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The Impact of China's Environmental and Trade Policies on U.S. Plastic and Paper Waste Exports

This article documents major environmental and trade policy changes in China and their impact on plastic and paper waste trade between the U.S. and China and other trade partners. The article explains how U.S. plastic waste exports have been nearly annihilated by these policies. Paper waste trade is more resilient and has survived the policy shifts in China, although quite diminished.

Until very recent years, China had been the world's largest importer of plastic and paper waste, importing 42.2% of global plastic and 39.5% paper waste trade since 1992 based on Comtrade data. Many countries, including the U.S. and the EU, did not diversify export destinations and conveniently shipped most of their plastic and paper waste to China. The merchandise trade imbalance between China and the U.S. created opportunities to ship low-value bulky waste to China based on low-transportation costs between the U.S. and China – from containers going back empty to China. Low labor cost in China for sorting waste was also a factor facilitating the waste trade (Parts, 2019).

Starting in 2013, the Chinese government has been taking various actions to reduce its imports and processing of waste, including reducing waste import licenses, reducing the size of its processing sector, and implementing a series of environmental policies to improve its environment and reduce potential health effects associated with these industries. Finally, the U.S.-China trade war under the Trump administration has led to tariff retaliation against plastic and paper waste imports, further handicapping them. The U.S. had imposed a series of tariffs in 2018-19 on various products out of China.

The interdependence between China and the U.S. in these waste markets was destabilized by China's policy changes and has led to some disarray in U.S. waste industries with a near-collapse of the plastic waste export market, which

reverberated in the domestic market. The U.S. recycling industry tried to find new export destinations, especially in Asia with some success but not sufficiently enough to offset the loss of the Chinese market. These new countries do not have sufficient processing capacity. In addition, these countries also started adopting policies to limit their plastic waste imports (Parts, 2019).

Overview of the U.S. Supply of Waste

The U.S. produces more than 30% of the planet's total waste products. The waste includes 29.7% of containers and packaging among other things (Bradford, 2018). The total generated waste in the United States increased from 88.1 million U.S. short tons in 1960 to 292.4 million U.S. short tons in 2018. This article focuses on plastic and paper waste.

Plastic Waste

The U.S. generation of plastic waste has increased tremendously since 1960 as shown in Table 1. In 2010, the U.S. generated 28.5 Million Metric Tons (MMT) of plastic waste, of which only 2.27 MMT was recycled. In 2018, the total generated plastic waste was 32.37 MMT, and only 2.74 MMT were recycled (see Table 1). The plastic waste which was not recycled was composted, combusted with energy recovery, or thrown in the landfills. Table 1 documents the remarkable growth in plastic waste generation and the limited recycled volume over time.

As shown in Table 2, U.S. plastic waste exports went primarily to China directly, and indirectly through Hong Kong, and then to NAFTA partners, and Asian countries (India, Indonesia, Malaysia), and others. Total U.S. plastic waste exports decreased by 63.5% .

between 2010 and 2018, with an aggregate reduction of 1.412 MMT. Hong Kong and China had significantly decreased their plastic waste imports from the U.S. and other sources as well, including the EU (Parts, 2019). Other countries such as Mexico, India, Indonesia, Malaysia, and many others increased their imported plastic waste in 2018 compared to 2010, but not enough to make up for the lost market in China and Hong Kong. The latter loss was about 1.760 MMT. Exports to other countries increased by about 348 Thousand Metric tons (TMT), roughly 20% of the lost exports to China and Hong Kong combined

Paper Waste

The U.S. generated 27.21 MMT in 1960, of which 4.61 MMT were recycled. The total generated paper waste increased year after year until 2000 after which it started dropping down after reaching a peak of 79.60 MMT, as shown in

Table 3. Surprisingly, the quantity of paper waste recycled kept increasing even after 2000 when the paper waste generated started decreasing. Recycling paper waste is less complicated and more profitable than recycling plastic which has to be sorted by plastic-type.

Table 4 shows that in 2010, the U.S. exported 16.4 MMT of paper waste, which was 2.5 MMT higher than the volume exported in 2018. This change was caused by a large drop in China's imported paper waste, which still represented 5.6 MMT in 2018, from 10.9 MMT in 2010. However, other countries, including Mexico, Thailand, and Indonesia, imported more U.S. paper waste from 2010 to 2018 as shown in Table 4, which considerably mitigated the loss of Chinese markets.

Table 1: 1960-2018 Data on Plastic waste in MMT*

Management Pathway	1960	1970	1980	1990	2000	2005	2010	2015	2017	2018
Generation	0.35	2.63	6.2	15.54	23.18	26.65	28.5	31.3	32.12	32.37
Recycled	-	-	0.02	0.34	1.34	1.61	2.27	2.83	2.72	2.74

*The original data from EPA was in thousands of U.S. short tons. (U.S. EPA, 2020b).

Table 2: Total U.S. plastic waste exports in 2010 and 2018 (TMT)*

Country/Year	Total U.S. Exports	Hong Kong	China	Canada	Mexico	India	Indonesia	Malaysia
2010	2,222.70	1,219	693	142.5	42.7	37.6	27.5	11
2018	810.9	150	2.3	144	138.6	64.3	62.6	46.4

*The total exports were calculated using the United Nations Comtrade. For 2010, the export quantity was calculated from the average value between 2010 & 2011, and for 2018, it was the average of 2018 and 2019 export values to smooth out annual variations.

Table 3: 1960-2018 data on U.S. paper waste in MMT*

Management Pathway	1960	1970	1980	1990	2000	2005	2010	2015	2017	2018
Generated	27.21	40.20	50.04	65.98	79.60	76.97	64.69	61.73	60.79	61.14
Recycled	4.61	6.14	10.65	18.35	34.07	38.07	40.43	41.11	40.07	41.70

*The original data from the EPA was in thousands of U.S. short tons ((U.S. EPA, 2020a)

Table 4. Total U.S. exports of paper waste in 2010 and 2018 in TMT*

Country/year	Total exports	China**	Mexico	Republic of Korea	India	Canada	Thailand	Indonesia
2010	16,469	10,958	1,431	982.5	843.2	746.1	165.3	201.4
2018	13,921	5,613	2,725	545	981	988	671	372

*U.N. Comtrade data. For 2010, the exported amount was calculated from the average value of 2010 & 2011, and for 2018, the average of 2018 and 2019 export values. **Hong Kong imports negligible volumes of paper waste.

China's Implemented Policies

China has implemented three major waste-related environmental policies since 2013 (Parts, 2019).

The Green Fence Policy

Green Fence restrictions were implemented in two phases. The first one took place from February to November 2013; the second phase was a two-month program in 2015 which focused on tightening implemented policies and fighting recyclable smuggling. Chinese authorities implemented the Green Fence policy to restrict contaminated recyclables by increasing the inspection of shipments. Green Fence set a 1.5% limit on allowable contaminants on the imported recyclable. It also suspended the import licenses of 247 Chinese companies which stopped importing recyclables exceeding the standard (Earley, 2016). During the first four months, Green Fence reduced imported quantities of plastic waste by 5.5% (Toloken, 2013). This policy had adverse effects on both U.S. and Chinese businesses. U.S. recycling companies exporting waste products to China lost their purchasing partners. Delays at customs were also noted with increased inspections. The second phase focused on tightening policies implemented in 2013 and preventing both the smuggling and resale of smuggled recyclables. The tight standard on contaminants did not apply equally to domestic waste, potentially violating national treatment under WTO obligations (Parts, 2019).¹

The National Sword Policy

The National Sword policy was announced on February 7, 2017, by the General Administration of Customs, collaborating with China's Ministry of Environmental Protection. This policy focused on limiting the smuggling of recyclable products, including illegal recycling operations. National Sword's new rules include bans on 24 types of recyclable waste as detailed in China's notifications to the World Trade Organization (WTO, 2017). Trade concerns were expressed at the WTO by several countries including the U.S., Canada, Australia, Japan, and the EU). This policy states that post-industrial plastics may still be allowed into the country but must be carefully inspected for quality, with a strict maximum contamination standard of 0.5 percent. In addition, China implemented further reductions in the number of waste and paper import licenses (Solus Group, 2018). Under the latter policy, there is no allowance for shipments mixed with trash and low-quality recyclables, leading China to further reduce recyclable waste imports.

The Blue Sky Policy

Blue sky is a policy related to the National Sword policy that the Chinese government announced on March 6, 2018,

and implemented until December 31, 2018. It was run by the General Administration of Customs, aiming to crack down on illegal smuggling of materials into China (Parts, 2019). Since every load of recyclable materials has to be checked, the policy resulted in inspection backlogs. Blue Sky is reported to have led to the seizure of nearly 867 TMT of solid waste and hundreds of arrests. Blue Sky also tightened the enforcement of the 0.5 percent contamination standard initiated during the National Sword policy in 2017 (Staub, 2018; Solus Group, 2018). In an announcement released on April 13, 2018, different plastics were included in the solid waste list to be banned by the end of 2018 (Ministry of Ecology and Environment, 2019).

Tariff Retaliation in U.S.-China Trade War

In addition to these environmental policies, trade tensions between the U.S. and China since 2017 have led to retaliatory import tariffs being levied on U.S. waste exports to China. China has imposed a 25% tariff on U.S. plastic and paper waste, in addition to the 6.5 % Most-Favored Nation tariff on plastic waste applied on imports from any WTO member. Both plastic and paper waste also pay a value-added tax of 13%. In February 2020, China's Ministry of Finance, under the Customs Tariff Commission of the State Council, announced a process that allows tariff exemptions for certain products, in particular for old corrugated cardboard and other recovered fiber favoring paper waste relative to plastic waste. Exemptions are on a company-by-company basis.

The impact of these policies and potential U.S. policy response

The more stringent standards, import bans, and reductions in import licenses, and plant closings had strong consequences for the plastic and paper waste trade. The reduction of licenses resulted in importing only quality plastics and importing a smaller volume of waste than their pre-policy levels. This caused a global challenge due to the dependence on the Chinese market, which harmed industries in both countries, including U.S. recycling companies, but also in the EU and other countries' industries. This reduction in licenses raised the price of recyclables in the Chinese domestic recyclable market since the competition from plastic imports to supply the Chinese market was reduced. In addition to these measures affecting all exporters, U.S. exporters were affected negatively by the tariff retaliation on waste sourced in the U.S.

The total world export of U.S. plastic waste was 2.22 MMT in 2010-11 (average of 2010 and 2011). It was exported at an average unit value of \$0.51/kg. In 2018-19 (average of the two years), the total demand for

¹ Domestic treatment says that like-products cannot be discriminated by a policy favoring the domestic good at the cost of the imported substitute.

U.S. plastic waste products was 0.8 MMT at an average unit value of \$0.40\$/Kg. Hence, both volume and unit value fell, implying a dramatic decrease in total export demand and revenues. The drop in Chinese demand for U.S. plastic waste, net of some increases in exports to other countries, was still dramatic. The more limited decrease in unit value, suggests that the supply also decreased. Else, the unit value decrease would have been precipitous. In addition, remaining exports to China, have had to meet more stringent standards on contaminants, implying a higher cost per unit further reducing the U.S. supply of exports.

Total export demand for U.S. plastic waste dropped by 64%. The lower unit value stimulated export demand in countries other than China, but was not sufficient enough to offset the decreased demand in China. These countries include Vietnam, India, Malaysia, Thailand, and others. Also, these new markets started restricting the imports of waste as well and tightening contaminant standards.

In 2010, both China and Hong Kong combined represented 87% of total plastic waste exports from the U.S. These dropped down to 18% of total exports in 2018. The total combined imports from the U.S. to China was 1.93 MMT in 2010, whereas it was only 0.15 MMT in 2018. With changes in plastic waste imports, the average import unit value to China did not change much. It was \$0.47/kg in 2010 and \$0.44/kg in 2018. Considering that China was only accepting high-quality recyclables, the cost of production for the U.S. recycling companies increased. This did not translate into higher prices and profitability most likely decreased.

The paper waste trade did not change as dramatically as the plastic waste did. In 2010, the U.S. exported 16.47 MMT of paper waste at an average unit value of \$0.28/kg. In 2018, the U.S. only exported 12.39 MMT at an average unit value of \$0.24/kg. The limited decrease in unit value reflects the higher variable cost to meet stringent standards (a shift of the supply to the left), mitigating the price decrease induced by the sharp decrease in China's demand.

The U.S. paper recycling industry has been impacted negatively by the joint reduction of unit values and volume exported. Paper waste exports for China and Hong Kong combined decreased from 10.9 MMT in 2010-11 to 5.6 MMT in 2018-19. New export markets for paper waste mitigated the loss of Chinese markets. The unit value specific for China imports did not change much (\$0.25 per Kg in 2010 to \$0.24 per Kg in 2018), reflecting the higher cost of meeting Chinese standards and the emergence of alternative export markets.

What are the possible policy responses by the U.S. government following the Chinese policies? One way would be through diplomatic negotiations through the WTO Dispute

Settlement Body with a formal dispute. As noted, The Chinese policies allegedly violate domestic treatment among other things (Parts, 2019). The U.S. has expressed strong doubts about the effectiveness of the DSB and has blocked the appointment of members of the Appellate Body (CSIS, 2020). Given this skepticism and the state of trade tensions and confrontations between the two countries (Schwartz, 2018), a formal dispute does not seem to be a promising alley to help the U.S. waste industry and its exports. If the U.S. initiated a dispute, China could invoke exceptions under Article XX(b) of the GATT to justify its policy as necessary to protect human, animal or plant life or health, although several countries have raised concerns about the lack of transparency and scientific basis for measures taken by China (WTO, 2017).

Another possible strategy would be to build domestic processing facilities. The process of plastic recycling is challenging, but nowadays, some Americans and Chinese invest in the United States by building recycling facilities (Jacobson, 2020). More recycled plastic could be reused in the U.S. and cleaner plastic waste could be exported to China as it meets standards on contaminants and types of plastic which are allowed to enter. Current U.S. policy consideration of a significant carbon tax and other taxes on non-biodegradable plastics might also help shift away from traditional plastic U.S. e in favor of paper or biodegradable alternative plastics, reducing the huge volumes of conventional plastic waste generation.

References Cited

- Bradford, A. (2018). *Trash in America: Moving from Destructive Consumption to a Zero-Waste System*. Frontier Group.
- Center for Strategic and International Studies (CSIS). (2020). "The World Trade Organization: The Appellate Body Crisis" <https://www.csis.org/programs/scholl-chair-international-business/world-trade-organization-appellate-body-crisis>
- Chinese Ministry of Ecology and Environment on (2018, April 19). Announcement on Adjustment to the Catalogue for the Administration of Import Solid Waste. <https://images.magnetmail.net/images/clients/ISRIID/attach/MEEAnnouncement20182019BannedItems.pdf>
- Earley, K. (2016, October 10). Could China's 'green fence' prompt a global recycling innovation? *The Guardian*. <https://www.theguardian.com/sustainable-business/china-green-fence-global-recycling-innovation>

- Jacobson, L. (2020, March 1). Why Chinese companies are investing in American recycling. CNBC. <https://www.cnbc.com/2020/02/28/why-chinese-companies-are-investing-in-american-recycling.html>
- Parts, C. (2019). Waste not want not: Chinese recyclable waste restrictions, their global impact, and potential U.S. responses. *Chicago J. International Law* 20(1), 291-331.
- Schwartz, B. (2018, October 22). Chinese official tells American investors at a meeting: We don't fear a trade war with the U.S. <https://www.cnbc.com/2018/10/22/chinese-official-tells-us-investors-at-meeting--we-dont-fear-trade-war.html>
- Solus Group. (2018, March 19). N.C.T.R. China's national sword and recycling import ban: Responding to market changes.
- Staub, C. (2018, March 13). *Chinese customs enforcement ramps up with blue sky 2018 - Resource recycling*. Resource Recycling News. <https://resource-recycling.com/recycling/2018/03/13/chinese-customs-enforcement-ramps-up-with-blue-sky-2018/>
- Toloken, S. (2013, May 20). China's 'Green Fence' makes unprecedented cuts in recycled plastic imports. <http://wmnorthwest.com/pdf/greenfence/plasticsnews0513.pdf>
- USEPA. (2020 a). Facts and Figures about Materials, Waste and Recycling: Paper and Paperboard: Material-Specific Data (November 2020). <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data>
- USEPA. (2020 b). Facts and Figures about Materials, Waste and Recycling: Plastics: Material-Specific Data. (September 2020). <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data>
- WTO. (2017). Technical Barriers to Trade Information Management

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