Walking the Talk: The Responsibility of the Scientific Community for Mitigating Conference-generated Waste

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Keywords: Zero Waste, Waste Reduction, Marine Debris, Plastic Pollution, Single-use plastic, Food Waste, Conference Planning, 6IMDC

Abstract

An estimated 19-23 million metric tons of global plastic waste reportedly entered aquatic environments in 2016 with mounting evidence that plastic marine debris causes ecological effects across all levels of biological organization in aquatic systems. Scientific conferences generate opportunities for waste through food and beverage services, giveaways, marketing and registration materials, poster and trade exhibits, attendee travel, lodging services, and local transportation. Zero waste measures instituted at the Sixth International Marine Debris Conference resulted in the avoidance of 76,300 single-use items. Zero waste is a process defined by a spectrum of actions ranging from no reduction whatsoever to generation of absolutely no waste. Achieving 100% zero waste is very difficult. Deciding where on the spectrum you wish to land and being comfortable with that target is paramount for event planning. Planning for reduced waste takes time, funding, and determination, but environmentally-themed organizations have a responsibility to lead by example.

1. Introduction

Plastic pollution in the global ocean was recently described as a creeping crisis (Mæland et al. 2020), with mounting evidence that plastic marine debris causes ecological effects across all levels of biological organization in marine and freshwater systems (Bucci et al. 2020). In 2019, global annual production of plastics reached 368 million metric tons (MMT), with packaging as the largest end-use market (nearly 40%) (PlasticsEurope, 2019). An estimated 19 to 23 MMT of global plastic waste reportedly entered aquatic environments in 2016 (Borrelle et al. 2020).

Historically, plastics have been extremely beneficial to society, enabling medical advancements, providing affordable and convenient meals and food storage, increasing transportation efficiency, and so on. The concern is not plastic itself, but the normalization of a throw-away society, first

described by Life Magazine in 1955, and now often referred to as throw-away or convenience culture. Ultimately, globally-coordinated action that includes pre-consumptive (e.g. decreased demand, alternative products) and post-consumptive (e.g., waste management, recycling) measures are needed to reduce plastic pollution Lau et al. 2020), which means substantial behavior change related to design, production, use, reuse, and reclamation. Because human behavior is determined by variables ranging from emotions and values to politico-economic and socio-cultural conditions, the most effective behavior change initiatives are typically multifaceted (Stoll-Kleemann 2019). Individuals can derive personal satisfaction from choosing to engage in sustainable activities, and these choices reflect larger social norms and values (Lubchenco et al. 2016). In this way, shifts in social norms can also drive individual behavior (Lubchenco et al. 2016).

Scientific conferences create numerous opportunities for waste including through food and beverage services, giveaways, marketing and registration materials, poster and trade exhibits, attendee travel, lodging services, and local transportation. During recent decades, event-generated waste has been more closely scrutinized (Roig et al. 2011), especially for environmentally-themed meetings. Since 2007, MeetGreen, a sustainable event consulting and planning firm based in Oregon, has collected data from 92 events in which various sustainable practices were implemented. MeetGreen estimates that the typical attendee generates 1.9 kg of waste per day, of which 0.8 kg (~42%) goes to landfill (MeetGreen 2020). Using these estimates, a scientific conference supporting 500 to 1000 attendees has the potential to generate 950 to 1,900 kg of waste per day, with 400 to 800 kg going to landfill. Over the course of five days, a conference of that size could generate between 4,750 and 9,500 kg of waste (roughly the weight of 3.4 - 6.5 2019 Volkswagen Beetles) and send 2,000 to 4,000 kg straight to landfill (roughly the weight of 1.4 - 2.9 2019 Volkswagen Beetles) (https://www.caranddriver.com/volkswagen/beetle/specs).

Environmental scientists have a particular responsibility to mitigate conference-generated waste and shift social norms in conference planning. As members of the environmental science community, the National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program (MDP) is committed to "walking the talk." As such, we implemented zero waste initiatives at the 2018 Sixth International Marine Debris Conference (6IMDC), a five-day event with 725 attendees, co-organized by NOAA and United Nations Environment. Two years of effective planning by 6IMDC's Zero Waste Working Group (ZWWG) resulted in the avoidance of 76,300 single-use items. Other zero waste measures halved the venue's typical weekly amount of landfill waste, largely by recycling 240 kg of materials, composting 3,130 kg of food scraps, and donating excess food to support 300 meals through Chefs to End Hunger.

2. Before the Conference

Prior to embarking on this journey, we set realistic expectations regarding our target on the zero waste spectrum; producing a large amount of conference waste was unacceptable while generation of absolutely zero waste was likely not possible. Given the resources at hand, we focused on reducing single-use items and food waste as much as possible. Immediate formation of the ZWWG and selection of an environmentally-conscious venue 18 months prior to 6IMDC (San Diego Mission Bay Resort) was key to our success.

Awareness and convenience have been the greatest impediments limiting conference attendees' ability or willingness to reduce resource usage (Jarchow et al. 20211). With this in mind, messaging, shared early and often, was another major factor in our success. In an effort to establish social norms and values during the conference, registrants were encouraged early and often to bring reusable items (e.g., water bottles, coffee mugs), opt out of in-room services (e.g., single-use toiletries), download the conference app or access the online program *in lieu* of a paper program, recycle, use on-site compost bins, and more. This messaging was shared on the conference website and agenda, and via emails to registrants. Lastly, the ZWWG developed reduction metrics for post-conference report outs.

3. During the Conference

At on-site registration, attendees were presented with a reusable, magnetic name tag (to be returned following the conference) and a reusable metal cup for use at water stations and networking events (Figure 1). Digital screens and reusable or recyclable signs displayed zero waste messaging throughout the venue, and reminders of the zero waste initiatives were shared during plenary sessions. No paper handouts were distributed. Reusable and bulk items (e.g., tableware, napkins, condiments) were offered during breaks, meals, and networking events. Venue-laundered cloth bags (recycled cotton) were reused for lunches and also served as a giveaway item (Figure 1). Well-marked compost, recycling, and landfill bins were staffed by ZWWG members during breaks and meals to assist with compliance. On-site dining facilities and coffee shops provided plastic straws and lids on request only. Digital hotel receipts were sent upon checkout, unless otherwise requested.

4. After the Conference

Following 6IMDC, the ZWWG, venue, and Resource Management Group, Inc. (provider of the compost bins and now called PreZero US, Inc.) tallied reduction metrics. These were shared with attendees at the closing ceremony and through the conference proceedings (Figure 2). At the request of attendees, the ZWWG compiled and shared lessons learned via the Zero Waste Planning Guide for Large-scale Events and/or Conferences (https://bit.ly/2Co4ZY6). A Virtual Special Issue (VSI) of Marine Pollution Bulletin titled, "Selected Papers from the Sixth International Marine Debris Conference: Innovation, Collaboration, Action" hosted a number of articles representing the diversity, depth and maturity of our current understanding of the global issue of marine debris. The VSI included a paper highlighting non-legislative strategies (i.e. self-imposed interventions like those employed at 6IMDC) for reducing single-use plastics (Schnurr et al. 2018).

Waste reduction efforts implemented at 6IMDC inspired the venue to conduct staff-led beach cleanups, promote reusable items on-site, highlight waste reduction activities in promotions, and achieve Surfrider Foundation-certified Ocean Friendly Restaurant status. Using momentum from 6IMDC, we began incorporating zero waste initiatives into our smaller regional workshops and professional meetings (15-65 person events). In doing so, we diverted more than 12,000 items from landfill in the 13 workshops we hosted in 2019 (Figure 2). This includes the reuse of over 460 reclaimed 6IMDC name tags. Additionally, NOAA MDP helped establish a Zero Waste

Team within NOAA's National Ocean Service line office with the goal of reducing waste in daily operations and encouraging employee participation in waste reduction efforts.

5. What We Learned

The most important takeaway is that zero waste is a process defined by a spectrum of actions bookended by no reduction whatsoever and generation of absolutely no waste. We learned that 100% zero waste is very difficult to achieve; thus, deciding where on the spectrum you wish to land and being comfortable with that target is paramount. Based on attendee feedback, the zero waste initiative was one of the most valued aspects of 6IMDC. Attendees deeply appreciated that the conference, which was focused on mitigating the harmful impacts of all marine debris, incorporated that same standard into organization. Creating awareness of intended zero waste goals through continued communication among attendees and organizers was of utmost importance during planning and execution. Availability of plastic alternatives, reusable items, and food waste bins made it more convenient for attendees to reduce individual waste footprints. Additionally, it was essential for the conference hosts to have an early understanding and commitment to the full suite of costs required for reaching our waste reduction goals. Single-use items are often cheaper, require less preparation and maintenance, and are easier to purchase than reusable items, which can make the decision to switch to reusable items difficult, especially with constrained budgets. Taking these considerations into account during pre-planning greatly increases the likelihood of having a successful zero waste event. 6IMDC attendees already derive personal satisfaction from engaging in sustainable activities, but by establishing zero waste goals as social norms for the conference we also drove behavior toward more sustainable efforts within our agency.

Planning a zero waste event takes time, funding, and determination, but environmentally-themed organizations have a responsibility to lead by example. With a dedicated team, as well as proper planning and communication, major waste reduction efforts are achievable. Our hope is that, moving forward, these efforts can drive a shift toward more sustainable social norms.

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Acknowledgements
Indirect support provided by the NOAA NOS Marine Debris Program (A.V.U.), the NOAA NESDIS Program Analysis Branch (A.L.L.), I.M. Systems Group, Inc. (C.H., S.L., S.M.L.) and Freestone Environmental Services, Inc. (D.F., C.K.). We appreciate the hard work and dedication of the entire 6IMDC planning team, the accommodating staff at the San Diego Mission Bay Resort and the support of PreZero US, Inc.and Chefs to End Hunger. We thank 6IMDC attendees for striving to "walk the talk" throughout 6IMDC. We recognize the spirit and energy of the rest of the NOAA Marine Debris Program staff in advancing zero waste initiatives throughout the broader marine debris community and within NOAA. We benefited from conversations with E.W. and A.E. of MeetGreen. Any views or opinions expressed herein, are those of the authors and do not necessarily reflect the views of NOAA or the Department of Commerce.

Author contributions
A.V.U. conceived of the original paper. All authors contributed formative ideas, wrote the original draft, and assisted with reviewing and editing the paper. A.L.L. and A.V.U. made substantial content revisions. D.F. and S.L. prepared Fig. 1. All authors reviewed and approved of the manuscript.

Competing interests
S.L., S.M.L. and C.H. were employed by the company I.M. Systems Group, Inc. D.F. and C.K. were employed by Freestone Environmental Services, Inc.

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Figure Captions
Figure 1. Reusable chalkboard name tag, cloth lunch bag and metal cup presented to attendees at 6IMDC on-site registration.

Figure 2. Waste diverted by reduction, reuse, and recycling at 6IMDC (top left) and at 13 two-three day, MDP-led workshops in fiscal year 2019 averaging 35.6 participants per workshop (top right). Top 10 diverted items at 6IMDC and MDP-led workshops (bottom). Many values are estimates, derived from formulas used to calculate waste. Calculations account for items supplied by the conference or workshop. Items brought by attendees are not included.


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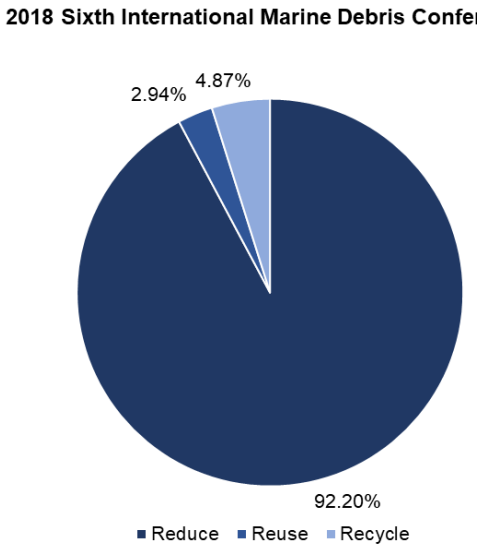
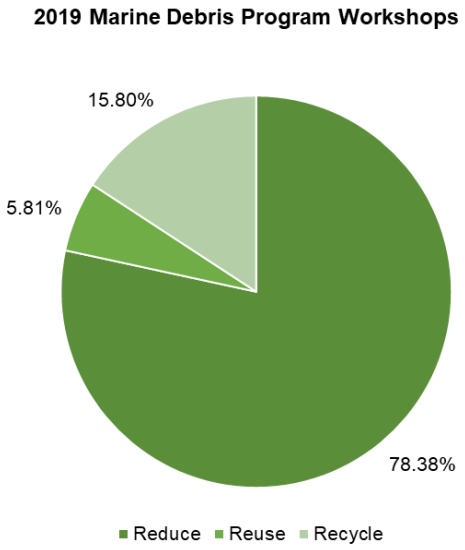
Innovation. Collaboration. Action.
Fig. 1





Rank	2018 Sixth International Marine Debris Conference Top 10 Diverted Items		Rank	2019 MDP Workshops Top 10 Diverted Items	
1	Sheets of paper	27,913	1	Sheets of paper	1,778
2	Single-use coffee cups	11,765	2	Single-use utensils	1,685
3	Single-use napkins	6,525	3	Single-use napkins	1,396
4	Single-use utensils	6,525	4	Single-use plates	1,117
5	Single-use plates	5,075	5	Single-use coffee cups	1,017
6	Single-use coffee stirrers	4,350	6	Single-use water bottles	986
7	Single-use water bottles	3,240	7	Single-use coffee stirrers	917
8	Single-use beverage cups	3,177	8	Individual creamers	851
9	Single-use food wrappers	2,900	9	Individual sugar packets	602
10	Reusable name tags	725	10	Reusable name tags	477
	TOTAL	**72,195**		**TOTAL**	**10,826**

Fig. 2