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# China's regulatory respond to plastic pollution: Trends and trajectories

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Despite China having an international reputation as one of the largest contributors to plastic pollution in the world's oceans, research analyzing China's regulatory approach to governing plastic has been limited and fragmented, and as such, little is known about trends and trajectories dominating China's plastic policy landscape. In this paper, we seek to address this gap in the literature through the construction and analysis of a complete inventory of China plastic-related policies from 1 January 2000 to 30 June 2021. Utilizing NVIVO (a qualitative analysis software), our analysis of 231 Chinese plastic policy documents shows that China's serious and concentrated effort to governing plastics really took off in the year 2016. From 2016, China saw a rapid increase in the attention paid to plastic pollution in the regulatory realm. In 2000, there were only four plastic-pertinent policies, but by the first half of 2021, this number has grown to 41, representing an increase of 925%. In this period, China has also significantly transformed its approach to governing plastics; not only has the goal and purpose of regulating plastic increased in complexity, but the type of plastics targeted and the different aspects of the plastic value chain included in various policies have become increasingly comprehensive over time. Concurrently, the deployment of different types of regulatory instruments utilized for the purpose of governing plastics in China has become much more diversified, with a major focus on prohibitive bans and information campaigns currently dominating Chinese plastic policy instruments. Economic policy instruments, on the other hand, especially economic incentives, have only recently been gaining popularity. Finally, today, most government agencies have published policies that are relevant to the regulation of plastic pollution control and prevention in China. Despite the massive increase in plastic pertinent policies in China, the predominant focus is still on back-end policy, with little regulatory attention on the upstream part of the plastic lifecycle (i.e., prodigious production of plastics). China's fairly recent plastic policy awakening should be understood in light of China's focus on the circular economy, the county's ramping up of regulatory focus, and fiscal investment in solid waste management and pertinent

infrastructure. Towards the end of the paper, we point to some possible trajectories for the China plastic policy landscape, highlighting the synergies between reducing plastic production, consumption, and waste treatment and China's carbon neutrality ambition, as well as predicting a stronger policy focus and emphasis on plastic cleanup efforts.

#### KEYWORDS

**China, plastic, policy instrument, plastic policy, plastic pollution management, regulatory framework and governance, policy design, policy trend analysis**

## 1 Introduction

China is now the world's largest plastic producer. In 2021 alone, China produced 80.1 million tons of plastic (NBS, 2022), and whereas estimates vary<sup>1</sup> with regard to China's impact of plastic pollution on the world's oceans, it is clear that China plays an important role in addressing the global plastic pollution challenge. Despite earning an international reputation as one of the biggest contributors to global plastic pollution (Chen et al., 2019), China has undertaken serious efforts in the last two decades to address plastic pollution through, among others, ramping up and strengthening its regulatory frameworks with an ambition to significantly reduce leakage of plastic into the environment (Wang and Li, 2021). Some of these policies, such as China's ban on imports of plastic waste in 2017<sup>2</sup>, are well-known to the international community for their remarkable impacts on global plastic trade flow (Brooks et al., 2018; Wang

et al., 2019), but many of the plastic-related regulations and policies that have been developed on subnational levels in China in recent years are less well known. The Chinese legal and policy ecosystem is complex, and it is not within the scope of this paper to detail the structure of this system in detail. However, to support the reader in fully understanding the analysis presented in this paper, it is pivotal to explain some of the central features of how Chinese laws and policies are enacted and amended. It is the National People's Congress (NPC)<sup>3</sup> and its Standing Committee<sup>4</sup> that exercise the legislative power of the Chinese state. They enact and amend basic laws governing criminal offenses, civil affairs, state organs, and other matters (Gasper, 1982; Backer, 2012; Zhang, 2017). The NPC Standing Committee enacts and amends laws when the NPC is not in session, as long as such enactments or amendments are not in contradiction to the basic principles of such laws (Yan, 2013). The State Council formulates administrative regulations in accordance with the Constitution and laws and, upon

1 For example, Jambeck et al. (2015) estimated that 76% of all of China's waste had been mismanaged in the year 2010, which resulted in over 8 million tons of mismanaged plastic every year, of which between 1 and 3 million tons of plastic has been estimated to be released into the global oceans from China. In a paper published in 2020, Law et al. (2020) put China's mismanagement rate at 25% (for the year 2016) and the annual mismanaged plastic in China at about 1 million tons. In 2020, Li et al. calculated the mismanaged waste percentage for Chinese cities to range between 1% and 3.9% in 2017, whereas the estimated proportion was 12.8% and 27% for towns and rural townships, respectively. Li et al. therefore concluded that the annual mismanaged waste entering ocean from China to be between 0.257 and 0.353 million tons (in 2020).

2 In July, *Notice of the General Office of the State Council on Issuing the Implementation Plan for Prohibiting the Entry of Foreign Garbage and Advancing the Reform of the Solid Waste Import Administration System* (official English translation, "禁止洋垃圾入境推进固体废物进口管理制度改革实施方案" in Chinese) was approved and issued by the state council, which would stop the import of 24 kinds of solid waste from foreign countries, including plastics, textiles, paper products, etc.

3 The NPC is the highest organ of State power in China. It is composed of NPC deputies who are elected from 35 electoral units according to the law. These units include people's congresses of provinces, autonomous regions, municipalities directly under the central government, the servicemen's congress of the People's Liberation Army, the deputy election council of the Hong Kong Special Administrative Region, the deputy election council of the Macao Special Administrative Region, and the Taiwan compatriots' consultation election council. Each congress is elected for a term of 5 years.

4 The NPC Standing Committee is composed of a chairperson, several vice-chairpersons, the secretary general, and other members. They are all elected by the NPC from its deputies for a 5-year term, the same as the NPC term. The NPC Standing Committee normally meets once every 2 months. It may hold interim meetings when there is a special need. The NPC Standing Committee is responsible to the NPC and reports on its activities to it. The NPC has the power to alter or annul inappropriate decisions made by the Standing Committee and to remove its members from office.

authorization by the NPC, enacts provisional rules and regulations on economic system reform and opening-up policy (Yi-chong and Weller, 2016). Below the national government are local governments at the provincial, prefectural, county, township, and village levels. Here, the legal and policymaking infrastructure resembles that of the national level, with the local parties, governments, and people's congresses playing analogous roles (Xia, 1997). Subnational laws and policies can be developed by relevant state organs given that they are not in violation of related national-level policies (Li, 2010; Zhong, 2003). In addition, it should be noted that China retains many features of a command economy. One of the most prominent is the government's reliance on 5-year plans<sup>5</sup> and pertinent action plans to guide policymaking and measure the effectiveness of implementation (Hu, 2013).

In the last two decades, there have been several developments pertaining to China's approach to governing plastic within this complex ecosystem of state organs issuing laws and policies. Yet today, the Chinese landscape of plastic-related policies and regulatory developments remains uncharted territory. This might be due to the fact that research investigating China's plastic policies remains at an early stage. A handful of studies portray policies focusing on plastic packaging (Wei and Dong, 2008), disposable foam plastic tableware (Dong, 2009), the import of plastic waste, the ban on nondegradable single-use plastic straws (Xu et al., 2021), and tax policy for plastic pollution control (Xu et al., 2021). Certain studies go more in-depth in the analysis of a specific plastic policy; for example, Wei and Dong (2008) provide an analysis of plastic-related policies and pertinent developments with regard to the implementation of a quality safety licensing system for plastic packaging for food. Some studies have attempted to assess the effectiveness of various plastic bans or restriction orders, pointing to certain deficiencies in the policy design that led to ineffective implementation of such bans (at the early stages of the plastic bans in the mid-2000s) (Wang et al., 2019). One study, which investigated the usage of plastic bags in China after 2020 (Wang and Li, 2021), discovered several unintended impacts of the pricing policy and pointed to several gaps and loopholes in the design and the implementation of plastic-banning-related policies. One group of researchers assessing China's plastic bag policy (O'Loughlin, 2010) has highlighted that a plastic bag recycling program and the mainstream uptake within the general public of using environmentally friendly products is still underdeveloped in China. Other studies have found that policies banning plastic bags have led to a 49% reduction in the

use of new plastic bags (He, 2012). However, the study finds that the regulatory effects of such plastic bag-banning policies differ broadly among consumer groups, regions, and shopping occasions. A study looking into promoting plastic pollution control through tax policy (GPTS, 2021) discovered that China's current laws and regulations related to plastic pollution governance are mostly administrative directives and that fiscal and tax policies have not yet become an important tool to restrict the production and use of plastic products. Jiang et al. (2020) have focused on assessing plastic stocks and flows in China from 1978 to 2017 and argues that material and waste management policies have been found to have a positive impact on improving recycling on a generic level, and although plastic policies *per se* was not an explicit focus of this particular study, it can be deduced that such policies have also had a positive impact on plastic waste management (Li, 2020).

Our current knowledge about China's approach to regulating plastics is therefore informed only by studies that take a narrow focus on examining policies targeting specific plastic products. Studies which comprehensively analyze the trends and trajectories of Chinese plastic policies on a national and subnational level are virtually nonexistent. This paper seeks to address some of the current gaps in the literature and subsequent general understanding of China's approach to regulating plastics through a regulatory and policy framework by asking and answering the following research questions:

1. What regulatory approach has China adopted to address plastic pollution since the year 2000? Which policies, regulating which type of plastic and at which stage of the plastic value chain, have been issued at what levels (national, provincial, city) by which agencies since the year 2000?
2. Which types of regulatory instruments have Chinese policymakers utilized to regulate which types of plastics since the year 2000? Which entities are targeted in such policies?
3. What trends and trajectories can be derived from the analysis of Chinese plastic-pertinent policies since the year 2000?

In this paper, we present a comprehensive mapping and analysis of 231 Chinese policy documents pertaining to the whole value chain of plastic production, consumption, and waste management. Based on NVIVO and textual analysis, this paper provides a comprehensive and in-depth analysis of various trends and trajectories pertaining to China's approach to managing plastics over the last 20 years. In the next section, we will introduce the methodology upon which the analysis presented in this paper is based. In the following section, we will present the main findings and analysis of the study. This will be followed by a discussion section and a concluding section.

<sup>5</sup> The Five-Year Plan, full name: the "Outline of the Five-Year Plan for National Economic and Social Development of the People's Republic of China," is an important part of China's national economic plan. It is mainly created to set goals and directions for the long-term development of the national economy, culture, environment, etc.

## 2 Methodology and conceptual framework

This study draws on previous research conducted by [Diana et al. \(2022\)](#) and [Karasik et al. \(2020\)](#) mapping the global regulatory landscape of plastic policies and nation-state approaches to governing plastic.

In order to identify and characterize the public policy instruments various government agencies (such as the Ministry of Ecology and Environment and their subnational counterparts) have used to regulate plastic pollution in China, and in order to answer the research questions stated above, we undertook several analytical steps to screen the relevant policies, while concurrently building a conceptual framework for analysis of the regulatory documents included in the study. The study was guided by two overarching steps, each with several subcomponents:

1. The construction of a noncomprehensive China Plastics Policy Inventory through a screening process; and
2. Analysis of the content of the policy documents in the inventory to identify and characterize trends and trajectories of the identified policy instruments.

In the following section, we explain these steps. More detailed information about the methodology can be found in the appendices labeled “Detailed description of data cleaning” and “Complete codebook.”

### 2.1 The construction of a noncomprehensive inventory of Chinese plastic policies

As with the methodological approach taken by [Diana et al. \(2022\)](#) and [Karasik et al. \(2020\)](#) in their study on the global plastics policy inventory and effectiveness review<sup>6</sup>, we started this research process with the compilation of original Chinese public policy documents, defined here as official documents that include public-facing laws, statutes, ordinances, and management plans written and adopted by government entities, demonstrating an intent to reduce plastic pollution at various stages of the life cycle of plastics. We did not include other government documents such as judicial interpretation, monitoring reports, typical cases of trials<sup>7</sup>, replies to administrative permit applications<sup>8</sup>, or research papers. Given that, at the time of conducting this research, there was no (publicly

available) comprehensive database of Chinese policies addressing plastic pollution, we had to start from scratch with the creation of a Chinese plastic policy inventory (hereinafter referred to as “the Inventory”). Only policies issued by mainland China government agencies have been included in the Inventory and the study.

The researchers utilized PKULaw (<https://pkulaw.com>) to search for relevant regulatory documents. PKULaw is considered to be one of the most comprehensive, professional, and authoritative law and policy databases in China, including nearly comprehensive coverage of laws and regulations from modern China (1949–present) promulgated by Chinese central and local governments.<sup>9</sup> In order to build the Inventory, we confined the search for documents to be included based on a list of keywords. As a complementary to the work undertaken by [Karasik et al. \(2020\)](#) and [Diana et al. \(2022\)](#) on the global plastic policy landscape, we used a new set of keywords as used by these scholars in their relevant scholarly work. For the purpose of this study, we added four new keywords in the search including plasticizer, polyethylene terephthalate<sup>10</sup>, polyester, and fiber, as shown in [Table 1](#). These keywords were added based on consultations with several relevant Chinese scholars and practitioners. The search was conducted using Chinese, the official written language in China, in order to capture as many details as possible in the original language (as only a limited number of policies were available in English).

Once we had decided on the list of keywords, we started to search for the relevant law and policy documents. In order to assure the most comprehensive results, we searched all the keywords independently *via* full-text search in the PKULaw database, rather than conducting searches with combined texts (e.g., plastic AND tire). The first screening result yielded approximately 20,000 policy documents, which were included in the original pool of policy

<sup>6</sup> Chinese policies are included in the global inventory developed by [Diana et al. \(2022\)](#) and [Karasik et al. \(2020\)](#) but are limited to national-level policies, which have been issued also in English (in addition to Chinese). This study does not capture the complexities of the Chinese regulatory landscape.

<sup>7</sup> Different levels of courts in China irregularly publish several cases of trials on the same subjects (such as damaging environmental resources, judicial protection of intellectual property rights, protection of juveniles, etc.), which are typical and have a strong demonstration significance, as a collective file.

<sup>8</sup> Different levels of the Chinese government publish some replies to **administrative permit** applications for multiple issues, such as the constructional detailed planning of the land reconstruction project of a factory, renaming a branch of a state bank, etc.

<sup>9</sup> The PKULaw database also includes secondary legal information such as white papers, law journal articles, legal news, and more, but these materials were not utilized for the purpose of this study.

<sup>10</sup> Plastics are sometimes abbreviated in English, e.g., PET, PP, and PVC. In China, both Chinese full-names and English abbreviations may be used based on different contexts. In Chinese policies, such specific types of plastic are not usually listed, rather the generic term ‘plastic’ is utilized, with specific types of plastics or polymers referred to in policy appendices.

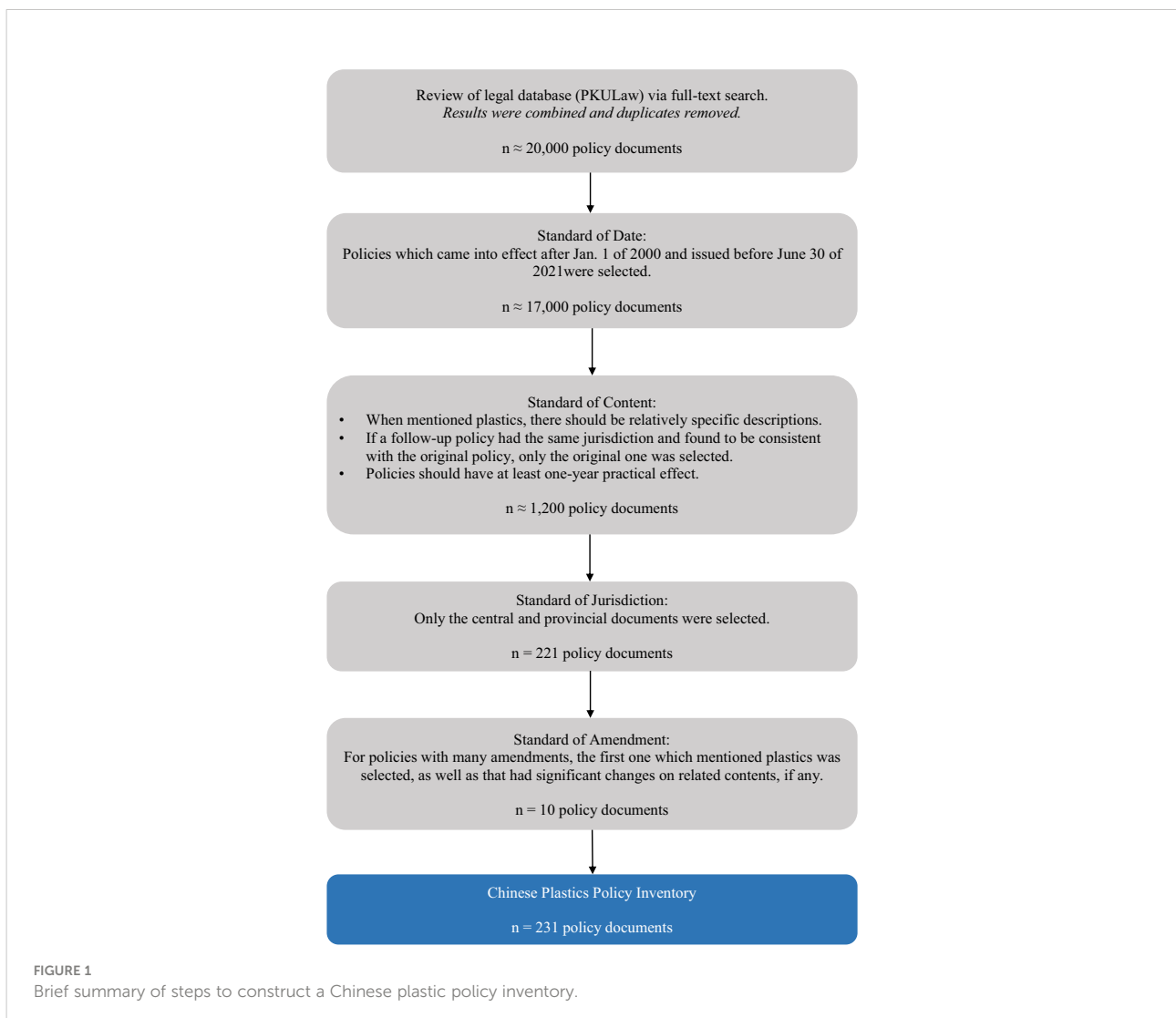
TABLE 1 Keywords used to search for relevant public policy documents.

| English  | Chinese  |
|--|--|
| Cigarette waste, marine debris, marine litter, microplastic, microfiber, nurdle, nylon, plastic, polyethylene, polymethyl methacrylate, polypropylene, polystyrene, polyvinyl chloride, shopping bag, styrofoam, synthetic disposable, tire, tyre, beach clean-up, coast clean-up, river clean-up, recycle, polymer, bioplastic, oxodegradable, <b>plasticizer, polyethylene terephthalate, polyester, fiber</b> | 烟蒂, 海洋废弃物, 海洋垃圾, 微塑料, 微纤维, 树脂颗粒, 尼龙, 塑料, 聚乙烯, 聚甲基丙烯酸甲酯, 聚丙烯, 聚苯乙烯, 聚氯乙烯, 购物袋, 泡沫塑料, 一次性用品, 轮胎, 车胎, 净滩, 河流清理, 可回收, 聚合物, 生物塑料, 可降解, <b>增塑剂, 聚对苯二甲酸乙酯, 涤纶, 纤维</b> |

documents entering the screening process. We then embarked on a screening process following the steps outlined below, and in the end, we decided on a total number of 231 policy documents, which were included, full text, in the Inventory utilized for the purpose of the study (see [Supplementary Material](#) “China plastics policy inventory” for more details). The process of going from the original result of 20,000 policy documents, which included one of the keywords listed above, to the selection of the 231 core policy documents analyzed in this study is described in more detail in [Figure 1](#).

For more details on the whole process of screening the policy documents, please see the [Supplementary Material](#) “Detailed description of data cleaning.”

We acknowledge that there are methodological caveats in our study which may well bias our interpretation of the plastic-related policies of China. First, this study only accounts for regulatory documents in the period between 1 January 2000 and 30 June 2021. Policies issued before or after this time period are not accounted for. We are confident that this does influence our results, given the limited focus on plastic within the Chinese policy domain prior to the year



2000. Some relevant policies have been implemented in the period between the analysis of the Inventory and the writing of this paper. For instance, a *Notice by the National Development and Reform Commission and the Ministry of Ecology and Environment for the “14th Five-Year Plan” Action Plan for Plastic Pollution Control* issued on 8 September 2021, *Notice by the State Council of the Action Plan for Carbon Dioxide Peaking Before 2030* issued on 24 October 2021, and *Notice by the General Office of the State Council for New Pollutant Control Action Plan* issued on 4 May 2022. Although these policies and action plans are not included in the Inventory, we refer to them in our discussion section towards the latter part of the paper. Second, as the Inventory utilized for the purpose of the analysis in this paper includes both national-level and subnational-level policies, the manner in which subnational-level policies are oftentimes a response to the issuance of a national-level policy might have some impacts on the trends and trajectories derived from the analysis. For example, after the policy document *Opinions on Further Strengthening the Control of Plastic Pollution*<sup>11</sup> was issued by the National Development and Reform Commission and Ministry of Ecology and Environment in January 2020, 19 provinces and province-level cities subsequently issued similar policies later in the same year. As a result, when several subnational policies are released on the same topic, it is possible that there might be some inaccuracies in our analysis of pertinent trends and trajectories due to duplicated or variant policies. Moreover, our study does not address questions related to the effect or impact of the enacted laws and policies. Whereas we acknowledge that laws and policies on paper do not necessarily lead to changes on the ground, it is not within the scope of this study to examine the policy effectiveness of China’s approach to regulating plastics.

## 2.2 From law and policy inventory to analysis

After law and policy documents were used to compile the Inventory, a methodology for analyzing these documents was devised. A codebook, drawing on the approach utilized by [Diana et al. \(2022\)](#) and [Karasik et al. \(2020\)](#), was adopted for the purpose of this study, which contains four “attribute” types (including “jurisdiction,” “policy efficacy,” “effective date,” and “the main purpose of policy”) and four sets of “nodes” (including “plastic targeted,” “stage of the plastic life cycle targeted,” “types of policy instrument,” and “publishing agency”). Details pertaining to the codebook can be found in “Complete codebook” and will not be introduced in detail here. We used NVIVO—a qualitative analysis software—for textual analysis of the documents included in the

<sup>11</sup> Translated by authors, “关于进一步加强塑料污染治理的意见” in Chinese. This policy was announced in January, 2020 by the Chinese National Development and Reform Commission and the Ministry of Ecology and Environment.

Inventory. All 231 policy documents were input into NVIVO in full text in Mandarin. The coding and analysis were also conducted in Mandarin to ensure the most accurate analytical results. The results presented in the following section were subsequently translated back into English.

## 3 Results

### 3.1 The development of Chinese plastic policies: From calm waters in the early 2000s to a tidal wave of policies starting from 2016

In the early 2000s and before that, China was still at an initial stage with regard to the governance of plastic pollution. From 2000 to 2007 (effective dates of the policies), there were only 13 policies adopted that referenced plastic issues, most of which only mentioned plastics in a very generic manner, and which were included in other environmentally relevant regulatory frameworks, for example, the *Atmospheric Pollution Prevention and Control Law*, *Marine Environment Protection Law*, and *Regulations on Environmental Protection*. China’s more explicit focus on regulating the consumption and use of plastic started in 2007 with very specific and targeted bans on certain plastic products namely a *Notice from the general office of the State Council on restricting the production, sale, and use of plastic shopping bags*<sup>12</sup>. A couple of months later (1 June 2008), the production, sale, and use of plastic bags with a thickness of less than 0.025 mm were banned in China. At the same time, a fee<sup>13</sup> for purchasing shopping bags was introduced. Specific provisions were made in the following years, on the production, sales, and use of plastic bags in order to take effective measures from the source, urging enterprises to produce durable and easy-to-recycle plastic shopping bags, while guiding and encouraging the general public to use plastic bags rationally, with the overarching goal of building a resource-saving and environment-friendly society.<sup>14</sup> However, the impact of

<sup>12</sup> Translated by authors, “国务院办公厅关于限制生产销售使用塑料购物袋的通知” in Chinese.

<sup>13</sup> The price of paid plastic bags is between 0.1 and 0.3 CNY.

<sup>14</sup> Typical examples include the *Announcement on the inclusion of ultra-thin plastic shopping bags in the list of eliminated industries* (translated by authors, “国家发展和改革委员会公告2008年第33号——关于将超薄塑料购物袋列入淘汰类产业目录的公告” in Chinese, effective in 2008), *Administrative Measures for the Paid Use of Plastic Bags at Commodity Retailing Places* (official English translation, “商品零售场所塑料购物袋有偿使用管理办法” in Chinese, effective in 2008), and *Notice on Deepening the Implementation of Restrictions on Production, Sales, and Use of Plastic Shopping Bags* (translated by authors, “国家发展和改革委员会、教育部、工业和信息化部等关于深化限制生产销售使用塑料购物袋实施工作的通知” in Chinese, effective in 2013).

these bans was limited, and for about 10 years, the focus on plastic pollution prevention and mitigation in China was put in the shadow of China's war on air pollution and the very early stages of solid waste management, which developed slowly until around 2019 (Guo et al., 2021).

The year 2016 marked a watershed movement in the development of Chinese plastic policies. This tidal wave of plastic-related policies most likely occurred as a response to the 13th Five-Year Plan (2016–2020), which laid the foundation for an unprecedented high level of ambition with regard to improving China's ecological and environmental quality by 2020 (Wan et al., 2022). As exemplified in one of the key policies issued during this period, the *Circular of the State Council on Printing and Distributing the 13th Five-Year Plan for the Protection of Ecological Environment*:

“The overall objective is to improve the environmental quality by 2020. This includes specified targets of promoting green life and production, advancing low-carbon development, notably bringing down the total discharge of major pollutants, effectively controlling environmental risks, reversing biodiversity loss, striving for a more stable ecosystem, building ecological- security shields, achieving significant strides in modernizing national environmental governance system and capacity, and of bringing ecological civilization more aligned with the goal of achieving a moderately prosperous society in all aspects.”<sup>15</sup>

To meet these targets, a number of policies have been issued in the domains of air, water, and soil pollution and their prevention, energy efficiency, etc. Concurrently, and for the first time, the number of new national-level policies addressing plastic issues promulgated within a single year reached 15, as illustrated in Figure 2A.

2020 is another critical year in China's plastic regulation history, marking the beginning of a new stage and approach concentrating explicitly on the governance of specific plastic types such as disposable plastic products, express packaging, and fertilizer packages, as well as specific stages of the plastic life cycle, including the use, collection, recycling, and reuse of various plastics. The policy document *Opinions on Further Strengthening the Control of Plastic Pollution*<sup>16</sup>, well-known as the new “plastic

ban,”<sup>17</sup> could be considered to be one of the most important policies issued in 2020. Many provinces and province-level cities subsequently issued similar policies later in that year, and a record high of 39 plastic policies were issued in 2020.

In the first half of the year 2021, when the 14th Five-Year Plan started, the total number of newly issued policies pertaining to plastic remained high, with 41 in total. A comparison between the 13th and the 14th Five-Year Plan shows that many more provinces and province-level cities mentioned plastics in their 14th Five-Year Plan, from 0 to 13. Overall, the total number of related policies has increased from 4 in 2000 (1-year data) to 231 by June 2021 (20.5-year data), which represents an increase of 5,675%. Central and provincial policies over the past two decades increased respectively from 3 to 97 and from 1 to 134 (Figure 2B).

## 3.2 Regulating plastics in China: From a single-issue ban on plastic bags to a comprehensive regulatory system governing the whole life cycle of plastics

### 3.2.1 The purpose of plastic policies is increasingly complex

One of the characteristics we utilized when analyzing the 231 policy documents in our Inventory was the “main purpose of the policy.” This attribute of the policies has been applied in the process of identifying the goal of the different plastic policies issued by various Chinese authorities. Based on the analysis of our Inventory, we identified five overarching policy/legal goals and 12 relevant subgoals. For each policy, we have only accounted for one subgoal, as such subgoals relate to the “main” purpose of the legal document or policy. For more details about examples and the complete classification, please see the [Supplementary Material](#) “Complete codebook.”

Among all the identified major goals, “plastics management and treatment,” “comprehensive plan or regulation,” and “specific ecosystem conservation” account for the top three, with a proportion of 36.8%, 26.4%, and 20.8%, respectively. Narrowing down the level of policies' goals, “ban or limit plastics (mainly bags and macroplastics)” is the most popular subpurpose among the policies issued (20.8%), followed by “development of ecological civilization (specific)” (18.2%) and “water protection (ocean, river, lake, and wetland)” (12.1%) (Figure 3).

15 *Circular of the State Council on Printing and Distributing the 13th Five-Year Plan for the Protection of Ecological Environment* (official English translation, “国务院关于印发‘十三五’生态环境保护规划的通知” in Chinese) issued in 2016.

16 Translated by authors, “关于进一步加强塑料污染治理的意见” in Chinese. It was announced in January, 2020 by the Chinese National Development and Reform Commission and Ministry of Ecology and Environment.

17 The old “plastic ban” generally refers to *Notice of the General Office of State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags* (translated by authors, “国务院办公厅关于限制生产销售使用塑料购物袋的通知” in Chinese) issued in 2007, which first proposed that ultra-thin plastic bags would be banned nationwide and plastic bags would be paid for use. It should be pointed out that the name plastic ban here, whether the old or new, was given by the masses and is commonly used in unofficial scenarios such as media reports, daily chats, etc.

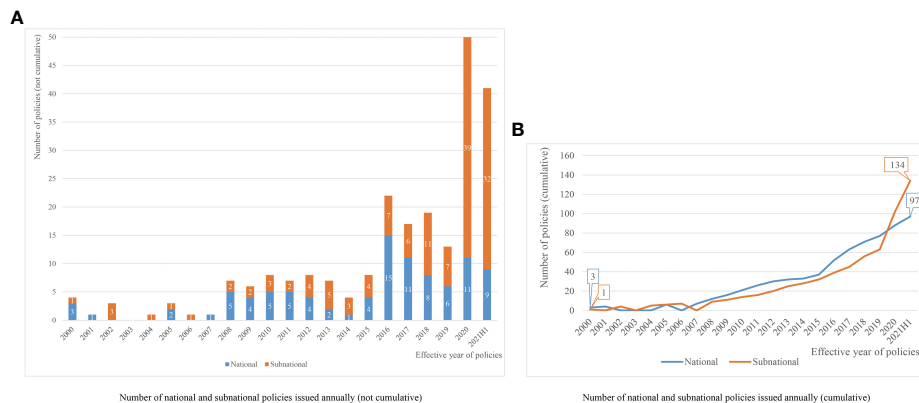


FIGURE 2

Trends in the number of Chinese plastic-pertinent policies. (A) Number of national and subnational policies issued annually (not cumulative). (B) Number of national and subnational policies issued annually (cumulative).

Considering the main goals of national policies only, policies issued on “plastics management and treatment” and “economic transformation and development” increased in fluctuation in the analyzed time period (Figure 4).

When taking subpurposes into account for all the policies, it is evident that a number of new purposes emerged around the year 2010, including “energy saving and emission reduction” (2008), “industrial or investment structure adjustment” (2009), “source collection and recycling” (2009), “body health” (2010), “deepening reform and opening-up (multiple aspects)” (2013), and “green transformation” (2013)<sup>18</sup>, which has increased the diversity of policy types (Figure 5).

After 2016, the first watershed year for Chinese plastic-pertinent policies, the subpurposes of policies mainly concentrated on the following four issues: “ban or limit plastics (mainly bags and macroplastics),” “development of ecological civilization (specific),” “waters protection (ocean, river, lake, and wetland),” and “deepening reform and opening-up (multiple aspects).” They correspond to concrete plastics, macroscopic planning, ecological conservation, and economic development, respectively.

<sup>18</sup> Most of the subpurposes are self-explanatory, whereas we may need to specify two here: “body health” means “to protect human health, usually including policies about the safety of food and drinking water, as well as control of smoking,” and “industrial or investment structure adjustment” means “to accelerate structural adjustment and promote industrial upgrading.” For the whole definition of all the subpurposes, please see the “Complete codebook.”

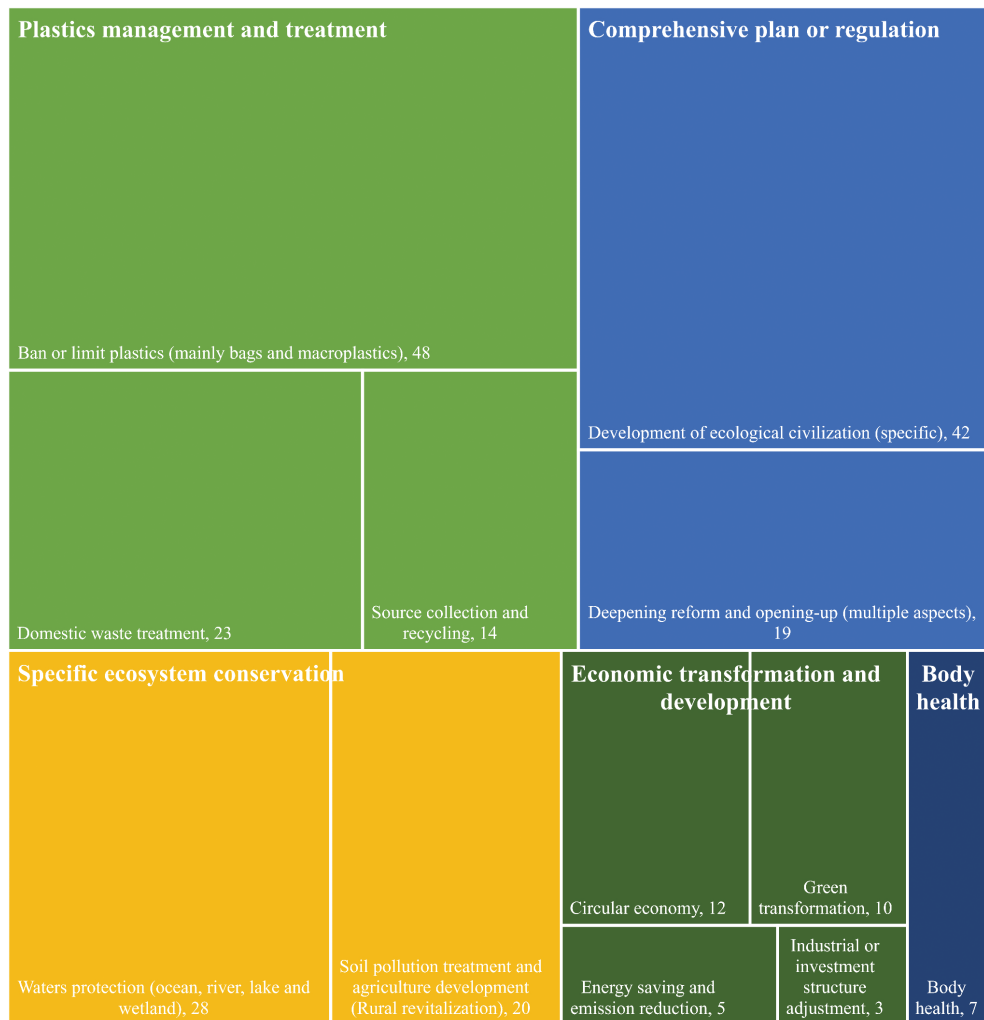
### 3.2.2 The plastic types targeted are increasingly becoming more complex

During 2000–2021, macroplastics and general waste (referred to as the category “all (general)” in the codebook) were the most frequently referenced plastic types targeted in Chinese policies, both occurring in over half of the 231 policies in our Inventory, followed by agricultural mulch (44.2%), bags (31.6%), and pesticide packages<sup>19</sup> (19.5%) as shown in (Figure 6), indicating a stronger focus on challenges pertaining to managing plastic waste in the agricultural sector and in rural areas in the later years.

As shown in Figure 7, microplastics, agricultural mulch, and pesticide packages are policy targets that have increased rapidly as items of interest for Chinese policymakers, among which microplastics is a fairly new plastic issue to be regulated in China. “Microplastics” first occurred in three government documents in 2016; two responded to the Notification of the

<sup>19</sup> Farmers are a large part of the Chinese population, and plastic pollution in the agricultural sector remains a challenge in the Chinese context. As such, many policies have been designed to address “issues concerning agriculture, countryside, and farmers.” In plastic-pertinent policies, in particular, “agricultural mulch” and “pesticide packages” are mentioned frequently. Given the extensive utilization of such plastic products, it makes logical sense to single these plastic items out as separate categories to be regulated. In China, pesticide packages can be hard plastic bottles (containing liquid or solid pesticides) or large and thick plastic bags (containing solid pesticides or fertilizers). Current Chinese policies do not distinguish pesticide packages in a comprehensive and overarching consistent manner, but they are treated somewhat differently in different policies.





**FIGURE 3**  
Number of policies issued on five major goals and 12 sub-purposes.

Marine Industry Standard System Revision, and one was related to the Notice of a disease research project application.<sup>20</sup>

<sup>20</sup> The first two are *Notice of the State Oceanic Administration on Organizing the Application for the Project Establishment of the 2016 Marine National Standard and Industry Standard Formulation and Revision Plan* (translated by authors, “国家海洋局关于组织申报2016年度海洋国家标准和行业标准制修订计划项目立项的通知” in Chinese) and *Notice of the State Oceanic Administration on the issuance of 49 marine industry standard formulation and revision plans including the 2016 “Technical Regulations for Monitoring and Early Warning of Marine Resources and Environment Carrying Capacity”* (translated by authors, “国家海洋局关于下达2016年度《海洋资源环境承载力监测预警技术规程》等49项海洋行业标准制修订计划项目的通知” in Chinese), and the latter is *Notice of the Ministry of Science and Technology on Issuing the 2016 Project Application Guidelines for the*

However, these notifications do not fall under the scope of documents included in this study, and as a result, the first detection we found for microplastics in our Inventory occurred in 2017. From 2017 to the first half of 2021, the number of policies referencing microplastics increased from 1 (2017) to a total of 29 (30 June 2021), most of which are provincial-level policies issued in 2020.

From the top to the bottom in [Figure 8](#), the absolute quantity of policies corresponding to each exact subpurpose goes from

*National Key Research and Development Program - 2016 Annual Project Application Guidelines for Key Projects such as Major Chronic Non-communicable Disease Prevention and Control Research* (translated by authors, “科技部关于发布国家重点研发计划重大慢性非传染性疾病防控研究等重点专项2016年度项目申报指南的通知” in Chinese).

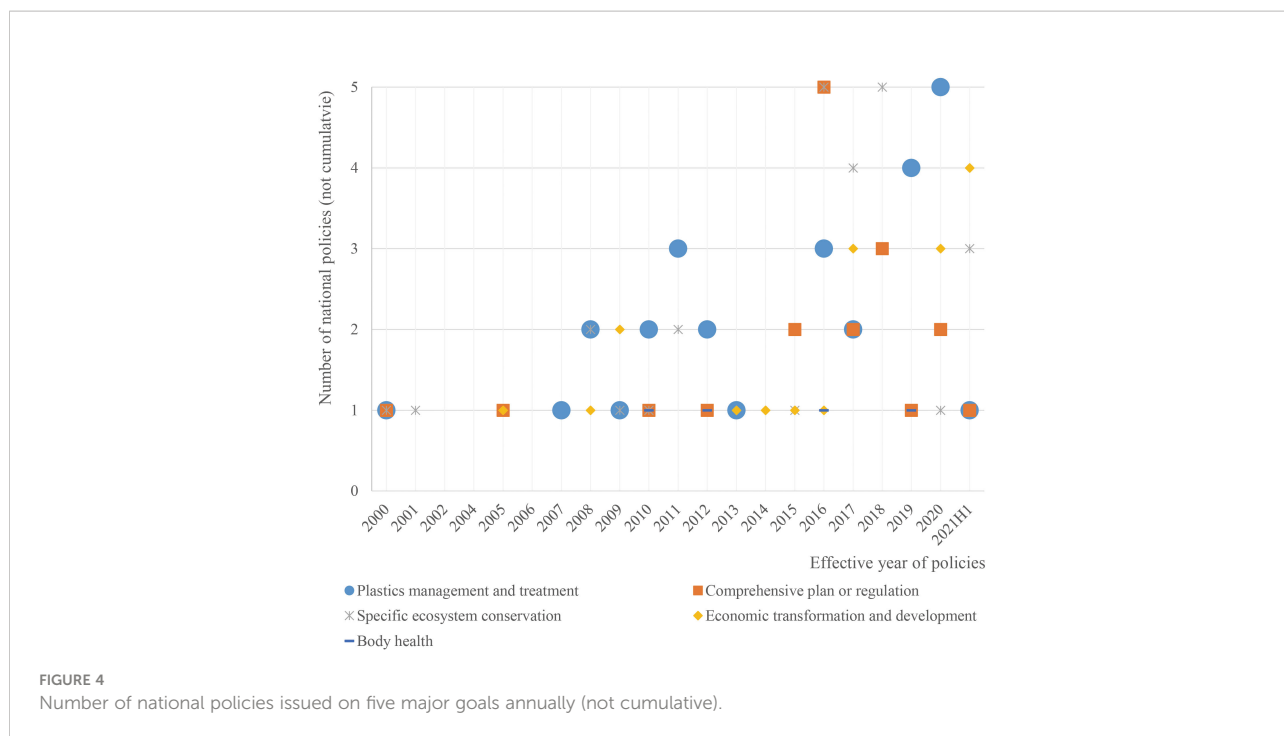


FIGURE 4 Number of national policies issued on five major goals annually (not cumulative).

high to low<sup>21</sup>. This chart indicates a strong correlation between the plastic targeted and the policies’ subpurposes: policies on plastic ban or limit are relatively specific to plastic types such as bags, macroplastics, microplastics, agricultural mulch, and pesticide packages, accounting for over 90% of all the policies on “ban or limit plastics.” General waste was most frequently mentioned in policies where the objective of the policy was to manage domestic waste (45.5%); marine sources, as a category of plastic analyzed in our study, play an important role (30.4%) in policies issued with the goal of protecting water, as do agricultural mulch and pesticide packages (74.2%) for policies issued in relation to “soil pollution treatment and agricultural development.” An emphasis on agricultural plastic types by “circular economy” policies is also clear; agricultural mulch and pesticide packages account for 1/3 of all mentioned plastic targeted, which indicates the importance of agricultural issues within the Chinese circular economy.

### 3.2.3 The stages of the plastic value chain targeted are increasingly becoming more complex

China’s plastic-pertinent policies have mainly focused on the following stages of the plastic life cycle: “collection” occurred in 72.7% of the policies, followed by “recycling” in 61.9%, “use” in

55.8%, “production” in 42.0%, “sales” in 39.4%, “disposal” in 34.6%, etc. (Figure 9).

Looking at the trend of stages of the plastic life cycle targeted from the temporal perspective (Figure 10), the proportion of front-end phases (including production, import, and selling) showed a fluctuating downward trend in recent years, whereas that of back-end phases (including collection, recycling, and reuse) has experienced exactly the opposite development, with an increase in policies issued for the purpose of managing plastic waste.

When taking five major goals of policies into consideration, as shown in Figure 11<sup>22</sup>, the stage of disposal was mentioned most frequently (20.2%) in policies issued on “specific ecosystem conservation,” compared to the same stage in other policies. Moreover, policies on economic transformation and development focus more on plastics’ reuse than others, with a percentage of 15.5%.

### 3.3 Chinese authorities utilize all the tools in the regulatory instrument toolbox to regulate plastics

In our analysis of the regulatory approaches utilized by Chinese policymakers, we investigated three overarching types of policy

21 For reference, since one policy that has only one subpurpose may mention multiple plastic targeted in the content, the total number of each bar in this figure might be higher than that of policies on the subpurpose itself.

22 For reference, as one policy that has only one major goal may mention multiple stages of the plastic life cycle targeted, the total number of each column in this figure might be higher than that of policies on the main goal itself.

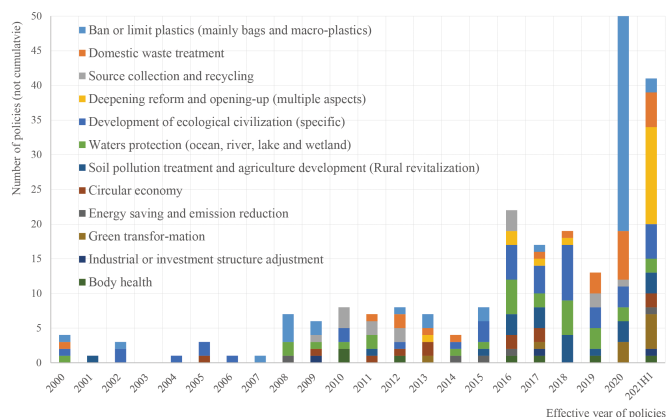


FIGURE 5  
Number of policies issued on 12 sub-purposes annually (not cumulative).

instruments: regulation, economic tools, and information. Among the 231 policies in the Inventory, 98.3% mentioned the use of at least one type of policy instrument. In total, 95.7% have used regulation as a policy tool; information has been utilized in 74.0% of the policies; and economic instruments have been incorporated in 45.0% of the policies in the Inventory.

As shown in Figure 12A, among the 221 policies utilizing regulation as a policy instrument, “responsible handling of plastic” is the most used instrument (77.4%) to achieve affirmative regulation, while “limit plastic” is the most frequently utilized for the purpose of prohibitive regulation (48.9%). For 104 policies with economic instruments, 83.7% referred to incentives<sup>23</sup>, while 41.3% utilized disincentives, including fees, tax, levy, and duty. Such economic disincentives can be applied under several circumstances in pertinent Chinese plastic policies. For example, a fee can be added to the use of plastic bags a fee can be charged for waste

disposal for urban residents, a higher tax rate for the heavier-polluted industry, and a fee for irresponsible handling of plastics. Out of the 171 policies utilizing information tools as a policy instrument, 80.7% focused on environmental education or outreach to the public<sup>24</sup>, 69.0% of them focused on the utilization of research data collection to promote sustainable waste management<sup>25</sup>, and 33.9% of them mentioned the usage of labels, placards, or notices with pertinent environmental information.

When looking at these instruments over time (Figure 12B), we can see a similar tendency among all instruments except the “Economic - Disincentive”; from 2018 to 2021, the number of policies using this policy tool has kept increasing, from 1 to 13 (not cumulative). This indicates that Chinese policymakers have decided to ramp up efforts to regulate plastics through stronger economic disincentives.

Among the study’s policy instruments, we noticed three interesting trends. First, “Non-government investment (encouragement)” as a category of policy instrument first

23 Here are some typical examples for different economic incentives: “Cash or token for return”: In the *Procedures of Shanghai Municipality on the Administration of Renewable Resource Recovery* (official English translation, “上海市再生资源回收管理办法” in Chinese), city and county authorities should guide relevant enterprises to launch trade-in and bonus-point activities to promote recycling resources. “Subsidy”: In the *Regulations of Guangdong Province on the Management of Urban and Rural Domestic Waste* (translated by authors, “广东省城乡生活垃圾管理条例” in Chinese), the waste disposal treatment fee can be raised with governmental subsidies. “Tax break”: In the *Regulations of Hainan Special Economic Zone on Prohibiting Disposable Non-degradable Plastic Products* (translated by authors, “海南经济特区禁止一次性不可降解塑料制品规定” in Chinese), a tax break can be applied to companies that produce substitutes for disposable nondegradable plastic products and recycle disposable plastic products.

24 Many Chinese policies involve public participation in the form of public education and outreach. For example, in the *Law of the People’s Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes* (official English translation, “中华人民共和国固体废物污染环境防治法” in Chinese), it is suggested that national authorities educate the public to participate in solid waste pollution prevention and guide consumers to use green packages.

25 A typical example of research data collection is in the *Law of the People’s Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes* (official English translation, “中华人民共和国固体废物污染环境防治法” in Chinese), in which waste disposal treatment entities are required to monitor and publish the real-time pollution data.

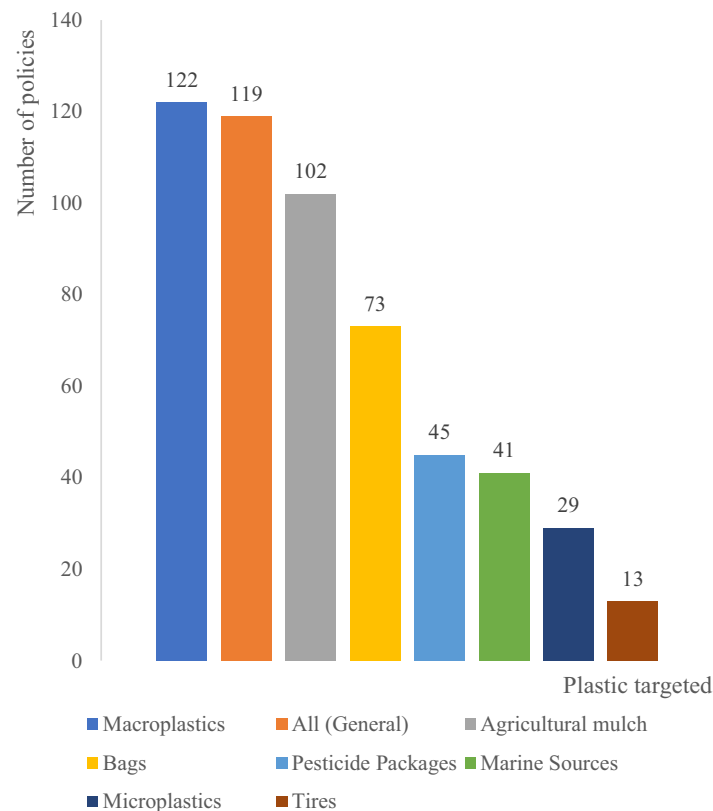


FIGURE 6  
Number of policies that contained different plastic types.

occurred in *Measures for Comprehensive Utilization of Renewable Resources in Gansu Province*<sup>26</sup> issued in 2010, encouraging units and individuals to invest in the construction of renewable resource utilization projects with high technology content and advanced technology, representing Chinese government's will to involve more actors in the overarching plastic governance process. Second, "Cash or Token for Return" as a policy instrument was first utilized in *Opinions of the General Office of the State Council on Establishing a Complete and Advanced Recycling System for Waste and Used Commodities*<sup>27</sup> issued in 2011. This policy document is the first document we have identified which focuses on the establishment of automatic paid recycling machines as one of several flexible and diverse recycling methods, along with deposit recycling and trade-in, which indicates the emergence

of a new incentive-type policymakers used to reduce (plastic) waste. Third, the instrument "post-leakage plastic capture," as a policy instrument, was not used before 2012 when it first appeared in the *Notice of the State Oceanic Administration on Printing and Distributing the National Island Protection Plan*,<sup>28</sup> which is the first policy document that mentions carrying out marine litter clean-up. This instrument increased rapidly after the year 2018. From 2012 to the first half year of 2021, the number of policies that used "post-leakage plastic capture" as an affirmative regulation tool increased from 1 to 39 (cumulative).

### 3.4 A complex system of government agencies involved in governing plastics

In order to examine and capture trends and trajectories pertaining to the state agencies involved in the issuance of plastic

26 Translated by authors, "甘肃省再生资源回收综合利用办法" in Chinese.

27 Official English translation, "国务院办公厅关于建立完整的先进的废旧商品回收体系的意见" in Chinese.

28 Translated by authors, "国家海洋局关于印发全国海岛保护规划的通知" in Chinese.

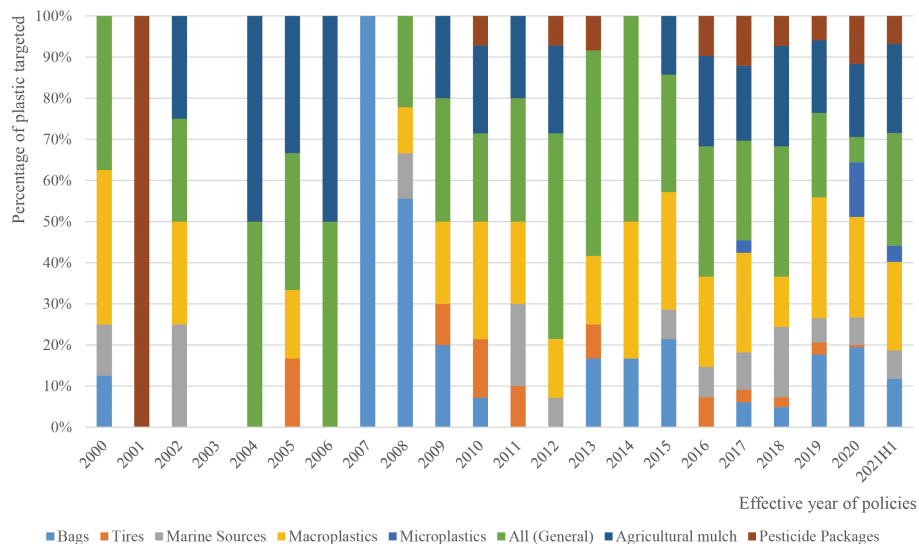


FIGURE 7  
Proportion of plastic targeted contained in Chinese plastic-pertinent policies annually.

policies, we classify Chinese policymakers into five types: “Party-masses body,” “People’s Congress,” “Governmental body,” “Deliberation and Coordination Agencies (Temporary Small Groups),” and “Social organizations with a governmental background.” There are 1 to 24 subagencies under each type. For the full classification, please see the “Complete codebook.”

In China, a policy document may be published by more than one agency. Among all the 375 publishing agencies of the 231 policies, governmental bodies appeared most frequently with a percentage of 75.5 (Figure 13A). Thereinto, the top five are “Central and Provincial Government” ( $n = 72$ ), “Development and Reform Commission” ( $n = 45$ ), “Ecology and Environment (previously Environmental Protection)” ( $n = 42$ ), “Commerce” ( $n = 21$ ), and “Agriculture and Rural Affairs (previously Agriculture, Agriculture Commission)” ( $n = 16$ ).

As shown in Figure 13B, from 2000 to the first half of 2021, the number of policies published by the People’s Congress has increased steadily, while policies published by different governmental agencies have experienced a remarkable growth. Policies following *Opinions on Further Strengthening the Control of Plastic Pollution*<sup>29</sup> in 2020 and the 14th Five-Year Plan in 2021 led to the peak in 2020 and 2021.

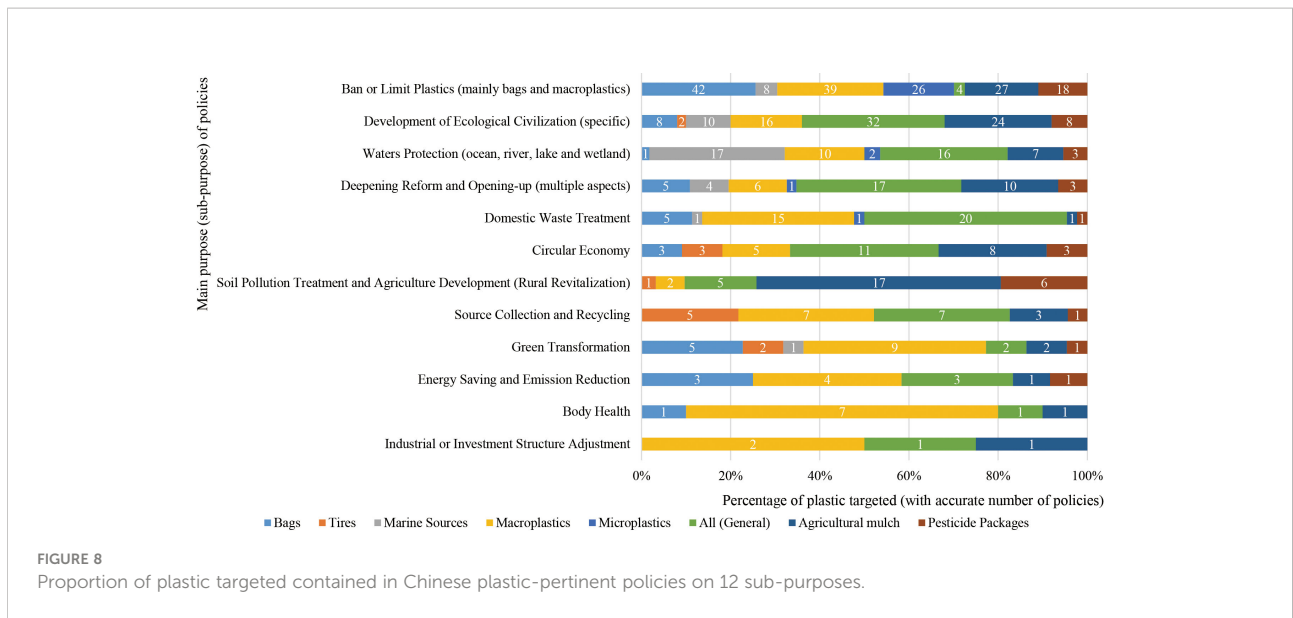
<sup>29</sup> Translated by authors, “关于进一步加强塑料污染治理的意见” in Chinese. This policy was announced by the Chinese National Development and Reform Commission and the Ministry of Ecology and Environment.

## 4 Trends, trajectories, and the possible future for China’s plastic policy landscape

### 4.1 China’s plastic policy landscape has mushroomed in all aspects in the last decade

Our analysis of 231 plastic-related Chinese policies reveals several clear trends and trajectories, illuminating China’s shifting approach to governing plastics in the last two decades. Here, we summarize these trends and trajectories and, based on our analysis, point to some possible future advances in China’s plastic regulatory landscape.

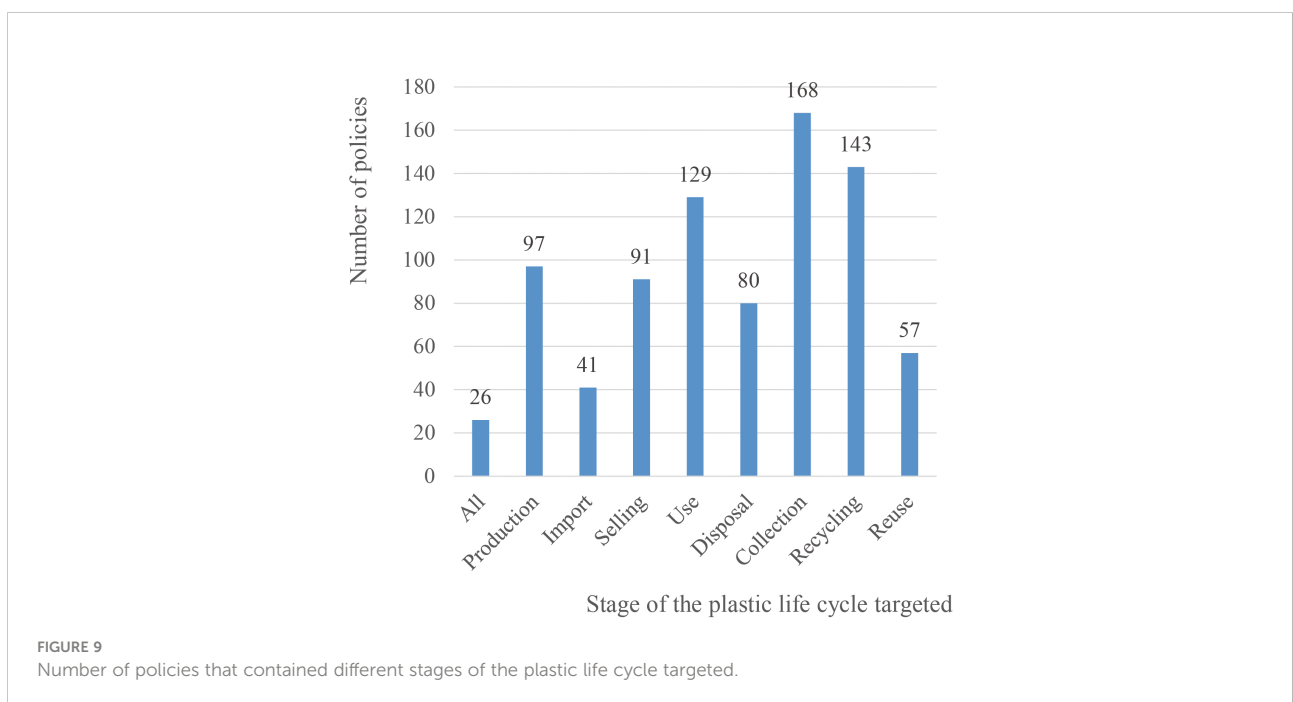
China’s serious and concentrated effort to govern plastics really took off in the year 2016. Prior to 2016, plastic regulations were relatively scarce and fragmented in a number of different regulatory frameworks. In the time leading up to 2016, a particular focus was put on regulating the usage of various types of plastic bags. Starting with the 13th Five-Year Plan, China saw a rapid increase in the attention paid to plastic pollution in the regulatory realm. This focus has been further strengthened in the 14th Five-Year Plan. From 2000 to the first half of 2021 (effective date), the total number of Chinese plastic-pertinent policies has increased from 4 to 231. In this period, China has also significantly transformed its approach to governing plastics; not only has the goal and purpose of

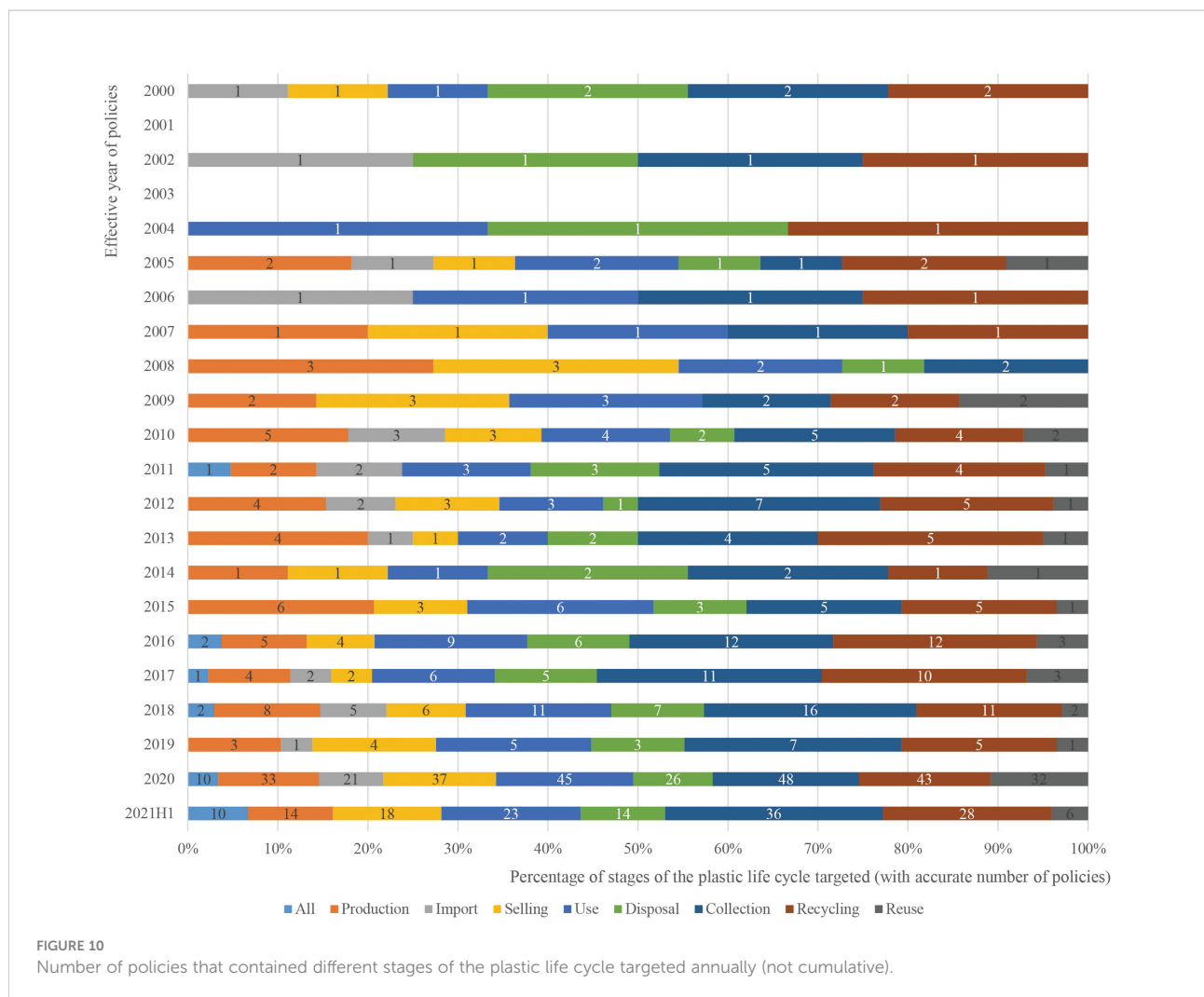


regulating plastic increased in complexity, but the type of plastics targeted and the different aspects of the plastic value chain have also become more comprehensive over time. In a similar fashion, the utilization of different types of regulatory instruments employed for the purpose of governing plastics in China has become much more diversified over time, and finally, today, most government agencies have published policies that are relevant to the regulation of plastic pollution control and

prevention in China. Today, governing plastic is certainly not seen as the responsibility of the Chinese environmental authorities alone.

Over two decades of addressing plastic pollution, China has yet to develop a regulatory framework that addresses the upstream parts of the plastic lifecycle, namely the production of plastic products and the involvement of the extractive resources industry and chemical companies in such processes.





Like many other countries in the world, China is focusing its regulatory attention on plastic treatment on the symptoms of the problem (e.g., cleanup, recycling, etc.), not the source (i.e., prodigious production of plastics) (Owens and Conlon, 2021).

China’s efforts to address plastic pollution take place within the broader context of tackling solid waste pollution, upgrading city planning, and installing a “circular economy.” Long before China started to seriously regulate plastic production, consumption, and waste management, the *Circular Economy Promotion Law of the People’s Republic of China* came into force<sup>30</sup>. In line with the basic principles of the circular economy law, China now clearly intends to build a circular plastic value chain, and as such, new plastic pollution restrictions have set up

a life-cycle regulatory regime, covering all aspects of production, consumption, and treatment<sup>31</sup>.

30 Official English translation, “中华人民共和国循环经济促进法” in Chinese. It was issued on 1 January 2009, and revised on 26 October 2018.

31 Examples include but are not limited to *Opinions of the General Office of the State Council on Establishing a Complete and Advanced Recycling System for Waste and Used Commodities* (official English translation, “国务院办公厅关于建立完整的先进的废旧商品回收体系的意见” in Chinese, effective in 2011), *Provisions on the Administration of Prevention and Control of Environmental Pollution by Processing and Utilization of Waste Plastics* (official English translation, “废塑料加工利用污染防治管理规定” in Chinese, effective in 2012), *Notice of the National Development and Reform Commission, the Ministry of Education, the Ministry of Industry and Information Technology, etc. on deepening the implementation of restrictions on production, sales, and use of plastic shopping bags* (translated by authors, “国家发展和改革委员会、教育部、工业和信息化部等关于深化限制生产销售使用塑料购物袋实施工作的通知” in Chinese, effective in 2013).

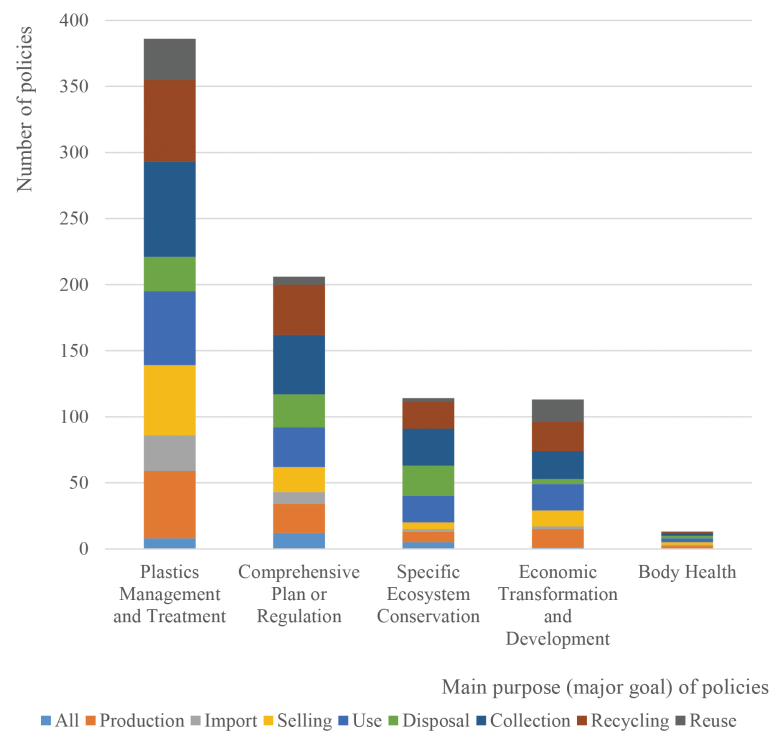


FIGURE 11

Number of policies issued on five major goals that contain different stages of the plastic life cycle targeted.

Alongside the importance of understanding China's approach to plastic pollution governance and management in light of the country's overarching focus on a circular economy, China's efforts to manage plastics should also be analyzed and understood in conjunction with the country's effort to overhaul the solid waste management regulatory framework and infrastructure. The *Law of the People's Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes*<sup>32</sup> (generally referred to as the Solid Waste Law) is the main body of legislation relevant to solid waste governance and pollution control. In December 2004, the Solid Waste Law was amended for the first time since its enactment in 1996, and subsequent amendments were made in 2013, 2015, 2016, and 2020. Plastic was not explicitly referenced prior to the 2020 amendment to this law, despite the fact that collected municipal solid waste consists of estimates varying between 25% plastic (Zhan et al., 2008) and 10%–20% plastic (Zhang et al., 2010), and despite the fact that plastic is one of the fastest growing waste

streams in China (Hoornweg and Bhada-Tata, 2012). Moreover, research indicates that the presence of heavy metals (Ba, Zn, Cu, Mn) was high in most plastic waste samples (Xu et al., 2020). Additionally, the detection of exceeded levels of various heavy metals (trespassing the threshold for national drinking water quality), including Mn, Pb, Ni, and Zn, which can be attributed to the release of chemical compounds stemming from plastic waste, has occasionally been found in samples of drinking water (Xu et al., 2020). Thus, researchers suggested that plastic waste should be managed in a controlled manner (Xu et al., 2020). The 2020 amendment of the Solid Waste Law has responded to some of these issues, as the law, for the first time, specifies plastic waste management<sup>33</sup> and control of plastic pollution, and clearly stipulates the pollution prevention and control of agricultural films, packaging materials, and disposable plastic products, while also clarifying the legal responsibility for relevant illegal acts. The 2020 amendment to the Solid Waste Law, therefore, in theory at least, provides a legal guarantee to control plastic pollution.

32 Official English translation, “中华人民共和国固体废物污染环境防治法” in Chinese.

33 Article 69 and 106 strengthened the relevant requirements for the prevention.



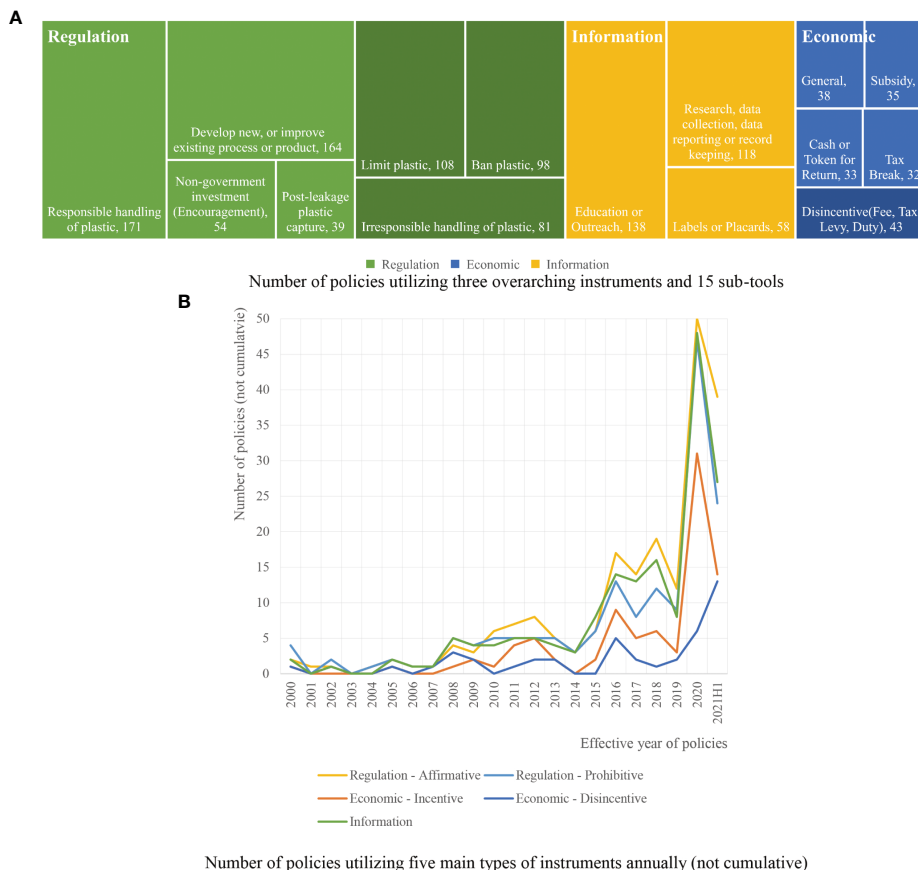


FIGURE 12

Chinese authorities have utilized multiple instruments to regulate plastics. (A) Number of policies utilizing three overarching instruments and 15 subtools. (B) Number of policies utilizing five main types of instruments annually (not cumulative).

## 4.2 What is next for China’s plastic policy developments?

China has already developed a strong regulatory framework to govern various aspects of plastic production, consumption, and waste management. What does the future hold for China’s plastic governance? Here, we ponder some possible developments. First, it is likely that China’s carbon neutrality ambitions will further strengthen the motivation for various Chinese stakeholders to adopt measures to reduce plastic production, consumption, and (mismanaged) waste.

According to the *Action Plan for Carbon Dioxide Peaking Before 2030*<sup>34</sup>, controlling and treating plastic pollution will be an important element in China’s road toward carbon neutrality. Recently, researchers and practitioners have been urging us to

pay closer attention to the links between plastic and climate, as plastic produces tremendous carbon emissions from the cradle to the grave at every stage (Zheng and Suh, 2019). Given that China’s plastic manufacturing operations are largely dependent on fossil fuels, carbon emissions from the production of plastics remain high, and the potential for carbon reduction in this sector is equally elevated. Whereas the direct links between plastics and carbon are not often explicitly expressed in Chinese policy documents, we find plenty of evidence of the implicit relationships. For example, the *Action Plan for Carbon Dioxide Peaking Before 2030* stresses the urgency of peaking carbon in the petrochemical and chemical industries, both of which are closely related to plastic production. The 14th *Five-Year Plan for Green Industrial Development*<sup>35</sup> also mentioned the need to support the development of the plastic recycling industry in

34 Official English translation, “2030年前碳达峰行动方案” in Chinese.

35 Translated by authors, “十四五工业绿色发展规划” in Chinese.

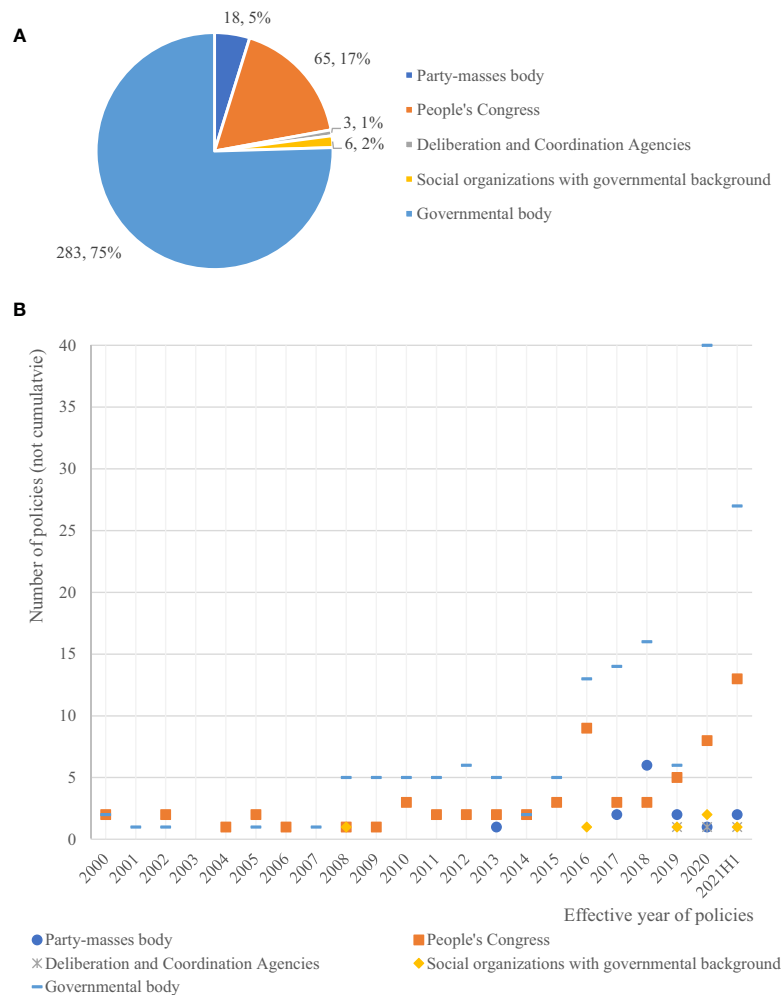


FIGURE 13

A complex system of government agencies involved in plastic governing. (A) Number and proportion of policies published by different agency types. (B) Number of policies published by different agency types annually (not cumulative).

China. This is important as, at present, much of the discarded plastics in China, especially low-value packaging materials, are mixed with household waste and end up in either landfills or incinerators (Wen et al., 2021). However, currently, other policy developments are not necessarily designed to address these challenges. The latest 14th *Five-Year Plan for Solid Waste Environmental Management of Hunan Province*<sup>36</sup> indicates that the percentage of incineration will increase to 65% in 2025 from the current level of 45%, adding additional carbon footprints as the burning of plastic emits 2.9 kg of CO<sub>2</sub> for every kg of plastic burned. To achieve its ambitious carbon neutrality

goal, China must therefore among others, address issues pertaining to treating end-of-life plastic through incinerators.

In the coming years, we will also likely see a focus on cleanups. Several action plans issued by the Chinese central government, such as the *Action Plan for Water Pollution Prevention and Control*<sup>37</sup> issued in 2015, the *Action Plan for Tackling Pollution in Agriculture and Rural Areas*<sup>38</sup> issued in 2018, and the *Action Plan of Bohai Sea comprehensive governance*<sup>39</sup> issued in 2018, have referenced the removal of

37 Translated by authors, “水污染防治行动计划” in Chinese.

38 Translated by authors, “农业农村污染治理攻坚战行动计划” in Chinese.

39 Translated by authors, “渤海综合治理攻坚战行动计划” in Chinese.

36 Translated by authors, “湖南省‘十四五’固体废物环境管理规划” in Chinese.

waste in a generic and marginal manner, with no explicit focus on plastic waste cleanup. This is about to change. In 2020, Fujian province issued the *Action Plan for Further Strengthening the Comprehensive Management of Floating Garbage in the Sea*<sup>40</sup>, which, to the best of our knowledge, is the first Chinese policy document explicitly developed for the purpose of comprehensively addressing marine waste cleanups, including, of course, plastic waste in the marine environment. In September 2021, another important policy document, the “14th Five-Year Plan” *Action Plan for Plastic Pollution Control* was issued, which highlights the importance of “vigorously carrying out the cleaning-up of plastic waste in key areas” as one of the three main tasks detailed in this Action Plan.<sup>41</sup> Moreover, this Action Plan also proposes that, by the year 2025, the historical legacy of open-air plastic waste in key water areas, key tourist attractions, and rural areas should be effectively removed. Furthermore, a goal for this Action Plan is to effectively control the leakage of plastic waste into the natural environment by 2025.<sup>42</sup> Alas, it is highly likely that a stronger regulatory focus will be placed on plastic cleanup initiatives in the years to come.

## 5 Conclusion

Despite earning an international reputation as one of the largest contributors to plastic pollution in the world’s oceans, research comprehensively examining the Chinese plastic policy landscape has been scarce, and much of the developments taking place within this policy terrain, particularly at the subnational level, have not been documented. We have sought to address some of the gaps in this field through a comprehensive analysis of an Inventory of the Chinese plastic policy documents. From our analysis, we find that policies explicitly managing and governing plastics are a fairly recent policy phenomenon in China, commencing in 2008. This changed rapidly in the period between 2016 and 2021, when there was an incredible increase in plastic policies. In this period, China has also significantly

transformed its approach to governing plastics. Not only has the goal and purpose of regulating plastic increased in complexity, but the type of plastics targeted and the different aspects of the plastic value chain included in various pertinent policies have also become more comprehensive over time. In a similar fashion, the utilization of different types of regulatory instruments utilized for the purpose of governing plastics in China has become much more diversified over time, and finally, today, most government agencies have published policies that are relevant to the regulation of plastic pollution control and prevention in China. Furthermore, we find that a diverse set of regulatory instruments have been utilized by Chinese policymakers in designing policies with the aim of regulating plastics. Our analysis also reflects an increased acknowledgment of the complexities of governing plastics, as such policies have evolved significantly in terms of the type of plastic governed by such policies and the stage of its life cycle targeted, as well as a more diversified utilization of more comprehensive regulatory instruments. Overall, our analysis of these policy documents indicates that plastic pollution has become a growing concern for the Chinese government at both national and subnational levels since early 2000, with a sharp increase since 2016. Today, China has a fairly well-established regulatory framework aimed at reducing plastic pollution through the overarching approach of circular economy, ramping up of solid waste management and infrastructure as well as an overhaul of city planning. However, this China’s plastic policy landscape focuses much on the end pipe solution, while a focus on addressing the production of plastics is limited. As a global leader in plastic production, China has a great deal of power in demonstrating effective strategies for solving the plastic problem. However, as long as China is focusing on back-end policies, this could potentially mean that the reduction of plastic production will be very limited. Moreover, this current approach to regulating plastics domestically in China could have implications for China’s position in the upcoming global plastic treaty negotiation process.

Whereas this study has provided important new insights pertaining to China’s approach to governing plastic, it has also laid the foundation to explore other relevant questions. First, and perhaps the most pressing question related to examining the impact of these policies, China has adopted several regulatory instruments to govern plastic, but how effective are these instruments in preventing and/or controlling plastic pollution? How do different stakeholders respond to these different instruments? Which variable factors can explain and account for the different effects of the regulatory instruments? Some scholarly progress has been made in addressing these questions (Diana et al., 2022; Global Plastic Policy Centre, 2022). However, little is known about effective enforcement and compliance with such policies in China and the variable factors that influence such processes. Our study and the creation of the inventory of China’s plastic policies have laid the foundation for future research undertakings seeking to examine the policy effectiveness of

40 Translated by authors, “进一步加强海漂垃圾综合治理行动方案” in Chinese.

41 The other two were “actively promoting the reduction of plastic production and use at source” and “accelerating the promotion of standardized recycling and disposal of plastic waste,” which all had targeted policies over the past two decades.

42 Notice by the National Development and Reform Commission and the Ministry of Ecology and Environment for the “14th Five-Year Plan” *Action Plan for Plastic Pollution Control* (translated by authors, “国家发展改革委、生态环境部关于印发‘十四五’塑料污染治理行动方案的通知” in Chinese). The texts of the goal are also translated by authors. This policy is not involved in this study, since we only accounted for policy documents in the period between 1 January 2000 and 30 June 2021.

China's regulatory response to the plastic pollution crisis. As our work has focused on analyzing the trend of policy issuances and the characteristics of these policies, we have not been able to focus on the enforcement and implementation of these policies. How are different state and nonstate actors involved in the processes leading up to the issuance of plastic policies? And what role do they play, once policies and regulations have been issued, in governing plastics in China? Second, whereas our research shows a sharp increase in national- and subnational-level policies published by a variety of different government agencies, we still do not know a lot about what motivates the issuance of plastic-related policies by these different actors. Why have some provinces taken a more proactive role in issuing plastic-related policies? Future research can build on this study when examining the drivers and motivations behind the promulgation of plastic-related policies at subnational levels in China. Third, and on a related note, our research shows that Chinese policymakers have had a strong focus on the utilization of information based on regulatory policy instruments and that there is still a strong emphasis on mandating the implementation of information campaigns and awareness-raising as a means to reduce plastic pollution reduction among the general public. However, we know little about the effect of such information campaigns, as we lack data on the general level of knowledge and awareness among the general public on issues related to plastic production, consumption, and waste management (and the impact and consequences of inadequate plastic waste management). There is also a need to critically examine the rationale behind the policies utilizing information as a regulatory instrument, as we know little about the actual impact on an increased level of awareness and/or knowledge about different problems related to plastic; do information campaigns lead to a higher level of knowledge, and do higher levels of knowledge lead to behavior change?

The process of establishing and analyzing our database of China's plastic policy landscape has provided new insights into China's regulatory approach to addressing plastic pollution. At the same time, we are left with a number of new and burning research questions that urgently need more attention from our collective scholarly community ahead of the global plastic treaty negotiation process.

## Data availability statement

The original contributions presented in the study are included in the article/[Supplementary Material](#). Further inquiries can be directed to the corresponding author.

## Author contributions

KF: conceptualization, methodology, writing—original draft, writing—review and editing, and funding acquisition. YF: methodology, investigation, writing—original draft, writing—

review and editing, data curation, and visualization. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2022.982546/full#supplementary-material>

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