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## SEEKING TO BE ‘LIKE WATER’: PLASTIC REGULATION IN THE PEOPLE’S REPUBLIC OF CHINA

### ABSTRACT

*China is one of the biggest producers of both virgin plastic and plastic waste. In order to tackle its growing plastic pollution crisis, China has recently made a number of significant legislative reforms directed at minimizing the use of disposable plastics, increasing the production of degradable plastic items and cutting off its reliance on imported plastic waste for recycling feedstock to boost its own recycling efforts. However, relying on recycling and degradable plastics as solutions to the plastic waste crisis may not be sufficient. China’s approach highlights an inherent contradiction in minimizing plastic pollution whilst simultaneously increasing plastic production.*

### INTRODUCTION

This article provides a review and critical analysis of China’s attempts to regulate plastic pollution, with a particular focus on the developments of the past decade.<sup>1</sup> The article begins by exploring the current scale of plastic consumption and production in China. China is the world’s largest producer and user of plastics, accounting for nearly one-third of the total global flow.<sup>2</sup> It is also one of the leading producers of plastic waste in the world, surpassed only by the US, the EU and India.<sup>3</sup> The article then analyses the regulatory approaches that are currently in place to deal with plastic pollution and identifies the key stakeholders engaged in the plastic pollution regulatory debate. The focus of the discussion will be China’s plastic waste import ban, as well as the more recent restrictions and phase outs covering a wide range of disposable plastic items.

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1. Most of the legal documents, such as policy papers, plans, laws, and regulations that are analysed in this article are available in Chinese only. The authors relied on the unofficial translations of these legal documents provided by various news outlets and academic publications. As such, the authors cannot guarantee the accuracy of the translations.

2. Xiaobin Jiang et al., *Assessment of Plastic Stocks and Flows in China: 1978–2017*, 161 RES. CONSERVATION & RECYCLING 104969, 104969 (2020).

3. NAT’L ACADS. SCI., ENG’G, & MED., RECKONING WITH THE U.S. ROLE IN GLOBAL OCEAN PLASTIC WASTE 22 (2022); see also Kara Lavender Law et al., *The United States’ Contribution of Plastic Waste to Land and Ocean*, 6 SCI. ADVANCES 1, 1–2 (2020).

The aim of this article is to present a comprehensive understanding of China's sometimes opaque efforts to reduce plastic pollution. In doing so, the discussion highlights the hidden tension between China's position as the world-leading producer of plastics and its new environmental policy, which is directed at both cleaning up three decades of environmental degradation and creating an "ecological civilization" based on the concept of the circular economy.<sup>4</sup> The paper illustrates how China's post-consumer 'downstream' solutions to plastic pollution, such as waste collection, recycling and disposal, are evolving, yet its pre-consumer 'upstream' solutions, such as the reduction of the production of plastics, are lagging behind, as the Chinese plastic industry grows. Ultimately, however, in order to seriously curb the growth of plastic pollution, these approaches must be applied in parallel.<sup>5</sup>

## I. CHINA AS THE LEADING PRODUCER OF PLASTICS

China is the world's largest oil and gas importer in the world.<sup>6</sup> As China's own oil production continues to fall,<sup>7</sup> its dependence on oil imports has increased each year since 1993—when China became a net oil importer for the first time.<sup>8</sup> In 2020, China imported \$150 billion in crude oil, becoming the largest importer of crude oil in the world.<sup>9</sup> By 2023, China is predicted to import a record amount of crude oil to meet growing domestic demand and to ensure that its refineries are able to supply more feedstocks to the petrochemical sector.<sup>10</sup> China's continuing economic growth has produced an unprecedented energy vulnerability which has seen securing energy supplies to be one of the top concerns for China's policy makers.<sup>11</sup> China's somewhat controversial 'Belt and Road Initiative' involves significant investment in oil exporting countries in the Middle-East and Central Asia, so that China can increase its oil imports and thereby enhance its energy security.<sup>12</sup>

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4. Jiang et al., *supra* note 2; Michael Standaert, *As It Looks to Go Green, China Keeps a Tight Lid on Dissent*, YALE ENV'T 360 (Nov. 2, 2017), <https://perma.cc/FAK3-2JSG>.

5. Combining the maximum foreseen application of pre- and post-consumption solutions represents the most effective possible solution to plastic crisis (given current technology). See Winnie W. Y. Lau et al., *Evaluating Scenarios Toward Zero Plastic Pollution*, 369 SCI. 1455, 1460 (2020).

6. Jude Clemente, *China is the World's Largest Oil & Gas Importer*, FORBES (Oct. 17, 2019, 7:05 PM), <https://perma.cc/4HAQ-QNWY>.

7. See Dan Wang et al., *Feasibility of the Northern Sea Route for Oil Shipping from the Economic and Environmental Perspective and its Influence on China's Oil Imports*, 118 MARINE POL'Y 104006, 104006 (2020) (noting that, as of 2018, production was around 170–200 million tonnes per year).

8. Haijiang Wang, *China's Impact on the World Crude-Oil Market*, 19 J. ENERGY & DEV. 81, 81 (1993).

9. *Crude Petroleum in China*, OBSERVATORY ECON. COMPLEXITY, <https://oec.world/en/profile/bilateral-product/crude-petroleum/reporter/chn> (last visited May 18, 2023) (set "Trade Balance" year to "2020").

10. Chen Aizhu & Muyu Xu, *China Set for Record Crude Oil Imports in 2023, Analysts Say*, REUTERS (Feb. 19, 2023, 6:00 PM), <https://www.reuters.com/business/energy/china-set-record-crude-oil-imports-2023-analysts-2023-02-17/>.

11. See generally Shi Qiang Liu et al., *How is China's Energy Security Affected by Exogenous Shocks? Evidence of China-US Trade Dispute and COVID-19 Pandemic*, 1:2 DISCOVER ENERGY 1 (2021); see also Benye Shi & Tian Cai, *Has China's Oil Investment in Belt and Road Initiative Countries Helped Its Oil Import?*, 13 ENERGIES 3176, 3177 (2020).

12. Shi & Cai, *supra* note 11, at 3179.

In line with these policies, China also stockpiles crude oil when prices are low.<sup>13</sup> For example, China's crude oil imports surged 25 percent in July 2020 compared to a year earlier, as massive purchases were made after oil prices collapsed in April 2020.<sup>14</sup>

China uses much of this oil to make plastics.<sup>15</sup> According to the *Global Plastic Waste Makers Index*, five Chinese companies are among the top 20 virgin polymer producers in the world—with Chinese Sinopec being the second largest producer in the world.<sup>16</sup> Overall, China produces over 29 percent of the world's plastic, which makes it the world's leading producer.<sup>17</sup> China is also the main producer of plastic feedstock from coal (the process of producing plastic feedstocks from coal is called 'coal to olefins production', with the most important olefins being ethylene and propylene).<sup>18</sup> China intends to expand its capacity and production of plastic feedstocks—it's predicted to invest more than \$100 billion in coal to olefins technology.<sup>19</sup> Yet, coal to olefins production is generally considered "dirty" and massively carbon intensive.<sup>20</sup> Specifically, coal to olefin plants in China produce 6–10 tonnes of CO<sub>2</sub> per tonne of chemicals.<sup>21</sup>

Despite its position as the world leader in plastic polymer production, China still relies on polymer imports. Between 1978–2017, the country imported about 322 Megatonne (Mt) of the most important plastic polymers, leading to a 34 percent

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13. Laura He, *China Has Been Stockpiling Oil for Years. Low Prices Give It Reason to Buy More*, CNN BUS. (Apr. 8, 2020, 11:40 PM), <https://perma.cc/3TGS-3X2Z>.

14. Chem. Indus. Dig. *China on a Buying Binge, Oil Imports Increased by 25% in July*, GALE ACAD. ONEFILE (Aug. 7, 2020), <https://perma.cc/L6Y2-WKR9>.

15. DOMINIC CHARLES ET AL., MINDEROO FOUND., *THE PLASTIC WASTE MAKERS INDEX* 31 (2021).

16. *Id.*

17. RACHEL KARASIK ET AL., *20 YEARS OF GOVERNMENT RESPONSES TO THE GLOBAL PLASTIC POLLUTION PROBLEM: THE PLASTICS POLICY INVENTORY* 14 (2020).

18. Olefins are indispensable types of plastic feedstock. The most important types of olefins are ethylene and propylene. Olefins can be produced from naphtha, gas or coal. Producing plastic from naphtha is the most expensive, followed by production from coal. The cheapest way to produce olefins is from gas, which is not readily available in China. DEUTSCHE BANK MKT. RSCH., *INDUSTRY: CHINA'S COAL TO OLEFINS INDUSTRY* 1–3 (2014); see also *What Are Olefins Used for and Why Do They Matter?*, SYZYGY PLASMONICS <https://perma.cc/6EGZ-TCWF> (last visited May 19, 2023); KARASIK ET AL., *supra* note 17, at 126.

19. Gerald Ondrey, *Methanol-to-Olefins Plant Starts Up in China*, CHEM. ENG'G (Feb. 22, 2017), <https://perma.cc/32SK-ER9P>.

20. "Coal-to-olefins is 2.5–3 times more energy intensive than other polymer production processes because of the low yields and high coal-based emission factors." DOMINIC CHARLES & LAURENT KIMMAN, MINDEROO FOUND., *THE PLASTIC WASTE-MAKERS INDEX 2023* at 30 (2023). It is estimated that about 4% of the world's single-use plastic are produced in this way, generating approximately 55 MMT CO<sub>2</sub>e (12%) of the total associated emissions. *Id.*

21. Joseph Chang, *Commentary: China Coal-to-Olefins (CTO) Investment to Slow*, INDEP. COMMODITY INTEL. SERVS. (May 26, 2016), <https://perma.cc/3PPM-8KXQ>. In comparison, oil to olefins plant produces only about one ton of CO<sub>2</sub> per one ton of olefins.

import reliance.<sup>22</sup> In 2020, China became the world's leading importer of plastic feedstock,<sup>23</sup> importing a record all-time high of 28.5 million tonnes.<sup>24</sup>

With an ever-growing demand for plastic material, China has been developing its own plastic industry and increasing its manufacturing capacity in order to reduce its dependence on imported plastic feedstock.<sup>25</sup> Already, between 2021 and 2022, China's polymer imports were at their lowest in five years.<sup>26</sup> This sharp decline in the polymer imports can be explained by the difficulties due to the strict COVID rules in China and the uncertain economic climate in many Western countries.<sup>27</sup> Moreover, China's increased self-sufficiency (especially in producing polypropylene and polyvinyl chloride) is another reason for this decline, and it is expected that its polymer imports will shrink even further.<sup>28</sup>

The production of plastics is responsible for substantial environmental and health impacts that take place—take, for instance, the release of particulate-matter (PM) emissions.<sup>29</sup> As a result, China now has the most plastic related PM health impacts of any country.<sup>30</sup> Despite these health-related challenges, Chinese polymer producers have some of the most relaxed reporting and environment requirements in the world.<sup>31</sup>

In line with the push for self-sufficiency in polymer production, China is expected to commence operations of 44 crude oil refinery projects between 2022 and 2026, accounting for 24 percent of all crude oil refinery projects in Asia.<sup>32</sup> It is estimated that up to 80 percent of the new refining capacity in China will be plastics focused.<sup>33</sup> An example of this trend is the new mega-plant project in the Zhejiang

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22. Jiang et al., *supra* note 2, at 104972.

23. Yanan Ren et al., *Spatiotemporal Evolution of the International Plastic Resin Trade Network*, 276 J. OF CLEANER PROD. 124221, 124224–124225 (2020).

24. Dilip Kumar Jha, *China's Polymer Imports Slump in 2022, Economic Growth to Set the Momentum for 2023*, POLYMERUPDATE (Jan. 24, 2023), <https://www.polymerupdate.com/news/details/1210314>.

25. Jiang et al., *supra* note 2, at 104972. China is the primary supplier of finished goods to the world and as a direct result, is the principal importer of polymers. This reliance on polymer imports is not effective from the economic point of view. The country has limited hydrocarbon resources (with the exception of coal), so the ideal scenario for China is to import the raw materials (oil/natural gas/petroleum gases, which China is already doing) and retain all the value to the top of the chain (polymers and manufactured goods) within China. See Craig Jallal, *Analysis: can China cure its chemical import dependency?*, RIVIERA (Mar. 22, 2021), <https://perma.cc/L5Z8-USJT>. The push for self-sufficiency in polymers is a part of the large goal to become less reliant on external trade, especially in the unstable geopolitical situation in the world. See Kai Pflug, *China's Quest for Self-sufficiency in Chemicals*, CHEMANAGER INT'L (May 2, 2022), <https://perma.cc/29G5-RFGE>.

26. Jha, *supra* note 24.

27. *Id.*

28. *Id.*

29. Livia Cabernard et al., *Growing Environmental Footprint of Plastics Driven by Coal Combustion*, 5 NATURE SUSTAINABILITY 139, 139 (2022).

30. *Id.* at 143.

31. CHARLES ET AL., *supra* note 15, at 36.

32. Globaldata, *China to account for 24% of upcoming Asia crude oil refinery projects*, PLANT ENG'G (June 30, 2022), <https://perma.cc/5PUH-W6VX>.

33. *Oil Companies are Ploughing Money into Fossil-Fuelled Plastics Production at a Record Rate – New Research*, THE CONVERSATION (Nov. 2, 2021), <https://perma.cc/JWY8-7Kfy> [hereinafter *Oil*

province.<sup>34</sup> Once completed, it will be a fully integrated petroleum refinery and petrochemical production facility with the capacity to process 800,000 barrels of crude oil per day.<sup>35</sup> It will be one of the largest refineries in the world, and most of its chemical products will be common plastics, such as polyethylene for packaging.<sup>36</sup>

There are also plans to build more plastic plants, and multinational companies are actively investing in China's plastics manufacturing.<sup>37</sup> For instance, German chemical giant BASF is investing \$10 billion into a 60,000 metric-ton annual capacity plastics plant in China.<sup>38</sup> Overall, China is forecast to spend an additional \$140 billion on 15 large projects by 2023.<sup>39</sup>

China's drive to stockpile oil and its continuous investments into plastic production are in line with global trends and forecasts.<sup>40</sup> Thus, it is predicted that plastics and related petrochemicals—and not vehicle fuels—will soon become the largest driver of oil demand.<sup>41</sup> Consequently, investing in plastics has become strategically important for fossil fuel companies around the world.<sup>42</sup> Assuming a 'business as usual' approach, the growth in plastic production is expected to continue past 2025, reaching 1606 Mts by 2050.<sup>43</sup>

## II. CHINA AS A PRODUCER OF PLASTIC WASTE

China is also one of the biggest generators of plastic waste in the world.<sup>44</sup> In 2020, over 76 million tonnes of plastic products were produced in China.<sup>45</sup> About 135 million tonnes of plastic products were domestically consumed, and only 16 million tonnes (about 17 percent) were reused.<sup>46</sup> In 2019, over 25.3 million tonnes of single-use plastic waste came from China, about a fifth of the world's total.<sup>47</sup>

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*Companies and Fossil-Fuelled Plastics*]. China's novel refining capacity is likely to focus on plastic going forward.

34. *Id.*

35. *Id.*

36. *Id.*

37. Tom Walker, *INEOS Styrolution Invests in ABS World-Scale Plant in China*, INTERPLAS INSIGHTS (Jan. 10, 2020, 2:15 PM), <https://perma.cc/CDU8-PA57>; *See also* Stephen Moore, *Domo to Invest in PA Compounding in China*, PLASTICS TODAY (Mar. 16, 2020), <https://perma.cc/D9JB-Y8DT>.

38. Steve Toloken, *BASF making \$10B investment in China*, PLASTICS NEWS (May 21, 2019, 2:00 AM), <https://perma.cc/7VQN-Z79E>; *see also* Anna Han & Yvonne Yu, *BASF inaugurates the first plant of its new Zhanjiang Verbund site*, BASF (Sep. 6, 2022), <https://perma.cc/WB96-DFAQ>.

39. PEW CHARITABLE TRUSTS & SYSTEMIQ, *BREAKING THE PLASTIC WAVE: A COMPREHENSIVE ASSESSMENT OF PATHWAYS TOWARDS STOPPING OCEAN PLASTIC POLLUTION* 31 (2020).

40. *Oil Companies and Fossil-Fuelled Plastics*, *supra* note 33. As a result, international fossil fuel companies are likely to prioritise plastic investment going forward.

41. *Id.*

42. *Id.*

43. Jiajia Zheng & Sangwon Suh, *Strategies to Reduce the Global Carbon Footprint of Plastics*, 9 NATURE CLIMATE CHANGE 374, 375 (2019).

44. Jianli Liu et al., *The Value of China's Legislation on Plastic Pollution Prevention in 2020*, 108 BULL. OF ENV'T CONTAMINATION AND TOXICOLOGY, 601, 601 (2021).

45. *Id.*

46. *Id.*

47. *See* CHARLES ET AL., *supra* note 15, at 43, 64; Cheryl Heng, *China's plastic waste mountain the biggest in the world: study*, S. CHINA MORNING POST (May 23, 2021, 8:00 AM), <https://perma.cc/LBE9-NJ8Y>.

However, the per capita rate of plastic waste in China is only about 18 kilograms per year.<sup>48</sup> In comparison, the US per capita rate is three times more at 54 kilograms annually.<sup>49</sup>

China was virtually plastic free in the early 1970s, mainly because the country was income poor and for the majority of its citizens there was very little to buy.<sup>50</sup> However, by the 1990s, China's industrial sector started growing fast as it moved away from its traditional communist approach to its economy and adopted capitalist mores that saw its economic output soar.<sup>51</sup> In 2001, China became a member of the World Trade Organisation,<sup>52</sup> and within a year the country turned into the, "World's Manufacturing Powerhouse."<sup>53</sup> However, the problem of raw material scarcity, high prices and a lack of significant domestic oil and gas resources needed to be overcome if China's manufacturing industry was to continue to thrive.<sup>54</sup>

China adopted a solution to import plastic waste from developed countries, which were producing an increasing amount of waste and were, as a result, concerned about the state of their environments.<sup>55</sup> This scheme was economically viable only because China, as a low-income country with lax environmental laws, had both a demand for scrap, including plastic scrap, and ample cheap labour to sort that scrap manually before it was ready to be recycled.<sup>56</sup>

Indeed, imported waste plastic from the developed countries was often hand-sorted by China's poorest workers—waste pickers—who searched for raw material that could be used to manufacture new plastic items.<sup>57</sup> The imported plastic waste was "primarily used to substitute virgin plastic resin to make low-value plastic products such as toys, pipes, [and] bags, contributing to approximately 28 [percent] of recycled plastics in China."<sup>58</sup> Waste pickers continue to play an important part in reducing plastic waste in China.<sup>59</sup> However, they focus only on high value plastic waste, leaving low-residual-value plastics behind.<sup>60</sup> With the current plastic-waste

48. CHARLES ET AL., *supra* note 15, at 64.

49. *See id.* at 63.

50. *See* Isabel Hilton, *Plastic in China: A Short History of a Crisis*, in MARE PLASTICUM - THE PLASTIC SEA 129, 130 (Marilena Streit-Bianchi, Margarita Cimadevila, & Wolfgang Trettnak eds., 2020).

51. *See generally* Loren Brandt et al., *Industrialization in China*, DISCUSSION PAPER SERIES NO. 10096, July 2016.

52. *China and the WTO*, WORLD TRADE ORG., <https://perma.cc/B37P-N6FZ> (last visited May 10, 2023).

53. HELEEN MEES, *THE CHINESE BIRDCAGE: HOW CHINA'S RISE ALMOST TOPPLED THE WEST* 21 (Springer, 2016).

54. Yanan Ren et al., *Life-Cycle Environmental Implications of China's Ban on Post-Consumer Plastics Import*, 156 RES. CONSERVATION & RECYCLING 1, 1 (2020); Aya Yoshida et al., *Secondary materials transfer from Japan to China: Destination analysis*, 7 J. OF MATERIAL CYCLES AND WASTE MGMT. 8, 9 (2005).

55. Hilton, *supra* note 50, at 131.

56. Donald Lyons et al., *Circuits of Scrap: Closed Loop Industrial Ecosystems and the Geography of US International Recyclable Material Flows 1995-2005*, 175 THE GEOGRAPHICAL J. 286, 296 (2009).

57. Hilton, *supra* note 50, at 131.

58. Shen Qu et al., *Implications of China's foreign waste ban on the global circular economy*, 144 RES. CONSERVATION & RECYCLING 252, 252–253 (2019).

59. OCEAN CONSERVANCY, *STEMMING THE TIDE: LAND-BASED STRATEGIES FOR A PLASTIC-FREE OCEAN* 19–20 (2015).

60. *Id.* at 20.

growth rate, “it is unlikely that waste pickers will have any incentive to start extracting low-residual-value plastics.”<sup>61</sup> Moreover, it is simply unethical to treat waste-pickers—some of the poorest people in China, working in hazardous conditions which significantly reduce their life span—as a solution to waste-management problems.<sup>62</sup>

This waste importing scheme discouraged developed countries from implementing their own sustainable recycling systems for plastics because exporting waste was cheaper.<sup>63</sup> Moreover, plastic containers were often contaminated with banned materials hidden inside them, causing considerable amounts of imported waste to be dumped, which added to China’s growing plastic pollution problem.<sup>64</sup> Nevertheless, China still preferred the imported waste for the purpose of recovery, as it was of a higher quality than domestic plastic waste.<sup>65</sup> In 2014, China was home to the world’s largest recycling industry, importing over 50 percent of the global trade for end-of-life plastic.<sup>66</sup> However, approximately, 20 percent of all the imported plastic ended up being mismanaged and entered the waste stream.<sup>67</sup>

In addition to importing waste for repurposing, China started producing its own plastic waste at an alarming rate. In 2018, China’s Academy of Sciences analysed China’s plastic waste and identified three important sources of domestic plastic waste.<sup>68</sup> First, China’s huge population is one of the biggest users of plastic bags in the world.<sup>69</sup> According to the 2015 data over 3 billion plastic bags were utilized in China every day.<sup>70</sup> Second, plastic food containers have been a problem in China since the late 1980s—when China Railway introduced them for their onboard meal service, and large quantities of discarded plastic boxes began to accumulate along the railways.<sup>71</sup> In 2016, the waste generated by the food-delivery sector alone reached 1.68 Mt, including 1.33 Mt of plastic waste.<sup>72</sup> To put that in perspective, the entire world only produces approximately 300 Mt annually with 50% of that single use plastic.<sup>73</sup>

Plastic waste from food delivery packaging in China is normally contaminated with food residue and is frequently mixed with other municipal solid waste and disposed of by either (1) sanitary landfilling (62 percent), (2) incineration

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61. *Id.* at 16.

62. *Id.*

63. Hilton, *supra* note 50, at 131.

64. *Id.* at 132; see Yuhong Zhao, *Trade and Environment: Challenges After China’s WTO Accession*, 32 COLUM. J. ENV’T L. 41, 45–46 (2007).

65. Hilton, *supra* note 50, at 132.

66. OCEAN CONSERVANCY, *supra* note 59, at 12.

67. *Id.* at 21.

68. Hilton, *supra* note 50, at 132.

69. Bairong Wang & Yong Li, *Plastic Bag Usage and the Policies: A Case Study of China*, 126 WASTE MGMT. 163, 164 (2021).

70. Maria Kasidoni et al., *The Existing Situation and Challenges Regarding the Use of Plastic Carrier Bags in Europe*, 33(5) WASTE MGMT. & RSCH. 419, 419 (2015).

71. Hilton, *supra* note 50, at 132.

72. Xuexiu Jia et al., *Energy-Emission-Waste Nexus of Food Deliveries in China*, 70 CHEM. ENG’G TRANSACTIONS 661, 664 (2018).

73. Courtney Lindwall, *Single Use Plastic 101*, NRDC (Jan. 9, 2020), <https://perma.cc/JZQ3-GKGP>.



(32 percent), or (3) illegal dumping and open burning (6 percent).<sup>74</sup> Nowadays, the problem is exacerbated by easily available take-away meals and food-delivery services, the popularity of which has grown significantly during the COVID-19 pandemic.<sup>75</sup> The COVID-19 pandemic has also increased demand for many types of plastic that are used as common packaging materials.<sup>76</sup>

The third source, plastic film mulching, is a significant source of plastic pollution but often remains out of the spotlight.<sup>77</sup> China is the world's largest user of plastic film mulching.<sup>78</sup> In 2020, China consumed 2.39 million tonnes of agricultural films, including 1.36 million tonnes of mulch films.<sup>79</sup> Due to the rapid growth of agricultural production, the use of plastic mulching in China increased by 91 percent over the last two decades.<sup>80</sup> Application of plastic mulch can significantly improve crop yield due to its effects on soil warming, moisture conservation and weed control.<sup>81</sup> This is particularly important for China, a large agricultural country, where food security is significantly limited by the shortage of water resources which can be further aggravated by the phenomenon of plastic mulching.<sup>82</sup>

A number of studies have demonstrated that plastic mulching is a direct and significant source of terrestrial microplastic pollution.<sup>83</sup> Removing all the plastic mulch from the field is labor-intensive and time-consuming.<sup>84</sup> Therefore, plastic films are often left in agricultural soils, where, due to photodegradation and exposure to other elements, they can become brittle and break down into micro-sized particles.<sup>85</sup> Some studies have shown a significant amount of plastic pollution of agricultural soil in China.<sup>86</sup> One solution to this problem is to use "biodegradable

74. Guanghan Song et al., *Packaging Waste from Food Delivery in China's Mega Cities*, 130 RES. CONSERVATION & RECYCLING 226, 226 (2018).

75. Charlene Li et al., *Review of Online Food Delivery Platforms and their Impacts on Sustainability*, 12 SUSTAINABILITY 5528, 5536 (2020).

76. Jiří Jaromír Klemeš et al., *Minimising the present and future plastic waste, energy and environmental footprints related to COVID-19*, 127 RENEWABLE & SUSTAINABLE ENERGY REVS. 109883, 109885 (2020).

77. See Stefani Daryanto et al., *Can ridge-furrow plastic mulching replace irrigation in dryland wheat and maize cropping systems?*, 190 AGRIC. WATER MGMT. 1, 2 (2017).

78. Haihe Gao et al., *Effects of Plastic Mulching and Plastic Residue on Agricultural Production: A Meta-Analysis*, 651 SCI. OF THE TOTAL ENV'T 484, 485 (2019).

79. Hantao Dong et al., *Recycling, Disposal, or Biodegradable-Alternative of Polyethylene Plastic Film for Agricultural Mulching? A Life Cycle Analysis of their Environmental Impacts*, 380 J. OF CLEANER PROD. 134950, 134950 (2022).

80. *Id.*

81. He Wenqing et al., *The benefits and challenge of plastic film mulching in China*, WORLD AGRIC. (May 10, 2017), <https://perma.cc/2QMV-BESG>.

82. Gao et al., *supra* note 77, at 484–485.

83. See, e.g., *id.* at 484–485 (2019); A. F. Astner et al., *Mechanical formation of micro- and nano-plastic materials for environmental studies in agricultural ecosystems*, 685 SCI. TOTAL ENV'T 1097, 1098 (2019); E. K. Liu et al., *'White revolution' to 'white pollution'—agricultural plastic film mulch in China*, 9 ENVIRON. RES. LETT. 1, 2 (2014); Yi Huang et al., *Agricultural plastic mulching as a source of microplastics in the terrestrial environment*, 260 ENV'T POLLUTION 114096, 114099 (2020).

84. See Douglas G. Hayes et al., *Effect of diverse weathering conditions on the physicochemical properties of biodegradable plastic mulches*, 62 POLYMER TESTING 454, 454 (2017).

85. *See id.*

86. E.g., Kuok Ho Daniel Tang, *Microplastics in Agricultural Soils in China: Sources, Impacts and Solutions*, 322 ENV'T POLLUTION 121235, 121235 (2023).

mulches” (BDMs), which are mulch films prepared from biodegradable plastics.<sup>87</sup> Such BDMs are extensively used in Europe.<sup>88</sup> However, Chinese farmers have been hesitant to replace conventional PE mulches with BDMs due to their higher costs.<sup>89</sup> In addition to these three main types of plastic waste, the plastic products used in household electric appliances, vehicles and construction are also a significant source of plastic pollution in China.<sup>90</sup>

A big part of the plastic waste problem in China is, of course, poor municipal solid waste (MSW) management in China in general.<sup>91</sup> Plastic waste that ends up in oceans from land-based sources is mainly uncollected rubbish (75 percent), with the remaining 25 percent coming from post-collection mismanagement.<sup>92</sup> China’s collection and recycling rates for solid waste, which include plastic, are relatively low.<sup>93</sup> Data from 2014 shows that China’s national average collection rate is just below 40 percent.<sup>94</sup> China’s overall recycling rate is somewhere between 5 and 20 percent, depending on the source.<sup>95</sup>

However, a closer analysis reveals that there is a wide discrepancy between urban and rural areas.<sup>96</sup> The urban waste collection rate in some areas could be as high as 65 percent, whereas in some remote rural areas it is not even 5 percent.<sup>97</sup> Poor collection rates lead to waste mismanagement, and people in these remote areas are more likely to resort to burning or river dumping.<sup>98</sup> In addition, recycling of plastic waste in China is often a toxic endeavour, with many chemicals—such as volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and

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87. Hayes et al., *supra* note 83, at 455.

88. See, e.g., Press Release, Biodegradable Mulch Films Supported in Revision of EU Fertilisers Regulation, European Bioplastics (July 13, 2017).

89. Yan Changrong et al., *Plastic-film mulch in Chinese agriculture: Importance and problems*, 4 *WORLD AGRIC.* 32, 35 (2014).

90. See Liu et al., *supra* note 44, at 602.

91. Municipal solid waste in China consists of food waste (47.7%), followed by recycling waste (26.7%) and landfill waste (24.9%). Yanli Zhu et al., *A Review of Municipal Solid Waste in China: Characteristics, Compositions, Influential Factors and Treatment Technologies*, 23 *ENV'T DEV. & SUSTAINABILITY* 6603, 6612 (2021).

92. OCEAN CONSERVANCY, *supra* note 59, at 7.

93. See *id.*

94. *Id.* at 19.

95. Piotr Dobrowolski, *Recycling in China: From Zero to Hero?*, *WASTE MGMT. WORLD* (Apr. 20, 2021), <https://perma.cc/75XG-LN5C>.

96. OCEAN CONSERVANCY, *supra* note 59, at 19.

97. *Id.*

98. *Id.*

phthalate esters (PAEs).<sup>99</sup> Such VOCs are often emitted in the process, as many recycling plants do not abide by environmental standards.<sup>100</sup>

Due to relatively low recycling rates, most of the collected waste is destined for a landfill.<sup>101</sup> While an increasing amount of MSW is incinerated, landfill sites remain the predominant waste disposal method in the country.<sup>102</sup> In 2017, of the 210 million tonnes of MSW that were disposed of in China's cities, almost 60 percent were landfilled.<sup>103</sup> The predominant reliance on landfills as an MSW management solution has led to an increasingly critical waste disposal situation due to constraints of land availability, as well as associated environmental, health and safety issues.<sup>104</sup>

Overall, the combination of poorly disposed imported plastic waste combined with the growing amount of domestic plastic waste, and inadequate management, have made China one of the most significant contributors to ocean plastic pollution. Its rivers have acted as a key conduit of such debris reaching the ocean.<sup>105</sup>

In 2019, the COVID-19 pandemic significantly exacerbated some of the plastic production and consumption trends.<sup>106</sup> The pandemic highlighted the essential role of single-use plastic in management of the virus, including increased demand for plastic in the medical sector.<sup>107</sup> These single-use plastics have included various items of personal protective equipment (PPE), such as face shields, gowns, vinyl gloves, as well as disposable bags, tubes, and masks (polypropylene is the most common constituent of PPEs).<sup>108</sup>

The increased demand for PPE is expected to be sustained beyond COVID-19, and it is estimated that the compound annual growth in facial and surgical masks

99. Such chemicals have been linked to respiratory issues and have been found to damage the central nervous system and organs. Particular susceptible groups to long-term exposure to VOCs are babies, the elderly and those with underlying respiratory problems like asthmatics. The World Health Organisation has deemed the acceptable level of VOCs indoors to be less than 400 parts per billion. *Volatile Organic Compounds*, AM. LUNG ASS'N, <https://perma.cc/LAZ7-Q877> (Nov. 17, 2022); Cheska Bugayong, *Understanding VOCs and its effects on health*, UHOO (Apr. 27, 2022), <https://perma.cc/Y4W8-VHT5>.

100. De-Yin Huang et al., *Pollution Characteristics of Volatile Organic Compounds, Polycyclic Aromatic Hydrocarbons and Phthalate Esters Emitted from Plastic Wastes Recycling Granulation Plants in Xingtian Town, South China*, 71 *ATMOSPHERIC ENV'T* 327, 327–328 (2013); see generally Weining Wan et al., *Occurrence and Distribution of Organophosphorus Esters in Soils and Wheat Plants in a Plastic Waste Treatment Area in China*, 214 *ENV'T POLLUTION* 349, 349 (2016).

101. Yin Ding et al., *A Review of China's Municipal Solid Waste (MSW) and Comparison with International Regions: Management and Technologies in Treatment and Resource Utilization*, 293 *J. CLEANER PROD.* 126144, 126145 (2021).

102. About 52% of MSW in China is landfilled and 45% is incinerated. *Id.*

103. Roh Pin Lee et al., *Sustainable Waste Management for Zero Waste Cities in China: Potential, Challenges and Opportunities*, 4 *CLEAN ENERGY* 169, 171 (2020).

104. For example, “[a]bout 47% of landfill sites in China are built without an effective leachate disposal system.” *Id.* at 172.

105. See Jenna R. Jambeck et al., *Plastic Waste Inputs from Land into the Ocean*, 347 *SCI.* 768, 769 (2015).

106. Neil J. Rowan & John G. Laffey, *Unlocking the Surge in Demand for Personal and Protective Equipment (PPE) and Improvised Face Coverings Arising from Coronavirus Disease (COVID-19) Pandemic – Implications for Efficacy, Re-Use and Sustainable Waste Management*, 752 *SCI. TOTAL ENV'T* 142259, 142269 (2021).

107. *Id.*

108. *Id.*

supply from 2020 to 2025 will be about 20 percent.<sup>109</sup> China is one of the leading producers of PPE in the world.<sup>110</sup> In addition, the price of crude oil has fallen dramatically during the pandemic due to the decrease in water, land and air transport, which favours the manufacturing of virgin plastics (over recycled plastics) by the plastic industry.<sup>111</sup> Therefore, COVID-19 has inadvertently acted as another boost for the Chinese plastic industry.

Moreover, discarded PPE has contributed greatly to plastic pollution problem in China.<sup>112</sup> It has been reported that, “[h]ospitals in Wuhan, the center of the COVID-19 outbreak, produced more than 240 tons of single-use plastic-based medical waste . . . per day at the peak of the pandemic, [which is six] times more than the daily average before the pandemic occurred.”<sup>113</sup> Overall, the COVID-19 pandemic has significantly slowed down the roll out of the policies aiming to curb plastic pollution and to reduce single-use plastic in China and in the world in general.<sup>114</sup>

### III. CHINA AND CIVIL SOCIETY IN THE CONTEXT OF PLASTIC POLLUTION PROBLEM

With the rise of the middle class and the growing impact of modern media, China’s urban public is becoming increasingly concerned about environmental degradation and plastic pollution.<sup>115</sup> This concern has led to a number of conflicts, highlighting the need for internal coordination, cooperation and balance between economic and environmental values.<sup>116</sup>

The country has witnessed a steady rise in the number of small NGOs, such as Rendu Ocean, a non-profit organization in mainland China that focuses on marine plastic debris.<sup>117</sup> However, it is not uncommon for the Chinese government to clamp down on environmental campaigns that aim to shed light on the environmental problems of the country, especially when such environmental campaigns appear to

109. Narendra Singh et al., *Environmentally Sustainable Management of Used Personal Protective Equipment*, 54 ENV’T SCI. & TECH. 8500, 8500 (2020).

110. Keith Bradsher, *China Dominates Medical Supplies, in This Outbreak and the Next*, N.Y. TIMES (July 5, 2020), <https://www.nytimes.com/2020/07/05/business/china-medical-supplies.html>; Finbarr Bermingham & Su-Lin Tan, *Coronavirus: China’s Mask-Making Juggernaut Cranks into Gear, Sparking Fears of Over-Reliance on World’s Workshop*, S. CHINA MORNING POST (Mar. 12, 2020, 1:07 PM), <https://perma.cc/3SV2-D25P>.

111. Ana L. Patrício Silva et al., *Rethinking and Optimising Plastic Waste Management Under COVID-19 Pandemic: Policy Solutions Based on Redesign and Reduction of Single-Use Plastics and Personal Protective Equipment*, 742 SCI. OF THE ENV’T 140565, 140567 (2020).

112. Mandy Zuo, *Coronavirus Leaves China with Mountains of Medical Waste*, S. CHINA MORNING POST (Mar. 12, 2020, 1:45 AM), <https://perma.cc/Z4AG-7A4J>.

113. Tanveer M. Adyel, *Accumulation of Plastic Waste During COVID-19*, 369 SCI. 1313, 1314 (2020).

114. Silva et al., *supra* note 109.

115. Yi Liu et al., *A Governance Network Perspective on Environmental Conflicts in China: Findings from the Dalian Paraxylene Conflict*, 37 POL’Y STUD. 314, 314 (2016).

116. *Id.*

117. Standaert, *supra* note 4 (“These restrictions include the passage [in 2021] of a Charity Law overseeing domestic NGOs, as well as adoption of a foreign NGO law.”); Beatriz Garcia et al., *Marine Plastic Pollution in Asia: All Hands on Deck!*, 3 CHINESE J. OF ENV’T L. 11, 26 (2019).

be gaining broad popular support.<sup>118</sup> One example of this occurring is the documentary titled “Plastic China,” which exposed the dirty business of recycling imported plastic.<sup>119</sup> The Chinese government blocked the documentary on the Internet, even though it could have acted as an impetus to speed up the implementation of the ban on the imported plastic waste.<sup>120</sup> Cases such as this illustrate the increasing tension between public demands for effective regulation of plastics and a reluctance on the part of the Chinese government to accept public interest in the matter.<sup>121</sup>

As the plastic industry in China has experienced rapid expansion, protests have been organised in response in many cities, such as Dalian, Xiamen, Ningbo, Zhangzhou and Maoming, where the government planned to build new paraxylene production facilities (commonly called anti-XP protests).<sup>122</sup> As private and state-owned chemical companies seek to increase paraxylene production capacity, affected communities have called for a more effective government response to pollution.<sup>123</sup>

Although these protests tend to be localised and often driven by the Not in My Backyard mentality (NIMBY),<sup>124</sup> they also demonstrate growing awareness and concern about environmental pollution.<sup>125</sup> Moreover, these protests may also indicate growing public dissatisfaction with the Chinese ‘adaptive authoritarianism’ governance model and may expose the model’s limitations, such as poor planning and lack of deliberation and consultation.<sup>126</sup> Multidimensional “wicked” problems,<sup>127</sup> such as plastic pollution, “requires coordination among various actors: governmental agencies dispersed over various government levels and sectors, state-owned companies, private business, NGOs, citizens, and activists.”<sup>128</sup> If the Chinese government is serious about reducing plastic waste and greening up its act, it must balance and accommodate an increasing variety of values.<sup>129</sup> This requires involvement of the communities and civil society in the decision-making processes.<sup>130</sup>

118. Standaert, *supra* note 4.

119. PLASTIC CHINA (CNEX Studio Corp. 2017); Matt Logan, *Plastic China*, ASS’N FOR ASIAN STUD. (2020), <https://perma.cc/3G3Z-SJMS> (stating that the documentary focuses on the operation of one small and seemingly unregulated recycling factory in China and the community living around it, amid plastic waste and factory fumes).

120. Standaert, *supra* note 4.

121. *Id.*

122. Kingsyhon Lee & Ming-sho Ho, *The Maoming Anti-PX Protest of 2014: An Environmental Movement in Contemporary China*, 3 CHINESE PERSPECTIVES 33, 33 (2014).

123. *See generally id.*

124. Hongyan Gu, *NIMBYism in China: Issues and Prospects of Public Participation in Facility Siting*, 52 LAND USE POL’Y 527, 527 (2016).

125. Lee & Ho, *supra* note 120, at 39.

126. *See generally id.* at 35.

127. Horst W. J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning*, 4 POL’Y SCI. 155, 155 (1973).

128. Liu et al., *supra* note 113, at 315.

129. *Id.*

130. *Id.*

#### IV. PLASTIC POLLUTION REGULATION IN CHINA

One of the primary ways that the Chinese government has sought to regulate plastic pollution is through its solid waste management system. In China, solid waste management involves many government departments, and overall, it appears that the approach is siloed. For example, the Ministry of Housing and Urban-rural Development (MOHURD) is responsible for solid waste collection, transportation, and treatment/disposal.<sup>131</sup> The Ministry of Environmental Protection (MOEP) deals with industrial waste and hazardous waste management.<sup>132</sup> The Ministry of Commerce (MOC) oversees recovery and circulation of recyclable waste materials, while the National Development and Reform Commission (NDRC) is responsible for its processing and utilization.<sup>133</sup>

The Chinese waste management sector and the country's efforts towards a circular economy have been transitioning and evolving quickly, especially in the past few years.<sup>134</sup> China has been a strong supporter of the circular economy concept for over two decades.<sup>135</sup> This concept, in the Chinese context, is based on the 3Rs framework: reduce, reuse and recycle.<sup>136</sup> The *Circular Economy Promotion Law* was adopted in August 2008, requiring that local and provincial governments consider this framework in their investment and development strategies.<sup>137</sup> The circular economy became a national development strategy in the 12<sup>th</sup> Five-Year Plan (2011–15).<sup>138</sup> The 13<sup>th</sup> Five-Year-Plan also establishes the circular economy as a fundamental pillar of the Chinese economy.<sup>139</sup>

131. China's goal is to increase the utilization rate of urban household waste to around 60 percent by the end of 2025. Moreover, it is predicted that China's capacity for household garbage sorting, collection, and transportation will be around 700,000 metric tonnes per day by the end of 2025. Finally, the incineration treatment capacity of China's urban household garbage should reach 800,000 tonnes per day. Xinhua, *China to Improve Urban Garbage Treatment*, STATE COUNCIL THE PEOPLE'S REPUBLIC OF CHINA (May 14, 2021), <https://perma.cc/Q48J-PY53>.

132. CHEN LIU ET AL., STATE OF THE 3RS IN ASIA AND THE PACIFIC: THE PEOPLE'S REPUBLIC OF CHINA 3 (2017).

133. *Id.*

134. *See generally id.*

135. *See* Raimund Bleischwitz et al., *The Circular Economy in China: Achievements, Challenges and Potential Implications for Decarbonisation*, 183 RES. CONSERVATION & RECYCLING 106350, 106350 (2022).

136. Marco Pesce et al., *Circular Economy in China: Translating Principles into Practice*, 12 SUSTAINABILITY 1, 2 (2020).

137. Zhōnghuá rénmín gònghéguó xúnhuán jīngjì cùjìn fǎ (中华人民共和国循环经济促进法) [Circular Economy Promotion Law of the People's Republic of China] (promulgated by the Standing Comm. of the Nat'l People's Cong., Aug. 29, 2008, effective Jan. 1, 2009), art. 3, CLI1.107971(EN) (Lawinfochina).

138. John A. Matthews & Hao Tan, *Circular Economy: Lessons from China*, 531 NATURE 440, 441 (2016).

139. *See* The 13th Five-Year Plan For Economic and Social Development of the People's Republic of China: Chapter 43 Promote Economical and Intensive Resource Use (2016–2020), (Compilation and Translation Bureau, Central Committee of the Communist Party of China Beijing, China) (China) ("We will stay aware of the need for the economical, efficient, and circular use of resources, bring about a fundamental change in the way resources are utilized, and strengthen conservation management throughout the entire process of resource use . . . We will implement a plan for guiding circular

Support by the Chinese government for the adoption of a circular economy national strategy in China is not based on “green altruism.”<sup>140</sup> The document aims to address key issues that China has been facing in over several decades of its economic growth: resource scarcity and low productivity.<sup>141</sup> The strategy also provides a solid platform for other government initiatives directed at plastic waste (discussed in the *China’s Regulation of Disposable Plastic Items* section below).<sup>142</sup> China appears to have realized that it needs to maintain its competitiveness on international markets by presenting itself as “green and clean.”<sup>143</sup> A global sense of crisis, as well as the desire to enhance its global environmental reputation, encouraged China to accelerate its anti-plastic pollution efforts.<sup>144</sup> Consequently, China has released a number of significant environmental policy documents and enacted new laws—especially since January 2020. The papers demonstrate that it does not want to be seen as lagging behind the EU and the United States in tightening its regulation and playing a major role in the war against plastic pollution.<sup>145</sup> The analysis which follows highlights some of these key regulatory developments.

#### A. China’s Regulation of Disposable Plastic Items.

On December 31, 2007, China’s State Council issued the *Notice on Restricting the Production and Sale of Plastic Shopping Bags*, commonly referred to as the special ‘plastic limit order.’<sup>146</sup> It provided, effective on June 1, 2008, for a total ban on the production and sale of thin plastic bags—plastic bags with a thickness of less than 0.025 mm, normally used for fresh produce—and the imposition of a fee on other types of plastic bags.<sup>147</sup>

While the plastic limit order reduced plastic bag use, its success was limited.<sup>148</sup> The prices set for the plastic bags were too low (0.01 USD–0.06 USD, which is a nominal sum for most) or were not charged at all, which was due in part to weak enforcement and direction by the central government.<sup>149</sup> For example, 80 percent of retail stores in rural regions continued to provide free plastic bags, as their use remained prevalent particularly among street vendors and smaller stores.<sup>150</sup>

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development, encourage the circular use of resources between production and society, and accelerate efforts to recycle resources from refuse.”).

140. Junming Zhu et al., *Efforts for a Circular Economy in China: A Comprehensive Review of Policies*, 23 J. INDUS. ECOLOGY 110, 116 (2018).

141. *Id.*

142. *Id.*

143. Pesce et al., *supra* note 134, at 2.

144. *See id.*

145. *See id.* at 2–3.

146. Qunfang Zhu, *An Appraisal and Analysis of the Law of “Plastic-Bag Ban,”* 5 ENERGY PROCEDIA 2516, 2517 (2011).

147. *Id.*

148. Mary O’Loughlin, *B.Y.O.B. (Bring Your Own Bag): A Comprehensive Assessment of China’s Plastic Bag Policy*, 18 BUFFALO ENV’T L. J. 298, 298 (2011).

149. *Id.* at 300–318.

150. Asphat Muposhi et al., *Considerations, Benefits and Unintended Consequences of Banning Plastic Shopping Bags for Environmental Sustainability: A Systematic Literature Review*, 40 WASTE MGMT. & RSCH. 248, 256 (2022).

Moreover, the disposable plastic packages used by some industries, such as express delivery and food delivery, are not subject to the plastic limit order at all.<sup>151</sup> This meant that in 2018, China's express delivery industry consumed about 24.5 billion plastic bags.<sup>152</sup> Significant loopholes such as these demonstrated that the plastic limit order has failed to achieve anticipated results.<sup>153</sup> The order faced further challenges in keeping up with the development of new, disposable, plastic-hungry industries.<sup>154</sup> In response, in 2020, the Chinese government rolled out a series of fresh policies, laws and regulations with the aim of dramatically reducing disposable plastic waste.<sup>155</sup>

On January 16, 2020, the Chinese government released a policy document titled *Opinions of National Development and Reform Commission and Ministry of Ecology and Environment on Further Strengthening the Control of Plastic Pollution*<sup>156</sup> that outlined the process of eliminating the use of certain single-use plastic items, substituting many other single-use plastics with biodegradable materials, regulating the use of agricultural plastic mulch and improving material recycling from 2020 to 2025.<sup>157</sup>

On July 10, 2020, the NDRC and MEE, together with eight other ministries, jointly released the “*Notice on Solidly Promoting Plastic Pollution Control*” (July 2020 Notice).<sup>158</sup> The focus of the July 2020 Notice is on the goal, set up by the January policy document, that by 2025 China will establish a management system for the production, circulation, consumption, recycling and disposal of plastic products. It makes great progress in developing alternative materials, significantly decrease plastic waste in landfills of key cities, and effectively control plastic pollution.<sup>159</sup> The July 2020 Notice required that a detailed and feasible plan for each administrative division of China should be issued before mid-August, 2020.<sup>160</sup> As of the January 1, 2021, 31 out of 34 administrative divisions in China have issued relevant implementation plans or action plans for plastic pollution control.<sup>161</sup>

Moreover, the July 2020 Notice also prescribes relevant measures that should be implemented by 2020 in key areas, with the emphasis on supervision, investigation, punishment, and control.<sup>162</sup> For example, local authorities are required to launch law enforcement inspections on shopping malls, supermarkets, peddlers’

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151. Liu et al., *supra* note 44, at 602.

152. *Id.*

153. *Id.*

154. *Id.*

155. *Id.*

156. *Opinions of National Development and Reform Commission and Ministry of Ecology and Environment on Further Strengthening the Control of Plastic Pollution (I)*, CBCGDF (Jan. 20, 2020), <https://perma.cc/8UQS-PBGB>.

157. Liu et al., *supra* note 44, at 602; Xinhua, *China Reveals Plan to Cut Plastic Use by 2025*, XINHUA NET (Jan. 19, 2020), <https://perma.cc/7CES-28PE>.

158. Guānyú zhāshi tuījìn sùliào wūrǎn zhīlǐ de tōngzhī (关于扎实推进塑料污染治理的通知) [Notice on Solidly Promoting Plastic Pollution Control], (NDRC ER [2020] No. 1146) (July 10, 2020) (translated to English).

159. *Id.*

160. *Id.*

161. Liu et al., *supra* note 44, at 605.

162. *Id.* at 603.



markets and the catering industry to ensure effective compliance with the non-degradable bag ban and the ban on ultra-thin plastic shopping bags.<sup>163</sup> Likewise, local agriculture and rural affairs departments are directed to carry out investigations and punishment for the production and sale of polyethylene agricultural film with a thickness of less than 0.01 mm, as well as packaging plastic film used for farmland coverage.<sup>164</sup>

These policy documents were further strengthened by the amendment of the *Law of the People's Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes*, which China's People's Congress passed on April 29, 2020 and came into force on September 1, 2020.<sup>165</sup> This law prohibits and restricts the production, sale, and use of non-degradable plastic bags and other disposable plastic products.<sup>166</sup> It also purports to regulate the use of disposable plastic in e-commerce, express delivery services and food-delivery services by prescribing reporting requirements.<sup>167</sup>

On August 28, 2020, China's MOC published another Notice, titled "*Further Strengthening the Control of Plastic Pollution in the Commercial Sector*" (August 2020 Notice).<sup>168</sup> The August 2020 Notice requires local authorities to facilitate the establishment of a centralised purchase and sale system for shopping bags in grocery markets.<sup>169</sup> These local authorities must also supervise businesses such as e-commerce and food delivery businesses to ensure that they reduce their consumption of disposable plastic products.<sup>170</sup> Various businesses, such as catering, are required to promote the use of alternative products, such as film-coated straw

163. *Id.*

164. *Id.* at 602, 604.

165. For a translation of the most recent version of the law, see generally PKULAW, LAW OF THE PEOPLE'S REPUBLIC OF CHINA ON THE PREVENTION AND CONTROL OF ENVIRONMENTAL POLLUTION CAUSED BY SOLID WASTES (2020 REVISION) (2020).

166. Zhōng huá rén mín gòng hé guó gù tǐ fèi wù wū rǎn huán jìng fáng zhì fǎ (中华人民共和国固体废物污染环境防治法) [Law of the People's Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes] (adopted Oct. 30, 1995, effective Apr. 1, 1996; revised Dec. 29, 2004, effective Apr. 1, 2005; amended and effective June 29, 2013; amended and effective Apr. 24, 2015; amended and effective Nov. 7, 2016; revised Apr. 29, 2020, effective Sept. 1, 2020), art. 69, CLI.1.341902(EN) (Lawinfochina).

Art 69 is translated as:

Article 69 The state shall prohibit and restrict the production, sale, and use of non-degradable plastic bags and other disposable plastic products according to the law.

The owners of goods retail sites, e-commerce platform enterprises, express delivery enterprises, and food delivery enterprises shall report the use and recovery of disposable plastic products such as plastic bags to the commerce, post and other departments in accordance with the relevant provisions issued by the state.

The state shall encourage and guide the reduced use and active recovery of plastic bags and other disposable plastic products and promote the application of recyclable, easily recyclable and degradable alternative products.

167. *Id.*

168. Guānyú jìnyībù jiāqiáng shāngyè lǐngyù sùliào wūrǎn zhìlǐ de tōngzhī (关于进一步加强商业领域塑料污染治理的通知) [Notice on Further Strengthening the Control of Plastic Pollution in the Commercial Sector] (Ministry of Com. Of the People's Republic of China, Aug. 28, 2020).

169. *Id.* art. 5.

170. *Id.*

boxes and biodegradable plastic bags, over traditional disposable products.<sup>171</sup> The August 2020 Notice also sets forth specific actions and deadlines for banned and limited plastic products, with the three-phased goals of 2020, 2022 and 2025.<sup>172</sup> Details of the proposed actions and deadlines are summarised in the table below:<sup>173</sup>

**Table 1**

Targeted plastic items	Proposed actions	Applicable areas	Deadline
Non-degradable plastic bags	Ban on the use of non-degradable plastic bags in shopping malls, supermarkets, catering delivery services, and various exhibition activities	Municipalities, provincial capitals, and urbanised area in the cities specifically designated in the national development plan	End of 2020. It was announced that the ban has taken effect from 1 January 2021 and has been implemented. <sup>174</sup>
	Standardisation and restriction on the use of non-degradable plastic bags in grocery markets	All urbanized area of the cities at prefecture level and all built-up county area in the coastal regions	End of 2022
	Ban on the use of non-degradable plastic bags in grocery markets	All urbanized area of the cities at prefecture level and all built-up county area in the coastal regions	End of 2025
Disposable Plastic Tableware	The catering industry prohibits the use of non-degradable disposable plastic straws	Nationwide	End of 2020 and implemented <sup>175</sup>

171. *Id.*; *China Continues Efforts to Ban and Limit Use of Plastic Products*, PACKAGING LAW (Nov. 9, 2020), <https://perma.cc/G5Y8-RPXK> [hereinafter *Ban of Plastic Products*].

172. *Ban of Plastic Products*, *supra* note 169.

173. *Id.*

174. Laney Zhang, *China: Single-Use Plastic Straw and Bag Ban Takes Effect*, LIBR. OF CONG. (Mar. 23, 2021), <https://perma.cc/QV3H-YKVZ>.

175. Apparently took effect on the 1<sup>st</sup> of January 2021. *Id.*

	Ban on the use of non-degradable disposable plastic tableware in dine-in catering services	Urbanized area of the cities at and above prefecture level	End of 2020 and implemented <sup>176</sup>
	Ban on the use of non-degradable disposable plastic tableware in dine-in catering services	Built-up county area Cities at and above prefecture level	End of 2025
	Consumption of non-degradable disposable plastic tableware in the catering delivery business decreased by 30%	Nationwide	End of 2025
<b>Disposable plastic products in the hospitality industry</b>	No longer offering disposable plastic products in star hotels, guesthouses, etc.	Nationwide	End of 2022
	The above implementation extended to all the hotels, guesthouses, and homestay	Nationwide	End of 2025

Source: *China Continues Efforts to Ban and Limit Use of Plastic Products*, PACKAGING LAW (Nov. 9, 2020), <https://perma.cc/6YHM-9JBL>.

New guidelines that set unified standards for green packaging and targeted e-commerce and express delivery industry, which is notorious for unnecessary packaging, were published on December 14, 2020, by eight departments of the Chinese government, including the NDRC and the State Post Bureau.<sup>177</sup>

Finally, In February 2021, the State Council of China issued its *Guiding Opinions on Accelerating the Establishment and Improvement of a Green and Low-*

176. *Id.*

177. Liu et al., *supra* note 44, at 603; 'Green Drive' to Make China's Express Delivery Sector More Eco-Friendly, CGTN (Dec. 27, 2020), <https://perma.cc/BHR7-89ED>.

*Carbon Circular Development Economic System*.<sup>178</sup> This guiding opinion focuses more broadly on the overall green transformation of the economy, particularly on the low-carbon future.<sup>179</sup> However, it also emphasizes recycling plastics and utilization of renewable resources as a part of the green future.<sup>180</sup>

1. *The Outcome of the Single Use Plastics Phase-Out in China: Looking into Degradables*

China's war on disposable plastics specifically exempts degradable alternatives, such as degradable plastic bags, cutlery, and packaging. Therefore, China's degradable plastics industry has seen explosive growth in the past two years.<sup>181</sup>

However, the definition of degradable plastic is unclear.<sup>182</sup> Various terms are commonly used to refer to disposable plastics without clear distinction, including: 'compostable plastics', 'bioplastics', and 'bio-based plastics.'<sup>183</sup> These terms are often used incorrectly in public communications, including in China.<sup>184</sup>

Therefore, it is important to provide some clarity on the term 'degradable plastics.' There are broadly two types of degradable plastics. The first type includes photodegradable and oxo-degradable plastics. They are usually made from conventional plastics with some additives, which helps the products to break down under sunlight and oxygen.<sup>185</sup> In theory, after breaking down into small fragments, the degradation process should be completed by microorganisms. However, in practice, studies have shown that photo- and oxo-degradable plastic leads to the accumulation of incompletely degraded plastic fragments in the environment, as it does not biodegrade within a reasonable time.<sup>186</sup>

The second type is biodegradable plastic.<sup>187</sup> There are more than 20 kinds of biodegradable plastics. These can be divided into two main sub-categories:

178. Guówùyuàn guānyú jiākuài jiànli jiànquán lǜsè dì tàn xúnhuán fāzhǎn jīngjì tǐxì de zhǐdǎo yìjiàn (国务院关于加快建立健全绿色低碳循环发展经济体系的指导意见) [The State Council's Guiding Opinions on Accelerating the Establishment and Improvement of a Green and Low-Carbon Circular Development Economic System] (Feb. 22, 2021) (Guo Fa [2021] No. 4) [hereinafter Guiding Opinions on Circular Development]. State Council of China is the highest Chinese governing body. Guiding opinions are official documents issued by government authorities to communicate government policies and put forward non-specific and non-operational opinions and solutions on issues of importance to the Chinese authorities. *Glossary Guiding Opinion (指导意见)*, THOMSON REUTERS, <https://perma.cc/MK7P-QPV6> (last visited May 22, 2023).

179. Guiding Opinions on Circular Development, *supra* note 176, § 3.

180. *Id.* § 4.

181. See Barry van Wyk, *The rise of China's biodegradable plastics industry*, THE CHINA PROJECT (June 27, 2022), <https://perma.cc/9EUR-LES5>.

182. MOLLY ZHONGNAN JIA, GREENPEACE, BIODEGRADABLE PLASTICS: BREAKING DOWN THE FACTS—PRODUCTION, COMPOSITION AND ENVIRONMENTAL IMPACT 5, 12 (2020).

183. *Id.* at 5, 6.

184. *Id.* at 5.

185. Isabelle Vroman & Lan Tighzert, *Biodegradable Polymers*, 2 MATERIALS 307, 308 (2009).

186. JIA, *supra* note 180, at 6.

187. See generally Markus Flury & Ramani Narayan, *Biodegradable plastic as an integral part of the solution to plastic waste pollution of the environment*, 30 GREEN AND SUSTAINABLE CHEMISTRY 100490 (2021).

Synthetic (fuel-based) and natural (bio-based plastics) biodegradable plastics.<sup>188</sup> Synthetic biodegradable polymers are often as versatile as normal, non-degradable ones. They also tend to decompose easily. However, due to their high cost of production, their use has been limited to certain processes and applications, for example medical procedures.<sup>189</sup>

Bio-based plastics are synthesized from the plants or biomass, such as cellulose, corn, sugarcane or bacteria. It is important to know that while terms such as ‘bio-based’ and ‘biodegradable’ are used interchangeably, they are not synonyms. Bio-based addresses a product’s origins, while biodegradable addresses end-of-life issues, so not all bio-based plastics are actually biodegradable.<sup>190</sup> According to European Bioplastics, more than 50 percent of the bioplastics produced in 2022 are biodegradable.<sup>191</sup>

Overall, the degradable plastic industry is booming in China.<sup>192</sup> According to Greenpeace, by 2020, 36 companies in China had planned or built new biodegradable plastic manufacturing facilities, adding production capacity of more than 4.4 million tonnes per year—a sevenfold increase from 2019.<sup>193</sup> While use of degradable plastics may appear to offer a useful solution to the plastic pollution problem, there are considerable challenges associated with over-reliance on degradable plastics in China.<sup>194</sup>

According to a recent estimation, by 2025, China’s production of two main types of bio-based plastic, PBAT and PLA, will reach 7 million and 1 million tonnes respectively, up from 300,000 and 100,000 tonnes in 2020, which represents about two-thirds of the global output.<sup>195</sup>

Bio-based plastics pose ongoing environmental and social challenges.<sup>196</sup> First, the main feedstocks for the production of bio-based plastics, especially PLA, comes from plants, such as cassava, potato, corn and sugar cane; these feedstocks are often sourced from the Global South.<sup>197</sup> There are potential issues with a long supply chain that lacks transparency.<sup>198</sup> There are also concerns about food security and land use due to the potential competition for arable land, fresh water and food

188. Adriaan S. Luyt & Sarah S. Malik, *Can Biodegradable Plastics Solve Plastic Solid Waste Accumulation?*, in *PLASTICS TO ENERGY* 403, 404–405 (2019).

189. *Id.* at 405.

190. Clare Goldsberry, *Consumers Confused by Distinction Between Biobased and Biodegradable Plastics*, *PLASTICS TODAY* (Feb. 8, 2020), <https://perma.cc/U943-4SMX>.

191. *Bioplastics market data*, EUROPEAN BIOPLASTICS, <https://perma.cc/V6KF-JTK4> (last visited May 24, 2023).

192. *See* JIA, *supra* note 180, at 9.

193. *Biodegradables will not solve China’s plastics crisis*, GREENPEACE INT’L (Dec. 17, 2020), <https://perma.cc/FX59-QRLD>.

194. *See id.*

195. Gao Baiyu, *China cools on biodegradable plastic*, *CHINA DIALOGUE* (Mar. 3, 2022), <https://perma.cc/SS6M-XU8Z>.

196. JIA, *supra* note 180, at 13–27.

197. *Id.* at 11–13.

198. *Id.* at 13. For example, in the case of bio-plastics, the feedstock (plant material, such as cassava) may grow very far from a plastics facility and must be shipped from overseas (usually from the developing countries). However, “[o]nly a few leading companies reveal their source of feedstock and commit to responsible and sustainable sourcing – in many countries, disclosing the source of feedstock is voluntary.”

production.<sup>199</sup> For example, a Chinese company called Anhui Fengyuan recently announced a production plan for PLA, promising to reach the capacity of 35 million tonnes by 2030, which, if achieved, would be 100 times greater than current global PLA capacity.<sup>200</sup> Anhui Fengyuan plans to import corn from Brazil as its main PLA feedstock.<sup>201</sup> “Currently no public information is available to evaluate the sustainability and responsibility of feedstock sourcing by Chinese PLA producers.”<sup>202</sup> As China is expanding its bio-based plastics production, it needs to ensure that the feedstock sourcing is regulated.<sup>203</sup>

A second concern with bio-based plastics is that similar to the fossil-based plastics, they may also contain additives such as stabilizers, plasticizers and other agents meant to enhance their physical properties.<sup>204</sup> For example, certain “additives can reduce the [original] brittleness of PLA”.<sup>205</sup> “However, this reportedly may hinder their biodegradability when compared to pure polymer, and consequently leads to the generation of microplastics.”<sup>206</sup> Moreover, these potentially toxic additives may leach into the soil and water.<sup>207</sup>

Finally, reference to the term “biodegradable” most commonly means “biodegradable under certain conditions.”<sup>208</sup> Thus, PLA biodegradation requires composting under specific conditions that are only available in industrial composting facilities.<sup>209</sup> Throwing PLA items into the domestic compost would not allow them to biodegrade properly.<sup>210</sup> Overall, there is a need for proper infrastructure for the sorting, collection, recycling and composting of bio-based plastics.<sup>211</sup> “China does not have enough composting facilities to support the end-of-life treatment, nor the collection system for compostable waste.”<sup>212</sup> Without the proper infrastructure, bio-based plastics are likely to end up in landfill, where the biodegradation processes may be severely inhibited.<sup>213</sup>

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199. “To produce 146 million tonnes of PLA [which is the amount of fuel-based plastics the packaging industry uses in a year] would require 348,940,000 tonnes of corn as feedstock, which uses 54,020,000 ha of land.” JIA, *supra* note 180, at 14–15; *see also* Carly A Fletcher et al., *Addressing Stakeholder Concerns Regarding the Effective Use of Bio-Based and Biodegradable Plastics*, 10 RES. 95, 97 (2021).

200. JIA, *supra* note 180, at 9.

201. *Id.*

202. *Id.*

203. *Id.* at 31.

204. Zvanaka S. Mazhandu et al., *Integrated and Consolidated Review of Plastic Waste Management and Bio-Based Biodegradable Plastics: Challenges and Opportunities*, 12 SUSTAINABILITY 8360, 8396 (2020).

205. *Id.*

206. *Id.*

207. Scott Lambert & Martin Wagner, *Environmental Performance of Bio-Based and Biodegradable Plastics: The Road Ahead*, 46 CHEM. SOC’Y REVS. 6855, 6865 (2017).

208. JIA, *supra* note 180, at 31.

209. Luyt & Malik, *supra* note 186, at 404.

210. *See id.* at 404.

211. Mazhandu et al., *supra* note 202.

212. JIA, *supra* note 180, at 31.

213. *See id.* at 24.

Before degradable plastic can truly become a part of a solution to plastic waste in China, it needs to be properly regulated.<sup>214</sup> The first applicable Chinese national standard on degradable plastic, which was introduced in 2006, identified four types of degradable plastic: biodegradable, compostable, light degradable and thermal-oxidative degradable; light degradable and thermal-oxidative degradable plastics fragment into microplastics and remain in the environment, polluting it.<sup>215</sup> “In 2020, the China National Light Industry Council published guidance on categorizing and labelling degradable plastics, with a new definition and a requirement that a material must have a degradability of 90 [percent] or more to be labelled ‘biodegradable.’”<sup>216</sup> However, that document was not a binding national standard.<sup>217</sup> Only on June 1, 2022, did the Chinese government finally implement a new national standard, replacing the 2006 one: “Degradability and Identification Requirements of Biodegradable Plastics and Products” (GB/T 41010-2021).<sup>218</sup> The new GB/T 41010-2021 standard provides some regulatory clarity regarding the term biodegradable plastics, as it defines the terms such as biodegradation and stipulates requirements on degradation performance and labelling of biodegradable plastic products.<sup>219</sup> It applies to both synthetic and bio-based biodegradable plastics.<sup>220</sup>

Further clarification is required in relation to the concept of ‘degradable’ plastic and its exemption from the disposable plastic ban. Without that clarification, some manufacturers use consumer confusion to their own advantage and keep presenting their oxo-degradable plastic as biodegradable.<sup>221</sup> Moreover, proper market governance, waste disposal and treatment, feedstock sourcing, supply chain monitoring and chemical safety are needed to ensure that consumers are not confused or misled.<sup>222</sup>

Nevertheless, the switch from conventional plastics to degradable plastics should not be considered a panacea, nor should it compete with other strategies to combat plastic waste—e.g., reducing both the production and the consumption of plastic.<sup>223</sup> Even binding national standards cannot resolve all issues related to degradable plastics, as many of those issues are caused by limitations in our existing

214. *Id.* at 31.

215. Baiyu, *supra* note 193.

216. *Id.*

217. *Id.*

218. Shēngwù xiáng jiě sùliào jí zhìpǐn de jiàngjiě xìngnéng jí biāozhì yāoqiú (生物降解塑料及制品的降解性能及标识要求) [Degradability and identification requirements of biodegradable plastics and products] (promulgated by State Administration for Market Regulation, Nov. 26, 2021, effective June 1, 2022), GB/T 41010–2021; *GB/T 41010-2021 (GBT 41010-2021)*, CHINESE STANDARD, <https://perma.cc/H8ZL-CVWC> (last visited May 22, 2023) (providing the information in English).

219. Liu Yake, *China releases national standards for biodegradable plastic materials and products: Rules for biodegradability, labeling introduced*, ENVILIANCE ASIA (Dec. 27, 2021), <https://perma.cc/G9KB-DQEF>.

220. *Id.*

221. *See Oxo-degradable Plastic Ban*, POLYPAK, <https://perma.cc/7YE2-SMA5> (last visited May 3, 2023).

222. JIA, *supra* note 180, at 31.

223. *Id.* at 39.

knowledge.<sup>224</sup> Instead, the focus should be on consuming less plastic in general<sup>225</sup> and resorting to bioplastics in certain situations, such as a genuine need for a product, where existing and well established end-of-life processing routes are available, and where existing reusable solutions are not an option.

## V. SOLID WASTE IMPORT REGULATION IN CHINA.

China imported approximately 106 million tonnes of plastic waste between 1992 and 2018.<sup>226</sup> While China's economy has benefited from the global recycling trade, the scheme simultaneously suffered from poor management of waste and rampant waste smuggling.<sup>227</sup> Instances of waste smuggling and mislabeling of materials as recyclable were very common and the imported waste was often contaminated.<sup>228</sup> For instance, customs officials reported that they had seen "recyclables" shipments filled with 40 percent non-recyclable materials, contributing to pollution levels in China.<sup>229</sup>

Consequently, the country started regulating solid waste imports.<sup>230</sup> In 2011, China banned all imported waste "that [could not] be used as raw materials."<sup>231</sup> This ban was supplemented by the program known as "Operation Green Fence" (OGF), which ran from February 2011 to November 2013.<sup>232</sup> It was designed to start unexpectedly, and waste exporters learned of the intervention on the day it was launched.<sup>233</sup> The program's objective was to enhance enforcement of the 2011 ban, which had to that point been lax.<sup>234</sup> Therefore, OGF focused mainly on curtailing the illegal hazardous-waste trade and improving the quality of the imported waste via stricter inspection policy.<sup>235</sup> Overall, the program resulted in a reduction of imports

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224. Janis Brizga et al., *The Unintended Side Effects of Bioplastics: Carbon, Land, and Water Footprints*, 3 ONE EARTH 45, 50 (2020).

225. *See id.*

226. Amy L. Brooks et al., *The Chinese Import Ban and its Impact on Global Plastic Waste Trade*, 4 SCI. ADV. 1, 2 (2018).

227. *China Recycling Clean-Up Jolts Global Industry*, S. CHINA MORNING POST, <http://perma.cc/BJT8-N8LW> (Oct. 3, 2013, 4:10 PM).

228. *Id.*

229. *Id.*; Josh Loeb, *Plastic Bottleneck as China Rejects 'Contaminated' Recyclables*, 12 ENG'G & TECH. 14, 14 (2017); Chao Wang et al., *Structure of the Global Plastic Waste Trade Network and the Impact of China's Import Ban*, 153 RES. CONSERVATION & RECYCLING 104591, 104591 (2020).

230. *See e.g., infra* notes 231–238.

231. PEOPLE'S REPUBLIC OF CHINA MINISTRY OF ENV'T PROT., MEASURES ON THE ADMINISTRATION OF IMPORT OF SOLID WASTES 3–4 (2011) (Articles 8 and 12); for original text in Cantonese with English translation, see *Administrative Measures for the Import of Solid Waste*, LAWINFOCHINA, <https://perma.cc/B5XC-NHB4> (last visited May 3, 2023).

232. Adomas Balkevicius et al., *Fending off Waste from the West: The impact of China's Operation Green Fence on the international waste trade*, 43 WORLD ECONOMY 1, 2 (2017).

233. *Id.* at 4.

234. *Id.*

235. Trang Tran et al., *The Impact of China's Tightening Environmental Regulations on International Waste Trade and Logistics*, 13 SUSTAINABILITY 987, 988 (2021).



of plastic waste into China.<sup>236</sup> Less plastic waste was accepted at the Chinese border with some shipments turned away.<sup>237</sup> The program also affected plastic recycling industries globally since little infrastructure existed elsewhere to manage the rejected waste.<sup>238</sup>

In 2015, OGF was followed by a short two-month program that specifically targeted plastic imports.<sup>239</sup> It focused on verifying whether recyclable imports were being processed correctly and preventing the import of contaminated shipments.<sup>240</sup> The program was implemented through a directive to local authorities in partnership with the anti-smuggling bureau within the General Administration of Customs.<sup>241</sup>

In February 2017, China's General Administration of Customs introduced the "Operation National Sword" (ONS).<sup>242</sup> The ONS sought to ban the import of a range of solid wastes, including unsorted paper and post-consumer plastic scrap.<sup>243</sup> As part of this policy, "every container of waste plastic and paper entering the country was checked from March 2017 to November 2017."<sup>244</sup> In July 2017, China notified the World Trade Organization (WTO) about its intention to ban, by the end of 2017, the import of 24 kinds of solid waste including all post-consumer plastic waste—notably, post-industrial plastic waste was exempt.<sup>245</sup> China's notification to the WTO justifying the ban stated that "[they] found that large amounts of dirty wastes or even hazardous wastes are mixed in the solid waste that can be used as raw materials. This polluted China's environment seriously."<sup>246</sup>

In November 2017, China amended its WTO notification to impose contamination standards for waste that was still being accepted.<sup>247</sup> The key contamination thresholds included 0.5 percent for post-industrial plastics; scrap paper or paperboard; smelt slag; wood; waste electric motors; wires and cables; metal and appliance scrap; and ferrous metals.<sup>248</sup> This means that for every one kilogram

236. *China's 'Green Fence' makes unprecedented cuts in recycled plastic imports*, GALE GEN. ONEFILE (May 19, 2013), <https://perma.cc/5XJC-3ZK5>; see Jerry Powell, *Operation Green Fence is deeply affecting export markets*, RES. RECYCLING, <https://perma.cc/26ED-U3N3> (Jan. 21, 2020).

237. Powell, *supra* note 234.

238. Brooks et al., *supra* note 224, at 3.

239. *Two-Month Crackdown Relating to China's Plastic Scrap Imports*, BUREAU OF INT'L RECYCLING (Nov. 5, 2015), <http://perma.cc/W76H-GJS9>.

240. *Id.*

241. *Id.*

242. Edward Perchard, *China Starts National Sword Campaign to Target 'Foreign Waste' Smuggling*, RES. (Feb. 23, 2017) <https://perma.cc/82FL-VBKF>.

243. *See id.*

244. Tran et al., *supra* note 233.

245. Notification, *Catalogue of Solid Wastes Forbidden to Import into China by the End of 2017*, WTO Doc. G/TBT/N/CHN/1211 (Jul. 18, 2017).

246. *Id.*

247. Notification, *Environmental Protection Control Standard for Imported Solid Wastes as Raw Materials – Waste and Scrap of Plastics*, WTO Doc. G/TBT/N/CHN/1233 (Nov. 15, 2017), translated in MINISTRY FOR ENV'T PROT. & STATE ADMIN. FOR QUALITY SUPERVISION, INSPECTION, AND QUARANTINE, ENVIRONMENTAL PROTECTION CONTROL STANDARD FOR SOLID WASTE IMPORTED AS RAW MATERIALS – WASTE AND SCRAP OF PLASTICS.

248. *Id.* The total contamination threshold is mentioned in para 4.4 of the document: "[i]nclusion of carried waste other than materials listed above shall be restricted in imported waste and scrap of plastics (including waste paper, waste wood-chips, scrap metal, waste glass, waste rubber/tyres, thermosetting

of accepted waste, only 5 grams or less of other contaminating matter (soil, other residues) could be present. Many recyclers considered this threshold nearly impossible to meet.<sup>249</sup> As a consequence, the number of import licences in China has been significantly restricted.<sup>250</sup> G7 nations who had sold 60 percent of their plastic waste to China in 2017, found only 10 percent was being accepted and global shipments of plastic to China fell by 99 percent between 2017 and 2018.<sup>251</sup>

In March of 2018, another enforcement campaign called “Blue Sky 2018” was announced.<sup>252</sup> Blue Sky 2018 ran until December 2018, with the main objective to monitor the import ban and enforce the contamination threshold.<sup>253</sup> On April 19, 2018, China announced several additional categories of waste to be banned by the end of 2018 and by the end of 2019.<sup>254</sup> The list included waste plastic from industrial sources, which was exempt under the previous 2017 ban.<sup>255</sup>

Finally, in 2020, the Chinese government announced a complete ban on all imported waste, effective January 1, 2021.<sup>256</sup> The announcement was made in line with the amendments to the *Law of the People’s Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Wastes*, mentioned above.<sup>257</sup> The Chinese Ministry of Ecology and Environment completely stopped

plastics, other plastics with a metallic coating, uncompressed foaming plastic waste) and its overall weight shall not exceed 0.5 % of that of the imported waste and scrap of plastics.”

249. Ian Martin, *Industry Concern as China Confirms New Thresholds for Contaminants*, RECYCLING INT’L (Nov. 17, 2017), <https://perma.cc/L7S9-E8E7>.

250. Christine Covington et al., *In the Wake of China’s National Sword*, 33 AUSTRALIAN ENV’T REV. 83, 83 (2018).

251. Shaun Cameron, *China: Rejecting Rubbish*, THE INTERPRETER (Nov. 10, 2021), <https://perma.cc/K3UE-VX2D>.

252. ‘Blue Sky 2018’ Campaign Hits ‘Foreign Wastes’, with Customs Control and Supervision to be Intensive for Long, GEN. ADMIN. OF CUSTOMS PEOPLE’S REPUBLIC OF CHINA (Apr. 19, 2018), <https://perma.cc/62VS-DM7T>.

253. *See id.*

254. Adam Redling et al., *China Announces Import Ban on an Additional 32 Scrap Materials*, RECYCLING TODAY (Apr. 19, 2018) <https://perma.cc/9LU4-73BE>. Plastic from industrial sources is defined as ‘industrial waste and scrap of plastics (referring to the thermoplastic remnant materials, leftover materials, and inferior products produced in the manufacture of plastics and processing of plastic products. See Guānyú tiáozhēng gùtǐ fèiwù jìnkǒu guǎnlǐ mùlù de gōnggào (关于调整固体废物进口管理目录的公告) [Announcement on Adjusting the Catalogue for the Management of the Import of Solid Wastes] (Announced by the Chinese Ministry of Ecology and Environment, Announcement No. 6, Apr. 13, 2018, effective Apr. 13, 2018 ), CLI.4.313790(EN) (Lawinfochina), translated in THE MINISTRY OF ECOLOGY AND ENVIRONMENT, ANNOUNCEMENT ON ADJUSTMENT TO THE CATALOGUE FOR THE ADMINISTRATION OF IMPORT SOLID WASTE [hereinafter Announcement Adjusting Catalogue].

255. Announcement Adjusting Catalogue, *supra* note 252.

256. *China to End All Waste Imports on Jan 1*, PHYS ORG (Nov. 27, 2020), <https://perma.cc/BET7-S32G>; *See also*, Guānyú quánmiàn jìnzhǐ gùtǐ fèiwù jìnkǒu yǒuguān shìxìng de gōnggào (关于全面禁止固体废物进口有关事项的公告) (Announcement Regarding Matters Concerning Comprehensively Prohibiting the Import of Solid Waste) (Announced by Ministry of Ecology and Environment, the Ministry of Commerce, the National Development and Reform Commission and the General Administration of Customs, Announcement No. 53, Nov. 24, 2020, effective Jan 1, 2021) CLI.4.348198(EN) (Lawinfochina), translated in Oasis P&I Circular: China Implements the Complete Ban of Import of Solid Waste from 01 Jan 2021 (2014).

257. Zhōnghuá rénmín gònghéguó gùtǐ fèiwù wūrǎn huánjìng fángzhì fǎ (中华人民共和国固体废物污染环境防治法) [Law of the People’s Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Wastes], (promulgated by Standing Committee of the National

accepting or approving applications for import license of solid waste that can be used as raw materials under the category of restricted import.<sup>258</sup> The total ban is the culmination of the three-year journey to phase out the import of solid waste; China has closed the door to foreign rubbish.

### A. The Impacts of the Plastic Waste Import Ban

China's adjustment to its waste import policy is an integral part of its campaign for sustainable development and its move towards the establishment of a circular economy.<sup>259</sup> There are also significant political reasons for its increasingly tough stance on this matter.<sup>260</sup> In particular, the changes and the eventual ban on all imported waste coincide with China's attempts to exert more influence internationally, and it is difficult to conceive of a global superpower that would collect "foreign garbage from around the world."<sup>261</sup>

China's plastic import ban threw the global plastic waste trade into turmoil, forcing many countries to reconsider their approach to recycling.<sup>262</sup> The three-year phase-out acted as a catalyst for significant changes to waste management systems in the nations that relied on China as their plastic waste destination, such as Australia and the US.<sup>263</sup> The short-term impacts of the ban have been severe.<sup>264</sup> For example, after the waste import ban in the second half of the 2017, approximately 60 curbside waste collection programs were cancelled and waste drop-off sites were closed in the US.<sup>265</sup> Companies in the US had to resort to burning, storing, or landfilling recyclables.<sup>266</sup>

In Australia, the recycling market has collapsed as commodity prices for recyclable material have plummeted.<sup>267</sup> Recycling contractors around Australia

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People's Congress, adopted Oct. 30, 1995, effective Apr. 1, 1996; revised Dec. 29, 2004, effective Apr. 1, 2005; amended and effective June 29, 2013; amended and effective Apr. 24, 2015; amended and effective Nov. 7, 2016; revised Apr. 29, 2020, effective Sept. 1, 2020), art 115, CLL1.341902(EN) (Lawinfochina).

Art 115 is translated as: 'Whoever, in violation of the provisions of this law, imports solid waste into China shall be ordered by the customs to return the solid waste and shall be fined not less than CNY 500,000 but not more than CNY 5,000,000. The carrier and the importer shall be jointly and severally liable for the return and disposal of the solid waste mentioned in the preceding paragraph.' (translation provided by the website).

258. *Id.*

259. See Standaert, *supra* note 4.

260. See Cameron, *supra* note 249.

261. *Id.*

262. See Brooks et al., *supra* note 224, at 1.

263. See Cole Rosengren et al., *How recycling has changed in all 50 states*, WASTE DIVE, <https://perma.cc/JW38-PKKB> (Nov. 15, 2019); Jennifer Macklin, *China's recycling 'ban' throws Australia into a very messy waste crisis*, THE CONVERSATION, <https://perma.cc/S23L-ZPZW> (Apr. 26, 2018).

264. Rosengren et al., *supra* note 261.

265. *Id.*

266. Aria Bendix, *China is refusing to take 'foreign garbage' from the US, so these 6 cities are burning or throwing away your recycling*, BUS. INSIDER (May 28, 2019, 5:24 PM), <https://perma.cc/PY59-8F2U>.

267. Covington et al., *supra* note 248.

stockpiled or sent recyclable materials to landfill.<sup>268</sup> In the long term, however, the ban may have provided a much-needed shake-up of the local recycling industry and disrupted Australian reliance on export markets.<sup>269</sup> In general, China's closure to imported waste may provide an opportunity for wealthier, waste-exporting nations to redesign and expand recycling markets at home.<sup>270</sup> This may take time as reforms in this space require product design changes.<sup>271</sup> The import ban also works as an eye opener to the fact that the current methods of dealing with plastic waste are unsustainable.<sup>272</sup>

Moreover, the snowball effect of the ban resulted in other potential waste destinations adopting similar measures and restricting waste imports into their states.<sup>273</sup> The early days of Chinese National Sword Policy led to concerns that environmental and social problems from foreign waste seen in China would merely be relocated to other developing countries in Southeast Asia, such as Thailand, Malaysia, Indonesia and Vietnam.<sup>274</sup> Indeed, there was a rise in waste exports as some states responded to the Chinese import restrictions by shipping recyclables to these countries, and since 2017, Malaysia has become the top plastic waste importer.<sup>275</sup>

However, these countries have also begun implementing their own import restrictions.<sup>276</sup> The Malaysian government temporarily suspended scrap plastic import permits on July 23, 2018, and imposed stricter monitoring of permit holders.<sup>277</sup> The Vietnamese government also paused granting of new licenses for plastic waste imports on July 25, 2018, and tightened the existing regulations of the plastic waste imports.<sup>278</sup> In July 2018, the Thai government halted the issuance of new import permits for plastic waste.<sup>279</sup>

Ultimately, for China, the plastic waste import ban means that the country can no longer rely on imported plastic waste as a source of raw material for

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268. *Id.*

269. *Id.*

270. *Id.*

271. Laura Parker & Kennedy Elliott, *Plastic Recycling Is Broken. Here's How to Fix It*, NAT'L GEOGRAPHIC (June 20, 2018), <https://perma.cc/E649-5Q66>.

272. *Id.*

273. EUGÉNIE JOLTREAU, CTR FOR ENERGY & CLIMATE CHANGE, FIVE YEARS AFTER CHINA'S PLASTIC IMPORT BAN HAVE EUROPEANS TAKEN RESPONSIBILITY? 3 (2022).

274. See Zongguo Wen et al., *China's Plastic Import Ban Increases Prospects of Environmental Impact Mitigation of Plastic Waste Trade Flow Worldwide*, 12 NATURE COMM'NS 425, 428 (2021).

275. Joe Sandler Clarke & Emma Howard, *US Plastic Waste is Causing Environmental Problems at Home and Abroad*, UNEARTHED (Oct. 5, 2018), <https://perma.cc/RHL4-UX4R>; Hui Ling Chen et al., *The Plastic Waste Problem in Malaysia: Management, Recycling and Disposal of Local and Global Plastic Waste*, 3 NS APPLIED SCIS. 437, 437 (2021).

276. Hui Ling Chen et al., *supra* note 273, at 444.

277. *Id.*

278. Steve Toloken, *Vietnam, Malaysia Limit Plastic Scrap Imports*, PLASTICS NEWS (July 26, 2018, 2:00 AM), <https://perma.cc/H56K-L4KJ>; see also Decree Detailing a number of articles of the Law on Environmental Protection, Viet., 2021, translated in MINISTRY OF NAT. RES. & ENV'T, CIRCULAR (2018).

279. So Sasaki, *The Effects on Thailand of China's Import Restrictions on Waste: Measures and Challenges Related to the International Recycling of Waste Plastic and E-waste*, 23 J. OF MATERIAL CYCLES AND WASTE MGMT. 77, 79 (2021).

processing and manufacturing of plastic commodities.<sup>280</sup> It must seek an alternative source to make up for shortage of domestic resources.<sup>281</sup> There are generally three ways to address this shortage (1) use virgin plastics, (2) import half-finished products from other countries (recycled plastic pellets), and (3) use domestic waste plastics.<sup>282</sup> For example, in 2017, 86 percent of China's imported post-consumer PET bottles were recycled to produce recycled PET fibres.<sup>283</sup> It is not possible to compensate for the loss of imported PET bottles by relying on domestic recycling as China has already reached near maximum collection rates for its domestically generated post-consumer PET bottles.<sup>284</sup> In the absence of imported post-consumer PET bottles to recycle, China must increase the use of virgin materials.<sup>285</sup> For the most part, China uses the "dirty" method of coal to olefins to produce PET.<sup>286</sup>

There are benefits associated with the strict import restriction approach. The ban has allowed China to focus on its domestic plastic waste recycling, and since July 2017, the government has been busy with the construction of a domestic collection and recycling system.<sup>287</sup> "Since early 2019, more than 40 Chinese cities, including Shanghai, Guangzhou, Xi'an and Kunming have rolled out pilot waste sorting programs for recyclables and trash."<sup>288</sup> More central state-owned recycling enterprises, as well as listed companies, began to engage in domestic collection and recycling, and many were forced to transform their businesses by upgrading technology.<sup>289</sup> For instance, in September 2020, multinational chemical company Dow and Luhai, which is an integrated waste management company located in Xiamen, announced their collaboration to give plastics waste collected by Luhai a second life, thereby increasing the circularity of plastics in China.<sup>290</sup>

However, domestic recycled plastic is not enough to meet current needs, so Chinese plastics recycling companies have set up facilities outside the country, particularly in Southeast Asia, to import raw scrap material, process it and export finished recycled pellets to China.<sup>291</sup> These actions are in line with China's "The Belt and Road Initiative."<sup>292</sup> In just about two years, China has transformed itself from being the world's largest importer of scrap plastics to the largest importer of recycled plastic pellets.<sup>293</sup> A Chinese waste plastic recycling industry report estimated that

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280. Aya Yoshida, *China's Ban of Imported Recyclable Waste and its Impact on the Waste Plastic Recycling Industry in China and Taiwan*, 24 J. OF MATERIAL CYCLES AND WASTE MGMT. 73, 77 (2022).

281. *Id.* at 76.

282. *Id.* at 77.

283. Ren et al., *supra* note 54, at 2.

284. *Id.*

285. *Id.*

286. *See id.*

287. Yoshida, *supra* note 278, at 76.

288. Rebecca Kanthor, *After Limiting Imports, China Aims to Boost Domestic Plastic Recycling*, PLASTICS NEWS (Dec. 11, 2019, 11:43 AM), <https://perma.cc/WD8K-RBJD>.

289. Yoshida et al., *supra* note 278, at 76.

290. *Dow and Luhai announce partnership to increase the circularity of plastics in China*, PR NEWSWIRE (Sept. 25, 2020), <https://perma.cc/BP77-K2U9>.

291. *See* Brian Taylor, *Is China's Shift to Plastic Pellet Imports Gaining Steam?*, WASTE TODAY (July 8, 2018), <https://perma.cc/X3PS-ZHB2>.

292. Yoshida, *supra* note 278.

293. Taylor, *supra* note 289.

approximately 3 million tonnes of recycled pellets were imported to China in 2018.<sup>294</sup> In 2019, China opened a large-scale plastic waste recycling plant in eastern Kenya to process plastic bottles into pellets to be used to make synthetic fibres in China.<sup>295</sup> It appears that China, in a way, is outsourcing its environmental problems to other countries that are still willing to accept imported waste.<sup>296</sup> Furthermore, while recycling is very important in dealing with plastic pollution, it is not a solution to the environmental crisis created by the world's obsession with everything plastic.<sup>297</sup>

For the most part, the shortage of plastic material caused by the import ban will be met with virgin plastic. As discussed above, China is already significantly boosting its production. As sharp decline in imported waste plastics led to shortages in the domestic waste plastics market, "the average price of most waste plastics increased by 6–16 [percent] in 2018 as compared with 2017."<sup>298</sup> There is evidence that the consumption of virgin plastics in China is increasing because of the higher prices for recycled materials.<sup>299</sup>

Overall, the import ban has been correctly labelled a double-edged sword.<sup>300</sup> While it may push some countries, including China itself, to find more sustainable solutions to plastic waste and recycling problems, it may simply divert the plastic waste problem to other, often poorer countries.<sup>301</sup> Moreover, there is a possibility that the ban may result in higher reliance on virgin plastic production, which is essentially the core of the problem.<sup>302</sup>

## CONCLUSION

China is the world's largest plastic producer, accounting for nearly one third of global plastics production. It is rapidly expanding its plastic production capacity to meet its growing demands. At the same time, China has developed a serious plastic pollution problem, caused by a combination of its own consumption of plastic, especially of single-use plastic items, including shopping bags, food containers and plastic mulch. Its undeveloped municipal solid waste management schemes that have resulted in poor collection and recycling levels. Importing foreign plastic waste as a source of plastic feedstock exacerbated the problem, as large quantities of the imported waste were of poor quality, or contaminated and were subsequently mismanaged instead of being recycled. By 2015, China became one of the largest plastic polluters in the world.

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294. Yoshida, *supra* note 278.

295. Lucie Morangi, *Chinese Company Invests in Kenya's Recycling*, CHINA DAILY, <https://perma.cc/WE8U-4LYF> (Apr. 9, 2019).

296. *See id.*

297. Press Release, Hellen Kahaso Dena, Greenpeace Africa's Communication and Story Manager, *Recycling is not enough to solve the plastic crisis: Greenpeace* (Aug. 30, 2020).

298. Yoshida, *supra* note 278, at 78.

299. *Id.*

300. Samantha Peone, *China's double-edged sword and its effects on Spokane recycling*, J. OF BUS. (May 10, 2018), <https://perma.cc/6RB5-3NPQ>.

301. *See id.*

302. Yoshida, *supra* note 278, at 78.

However, environmental concerns, including plastic pollution, have gained considerable attention in China over the past decade. There has also been a rise in civil society's level of concern over plastics and plastic pollution in China, which has had an important impact despite the command-and-control nature common to China's regulatory approach. The desire to remain competitive on the international market by creating a cleaner and 'greener' image, as well as the need to become more resource efficient, resulted in several important regulatory developments regarding plastic waste in the past fifteen years. Thus, in 2011, the circular economy concept was given a status of a national development strategy. Over the past 10 years, China has imposed a strict ban on imported waste, refusing to be the world's dumping ground, and has restricted the production and use of a wide range of disposable plastic items, such as cutlery and bags.

China's recent efforts in combating plastic pollution appear to be significant and far reaching. Its regulatory approach does, however, give rise to several new challenges. While banning single use plastic items is an effective measure to reduce unnecessary waste, this measure also drives the growth of the degradable plastic industry, as degradable single-use plastic items are specifically exempt from the ban. Degradable plastic, both oxo-degradable and biodegradable, and its classification are still poorly regulated in China. Without better classification, environmentally damaging oxo-degradable plastic can be presented to consumers as biodegradable. Moreover, even biodegradable plastics can have negative impacts for environment and food security if its production chain is not properly regulated.

The plastic waste import ban has had a number of positive outcomes, such as forcing countries that relied on China as their plastic trash destination to invest in and develop their own recycling industry. However, it also cut off an important source of plastic feedstock for China. The shortage of plastic feedstock cannot be resolved through China's domestic recycled plastic alone. China, therefore, now invests in recycling plants in other developing states that still accept imported plastic waste and imports recycled pellets. Further, it is likely that the shortage of feedstock will increasingly be met with virgin plastic.

However, the main concern is that these recent regulatory changes in China may detract attention from the core problem: the perpetually increasing amount of plastic entering the supply chain, by focusing on downstream consumption and waste. Framing the plastic pollution issue as a waste problem is not helpful as it precludes a more holistic approach to the solution. Plastic pollution requires consideration of the entire life cycle of plastics, from production, through consumption and to waste.<sup>303</sup> If the focus of the solutions remains on waste, or on certain types of plastic waste, i.e., disposable plastic items such as plastic cutlery or shopping bags, then plastic producers may feel free to keep increasing the total supply of plastic entering the system—as is happening in China.<sup>304</sup> While China increases its efforts to combat plastic waste, its plastic industry is preparing to increase its production of virgin plastic polymers made out of oil, gas and coal feedstocks.

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303. Tobias Nielsen et al., *Politics and the Plastic Crisis: A Review Throughout the Plastic Life Cycle*, 9 WIRE'S ENERGY AND ENV'T 1, 13 (2019).

304. *Id.*

This emphasis on waste reduction and downstream solutions serves some of the main stakeholders: the fossil fuel industry in general, and oil and gas companies in particular, specifically, their petrochemical divisions. More attention should be directed to these actors and to their investment and production decisions, especially since there is a growing consensus that one of the main solutions is setting global limits for virgin plastic production.<sup>305</sup> Unfortunately, China's actions point towards the opposite direction. While the circular economy is now a national policy, polymer producers headquartered in China are not making much progress towards circularity.

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305. See Stephanie B. Borrelle et al., *Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution*, 369 SCI. 1515, 1515 (2020).