Journal of Electronics and Information Science (2022)
Clausius Scientific Press, Canada

DOI: 10.23977/jeis.2022.070113
ISSN 2371-9524 Vol. 7 Num. 1

Research on the Problems of EDP Based on Model Index Method

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Keywords: Global warming, EDPs, Migration, AHP

Abstract: Recently, the problems of global warming and air pollution are increasingly getting worse. Aiming at studying the risk of EDPs losing culture in the process of immigration in some small island states, choosing the economy, the population, the popularity of the language, the religious beliefs and the education of the absorbing country as the five general factors that affect the safe and effective flow of EDPs. EDPs has three possibilities of cultural extinction, cultural coexistence and cultural conflict in the process of immigration. Taking safe migration as the goal, five factors as the criterion and three possible phenomena as the scheme, AHP is conducted to obtain the probability of risks faced by culture in EDPs safe migration.

1. Introduction

Some island nations like Kiribati [1] in figure 1 are in danger of disappearing because of rising sea levels. Citizens have to move abroad to survive before their nation's land disappears. The kind of persons is called by us environmentally displaced persons (EDPs). Not only do these environmentally displaced persons (EDPs) need to relocate, but there is also a risk of losing a unique culture, language, and way of life. Immigration is accompanied by a series of social, economic, political, cultural and other problems.

Figure 1: Kiribati

Based on the global sea height variation data provided by NASA, using population density, land area and search index to build an EDPs model used to predict the number of EDPs changes, and finally carry out data visualization. Using the analytic hierarchy process to find a reasonable solution.

Assuming the policy can be implemented, we study the impact of the policy by modifying the impact parameters of the EDPs population prediction model and the decision matrix of the AHP analysis of cultural risks of EDPs, and qualitatively analyzing the results [2].

2. Model analysis

In Figure 2, the data on sea rise, most of average elevation of each island nation/demographic and geographic information of each country, and a small percentage of average elevation of each island nation is respectively found on GLOBAL CLIMATE CHANGE of NASA Officalwebsite, List of island countries of Wikipedia, Google and publicly published Chinese journals. When searching for the dying island country on Google, the number of related terms is returned, as shown in Table 1. The units of area and population density are km^2 and per km^2.

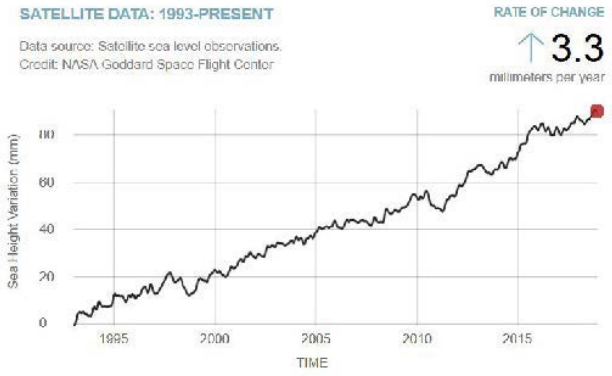

Figure 2: Sea Height Variation (mm) from NASA

Table 1: Information of seven island countries in danger

Country	Elevation	Population	Area	Population density	Google index
Tuvalu	1.0	12373	26	475.88	182000
The Maldives	1.8	329198	298	1105	779000
Marshall Islands	2.0	62000	181	342.50	7220000
Kiribati	2.0	98000	811	135.00	261000
Micronesia	2.1	101351	702	158.10	806000
Solomon Islands	2.7	523000	28400	18.10	7050000
Fiji	5.0	926276	18274	46.40	1360000

3. Index-based Model

Using the comprehensive index (call Model Index) to make the model more convincing. Besides, we also introduce population density, area and the number of articles on the search engine concerns island nations disappearing as three factors to consider. Finally, an index-based model for EDPS population prediction is obtained.

Dividing the Model Index into Two major parts, Index One, which is dominated by sea-level rise, and Index Two, which is composed of Web Index and PAI. Then assigning weight 1 to Index One, weigh α to PAI, and weigh β to Web Index. See figure 3 below for details [3].

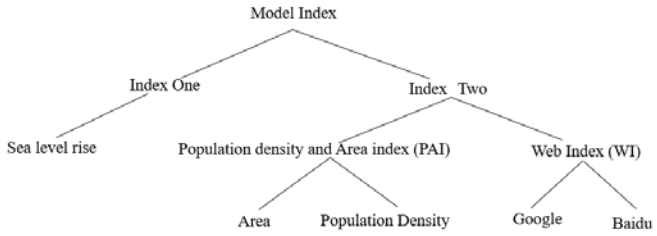

Figure 3: Index Model

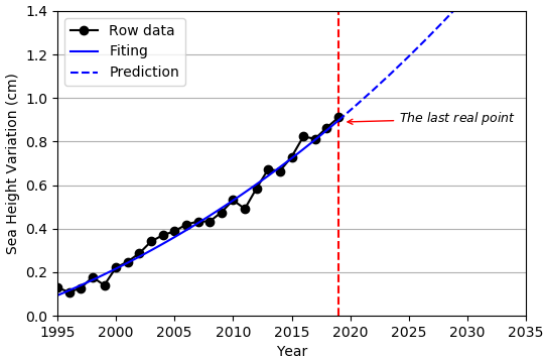

Figure 4: Prediction of Sea Height Variation

To begin with, Use Ridge Regression to figure out how many the sea level will rise for the next 100 or 200 years from previous sea level data. Choosing a gradient descent algorithm to minimize the objective function, linear least squares with L_2 regularization in the Ridge Regression algorithm is desirable.

$$\min_{\omega} \left\| X\theta - y \right\|_2^2 + \alpha \left\| \theta \right\|_2^2 \tag{1}$$

When training is finished, we can visualize the data we want in Figure 4. It can determine the percentage according to WI_m's and PAI_m 's proportions to the maximum value. The principle is similar to mean normalization.

$$WI_m = \frac{(GI_m + BI_m)}{\max \sum_{m=1}^{8} (GI_m + BI_m)} \tag{2}$$

$$PAI_m = \frac{PD_m}{\max \sum_{m=1}^{8} PD_m} \tag{3}$$

Average Sea level growth of the global can be calculated by the equation below.

$$\Delta SH_t = SH_t - SH_{2020} \tag{4}$$

The three factors play different roles in Model Index according to different importance.

$$MI_m = 1 + \alpha WI_m + \beta AI_m (0 < \alpha < \beta < 1) \tag{5}$$

The HDS is decided by AE_m, SH_t and MI_m

$$HDS_m^t = AE_m - \Delta SH_t * MI_m \tag{6}$$

Finally, based on equation (5) and equation (6) we can figure out how many the population of EDPs is and draw a figure(5) below.

$$LP_m^t = \begin{cases} Population_m^t * 30\%, if \quad A \quad level \quad alarm, \\ Population_m^t * 60\%, if \quad AA \quad level \quad alarm, \\ Population_m^t * 90\%, if \quad AAA \quad level \quad alarm. \end{cases} \tag{7}$$

$$EDP_t = \sum_{m=1}^{8} LP_m^t \tag{8}$$

We suppose $\alpha = 0.1$, $\beta = 0.2$, finally according to the above formula, we can draw the following figure 5.

Tuvalu will be the first disappearing island country in these countries, followed by The Maldives. As for the population of EDPs take a durable step-change upward, which will be 106183(K) by 2066, 183583(K) by 2113, 217700(K) by 2160, 316459(K) by 2206, 581165(K) by 2253, and 944629(K) by 2300.

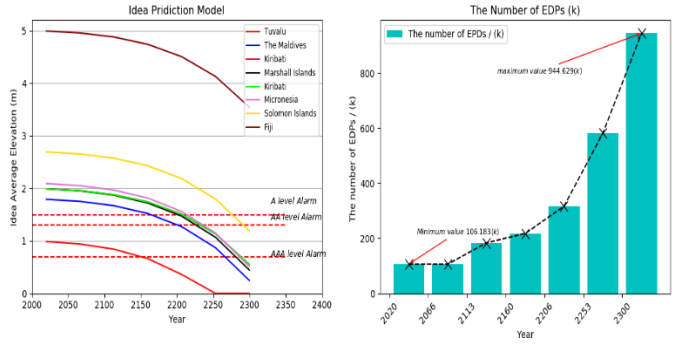

Figure 5: The EDPs Pridiction

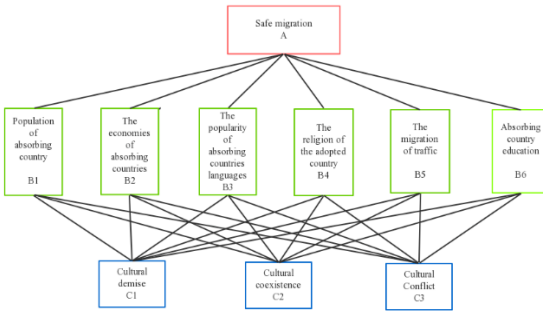

Figure 6: Hierarchical Substructure

4. Conclusion

By using Index-based Model, we know that as time goes on, a growing number of people will have to leave the country where they have lived for a long time and migrate to other countries to survive. Apart from that, EDPs also must face the cultural demise and cultural conflict risk. In conclusion, the EDPs problem is not a matter that can be solved by several countries or institutions, when all human beings start to join hands, face it and solve it, it could be finished off.

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