For office use only	Team Control Number	For office use only
T1 _____	**74971**	F1 _____
T2 _____		F2 _____
T3 _____	Problem Chosen	F3 _____
T4 _____	**E**	F4 _____

2018 MCM/ICM Summary Sheet

Climate counts! Less Fragility & better Countries

Abstract

With the rapid increase of the climate change influence, considerable attention has been attached to so-called 'fragile' country. In order to measure the impact of climate change and propose reasonable state interventions, we establish the Fragile-Climate Change Coupling Model and other models based on the theory of country fragility and climate change.

In task 1, for the sake of numeric measurement of the climate change's influence, we introduce the anomaly of meteorological elements and the extreme weather probability, which make up the climate change index(CCI). Furthermore, 12 indicators closely related to the climate change from three aspects are selected primarily, and then entropy weight method (EWM) and coefficient of variation method(CVM) are applied to integrate the indexes into the fragility index based on the climate change(FCI). Moreover, fuzzy cluster analysis(FCA) is employed to clarify countries into four: impregnable, stable, vulnerable, and fragile.

In task 2, we select Somalia as a research object and analyze the correlation between its CCI and the 12 indexes in the fragile state index(FSI) to reveal the impact of climate change. The result indicates that the economic fragility is sensitive to CCI. Meanwhile, the social fragility has less reaction to climate change, and climate change has potential effect on politics.

In task 3, the Chi-square analysis and fitting method are employed to reflect the specific function relationship between FCI and CCI, by which we establish the Fragile-Climate Change Coupling Model. Thus, it comes to us that with the increase of climate change in Mexico, the fragility rises up correspondingly. We define the country tipping point in the light of the result of fuzzy cluster, and build up the climate change prediction model by utilizing the second exponential smoothing method. The conclusion is that a country reaches the tipping point when the CCI of the country drops down to 58.72, and it will probably fall into fragile country. When the other indexes reach their own critical points, it should also be vigilant.

In task 4, on the basis of three perspectives of fragility, we propose some human interventions aimed at the twelve fragility indicators. They are listed as follows: strengthen infrastructure construction, reuse of resources, improve the covering rate of gardening, return arable land to the water and so on. Then we establish the Intervention Cost Prediction Model, which is composed of the cost of intervention of economic recession, ecosystem sustainability, society habitability, and opportunity cost.

In task 5, we propose some modifications to apply our model into smaller or larger states. With the appropriate alteration of indicators of fragility and climate change, our models have high stability and extensive applicability..

Key Words: Climate change, Fragility, EWM, Fuzzy clustering