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# Research on the "Island's EDPs and Cultural Loss" Based on AHP Algorithm and SIR model

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***Abstract:*** *This article focuses on the problem that people on remote islands may lose their homes due to rising sea levels, and through the AHP algorithm and SIR model to measure the number of people who may become environmentally displaced persons (EDPs) and the scope of cultural loss. Testing with real data, it is feasible to help EDPs with this policy. It can adjust the weight settings according to different affected countries, so as to obtain areas or countries suitable for the people's migration.*

***Keywords:*** *rising sea levels, EDP, AHP, SIR, cultural assimilate*

## 1. Introduction

Global warming has been a popular environmental topic in the past decade around world. Excessive greenhouse gas emissions have led polar glaciers to melt. Moreover, scientists in Antarctica have recorded a new record temperature of 20.75 degrees Celsius (69.35 Fahrenheit), breaking the barrier of 20 degrees for the first time on the continent. Heating also swells the upper seawater, all of which ultimately cause rising sea levels. Natural disasters that are likely to continue in the future will lead to more victims. Therefore, there is an urgent need to establish a complete EDP policy so that it can work to help improve the status quo. To better address these issues, we make a few suggestions and use models to measure their impact at once to help improve policy.

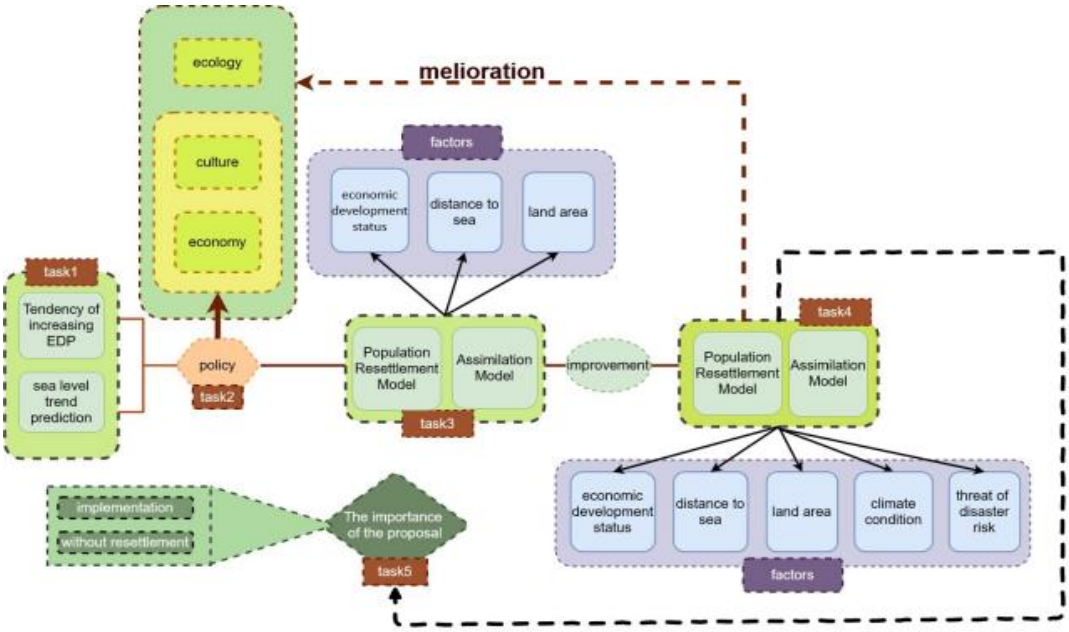


*Figure 1: The graph of Task*

## 2. Model analysis

Firstly, make the following assumptions: (1) This article considers the Maldives as the primary sample. In this article, we only consider the risks brought by the gradual slow climate, but not the extreme sudden catastrophic. (2) The sea-level rise mentioned in the full text is relative sea level. (3) Cultural assimilation is the process by which a person or a group's language and/or culture come to resemble those

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of another group [1]. This specifically refers to environmental migration. (4) This article defines EDP as a group of persons who their lives are threatened as their home is no longer suitable for living. (5) It is assumed that the population is evenly distributed on the island. It is sea level rise that be taken as the most critical and unique factor in climate.

Then analyze the potential risk model. The first is global impact, using time series model, as shown in Figure 2, it can simulate future EDP growth rates and scales based on the data of past and current EDP population. The second is situation in the island country, such as sea level, population and culture treat. Due to all these risks, there is an urgent need to improve the international protection law on climate migration, which is to protect and compensate the countries and people who have been affected so far.

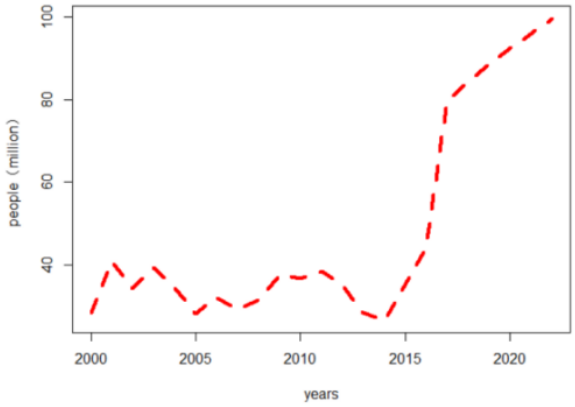


*Figure 2: Tendency of Increasing EDP*

## 3. Trade-offs in Modeling

### *3.1 Population Resettlement Model*

When measuring whether the resettlement country meets the resettlement standards, we take the following factors as the main considerations. Conditions: Economic conditions in different countries in the world, climate severity, pollution emissions, population density, recording sea level distance and other factors, using AHP to calculate weights to determine the weight of each factor, as EDPs. The reference for migrating to the resettlement country, establishing a population resettlement model, and completing environmental resettlement. Calculate the Q value of each resettlement country by the Q value method. Select the resettlement country represented by its maximum value to resettle the corresponding proportion of EDPs.

#### *3.1.1 Terms, Definitions and Symbols*

Signs and definitions indicated above are still valid. Here are some extra signs and definitions.

PS（n,m,p) where **n** is the number of alternative resettlement countries. **m** is the number of refugees/ refugee countries. **p** is the weight of the country's housing conditions. The higher the weight, the larger the share of housing.

$$Q=\frac{P^2}{x_i\left(x_i+1\right)} \tag{1}$$

P is the score of the country after calculation, $x_i$ is the number of places currently in the country. When an EDP is allocated to a certain country, the Q value should be recalculated, then, the current Q values of all countries should be sorted.

#### *3.1.2 Additional Assumptions*

(1) All refugees assigned to resettlement countries are whole numbers.

(2) The model does not consider the host country's own requirements. It is assumed that all host countries must host EDPs.

(3) The assumption is that the EDP will migrate to a certain area of the host country, so the host

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country's culture will be lower than the EDP culture.

(4) In order to simplify the model, assume that all personnel in this scenario obey the UN's distribution arrangements unconditionally.

### *3.1.3 The Foundation of Model*

Considering receiving countries from the perspective of EDP, we mainly choose economic development conditions, the distance to sea, land area, threat of disaster risk and climate condition as weighting factors.

*Table 1: The weights of index Ⅱ*

| factors | economic development status | distance to sea | land area | Threat of disaster risk | climate condition |
|---|---|---|---|---|---|
| Weight | 0.0569 | 0.17 | 0.108 | 0.2065 | 0.4586 |

Here, the analytic hierarchy process is used to calculate the influence factor weights and pass the consistency check. The consistency check of the calculation results is acceptable (the former angle CI is 0.0382, CR is 0.0735)

With the calculation method as the (1), we calculated the Q value ranking from the perspective of EDP to select the resettlement country as follows.

*Table 2: The ranking of Receiving Country Ⅱ*

| country | score | percentage | Proportional migration (assuming 1000 EDPs) | Refer to the results of the convention | Q-value method |
|---|---|---|---|---|---|
| **Switzerland** | 77.1128 | 13.38% | 133.80939 | 134 | 0.32964 |
| **France** | 74.198 | 12.88% | 128.75151 | 129 | 0.32955 |
| **Denmark** | 72.224 | 12.53% | 125.32614 | 125 | 0.32948 |
| **Malta** | 71.636 | 12.43% | 124.30582 | 124 | 0.32946 |
| **Sweden** | 71.3084 | 12.37% | 123.73735 | 124 | 0.32945 |
| **Australia** | 70.0148 | 12.15% | 121.49264 | 121 | 0.32940 |
| **UK** | 69.9476 | 12.14% | 121.37603 | 121 | 0.32939 |
| **Ireland** | 69.8468 | 12.12% | 121.20112 | 121 | 0.32939 |

Similarly, after completing an EDP allocation, we can see that the ranking of different countries has also changed due to the Q value.

*Table 3: Comparison Chart Ⅱ*

| country | Q-value method |
|---|---|
| Australia | 0.32667 |
| UK | 0.32605 |
| Denmark | 0.32598 |
| Malta | 0.32582 |
| Ireland | 0.32511 |
| Swiss | 0.32388 |
| France | 0.32327 |
| Sweden | 0.32285 |

initial

| country | Q-value method |
|---|---|
| Swiss | 0.32964 |
| France | 0.32955 |
| Denmark | 0.32948 |
| Malta | 0.32946 |
| Sweden | 0.32945 |
| Australia | 0.32940 |
| UK | 0.32939 |
| Ireland | 0.32939 |

After the first round

According to the population resettlement model, the optimal immigration country is calculated after changing the weights. We considered the climatic factors and degree of disaster risk as reference conditions from the perspective of humanization. Finally, after concluding that the countries above were the best immigration addresses.

This map represents the distribution of countries suitable for immigration. It can be identified whether the country is suitable to immigrate through the color of its map. The darker the color of the area, the more suitable it is to move.

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*Figure 3: Countries Suitable for immigration*

### *3.2 Cultural Assimilation Model*

The SIR model is a propagation model and an abstract description of the process of information dissemination. Based on the SIR model, a new definition of the symbol is given, and it is used as a cultural risk model to describe the cultural scope that EDP may disappear with the passage of time. In the model, the ethnic language spoken by the refugee is regarded as a condensed cultural symbol, which represents the culture of the race, so the abstract culture is quantified as a person's dialect mastery.

#### *3.2.1 Terms, Definitions and Symbols*

1) The annual assimilation rate of the units in the resettlement country is λ.

2) The anti-assimilation rate of EDP is μ.

#### *3.2.2 Additional Assumptions*

1) It is assumed that the culture brought by EDP and the amount of culture in the receiving country will not change.

2) The long-term assimilation of EDP-protected culture in the resettled country, that is, it may be affected by new policy assimilation in different periods.

3) The EDP of all immigrants in this scenario is assigned to immigrants and is subject to unconditional compliance based on the calculation results of the personnel placement model. All EDPs are accepted by the same country as a prerequisite for learning the local language.

4) In a comprehensive practical situation, the model assumes that all EDP cultures, resettlement country cultures, and EDP cultures that are changing the assimilation trend are consistent.

5) In the chart, the unit assimilation rate of the resettlement country is 0.7, and the EDP assimilation prevention rate is 0.3.

#### *3.2.3 The Foundation of Model*

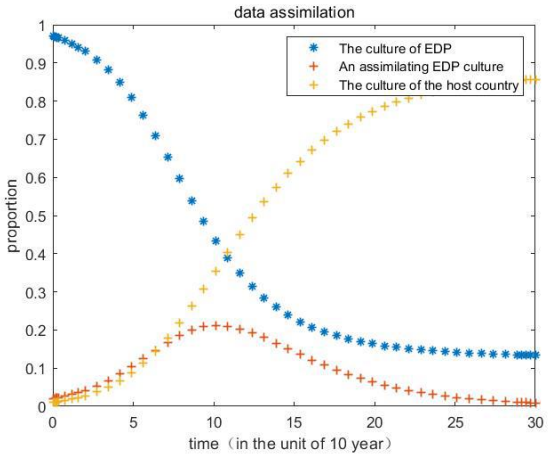


*Figure 4: The Cultural Assimilation rate Ⅱ*

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It can be seen from the Figure 4 that after the optimization of the resettlement model, as the degree of cultural difference between the national culture of receiving countries and the affected country has decreased, the assimilation rate has also weakened. It can be found that, due to the weakening of the assimilation ability, though decline in the previous decade is large, the rate of cultural assimilation has declined then, and the affected country have not completely lost their culture. It is proved that the adjustments made to the population resettlement model previously are beneficial to the resettlement choices and lives of environmental relocates in the resettlement areas.

## 4. Conclusion

It is concluded from our model that immigrants should consider climate, environment, and stability of survival more. Therefore, after we assign EDPs to the receiving country, we must also pay attention to the environment of the host country. So, we added some policies: (1) Strengthen climate protection work in host countries and adopt sustainable development of production and lifestyle. (2) Builds a bridge between the government and immigrants, and strengthens ethnic exchange [2]. (3) Develop non-governmental charity organizations, and gradually cultivate a harmonious relationship with the residents of the immigrants [3]. (4) Publicize the status quo of pollution through multiple channels and increase people's awareness of the current status of the environment.

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