



Effect of Micro Plastics in Asian Rivers

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INTRODUCTION

Plastics, among the most adaptable materials ever created by humans, have considerably improved parts of daily living, albeit with major environmental consequences. Mismanagement of plastic trash has arisen as a major environmental concern, destroying natural beauty and leaving lasting contamination for future generations. Mislabeled plastics, which migrate from the terrestrial to aquatic realms, endanger vital water resources and increase human exposure to contaminants, particularly micro plastics. Micro plastics, which are divided into primary and secondary varieties, come from a variety of sources. Primary micro plastics enter ecosystems through industrial and residential activities such as textile and plastic production, agriculture and personal care goods, resulting in the release of billions of particles annually.

DESCRIPTION

Secondary micro plastics are formed when bigger plastic items degrade due to environmental causes, contributing to contamination in ecosystems. Micro plastics are ubiquitous in environmental matrices such as sediments, surface waters and organisms, posing major threats to human, animal and ecosystem health. Human exposure occurs through consumption, inhalation and skin contact, most commonly through contaminated food. Long-term exposure poses health risks, including inflammation, metabolic changes and reduced barrier functioning, depending on individual clearance rates. Furthermore, direct human contact with micro plastics via the skin and respiratory systems creates new exposure pathways, with some plastics providing increased dangers due to their size and physical qualities. Despite this expanding understanding, freshwater plastic contamination, particularly in Asia, is understudied when compared to marine habitats. Recent studies in several countries have begun to address this gap, emphasizing the essential role of rivers in delivering plastics to the oceans. Freshwater

plastic pollution is a relatively young area, with most efforts focused in Europe and North America's industrialized nations. Initially, micro plastics research focused on marine environments. Micro plastics in rivers have recently been researched in several countries, including England, Germany, France and Switzerland.

Asia, with its high plastic consumption and manufacturing, notably in China and Japan, is a significant contributor to worldwide micro plastic pollution. Asian rivers, clogged with plastics as a result of fast urbanization and poor waste management, are major sources of marine pollution. While marine studies predominate, the lack of study on freshwater systems, particularly in Asia, highlights the critical need for thorough studies to inform risk assessments and policy design. This study attempts to fill a knowledge gap about micro plastic pollution in Asian inland waters, emphasizing the importance of thorough research to understand the entire spectrum of micro plastic impacts and guide effective mitigation methods.

To thoroughly assess the presence of micro plastics in Asian freshwater systems, we conducted a thorough literature search in March 2022 using the Scopus database. The Electronic Supplementary Materials (ESM) contains thorough information on the search technique and outcomes. From a total of 457 studies, we discovered 36 overlaps between queries. After deleting duplicates, the authors assessed the literature list using their own expertise and experience, discovering seven missing papers that were added to the search results. The selected papers were then matched to references from recent micro plastics literature reviews, revealing one more relevant study, which was included to the search results. Following identification, full-text materials for all 429 indexed publications were requested. The 428 publications were reviewed for eligibility, with 199 excluded due to geographical irrelevance, focus on unrelated topics (e.g., biofilms, risk assessments) or methodological inconsistencies.

Data extraction and analysis for data extraction, we created a google sheets template with three major elements.

Initially, we recorded the country, freshwater system type, sample year, compartment, micro plastic size range and equipment utilized. While rivers were the primary emphasis, we also studied canals and lakes. Water sampling methods ranged from nets and traps to manual sediment techniques and biota collection approaches ranged from fishing to direct purchase. Next, we gathered river and compartment specific data, such as the abundance of micro plastics and their main shapes, materials, colors and sizes. We also took note of suspected micro plastic sources and other pertinent observations. Following data extraction, we conducted a consistency check and corrected any errors discovered.

Micro plastic concentrations were standardized for comparison and the data was used to rank freshwater ecosystems based on pollution levels and categories the most frequent micro plastic characteristics. This analysis made it easier to identify long-term methodological and spatial trends.

CONCLUSION

In the final part, we collected geographic coordinates for each study's sampling locations, allowing us to map the data and indicate areas that require extensive or limited research. Of the 228 papers, 117 supplied coordinates in the text or as additional resources. Where necessary, we obtained coordinates from provided figures or contacted the authors directly. This mapping work helps identify both well-studied and under-researched areas.