Workshop Report:
Maximizing the Value of Environmental Microplastics Data

Convened on September 27-28, 2021

Report Prepared by:

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Organised and facilitated by

University of Waterloo's Water Institute, the Federated Research Data Repository (FRDR) and the Gordon Foundation.

Suggested citation:

Executive Summary

On September 27th and 28th, 2021, the University of Waterloo's Water Institute, the Federated Research Data Repository (FRDR), and the Gordon Foundation hosted a workshop titled "*Maximizing the Value of Environmental Microplastics Data*".

The workshop brought together microplastics researchers and data experts to explore how the FAIR principles (Findable, Accessible, Interoperable, Reusable) could be applied to microplastics data to improve data management. The workshop was discussion-based and focused on how the accessibility of microplastics data could be improved with data repositories and the application of data standards. A total of 50 people attended, who represented a range of roles related to microplastics research, including data users, data generators, and data managers.

Ahead of the workshop, the first version of a microplastics (meta)data reporting template was drafted and distributed to participants. Further discussions aimed to build consensus around a standard set of metadata fields for the template, which could be used by researchers to increase interoperability of data across research projects. Additionally, participants identified steps that could be taken to support the ingest of microplastics data into FRDR and DataStream.

The workshop consisted of two two-hour sessions. It began with a presentation with Paul Helm from the Ontario government on the challenges of microplastics data management, which included examples of how having access to microplastics data could improve decision making. Our workshop hosts then provided an overview of the FRDR and DataStream repositories and shared ideas for enhancing the accessibility of microplastics data. A panel of researchers shared their current approach to data management, highlighting challenges they have encountered, and identifying potential opportunities for increasing data accessibility. The panels were followed by breakout groups that enabled all participants to discuss opportunities for applying the FAIR principles to microplastics data. On the second day, our team presented the work we have done to date to standardize environmental microplastics metadata. Participants also heard from Win Cowger, Research Scientist from Moore Institute for Plastic Pollution Research whose earlier work in the field helped form the basis for the template. The following breakout discussions were used to gather feedback on the proposed metadata template and identify next steps associated with implementing the template.

Through discussions in the breakout groups, participants made several recommendations for improving the microplastics (meta)data reporting template. In general, participants agreed on the need for increased training and education opportunities, support for continuous engagement with the microplastics community and the incorporation of open science and FAIR principles.

Workshop Hosts

Water Institute

The Water Institute was established by the University of Waterloo in 2009 to be a global leader in interdisciplinary water research and education. The Institute facilitates interdisciplinary collaboration and knowledge exchange in addressing complex water challenges and promotes innovation in interdisciplinary research and education. With over 150 faculty members, including more than 20 Canada and University Research Chairs, representing 23 departments and schools across all 6 faculties, the Water Institute is the largest water research centre in Canada.

Data Stream

DataStream is an open access platform for sharing water quality and sediment quality data in Canada. Developed by The Gordon Foundation, DataStream is carried out in collaboration with regional monitoring networks in four hub regions--the Mackenzie Basin, Lake Winnipeg Basin, Atlantic Canada, and the Great Lakes and Saint Lawrence region. DataStream is free to use and brings together data from across sectors, generated by monitoring programs of all sizes, including community-based water monitoring efforts, Indigenous led programs, academic research initiatives and provincial/territorial and federal programs. As the platform grows and the digital infrastructure advances, the DataStream system is scaling to become a pan-Canadian platform that is able to bring in larger datasets and higher frequency data to meet user's needs. DataStream ensures data are open and adheres to FAIR principles by minting Digital Object Identifiers (DOIs)to datasets, publishing datasets under open data licenses, providing structured metadata and adhering to the US EPA and USGS's WQX schema for water quality data.

Federated Research Data Repository

The Federated Research Data Repository (FRDR) is a national (Canadian), general-purpose repository service managed by the Digital Research Alliance of Canada. FRDR can ingest, publish, and preserve data in a wide variety of formats, and is an appropriate solution for researchers who need to publish large datasets, data from multi-institutional research projects, and data that do not fit into an existing institutional or disciplinary repository, such as DataStream. FRDR assigns DOIs to published datasets to make them easy to cite and link to, and dataset views and downloads are tracked, which can help researchers demonstrate the value and interest in open data. FRDR is also a discovery portal for Canadian research data. FRDR harvests metadata from repositories across Canada so researchers can search for data in one place, and feeds metadata from Canadian repositories into international discovery portals such as OpenAIRE.

Background and Context

Microplastic (MP) pollution is a global environmental hazard with far-reaching consequences for food webs, biodiversity, ecosystem services and human well-being. As concern over microplastics grows, research has increased exponentially in Canada (see figure 1), yet the underlying data are not easily discoverable. Disciplinary repositories that describe data in a standardized manner, such as the Global Freshwater Quality Database GEMStat or the Canadian water quality DataStream repository, are not yet designed to support the diversity of data inherent in microplastics research, limiting their ability to accommodate this field. General-purpose repositories such as the Federated Research Data Repository (FRDR), Polar Data Catalogue, or institutional Scholars Portal Dataverse repositories can accept any type of data so are well-suited to multidisciplinary fields, but they don't require metadata fields that capture the diverse MP data. When data are not shared, and when available data and metadata are not interoperable, it is difficult to translate research results into public policy, programs and strategies.

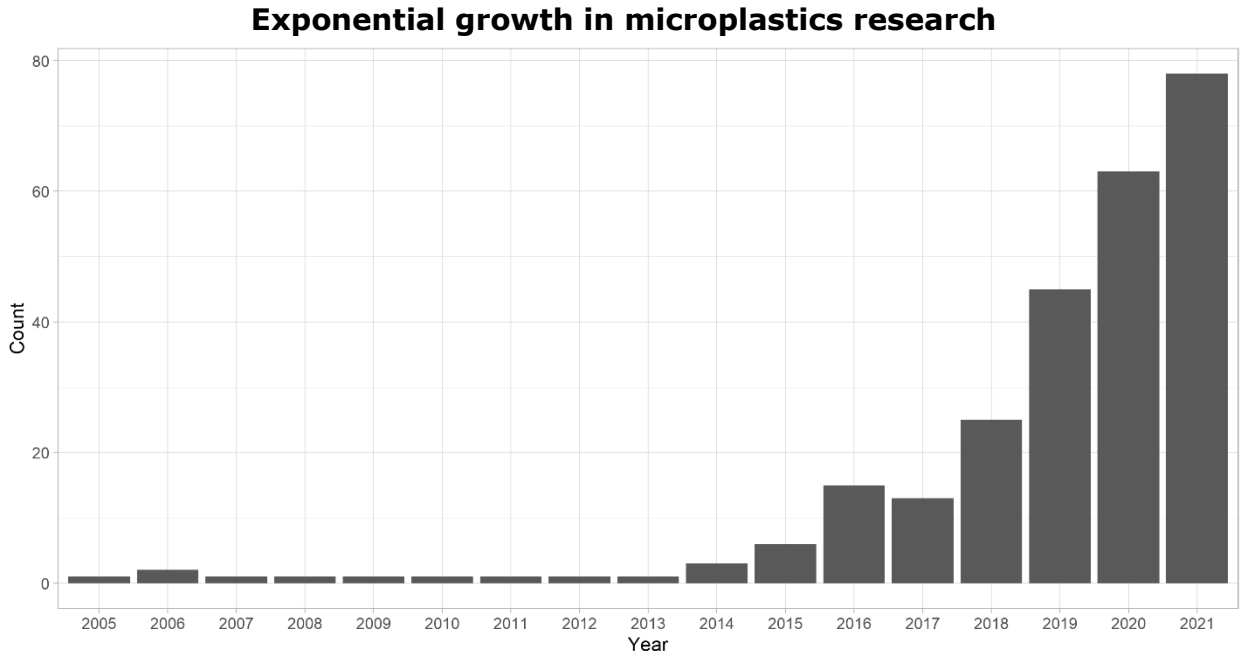


Figure 1: Number of publications with a Canadian institution affiliated author that are related to microplastics (2005-2021). Data was downloaded from Scopus via University of Waterloo library on Aug. 2021 using the search term "microplastic*" and limiting to the Subject Area of Environmental Science.

Workshop and Report Scope

This report provides a summary of the workshop discussions, drawing on content from the presentations and breakout group conversations. Discussions were centered around data management with a focus on environmental microplastics data, specifically data collected from soil, water, atmosphere and aquatic sediments.

Workshop Goals

1. Bring together the microplastics research community to identify strategies to improve microplastics data management through the FAIR principles (Findable, Accessible, Interoperable, Reusable).
2. Identify barriers that prevent research groups from sharing microplastics data on open data repositories.
3. Discuss strategies that would enable FRDR and DataStream to accept and publish microplastics data.
4. Identify strategies for implementing data management recommendations outlined in the literature. Seek consensus on a standard set of metadata fields that can be used by researchers to facilitate interoperability across datasets.
5. Identify next steps or further actions needed to implement microplastics data management best practices that align with Canada's commitments to open data and the FAIR principles.

Template Development

As stated above, one goal of the workshop was to seek consensus on a standard set of metadata fields. As such, in preparation for the workshop, the University of Waterloo research team developed a draft template that would capture both metadata and data for microplastics research. The first step was to conduct a literature review and connect with colleagues who have experience in this area. Some of the most helpful resources included the Arctic Monitoring & Assessment Programme (AMAP) Litter and Microplastics Monitoring Guidelines, Cowger et al. (2020), GEMStat report, US EPA's Water Quality Exchange (WQX) user templates, and DataStream's data upload templates. We then adapted the DataStream surface water quality upload template for microplastic characterization (meta)data by adding new elements and metadata tabs to reflect the reporting guidelines recommended by the literature. Many of the elements (49%) that are required for reporting environmental microplastics (meta)data are the same as the elements required for environmental water quality monitoring and already found in DataStream's current template or within WQX templates (Table 1). The additional metadata elements (51%) came from recommendations in the AMAP report and in Cowger et al. (2020).

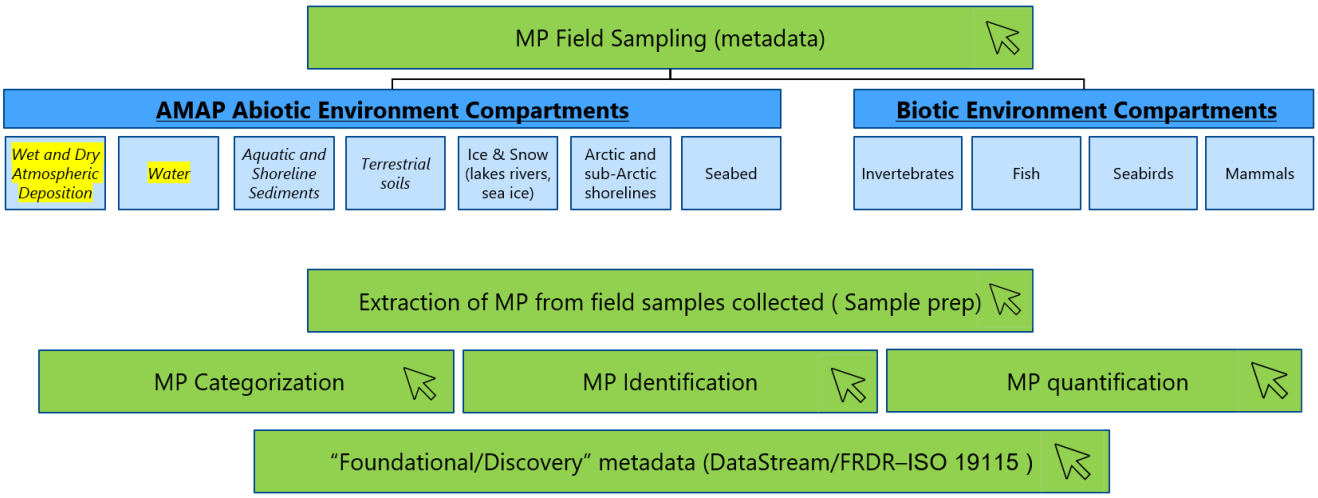


Figure 2: A summary main proposed metadata categories suggested in the draft (meta)data reporting template for microplastics. (Slide from Rodney Smith Presentation – Appendix 5). The text highlighted in yellow were the main media/compartments types that were the focus of the template

	Number of elements	Percent of total
From DataStream & WQX	**36**	**21%**
From WQX	**33**	**19%**
New proposed fields	**101**	**59%**
Total elements from WQX	**69**	**41%**
Total elements in template	**170**	**100%**

Table 1: Summary of metadata elements in WQX or DataStream Templates along with new proposed metadata elements

Template level of detail

In its current form, the template (Appendix 4) includes a significant number of fields, however, this is necessary for reporting FAIR microplastics data. The fields included are important metadata elements, which provide the granularity necessary for reporting microplastics characterization data at multiple scales of analysis, and which relate to different disciplines of study. Populating standardized metadata elements and recording (meta)data in a consistent manner will help the community harmonize methods for sampling and measuring microplastics. This will support reproducibility and comparability of results and will eventually lead to the quality data to needed conduct risk assessment. If using the template to collect or collate data, it is important that focus be placed on understanding the data in the context in which it is collected, especially in the rapidly

growing microplastics discipline. Notwithstanding, the template in its current form should help a developing microplastics community of practice further build consensus around what elements are necessary to document when collecting and managing microplastics data.

Workshop Content

This section outlines the main concepts and ideas highlighted by the panelists and/or participants.

Common practices for microplastics data management

Summary of types of data

The microplastics characterization data collected by workshop participants are heterogeneous in terms of data types, scale of analysis, and environmental media. The environmental media types being sampled, and from which microplastics samples are being separated, include sediments, rainwater, surface water, soils, and animal tissue. Microplastics characterization data are also being collected for non-environmental commercial (micro)plastics samples to build spectral and other characterization method databases. The variables characterized during microplastics sample analysis include: colour, shape, size and polymer type. These variables are characterized by individual microplastic particles separated from a bulk sample to give a total percent abundance value of each colour, shape, size and polymer type category for the bulk environmental sample. The total number of microplastic particles in each sample is often counted manually, although there are techniques such as Pyrolysis GC-MS which can measure the total mass of plastic in a sample. Raman and/or Fourier Transform Infrared (FTIR) spectroscopy techniques are used to characterize the polymer type of individual microplastic particles. These analyses are labour intensive. They are often performed on a subset of the particles in the bulk sample, and it is assumed that the percent abundance of polymer types in this random subset can be scaled up to the whole sample. Spectral libraries (or databases) are used to identify the polymer types of individual particles by comparing their spectra to reference spectra for known plastic types in the spectral library. These spectral libraries are currently not developed with environmental microplastics samples in mind, and inaccurate identification of the polymer of microplastic particles is likely. For this reason, researchers encourage retention of raw sample spectra files so that these spectra can be reanalyzed later, although this practice is not common in all research groups. Given the relative abundances of the polymer types in the sample, and the total particle count for a sample, researchers can use the average densities of each polymer type and the measured particle sizes to calculate the total mass of microplastics in their bulk sample. This approach is less common, and researchers globally are still working on ways to automate the process of estimating the mass of microplastics in a sample, and ways to count the microplastic particles in a sample using image analysis. It is also common for researchers to take photos of their samples. Since categorization of microplastics is not yet standardized, the photos can be reanalyzed in the future.

Software and data dissemination

Microplastics science across Canada is growing but management of data within this community is *organic*, dispersed, and often disparate. Workshop participants highlighted the fact that most researchers use Microsoft Excel to manage their data. In terms of data dissemination, some

microplastics data, along with their metadata, are included as supplemental materials at the point of publication (if the journal publisher has an explicit data sharing policy), but other times, data files remain on researchers' hard drives and are never shared in a repository or database.

Challenges in managing microplastics data

Inconsistent level of metadata detail

Data management practices are primarily driven by students working in research labs, with limited or no training provided in Research Data Management (RDM). Their specific research questions will dictate what (meta)data elements are recorded and how the data are organized. While some efforts are made to streamline consistency, it can be challenging to sustain within a lab or across the academic community because students move on after graduating. New students and Highly Qualified Personnel (HQPs) often have to decode the data to reuse it. This points to the need for a community data management standard with some common metadata elements.

Data collection/generation is not always homogenous. In microplastics, some basic definitions still need to be agreed on (e.g., definitions for size and morphology) and separation and characterization methods have yet to be standardized. There are many categories that mean different things, and different researchers are using different terms. How can we bring these together as equivalents or sub-categories to help to standardize information or make it comparable across research projects? For example, to describe morphology, people use their own set of terms. Pellets and fibers/fibres and films are common, but other shapes are *ad hoc* or used interchangeably -- e.g., pellets and beads are sometimes used interchangeably, although they are different). This can lead to frustration when a researcher is unable to compare samples (across spatial and temporal scales) with the literature, because the words and their meanings are different. Participants also recognized that emerging new methods add another layer of complication to standardization of metadata elements for microplastics research. In addition, there is not yet consensus around which (meta)data elements are essential for reporting. Since microplastics is a new field, early in its development, there are limited resources that document what the minimum data requirements/formatting are, and what is essential for reporting. To meet the needs of the community, data generators and data users, basic definitions, standardizing methods and minimum reporting requirements need to be determined.

Discipline specific repositories and databases do not ingest microplastics data

Some groups who are interested in making their data open access using a standardized format have approached discipline specific repositories, such as the Canadian Integrated Ocean Observing System (CIOOS), as potential places to deposit microplastics data. However, issues related to the lack of standardization surfaced as they tried to assess how to classify and deposit the data. The metadata collected by existing disciplinary repositories are not currently designed to capture the breadth and depth of microplastics (meta)data. There are questions around how to balance collecting and publishing meaningful metadata while also trying to make it fit with current repository standards and practices, and with researcher and data user needs. Participants suggested this may require constructing a database from the ground up, standardizing collection procedures and defining morphology with the ultimate goal of standardized and interoperable data and

metadata. While the workshop was a step towards improved collaboration for data management, there remains a need for better coordination/standardization to ensure microplastics data are interoperable and reusable.

Managing historical/ backlog microplastics data

Another issue highlighted at this workshop is that many researchers have a backlog of data that has not yet been added to a data portal with appropriate metadata. This raises the question: How do we get historical data into a repository with standardized metadata fields? Participants acknowledged that this process would require substantial resources, time and training to ensure that it is done well and within acceptable data management standards. However, funding for these types of data management activities is limited, and this will continue to be a major limitation for FAIR microplastics data management going forward.

Limited incentives for making data open

Publishing datasets as entities equivalent to articles and other scholarly outputs is perceived as not providing immediate reward/incentive. There are limited rewards available to incentivize researchers who compile, curate, and share data openly to support data interoperability. Data publication often does not count towards tenure promotion, and funding is not readily available to support hiring data managers or other HQP to help implement the data management life cycle process. At this time, data are typically only shared when it is required by journals or funders. For example, a workshop participant stated that in crystallography, changing the requirements for publication changed the landscape of research. As a next step, something similar could be done in the microplastics field to encourage data publication and sharing.

Limited knowledge/access

The newness of the field was highlighted as a potential barrier to microplastics data publication. Workshop participants discussed the difficulty of sharing microplastics data given that there is no standardization between datatypes. There is also limited guidance about which repositories are suitable to store and share microplastics research, and limited training opportunities on how to create clean data or how to upload data to repositories. To make data more open and available, training should be developed to cover how to collate, manage, and upload data. Ideally there will also be direction about which repository(ies) to use for microplastics research, to get everyone on the same platform.

Feedback on the (meta)data reporting template

The second day of the workshop focused on describing how the template was developed, and participants were asked to provide feedback on how the template may be used, as well as opportunities for improvement. In summary, there was strong support for developing a standardized template and encouragement of its widespread use.

We heard that some participants felt overwhelmed by the detail in the template (Appendix 4) when it is first opened. However, we also heard that an illustration of the template (in PowerPoint, Appendix 5) was extremely helpful, highlighting the need for complementary training. Additionally, because the template includes so many fields (many of which are optional),

participants were worried that filling it out would be too time consuming. As such, re-organizing the information and using tools such as automation may also be helpful in increasing usability and uptake. Overall, workshop attendees felt that the template would benefit their research, would advance efforts to standardize microplastics data, and would enable future use of the data, such as to set research priorities and for decision making purposes.

Optimizing the workflow for microplastics data management

In the workshop, it was suggested that the metadata in the template needs to be managed within the context of a researcher's motivation. For example, some researchers are focused on abiotic compartments while others may be focused on microplastics in biotic compartments, and others still are collecting data on commercial (rather than environmental) (micro)plastics. Workshop participants shared many suggestions for improving the metadata template. Some of these suggestions are as follows:

- Include more environmental compartments: Many researchers in the microplastics community study microplastics beyond water and sediments, so any metadata also needs to be managed within the context of a researcher's motivation/research question. For example, some researchers focused on abiotic compartments, but many researchers also focused on microplastics in the biotic compartments). The template should be expanded to include other types of biotic compartments.
- Include more fields about plastic composition: some researchers are collecting characterization, often spectroscopy, data for commercial plastic samples, so including known information about the plastic composition (e.g., manufacturer dye, polymer composition, crystallinity) would be useful; this may require a separate tab.
- Automation of (meta)data template: There are many fields to populate, which can be especially overwhelming in the beginning. Explore the possibility of a template that researchers can query, and allow them to build the template that they need by selecting a specific set of applicable metadata fields. Although these custom templates would vary slightly, the terms and units of measure would remain consistent across templates (projects), which would facilitate interoperability and ease of reuse. Additionally, having a batch pattern function and a way to streamline correcting data to make the template more user friendly and reduce time restraints.
- The template should include a category "*other*" for new methodology techniques (e.g., microwave analysis).
- The use of unique sample identifiers, such as International Geo Sample Number (IGSN), is needed to manage data at various levels; this is needed in IR and Raman Spectral databases. Specifically, realistic databases with spectra of aged plastics that includes sample data associated with the spectral data. Including a repository for the spectra is important since matching quality is based on the extensiveness of a library. This would provide an opportunity for people to go back and do spectral matching with a more updated library and get more accurate results.
- The organization of the template: suggestions include reducing the number of minimum metadata elements (critical elements that need to be met by everyone), since this may be a barrier for broad use due to its complexity. Alternatively, another suggestion was to

have versions/levels, for example, collapsible templates for specific sets of metadata elements, with the flexibility to expand when needed.

- Training: Provide a quick video tutorial, linked from the instructions tab, to explain how the template is organized, and to demonstrate how it functions. This will increase the accessibility of the template, especially for those new to the microplastic community.
- Additional elements to consider adding:
    - Taxonomy descriptions for large scale trash since it would be beneficial for microplastics.
    - A field to indicate whether a sample is commercial or not.
    - A contaminants section to allow researchers to identify if mass spectroscopy was used and if contaminants were identified
    - Product number and name of chemical supplier to promote replicability in procedure and process.

Proposed next steps: Recommendations from workshop participants

The following ideas or concepts were raised during the workshop as suggestions for how we might move towards implementing the template in practice.

Education, training and awareness

As outlined earlier, the level of detail poses an initial barrier that might prevent researchers in the microplastics community from using the template; it will take time for them to become familiar with it. For this reason, attendees emphasized the need for education and training, not only on the template itself, but for data management in general. Workshop participants noted that students and researchers tend to focus on the short-term goals, such as collecting and analyzing data to facilitate graduation or publication. Some may not consider the long-term use of the data they are collecting and therefore may not recognize the importance of proper data management to facilitate the reuse of data. Additionally, training could also increase collaboration. Instead of having each university develop its own training program, consider working together to develop training materials and workshops that promote interoperability and standardization and help everyone use the template correctly.

Continuous engagement

There is a need for collaboration (beyond the institution level) on methods standardization, (meta)data reporting standardization, and consensus building. A number of potential next steps were identified by workshop participants:

- Identify funding opportunities to support further attempts to improve microplastics data management (e.g., NSERC Create)
- Host subsequent workshops that include more researchers, users, and curators to determine what data people feel is essential for reporting and what is needed for reproducibility.
- Create a strategy to ensure long-term sustainability of the template including the incorporation of ongoing feedback,

- Create a network or society (e.g., Canadian Environmental Microplastics Society) that could support ongoing coordination of data management. They could undertake a variety of activities such as coordinate training, develop other resources, organize annual conferences, encourage consensus building, etc.
- Collaborate on a manuscript or associated paper (e.g., describe the template, and how it attempts to improve the FAIRness of microplastics data)
- Test the template by asking research labs to add data and provide feedback

Next Steps: Looking forward in a rapidly growing discipline

DataStream

The workshop and development of MP data template will inform DataStream's approach as they continue to scope the feasibility of accepting field-collected, environmental microplastics data. DataStream will remain engaged with collaborative efforts to refine microplastics data standardization (particularly around microplastics abundance and concentration measures) and will use the outcomes of these efforts to guide future DataStream developments around this data type.

Federated Research Data Repository

FRDR will work with the community to index repositories that host Canadian microplastics data, where technically feasible and in scope, thus expanding the number of repositories that are harvested for discovery. FRDR curators are committed to working with researchers, data managers and research data management librarians at institutions across Canada to enhance the FAIRness of microplastics research outputs. FRDR curators can help draft or review documentation, structure data, augment metadata, suggest appropriate file formats for long-term preservation, and engage in risk and rights management with researchers who deposit data in FRDR. There is also the possibility to create a microplastics 'collection' in FRDR, which would allow researchers from all NSERC/ECCC funded microplastics projects to upload data that does not fit into an existing disciplinary repository in a central location if that is deemed appropriate by the microplastics community and project principal investigators.

FRDR is a service of the Digital Research Alliance of Canada. The Alliance was established to harmonize and improve access to digital tools and services for Canadian researchers, and Alliance staff are available to further discuss the development of research data management training opportunities and resources that would benefit microplastics researchers in Canada.

Water Institute

The University of Waterloo's Water Institute is committed to advancing open data goals and supporting a culture shift towards data sharing within academia and beyond. The Water Institute will continue to facilitate dialogue and conversation that brings together researchers, students and stakeholders to address data sharing barriers. The Water Institute will continue participating in

efforts such as those related to microplastics that help innovate open data practices. Finally, the Institute supports researchers by helping them identify appropriate platforms for their data, including DataStream and the Federated Research Data Repository.

Microplastics project Team at the University of Waterloo

The University of Waterloo project *Microplastics fingerprinting at the watershed scale: from sources to receivers* project team commits to continue to test the template. The draft (meta)data template was developed out of a need identified by this research project which is a four-year project funded by the ECCC/NSERC Plastics for Cleaner Future program. The research team is committed to ongoing development of the template, including in the following ways:

- Immediately begin to stress test the template by adding data from our project. This includes atmospheric and lake core samples.
- Train our research team, including students, on how to use the template.
- Engage with other microplastics research groups within and external to the University of Waterloo to see if they are interested in using the template and providing feedback.
- Develop a process to seek feedback from those who are testing the template in order to make improvements.
- Investigate opportunities for additional funding to support additional work (e.g., automation of certain aspects of the template, data visualization projects, development and delivery of a student training program, publications)
- In the long-term, share data resulting from the project on appropriate open access data portals and in data journals
- Continued engagement with FRDR and DataStream to identify opportunities to support FAIRness of microplastics data

What can individual researchers/research do?

In the microplastics community, each researcher has the responsibility to commit to exercising best data management practices within their individual research group and if possible, make concerted efforts to use available RDM resources available such as the template. They should also provide feedback for improvement because this small step aims to standardize data collection and improve microplastics RDM practices can lead to multiplicative impacts over time.

Acknowledgements

The workshop is funded by Compute Ontario. Additional support was provided by the NSERC/ECCC Alliance Grants - Plastics science for a cleaner future program, the Global Water Futures Program, University of Waterloo Library, Federated Research Data Repository and the Gordon Foundation. The invigorating presentations and discussion provided by all the presenters and attendees at this workshop is appreciated.

References

AMAP (2021). *AMAP Litter and Microplastics Monitoring Guidelines (pp. 1-226)* Tromsø, Norway: Arctic Monitoring and Assessment Programme (AMAP). https://www.amap.no/documents/download/6761/inline

Cowger, W., Booth, A. M., Hamilton, B. M., Thaysen, C., Primpke, S., Munno, K., … Nel, H. (2020). Reporting guidelines to increase the reproducibility and comparability of research on Microplastics. *SAGE Journals*, *74*(9), 1066–1077. https://doi.org/10.1177/0003702820930292

DataStream (2021). *DataStream Upload Template 2.6 Public*. Mackenzie DataStream. https://docs.google.com/spreadsheets/d/1ZADNM8_LzmwugSJbrFe2-G3Cr8L5Wscr9XYyRYsToDw/edit#gid=454726228

GESAMP (2019). *Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean* (No. 99) United Nations Environment Programme (UNEP). http://www.gesamp.org/publications/guidelines-for-the-monitoring-and-assessment-of-plastic-litter-in-the-ocean

United Nations Environment Programme. (2020). *Monitoring Plastics in Rivers and Lakes: Guidelines for the Harmonization of Methodologies* (pp. 1–108). Nairobi, Kenya: United Nations Office Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/35405/MPRL.pdf

Environmental Protection Agency. (n.d.). *Water Quality Exchange Web Template Files*. EPA. Retrieved October 6, 2021, from https://www.epa.gov/waterdata/water-quality-exchange-web-template-files.

Appendices

Appendix 1: Agenda

Day 1 – September 27, 2:00 pm to 4:00 pm EST		
TIME	**AGENDA ITEM**	**PRESENTER**
1:55	Please join the meeting 5 minutes early to ensure we can begin on time.	
2:00 - 2:15	**Welcome:** Land acknowledgement, workshop goals, agenda overview	**Chair**: Philippe Van Cappellen, University of Waterloo
Part A: Set the stage – A vision for the future of microplastics data management		
2:15 – 2:25	"Microplastics Data: What's the Purpose?" Presenter: **Paul Helm**, Senior Research Scientist, Ontario Ministry of Environment, Conservation and Parks	
2:25 – 2:55	Improving microplastics data availability: A vision from Canadian open data repositories Presenters: • **Lee Wilson**, Portage Service Manager, Federated Research Data Repository • **Mary Kruk**, Water Data Specialist, The Gordon Foundation	
2:55 – 3:00	Break	

Part B: What are the data challenges and opportunities with respect to microplastics data access in Canada		
3:00 – 3:20	Representatives from microplastics research groups in U.S. and Canada to provide an overview of data management practices, including challenges and opportunities. Presenters: • **Dr. Sherri A. (Sam) Mason**, Professor and Sustainability Coordinator, Penn State Erie, The Behrend College	
	• **Win Cowger**, Research Scientist, Moore Institute for Plastic Pollution Research • **Rachel Giles**, PhD Candidate, Rochman Lab, University of Toronto	
3:20 – 3:50	**Breakout group discussions** Applying FAIR principles to microplastics data: Challenges and opportunities	
3:50 – 4:00	Wrap up and sneak peek into Day 2	**Chair**, Philippe Van Cappellen, University of Waterloo

Day 2 – September 28, 2:00 pm to 4:00 pm EST

TIME	**AGENDA ITEM**	**PRESENTER**
1:55	Please join the meeting 5 minutes early to ensure we can begin on time.	
2:00 - 2:10	Day 1 review Objectives for Day 2	**Chair:** Philippe Van Cappellen, University of Waterloo

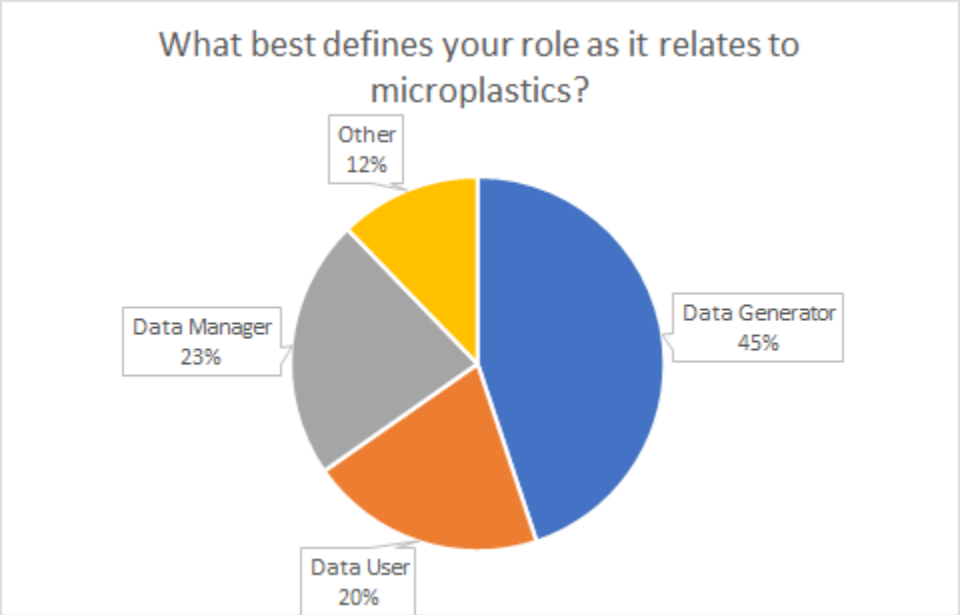
Part C: Implementing Data Management FAIR Principles		
2:10 - 2:30	"Reporting guidelines to Increase the Reproducibility and Comparability of Microplastic Research" Presenter: **Win Cowger**, Research Scientist, Moore Institute for Plastic Pollution Research "Standardizing Metadata for Environmental Microplastics Research" Presenter: **Rodney Smith**, Assistant Professor, University of Waterloo	
2:30 – 2:50	Q&A	
2:50 – 3:20	**Breakout group discussions** Feedback: Does the proposed metadata template meet your needs?	
3:20 – 3:30	Break	
Part D: Next steps		
3:30 - 3:55	**Breakout groups** What are the next steps associated with implementing a template?	
3:55 - 4:00	Wrap up: summary of deliverables and commitments	**Chair**: Philippe Van Cappellen, University of Waterloo

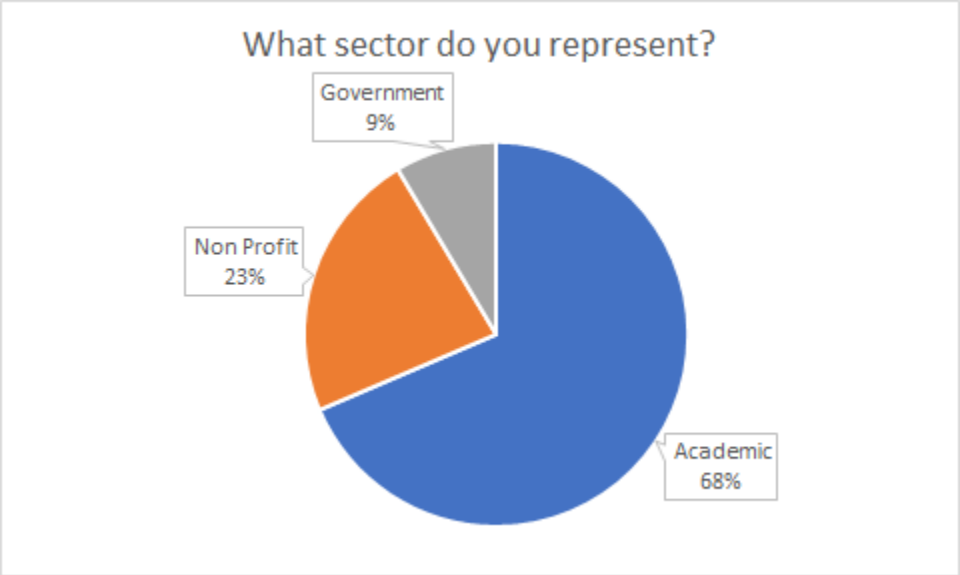
Appendix 2: Workshop Participants

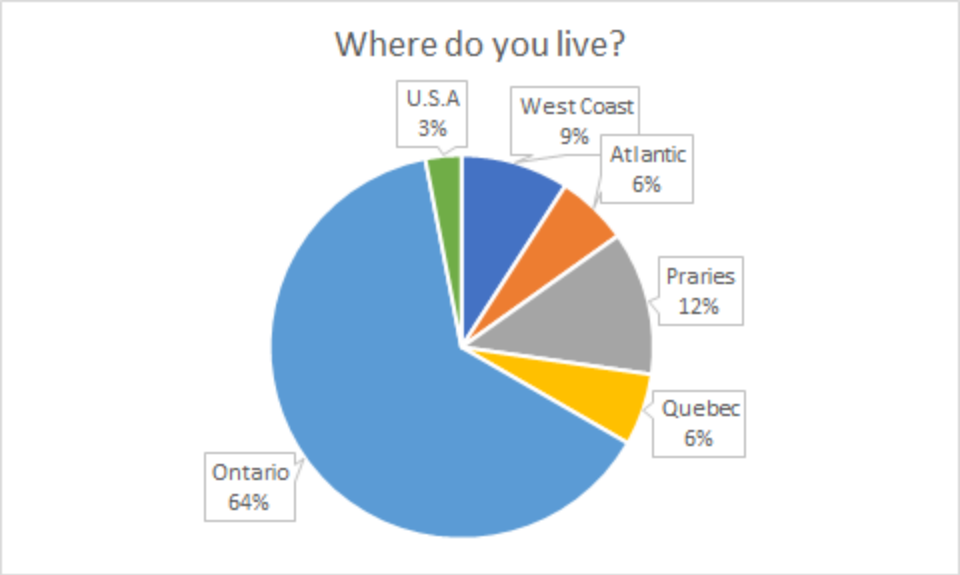
Workshop Participants	
Name	**Institution**
Julia Baak	McGill University
Shuhuan Li	University of Waterloo
Leah Bendell	Simon Fraser University
Komal Habib	University of Waterloo
Mary Kruk	Gordon Foundation
Benjamin Lei	University of Waterloo
Lilian Tran	Gordon Foundation
Meredith Watson	University of Waterloo
Philippe Van Cappellen	University of Waterloo
Krysha Dukacz	McMaster University
Reyna Jenkyns	Ocean Network Canada
Genevieve D'Aviognon	McGill University
Kathy Szigeti	University of Waterloo
Boxin Zhao	University of Waterloo
Liisa Jantunen	Environment and Climate Change Canada
Maria Dittrich	University of Toronto
Dominique Roche	Carleton University
Chris Loken	Compute Ontario
Will Farrel	Gordon Foundation
Matthew Ross	MacEwan University
Jennifer Provencher	Environment and Climate Change Canada
Bhaleka Persaud	University of Waterloo
Scott Bruce	Memorial University
Sherri A Mason	Pennsylvania State University
Greg Vey	University of Waterloo
Frank Zhu	University of Waterloo
Paul Helm	Ontario Ministry of Environment, Conservation and Parks
Julian Aherne	Trent University
Julian Fulton	California State University Sacramento
Rodney Smith	University of Waterloo
Pei Zhao	University of Waterloo
Aleksander Cholewinski	University of Waterloo
Erin Clary	Digital Research Alliance of Canada
Mickey Nielsen	University of Waterloo
Rachel Giles	University of Toronto
Monica Granados	Environment and Climate Change Canada
Peter Huck	University of Waterloo
Markus Brinkmann	University of Saskatchewan
Ariel Smith	Coastal Action
Tia Jenkins	University of Waterloo
Stephanie Slowinski	University of Waterloo
Fereidoun Rezanezhad	University of Waterloo
John Honek	University of Waterloo

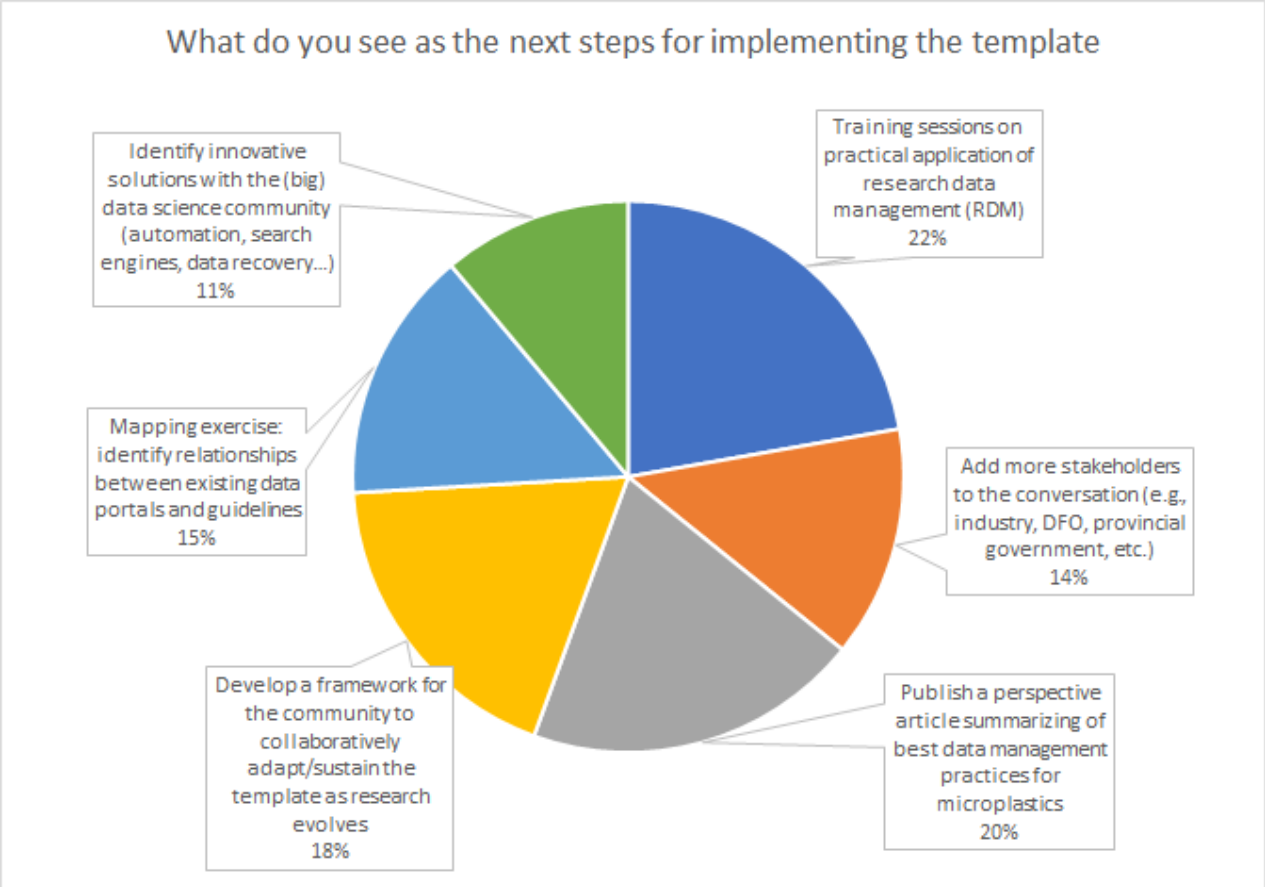
Alex Waldie	University of Waterloo
Win Cowger	Moore Institute for Plastic Pollution Research
Kelly Stathis	Digital Research Alliance of Canada
Jesse Vermaire	Carleton University
Sigrid Peldszus	University of Waterloo
Lee Wilson	Digital Research Alliance of Canada
Nancy Goucher	University of waterloo

Appendix 3: Workshop Poll Results









Appendix 4: Metadata Template Version 1 (in excel)

Appendix 5: Rodney Smith slide deck on metadata data template summary