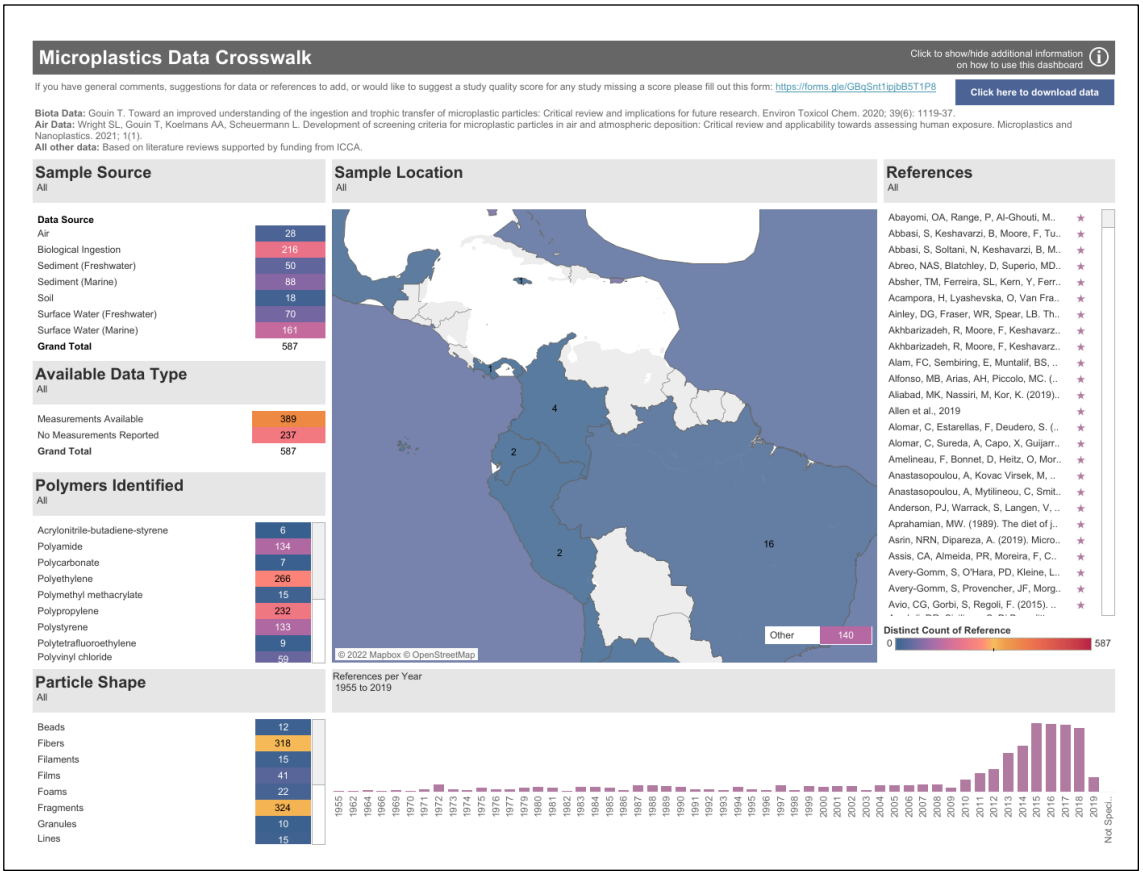
Exploring Microplastics Environmental Monitoring Data: Development of a Dashboard to Track, Analyze, and Display Data

Background

Concern over microplastics in the environment has emerged as a global issue in recent years. To better understand and facilitate access to published environmental monitoring studies and data, a pilot project was initiated by the American Chemistry Council's Long-range Research Initiative (ACC LRI) to collect and organize these studies using a data visualization tool. Published studies reporting microplastics in several environmental media (biological, sediment, soil, and surface water) were reviewed, relevant data extracted and cataloged in a spreadsheet, and then the data were linked to the Tableau® analytics platform so that the data can be visualized and queried interactively, and areas of interest, gaps, and research opportunities could more easily be identified.

Creation of the Dashboard: click here to access the interactive environmental monitoring data visualization tool

The use of interactive dashboards, such as Tableau, can be an efficient way to organize and explore extracted data. Accordingly, an interactive dashboard (Figure 1) was created for this pilot project by incorporating high-level data extracted from a select set of microplastics references[1] (see the "References" field on the dashboard for a full list of references included and click the download button in the top right of the screen to download the data behind the dashboard).



Extracted data were systematically categorized to derive distinct counts of specific features (e.g., dates and location of sampling, media sampled, polymers identified, particle shape, quantitative data, etc.) of each study. These meta data were then cataloged and linked within Tableau. Using the Tableau dashboard, study features can be aggregated and viewed in the

The microplastics dashboard can be accessed at: https://public.tableau.com/views/MicroplasticsCrosswalk/MicroplasticsDataCrosswalk?:language=en-US&:display_count=n&:origin=viz_share_link

colored 'heatmaps' using "cool toned" color shading for smaller counts and "warm-tone" shading for larger counts. This shading makes it easy to visualize where data gathering has been concentrated, areas with fewer studies, and to explore specific studies and their datasets in more detail. The dashboard can be customized with interactive filters for additional variables of interest to allow further exploration of the available data resulting from systematic categorization.

Utility and Features of the Dashboard

The dashboard is a living resource and contains a Read Me tab to help the user navigate the interactive features and explore the data. Some of the key features are described below.

Map: The main map at the top of the page shows numbers of studies by location parameters. Numbers represent distinct counts of studies, and shading indicates least-to-most studies in a cool-to-warm tone shaded pattern. A tooltip shows details about examined and measured endpoints activated by hovering over each colored block on the map. With a click or a hover, the user can apply filters, determine counts, and obtain pop-outs of reference material.

References: The references shown in this dashboard are listed in the top right of the dashboard by short citation. Hovering over the star alongside each reference provides additional reference information.

Filters: A variety of filters are available to filter the dashboard by several variables. Use the drop-down checkbox filters to include or exclude various values or click on a bar of the 'year' bar chart or a row of the 'Polymer Domain' or 'Source' filters to filter as well. Once the dashboard has been filtered to the desired references, the information can be downloaded using the download icon in the bottom right of the dashboard and selecting "Data."

Study Quality Score: The study quality score is not currently represented in the dashboard, but the feedback link in the dashboard allows for a preliminary review of the study quality.

Next Steps and How to Get Involved

This version of the dashboard is considered a "Beta-Version" developed as a pilot study by the ACC LRI. The literature set used in developing this version only runs through 2019. This beta version will be available for 6 months to gather input and feedback from users. At the end of that time, the feedback will be reviewed, and a determination will be made whether to continue with the development of this tool (e.g., update the dataset through 2022 and whether to add additional data and filters).

For more in depth steps on how to use the dashboard, please view the "Visualizing Microplastics Environmental Monitoring Data" video found here and in the dashboard.

For a high-level example of how to download a data set from the dashboard, please find the "click here to download the data" tab in the dashboard. This download provides a sample spreadsheet of relevant data and includes a READ ME tab on understanding the spreadsheet and the data provided.

As you review the dashboard, please consider filling out the survey located at the top of the screen to provide feedback and your ideas of how to edit, update, and improve the dashboard. This survey allows you to:

- Add general comments about the dashboard or these efforts
- Request new studies or data to be added
- Add ideas for new features
- Suggest a Study Quality Score (Not a suggestion of true quality, but can be used to identify potentially useful studies)

If you have further questions or would like to stay updated, please contact acc_lri@americanchemistry.com for more information.

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[1] **Biota Data:** Gouin T. Toward an improved understanding of the ingestion and trophic transfer of microplastic particles: Critical review and implications for future research. Environ Toxicol Chem. 2020; 39(6): 1119-37. **Air Data:** Wright SL, Gouin T, Koelmans AA, Scheuermann L. Development of screening criteria for microplastic particles in air and atmospheric deposition: Critical review and applicability towards assessing human exposure. Microplastics and Nanoplastics. 2021; 1(1). **All other data:** Based on literature reviews supported by funding from ICCA.