



Waste Streams: Can we stem the plastic tide?

A Policy, Production and Consumer Perspective

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EXECUTIVE SUMMARY

Science & Policy Exchange (SPE) held a public forum entitled “WASTE STREAMS: Can We Stem the Plastic Tide?” with the goal of bringing the public together with researchers and professionals involved in addressing plastic pollution in waterways. This report summarizes the perspectives of our panelists, as well as the concerns raised by the general public during the question period.

Scientific Perspective

- Microplastic pollution is difficult to remove from the environment and makes up a significant portion of total plastic waste.
- The international scientific community, with governmental support, is continually working to monitor the climate and health impacts of this problem.
- Science can contribute to the development of technology that can address microplastic pollution.

Economic Perspective

- Problem-solving will require large scale collaboration between all stakeholders - including corporations, NGOs.
- A circular economy for plastic products would be beneficial.
- Government regulation is essential in transitioning us towards this circular economy.
- Consumers are a key player in driving changes in the plastic product economy.

Governmental Perspective

- The government’s proposed Ocean Plastics Charter aims to take concrete steps to address plastic pollution.
- Zero-waste plastic initiatives can be compatible with economic growth.

Community Discussion

- The public is wary of financial and health concerns of plastic pollution.
- A *complete* scientific assessment of the issue is unnecessary before taking action.
- Although the scope of the problem may seem overwhelming, it is important to reiterate the significance of collaborations and to build upon incremental successes.

INTRODUCTION

This report summarizes the discussion held at the SPE Forum “WASTE STREAMS: Can We Stem the Plastic Tide?” This event brought the public together with experts from research, NGO, and government perspectives to discuss plastic pollution. Understanding the various stakeholders involved in the life cycle of plastic products, and their perspectives, is critical to ultimately implement policies around this multidisciplinary issue. In parallel, while solutions are developed and policy is enacted, scientific research must continue to determine how exactly plastics reach waterways and what are the effects on the environment and human health.

Throughout the panel discussion, two strategies were highlighted by nearly every speaker: (1) collaboration and (2) building upon uplifting achievements. The research, industry, economic, and policy considerations will be summarized followed by the discussion themes brought by the public to this event.

I: Science & Research

The scientific community is a key player in providing data and evidence to assess the landscape of the plastic problem. One of the landmark papers displaying the magnitude of plastic pollution was that of Dr. Marcus Eriksen et al.¹. The authors reported the total number of plastic particles floating in the world’s oceans across all five sub-tropical gyres: data collected between 2007-2013 reveal an estimate of 5.25 trillion plastic particles weighing almost 270,000 tons. Their findings also highlighted the abundance of microplasticity (plastic particles less than 5mm in size) in our environment resulting mostly from the breakdown of larger plastic items. This provided an incentive for scientists to collect data in their local communities in order to assess both the origins of these pollutants and to determine solutions to this problem.

As an example of current scientific research, Jesse Vermaire presented his work at the Institute of Environmental and Interdisciplinary Sciences at Carleton University. His research pertains to the study of human impact on lakes and rivers, gathering most of his data from the Ottawa, Gatineau and Rideau Rivers, which eventually flow into the Saint-Laurent river. He aims to assess the magnitude of plastic pollution in the Ottawa-Gatineau area and to identify their sources.

¹ Eriksen, Marcus, et al. “Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea.” *PLOS ONE*, Public Library of Science, 10 Dec. 2014, <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>.

Most of Vermaire's team's data is gathered by one of two methods. The first is through a *citizen science* program where his research team has partnered with the Ottawa Riverkeeper to collect filtered water samples to be analyzed for microplastics. The second method is to collect larger plastic items through *trawling* methods. His data show that there is an abundance of microplastic pollution in the Ottawa-Gatineau river. The next step is therefore to assess the sources of these pollutants.

Vermaire has partnered with the City of Gatineau in order to determine the sources of its plastic pollution. Their research team found that most of the plastic pollution comes from wastewater systems. While they were not originally built for such tasks, the wastewater system filters plastic fragments larger than 19 mm in size. His studies show that wastewater systems are an efficient filtering mechanism for plastic pollutants, with 99% of them filtered out. However, this system does not address microplastics, mostly falling in the category of *microfibres* – this suggests that clothing greatly contributes to plastic pollution in our waterways.

Given that wastewater systems can act as filters for larger plastic pollutants, engineering solutions to address smaller plastic pollutants could be prioritized to filter additional plastics. Mission 100 tonnes² studies the life cycle of plastic and found that if it can reach management facilities, 98% of the waste is safely contained on site. Much of the plastic in the ocean also comes from terrestrial sources through the wind. Therefore, picking up trash on the beach and near waterways can prevent plastic from breaking down and reaching water streams.

While Vermaire's research focuses on evaluating the impact of human activity on lakes and rivers, other scientists tackle the problem from different perspectives. For example, Nancy Hamzawi pointed out that the Science Advice for Policy by European Academies published a report³ about microplastics and its impact on nature and society. Furthermore, as referenced by Rachel Labbé-Bellas, the Center for International Environmental Law published a report on plastic pollution and its impact on health⁴, and another on its role in climate changes⁵. The first report identifies methods of exposure to plastic toxicity or its associated by-product chemicals, and subsequently proposes solutions to reduce these exposures. The second report identifies and offers solutions to the environmental impact (pertaining to climate change) of the life cycle of plastics.

² <http://www.mission100tonnes.com/>

³ Koelmans, Bart, et al. *A scientific perspective on microplastics in nature and society*. SAPEA, 2019.

⁴ Azoulay, David, et al. "Plastics and Health The Hidden Cost Of A Plastic Planet." (2019).

⁵ Hamilton, Lisa Anne, et al. "Plastic and Climate The Hidden Cost Of A Plastic Planet." *Center for International Environmental Law (CIEL)* (2019).

Lyne Morissette, a sustainability researcher, discussed how scientists have traditionally focused on popularizing the literature and shocking consumers with troubling statistics. Morissette argues that this was counterproductive, as it made people feel ineffective and resulted in most people ignoring the problem. Morissette stressed that, instead, scientists should strive to inspire people with success stories. Therefore, going forward, the sharing of success stories should be prioritized along with the dissemination of research in order to drive support for policy changes to promote real change.

Overall, the scientific community is rapidly working towards assessing the magnitude of plastic pollution in our waterways, defining their sources, and determining solutions to the problem. They are also working towards determining the impact of this problem on other facets of society including public health, climate change, biodiversity, and more. Because of the lack of data, and the scale of the problem, collaborations between different institutions and the public is necessary to accelerate the science. While it is imperative for science to provide the data and knowledge to galvanize society towards action, this is an instance where the public and policymakers must act in parallel to the research.

II: Economy: Consumers, Corporations, & NGOs

A stand-out theme of this event was “all hands-on deck”. Corporations, especially those that produce and use plastic, have a significant role to play in helping us address the systemic issues that led to our current plastic consumption. Both consumers and producers/distributors of plastic-containing products can drive change by using their economic leverage to push for solutions. To effectively address this issue, corporations must address the complete life cycle of plastics. This includes its extraction from natural resources, production into final products, distribution and commercialization, usage in daily life and disposal. To achieve such structural reform requires collaborations between scientists and engineers to produce sustainable alternatives.

Given the role of corporations in our economy, they must be brought to the table. Labbé-Bellas presented a 2019 ocean excursion for corporate executives, which aimed to bring the executives in close contact with the plastic problem. The excursion was also attended by 5 Gyres, Greenpeace, and other NGOs, along with some policymakers. The executives noticed their own products amongst the plastic in the oceans, highlighting their responsibility, and the excursion sparked discussion and built ideas amongst the participants⁶.

⁶ Jacobsen, Rowan. “An Epic Ocean Plastics Field Trip for Corporate Executives.” *Outside Online*, 9 Aug. 2019, <https://www.outsideonline.com/2400590/ocean-plastic-pollution-soulbuffalo>.

Some examples of corporate strategies proposed include the implementation of virgin plastic fees/taxes, the recycling of chemicals and water, the promotion of container recycling rewards for consumers and identifying big polluters through brand auditing. The public, NGOs and governments can hold corporations accountable to these types of promises, and help track the success of these programs.



#SPEForum panelists answer questions from the audience. Left to right: Lyne Morissette, Rachel Labbé-Bellas, Jesse Vermaire, Nancy Hamzawi

Since removing microplastics from our waterways is an excessively challenging task, the importance of preventing plastics from getting into waterways in the first place was emphasized. The public has a role in these preventative solutions. For example, Labbé-Bellas discussed a brand auditing app⁷ that has recently been developed. It is now used internationally by over 1400 organizations and myriad consumers to collect data on plastic production and pollution from corporations. This data can help consumers decide which companies they would like to support or not. Labbé-Bellas used this example to demonstrate the importance of making evidence accessible to the public and of using comparable (or identical) software between organizations worldwide to facilitate communication.

During the discussion portion of the event, the fact that the consumer marketplace is changing was mentioned. Many consumers in Canada and the US prefer “green” alternatives and are trying to be more environmentally conscious. Corporations are recognizing this trend and changing their practices to match consumer tastes. This is one example of how *consumer and economic pressure* can put pressure on corporations to change, even without explicit government policies. This also underscores the notion that all stakeholders will need to come together and work together to solve the plastic problem.

Non-governmental organizations (NGOs) are also involved in taking action on this problem outside of policy. NGOs like 5 Gyres or M-Expertise Marine Consulting conduct several activities to raise awareness and find solutions to plastic pollution: a data collection app for litter pick-up, group/community clean-ups, facilitating research excursions, and education/outreach, including events like the aforementioned corporate

⁷ “Trashblitz.” 5Gyres.Org, <https://www.5gyres.org/trashblitz>.

executive trip. Many NGOs are non-profit, and most rely on collaboration and fundraising from corporations, government, and community donations to fund their activities.

Economically, consumers, corporations, NGOs, and governments are all stakeholders in solving the plastic problem. While some actors are seen as contributors (corporations), and some are seen as problem-solvers (NGOs), all have parts to play in changing habits and expectations. Regardless, the active participation and collaboration of people from all spheres are critical to fully understanding and addressing the scope of the problem.

III: Governmental Policies

Nancy Hamzawi, speaking from a government perspective, offered the most insight into currently discussed policies regarding microplastics. The objective is clear: we must stop the flow of plastics into our environment. This requires that we address the complete lifecycle of plastics, from monomers to recycled products. The aim is therefore to move this product towards a circular economy. This will necessarily require the assistance of the international community, including industries, scientists, NGOs and different levels of government. When working together, it is important to make concise, time-bound, concrete commitments when developing policies to address this issue.

Canada's Ocean Plastics Charter, recently proposed as part of its G7 presidency, includes two phases: phase 1 focuses on government efforts to prevent future plastic waste and phase 2 focuses on increasing consumer awareness and cleaning up current plastic waste. Phase 1 includes measures such as extending producer responsibility and supporting recycling infrastructure, innovation in plastic manufacturing & green procurement practices. Phase 2, which aims to be enacted in 2020, includes measures such as identifying actions to improve consumer awareness, advancing science, and cleaning up debris and reducing waste and pollution from aquatic activities, which involves collaborating with industry to receive abandoned, lost or discarded fishing gear. Another collaboration proposed is the funding of NGO endeavors, such as the Great Canadian Shoreline Cleanup, 10000 Changes Initiative, Ocean Research, and Solutions Program & Ocean Plastics Education Kit, which would bring together 5 NGOs.

The Trudeau government aims to lead by example to meet the objectives of the Ocean Plastics Charter. Besides its commitment to ban single-use plastics across the nation by as early as 2021, Hamzawi shared that the federal government itself has also made strides towards diverting at least 75% of plastic waste from federal operations by 2030⁸.

⁸ Canada, Service. "Government of Canada." *Canada.ca*, Government of Canada, 26 July 2019, <https://www.canada.ca/en/services/environment/pollution-waste-management/zero-plastic-waste/canada-action.html>.

The federal government has also introduced a ban on microbeads in toiletries, invested in wastewater infrastructure to reduce plastic debris, and launched plastic innovation challenges to encourage Canadian businesses to develop new solutions to reduce plastic waste.

Hamzawi also importantly highlighted that protecting the environment does not have to negatively impact the economy, as moving towards zero plastic waste could generate more than 42 000 jobs and recuperate 4.8 billion dollars in lost revenue by 2030⁹. This includes revenues generated by the reuse of plastic items, the direct and indirect jobs created from a circular economy, and the savings from removing plastic products from our environment.

It is important that the government remains continuously informed of the status of research so that policy proposals remain supported by the science. As such, Environment and Climate Change Canada and Health Canada are generating a report about the science assessment of plastic pollution which will soon be made available to the public. This study investigates the broad effects and presence of both macro and microplastics pollution in the environment, leveraging all evidence in Canada and abroad, and consider the relationship of environmental plastics on the economy and on different ecosystems. The government has also recently published a Plastic Science Agenda¹⁰, in which it announced its pledge to (1) fund research that focuses on turning landfill waste to fuel and (2) work closely with Indigenous communities.

To summarize, the key policy recommendations proposed by the speakers were:

1. Develop measures to encourage collaboration and conversation between scientists, individuals, companies and government entities
2. Reduce the number of microplastics currently entering Canada's waterways by
 - a. investing in smaller filters at wastewater treatment plants
 - b. funding research that examines water plastic concentration & sources
 - c. encouraging individuals to take part in this research

⁹ Public Services and Procurement Canada, Integrated Services Branch, and Government Information Services, Publishing and Depository Services. "Economic Study of the Canadian Plastic Industry, Markets and Waste : Summary Report to Environment and Climate Change Canada.: En4-366/1-2019E-PDF." *Government of Canada Publications - Canada.ca*, 3 Apr. 2013, <http://publications.gc.ca/site/eng/9.871296/publication.html>.

¹⁰ Climate Change Canada. "Government of Canada." *Canada's Plastics Science Agenda - Canada.ca*, Government of Canada, 28 June 2019, <https://www.canada.ca/en/environment-climate-change/services/science-technology/canada-science-plastic-agenda.html>.

3. Make research and evidence available to the average consumer and encourage organizations to use the same, easily-accessible platform to record their findings.
4. Develop concise, time-bound, concrete commitments, considering every step in a product's life cycle and move towards a circular plastics economy.
 - a. This includes government efforts, such as extending producer responsibility and supporting recycling infrastructure, and other efforts like improving consumer awareness, advancing science, and collaborating with industry to receive abandoned, lost or discarded fishing gear.
5. Enact policies reducing plastics, such as the federal government's recent commitments to divert at least 75% of plastic waste from federal operations, eliminate the unnecessary use of single-use plastics, and ban microbeads in toiletries, among others.
6. Leverage all current research from Canada and from abroad to develop policy, taking into account possible impacts on people, the economy and wildlife. It must be noted here that single-use plastic bans in particular have been criticized as non-inclusive or even harmful policies, particularly for those people with disabilities.
7. Use a multidisciplinary team to develop policy and highlight the importance of individual action.
8. Popularize science, without being discouraging, by focusing on major success stories.

IV: Public Opinion & Community Discussion



A full house at Bibliothèque et Archives nationales du Québec (BAnQ) for #SPEForum.

This forum provided the public with an opportunity to engage with leading experts in research and policy. As mentioned by Morrisette, issues around plastic have become trendy and the importance attributed to this crisis by the majority of the population will help guide political decision-making and allow for

science to thrive. Policy can give an official structure in which changes will have a bigger impact, such as within communities and industries. Importantly, the public also has concerns about how new policies regarding plastic can be implemented, how they will impact their lives, and what is the best way to help. The public's perspectives discussed at the forum are summarized below:

Financial Burden: Towards a Circular Economy

A major concern of the public regarding policy in the area of plastics is the personal and financial burden that follows from these changes. The policy of taxing plastic producers instead of consumers was discussed. This goes hand-in-hand with extended producer responsibility and working towards a circular economy. Ideally, initiatives to urge companies to take responsibility for their waste would be made mandatory by the government. For example, it should be producers that invest in recycling facilities rather than cities charging taxpayers for the improvement of their infrastructures. For more information on circular economy, please consult SPE's report on *Zero Waste Cities: Reality or Fantasy* or the *Canada-Wide Action Plan on Zero Plastic Waste*¹¹.

Health concerns

The public is concerned about the effects of plastic pollution on their health. Plastic can potentially be toxic, especially in the form of microplastics. Labbé-Bellas from 5 Gyres put forward that there have been studies on the impact of plastic on the endocrine system, the disruption of hormone levels and how plastic affects the fertility system¹². The impact of microplastics is also being assessed by European Science Advisors. The exact effects of plastic pollution on the environment, and how this impacts human health is not yet known, but the public expressed eagerness to deal with the problem as a precautionary measure while also continuing to research this issue.

Precautionary Principle

A prominent discussion point was whether plastic waste solutions can be developed before all the science is known, as climate and pollution research is still ongoing. Hamzawi brought an important point: science and actions are not sequential, they are parallel pathways. Already, "the public is way ahead of where the science is [...] plastic waste does not belong in the environment, you don't need scientists to tell you that." Many

¹¹ Canada, Service. "Government of Canada." *Canada.ca*, Government of Canada, 26 July 2019, <https://www.canada.ca/en/services/environment/pollution-waste-management/zero-plastic-waste/canada-action.html>.

¹² Boberg, Julie, et al. "Environmental Toxicology: Plastics." *Encyclopedia of Reproduction*. Academic Press, 2018.

actions have been taken in response to concern from citizens and governments, e.g. the microbead ban¹³. Some industries are not waiting for the law to change to take action for consumers.

Collaborations

Collaborations are important, finger-pointing can be counterproductive, and working together makes the movement even more powerful and efficient. Interdisciplinary projects have a huge impact. For instance, artists or journalists can have the ability to reach more people than a 400-page scientific report. It is important for scientists to exchange more with journalists. Indeed, journalists can be misinformed; but scientists are also responsible for learning to effectively communicate science to these audiences. Hamzawi stated that the government has a departmental scientific integrity policy when communicating with the media. In fact, their scientists are encouraged to talk with the media to “build a bridge between science and policy, like we are doing tonight”.

Hopeful stories

Given the magnitude of the problem, it is easy to feel helpless in the face of large policy challenges. Yet there are glimmers of hope that can serve as the seed for future innovations and solutions. The public asked the panelists for examples of hopeful stories from their work on plastics. Examples from nature mentioned here were mangroves and whales. Mangroves are plants that can digest toxins and microplastics through their roots without producing waste from its digestion. Nature conservancies are now looking into the science behind this. Morrissette also offered hope by suggesting that although whales are a charismatic endangered species affected by plastic, their deaths spark attention from the public and guide the urge to take action on plastic pollution. Finally, it was noted that one should not wait for perfection, because all systems and policies will have their flaws. Morrissette indicated that the additive effect of many “small” ideas can and will make a difference. Together, all stakeholders can come together and collaborate in order to permit a positive future for the Canadian and global public.

¹³ Canada, Health. “Government of Canada.” *Canada.ca*, Government of Canada, 30 Nov. 2018, <https://www.canada.ca/en/health-canada/services/chemical-substances/other-chemical-substances-interest/microbeads.html>.