Problem Chosen	2020 MCM/ICM Summary Sheet	Team Control Number
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"I want to say one word to you. Just one word: Plastics!". This occurs in Mike Nichols's 1967 film *The Graduate*. In the film, "plastics" is regarded as a cheap, sterile, ugly, and meaningless way of life. Now, the large amount of single-use and disposable plastic products have severe environmental consequences. Furthermore, the time these products are useful is significantly shorter than the time it takes to decompose. Therefore, it is desirable to design a plan to significantly reduce, if not eliminate, the single-use and disposable plastic product waste.

To this end, we make the following main contributions:

- We first propose the model, MPMV, that estimates the maximum levels of single-use or disposable plastic product waste that can safely be mitigated without further environmental damage. Specifically, we classify the single-use or disposable plastic product waste into degradable, recyclable, and non-recyclable plastic product waste. The former two kinds of plastic product waste can be wholly mitigated without further environmental pollution, and the latter are incinerated and may generate carbon dioxide and other toxic gases. So, we consider the amount of exhaust gas that the environment can withstand and the proportion of waste gas absorbed by incineration plants, and on this basis, we quantify the maximum levels of plastic product waste mitigated in an environmentally safe way.

- Then, we design a three-level evaluation system for plastic waste reduction capability, PMC, to investigate the minimal achievable level of global waste of single-use or disposable plastic products. To concrete, based on Analytic Hierarchy Process (**AHP**) and Entropy Weight Method (**EWM**), we select six indicators indicating generating less and mitigating more single-use or disposable plastic product waste, and on this basis, construct the three-level evaluation system. To validate the generalization of the designed three-level evaluation system, we apply it to Japan and Vietnam and compare the minimal achievable level of waste of single-use or disposable plastic products in Japan and Vietnam. On this basis, we highlight several suggestions for future mitigation of single-use or disposable plastic product waste.

- Thereafter, we propose a target for the minimum achievable level of global waste of single-use or disposable plastic products in 2030 via perturbing the indicators in the PMC model. To concrete, we use the **Grey-Verhulst model** to predict and compare the PMC curve and the perturbed PMC curve to evaluate the effectiveness of the perturbed PMC. Then, on this basis, we discuss the impacts of achieving such a level on laws and regulations, human life, ecological environment, and the multi-trillion-dollar plastic industry.

- Finally, we conduct the in-depth analysis of MPMV and PMC models, and put forward the SPMV model based on the careful consideration of national plastic waste reduction potential and development status, in order to ensure the equity of task distribution of plastic waste reduction among countries.

In summary, the proposed models formalize a fairer globally achievable goal and promotion measures for mitigating single-use or disposable plastic product waste. What's more, they can dynamically adapt according to, including but not limited to, the amount of plastic product waste, national development capacity.