

# Impact of Climate Change on Vulnerability

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**Abstract:** Manufacturing unsustainable environmental practices, migrations, and resource shortages that prevail in developing countries may worsen countries with weak governance[1]. Many experts have also conducted research on this, although environmental pressure does not necessarily lead to violent conflicts in itself. When it is combined with weak governance and social division, it will lead to violent conflicts that can aggravate the spiral of violence, usually It is latent ethnic and political disagreements.

**Keywords:** Climate change; Fragile; Stable; Society

## 1. Introduction

The Intergovernmental Panel on climate change (Intergovernmental Panel on Climate Change) said that the net damages the costs of climate change can be significant. These effects will change the human way of life, may lead to weakening the structure of society and government and collapse. Therefore, we need to establish the index system to evaluate the vulnerability, and the climate factors into consideration, is to determine the direct or indirect way to influence vulnerability.

## 2. Modeling

Firstly, select the indicators to represent the national vulnerability. As with the national relevant vulnerability index number a lot, so we use the method of principal component analysis to reduce the main index. Based on previous experience, we use PCA methods to reduce the number of indicators [2] and get the final required indicators. Different contribution evaluation index for critical weighted model. Therefore, this section uses two models to calculate the weight of the weight vector.

### 2.1. Weighted model based on entropy weight method (EWM)

In information theory, entropy is a measure of uncertainty, according to the characteristics of entropy, entropy can be calculated to determine the randomness and disorder of an event, but also the entropy can be used to determine the discrete degree of an index, the greater the degree of dispersion index, the index of comprehensive evaluation Influence(weight) more[3]. It is a kind of objective weighting method, because its dispersion depends only on the data itself.

The measuring unit of the indicators are not uniform, so in the calculation of comprehensive index with them before, must first normalized absolute value that index into relative value. In addition, positive indexes and negative indexes values represent different meanings (positive index value is good and negative index values as low as possible), therefore, for the positive and negative indicators need to use different algorithms for data standardization:

$$\text{positive index: } X_{ij}' = \frac{x_{ij} - \min\{x_{1j}, \dots, x_{nj}\}}{\max\{x_{1j}, \dots, x_{nj}\} - \min\{x_{1j}, \dots, x_{nj}\}}$$

$$\text{negative index: } X_{ij}' = \frac{\max\{x_{1j}, \dots, x_{nj}\} - x_{ij}}{\max\{x_{1j}, \dots, x_{nj}\} - \min\{x_{1j}, \dots, x_{nj}\}}$$

For convenience, the normalized data till represents as; Calculate the index j under the proportion of the indicator of sample i

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^n x_{ij}}, i = 1, \dots, n, j = 1, \dots, m$$

Calculate the entropy of the index j

$$e_j = -k \sum_{i=1}^n p_{ij} \ln(p_{ij}), j = 1, \dots, m, \left( k = \frac{1}{\ln(n)} > 0, e_j \geq 0 \right)$$

Among them,  $k = \frac{1}{\ln(n)} > 0$  Satisfy  $e_j \geq 0$ ;

Calculate the information entropy redundancy :  $d_j = 1 - e_j, j = 1, \dots, m$

Calculate the weight of each indicator:

$$w_j = \frac{d_j}{\sum_{j=1}^m d_j}, j = 1, \dots, m$$

**2.2. AHP-based weight model**

In order to make the indicators more comprehensive, we use the consistency judgment matrix to weigh each indicator, and we obtain the complementary judgment matrix by experts scoring each index according to experience. We can solve the feature vector matrix to obtain the weight. According to the method of group decision-making, the final weight can be obtained by combining the weight of experts and the weight of judgment matrix. The weight of each index is as follows:  
 The reliability of the weighted process can be checked in the following values: Consistency index value CI = 0.0786, Consistency ratio value CR =



Figure 1. Data

CI/RI=0.0527, Through the above method, we can finally calculate the weight of each indicator. The six dimensions of national assessment of vulnerability based, we identified a set of comprehensive indicators and the reasonable weights, including infrastructure, human resources, education resources, military resources, political authority and social stability, public diplomacy, economic system, image image, brand image ten index.

**3. Result: Impact of climate change on the weighting model**

The impact of climate change on vulnerability can be divided into direct and indirect effects[4]. We incorporate climate into the 11th weight indicator and reconstruct the weighting model, and calculate the weight of each component shown in picture as follows.

- Military : 0.1062
- Politics : 0.3184
- Economy : 0.0379
- Science & Education : 0.1581

Feasibility analysis :The weight by entropy method and AHP to determine the index, making the results more convincing, to avoid accidental. To complete the task of predicting the use of comprehensive prediction models, for different models may have limitations and vulnerabilities, makes the results more reliable. In some of the steps we use an index instead of the two indicators of evaluation, this may lead to errors or error evaluation.

**References**

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