2020 年美国大学生数学建模（MCM/ICM） E 题中文翻译

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翻译：淹没在塑料中

自 20 世纪 50 年代以来，由于塑料的用途多种多样，如食品包装、消费品、医疗器械和建筑等，塑料制造业呈指数级增长。虽然有显著的好处，但与塑料产量增加相关的负面影响令人担忧。塑料制品不易分解，难以处理，只有大约 9% 的塑料被回收利用 [1]。通过每年大约有 4-12 亿吨塑料废物进入海洋就可以看出 [1,2]。塑料废料对环境造成了严重的影响，据预测，如果我们以目前的趋势继续下去，到 2050 年，海洋中的塑料将比鱼类多 [2]。人类已经对塑料对海洋生物的影响进行了研究 [3]，但塑料对人类健康的影响尚未完全了解 [4]。一次性和一次性塑料制品的兴起导致整个行业致力于制造塑料垃圾。它还表明，塑料制品使用时间明显短于适当减少塑料浪费所需的时间。因此，要解决塑料废弃物问题，必须减缓塑料生产的流程，提高塑料废弃物的管理水平。

您的团队已被国际塑料废物管理委员会（ICM）聘请来处理这场不断升级的环境危机。你必须制定一个计划，来大大减少（如果不能消除）一次性使用和一次性塑料产品的浪费。

- 建立一个模型来估计一次性使用或一次性塑料产品废物的最大水平，这些安全废物可以在没有进一步环境破坏的情况下安全地减轻。在众多因素中，您可能需要考虑这些废物的来源、当前废物问题的严重程度以及处理废物所需
- 讨论在何种程度上可以减少塑料废

效性。这些因素可能因地区而异，因此考虑地区的具体制约因素，可能会使一些政策更为实际和有效。

- 利用你的模型和讨论，为全球一次性或一次性塑料产品的使用可达到的最低水平设定一个目标，并讨论达到这一水平的影响。你可以考虑改变人类生活的方式，环境影响，或者对价值数万亿美元的塑料工业的影响。
- 虽然这是一个全球性的问题，但其原因和影响并不是在每个国家或地区之间都相同。讨论全球危机引发的公平问题和你的预期解决方案。您建议 ICM 如何解决这些问题？
- 向 ICM 写一份两页的备忘录，说明全球一次性或一次性塑料制品废物可达到实际最低目标水平、达到该水平的时间，以及可能加速或阻碍实现目标和时间线的任何情况。

你的意见应包括：

- 单页摘要表
- 目录
- 两页备忘录
- 您的解决方案不超过 20 页，包含摘要、目录和两页备忘录时最多 24 页。

注：参考列表和任何附录不计入页面限制，应在完成解决方案后显示。您不应使用未经授权的图片和材料，其使用受到版权法的限制。确保你引用了你的观点的来源和你报告中使用的材料。

词汇表

- **一次性塑料制品**：不可回收的塑料材料或产品垃圾。
- **减轻**：减轻、缓和、减轻。
- **塑料垃圾**：未正确回收或无法回收的塑料物品；由塑料制成的碎片。
- **一次性塑料制品**：由塑料制成的产品，在废弃前仅使用一次。

原文：Drowning in Plastic

Since the 1950s, the manufacturing of plastics has grown exponentially because of its variety of uses, such as food packaging, consumer products, medical devices, and construction. While there are significant benefits, the negative implications associated with increased production of plastics are concerning. Plastic products do not readily break down, are difficult to dispose of, and only about 9 % of plastics are recycled [1]. Effects can be seen by the approximately 4-12 million tons of plastic waste that enter the oceans each year [2,3]. Plastic waste has severe environmental consequences and it is predicted that if our current trends continue, the oceans will be filled with more plastic than fish by 2050 [2]. The effect on marine life are not yet completely understoc

to properly mitigate the plastic waste. Consequently, to solve the plastic waste problem, we need to slow down the flow of plastic production and improve how we manage plastic waste.

Your team has been hired by the International Council of Plastic Waste Management (ICM) to address this escalating environmental crisis. You must develop a plan to significantly reduce, if not eliminate, single-use and disposable plastic product waste.

- Develop a model to estimate the maximum levels of single-use or disposable plastic product waste that can safely be mitigated without further environmental damage. You may need to consider, among many factors, the source of this waste, the extent of the current waste problem, and the availability of resources to process the waste.
- Discuss to what extent plastic waste can be reduced to reach an environmentally safe level. This may involve considering factors impacting the levels of plastic waste to include, but not limited to, sources and uses of single-use or disposable plastics, the availability of alternatives to plastics, the impact on the lives of citizens, or policies of cities, regions, countries, and continents to decrease single-use or disposable plastic and the effectiveness of such policies. These can vary between regions, so considering regional-specific constraints may make some policies more effective than others.
- Using your model and discussion, set a target for the minimal achievable level of globa waste of single-use or disposable plastic products and discuss the impacts for achieving such levels. You may consider ways in which human life is altered, the environmental impacts, or the effects on the multi-trillion-dollar plastic industry.
- While this is a global problem, the causes and effects are not equally distributed across nations or regions. Discuss the equity issues that arise from the global crisis and your intended solutions. How do you suggest ICM address these issues?
- Write a two-page memo to the ICM describing a realistic global target minimum achievable level of global single-use or disposable plastic product waste, a timeline toreach this level, and any circumstances that may accelerate or hinder the achievement of your target and timeline.

Your submission should consist of:

- One-page Summary Sheet
- Table of Contents
- Two-page Memo
- Your solution of no more than 20 pages, for a maximum of 24 pages with your summary, table of contents, and two-page memo.

and materials whose use is restricted by copyright laws. Ensure you cite the sources for your ideas and the materials used in your report.

Glossary

- **Disposable Plastic Products**: plastic materials or products that are not recyclable and become trash.
- **Mitigate**: To make less severe, to moderate, to alleviate.
- **Plastic Waste**: plastic objects that have not been recycled properly or cannot be recycled; debris made of plastic.
- **Single-Use Plastic Products**: products made of plastic intended for one time use before being discarded.

参考资料

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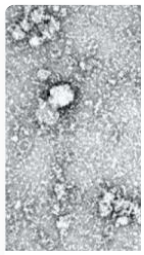

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