

A Bibliometric Analysis of the Plastic Waste

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Abstract—The spreading of plastic particles after disposal and the problems it implicates are one of the most emergent questions of today, requiring deep characterization and monitoring of the involved processes. In this work, we do a bibliometric analysis of 15350 publications, selected from the Web of Science, related to the fate of plastic after disposal in several branches of the plastic cycle. We've verified that plastics have become an interesting topic in recent years.

Keywords— plastic, bibliometric analysis.

I. INTRODUCTION

Plastic has become an indispensable and ubiquitous product of modern life, deeply ingrained in numerous aspects of our daily routines and industries. Its great versatility, durability, and cheapness makes it to be present in many objects and components of today. However, the awesomeness of plastic has prompted humanity to engage in its widespread production and utilize it in diverse applications, including many non-essential and quick-to-use items, leading to high disposal rates. It is precisely after disposal that plastic mostly becomes dangerous because it can be degraded into micro particles that are easily transported and ingested, having been detected all over the planet (Fig.1), including in the most remote and pristine zones and even inside the human body. These are hints that show humankind is facing a(nother) global emergency for which the whole picture is still not known. Concepts such as the plastic cycle [1], and plastic as part of the planetary boundary for novel entities [2] are being used to help articulate the problem but the scientific continues to alert for the fact that it is necessary to monitor more and put numbers on this problem, which requires a fast and unified effort of all political regions of the world.



Fig. 1 Fragments of plastic on natural soil.

In this work, we do a bibliometric analysis of 15350 publications related to the fate of plastic after disposal in several branches of the plastic cycle [1].

II. DATA AND METHODS

Publications on the concepts of receptacles and processes (Fig. 2) of plastic after disposal, based on [1], were retrieved in 26/05/2023 from the Web of Science using the query `TS=*plastic*` and `(TS=terrestrial or TS=atmosphere or TS=*water* or TS=coast* or TS=river or TS=ocean* or TS="ocean surface" or TS="ocean column" or TS=sediment* or TS=animal* or TS=organism* or TS= human or TS=fauna or TS=soil)` and `(TS=suspension or TS=deposition or TS=*flux* or TS=ingestion or TS=egestion or TS=mineralization or TS= mineralisation or TS=fragmentation)`.

Bibliometric analysis of the 15350 publications retrieved was then performed using R [3] package Bibliometrix.

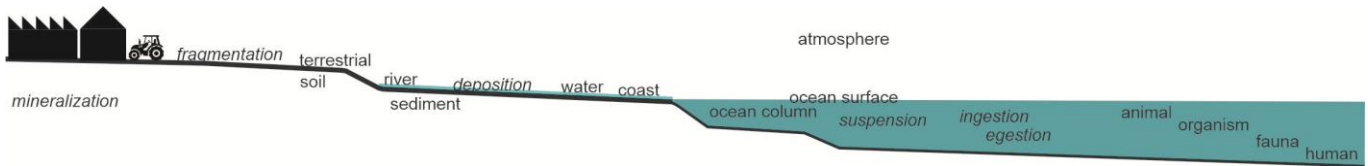


Fig. 2 Fate of plastic after disposal. Regular font represents receptacles, and italic font represents processes.

III. RESULTS AND DISCUSSION

Fig. 3 shows that the research areas that have covered the fate of plastic after disposal are Environmental Sciences Ecology, with 32% of total publications, followed by Engineering, with 14% of total publications.

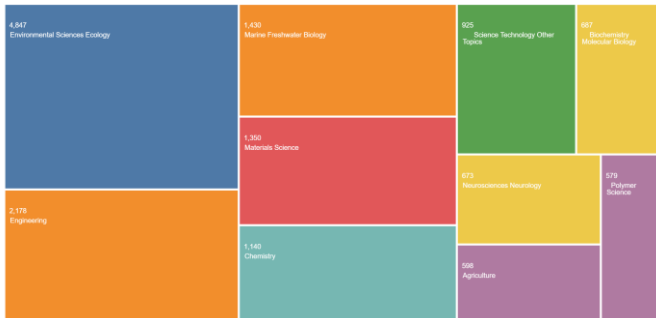


Fig. 3 Research areas that have covered the fate of plastic after disposal in the selected 15350 publications.

Fig. 4 presents the most frequent words, where we can identify the Ingestion process as the most mentioned and studied. The other processes identified in the plastic cycle have little frequency, which is the case of Deposition and Fragmentation. Receptacles such as Sediments and Sea have some frequency, and Surface Waters have a low frequency.

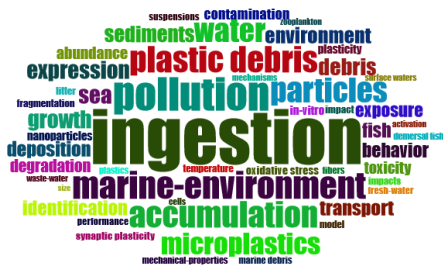


Fig. 4 Most frequent words in the selected 15350 publications.

Fig. 5 shows the thematic evolution of the themes of Expression, Water, and Ingestion between periods 1936-2018 and 2019-2023. Theme Water has evolved, among others, to two themes that are processes of the plastic cycle – Deposition and Suspension. Theme Ingestion is still being studied and it has also evolved into Pollution. Theme Expression is related to Neural Research, and it has evolved to more detailed neural subthemes. It is most certain that, in this case, the meaning of the word plastic is the easiness to be shaped, instead of the material plastic.

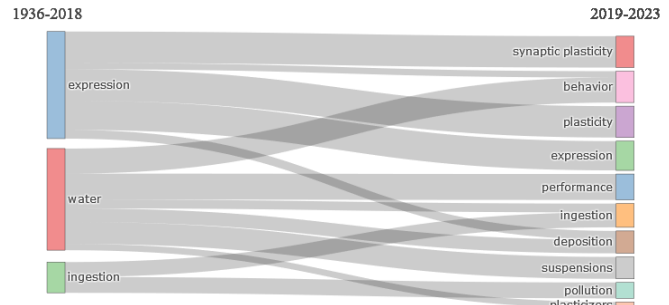


Fig. 5 Thematic evolution between periods 1936-2018 and 2019-2023 in the selected 15350 publications.

We've verified that, in the selected publications, plastics have become an interesting topic in recent years, which may indicate that this research interest is rising iteratively as the number of publications grows, calling more and more attention to the problem and simultaneously knowing it better and creating opportunities for solutions and innovation.

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