2023 URI GLOBAL PLASTIC FORUM / BUILDING CAPACITY

Building Partnerships for Action Working Groups

WORKING GROUP: Accelerating science through international research networks

Introduction: On May 15th and 16th of 2023, the University of Rhode Island hosted the *2023 URI Global Plastics Forum*. This conference brought scientists, engineers, policymakers, and industry professionals together with the goal of discussing and collaborating on plastic pollution in the environment. Three working groups were formed, the second of which was focused on addressing knowledge gaps and research needs in the field of plastic pollution, and what the present opportunities are for further collaboration to further understand the extent and impact of this environmental contaminant.

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Working Group Discussion Summary: The working group discussion was broken into four different areas, *Roadmap of Research Needs, International Engagement, Professional Development and Global Perspectives for Students and Leveraged Resources.*

Roadmap of Research Needs

Microplastic research is still a relatively novel field, and as such there are gaps in our current understanding of how these contaminants behave in/ enter the environment, interact with wildlife, and how their consumption affects human health.

A critical research need is to first understand and model how these contaminants are entering the environment, and how they behave once they do. Studies, such as *Plastic Waste Inputs from Land Into Ocean*[1], have estimated plastic input quantities into the worlds oceans. However, this model just provided a rough estimate on quantity, and sound and effective policy is driven and backed by accurate models with plentiful data. Gaining a better understanding of the scale of this issue, as well as what plastic types and how they are entering the environment will prove paramount to any solution in the future.

Another need in this field is method harmonization. Given that it is a newer field of study, there is a lack of standardization in quantifying the amount of microplastic pollution in a sample matrix. Certain principles, such as size exclusion, density separation and chemical digestion of organics can be found across many different methods, however the exact sequence, procedure and equipment used typically varies by who is conducting the research. This lack of standardization of methodology makes comparing data very difficult, which hinders our ability to understand the exact scale of the problem.

Research could also be conducted on how to best design plastic products for the end of life of plastic products, especially ones that are likely to become environmental contaminants, such as fishing gear. As mentioned previously, it is difficult to implement drastic change without data to backup the claim, so quantifying the environmental impacts from current practices and proposed new practices could serve to be beneficial. Tools such as environmental, social and cost life cycle assessment could be employed in this analysis.

Lastly, more research is needed to understand how microplastics affect human health. Recent studies have shown contamination in the foods we eat[2,3], water we drink[4], and even the air we breathe[5]. Unsurprisingly, they have also been found in human placenta[6], and smaller nanoparticle plastics have been found to be able to cross the blood brain barrier[7], which is concerning as they are known vectors for contaminants[8] and can leach additives as they age and breakdown. Microplastic consumption has been shown to negatively affect other organisms, such as in seabirds[9]. Therefore, it is paramount to understand to what degree these microplastics are affecting human health.

International Engagement

Given the global nature of this issue, engagement from the international community is integral to working towards a solution. Engagement from not just different countries, but all communities within their respective countries is key. This includes policy makers, scientists, industry, and business, as well as consumers.

There are many existing groups and infrastructure to support more international engagement with a variety of different communities. The North Atlantic Microplastics Center (NAMC) is one such prominent center that could help serve as a knowledge hub to engage more scientists, and more open communication and centralization of scientists could also lend to more standardized testing standards as discussed in the previous section.

The authors of the Jambeck paper also found a strong correlation between developing nations and their portion of mismanaged waste into the environment. It is therefore in the best interest to assist these communities with better waste management, some of which could be done through existing departments and programs, such as the United States Agency for International Development in addition to the Environment for Development. In a similar vein to the lack of standardization of methodology, there is a great number of experts and existing programs in the world, and bringing people together and working to unite what has already been established would unite the international community. This could lead to more progress on solving this issue, which could in turn lead to more engagement, starting a positive feedback loop.

Professional Development and Global Perspective for Students

One of the big ideas from this section was that each university, business, or other entity should play to its strengths. This will make the system more efficient, as well as serve to open more lines of communication between two people that may have never communicated otherwise.

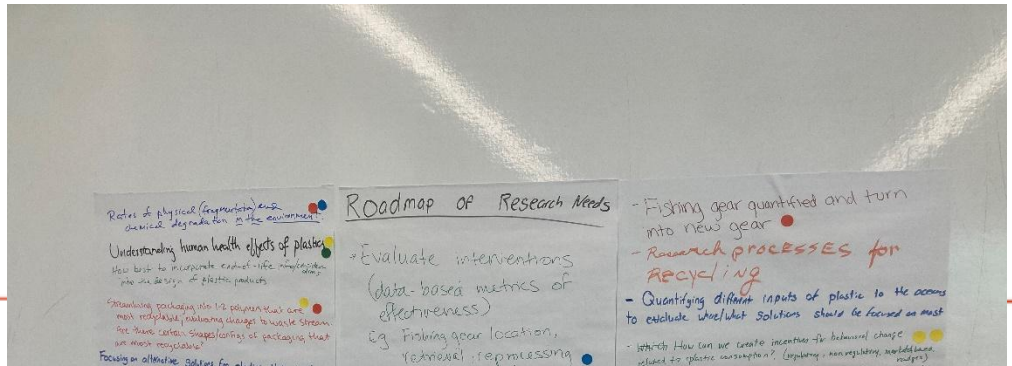
In the light of playing to strengths, another topic of having a transdisciplinary team was mentioned. As we all likely know, plastic touches nearly every aspect of our lives. Having a team composed of different professional and academic backgrounds would mirror the widespread use and application of plastic across a variety of different products and fields, which is important when understanding all aspects of this plastic pollution problem. In addition, equity and justice training should be incorporated as well, given that the problem of plastic pollution indiscriminately effects everyone, ignoring both international and cultural borders.

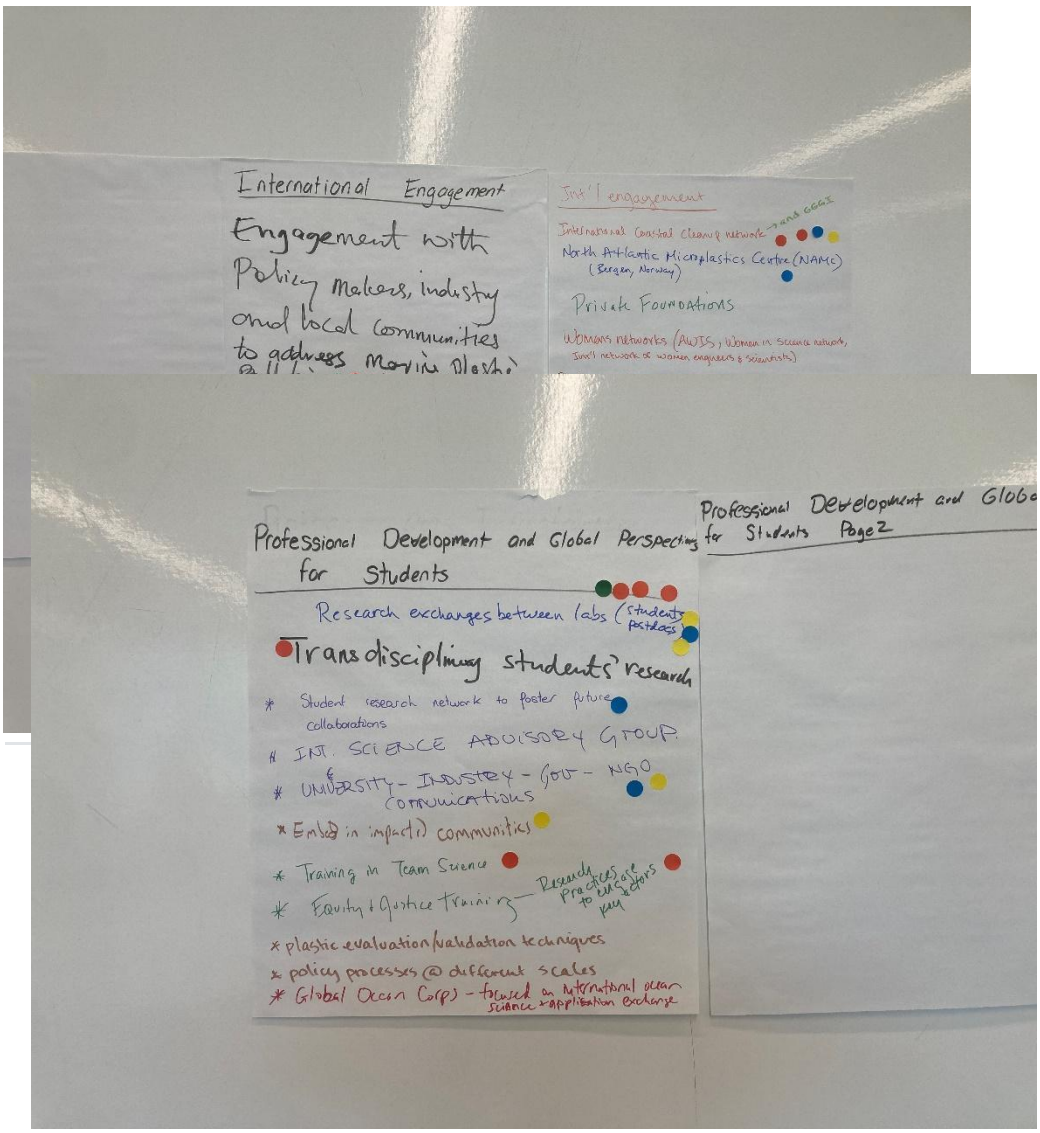
Lastly, the group discussed the importance of a research exchange. This would be beneficial not only for the sake of international engagement and communication but could also help demonstrate the impact on embedded communities. The widespread nature of this problem is well documented in the scientific literature, demonstrating that plastic has been found everyone from the depths of the ocean[10] to artic snowfall[11], however it is harder to capture the impact this has on specific communities. Programs such as a research exchange, where scientists experience different research techniques and methodologies, supplemented with seeing how the plastic pollution problem uniquely impacts a specific community could serve as a dual opportunity for both professional development and helping cultivate a global perspective.

Leveraged Resources

The last sub-topic discussed in this working group session was the topic of leveraged resources. One of the reasons that plastic research methodologies can vary greatly between different labs is the access to funding and the equipment available. The University of Rhode Island is unique in this regard, because of the state-of-the-art facilities, (Coastal Research Center, Shimadzu Core Laboratories, Coastal Institute) a large group of professors with different professional backgrounds interested in the topic, as well as an ability to sample different environments more easily with the connection to the ocean. However, most institutions and research facilities can lack in one or more of these areas, which can serve as a barrier to entry or lead to less compatible scientific data. Creating an interconnected network of people, infrastructure and equipment, across both academia and industry, could serve to improve the quality of the research output by making results more compatible between groups.

Figures




International Engagement
Engagement with Policy Makers, industry and local communities to address Marine Plastic
Int'l engagement
International Coastal Cleanup network
North Atlantic Microplastics Centre (NAMC)
(Bergen, Norway)
Private Foundations
Professional Development and Global Perspectives for Students
Research exchanges between labs (students post-docs)
Transdisciplining students' research
* Student research network to foster future collaborations
* INT. SCIENCE ADVISORY GROUP
* UNIVERSITY - INDUSTRY - GOV - NGO communications
* Embed in impacted communities
* Training in Team Science
* Equity + Justice Training — Rewards practices to encourage
* plastic evaluation/validation techniques
* policy processes @ different scales
* Global Ocean Corps - focused on international ocean science + application exchange
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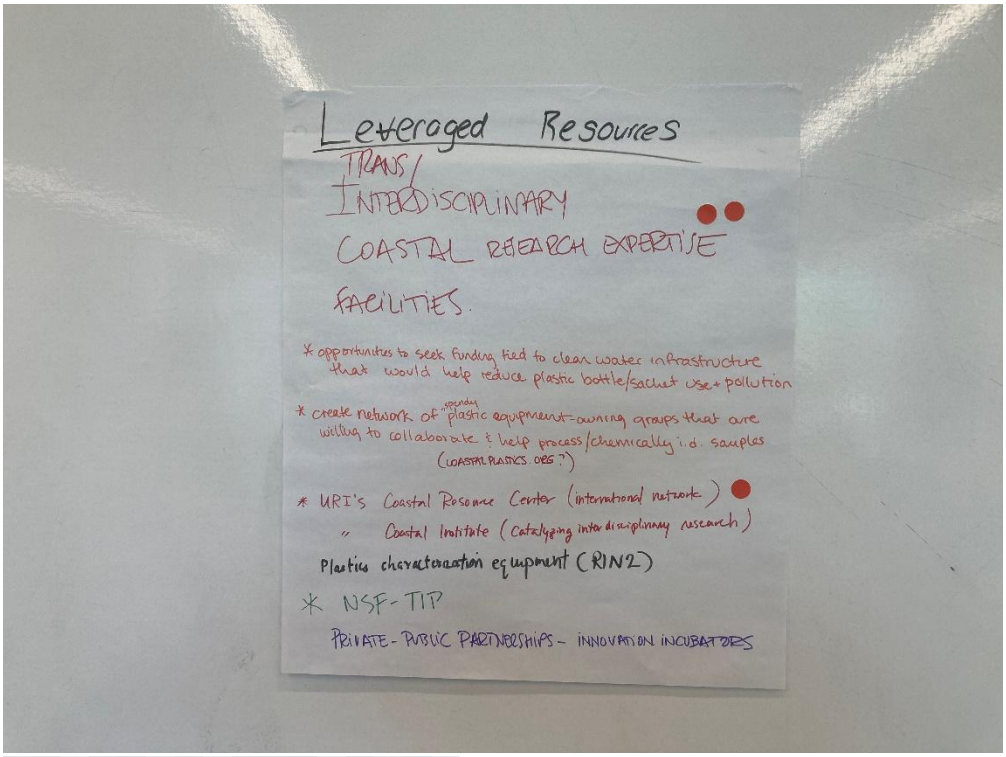

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