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| **Problem Chosen** F | **2020 MCM/ICM Summary Sheet** | **Team Control Number** 2010652 |

Where to go next

**Key words:**

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# Introduction

## Background

With carbon dioxide emissions rising, global warming is increasingly serious. Recent decades have seen sea level rising. Several island nations, such as The Maldives, Tuvalu, Kiribati, and The Marshall Islands are facing a series of impacts of climate change, for instance, the reduction of the territory area, flood disaster and land salinization, etc. They are not only in danger of sinking but also face the challenges about cultural differences and human rights. Therefore, these environmentally displaced persons (EDPs) need to relocate as their homeland becomes uninhabitable. In fact, the term “climate refugees” is not legally valid as the 1951 Refugee Convention does not recognize environmental factors as criteria to define a refugee.

Recently, a UN ruling has opened the door to the theoretical recognition of EDPs as refugees. As the IPCC report says, if greenhouse gas emissions continue to rise, sea-level will rise at 1.1m by 2100 and low-lying coastal countries will be at risk of disappearing. It is necessary to design a reasonable model and analyze this complex issue of when, why, and how the UN should take action to address the problem on the increasing number of EDPs. In particular, the response system guidance should include the desire of protections of cultural heritage.

## Restatement of the Problem

Considering the background, it is essential to establish an appropriate model to solve out the problem including three core aspects, which are the relocation decisions, resettlement and cultural preservation, and time factors. At the same time, make accurate predictions about the size of it. Under the circumstance, we are consulted to help address the complex issue of the migration of climate refugees. our main work is as follows:

* Define the scope of the issue of EDPs. Based on the data we collected, we use time series to predict the time and number of climate refugees.
* Propose policies to address EDPs. We are supposed to take human rights and cultural preservation into account. The risk of loss of culture is characterized by the retention rate of national cultures. Considering the cultural differences, we establish a cultural optimization model to integrate the immigrant cultures and native cultures better.
* Describe the development of a model used to measure the potential impact of proposed policies. Explain how to design our models and how they do good to proposed policies.
* State the importance of proposed policies in light of our analyzation and results. Give advice on the migration of EDPs. Let most countries pay attention to the issue of EDPs. Explain who should shoulder more responsibility for assisting climate refugees and what other aspects should we capture to develop our models.

# Analysis of the Problem

**Problem 1:**

**Problem 2:**

**Problem 3:**

# Symbols

Table 1

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# Simplifying Assumptions

# Model Design

## Model II: Model of Cultural Loss

### Cultural Classification and Loss of Culture

Culture refers to all the spiritual activities and products of human beings relative to economy and politics. Specifically, it refers to the traditional customs, life style, religious belief, literature and art, legal system and so on. We have a simple classification for our purposes.

Firstly, culture can be divided into material culture and intangible culture. Material culture can be divided into portable and non-portable categories, among which the portable category refers to the items that can be carried such as books, appliances, etc., while the non-portable category refers to the items that cannot be carried along in the process of national migration, such as buildings. The intangible cultural category can be divided into the behavioral category and the non-behavioral category. Behavior refers to the language (which can also be classified into a category), the culture embodied by specific behaviors such as living habits, customs, festivals and national skills, while the non-behavioral category refers to cultural signs, aesthetic interests and values.

Next, we define cultural damage. A material class is defined as damaged when it is damaged or lost. The destruction of intangible culture is defined as follows: for the culture of behavior, when all or most of the people in the nation lose the ability to perform the behavior or have the ability to perform the behavior but fail to happen after a certain year, the cultural behavior has been lost; A non-behavioral class is defined as a lost state when the culture is forgotten and unsearchable.

### Quantify culture

Because different countries have different populations, different areas and different cultural forms, their value cannot be compared with material richness and commercial value. In material terms, the total value of the culture of a large country is much greater than that of a small island country. In order to measure culture easily, we use the retention rate of national culture in this question to describe:



Whererepresent the retention rate of culture, the retention rate of a certain item in culture, and the importance of this cultural category. The sum of  is equal to 1.  can be obtained by investigating a nation's evaluation of the importance of different cultural categories. We can consider different cultural categories equally important in the absence of a survey:



Refine  further

# Sensitivity Analysis

# Strengths and weakness

# References

1. <https://migrationdataportal.org/themes/environmental_migration>
2. Cai Chang. Study on the problem of environmental refugees in Tuvalu [D]. Central China Normal University, 2012.
3. IPCC. Special report on global warming of 1.5℃[M]. UK: Cambridge University Press, 2019.

# Appendix

## Data

1. Global mean sea level data

Source: NASA. <https://sealevel.nasa.gov>

1. Population density

Source: OECD. <https://stats.oecd.org/>

## program