PERSPECTIVES

May 2nd, 2024

Where does our plastic waste go?

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Last Fall, the Federal Court declared invalid and unlawful the federal government Order that classified plastic articles as toxic under the Environmental Protection Act. The government quickly appealed the decision and the Federal Court of Appeal granted a stay motion which prevents the Federal court ruling from taking effect while the appeal is ongoing. Therefore, the *Single-use Plastics Prohibition Regulations* remain in force. Despite an acknowledgement that Canada must fight against plastic pollution, Canadian exports of plastic waste amounted to almost 175 thousand tonnes in 2022, hardly a stellar performance. In light of developments in recent years and the Canadian government's commitment to the management and use of plastics, the authors draw on available data to give an accounting of Canada's trade in plastic waste over the last 20 years and point some data gaps.

Globalisation has many impacts, including an impact on waste. For several years now, developing countries have exported a large share of their waste to their neighbours or to developing nations. Several recent investigations by journalists have brought to light difficulties encountered on a local level in the collection, sorting and recycling of waste in Canada, as well as the exporting of that same waste towards Southeast Asia or India (Shochat and Lavigne, 2022 and Shields, 2017).

Included in that waste is plastic, for which the demand has increased since the 1960s, a period during which it became popular due to its versatility and great resistance. In 2018, 6.3 million tons of plastic were produced for Canadian consumption (Government of Canada, 2022a). But plastic's resistance is also its greatest weakness, since it takes between 50 and 200 years to decompose (Gouvernement du Canada, 2022). Poor management of plastic waste results in plastic being the main cause of contamination of various environments, primarily in our oceans and developing nations (Jambeck et al., 2015). But effects are also felt on a local level, as the improper incineration of plastic wastes produces air pollutants (Zhang, 2022).

China, a "waste haven" until 2017

Historically, China was the main destination for a large share of the plastic waste generated by Western countries. With its enormous production of consumer goods destined for European and North American markets, China imported plastic with the goal of reinjecting it into the economy as raw material, even though plastic waste contained a high proportion of impurities. (Ren et al., 2020). China's status as a "waste haven" originally came about in a context characterized by lax or nonexistent environmental standards, in primarily informal waste management sectors (Kellenberg, 2012, Bernard et al., 2014). The low cost of transport resulting from the abundance of containers going from China to Western countries also contributed to the phenomenon. Indeed, the exporting of waste enabled the optimal utilization of containers that would otherwise have left port empty, and thus the sharing of costs associated with the transport of goods (Qu et al., 2019). The low cost of labour was also a factor here, especially in informal labour sectors, where the quality of workers' lives, and their exposure to toxic elements, are unfortunately not major concerns.

At the close of 2017, in a policy given the name *National Sword*, China tightened its import controls on recyclable materials and closed its borders to plastic waste imports. This policy was implemented, and justified by China, for health and environmental reasons. In July of 2017, China notified the World Trade Organization of its new policy and the ban officially took effect January 1, 2018. In just a few months, developing nations were forced to find other outlets for their waste, causing major upheavals in international trade in this area.

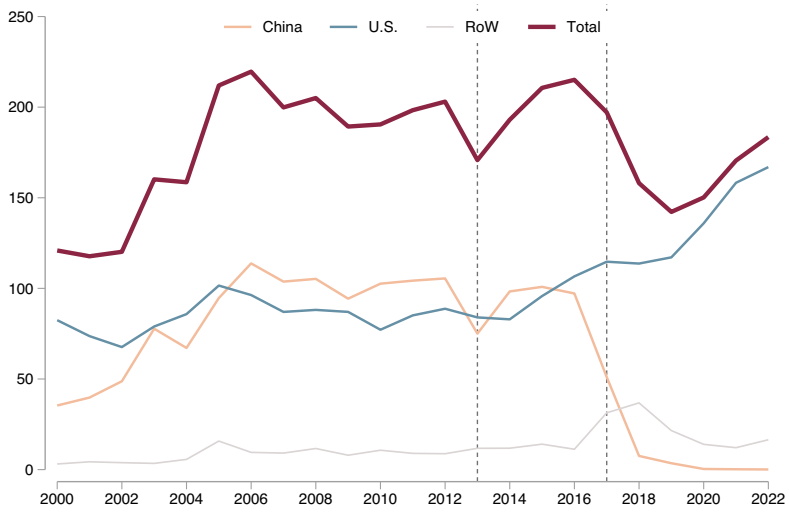
2017's *National Sword* operation — also known as *Green Sword* — was a successor to 2013's *Green Fence* initiative, which had similar goals. It involved stepping up inspections of bales of plastics entering the country. The goal was to ensure compliance with regulations that stemmed from measures adopted between 2006 and 2010, which set a maximum level for impurity in imported plastic matter. This stepping up of inspections lasted a year, but was not significant enough to result in a change in behaviours.

Through the policy adopted in 2017, China sought to become autonomous, or nearly autonomous, in the production of recycled materials. China was thus pursuing a national strategy based most notably on the principles of the circular economy and deployed for over a decade. This strategy included the formalisation of the informal waste management sector, the massive investment in industry and a toughening of environmental regulations.

The ramifications of *National Sword* for the countries that export waste have not been the object of much study. Analyses conducted using French customs data are one rare example (Martin et al., 2021). They show that French exporters reacted to this policy by temporarily redirecting waste exports toward other Asian countries, then toward the rest of the European Union and Turkey. As well, an analytical report by the International Criminal Police Organization — *INTERPOL* — points to the increase in the illegal trade in plastic waste toward more vulnerable nations (INTERPOL, 2020).

Where did our plastic waste go after China imposed its ban?

For about 20 years, Canada's plastic waste was mostly exported toward China and the United States. Operation *Green Fence* in 2013 resulted in a decrease in the volume of exports of waste toward China, but only temporarily. Exports went from 203 thousand tonnes (metric tonnes) in 2012 to 170 MT in 2013, rising back up to 192 MT in 2015 and 214 MT in 2016. Exports toward the United States and the rest of the world remained at the same level, meaning that in 2016, 45% of Canadian waste exports were shipped to China and 50 % to the United States.



Volume of Canadian exports of plastic waste by destination, in thousands of tonnes

The ban on imports of plastic waste imposed by China at the end of 2017 resulted in an immediate decrease in Canadian exports in China. In 2019, exports toward China (and Hong Kong) only made up 2% of the total volume of plastic waste exported.

A portion of the exports was redirected towards other countries. While exports toward "the rest of the world" made up 5% of the total at the start of the 2000s, they accounted for 23% of Canadian exports in 2018. The main destinations emerging in 2018 were Malaysia (7%), India (5%), and Thailand (3%). These countries were inundated with waste from the majority of developed nations and rapidly implemented restrictive import policies. The motivations behind these policies were no doubt the same as those that triggered the measures imposed by China. These countries had neither the capacity nor the resources to deal with these new amounts of waste. What's more, the waste was often poorly sorted and did not easily lend itself to the recovery process. The percentage of Canadian plastic waste exported toward the rest of the world thus went from 45% in 2016 to 15% in 2019, then down to less than 10% between 2020 and 2022. A large portion of Canadian exports once destined for China was absorbed by the United States: the share of exports to the U.S. was 93 % in 2021, whereas it had only been 50 % in 2016.

It is possible that a portion of the waste was handled in Canada rather than being exported, but it is difficult to document this phenomenon. There is no standardized database detailing amounts of plastic waste treated and recovered in Canada. Available information comes from public bodies and provincial governments. They are more or less reliable, depending on the province. In Quebec, data drawn from selective collection for the residential sector and a portion of the Industrial, Commercial and Institutional sector (ICI) reveal an increase in the amount of plastic treated locally subsequent to the Chinese ban in 2017: between 2010 and 2015, about 50% of recycled plastic was recovered in Quebec, whereas the rate was 66% in 2018 and 63% in 2021 (Recyc-Québec, 2023a, 2023b, 2013, 2014, 2017, 2020).

And what about Canada as a whole? Prior to 2017, nearly 210 MT of waste were, on average, exported as compared to an average of 150 MT for 2018 to 2020, i.e., the years that followed the Chinese ban. Exports increased again subsequently, so that by 2022, the amounts involved approached the quantities observed before the implementation of the Chinese restrictions. But since production of waste also increased during this period, we do not know whether the share of plastic waste treated and recovered in Canada increased (Government of Canada, 2022b).

Plastic bottles, yogurt cups, and food and beverage containers are more recyclable and in large part exported

In all countries, goods exchanged and declared at customs are logged according to an international classification system known as the Harmonized System (HS), which includes more than 500 product categories. Waste is no exception to the rule. Data on waste declared at customs probably do not paint an entirely accurate picture of the situation, given the fact that a

certain proportion of waste is exported illegally. Illegal trade in plastic waste takes many forms: false declarations at customs, the presence of plastic in bales of other materials like paper, or even illegal bales of material hidden in exports that appear to be transiting legally (INTERPOL, 2020). Nonetheless, these are the only data we have to conduct our analyses.

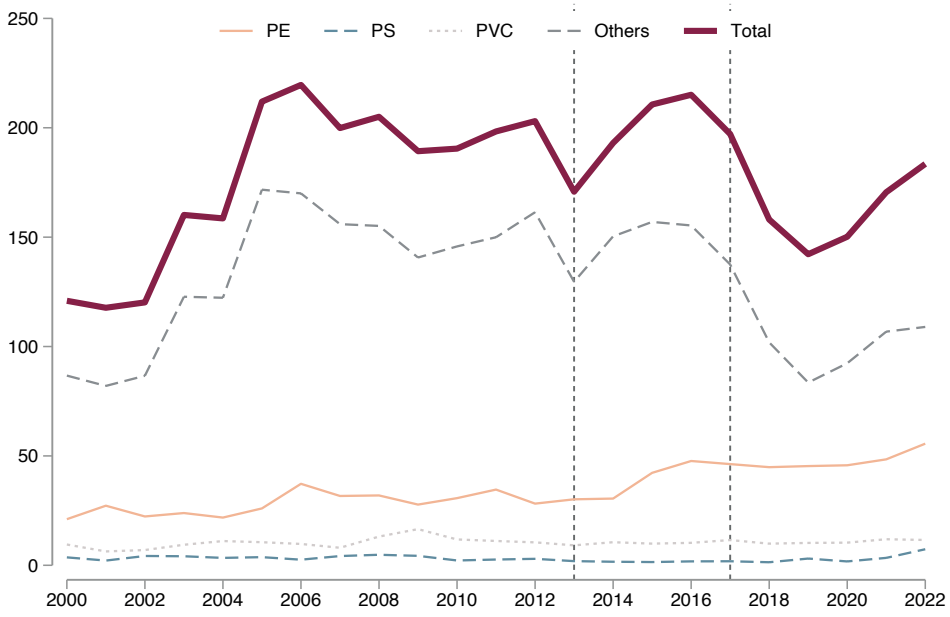
Plastic wastes declared at customs are counted using four product codes: polyethylene waste (PE), indexed using the code HS 391510 in the international HS classification, waste from polystyrene (PS) (HS 391520), polyvinyl chloride waste (PVC) (HS 391530) and "other plastic waste" (HS 391590).

In Canada, as elsewhere in the world, "other" plastic waste makes up the majority of the trade in plastic waste. This includes waste made up of polyethylene terephthalate (PET), used in the manufacturing of plastic bottles, and waste from polypropylene (PP), which is used in the manufacturing of yogurt cups and food and drink containers. These two materials have good recycling potential.

The second category of plastics most exported by Canada is polyethylene (PE), which also has a good recycling potential, in particular its high-density polyethylene (HDPE) component. This plastic is used, among other things, for manufacturing milk jugs and ice cream containers. Low-density polyethylene (LDPE) is also in the PE category, but its recycling potential is much lower than that of HDPE. LDPE is used for various types of plastic bags and for food wraps, a material that has a tendency to contaminate recycling chains. The fact that only small quantities of PVC and PS have been exported over the past 20 years is attributable to their low recycling potential.

As of 2013, Canadian exports of plastic waste declared as "other plastic wastes" followed the same trend as the one we indicated earlier with regards to overall exporting. This decline is attributable to *Green Fence*.

However, the amounts of PE, PVC and PS exported remained stable between 2012 and 2014. In 2016, 72% of the volume of Canadian exports of plastic waste was declared as being "other" plastic waste and 22% as being PE. The closing of Chinese borders in 2017 has mainly affected the exporting of the "other" plastic wastes, the volume of which went from 155 MT in 2016 to 101 MT in 2018 then to 92 MT in 2020. The volumes in other categories of waste remained steady or increased during this period. One plausible explanation is that certain waste was better sorted and could thus be exported as PE waste, for example, rather than as composite plastic waste.



Canadian exports of plastic waste, by category, in thousands of tonnes

The repercussions of the Chinese ban vary from one province to another

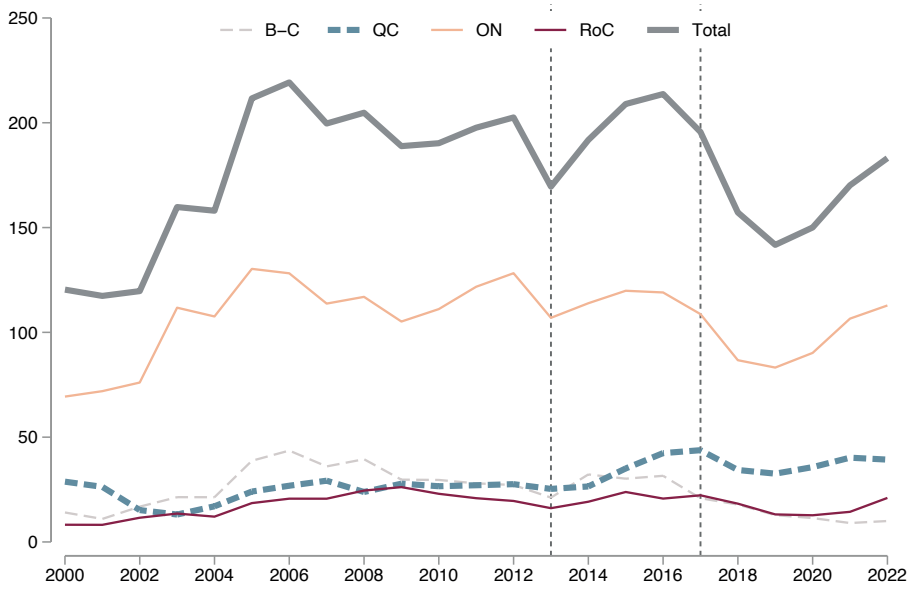
In 2016, thus prior to the Chinese ban, 56% of plastic waste exported by Canada came from Ontario, 20% from Quebec and 15% from British Columbia, for a total of 90 % of all Canadian exports of plastic waste. The situation has changed significantly since the ban. In 2021, Ontario accounted for 62 % of exports, Quebec 24 % and the portion of waste emanating from B.C. plummeted to just 5% of what was exported. Why?

Firstly, the total volume of plastic waste exported declined, and it is in British Columbia that the drop is the most significant with a reduction in volume of exported waste of nearly 70 % between 2016 and 2022. This drop is primarily due to a decline of 73 % in the volume of exports of "other" plastic waste, waste that was not as well sorted and not as recoverable. This drop is likely the result of the recycling strategies implemented by the province. Regulation focused on *Extended Producer Responsibility* was adopted by the government in 2004 and has been continuously enhanced since. In 2014, the province strengthened its policies with improved regulation on the management of residential packaging and paper (Government of British Columbia, 2023). Since then, more than 95% of plastic collected has been sold locally to a Vancouver-area recycler according to Recycle BC, the agency responsible for the recycling of residential packaging and paper (Recycle BC, 2023).

Ontario's volume of exports declined by 10% between 2016 and 2021, even though its share of total exports increased. As in British Columbia, this decrease is attributable to a reduction in its exports of "other" plastic waste.

So what is going on in Quebec? Montreal is at the heart of the strategy for managing waste matter. But Montreal's waste sorting centres have experienced several problems over the last few years: a change in operator, an accumulation of bales and an overly high rate of contamination. This might explain why Quebec is the province that had the lowest decrease in volume exported after the Chinese ban, a drop of barely 4% between 2016 and 2021.

Incentives that aim to produce better waste recovery internally might improve the situation. A more precise method of classifying exports could also help. A government could for example adopt regulations stipulating that only waste sorted to a certain degree of purity could be exported. This is currently difficult to do because materials are mixed together. Some countries, including China, use a more precise nomenclature for export declarations, which permits a distinction to be made between PET and the remainder of the "other" plastic waste.



Exports of plastic waste by province of origin, in thousands of tonnes

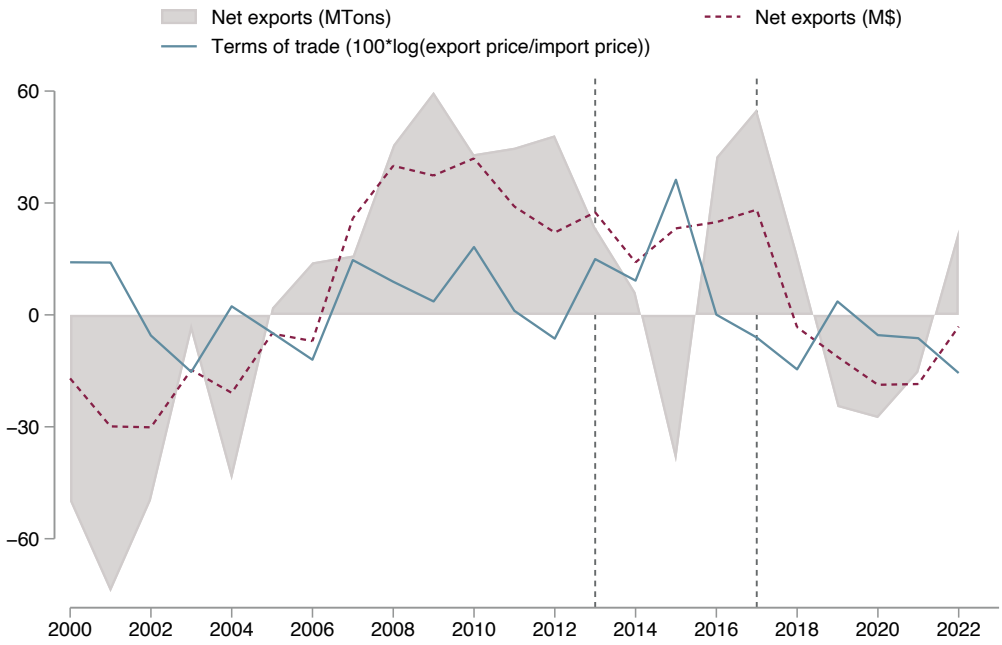
New rules modernizing selective collection that are set to come into force in 2025 in Quebec offer some grounds for hope. Under the new rules, three of the four categories of plastics targeted in efforts to reach specific recycling rates are in the category "other plastic waste" in the harmonized system (Gouvernement du Québec, 2023).

Currently, Canada imports more plastic waste than it exports

Surprisingly, Canada moves between being a net importer and a net exporter of plastic waste, whether by volume, i.e. thousands of tonnes of waste, or value, i.e., dollars. That is not the case for the United States nor for the European Union, both of which are net exporters of plastic waste. In 2019, Canada exported 142 MT of plastic waste and imported 166 MT. The quasi totality (95%) of imports came from the U.S., mostly from East Coast states such as New York and New Jersey.

Why does Canada import such large quantities of plastic waste, even though it is itself a big producer? One way to better understand the evolution of waste importing and exporting — known as intra-industry trade in the language of international trade — is to calculate the terms of trade by taking the logarithm of the ratio of the unit value of exports over the unit value of imports, multiplied by 100. A result that is less than zero indicates that the value of imports is greater than the value of exports.

Although there was some volatility between 2000 and 2022, since 2018, the trade balance for plastic waste has been negative. This suggests that Canada, and notably Quebec, exports bales of plastic waste of lesser value, and thus possibly poorly sorted, and imports waste of greater value, and thus better sorted and more easily utilized in production processes. This is a credible hypothesis, but detailed data would be required in order to prove or disprove it.



Plastic waste trade balance in Canada, in volume and today's dollars

Many questions remained unanswered due to lack of data

Our analyses of the repercussions of the implementation of the new Chinese policies on trade in plastic waste reveal three main Canada-wide tendencies: a shift in Canadian plastics exporting from China toward the United States, a decline in the volume of "other" plastics exported and Canada's moving into a position of being a net importer of waste.

Nonetheless, many questions remained unanswered, especially regarding the situation within provinces. It is striking to see how much British Columbia stands out in terms of waste management. We believe that differences in the quality of plastic sorting operations and in the type of plastic imported and exported could explain discrepancies between provinces, but we do not have the data we would need to properly document the phenomenon.

That leads into another key observation: we have nationwide data emanating from mandatory customs declarations, but there is nothing on a provincial level. Provincial data are collected by the various municipal or governmental bodies that oversee waste management and thus reflect each province's goals. Another gap: available data is often focused on residential waste, but a large proportion of plastic waste is produced by industries, shops and stores and institutions. A better understanding of these critical issues surely can only come through a greater willingness on the part of all stakeholders to improve methods for gathering relevant data, and its availability.

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To cite this article

Bernard, S., Lapointe, F., & Martin, J. (2024). Where does our plastic waste go? (2024PJ-05, Revue PERSPECTIVES, CIRANO.) https://doi.org/10.54932/FKAY1101

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ISSN 2563-7258 (online version)

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