

GREAT LAKES PLASTICS FORUM

SOLUTIONS FOR A SUSTAINABLE FUTURE

Summary Report



Pollution Probe is a national, not-for-profit, charitable organization that exists to improve the health and well-being of Canadians by advancing policy that achieves positive, tangible environmental change. Pollution Probe has a proven track record of working in successful partnership with industry and government to develop practical solutions for shared environmental challenges.



Council of the Great Lakes Region is a binational nonprofit organization that is dedicated to deepening the United States-Canada relationship in the Great Lakes Region. Its focus is on creating a stronger and more dynamic culture of collaboration in harnessing the region's economic strengths and assets, improving the well-being and prosperity of the Region's citizens, and protecting the Great Lakes for future generations. It achieves this mandate by conducting evidenced based policy research, connecting diverse perspectives at events like the Great Lakes Economic Forum, and acting as a strong voice for the Region's varied economic, social and environmental interests.



Clean Water Foundation is a Canadian non-profit organization dedicated to engaging individuals in actions that preserve, protect and improve our water. We work in partnership with public, private and charitable interests to create policies and programs that encourage water friendly behaviours.

Acknowledgements

The Great Lakes Plastics Forum and development of this report were made possible through generous support from:

Chemistry Industry Association of Canada
Canadian Plastics Industry Association
Ice River Springs
University of Toronto

Council of the Great Lakes Region and Pollution Probe thank the following individuals for their time and contributions to the planning and implementation of the forum, including their role as presenters, and expertise in reviewing drafts of this document:

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The contents of this report reflect information shared by stakeholders at the Great Lakes Plastics Forum and do not necessarily reflect the opinions or findings of the Council of the Great Lakes Region or Pollution Probe.

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CHEMISTRY INDUSTRY
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About this Report

Plastics are one of the most revolutionary innovations of the modern world. They play a critical role in shaping our economy and our daily lives. However, the way in which plastics are used, managed and disposed of, can pose significant challenges for the environment and for our health. Many plastics have the ability to be recovered, recycled or reconstituted more than once but this value is lost when they are discarded or improperly disposed of. Each day, plastic debris and fibres make their way into rivers, streams and lakes, where they accumulate. An estimated 22 million pounds of plastic including bottles, food packaging and microplastics,¹ flows into the Great Lakes each year and approximately 80% of all of the litter found in the lakes is plastic.

This report presents highlights from the Great Lakes Plastics Forum which sought to address issues related to plastic waste and improper disposal in the Great Lakes Region, with a focus on Ontario and Canada. Hosted by Pollution Probe, the Council of the Great Lakes Region and the Clean Water Foundation, the forum convened over 50 leading Canadian subject-matter experts from government, industry, not-for-profit organizations and academia on October 11, 2018, in Toronto. Keynote remarks were delivered by the Honourable Rod Phillips, Ontario Minister of the Environment, Conservation and Parks. The forum was made possible through generous support from the Canadian Plastics Industry Association, Chemistry Industry Association of Canada, Ice River Springs and the University of Toronto.

The forum provided a platform for the exchange of ideas around how best to work together to develop innovative and practical solutions to issues related to plastic waste and to set the stage for more focused, cross-border dialogue related to a circular economy and materials marketplace in the binational Great Lakes Region. Topics explored included the state of the science on plastics in the Great Lakes, examples of current leadership efforts, regulatory and policy priorities and engaging consumers in necessary behaviour change related to the proper use and disposal of plastics. The discussions and outcomes outlined in this report constitute a foundation upon which those with a stake in the future of plastics, a circular economy and the health of the Great Lakes, can base future actions.

Speaker presentations and further information on the Great Lakes Plastics Forum can be found at www.pollutionprobe.org/greatlakesplasticsforum.

¹ Hoffman, M.J., & Hittinger, E. (2017). *Inventory and transport of plastic debris in the Laurentian Great Lakes*. Retrieved from: <https://pdfs.semanticscholar.org/80c1/80a30b73fe4fd3490b7fa3355c36c346015a.pdf>

Report Outline

This report is divided into two sections describing the broad context for plastics in the Great Lakes, highlighting the important research efforts and industry leadership currently underway, and identifying the types of actions that should be prioritized moving forward.

Section One provides a summary of a number of context-setting speaker presentations. It introduces the regulatory landscape related to plastics and the Great Lakes at the federal and provincial level and describes some of the solutions being pursued by industry and other stakeholders.

Section Two outlines discussions from four sessions convened at the forum. It introduces some of the important research efforts currently underway to better understand the sources, fate and impact of plastic debris and fibres in the Great Lakes. It highlights examples of industry leadership and explores what else can be done to advance a circular economy for plastics. This section also includes an overview of forum discussions around best practices from other jurisdictions, new and innovative policies to be explored and how to effectively engage consumers in meaningful behavioural change.

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Introduction

Plastics play a critical role in shaping our economy and our daily lives. The unrivalled functionality, durability, low maintenance and relative cost effectiveness of plastic products have contributed to a significant growth in their application since the early 1950s. Today, plastics are ubiquitous, with over a thousand types available in the market. Their versatility makes them appealing for a range of applications including child safety helmets, airbags, cell phones, computers and other electronic equipment. Plastics are found in the roofs, walls, flooring and insulation that make homes energy efficient. Perhaps most importantly, plastics help keep food safe with packaging applications accounting for their greatest use worldwide. Plastics have also been shown to have a lower environmental impact than some alternative materials that perform the same function because they are lightweight, meaning more can be done with less.²

The durability of plastics means that most types do not break down easily in the environment, creating major challenges around their appropriate disposal. The full value of plastics as a resource is lost when they are discarded or improperly disposed of. This contributes to a need for new materials to be extracted from the earth, a process that can generate greenhouse gas (GHG) emissions, pollute water and release of harmful pollutants. Poorly managed waste also has the potential to contribute to the leaching of harmful pollutants or ingestion by small organisms and wildlife. When ingested, chemicals found in plastics have been shown to bioaccumulate and biomagnify up the food chain, contributing to a number of health effects including liver toxicity.³ In addition, there is evidence that plastic waste may host pathogens that are triggers for disease outbreaks, including in coral reefs.⁴

Plastic debris and fibres can make their way into rivers, streams and lakes, where they accumulate. It is estimated that 22 million pounds of plastic flows into the Great Lakes each year. The Great Lakes form the largest group of freshwater lakes on Earth, making up about 20% of the world's, and 84% of North America's, surface freshwater. Because of the wealth of resources and opportunities the lakes offer, the region around them has grown into one of the most economically powerful and culturally diverse in the world. Over 40 million people rely on the Great Lakes for everything from water to power generation for their homes and businesses, highlighting an urgent need to address the issue of plastic waste in the region.

Industry, governments, academia and the not-for-profit sector have prioritized action on plastic waste reduction, committed to ambitious targets and worked to advance the circular economy for plastics and the extension of their lifecycle. The significance of the challenge facing the Great Lakes will require

2 Lord, R. (2016). *Plastics and Sustainability: a valuation of environmental benefits, costs and opportunities for continuous improvement*. Retrieved from: <https://plastics.americanchemistry.com/Plastics-and-Sustainability.pdf>

3 Rochman, C.M., et al. (2013). *Ingested plastic transfers hazardous chemicals to fish and induces hepatic stress*. Retrieved from: <https://www.nature.com/articles/srep03263>

4 Lamb, J.B. et al (2018). *Plastic waste associated with disease on coral reefs*. Retrieved from: <https://science.sciencemag.org/content/359/6374/460>

collaboration among these stakeholders and others, in an effort to continue to develop and implement innovative solutions.

Forum Objectives

The Great Lakes Plastics Forum provided a space for dialogue and collaboration around the need to develop innovative and practical solutions to address the issue of plastic waste and improper disposal in the Great Lakes Region, supported by sound public policy. More specifically, the forum sought to:

- Identify barriers, opportunities and potential solutions to the challenges associated with plastic waste and improper disposal in the Great Lakes
- Provide a starting point for continued dialogue across a range of stakeholder groups
- Engage participants in knowledge-sharing that contributes to capacity building
- Catalyze movement for next steps to address identified areas for priority action

Forum Design and Process

The format for the day involved a combination of speaker presentations from leading subject-matter experts and facilitated, open dialogue with forum participants. This approach provided an opportunity to hear from leaders in the field from government, industry, academia and civil society organizations, while also allowing for audience participation and engagement.

Opening remarks were followed by two context-setting presentations that provided an overview of the federal and provincial plastics landscapes. The remainder of the forum was organized around four sessions that strategically built upon the information provided during the previous session. These sessions broadly sought to better understand the state of the science and current knowledge gaps, to highlight leadership efforts, to identify and prioritize policy and program needs moving forward and to advance dialogue around how to encourage behaviour change.

The following specific objectives were determined for each session:

Session 1: State of the Science. This session provided participants with a context-setting overview of some of the important research efforts currently underway to better understand the sources, fate and impacts of plastic debris and fibres in the Great Lakes.

Session 2: Leading the Way. Industry, academia and the not-for-profit sector have prioritized action on plastic waste reduction, committed to ambitious targets and worked to advance the circular economy for plastics and the extension of their lifecycle. Examples of these leadership efforts and a discussion about what more can be done were the focus of this session.

Session 3: Taking Action. This session examined existing priorities, policies and programs related to plastic debris and fibres and the creation of a circular economy for plastics in the Great Lakes Region. Existing barriers to addressing plastic waste and improper disposal were identified, and drawing on examples from other jurisdictions, new and innovative policies were explored.

Session 4: Consumer Engagement and Behaviour Change. This session aimed to advance dialogue around how best to engage consumers in necessary behaviour change related to the proper use and disposal of plastics in the Great Lakes Region.

The forum agenda and speaker biographies are found in **Appendix A** and **Appendix B**.

Key Themes Explored at the Forum

A range of barriers, opportunities and actions were explored throughout the Great Lakes Plastics Forum. This section highlights key themes that were discussed by speakers and forum participants.

1. Plastics are important for our economy and our daily lives

Recognition of the important role that plastics play in our daily lives was a recurring theme throughout the forum. Their unrivalled functionality, durability and low cost make them attractive for use across a range of different applications and sectors. Plastics offer significant social, economic and environmental benefits ranging from energy resource savings, consumer protection, reduced food spoilage, improved air quality and innovation that improve important sectors like healthcare. It is estimated that there are currently over a thousand different types of plastic in use globally.

The improper disposal of plastics however, contributes to significant environmental challenges. Plastic is often viewed as a waste product or a material to be used once and discarded. Greater efforts are required to shift perceptions around the true value of plastic throughout its entire lifecycle. At the same time, the systems necessary to create real economic value for plastics while also reducing the environmental impacts of this important resource, need to be developed.

2. Improper disposal of plastics is both an environmental and an economic issue

The economic impacts associated with the improper disposal of plastics are often left out of the conversation, despite their importance. While proper management is required to avoid plastics ending up in landfill and polluting our waterways and freshwater systems, including the Great Lakes, there can also be significant economic costs associated with improper disposal. For example, it is estimated that between \$100 and \$150 billion CAD of the material value of plastic packaging is lost to the economy each year. In addition, plastic pollution results in \$13 billion CAD per year in damage to marine ecosystems, which also affects the industries that rely on them (e.g., fisheries, tourism and shipping). The full extent of the economic impacts of plastics on ecosystems is still unknown.

3. We have enough science to act now

While more science and research around the impacts of plastics are necessary and will continue to be critical for ensuring a strong foundation upon which action, policy and programs can be built, forum participants noted that there is already enough data and understanding to act. It is clear from what is already known, that plastics, and more specifically, microplastics, are contributing to negative health impacts for a number of different species across a range of environments. In 2017, the Canadian government was one of the first to address microplastics in freshwater and marine ecosystems when

it published the *Microbeads in Toiletries Regulations*. The regulations prohibit the manufacture, import, and sale of all toiletries that contain plastic microbeads (with the exception of natural health products or non-prescription drugs which will be prohibited as of July 1st, 2019).⁵ Despite the fact that science associated with plastics will continue to be a moving target, these regulations are a positive example of how it is not always necessary to wait until things get worse before beginning to address the issue.

The specific types of research and data needed moving forward were also explored. To date, research and monitoring has tended to focus on documenting the types of plastic found in the lakes and how they make their way there. There is a need for greater understanding however, of the effects and impacts of plastics on ecosystems and human health. Standardized testing methods were noted as a means of contributing to less labour-intensive testing methods and improved comparisons across studies.

4. There are significant barriers associated with transitioning to a circular economy

Another theme that continued to re-emerge throughout the day related to the profound obstacles to transitioning to a circular economy. For many consumers, it remains more affordable to buy new products and use them for a short period of time before throwing them away than to invest in alternatives. Overcoming this barrier will require a broad suite of actions including a significant shift in consumer culture and habits, the development of supportive policy and regulatory frameworks and more attractive market systems. It was also noted that the current regulatory landscape in Ontario and other parts of Canada is not enough to support a transition towards a circular economy and as such, additional policies will need to be considered. Some of the potential options discussed included extended producer responsibility (EPR), deposit schemes and the promotion of new and innovative technologies.

5. Harmonization and standardization across jurisdictions should be prioritized

The need for regulatory harmony to support a circular economy was also a key theme discussed throughout the day. In Ontario alone, there are almost 250 different municipal blue box programs with limited linkages between them and significant barriers to be overcome to encourage cooperation related to scaling up. Consistency of waste collection programs across jurisdictions will be critical to facilitating improved recycling and recovery of plastics. Forum participants felt that an important short-term priority should be the harmonization of the design of recovery, recycling and re-utilization systems on a scale that would allow for the creation of competitive markets and material flows within Canada and across the border with the U.S. In other words, the creation of what was referred to as a “standardized basket of goods” or a “common bucket” for what is going into the stream in national or binational markets with regards to the four R’s (i.e., reduce, reuse, recycle, recovery).

Large-scale activities can create significant efficiencies and economies. Developing a system that can be scaled highlights synergies and a common approach to implementation. Working together, municipalities can increase bargaining power and pool resources, leading to improved cost efficiencies.

⁵ Government of Canada. *Microbeads*. Retrieved from: <https://www.canada.ca/en/health-canada/services/chemical-substances/other-chemical-substances-interest/microbeads.html>

In order for this to occur, a common set of definitions and policies that recognize the importance of strategies that contribute to a circular economy for plastics should be agreed on. Forum participants pointed to British Columbia (BC) as a leading jurisdiction that could be looked to for inspiration in establishing a standardized approach. While there is still much to do, BC's approach has contributed to increased efficiency and more cost-effective EPR, as well as better recovery and recycling.

6. Industry has taken a leadership role in addressing issues related to plastic waste

Industry has taken a leadership role in addressing the issues associated with plastic waste and set ambitious targets to support a transition towards a circular economy. Examples include the Chemistry Industry Association of Canada's (CIAC) commitment to 100% of plastics packaging being recyclable or recoverable by 2030, and 100% of plastics packaging being reused, recycled or recovered by 2040. In addition, the Canadian Plastics Industry Association (CPIA) has set a target for 100% of Canadian resin manufacturing sites operated by their members meeting Operation Clean Sweep (OCS) Blue guidelines by 2022.

Other examples of industry leadership explored during the forum included support for international programs working to address the issue of plastics pollution at the source (e.g., NOVA Chemicals' involvement in Project STOP), innovative recycling technologies and business cases (e.g., depolymerization and Ice River's 100% green recycled plastic bottles) and programs aimed at addressing non-recyclable materials (e.g., Dow's Hefty Energy Bag program).

7. While innovation should be supported, it needs to be properly staged

There was broad agreement among forum participants that support for innovation will be critical to transitioning to a circular economy. It will be important to ensure that innovation is competitive and that companies are involved in generating this competition themselves. However, there is also a need to properly stage innovation. If a new product can't be collected and recycled, it is of little value.

Participants highlighted that given the industries and academic strength found in the binational Great Lakes, there is no reason why the region shouldn't be a leader in product innovation and the circular economy. There is an opportunity to generate new economic opportunities and environmental benefits that could be a model for global export. In addition, participants noted that it will be critical for policy-makers to avoid made-in-Ontario and municipal-level solutions, as these are too narrowly focused to create the circularity required for success.

8. There is a need for greater understanding and an emotional component for encouraging behaviour change

Industry and consumers receive mixed messages about what's good for the environment, particularly related to plastics. Developing clear messaging related to the environmental benefits of recycling and why consumers should care, is necessary given that even those familiar with recycling are confused by what is accepted in take-back programs. Recycling rules vary across municipalities and regions in Canada. There are even some municipalities that do not collect waste, further contributing to challenges associated with educating consumers.

While forum participants agreed on the need for greater understanding and education, there was no consensus around the most effective way to accomplish this. Many discussed the fact that making small changes in the short-term can be easy, while maintaining new behaviours over the long-term is far more challenging. It was noted that the emotional component of behavioural change should be considered, as opposed to sharing large amounts of additional data in an effort to increase understanding. Participants indicated that unless a choice is simple, straightforward and affordable, it can be very difficult for consumers to make changes, even with the best of intentions.

9. Collaboration is critical to successfully addressing barriers and supporting potential opportunities

Perhaps most importantly, the forum highlighted the need for partnerships and collaboration to address plastic waste, improper disposal and a move towards a circular economy. As previously noted, a wide range of stakeholders have already begun working on new and innovative technologies, address environmental challenges and develop supportive policies and regulatory frameworks. However, it will require a concerted effort on the part of all stakeholders and consumers in the Great Lakes Region to overcome barriers and to realize the potential opportunities associated with a circular economy.

While the Great Lakes Plastics Forum provided the space to begin these complex discussions, continued dialogue and action between governments, industry (across the full value chain), civil society and academia, will be critical to move forward strategically and efficiently. The discussions and findings outlined in this report constitute a foundation upon which those with a stake in the future of plastics in the Great Lakes can base their actions.

Section One: Summary of Presentations

This section provides a high-level overview of the topics explored during the forum's opening remarks and speaker presentations on the federal and provincial landscape for plastics in the Great Lakes. It also explores the science and research currently being conducted related to plastics pollution.

Forum presentations can be downloaded at: <https://www.pollutionprobe.org/greatlakesplasticsforum>

Opening Remarks

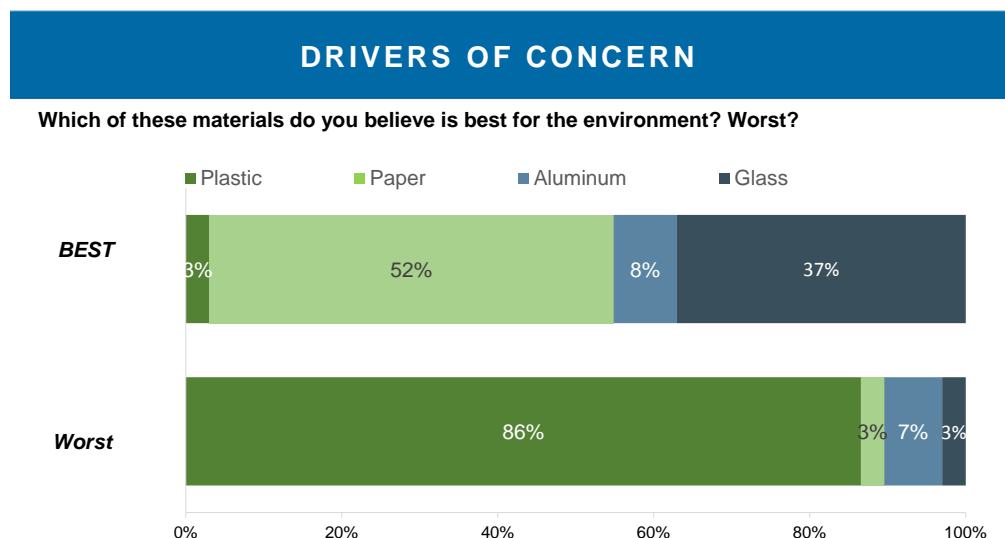
Bob Masterson

CEO and President, Chemistry Industry Association of Canada

The forum began with opening remarks from Bob Masterson who framed a number of the key issues that would be explored throughout the day. Mr. Masterson set the stage by providing an overview of Canadian perceptions of plastic waste based on a polling exercise conducted by Earncliffe and funded by CIAC and CPIA. The survey found that one in five Canadians believe the issue of plastic waste is too big to tackle, while four out of five think that behaviours and new technologies will help solve the challenge.

Mr. Masterson highlighted that when asked which materials they thought were best and worst for the environment, respondents felt that paper (52%) and glass (37%) were best, while plastic was overwhelmingly considered to be the worst (86%). The majority of respondents also felt that it is consumers who fail to recycle properly (58%), rather than companies (25%) or governments (18%), which are to blame for the plastic waste found in rivers, lakes and oceans. Only one in five respondents (22%) felt that a ban would be the best way to reduce plastic waste. Instead, a majority (46%) indicated that the recovery and reuse of plastic products through the development of new technologies, is the most appropriate way to proceed.

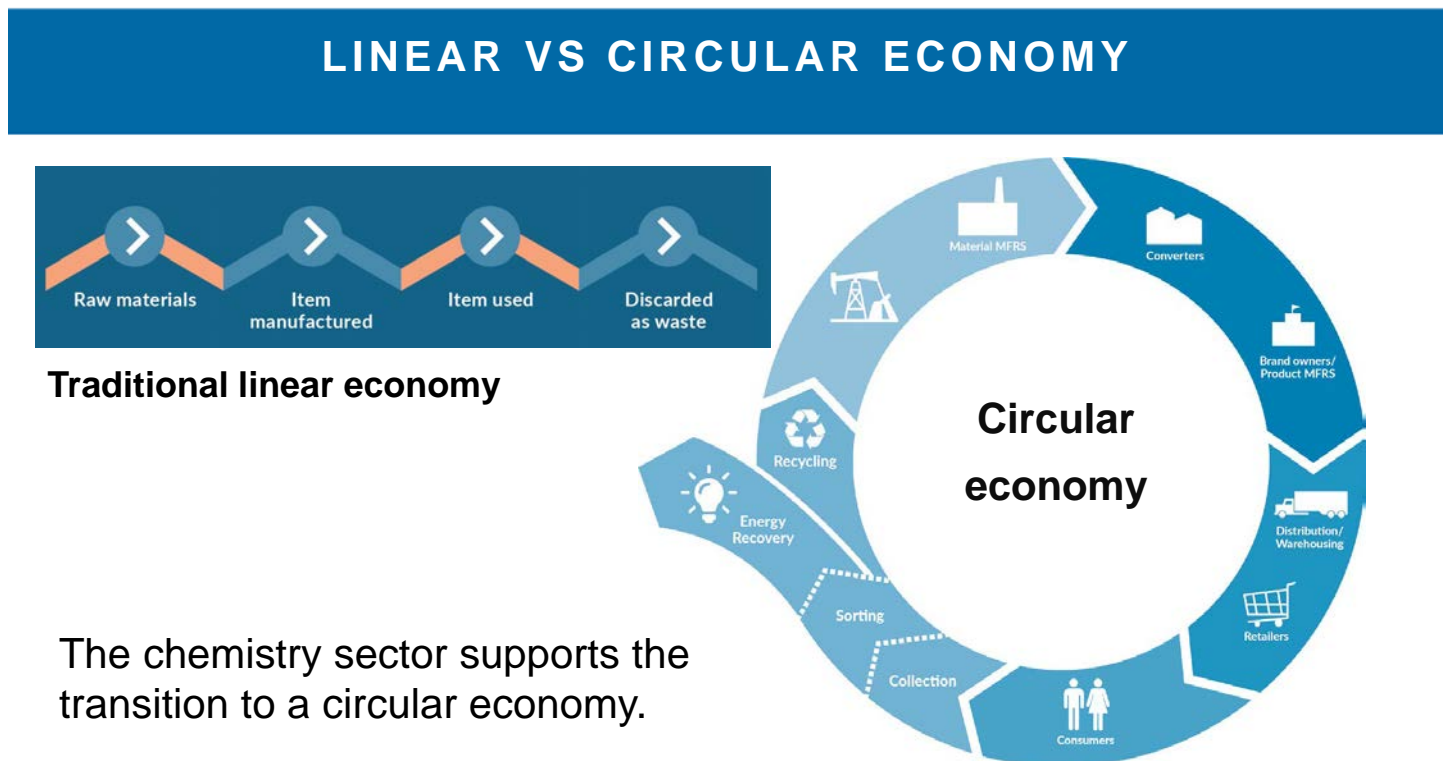
Figure 1: Materials believed to be best and worst for the environment



Source: Polling exercise conducted by Alan Gregg of Earncliffe and funded by CIAC and CPIA

Mr. Masterson indicated that despite an increasing number of opportunities related to the recycling of plastic, it is still being disposed of as a waste product. In fact, three-quarters of recyclable materials are going to landfill (e.g., polyethylene terephthalate (PET), plastic bags and overwrap, foam, food and protective packaging and plastic containers). While alternatives to plastic exist for many applications, they are not without considerable social, environmental and economic costs. It is estimated that overall, costs can be up to four times greater than business as usual. As such, the chemistry industry supports the transition away from a traditional linear economy towards a circular economy for plastics.

Figure 2: Linear vs. circular economy



Source: Bob Masterson, presentation at the Great Lakes Plastics Forum

The transition towards a circular economy will require significant work in collaboration with consumers, government and civil society organizations. Representing the broad plastics value chain in Canada, CIAC, CPIA and their members, announced the following waste reduction targets in May 2018:

- 100% of plastics packaging will be recyclable or recoverable by 2030
- 100% of plastics packaging will be reused, recycled, or recovered by 2040

Mr. Masterson indicated that while these are very ambitious goals, it is industry's responsibility to ensure that they are met. A number of options and opportunities will need to be explored in order to reach these targets including an increase in the volume of mechanical recycling – operations that recover plastics via mechanical processes such as grinding, washing, separating, drying, re-granulating and compounding. Even if existing plastic packaging recycling rates were tripled and the use of waste-to-fuel (WTF) increases, a significant amount of new material recovery will still be required by 2040. This points to a need for new solutions and opportunities to be explored including chemical recycling

— a process that breaks down plastics into their basic chemical components where they can then be used for new feedstocks or fuels. Converting non-recyclable plastics into ultra-low sulfur diesel for example, can contribute to reductions in GHG emissions, water consumption and traditional energy use. It is believed that these opportunities will play a critical role in closing the gap to meet ambitious goals for 2030 and 2040.

Mr. Masterson indicated that the current regulatory and legislative systems are not yet fully established to help facilitate a move towards a circular economy. He then outlined industry's principles related to plastics:

1. Plastics litter is unacceptable.
2. Landfill means a waste of precious resources.
3. Everyone has a role to play.
4. Science and life-cycle analysis, not emotion.
5. We will do our part and help others do theirs.

Mr. Masterson concluded by noting that everyone has a role to play in achieving the vision of a circular economy for plastics and what this looks like should be guided by both science and life-cycle assessment.

Representative from Ice River

Opening remarks delivered by a representative from Ice River provided an overview of the journey that began when they decided to make a conscious effort to address plastic waste and become a recycling company in addition to a bottled water company. Ice River felt that landfill was not an acceptable endpoint for their product and that there was a better use for their plastic bottles. At the time, Ice River's ownership were told that there was no way to make water bottles from 100% recycled PET. They invested in developing the first closed-loop PET recycling facility.

Ice River has since acquired a number of other companies to further diversify the plastics that they receive and process. In an effort to divert additional plastic types, Ice River bought C.R. Plastic Products, producers of recycled plastic furniture including Adirondack Chairs, in 2014. While the company was already producing furniture from plastic including milk jugs, Ice River began a product line made from bottle caps, a product that too often ends up in landfill or the natural environment even through the recycling process.

The company's investment in an extrusion – a high-volume manufacturing process in which raw plastic is melted and formed into a continuous profile – facility designed to process case wrap (a product also typically destined for landfill) was also discussed. While some grocery stores collect case wrap and repurpose it as garbage bags, these are then bound for landfill. In addition, the company owns Osprey Organics, which grows organic grains. Osprey Organics is located on 3,000 acres on Blue Mountain and the land used to grow the grains helps to protect the underground source water. The company ensures that no pesticides or chemicals are used so that there is no contamination of the source water.

Ice River currently purchases approximately 80% of all baled PET from the Blue Box program in Ontario, including clamshell and deli containers, which are then put into the bottle-to-bottle process, creating a truly circular economy. In summary, the representative from Ice River noted that these are just a few examples of the ways in which industry can contribute to being a part of the solution to issues associated with plastic waste.

Global Update: G7 Environment, Energy and Oceans Ministerial

Sarah Da Silva

A/Head, Marine Litter Unit, Plastics Initiative, Environment and Climate Change Canada

Sarah Da Silva provided an update on the current work being done globally to address plastic waste, with a focus on the recent G7 Environment, Energy and Oceans Ministerial. Ms. Da Silva discussed how plastics are a vital component of our everyday lives and an important resource for a range of sectors due to its unrivalled functionality, durability and low cost. Plastics production has been growing exponentially since the 1950s and there are now over 1,000 different types.

Approximately 90% of new plastics created are made from virgin fossil fuels and they are not currently being managed sustainably. Only 9% of plastic waste that has been produced globally has been recycled, with the remainder going to landfill, incinerators or leaked into the environment. A staggering average of 8 million tonnes of plastics are believed to enter the oceans from land each year. Without any action to address this issue, it is estimated that this number could double by 2025.

The improper disposal of plastics results in a significant loss of valuable material and embedded energy. It is estimated that between \$100 and \$150 billion CAD (\$80 – \$120 billion USD) of the material value of plastic packaging is lost to the economy each year. In addition, plastic pollution results in \$13 billion USD per year in damage to marine ecosystems, which also affects the industries that rely on them (e.g., fisheries, tourism and shipping). The federal government has been working to continue to advance this area of emerging science.

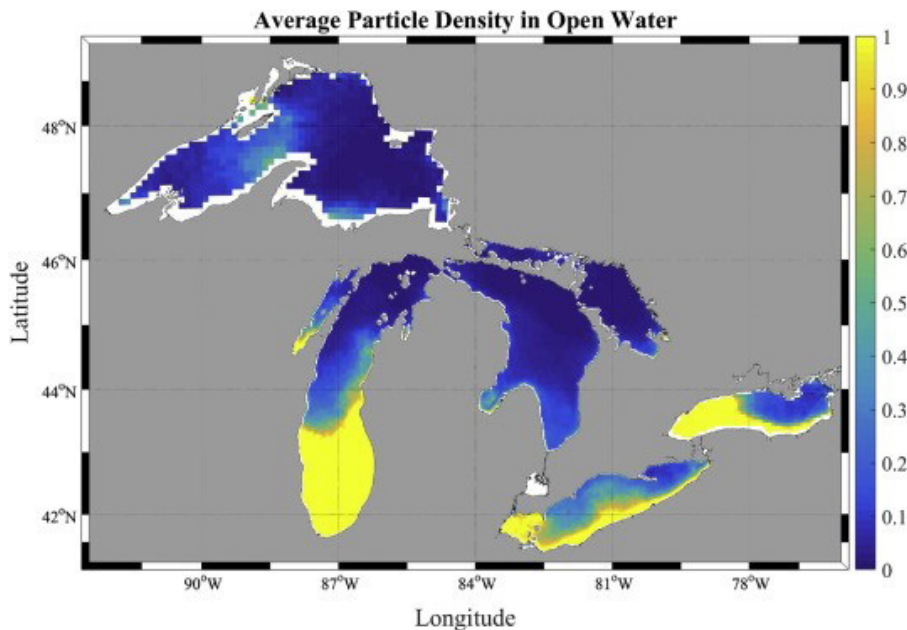
Ms. Da Silva noted that plastic pollution is not just an oceans-related issue. Freshwater impacts play a significant role in the story, not least because plastics in freshwater ecosystems eventually make their way into the ocean. In Canada, plastics have been found on all three coasts and in freshwater systems, including the Great Lakes. Specific examples of plastic accumulation in the Great Lakes include:

- An estimated 9,887 tonnes of plastic waste enters the Great Lakes every year⁶
- More than 43,000 microplastic particles/km² are found in the Great Lakes⁷
- Accumulation of microplastics found in sediment cores of Lake Ontario (10.5 pieces/m²) for the past 38 years⁸

6 Hoffman, M.J., & Hittinger, E. (2017). *Inventory and transport of plastic debris in the Laurentian Great Lakes*. Retrieved from: <https://pdfs.semanticscholar.org/80c1/80a30b73fe4fd3490b7fa3355c36c346015a.pdf>

7 Eriksen et al. (2013). *Microplastic pollution in the surface waters of the Laurentian Great Lakes*. Retrieved from: <https://pdfs.semanticscholar.org/80c1/80a30b73fe4fd3490b7fa3355c36c346015a.pdf>

8 Corcoran, P.L. et al. (2015). *Hidden plastics of Lake Ontario, Canada and their potential preservation in the sediment record*. Retrieved from: http://www.surface-science-western.com/wp-content/uploads/ep15_walzak.pdf

Figure 3: Modeled average particle density in open water between 2009 and 2014

Source: Hoffman, M.J., & Hittinger, E. (2017). Inventory and transport of plastic debris in the Laurentian Great Lakes

There has been incredible global momentum to address the issue of plastic waste. The federal government has been engaging a range of organizations around litter and resource efficiency, while also working to improve plastics management and reduce pollution. Industry has been contributing to building momentum on plastics, particularly related to their own commitments. For example, the Declaration of the Global Plastics Associations for Solutions on Marine Litter was voluntarily signed by 75 plastics organizations and allied industry associations operating in 40 countries. In January, 11 leading companies including Unilever and Walmart committed to 100% reusable, compostable or recyclable packaging by 2025 as part of the New Plastics Economy Initiative. This initiative, led by the Ellen MacArthur Foundation, has a goal of rethinking and redesigning the future of plastics, starting with packaging. Additional commitments were made in June 2018 through the UK's Plastics Pact which is aimed at creating a circular economy for plastics. The pact brings together businesses from across the plastics value chain, with governments and civil society organizations to tackle the issue of plastics waste through ambitious 2025 targets for reuse, recycling, composting and recycled content.

The issue of marine litter and the more efficient use of resources was a focus under the German presidency of the G7 in 2015. Every year since, and under different presidencies, discussions have continued around the need for further efforts. The following are examples of some of the recent G7 efforts and commitments related to plastics:

- G7 Action Plan to Combat Marine Litter (2015)
- G7 Alliance on Resource Efficiency (est. 2015)
- Toyama Framework on Material Cycles (2016)
- 5-Year Bologna Roadmap (2017)
- Ocean Plastics Charter (2018)

One of the priority themes under Canada's G7 Presidency has been **Working Together on Climate Change, Oceans, and Clean Energy**. On June 8 and 9, 2018, G7 leaders met in Charlevoix, Québec for a Leader's Summit. Two key outcomes emerged related to plastics:

- **Charlevoix Blueprint for Healthy Oceans, Seas, and Resilient Coastal Communities:** This strategy provides a framework for enhancing ocean and coastal resilience. It allows G7 members to commit to take action on the promotion of sustainable oceans and fisheries, support resilient coasts and coastal communities, and take action on ocean plastic waste and marine litter.
- **Ocean Plastics Charter:** This voluntary charter outlines concrete actions to eradicate plastic pollution and was initially endorsed by Canada, France, Germany, Italy, the UK, the European Union (EU) and a number of large corporations. There are now 16 governments and 20 businesses and other organizations who have endorsed the Charter.⁹ Endorsees commit to moving towards resource efficiency and a sustainable approach to plastics management through action on:
 - Sustainable design, production and after-use markets
 - Collection, management and other systems and infrastructure
 - Sustainable lifestyles and education
 - Research, innovation and new technologies
 - Coastal and shoreline action

In addition, the federal government committed to investing \$100 million to help developing countries rid the oceans of global marine litter and plastic pollution through support for waste management infrastructure, clean-ups, opportunities to improve design and other activities through the upstream value chain.

Building on the themes and outcomes from Charlevoix, Ministers met from September 18-21, 2018 in Halifax to discuss priorities related to climate change, oceans, and clean energy. Ministers agreed on the need to take a lifecycle approach to plastics, to prioritize advancing research and innovation and the importance of ensuring that all sectors are involved in taking action. All members agreed to a G7 Innovation Challenge to Address Marine Plastic Litter to stimulate innovation and to raise awareness about how to address marine plastic litter or facilitate improvements to plastics management in developing countries.

The Canadian government further amplified their commitment to the G7 Innovation Challenge to Address Marine Plastic Litter by investing \$20 million internationally to encourage innovation in developing countries and a further \$12 million for made-in-Canada solutions. As part of its \$100M investment to developing countries, the government will also invest \$65 million through the World Bank for an international fund to address plastic waste in developing countries and supporting better waste management processes. Innovative private-public partnerships through the World Economic Forum Global Plastics Action Partnership will receive a \$6 million investment. The federal government

⁹ Government of Canada. *Oceans Plastics Charter*. Retrieved from: <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html>

has also committed to taking action on plastics within their own operations with a goal of achieving a 75% plastic diversion rate by 2030.

Canada's domestic approach is aligned with its commitments internationally. In order to work in a comprehensive manner to take a lifecycle approach, the government will work in consultation with civil society groups, industry, Indigenous communities and others to inform a Canada-wide approach to keeping plastics in the economy and out of the environment. They will also work with territories and provinces through the Canadian Council of Ministers of the Environment (CCME). In November 2018, the CCME agreed in principle to a national strategy on zero plastic waste that outlines a vision to keep all plastics in the economy and out of the environment. The strategy identifies areas where changes are needed across the plastic lifecycle, from design to collection, clean-up and value recovery, and underscores the economic and business opportunities resulting from long-lasting and durable plastics.¹⁰ The CCME is currently working to develop an action plan for ministers to consider that sets out the measures and actions needed to implement the strategy. Specific to the Great Lakes, a number of activities are already taking place, including conducting research on the sources and impacts of plastic pollution in the lakes. Community actions are recognized through funding mechanisms, such as the EcoAction Community Funding Program, where outreach activities, cleanups and the development of educational materials are supported.

Moving Canada Toward Zero Plastic Waste public consultations were held through an online platform between April 22, 2018 and September 21, 2018. Approximately 13,000 Canadians provided the federal government with their views on solutions to plastic waste. Key takeaways included that Canadians recognize the need to take action now, and that no one solution can solve the problem. Some of the more commonly stated solutions included the need to focus on standards, identify environmentally sustainable alternatives, put strict limits on particular product types, and to improve recycling and waste management systems.

Ontario Context: The Provincial Plastics Landscape

Christopher Hilkene

Chief Operating Officer, Pollution Probe

Christopher Hilkene provided a brief overview of the provincial plastics landscape in Ontario. Mr. Hilkene noted that Ontario's economy is the third largest in the Great Lakes Region, which puts the province in a unique position to encourage and support a binational approach to plastics that would ensure a level playing field across competing jurisdictions.

While there have been a number of successful community actions and citizen science campaigns to address the issue of plastic waste in the province (e.g. beach clean ups), these types of efforts are often temporary solutions. With this in mind, Mr. Hilkene discussed the importance of the research and science related to plastics in the Great Lakes being conducted in Ontario and the need to further

¹⁰ Canadian Council of Ministers of the Environment. *Strategy on Zero Plastic Waste*. Retrieved from: https://www.ccme.ca/en/current_priorities/waste/waste/strategy-on-zero-plastic-waste.html

support these efforts, particularly given limited knowledge around associated human health and environmental impacts.

Mr. Hilkene also highlighted a number of examples of the province's commitment to addressing the issue of plastic waste including through the *Waste-Free Ontario Act* and the Resource Recovery and Strategy for a Waste-Free Ontario: Building a Circular Economy. Taken together, these regulations help to define a directional role for the province in resource recovery. Mr. Hilkene indicated that a number of questions have emerged around what a move towards a circular economy, enabled by the *Waste-Free Ontario Act*, would look like and whether the Act, as it currently stands, will be sufficient to support this transition.

While commonalities exist between the province's approach to the issue and that of the federal government, there are also key differences including Canada's ability to leverage national regulations and international agreements to help build momentum. For example, Canada, along with the U.S. and several other countries, has prohibited microbeads in toiletries (with exceptions for natural products and non-prescription drugs which will be prohibited as of July 1st, 2019). A number of companies worldwide have also removed them from their products. That said, Ontario has been participating in broader conversations around plastics pollution both by way of the G7 Ocean Plastics Charter and the CCME's approach to water through the Pan-Canadian Framework on Clean Growth and Climate Change.

Mr. Hilkene discussed the fact that while Ontario has shown leadership around some plastics-related programming (e.g., the Ontario Deposit Return Program which diverts alcoholic beverage containers from landfill), there are a number of jurisdictions that the province can look to for inspiration, best practices and lessons learned. For example, bans on single-use plastic items (e.g., bags, straws) are in place in BC and Québec, parts of the U.S. and Europe. By comparison, six out of eight of the Great Lakes states have laws prohibiting municipalities from regulating single-use plastic items. Furthermore, the implications of China and Vietnam closing their borders to recycled plastic scrap imports, with other jurisdictions predicted to join them, points to a critical need to determine a path forward that addresses where plastics end up.

California requires plastic producers to develop plastic discharge plans and install capture technologies (i.e., devices that physically trap litter found in stormwater systems, rivers, lakes and coastal areas). A number of non-regulatory approaches have also been pursued worldwide including the following:

- Plastic film recycling programs in BC, New York, Rhode Island and California.
- Los Angeles has installed city-wide storm drain screens to capture plastics before they enter the stormwater system.
- The EU's Green Dot symbol on packaging lets consumers know that the companies they purchase products from are using resource recovery systems.
- A number of jurisdictions have imposed requirements for the use of recycled or biopolymer material content in product manufacturing.
- California requires product labelling that differentiates between recyclable and compostable items.

Mr. Hilkene concluded his presentation by leaving forum participants with a number of questions to consider throughout the remainder of the day. These included:

- Where does plastic pollution occur in the Great Lakes?
- Can we identify its sources and pathways?
- What impacts are plastics having on the environment and our health?
- What tools can we use to achieve reductions in plastics entering the environment and more specifically, the Great Lakes?
- What actions do the public expect from government and industry?
- How do we measure success?

Section Two: Session Summaries

This section summarizes the outcomes of four sessions, each of which included both presentations and open dialogue with forum participants.

Session One: State of the Science

This session provided an overview of some of the current research efforts aimed at better understanding the sources, fate and impacts of plastic debris and fibres in the Great Lakes.

Dr. Chelsea Rochman

Assistant Professor, Department of Ecology and Evolutionary Biology, University of Toronto

Dr. Chelsea Rochman discussed the broader context for plastics in our water systems. The term microplastics is often used to capture a diverse range of categories of plastics of different sizes. Effective policy and management of microplastics must be informed by a clear understanding of sources, contamination and effects. There are a number of sources, some of which are sea-based, many of which are broken down pieces of larger plastics, and the majority of which originate on land. Many microplastics are not perceived as valuable resources and as such, end up as waste and can eventually find their way into the environment. As a result, microplastics contamination has become more than a plastics issue, it is a global contaminant issue.

Dr. Rochman explored how society's perception has shifted from viewing plastics as an amazing product, to one that is now considered a global contaminant. The initial popularity of plastics is partially attributed to the industrial revolution following WW2, when single-use items of convenience became more attractive. A number of single-use plastics continue to play a vital role in our daily lives, such as packaging to keep food fresh and prevent spoilage. It is critical however, to ensure that single-use plastics end up in the proper materials management systems. Currently, 8300 Mt of plastics are produced each year, with very little being recycled or incinerated.

Dr. Rochman indicated that her lab is currently working to better understand the impacts of plastics on wildlife and that they are also beginning to look at potential human health effects. Reports have indicated that more than 800 species have been contaminated by plastics, including over 220 species that have had microplastics discovered in their stomachs. Plastics contamination can also lead to exposure for humans when they ingest sea products including sea salts. From a freshwater perspective, Dr. Rochman and her lab found microplastics in drinking water sampled from water treatment plants that are served by the Great Lakes system.

Specific impacts from exposure to plastics in water can be physical or chemical. Species can become entangled in plastic products or mistake plastics for food where they can become lodged in their gut. At the same time, the chemical substances that the plastic is comprised of may end up floating in oceans and freshwater where they are easily absorbed by other plastics. These chemicals, some of which are toxic, also have the potential to leach into the tissues of the organisms that consume them. In a study conducted with mice, microplastics migrated into the kidney and liver. They have also been found in the livers of fish, raising further questions about the fate of the plastic within the

body. Dr. Rochman noted that whether or not the chemicals found in plastic transfer, biomagnify or bioaccumulate within the food chain needs to be further explored.

In 2016, Dr. Rochman synthesized the state of the science related to the impacts from plastics on different levels of biological organization. While there was little literature specific to plastic pollution in the ocean at the time, there was a lot in the medical literature related to how plastics are used for medical applications. It became clear from the literature review on plastics in the ocean, that every effect identified was attributed to a different size of plastic that ranged from tiny nano-plastic to macroplastics. Effects were also noted for every level of biological organization including gene expression, tissues and organs. These effects included tumors, change in behaviour, population level or communities, and even death. The wide range of outcomes is attributed to the fact that microplastics vary in size and shape and that the dose used to test, along with the length of exposure, all have an effect on the results. This points to a need for greater standardized testing.

Dr. Rochman's lab has been testing a number of mitigation technologies, including those aimed at reducing the number of microfibers that end up in wash water. They found that existing filter technologies reduced 87% of microfibers emerging from the wash. If filters were used in washing machines in each house, it could contribute to reducing between 20 and 31 trillion microfibers that find their way into Lake Ontario from Toronto every year. The lab also looked at how raingardens with bio-efficient cells reduce the amount of microplastics that end up in the drain and found that this was another simple, viable solution.

Dr. Rochman pointed to a number of priority questions and research needs for microplastics:

- Identify local entry points for microplastics into the environment, where we should act and how we prevent them from entering the Great Lakes.
- Identify largest reservoirs for plastic debris once they enter the environment
- Understand the fate of microplastics and associated chemicals in the environment
- Determine ecologically relevant impacts of microplastics:
 - Environmentally relevant laboratory studies, laboratory ecosystem study (mesocosm), field studies, multi-stressor
- Identify impacts to human health and food security
- Improve methods for quantifying and characterizing microplastics in complex matrices. There are currently no standard methods in place to do this.

However, Dr. Rochman also highlighted that while science is important for informing solutions and more is needed, there is already enough to act now to prevent further plastics from ending up in the environment. It is important to note that there will be no one-size-fits-all solution for addressing plastics, requiring a suite of actions. Targets should remain realistic and achievable and industry will be unable to meet its target of 100% recycling and recovery by 2040, without supportive infrastructure and policies in place at the municipal-level.

Dr. Paul Helm

Sr. Research Scientist, Great Lakes, Ontario Ministry of the Environment, Conservation and Parks

Paul Helm provided a Great Lakes-specific perspective on the issue of plastic waste. He began by presenting an overview of data and information currently available on the presence of plastics and microplastics in the Great Lakes Region. Examples included data collection initiatives like the Great Canadian Shoreline Cleanup¹¹ (Adopt-A-Beach in the US), which compiles information about litter including plastics, along with conducting microplastics monitoring, occurrence in organisms and incident response reporting. There are also a number of apps and online tools that aggregate data from community clean-ups, including Clean Swell, World Cleanup and Litterati – Clean the Planet. Dr. Helm explained that when this information is compiled, it paints a compelling picture of the type of items that are found in our waterways.

Dr. Helm introduced forum participants to Canada's Dirty Dozen – the 12 items found in greatest quantities along our shorelines, including any place land connects with water. Tiny plastic and foam topped the list in 2017, followed by cigarette butts, plastic bottles, food wrappers and bottle caps (see Figure 4).¹² While there has been municipal action and regulation in place in some jurisdictions to address some of the items on the Dirty Dozen list (e.g. plastic bags and straws), there is still more to be done.

Figure 4: Items found in greatest quantities in Canadian water systems



Canada's Dirty Dozen (2017 ranking)

Rank	Item	# Removed
1.	Tiny Plastic and Foam	333,289
2.	Cigarette Butts	244,734
3.	Plastic Bottles	50,285
4.	Food Wrappers	47,466
5.	Bottle Caps	38,624
6.	Paper Materials	22,877
7.	Plastic Bags	22,724
8.	Miscellaneous Packaging	18,465
9.	Straws	17,654
10.	Foam Materials	17,527
11.	Beverage Cans	17,327
12.	Rope (1 piece = 1 metre)	11,365

Source: Susan Debrececi, Great Canadian Shoreline Cleanup, Ocean Wise & WWF-Canada

¹¹ The Great Canadian Shoreline Cleanup. Retrieved from: <https://www.shorelinecleanup.ca/>

¹² The Great Canadian Shoreline Cleanup. *Cleanup Results by Year*. Retrieved from: <https://www.shorelinecleanup.ca/impact-visualized-data>

When compared to Toronto Area Litter Data from 2017, similar items top the list. Cigarette butts are found in the greatest quantities, followed by tiny plastic and foam, bottle caps, food wrappers and straws. Dr. Helm noted that litter data is able to provide a clear picture of both major and minor sources of litter, as well as a comparison between local and global scale information, while also providing citizen science opportunities to measure impacts and assess personal behaviour. Dr. Helm discussed the importance of participation in actions and activities that help raise awareness and support behaviour change however, the challenge with efforts like beach cleanups is that it is often the same people who show up which does not necessarily expand knowledge sharing among the broader population.

A number of studies on microplastics were discussed, most of which have emerged from foundation and government grant-funded research, academia and government monitoring studies or global scientific literature. Some of these efforts include:

- Global scientific literature including beach surveys, studies on sediment, surface water and organisms, exposures and effects.
- The first study on microplastics in the Great Lakes took place in 2008 and focused on pre-production pellets washing up on beaches, with the highest proportion found on those on Lake Huron.
- A 2012 study on Lakes Superior, Huron and Erie found microbeads in surface waters. This study was key in helping advance bans on microbeads.
- A number of citizen science, outreach and education initiatives that were early in addressing microplastics in the Great Lakes include eXXpedition in 2016. The mission for the trip was to make the unseen seen by leading the world's largest simultaneous water sampling project for microplastics.¹³ The Toronto Regional Conservation Authority's Watershed on Wheels and Ontario Streams were also early leaders in developing outreach and educational initiatives on microplastics.

Dr. Helm summarized findings of sampling for microplastics by the Ministry of the Environment, Conservation and Parks (MECP). A 2014 study sampled Great Lakes waters near or downstream of urban areas of Ontario, including Toronto Harbour and Humber Bay, Hamilton Harbour, Lake Erie near the Detroit River and downstream of Detroit-Windsor, and near the Grand River mouth. Microplastics were found to be more abundant near larger urban centres and microbeads accounted for on average approximately 20% of the total plastic counts in samples. Other categories however, were also significant with fragments (e.g., from broken-up litter, commercial processes) accounting for 50% of microplastic particles in the samples. Dr. Helm noted that results from sampling can be highly variable with a lot driven by stormwater.

More recent sampling by MECP has focused on the areas of Toronto Harbor, Humber Bay and Hamilton Harbour due to the influence of highly populated areas on inputs to the Great Lakes. The greatest abundances of microplastics were found near points of input to the lakes, with greater amounts of debris accumulating near shorelines, river mouths and wastewater treatment plant (WWTP) effluent discharges. Bottom sediments from the lake in these same areas also had relatively high amounts of microplastics found close to or in river mouths. Polyethylene and polypropylene, plastic that usually

¹³ Exxpedition Homepage. Retrieved from: <https://www.exxpedition.com/expeditions/greatlakes2016/>

floats on water, were the dominant types of plastic at lake bottom indicating that much of the small particles that enter the lakes will end up at lake bottom where organisms that live and feed in and near the sediments can ingest them. Dr. Helm noted that these Ontario-wide findings are consistent with measurements in other areas of the Great Lakes.

Dr. Helm outlined that the plastics we use are deposited onto land, before finding their way as part of stormwater to WWTPs, and into streams and lakes. Broad categories are being used to identify and group plastic particles, including fragment, foam, fiber, film and pellets. Dr. Helm suggested that these categories are not that helpful when considering source types and how best to reduce the occurrence of microplastics. For example, microbeads from personal care products are not often reported or at times may be referred to as pellets. However, the pellets category also includes pre-production pellets (“nurdles”) that are very different in terms of managing losses (e.g., spills, transfers, during transportation) when compared to microbeads found in consumer products such as body wash and facial scrubs.

The shape and characteristics of microplastics can be used to expand categories to better reflect sources. For example, the broad “fragment” category can be refined to differentiate between particles of broken up plastic from litter and debris generated by commercial processes (trimmings, cuttings, flash). Using refined categories, it was found that fragments resulting from commercial activities made up a greater portion of the microplastics in waters and wastewater effluent from western Toronto (Humber Bay area) compared to those areas affected more by residential stormwater runoff and WWTPs.

Together with the University of Toronto, the province has been studying the impacts of microplastics on fish in the Great Lakes. This work has involved assessing the ingestion of microplastics by fish from the Toronto waterfront through data collected in part by the Toronto Regional Conservation Authority. The number of particles found within the gut of the fish was found to be quite high, particularly for larger bottom-feeding fish. These concentrations were among the highest ever reported, and typically greater than what has been found for ocean fish. A third of the particles found were fragments, whereas fibers are almost exclusively found in offshore fish (e.g. lake trout).

Another potential source of information about the source of plastics found in the Great Lakes is the province’s Spills Action Centre. Environmental officers have responded to incidents of pellet spills that are reported to the centre. These spills tend to be the result of incidents during transportation and storage or transfer activities. Dr. Helm concluded by noting that industry has undertaken initiatives such as Operation Clean Sweep, to improve practices related to plastics. He highlighted that the information on plastic pollution gathered from citizen science and clean-up activities, monitoring and research studies and spills response, when taken together, is important for all stakeholders to consider while working collaboratively to address the issue of plastics waste in the Great Lakes.

Session Two: Leading the Way

Industry, academia and civil society organizations have prioritized action on plastic waste reduction, committed to ambitious targets and worked to advance the circular economy for plastics and the extension of their lifecycle. This session highlighted a number of examples of industry leadership efforts and explored what more can be done to support innovative technologies and programs.

Ken Faulkner

Director, Government Relations, NOVA Chemicals

Ken Faulkner introduced NOVA Chemicals, a global petrochemical company that takes a portfolio approach to plastics. The company works to engage its employees and communities in efforts to address plastics waste, including through participation in programs like the Great Canadian Shoreline Clean Up – a national conservation program where citizens collect trash - and Hard to Recycle collections in the U.S., which provide a safe outlet for household products not commonly accepted in traditional recycling programs.¹⁴

NOVA Chemicals has been working on its Sustainability Strategy design in collaboration with government, industry and communities to increase understanding about what the challenges are for plastics and how to move forward collectively to find solutions. The company makes significant investments in research and development (approximately \$55 to \$60 billion CAD a year) to improve products and technologies to allow for greater use of recyclable packaging and to increase consumer engagement. The company also works to innovate product design to decrease the amount of plastic required. For example, plastic caps on Nestlé water bottles are smaller today because they are produced from a sturdier, stronger polyethylene.

Mr. Faulkner discussed NOVA Chemicals' innovative 100% recyclable polyethylene stand-up pouches which have replaced the use of cardboard boxes or non-recyclable mixed-material packaging for a range of food products. Traditional polyethylene packaging was attractive to many companies because it allows for a greater quantity of food products to be transported on trucks, while the glossy look attracts consumers. As a result, the market for this type of packaging continues to grow each year despite it not being recyclable. NOVA Chemicals developed a made-in-Canada solution - an easily recyclable, oxygen-barrier film structure design that expands on its existing recyclable film designs and is suitable for dry foods and mixes, frozen foods and confectionaries.¹⁵

Mr. Faulkner also described NOVA Chemicals' involvement in Project STOP, a new initiative launched in 2017 by sister company Borealis, and SYSTEMIQ. The global initiative seeks to prevent plastic debris from reaching the ocean and to implement solutions to marine plastic pollution in countries with high leakage. NOVA's investment in the program will support its first city partnership in Muncar, Indonesia, a coastal fishing village in Banyuwangi where 30,000 people, or two-thirds of local residents dump their waste directly into the environment. In addition to reducing the leakage of waste, the program

¹⁴ PRC Hard to Recycle Collections. Retrieved from: <http://prc.org/programs/collection-events/hard-recycle-collections/>

¹⁵ NOVA Chemicals Introduces Recyclable Oxygen Barrier Film Structure Design. (2017). Retrieved from: www.novachem.com/Lists/News%20and%20Events/DispForm.aspx?ID=128

will contribute to increased plastic recycling and the building of circular economy value chains which in turn, will create new jobs, increase revenues and leave a collection system in place for future use.

NOVA Chemicals has also committed to the chemical industry's goals of 100% of plastics packaging being recyclable or recoverable by 2030 and 100% being re-used, recycled or recovered by 2040. In addition, 100% of Canadian resin manufacturing sites operated by CPIA members will participate in OCS Blue by 2022 (see p. 27).

Carol Hochu

President & CEO, Canadian Plastics Industry Association

Carol Hochu began by discussing that the plastics industry is critical to the Canadian economy and it employs over 82,000 people nationally. Plastic materials deliver significant social, environmental and economic benefits, including energy resource savings, consumer protection, innovation that improves healthcare and quality of life, and reduced food spoilage. It is essential however, that they are properly managed to ensure that they do not affect waterways and marine ecosystems. Industry has recognized that it has a key role to play in the sustainable materials management of its products. As such, CPIA is committed to the principle that plastics do not belong in the world's waterways and oceans and that they should instead be responsibly used, reused, recycled, and finally recovered for their energy value.¹⁶

Ms. Hochu introduced forum participants to Operation Clean Sweep (OCS) – an international program designed to prevent and help keep plastic litter out of the market environment. The campaign's goal is to help plastic resin handling operations implement containment practices and to work towards achieving zero pellet, flake, and powder loss, which in turn, will contribute to protecting the environment and saving valuable resources.¹⁷ CPIA holds the OCS license for Canada.

Plastic pellets, flakes and powders are a priority area for management as they easily make their way into local waterways, and ultimately, into estuaries and the ocean. In recent years, Ocean Conservancy and the U.S. Environmental Protection Agency have reported an increasing frequency of seabirds, turtles and fish having mistaken these plastic items for food. The results are often devastating as these plastics can't be passed through the digestive tracts of many of the species that ingest them. For this reason, industry has been pursuing a move towards zero pellet, flake and powder loss.

Ms. Hochu provided a high-level overview of the history of the OCS program's development and implementation. The Plastics Industry Association (PLASTICS) began education efforts around resin pellets 12 years ago under the name of OCS. A number of educational materials were disseminated to companies across the U.S. that promoted the idea that resin pellets should be contained, reclaimed and disposed of properly. The Plastics Division of the American Chemistry Council began working together with PLASTICS on an updated, voluntary OCS program to strengthen these education efforts

16 Canadian Plastics Industry Association. *Operation Clean Sweep*. Retrieved from: <https://www.plastics.ca/PlasticTopics/EnvironmentalSustainability/LitterPreventionManagement/MarineLitter/oc>

17 Operation Clean Sweep. *About Operation Clean Sweep*. Retrieved from: <https://www.opcleansweep.org/about/>

and to support behaviour change in the plastics industry.¹⁸ The program has since expanded to include new partners in the U.S., as well as participation from 13 countries globally, including Canada.

In 2015, OCS moved beyond its goal of addressing resin pellets, to the inclusion of flakes and powder loss, which enabled recyclers to join the program. Ms. Hochu highlighted the importance of this decision as engaging all parts of the value chain will be critical to keep plastics out of the environment. Also in 2015, a new OCS member category – Operation Clean Sweep Supporters - was introduced, which allowed companies that do not directly handle resin pellets and as such, don't qualify to be partners, to join and to become another important advocate group for the program and its goals.

OCS Blue is a new, data-driven, VIP member offering available for current OCS members. The new member level provides increased recognition for companies excelling within the existing program, allowing them to showcase basic data and metrics that are helpful for reporting as OCS continues to grow and gain broad industry support.¹⁹ Ms. Hochu indicated that CPIA has committed to having 100% of their members' resin manufacturing sites operating in line with OCS Blue guidelines by 2022 and that 100% of their members will also be signatories to the OCS. These targets are in addition to those CPIA made together with CIAC committing to all plastic packaging being recyclable or recoverable by 2030, and diverted from landfills by 2040.

Representative from Ice River

A representative from Ice River provided further context for Ice River's circular economy approach for their 100% recycled plastic water bottles made from green-coloured PET, as introduced during her opening remarks. The company decided to address the fact that only 6% of PET received at their BMP Recycling facility was green in colour. Green PET does not generally go into clear or blue bottle waste streams but instead, is downcycled – the recycling of waste where the recycled material is of lower quality or functionality than the original material - to create strapping, fibers and clothing. These items are often discarded after use, which means that green PET has a shorter lifecycle than other types.

The company made a decision to reclaim plastic from green bottles which initially created a great deal of pushback. There was a lack of support from the market due to concerns that consumers wouldn't buy a green bottle because they want to be able to see their water. The company began to focus on buyer and consumer education to address this challenge, highlighting the ability to divert 6% of blue bin PET material by simply choosing a recycled green bottle. Raising public awareness was not however, an easy undertaking and the company learned an important lesson about consumer willingness to read packaging. Ice River launched an advertising campaign, using top banners and flyers to make it easier for consumers to understand the story behind the bottle. Support for the product has continued to grow and the company now purchases green post-consumer PET from other locations and organizations to ensure the material does not end up in landfill elsewhere. Creating a circular economy for plastic packaging proved to be a viable business model for Ice River,

18 Operation Clean Sweep. *Plastic Pellet, Flake and Powder Loss — Its Impact and Its Management*. Retrieved from: <https://www.opcleansweep.org/about/plastics-in-the-environment>

19 OCS Blue. Retrieved from: <https://www.plastics.ca/PlasticTopics/EnvironmentalSustainability/LitterPreventionManagement/MarineLitter/ocs/OCSBlue>

despite initial challenges. Recycled PET is not necessarily cheaper to use than PET produced from virgin material however, carbon reductions and the diversion of material from landfill are important benefits. The company, after completing a third party lifecycle assessment, estimates that the purchase and use of a single recycled bottle, instead of a virgin bottle, saves enough energy to power an LED lightbulb for 18 hours. The conversion of one recycled PET (rPET) case (24 x 500 mL bottles) results in one km in vehicle emissions avoided. The use of 10 million cases of bottles made from rPET rather than virgin plastic, contributes to the avoidance of 2,630 metric tons in GHG emissions, which is the equivalent of planting 67,350 trees. The use of virgin material rather than rPET also results in greater transportation costs because most virgin material must be sourced from outside of Canada.

Over the past eight years, Ice River has diverted 350 million lbs of PET from landfill, which has even broader economic and environmental benefits. Ice River is committed to a circular economy approach for plastics. In addition, it will be critical moving forward to ensure that even when materials are recycled, that they do not end up being used for products that are used once before being discarded (e.g., garbage bags). Ice River's PET bottles can be recyclable again and again, creating a closed-loop.

Joe Hruska

Vice President of Sustainability, Canadian Plastics Industry Association

Joe Hruska began by discussing the importance of working to develop sustainable plastics and to use all available strategies and options (e.g., reducing, reusing, recovery and retention) for moving towards a circular economy. Mr. Hruska noted however, that the environmental cost of plastic to the consumer is 3.8 times less than if alternative materials were used. There are a number of reasons for this, including the weight of glass when transported, which can require considerably more energy and produce more GHG emissions. Mr. Hruska also discussed a number of important benefits of plastic use, including the fact that it contributes to major reductions in food waste.

While plastics have the potential to deliver significant societal benefits including energy and GHG emissions reductions, climate change mitigation and resource savings, their presence in the environment is unacceptable. As previously indicated by Ms. Hochu, CPIA has a goal of 100% of plastics packaging being re-used, recycled and recovered by 2040 with an interim goal of 100% of plastics packaging being recyclable or recoverable by 2030. The organization is also a signatory to the G7 Ocean Plastics Charter.

The circular economy is one effective means of ensuring the full value of plastics are taken into consideration. A circular economy is restorative and regenerative by design and seeks to ensure products, components and materials are recognized at their greatest utility and value. Mr. Hruska also discussed Sustainable Materials Management (SMM), a systemic approach to using and reusing materials more productively over their entire life cycle. This approach requires a shift in how society thinks about the use of natural resources and environmental protection by emphasizing the use of less, reducing toxic chemicals and environmental impacts and assuring sufficient resources to meet both today's needs and those of the future. By looking at a product's entire life cycle from extraction to end-of-life management, new opportunities to reduce environmental impacts, conserve resources and reduce costs can be better understood.²⁰

²⁰ U.S. EPA. *Sustainable Materials Management*. Retrieved from: <https://www.epa.gov/smm/sustainable-materials-management-basics>

Mr. Hruska highlighted a number of promising technologies and companies working to support the shift towards a circular economy for plastics, including:

- **Depolymerization:** A process that enables plastic recycling on a molecular level, depolymerization involves the breaking down of plastic into its component molecules and using these to produce new materials. The technology can be used to handle materials including polystyrene foam, which can be challenging to recycle.
- **ReVital Polymers, Pyrowave and INEOS Styrolution:** Together, these companies launched a closed-loop polystyrene recycling solution. The partnership will recycle polystyrene packaging collected in consumer curbside and depot recycling system, as well as restaurants, offices, schools and universities.²¹
- **GreenMantra:** This company developed an advanced recycling technology for polyethylene, which can be used to create asphalt modifiers, roofing materials, waxes and oils. Vancouver became the first city to use recycled plastics from their blue box as an asphalt mix on city roads.
- **Procter and Gamble (P&G):** To meet its sustainability goals for recycled content in polypropylene packaging, P&G invested in a process to purify recycled polypropylene back to a virgin-like polymer. The company's Fairy Ocean Plastic bottle is made from 90% post-consumer recycled plastic and 10% ocean plastic.
- **Dow Chemical:** Dow's Hefty Energy Bag program enables the collection of non-recyclable materials curbside that are used to make ethanol and other feedstocks for waxes, oils & new plastics.

Mr. Hruska closed by highlighting the importance of partnerships and collaborations and their role, together with supportive policies, in creating innovative new ideas and technologies.

Scott Thurlow

DOW Chemical

Scott Thurlow spoke about DOW Chemical's Hefty Energy Bag Program, an innovative solution for hard to recycle, dual-use plastics. The program works to empower individual consumers to make environmentally-friendly choices by providing residential curbside collection of hard to recycle plastics which are then used to produce ethanol and other feedstocks. The program's purpose is to divert plastics from landfill at a quality suitable for approved end markets (recycling or energy recovery) and to complement existing recycling programs. The program is based on a plastics recovery model where a combination of a number of different processes (e.g., mechanical recycling, chemical recycling, energy recovery and post-use collection) are used to ensure plastic products do not find their way to landfill.

The Hefty Energy Bag Pilot in Citrus Heights, California collected a total of 8,000 bags resulting in 6,000 lbs of non-recyclable plastic being diverted from landfill. Of those residents who participated in the

²¹ Revital Polymers. *ReVital Polymers, Pyrowave and INEOS Styrolution partner to launch closed-loop North American polystyrene recycling consortium*. Retrieved from: www.revitalpolymers.com/2018/09/revital-polymers-pyrowave-and-ineos-styrolution-partner-to-launch-closed-loop-north-american-polystyrene-recycling-consortium

program, 80% said they would participate again. In the Omaha, Nebraska area, the same program had 30,000 households participating in 2018 and it is anticipated that more than 60,000 will participate in 2019.

Mr. Thurlow echoed a message heard throughout the forum: that collaboration will be the key to success and that there is a need for strong partnerships to make these types of programs successful.

Keynote Remarks

Honourable Rod Phillips

Ontario Minister of the Environment, Conservation and Parks

The Honourable Rod Phillips, Ontario Minister of the Environment, Conservation and Parks delivered keynote remarks to forum guests over lunch. The Minister spoke about the need for partnership, collaboration and leadership to find the most effective ways to address environmental issues including plastics pollution. While they are an important part of every facet of our society and economy, many plastics are used only once before being discarded, constituting a loss to the economy and contributing to negative environmental impacts.

The Minister discussed some of the ways that the province has been working to address the issue of plastics pollution including through the collaborative research being conducted by Dr. Paul Helm on microplastics in the Great Lakes. The Minister also discussed some of the ways that Ontario has worked together with the federal government including through prohibiting the sale, manufacture and import of toiletries that contain plastic microbeads and on the development of a proposed national Strategy on Zero Plastic Waste through the CCME intergovernmental forum. This proposed strategy provides an opportunity to advocate for increased federal support for effectively managing plastic waste and preventing it finding its way into the Great Lakes.

The Minister highlighted a number of leadership efforts by industry to reduce plastics pollution including CIAC's work related to capturing, recycling and recovering plastics, CPIA's work on OCS and a number of companies that have announced commitments to phase out single-use plastic straws. The Minister pointed to the discussions taking place among leaders in the field at the Great Lakes Plastics Forum as being a critical step in the development of solutions to reduce, and hopefully eliminate, plastic pollution in the natural environment.

See **Appendix C** for the Minister's full keynote remarks.

Session Three: Taking Action

Session Three of the forum involved an open dialogue facilitated by the Council of the Great Lakes Region and Pollution Probe. It examined existing priorities, policies and programs related to plastic debris and fibres and the creation of a circular economy for plastics in the Great Lakes Region.

The following three questions were posed to set the context for the discussion that followed:

1. What data and knowledge gaps still exist and what science is needed to fill them?
2. What do we need to think about in terms of next steps for Ontario and the Great Lakes with respect to addressing plastics pollution?
3. What investments and private-public partnerships are needed to facilitate a move towards a circular economy?

The following is a brief summary of key discussion points from Session Three.

1. What data and knowledge gaps still exist and what science is needed to fill them?

Forum participants noted that much of the science and monitoring completed to date has focused on documenting the types of plastics found in the lakes and how they are ending up there. The science is still progressing in terms of measuring the impacts of plastic and most of the existing data has originated from lab-based studies rather than the field. It is challenging to document the effects of plastic on organisms and the environment other than when, for example, whales wash up on beaches with plastic bags in their stomachs.

In addition to the ecological risks associated with plastics in the Great Lakes, human health effects are a major focus for current research efforts. The routes of exposure and resulting health effects are only beginning to be documented. Occupational exposures to plastic fibers and their associated respiratory effects are one of the only potential human health impacts that there is a real understanding of.

Participants agreed that it would be helpful if governments were encouraged to support the scientific agenda as it relates to researchers in universities and cross-sector collaboration. They noted that one of the common themes that emerges when discussing investment in science and research is ensuring that there are standardized testing methods given how labour intensive collecting and analyzing data related to plastics in the Great Lakes can be. One approach to standardizing would be to determine the type of health outcomes and potential effects that require greater understanding, as this would help to guide the discussion and better determine the specific methods needed to effectively track or assess these effects.

Forum participants noted that the issues that tend to get acted on are those where information and data already exists. Having a sense of the types of plastics that are present in the geographic area that is being studied can be a helpful starting point. The more abundant a certain type of plastic is in the environment, the greater a priority it will be to address. There was discussion around the fact that plastics may have different toxicological profiles and that this should also be a focus for research.

Some participants noted that polymers that have certain additives, like flame retardants, should be a priority, however there is no consensus around moving forward in any particular direction.

2. What do we need to think about in terms of next steps for Ontario and the Great Lakes with respect to addressing plastics pollution?

Forum participants discussed the fact that science will continue to advance and that plastics need to be diverted from landfill without waiting on the science to catch up. It was also suggested that the *Waste-Free Ontario Act* on its own, may not be enough to support a shift towards a circular economy for plastics. Participants discussed additional policies that should be considered to create a supportive regulatory environment. Suggested options included putting a price on the use of certain plastics (i.e., EPR), regulating them or further promoting innovation and new technologies.

Participants highlighted the need to keep affordability in mind when implementing a circular economy. Governments have identified keeping costs low as a priority. Where the waste material stream is concerned, affordability often refers to finding ways to minimize the costs associated with landfill since 80% of materials end up there. However, this mindset needs to shift to acknowledge that plastics are a valuable resource rather than a waste product. A successful move towards a circular economy will not be possible based on increasing the cost of sending materials to landfill, alone.

The discussion also explored the fact that there is regulatory disharmony across the country and that there isn't one single province that has figured out how best to collaborate or form appropriate regulatory structures to address this issue. Until recently, the federal government had not played a major role either. Participants felt that one of the first things that should be considered, is how to harmonize the design of recovery, recycling and re-utilization systems on a scale that would allow for the creation of expanded markets within Canada. BC was mentioned as having a functional approach based on Recycle BC, the only system of its kind in North America. By building out a system that can be scaled, synergies and a common approach can be highlighted and implemented.

A number of challenges specific to Ontario were also discussed including the fact that materials like PET are actually priced higher than polystyrene, a product that is more challenging to recycle. Costs are based on the perceived value of the type of plastic in the market so it will be important to work to build a system that encourages both consumers and producers to use the types of plastic that are easier to recover or recycle. It was also acknowledged that a critical challenge for Ontario is that recycling is for the most part, energy and labour intensive, which contributes to its being more costly within the province.

Participants noted that not much attention has been paid to smaller, northern Indigenous communities in Ontario and that policy solutions that fail to consider these communities are unlikely to be successful. Determining how best to incorporate their unique needs into any framework related to plastics is not currently well-understood. As such, more consultation will be required to better understand challenges specific to these communities and geographies.

The idea of potentially working with small and medium-sized enterprises (SMEs) was also discussed by forum participants. SMEs are busy and looking at the bottom line, and often need to adjust quickly to

shifts in the economy. A number of SME leaders have been incorporating corporate social responsibility (CSR) programs that they have adapted from national and multi-national corporations, including those related to taking back packaging. There are examples of leadership on a small-scale, regional basis, that multi-national and national corporations can learn from.

Another challenge for Ontario is the fact that many systems are municipally operated, which requires that municipalities support any potential changes. Recycling programs are often piecemeal with different cities deciding what should be included in the blue box. By comparison, BC has one standard for recycled goods, which means they can reach consumers more efficiently because everyone receives the same message. In addition, participants highlighted the need for effective messaging and communications associated with addressing the plastics issue. For example, it was noted that messaging around plastics should not be linked to carbon emissions because this does not connect with the majority of consumers. Collaboration among government, industry and the not-for-profit sector will be needed to ensure strong, consistent messaging around plastics moving forward.

3. What investments and private-public partnerships are needed to facilitate a move towards a circular economy?

Participants noted that Canada is 10 years behind other jurisdictions in moving towards a circular economy. To facilitate this shift, it will be important to make innovation competitive in the current climate. The more companies that are involved in creating competition amongst themselves, the more incentive there will be for them to innovate. Participants felt that competitiveness is not often a Canadian strength but that there are many benefits to this approach. A Plastic Innovation Challenge like the one being introduced by the federal government could be an effective way to begin to encourage a move in this direction. It was noted however, that while innovation is clearly important, there is also a need to ensure that mechanisms exist to effectively accommodate new innovations within the system. If an innovative product can't be collected and recycled, it is of little value. The sequencing of innovation is therefore, of critical importance.

When you consider the industries and academic strength in Canada, participants discussed the fact that there is no reason why Canada shouldn't be a leader in innovation and the circular economy. There is a need to figure out how regions like Ontario and the Great Lakes more broadly, can be leaders in this space. There is an opportunity to develop a system that would generate new economic opportunities and which could be a model for global export. In addition, participants noted that it will be critical for policy-makers to avoid made-in-Ontario solutions because these would be too narrowly focused.

Session Four: Consumer Engagement and Behaviour Change

Session Four of the forum looked to advance dialogue around how best to engage consumers in necessary behavioural change related to the proper use and disposal of plastics in the Great Lakes Region. The session was facilitated by Pollution Probe and Ice River and involved an open dialogue with forum participants.

Forum participants discussed the fact that there is a perception that changing behaviour is easy. There is a need to understand the context for the types of changes that are being asked of consumers to determine the level of effort and related psychology that is involved. While making a small change in the short-term may be easy, maintaining the behaviour over the long-term can be much more challenging. Participants discussed the need to organize objectives according to the following three questions:

- What do we need our target audience to know?
- What do we want them to feel about the change?
- What do we want them to do next?

Clearly defining the change necessary according to these three categories allows for a more effective determination of how to motivate people. Participants noted that as consumers, unless a choice is simple, straightforward and affordable, it can be very difficult to make a change, despite the best intentions. In many cases, when addressing plastic waste, messaging is based on the emotion of guilt and the idea that people will judge if someone is not doing the right thing for the environment. The emotional component of behavioural change is a very important motivator.

Forum participants explored the idea that culture is defined by a combination of mindset and values, and that individual behaviours are built on top of these. It was acknowledged that values are a critical part of the discussion related to plastics. Values often shift and there is a need to make choices around how consumers are approached when this happens and what they are being asked to do. Storytelling has been proven to be an effective means of getting at people's emotional selves and in turn, contributing to an effective shift in values.

Forum participants discussed deposit return programs for plastics. Ontario and Manitoba are the only provinces that don't have a deposit on plastics, and Ontario has one of the worst recycling rates in the country. It was indicated that if there were more bottles coming back through take-back programs, more bottles could then be produced from 100% recycled material. This example points to there also being options for addressing plastics that do not require that every individual changes their behaviour. While market-based solutions don't always work, forum participants felt that carrots can be good motivators as people like to be rewarded.

Loblaws reduced single-use, non-recycled plastic bag use by 70% - 80% when they implemented a small fee for purchase. Many claim that consumer behaviour shifted based on the use of this fee however, there was also the element of guilt involved related to the negative environmental effects of plastic bags. In addition, there was an immediate alternative at the point of decision (i.e., reusable cloth bags) and the need to make a decision in front of other shoppers. As such, there are a number

of factors that need to be deconstructed to determine exactly why this change was so successful. While it is easy to jump to the conclusion that it was a price-based responsiveness but values were also clearly important.

One forum participant noted that one of the most inspiring things that she had learned about plastics was related to their noble and humble beginnings. Some early plastics were developed as alternatives to products made from endangered species. For example, some plastics were used as replacements for elephant ivory and to help save turtles whose shells were used for glasses. The value that plastics have contributed to our lives and the role they have played in conservation efforts needs further recognition.

A behavioural economics tool known as heuristics, or the ways that the human brain is vulnerable to certain ways of looking at things, making decisions or setting values, was also explored. Research shows that there are two tables that are exactly the same but someone spends time to put one of them together with their own hands, that table will have a greater value for them. This is also referred to as the sunk cost heuristic. For example, if every school child was provided a bucket and asked to fill it up with waste plastic and then to talk about it, they would be less likely to throw plastics away in future. This is an inspiring example of a positive way to inspire the adoption of a new behaviour instead of using a guilt-based approach.

Forum participants discussed the fact that industry and consumers are getting a lot of mixed messages about what's good for the environment. Developing clear messaging related to the environmental benefits of recycling and why consumers should care, is necessary. Even those familiar with recycling are confused by what is accepted in the blue bin. Recycling rules vary from region to region in Canada, and there are also some municipalities that do not collect waste at all. The BC system was highlighted again as it allows for one consistent message across the province which is easier for consumers to understand and remember.

Forum participants also explored the idea of EPR. A lot of producers support an EPR model that requires that a certain percentage of whatever is produced be recoverable. It was noted that the only plastic of value in the stream right now is PET, and if this were to be taken out through a deposit return scheme, producers would be left holding the bag for the remaining costs for the blue bin program. EPR is a system that is working well in parts of Europe, and which seems to be rolling out well in BC. While there is an emerging consensus that this model is the way to go, its implementation will likely be difficult to work through. If there is agreement in principle however, it could be the starting point upon which to build and layer in additional economic incentives and behavioural change.

Conclusion

The forum concluded with a review of the following summary slides based on topics discussed during the day's four sessions:

Session 1: State of the Science

- Plastics and microplastics are not only a marine or freshwater issue, they are a global contaminant issue
- Microplastics are diverse, originating from different sources and contaminating different environments, including the Arctic and the Great Lakes
- Some evidence of physical and chemical impacts to biota exist but more research needed
- Key research questions to be answered include:
 - where do microplastics come from?
 - where they end up?
 - how are they ecologically relevant?
 - what are impacts on human health and food security?
- Research is underway to quantify the effectiveness of different mitigation strategies
- While more science is needed, there is already enough to act
- Microplastics are more abundant near urban centres with the greatest abundance near points of input to the lakes
- Microplastics categories are broad and inconsistent and do not always reflect the source

Session 2: Leading the Way

- Plastics offer significant social, environmental and economic benefits, including energy resource savings, consumer protection and innovations that improve healthcare, reduce spoilage and improved quality of life
- BUT they must be properly managed to avoid ending up in landfill and waterways. There are also other tools beyond addressing what ends up in landfill, and other jurisdictions that could be looked to for inspiration
- There is a need for plastics to be responsibly used, reused, recycled, recovered and treated as a valuable resource, not waste
- Examples of leadership in advancing the circular economy:
 - Project STOP (NOVA Chemicals)
 - Operation Clean Sweep (CPIA is Canadian licensee)
 - 100% recycled plastic bottles (Ice River Springs)
 - Hefty Energy Bag Program (Dow)
- Partnerships are key to success and there is a need for collaboration between government, industry, consumers, civil society and academia
- Need for policies that incentivize innovation and are supportive of new technologies and the circular economy

Session 3: Taking Action

- What do we need to know about plastics in the Great Lakes and how we address any gaps?
- What is the role of public policy and what are the conditions needed to support innovation?
- What are the challenges in terms of making the transition to a circular economy for plastics?
- What advice should be communicated back to government in terms of domestic action?
- Harmonizing the regulatory environment and creating a standardized bucket for what is going into the stream for four R's across the country is necessary. There is also a need to create the marketplace, value the waste and standardize the inputs
- Replication and scalability either in Canada or across the border is required
- Need for deeper knowledge base and support for the science
- Need to make innovation competitive and ensure it is properly staged

Session 4: Consumer Engagement and Behaviour Change

- To secure consumer behavioural change requires discipline and design to make it simple from the point of view of the consumer
- Science still a moving target (behavioural economics)
- Must start with leadership (modeling desired behaviours is key)
- Driven by “feel” and simple, clearly articulated actions
 - Information is less important as a driver to consumers
- More work is needed to make materials management and waste policy simpler and easier for consumers to participate

In closing, the Council of the Great Lakes Region reiterated that the forum provided a great opportunity to bring together leaders from a range of stakeholder groups to have organized discussions specific to plastics in the Great Lakes. Forum participants were left with a final question to reflect on: how do we collectively drive change across the Great Lakes Region?

Appendix A: Workshop Agenda



**GREAT LAKES
PLASTICS FORUM**
SOLUTIONS FOR A SUSTAINABLE FUTURE



Location:

RBC Innovation Hub at ONRamp in the Banting Institute
University of Toronto, 100 College Street, Suite 150, Toronto, Ontario

Host: Pollution Probe and Council of the Great Lakes Region

When: October 11, 2018 from 9 a.m. to 4 p.m.

Objective:

The Great Lakes Plastics Forum will provide a space for dialogue and collaboration around the need to develop innovative and practical solutions to address the issue of plastic waste and improper disposal in the Great Lakes, supported by sound public policy.

AGENDA

09:00 - 09:20	Arrival and Registration
09:20 - 09:30	Welcome Christopher Hilkene, CEO, Pollution Probe and Mark Fisher, President & CEO, Council of the Great Lakes Region
09:30 - 09:45	Opening Remarks Bob Masterson, CEO and President, Chemistry Industry Association of Canada
09:45 - 09:55	Global Update: G7 Environment, Energy and Oceans Ministerial Sarah Da Silva, A/Head, Marine Litter Unit, Plastics Initiative, Environment and Climate Change Canada
09:55 - 10:05	Ontario Context: The Provincial Plastics Landscape Christopher Hilkene, Pollution Probe
10:05 - 10:15	Networking Break
10:15 - 11:00	SESSION 1: State of the Science This session provides participants with a context setting overview of some of the important research efforts aimed at better understanding the sources, fate and impacts of plastic debris and fibres in the Great Lakes. Dr. Chelsea Rochman, Assistant Professor, Department of Ecology and Evolutionary Biology, University of Toronto Paul Helm, Sr. Research Scientist, Great Lakes, Ontario Ministry of the Environment, Conservation and Parks

11:00 - 12:00

SESSION 2: Leading the Way

Industry, academia and the non-profit sector have prioritized action on plastic waste reduction, committed to ambitious targets and worked to advance the circular economy for plastics and the extension of their lifecycle. Examples of these leadership efforts and a discussion about what more can be done will be the focus of this session.

Session facilitated by **Carol Hochu**, President & CEO, Canadian Plastics Industry Association

12:00 - 13:00

Lunch

Keynote at 12:15 p.m. from the **Hon. Rod Phillips**, Ontario Minister of the Environment, Conservation and Parks

Introduction from **Ken Faulkner**, Director, Government Relations, NOVA Chemicals

13:00 - 14:00

SESSION 3: Taking Action

This session will examine existing priorities, policies and programs related to plastic debris and fibres and the creation of a circular economy for plastics in the Great Lakes region. Existing barriers to addressing plastic waste and improper disposal will be identified and drawing on examples from other jurisdictions, new and innovative policies will also be explored.

Session facilitated by **Mark Fisher**, Council of the Great Lakes Region, and **Christopher Hilken** and **Melissa DeYoung**, Pollution Probe

14:00 - 15:00

SESSION 4: Consumer Engagement and Behaviour Change

This session aims to advance dialogue around how best to engage consumers in necessary behaviour change related to the proper use and disposal of plastics in the Great Lakes region.

Session facilitated by **Ingrid Thompson**, Pollution Probe

15:00 - 15:15

Networking Break and Synthesis of Findings

15:15 - 16:00

Wrap-Up and Next Steps:

Based on findings from the day, the question of how we work together to develop innovative and practical solutions to the issue of plastic waste and improper disposal in the Great Lakes, supported by sound public policy, will be explored.

Session facilitated by **Christopher Hilken** & **Melissa DeYoung**, Pollution Probe and **Mark Fisher**, Council of the Great Lakes Region

Appendix B: Speakers Bios



SPEAKER BIOGRAPHIES

HONOURABLE ROD PHILLIPS



The Honourable Rod Phillips was sworn in as Ontario's Minister of the Environment, Conservation and Parks on June 29, 2018.

Minister Phillips, MPP for Ajax, assumes his current role following a successful business career. Most recently, he was Chair of Afiniti Canada, a global artificial intelligence company, and Postmedia, Canada's largest news media company.

The minister is a former President and CEO of the Ontario Lottery and Gaming Corporation, and of Shepell.fgi, a Canadian-based international employee health company. As well, he was volunteer chair of CivicAction, which brings together business, labour and community leaders to address challenges facing the Greater Toronto and Hamilton Area.

The minister has also served as chief of staff in the offices of then-Minister of Labour Elizabeth Witmer and former Toronto Mayor Mel Lastman.

Born in Newmarket, the minister has an Honours BA in political science and english from the University of Western Ontario and an MBA from Wilfrid Laurier University.

MARK FISHER



Mark Fisher was appointed President and CEO of the Council of the Great Lakes Region by the Council's board in 2014. Established in 2013, the Council is a bi-national nonprofit that brings decision-makers from business, government, academia and the nonprofit sector together to deepen the United States - Canada relationship in the region, and to find new ways of harnessing the region's economic strengths and assets and protecting the environment for future generations.

Prior to his appointment, he was a foreign policy advisor in the Foreign and Defence Policy Secretariat of the Privy Council Office where he focused on advancing Canada's relationship with the United States and Mexico, as well as countries in the Asia-Pacific, in the areas of trade, security, energy and the environment.

He is a seasoned professional with extensive knowledge of the public policy making process, board governance, strategic business planning, corporate communications, stakeholder engagement, advocacy, and issues management.

Mark also has extensive experience providing advice to key decision-makers and influencers, including the Prime Minister of Canada, provincial premiers and ministers, parliamentarians, and c-level executives from the private and not-profit sectors.

Among his many accomplishments, he is the recipient of the Royal Canadian Legion Cadet Medal of Excellence, and is the creator of the Great Lakes Economic Forum and the *Current* magazine.

In addition to his role with the Council, Mark is an elected school board trustee with the Ottawa-Carleton District School Board.

PAUL HELM

Paul Helm is a Sr. Research Scientist with the Great Lakes Unit, Environmental Monitoring and Reporting Branch, responsible for the design and implementation of monitoring and collaborative research studies on contaminants of emerging concern in the Great Lakes. Current study areas include sources and fate of microplastics in the Great Lakes, fate and transport of organic contaminants in aquatic and urban environments, passive sampling approaches to monitor and track hydrophobic and polar chemicals, and non-targeted analyses of chemicals in environmental matrices.

CHRISTOPHER HILKENE



Chris has been an environment and sustainable development professional for over 20 years and joined the Pollution Probe team in August 2018.

Chris has worked in government, consulting, academic and not-for-profit settings and has had an association with Pollution Probe for much of his career. Known more generally for his public policy and communications experience, he is recognized as a leader in freshwater policy and Great Lakes issues.

A Canadian appointee to Great Lakes Water Quality Board of the International Joint Commission (IJC), Chris has served as the Canadian Lead on emerging issues for the last 4 years. In 2007, Chris was appointed to the National Roundtable on the Environment and the Economy, where he served as Chair of the Water Programme.

He is an active volunteer and has served on boards and advisory bodies for numerous organizations including Ryerson University, Pollution Probe, WaterAid Canada, Carleton University's Global Water Institute, the City of Toronto's Task Force to Bring Back the Don, Green Living Enterprises, the Vimy Foundation and the George and Helen Vari Foundation.

CAROL HOCHU



Carol Hochu is honoured to serve as the President and CEO of Canadian Plastics Industry Association (CPIA), a position she has held since January 1, 2012. Since 1943, CPIA has served as the national voice and leader for plastics industry sustainability across Canada and beyond, representing the interests of the plastics value chain including resin and raw material suppliers, processors/converters, equipment suppliers, recyclers and brand owners.

With nearly 30 years' experience and leadership in the not-for-profit sector, Carol previously served as the Chief Staff Executive of Ontario Electronic Stewardship; the Ontario Stone, Sand & Gravel Association; and the Confectionery Manufacturers Association of Canada.

A respected and knowledgeable advocate for the environment, and a distinguished industry speaker, Carol is listed in the "Who's Who of Canadian Women" and "Women in the Lead". In addition, Carol is a Certified Association Executive (CAE), and holds a Master of Business Administration (MBA) degree from the Schulich School of Business at York University in Toronto, and a Bachelor of Applied Science (BASc) degree from the University of Guelph in Guelph.

BOB MASTERSON



Bob Masterson is President and CEO of the Chemistry Industry Association of Canada (CIAC). Reporting to the Board of Directors, he is responsible for executing the strategic direction and ongoing operations of the Association.

Bob joined CIAC in 2010 as Vice President of Responsible Care®, the industry's globally recognized sustainability initiative. Under his leadership, Responsible Care enacted a new set of sustainability principles and guidelines for Canada's chemistry industry.

Prior to joining CIAC, Bob was Director, Regulatory Affairs with the Cement Association of Canada and spent 15 years as a consultant on environment and sustainability issues in a number of industry sectors including forest products, electricity, cement, mining and energy.

CHELSEA ROCHMAN



Chelsea Rochman is an Assistant Professor in Ecology at the University of Toronto. Chelsea has been researching the sources, sinks and ecological implications of plastic debris in marine and freshwater habitats for the past decade. She has published dozens of scientific papers in respected journals and has led international working groups about plastic pollution. In addition to her research, Chelsea works to translate her science beyond academia. For example, Chelsea presented her work to the United Nations General Assembly and at the US State Department.

INGRID THOMPSON



After a multi-faceted 20+ year career with various roles in the energy, environmental and infrastructure sectors, Ingrid joined the Pollution Probe team in October 2016. Prior to this, Ingrid spent a decade consulting in Europe for a number of organizations, helping them to plan and navigate change and transformation programs.

In her early career, Ingrid served as senior advisor for various officials in the Ontario government, taking lead roles on key files such as the launch of Drive Clean, an overhaul of Ontario air quality standards, the Walkerton e-Coli water contamination tragedy, and the initial development of the Northern Ontario medical school. She also served as a volunteer Board Member for the "Clean Air Foundation."

In her free time, Ingrid is an avid reader and enjoys travel and scuba diving. She is also an advocate for people seeking treatment for chronic Lyme disease.

MELISSA DE YOUNG



Melissa is responsible for leading Pollution Probe's health-related programming and has more than 10 years of experience in the environmental sector. Since joining Pollution Probe in 2010, she has led a number of projects related to children's health, chemicals management, transportation and water. She was responsible for authoring Pollution Probe's *Primer on Toxic Substances*, which serves as an introduction to toxic substances and their impacts on human health and the environment, and the *Great Lakes Fact Sheets*, intended to build understanding on vital issues that impact the health of the Great Lakes and surrounding communities. She also represents Pollution Probe on the Annex 3 Chemicals of Mutual Concern Executive Sub-Committee for the Great Lakes Water Quality Agreement. Melissa is a certified Project Management Professional (PMP) and holds a Master of Environmental Studies degree from York University and an Honours Bachelor degree in Political Science from the University of Toronto.

Appendix C: Keynote Remarks

The Honourable Rod Phillips, Minister of the Environment, Conservation and Parks

Thank you, Ken (Ken Faulkner, Director, Government Relations at NOVA Chemicals), for the introduction.

It's a pleasure to join you for today's Great Lakes Plastics Forum.

I want to give special thanks to Pollution Probe and the Council of the Great Lakes Region for your leadership in seeking solutions through collaboration and partnership.

We'll be relying upon that leadership even more as we look for the best ways to meet some of the very important goals for everyone in this room.

We all want to have clean air, water and land for today... and for future generations.

We want to reduce waste and clean up our parks and waterways ... and keep Ontario beautiful for the people of our province and the millions of visitors who come here every year.

And we need to tackle climate change in a meaningful and transparent way ... that increases the resiliency of our communities and delivers the co-benefits of strong environmental protection and prosperity for all.

Fighting climate change will be the centerpiece of the comprehensive, made-in-Ontario environmental plan we are developing to reduce greenhouse gas emissions and keep our air, land and waters clean.

It will be a plan that maintains the right balance between protecting our environment ... while responsibly supporting a prosperous economy that creates jobs and opportunity for our citizens.

No place represents this opportunity better than where we are meeting today – the Great Lakes Region.

It's no mystery why so many of us live here. Over 13 million Ontarians make the Great Lakes and St. Lawrence River region home because of its clean, fresh water.

And it is because of this valuable freshwater resource that jurisdictions and communities within the Great Lakes Region are interconnected, with integrated economies.

The combined GDPs of the Great Lakes states and provinces make this the third largest regional economy in the world.

Our goals of protecting the environment and these waters have led Ontario to work collaboratively with Canadian and U.S. partners for half a century through initiatives like the Canada-Ontario Agreement.

As we know governments cannot do it alone.

That's why we look to you, as our partners, in the search for new ways to solve serious environmental issues of our day, including climate change... pesticides... invasive species... harmful algae... and habitat loss. The list also includes our subject today – plastic pollution.

Plastic is important to every facet of our society and economy. We use it in medical equipment, cars, planes, homes, clothing, food packaging, phones and toys.

Plastics production world-wide increased from 15 million tonnes in 1964 to 311 million tonnes in 2014 ...and it's expected to double again over the next 20 years.

The reason is simple: plastic is an affordable, useful and durable material.

But it's these very qualities that are at the root of a growing environmental problem.

Plastic's durability is a blessing and a curse – it's one of its most attractive qualities, but it means plastic takes hundreds of years to break down... if at all.

Some of the most commonly used plastic can produce greenhouse gas emission when they break down. Plastic typically also has low recycling and reuse rates. Also, most plastic is only used once and for a short period of time.

As a result, more and more plastic is ending up in our environment. And when plastic is not reused or recycled, it means a loss to the economy and a negative impact to the environment.

As we are learning... plastic pollution has been shown to harm fish and wildlife through entanglement or consumption, as plastic can be mistaken for food.

Once plastic is consumed by fish and wildlife, it can cause internal blockages and malnutrition. We have all heard of the ocean garbage patches, where ocean currents have created areas with high concentrations of plastic debris.

But this is not just a problem in the oceans. Scientists continue to find plastic pollution in nearly every part of the globe, including arctic sea ice.

It is also a problem closer to home, in the Great Lakes and our inland waterways.

More than 80 per cent of human litter collected during volunteer beach cleanups along the shorelines of the Great Lakes is plastic, such as cigarette filters, plastic bottles, food wrappers and bags.

It is estimated that almost 10,000 tonnes of plastic debris enters the Great Lakes each year.

As plastic degrades, it can break or fragment into smaller and smaller pieces called microplastics. As one of my ministry's scientists, Paul Helm, has described in more detail ... monitoring and collaborative research in Lake Ontario and Lake Erie have found a variety of microplastics in near shore waters, streams, wastewater effluent, sediment and fish stomachs.

In 2014, the ministry found up to 6.7 million particles of plastic per square kilometre in Lake Ontario near Toronto... a greater concentration than is found in oceans or open lake waters.

The Minister of Environment and Climate Change Canada – Catherine McKenna – has added her voice to the goal of preventing plastic from getting into our freshwater and marine environments.

Recently, Canada prohibited the sale, manufacture and import of toiletries that contain plastic microbeads. As you know, Ontario supported and worked with the federal government on this important initiative.

Canada was a signatory to the recent G7 Ocean Plastics Charter, which made a commitment to work with industry and other levels of government to dramatically increase the recycling and reuse of plastics.

While the proposed actions in the Charter are admirable, they are mainly focused on preventing plastic waste and reducing plastic in our oceans – not in the Great Lakes or other freshwater lakes and rivers that the Ontario government has advocated for.

Through the Canadian Council of Ministers of Environment, Ontario is working with the federal government as well as other provinces and territories on the development of a proposed national Strategy on Zero Plastic Waste.

Our continued work with the federal government and other provinces and territories presents us with an opportunity to develop a made-in-Ontario approach to managing plastic waste and plastic pollution ... that is good both for the economy and environment.

As some of you will know, Pollution Probe had a role in the early efforts that lead to what we know today as the Blue Box program.

Municipalities collect many types of plastic packaging as part of their Blue Box programs.

Some types of plastic packaging are difficult to recycle and create challenges for municipalities due to a lack of processing facilities, food contamination and a lack of end markets.

Making producers responsible for their products and packaging gives them an incentive to reduce the costs through the adoption of waste management best practices, innovation and new technologies.

In 2017, municipalities spent \$126.4 million on their Blue Box programs – making producers responsible for the materials in the Blue Box is expected to save municipal taxpayers this amount.

While the overall diversion rate for the Blue Box program in 2016 was 62.4 per cent, the diversion rate for plastic packaging was only 29.4 per cent, so we can and should be doing better.

The upcoming discussions on the proposed national Strategy on Zero Plastic Waste are an opportunity to advocate for more federal support ... for effectively managing waste plastic and preventing and cleaning up plastic pollution in the Great Lakes and our waterways.

We need greater national and international efforts to improve product labelling and packaging, set standards for recyclability and support the availability of end-markets for recycled plastics and new technologies for recycling.

Working with industry to achieve this will be important.

Indeed, the plastic industry is becoming a leader in reducing plastic pollution. For example:

- The Chemistry Industry Association of Canada adopted a goal for capturing, recycling and recovering plastics.
- The Canadian Plastics Industry Association promotes the international Clean Sweep Program in Canada to prevent plastic pellet, flake and powder loss into the environment.
- Companies like Starbucks, IKEA, Swiss Chalet, Harvey's, A&W Canada and Marriott hotels have all announced commitments to phase out use of plastic straws.

Let's be clear - we are not here to vilify plastic products. We are here to recognize that the resulting pollution is a problem we must solve together.

Plastic pollution in the Great Lakes comes from multiple sources – microbeads from personal care products... shavings and melted plastic droplets from commercial and industrial sources... fibres from clothing... and litter such as plastic bags, bottles and straws.

And every time it rains, more plastic flows into our lakes and rivers.

Given the wide range of sources of plastic pollution in the Great Lakes, we need to look at a variety of solutions:

- Science, monitoring and research
- Prevention and reduction
- Education and outreach
- Working with other jurisdictions
- Cleaning up plastic pollution from shorelines and coastal areas

We will need to work with our municipal partners and the development sector to find a common ground... and to take tangible action.

The City of Toronto, for example, is undertaking a number of actions to reduce plastic pollution, such as getting feedback on

how to reduce plastic single-use and takeaway items.

As we put increasing value on plastic as a resource, it will mean not just less plastic pollution in our lakes and rivers, but it will help Ontario's economy.

And it will help reduce greenhouse gas emissions emitted during the production and decomposition of some plastics.

I believe the people in this room can come up with a made-in-Ontario solution. A solution that uses Ontarians' knowledge and innovation, makes it easy for people and businesses to contribute and achieves results cost efficiently.

I hope that today's event will generate big ideas on the collective and effective actions we can take to reduce – and hopefully eliminate – plastic pollution and litter in our natural environment.

Addressing plastic pollution and protecting the Great Lakes and inland waters will be an important part of the comprehensive plan we are developing to fight climate change and sustain our precious natural resources.

This will be a plan that balances environmental stewardship with respect for our taxpayers and the economy.

Indeed, it's an exciting time for Ontario.

Working with you, we can find those balanced solutions that put people first...

- ... make life more affordable for families...
- ... restore our province's competitiveness...
- ... and take Ontario's leadership in protecting the environment and fighting climate change to new levels.

Thank you very much.