnerability first and then establish measures to mitigate the risks of climate change. We selects twelve indicators to assess national vulnerability and make countries into three classes by cluster analysis: the stable ones, the vulnerable ones and the extremely vulnerable ones. The data of temperature, precipitation and the population proportion of affected population in 2009 were collected. The entropy method was used to determine the weight of each index, then the climate change index of each country was obtained, and the correlation between climate change index and vulnerability index was calculated. Climate change indirectly affects national vulnerabilities by affecting 12 indicators of vulnerability.

**Keywords:** Country's fragility; Climate change; Twelve indicators; Human intervention

## 1. Introduction

We need to establish a model that will determine the vulnerability of nations while measuring the effects of climate change. The issue involves two major data sets, one is global climate change and the other is a dozen of indicators affecting the country's vulnerability. The use of the ten-point data of the index of vulnerable countries is determined by using the method of cluster analysis to determine the vulnerability of the country , The country is divided into three categories of vulnerability, extreme vulnerability and stability. Through the entropy method, the proportion of the affected population, the temperature and the precipitation in climate index are weighted, and the climate change index is obtained. Secondly, we establish the relationship between climate change indicators and the 12 indicators, and use the gray relational degree

to analyze the correlation between climate change and the 12 indicators and the correlation between the national indicators of vulnerability and measure the impact of climate change on the degree of national vulnerability.

## 2. The Model

### 2.1. Classification of national vulnerability

Using k - means clustering analysis to calculate the distance between national 12 indexes and clustering centers to get the distance between countries, and then divide 12 countries into three categories, namely, vulnerability, extreme vulnerability and stability. Methods as below: Vulnerability, extreme vulnerability and stability of countries are shown below:

**Table 1. Classification of Countries' Vulnerabilities by Indicator**

Fragile	Vulnerable	Stable
Afghanistan	Albania	Argentina
Azerbaijan	Algeria	Australia
Bangladesh	Angola	Austria
Bhutan	Antigua and Barbuda	Belgium
Bosnia and Herzegovina	Bahamas	Canada
Burkina Faso	Bahrain	Chile
Burundi	Barbados	Costa Rica
Cambodia	Belarus	Denmark
Cameroon	Belize	Estonia
Central African Republic	Benin	Finland
Chad	Bolivia	France
Colombia	Botswana	Germany
Comoros	Brazil	Hungary
Congo Democratic	Brunei	Iceland
Congo Republic	Bulgaria	Ireland
Cote d'Ivoire	Cape Verde	Italy

Egypt	China	Japan
Eritrea	Croatia	Latvia
Ethiopia	Cuba	Lithuania
Georgia	Cyprus	Luxembourg
Guinea	Djibouti	Malta
Guinea Bissau	Dominican Republic	Mauritius
Haiti	Ecuador	Netherlands
Iran	El Salvador	New Zealand
Iraq	Equatorial Guinea	Norway
Israel and West Bank	Fiji	Oman
Kenya	Gabon	Poland
Kyrgyz Republic	Gambia	Portugal
Laos	Ghana	Republic
Lebanon	Grenada	Singapore
Liberia	Guatemala	Slovak Republic
Malawi	Guyana	Slovenia
Mauritania	Honduras	South Korea
Myanmar	India	Spain
Nepal	Indonesia	Sweden
Niger	Jamaica	Switzerland
Nigeria	Jordan	United Arab Emirates
North Korea	Kazakhstan	United Kingdom
Pakistan	Kuwait	Uruguay
Philippines	DarussalaLesotho	
Rwanda	Libya	
Republic Sierra Leone	Macedonia	
Solomon Islands	Madagascar	
Somalia	Malaysia	
Sri Lanka	Maldives	
Sudan	Mali	
Syria	Mexico	
Tajikistan	Micronesia	
Timor-Leste	Moldova	
Togo	Mongolia	
Uganda	Montenegro	
Uzbekistan	Morocco	
Yemen	Mozambique	
Zimbabwe	Namibia	
	Nicaragua	
	Panama	
	Papua New Guinea	
	Paraguay	
	Peru	
	Romania	
	Russia	
	Sao Tome and Principe	
	Saudi Arabia	
	Senegal	
	Serbia	
	Seychelles	
	South Africa	
	Suriname	
	Swaziland	
	Tanzania	
	Thailand	
	Trinidad and Tobago	
	Tunisia	
	Turkey	
	Turkmenistan	
	Ukraine	
	Venezuela	
	Venezuela	
	Zambia	

**2.2. Analysis of climate change indicators to resolve the weight**

Through the entropy method, we can get the weight of the affected persons, the temperature and the precipitation in the climatic index, and draw the climatic change

index to get in touch with the 12 indexes. The method is as follows:

According to the size of the information, provided by the index observations to determine the index weight. There are m to be evaluated programs, n evaluation index, the formation of the original index data matrix, for a index xj, the greater the gap between the index value xij, then the index in the comprehensive evaluation of the greater the role; if an item Indicators index values are all equal, then the index in the comprehensive evaluation does not work.

The weight of the population affected by climate change is 0.488, and the weight of temperature as a proxy of climate change is 0.512.

**2.3. The impact of climate change on national vulnerability indexes**

The impact of climate change on the level of national vulnerability is measured by establishing linkages between climate change indicators and the 12 indicators and analyzing the correlation between climate change and the 12 indicators by gray relational degree and the relevance of the national vulnerability index. The result is as follows:

**Table 2. Relevance Description**

Index	R
E3: Human Flight and Brain Drain	0.6842
E2: Economic Inequality	0.7589
P1: State Legitimacy	0.7794
P2: Public Services	0.8096
S1: Demographic Pressures	0.8196
P3: Human Rights	0.8364

C3: Group Grievance	0.8479
C1: Security Apparatus	0.8574
C2: Factionalized Elites	0.8694
Total	0.8861
S2: Refugees and IDPs	0.9071
X1: External Intervention	0.9182
E1: Economy	0.9247

From this result, it can be seen that the correlation between climate change indicators and S2, X1 and E1 is larger than that of total, and this shows that climate change has an indirect effect on the national fragile total index.

**3 . Conclusions**

By setting up a model to identify the country's vulnerability and finding that the proportion of vulnerable countries in the world is still considerable, the stability of the country has a great impact on people's lives. By demonstrating the impact of climate change on national vulnerabilities, it is important to state that climate is a national vulnerability.

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