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# Local Nuances of Authoritarian Environmentalism: A Legislative Study on Household Solid Waste Sorting in China

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**Abstract:** Faced with an unprecedented increase in the amount of solid waste, China aims to tighten its waste management regulation. Corresponding local policy experiments are encouraged. This study explores China's authoritarian environmentalism through an examination of local legislations on Household Solid Waste (HSW) sorting. We present a full picture of relevant local legislation from five key dimensions: local legislative outputs, local standards of HSW classifications, reward and penalty provisions, the use of the social credit system and duties imposed on local governments. We then compare policy-making models based on the experience of Shanghai and Guangzhou. We find China's HSW sorting policy has been dominated by the central state. The local lawmaking process is generally non-transparent and non-participative. When attempting to mobilize the public, local policymakers emphasize educating the public about "how to" instead of "why to sort wastes". Also, while the central waste management policies are generally undermined locally, some sub-national governments do demonstrate a strong commitment to push the national policy through. Multiple factors account for this pattern. Though civic engagement did emerge in certain localities where civil society was relatively active, authoritarian environmentalism will continue to prevail in China in the near future.

**Keywords:** local legislation; household solid waste; authoritarian environmentalism

## 1. Introduction

From July 1, 2019, every morning before heading to work, Shanghai citizens greet each other with a seemingly provoking question: "What kind of waste are you?" This question is aimed at the city's daily household solid waste (hereinafter, HSW) that, according to a new local decree implemented on 1 July, must be sorted into one of four color-coded bins: dry, wet, recyclable and hazardous [1]. This local decree, the Shanghai HSW Management Regulation enacted by Shanghai Municipal People's Congress, is reported to be the most stringent and complex waste segregation regulation in China. Non-compliance will result in fines between 50 and 200 yuan (US\$ 7–30) per breach for individuals and up to 50,000 yuan (US\$ 7300) per breach for businesses. To ensure enforcement, 18,100 inspections targeting HSW were conducted in the first month of the new decree and fines were issued in 872 cases, 74 of them on individuals [2].

Though Shanghai's stringent new decree has attracted massive national attention, waste management regulations are far from new in China. Along with population growth, urbanization and industrialization, the quantity of HSW generation has been rapidly increasing [3]. To combat the waste management challenge, it has been almost two decades since China initially launched its tentative

HSW sorting policy within eight cities in the early 2000s. This policy, however, was carried out poorly and failed to achieve its aim [4]. In the year of 2017, two billion tons of HSW was generated in 202 big or medium-sized cities of China [5]. To address rising mountains of domestic wastes, in March 2017, China issued a more ambitious national plan, requiring 46 pilot cities, including Shanghai, to pass local decrees or local rules to adopt mandatory waste classification by the end of 2020. The era of compulsory garbage sorting in China thus began.

Despite achieving some initial results [6], Shanghai's rigid sorting policy has attracted skepticism from the public. Many find it difficult to learn the sophisticated segregation guidelines. Indeed, it is not straightforward why chicken bones are officially classified as "wet" waste while pork bones are considered "dry". The unsupportive feedback from the public suggests that it remains doubtful whether the Shanghai residents are embracing waste sorting as a new lifestyle [7]. Some categorized Shanghai's practice as "authoritarian environmentalism", emphasizing the lack of public participation in the enactment [1].

Long before Shanghai's new legislation, the concept of authoritarian environmentalism has been associated with China's environmental policies [8]. In theory, authoritarian environmentalism is a descriptive model that describes a policy-making process that resolves environmental problems via a top-down governance model with limited public participation [9] (p. 276). China's strong state tradition, its policy to address environmental issues by elite management and its people's deference to the state has led scholars to conclude that China has taken a non-participatory approach in the environmental area [8]. In the current phase of political recentralization, although there have been some local experiments to allow more civic engagement in the area of environmental protection [8], some predicted that authoritarian environmentalism would further strengthen in China [10], which seemed to be evidenced by Shanghai's new legislation. Internationally, authoritarian environmentalism is practiced in different countries. Democratic South Korea and Singapore, for example, have adopted an authoritarian approach when forming environmental policies [11,12].

Opinions diverged as to the merits of authoritarian environmentalism. For some observers, an authoritarian regime is a promising solution to environmental degradation, since an authoritarian government is arguably better equipped to decisively enforce necessary but unpopular environmental policies [13] (p. 38); [14] (pp. 125–126); [9,15]. Some argued that Singapore's successful transition into a "garden country" has much to do with its non-participatory, elite-driven law-making model [12]. However, some countered that despite being effective in producing rapid-fire responses, non-participatory regimes often led to incoherent policies [8]. Many argued from the perspective of central–local relations that, under China's fragmented political system, the good intention of national environmental policy would be easily undermined by sub-national governments, which have prioritized economic over environmental goals [16].

Lately, scholars began to call for more attention to local nuances in the authoritarian environmentalism narrative. Some analyzed the air policies of Hangzhou, one of the main cities in eastern China and found that Hangzhou has made institutional innovations to support the national environmental goals, casting doubt on the rough division between "national level effective/local sabotage" [17]. In the context of pollution regulation enforcement, research showed that richer regions whose economic and environmental interests were less likely to be in conflict were more supportive of national environmental policy [18].

This study aims to assess the effects of authoritarian environmentalism through the lens of local legislations on HSW sorting in China. While prior researches have examined China's environmental governance under the framework of authoritarian environmentalism, they have several limitations. First, while literature has recognized the significance of local nuances, prior findings are usually based on data of particular localities. As China is a vast, highly diverse country, a comparative study of different localities would be important. Second, more attention shall be paid to the newly introduced compulsory waste sorting policy, which marks China's latest environmental initiatives. After all, as China used to be the world's biggest consumer of scrap material, China's policy to stimulate

domestic waste recycling may have international implications [19]. Third, when assessing the local implementation of environmental policy, the perspective of legislative activities is under-researched. Local law-making is an integral part of the national 2017 HSW sorting plan. During the last two decades, a significant number of local legislation about waste management has emerged in China. A close examination of this local legislation may provide insights into China's environmental governance. By analyzing local legislation on HSW sorting throughout China, we hope to update and further refine the understanding of China's environmental governance and its legal frameworks.

To address its research objectives, this study conducted a qualitative comparative case study based on existing local legislation on HSW sorting throughout China. We analyze 45 legal documents (one pilot city, Shigatse, has none) promulgated by the 46 pilot cities listed in China's national waste management plan of 2017, among which 14 are local decrees, 15 are local administrative rules and 16 are local governmental implementation plans (listed as Table A1 in Appendix A). The differences between those are explained in Section 2.1. In addition, we looked into 18 local decrees of non-pilot cities for a wider comparison. All the 63 legal documents were collected as of 31 January 2020. During the comparative case study, we paid close attention to the level of local legislative outputs (2.2.1), as it indicates whether sub-national authorities are actively implementing the national waste management policy through local legislations. To assess the impacts of the existing local legislation, we examined the local standards of waste classification (2.2.2) and local legal instruments to promote waste sorting (including reward and penalty provisions (2.2.3); the use of social credit system (2.2.4); and duties imposed on local governments (2.2.5)), as reasonable classification standards and efficient policy instruments are essential to ensure effective local implementation of HSW sorting policy.

Then we went on to compare local policy-making approaches. Here, we focused on the cases of Guangzhou and Shanghai as they demonstrated a highly diverse picture of local environmental policy-making in China. If we look at the spectrum of local waste management policy-making strategies in China, Shanghai represents the relatively most authoritarian model, while Guangzhou represents the opposite. By examining and contrasting these two cases, we can obtain useful insights into local nuances of authoritarian environmentalism in China.

The remainder of this paper is organized as follows. Section 2 examines local laws and regulations on HSW sorting in China. Section 3 compares local policy-making processes, based on the cases of Shanghai and Guangzhou. Section 4 describes our discussions and findings. This paper concludes in Section 5 with a summary of our findings.

## 2. Local Laws and Regulations on HSW Sorting: A Horizontal Comparison

### 2.1. The General Framework

HSW sorting has been placed on the agenda of China's national environmental policies since 2000, when the Ministry of Construction piloted the first sorting program in eight cities (thereafter, the 2000 Plan). Laws and regulations have been made to implement the national HSW sorting policy at both national and local levels.

Article 26 of the 1982 Constitution (Last amended in 2018) stipulates that the state shall protect and improve the environment in which people live and the ecological environment, as well as prevent and control pollution and other public hazards. As is shown in Table 1, the Environmental Protection Clause of the Constitution is backed by several relevant national laws, including the Environmental Protection Law, the Law on the Prevention and Control of Environment Pollution Caused by Solid Wastes and the Circular Economy Promotion Law, etc. These national laws together form a rudimentary legal framework for HSW management. Besides, the State Council and its departments have the power to make administrative regulations and rules for implementing national laws. Several national administrative regulations and rules promulgated by the State Council or its departments, such as Administrative Measures for Urban HSW, have provided a few general principles for HSW sorting.

**Table 1.** Laws, administrative regulations and rules pertinent to waste sorting in China.

Name	Effective Date	Level of Authority	Contents Pertinent to Waste Sorting
Environmental Protection Law	01-01-2015	Law	“(Article 51) The local people’s governments at all levels shall take measures to organize the sorting and recycling of domestic wastes. [20].”
Circular Economy Promotion Law	26-10-2018	Law	“(Article 1) This Law is formulated for the purpose of promoting the development of the circular economy, improving the resource utilization efficiency... [21]”
Law on the Prevention and Control of Environment Pollution Caused by Solid Wastes	07-11-2016	Law	“(Article 1) This Law is enacted for the purpose of preventing and controlling environmental pollution by solid wastes ... [22]”
Regulation on the Administration of City Appearance and Environmental Sanitation	01-03-2017	Administrative regulation	“(Article 28) ... Harmless treatment and comprehensive utilization of waste shall be gradually achieved [23].”
Administrative Measures for Urban HSW	04-05-2015	Departmental Rules	“(Article 3) The principles of minimization, reclamation and environmentally friendly treatment and that whoever produces waste shall bear the responsibility for the disposal thereof shall be observed in the control of urban HSW [24].”

Note: In order of authority; data current to 31 January 2020.

The term “local legislation” in this article refers to two kinds of local laws and their lawmaking activities. One is local decrees, which are enacted by subnational people’s congresses. Although local decrees are also named “Regulation”, they are fundamentally different from the “administrative regulation” which are enacted by State Council. The other is local administrative rules, which are issued by subnational governments. A local decree has higher legal authority than local administrative rules issued by governments at the same level and lower level. [25] (p. 111). According to Art. 82 of Chinese Legislation Law, local administrative rules must not increase the scope of people’s duties without a legal basis provided by local decrees or national laws.

Under China’s “uniform legal hierarchy”, local legislations must not contradict higher ranking laws and regulations, including the Constitution, national laws and administrative regulations. As higher ranking relevant provisions provide no more than general principles, the local legislators have much freedom to explore HSW sorting rules that fit local conditions. Perhaps the central planners have deliberately left room for local experiments, given the problem of extremely unbalanced regional development.

The first relevant local legislation was published in August 2000 by the People’s Congress of Jinan city, just two months after the adoption of the 2000 plan. However, it was not until 2011 when Beijing for the first time classified HSW into different categories. Following Beijing, Guangdong province and cities like Shenyang and Suzhou also enacted their local HSW sorting decrees. Despite these efforts, the 2000 plan made little difference, neither did they cultivate proper sorting habits, nor had the separation of HSW been maintained properly after collection. The waste still remained largely unsorted and residents remained recalcitrant towards the task of sorting their garbage [26].

A new round of local legislations started in 2017. With China promoting its “ecological civilization” concept, an ambitious plan for compulsory HSW sorting, titled Implementation Plan of HSW Sorting (thereafter, the 2017 plan), was issued by the National Development and Reform Commission and Ministry of Housing and Urban–Rural Development [27]. The 2017 plan determines to put in place laws and regulations as well as industrial standards in 46 pilot cities by 2020 and to establish a nationwide urban HSW sorting system by 2025.

So far, a total of 32 local decrees have been promulgated at provincial and municipal levels to implement the national HSW sorting policy (Table 2). Below we present a horizontal comparison among various aspects of these legislations.

**Table 2.** Local decrees on household solid waste (HSW) sorting in China.

Name	Enactment Date	Level of Authority	Pilot City
Guangdong Provincial Urban and Rural HSW Management Regulation	25-09-2015	Provincial	No
Shenyang HSW Management Regulation	27-11-2015	Municipal	Yes
Suzhou(宿州) Rural HSW Management Regulation	10-11-2016	Municipal	No
Yinchuan Urban HSW Management Regulation	02-12-2016	Municipal	Yes
Yunfu Rural HSW Management Regulation	07-12-2016	Municipal	No
Xiamen Special Economic Zone HSW Sorting Management Measures	28-08-2017	Municipal	Yes
Gansu Provincial Rural HSW Management Regulation	28-09-2017	Provincial	No
Xiangyang Rural HSW Management Regulation	29-11-2017	Municipal	No
Jinhua Rural HSW Sorting Management Regulation	16-04-2018	Municipal	No
Guangzhou HSW Sorting Management Regulation	16-04-2018	Municipal	Yes
Jieyang HSW Management Regulation	13-06-2018	Municipal	No
Haikou HSW Sorting Management Regulation	10-08-2018	Municipal	Yes
Xiangyang Urban HSW Management Regulation	25-10-2018	Municipal	No
Changde Urban and Rural HSW Management Regulation	02-11-2018	Municipal	No
Yichun HSW Sorting Management Regulation	12-11-2018	Municipal	Yes
Taiyuan HSW Sorting Management Regulation	05-12-2018	Municipal	Yes
Fuyang HSW Management Regulation	21-12-2018	Municipal	No
Heyuan Rural HSW Management Regulation	25-12-2018	Municipal	No
Shanghai HSW Management Regulation	31-01-2019	Provincial	Yes
Changchun HSW Sorting Management Regulation	11-04-2019	Municipal	Yes
Wuxi HSW Sorting Management Regulation	10-06-2019	Municipal	No
Ningbo HSW Sorting Management Regulation	13-06-2019	Municipal	Yes
Puyang Rural HSW Management Regulation	01-07-2019	Municipal	No
Fujian Provincial Urban and Rural HSW Management Regulation	26-07-2019	Provincial	No
Hangzhou HSW Management Regulation	01-08-2019	Municipal	Yes
Xianning Rural HSW Management Regulation	12-09-2019	Municipal	Yes
Fuzhou HSW Sorting Management Regulation	26-09-2019	Municipal	Yes
Beijing HSW Management Regulation	27-11-2019	Provincial	Yes
Hainan HSW Management Regulation	29-11-2019	Provincial	No
Bengbu HSW Management Regulation	21-12-2019	Municipal	No
Zhangzhou HSW Management Regulation	03-12-2019	Municipal	No
Suzhou(苏州) HSW Sorting Management Regulation	09-12-2019	Municipal	Yes

Note: In order of enactment date; data current to January 31, 2020.

## 2.2. A Horizontal Comparison

### 2.2.1. Local Legislative Outputs

To improve the legal framework of HSW sorting and speed up relevant local legislation, the 2017 plan explicitly mandates the pilot cities to enact local decrees or at least local administrative rules on HSW sorting [27]. The level of local legislative outputs is an important indicator of local implementation of the national 2017 plan.

So far, out of 46 pilot cities, only 14 have enacted local decrees on HSW sorting, as is shown in Table 2. Most instead chose to make local administrative rules. Unlike local decrees enacted by the local People's Congress, local administrative rules and governmental implementation plans are promulgated by local government and do not undergo legislative scrutiny. While many local authorities of the pilot cities did release relevant legislative plans, such plans would not necessarily be carried out. Even at the national level, more than half of bills have never been signed into laws [28], let alone those proposed by local authorities with uneven legislative abilities. Moreover, some local officials may lack the incentive to implement national policies, especially environmental policies that are likely to raise contradictions between economic growth and environment protection [29].

By the end of 2019, no local legislations—either local decrees or local administrative rules—have been issued in 17 pilot cities, which means they only have local governmental implementation plans or nothing at all. With less than a year ahead, it is unlikely that these pilot cities would fulfill the obligation to legislate in due time. The implementation history of the 2000 plan might give some clues. The 2000 plan selected only eight pilot cities: Beijing, Shanghai, Nanjing, Hangzhou, Guilin, Guangzhou, Shenzhen and Xiamen. Most of them were from developed regions in China, the only exception being Guilin of Guangxi Province, whose GDP ranked 18 among 31 provinces in 2018 [30]. Back then, “The Notice on the Designation of Pilot Cities for HSW sorting” issued by the Ministry of Construction urged the making of local administration rules [31]. In 2011, Beijing, the capital city, took the initiative and enacted its local decree. Since then, the rest pilot cities had enacted their own administrative rules or amended old ones for HSW sorting (Shanghai in 2014, Nanjing in 2013, Hangzhou in 1996 and 2012, Guangzhou in 2011, Xiamen in 2004 and Shenzhen in 2015), except Guilin. In poorer regions like Guilin, the costs of waste separation will be a heavy burden. To this day, Guilin has had no formal HSW sorting legislations or rules of any kind. Only an internal executive order issued by Guilin Municipal Office in August 2015, announced that the government had formed a ‘special leadership group’ to coordinate the HSW sorting program [32]. HSW sorting legislation had once been included in the 2017 legislative plan of Guilin, but it was later removed.

Under the 2017 plan, the 46 pilot cities are evenly distributed provincially, meaning that each province has one or two of them. Among them, there are not only megacities like Beijing and Shanghai, but also cities from relatively underdeveloped regions. Like Guilin, some pilot cities may experience difficulties in fulfilling their obligation to legislate. For example, one of the pilot cities, Shigatse, a major city in Tibet, has had no local legislation or administrative rules on HSW sorting to date, not even general waste management regulations.

It is worth noting that while many pilot cities are falling behind the schedule, some non-pilot cities have been active in producing local HSW management decrees. Some of the non-pilot cities had formulated their local legislations even before the 2017 Plan. As is displayed in Table 1, more than half of the existing local legislation on HSW sorting was enacted by non-pilot cities. Most of the 18 non-pilot local legislations are distributed in richer regions in China. As many as four occurred in Guangdong Province, an important economic, political, cultural and industrial center in South China. The remaining 14 are scattered in the other 9 provinces, among which 7 (Jiangsu, Zhejiang, Henan, Hubei, Henan, Fujian and Anhui) are from richer areas in China, as measured by GDP in 2018. [30] That is to say, out of the 18 non-pilot local legislation, only 2 (Gansu and Hainan) are distributed in poorer provinces of China.

Overall, the current status of legislative outputs indicates that different regions respond differently to the national HSW sorting policy. Though every province has one or two pilot cities, the provincial distribution of local legislations on HSW sorting is quite uneven. Legislative outputs from non-pilot cities suggest that richer regions in China are more active in promoting HSW sorting without being pressured by the central government.

### 2.2.2. Local Standards of HSW Classifications

Most local legislations sort HSW into four categories: recyclable, hazardous, biodegradable (“wet waste” in Shanghai) and other waste (“dry waste” in Shanghai) (Figure 1). Some adopt a two- or three-category alternative. For example, Tianjin only requires a dry/wet separation.

Local technical capacities of waste management are likely to affect classification standards. In the absence of sophisticated end disposal facilities, a simple two-category sorting could be a practical compromise. It is worth emphasizing that, most Chinese cities have yet to form a comprehensive waste disposal system. The most-used disposal methods have been incineration and landfill. In 2017, only 2% of the annual waste was recycled [33], 97.5% was either burned or buried (Figure 2) [3].

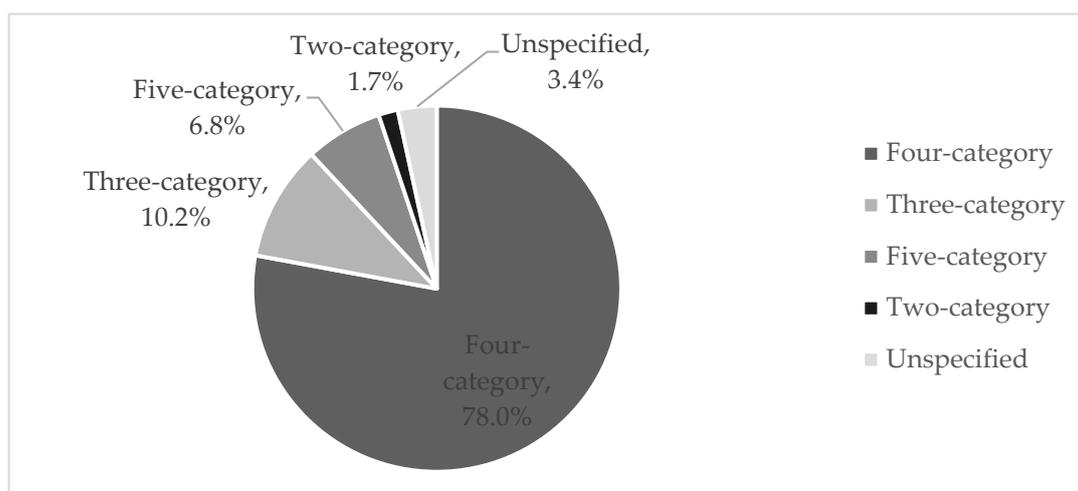


Figure 1. Distribution of existing HSW sorting methods. Data current to January 31, 2020.

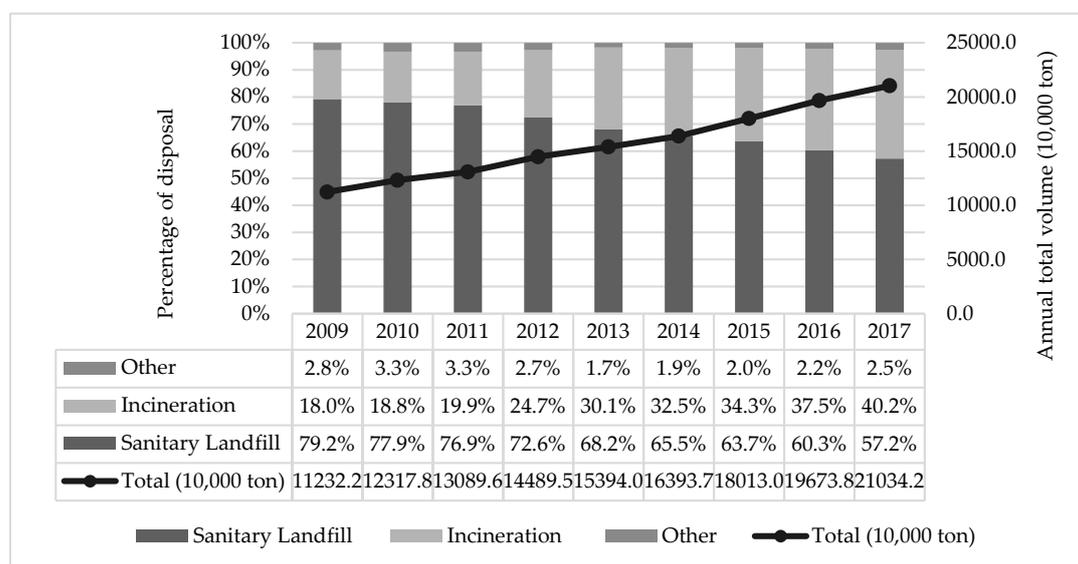


Figure 2. The composition ratio of harmless waste disposal (2009–2017). Data source: Ministry of Housing and Urban–Rural Development of the People’s Republic of China [34]. Data current to January 31, 2020.

Besides, non-technical factors may also influence local standards of classification. Interestingly, some local legislations apply different rules to different groups as to categorization methods. For example, in Tianjin city, while the general public is required to adhere to a simpler two-category sorting method, local Party offices, government departments and certain institutions such as schools and hospitals must separate waste into four categories. This unusual practice may reflect that, as will be further discussed below, some cities in China may adopt a complicated categorization method to prepare people for a greener lifestyle even before establishing corresponding disposal facilities.

Regardless of what standards are chosen, clearer guidelines are in need. The wet/dry distinction adopted by Shanghai has been criticized for being confusing. The public may have a problem understanding why a soaking-wet napkin is “dry” while a piece of dried-out chicken bone is “wet”. To better explain how different types of HSW are handled, Jinhua Rural HSW Sorting Management Regulation (Article 9) deliberately explain terms in layman’s language, explaining that “biodegradable waste” means “things that rot” and “recyclable waste” means “things you can sell for money” [35].

### 2.2.3. Reward and Penalty Provisions

Despite their debatable effectiveness [36], economic reward and punishment measures have been popular in many developed countries such as Japan and Germany for HSW management. Unsurprisingly, these measures, especially monetary penalty provisions are prevalent among local HSW sorting legislations in China.

This study finds 23 reward stipulations among 63 local implementation documents. Eight of the reward stipulations are from the local legislation listed above, including ones of Beijing, Taiyuan, Hangzhou, Ningbo, Xiamen, Guangzhou, Yinchuan and Changde. Shanghai, being most vigorous in implementing compulsory HSW sorting, does not reward residents for compliance. Recently Shanghai was reported establishing a “Green Account” system for rewarding residents’ sorting behaviors [37].

An observation of the existing 23 reward stipulations reveals that few reward stipulations set a detailed scheme for carrying out rewards (Table 3). Many simply copy the abstract wording from the documents of the 2017 Plan such as “Green Account” or “Environmental Protection File”. Only 5 out of 23 reward stipulations obligate municipal governments to provide supplementary regulations. Without detailed implementation rules, there are serious questions about whether and how will the reward be materialized.

Some innovations are being experimented with to implement reward schemes. Guangyuan, a city located at the north of Sichuan Province, has built 165 “Smart Sorting Houses” around the city, where people can receive points for throwing away properly sorted HSW; Deyang, another city of Sichuan, has set up 105 smart recycling machines named “Yellow Puppies”, with which people can exchange recycled bottles and paper boxes for money [38]. Yaohua, a sub-district of Nanjing city, has been outsourcing the work of establishing the “waste sorting reward platform” to private companies through public procurement; residents will receive points and gifts from the operator of the platform [39]. The “Yaohua model” was reported to be quite successful [39].

**Table 3.** Typical local reward stipulations for residents’ HSW sorting behaviors in China.

Type of Stipulation	Example
Generalized stipulation	Ningbo: “(Article 43) To mobilize residents to participate in HSW sorting activities, the government should take measures to establish an incentive mechanism including but not limited to gift redemptions or rewards [40].”
Generalized stipulation with the commitment of further rule-making	Guangzhou: “(Article 46) The city shall establish an incentive and guidance mechanism for the reduction and separation of HSW sources . . . The specific measures shall be formulated separately by the municipal people’s government [41].”
Green Account	Wuhan: “To mobilize residents to participate, the government shall establish a real-name Green Account system for residents to reward HSW sorting behavior [42].”
Point redemption	Hangzhou: “(Article 56) The government encourages enterprises and individuals to provide funds, goods, and services as prizes to mobilize residents to sort HSW by means of redeemable points, etc. [43].”
Point redemption with Smart Sorting House	Guangyuan: “Residents can collect points by putting the sorted recyclables or hazardous waste into the Smart Sorting Home and redeem rewards [44].”

Comparing to rewards, penalty provisions are more common and applicable. A total of 38 out of the 63 local implementation documents have penalty rules. Some allow issuing rectification notice. The others impose fines varying from 20 to 1000 yuan (US\$ 3 to 144) on individuals and 500 to 50,000 yuan (US\$ 72 to 7200) on organizations. As is shown in Table 4, the cost of the fines vary in different cities. In most cases, fines imposed on individual violators are between 50–200 yuan (US\$ 7 to 29). Several cities prescribe two tiers of penalties based on the severity of the violation, which is more transparent and reasonable.

**Table 4.** Typical local fine stipulations for residents' HSW sorting behaviors in China.

Type of Fine Stipulation	Example
Fine with lower and upper limits	Shanghai: "(Article 57) Those who refuse to make corrections shall be fined between 50 yuan and 200 yuan [45]."
Fine with an upper limit	Shenyang: "(Article 32) . . . The competent department of environmental sanitation shall order them to stop the illegal act and correct it within a time limit, and impose a fine under 200 yuan [46]."
a fixed amount fine	Changchun: "(Article 50) Those who refuse to make corrections shall be fined 100 yuan for individuals and 1,000 yuan for institutions [47]."
Fine based on a two-tier severity scale	Ningbo: "(Article 50) Those who refuse to make corrections shall be fined between 20 yuan and 200 yuan; if the circumstances are serious, they shall be fined between 200 yuan and 500 yuan [40]."

The governance instruments selected by the local legislations reflect the normative preferences of local policymakers. The status quo that penalty rules are not only more prevalent but also much more concrete indicates that the command-and-control approach remains central in China's environmental governance. However, from the viewpoint of law and economics theory, while the command-and-control approach has great strength when rapid-fire actions are in need, it is only efficient when certain conditions are met.

The local innovations to establish a reward mechanism through public–private partnerships, though less common, demonstrate some local authorities' willingness to experiment with new forms of regulatory intervention. These innovative efforts also indicate that some local policymakers are active in implementing central policy, challenging the rough division of "national level effective/local sabotage" affirmed by some literature on China's environmental governance.

#### 2.2.4. The Use of the Social Credit System

China's social credit system, first announced in 2014, aims to commend compliance and honesty and punish illegality and dishonesty. Credit service institutions are encouraged to collaborate with the government to explore credit-related rewards and punishments in such fields as commerce and trade, finance, tourism, lease and environmental protection [48]. The system is still under construction and is expected to be established by 2020. Currently, local governments are piloting their own experimental projects that work differently.

This study finds 13 of 63 local implementation documents, including the Shanghai one, either have established to or plan to deter violations by taking away their "social credit points" in the social credit system, which may affect the violator's capacity to apply for loans, to start a company or even to take a train trip [49]. As the consequences of being blacklisted in the social credit system are severe and long-lasting, resorting to the social credit system demonstrates the effort to generate effective deterrence against violation of local decrees.

However, the social credit system itself has garnered intense controversies ever since its beginning. One of the biggest problems is that, while China's Law of Administrative Penalty has established six types of administrative penalties, the social credit penalty can be categorized into none of them. Without effective legal restrictions, the social credit system has fuzzy boundaries and is likely to be abused. Legal scholars have criticized for years the social credit penalties as disproportionate and arbitrary [50]. According to the "Regulation for the Promotion of Civilized Behavior" recently enacted in many cities, even minor misbehaviors such as spitting in public could be recorded into the social credit files. For example, Tianjin's Regulation for the Promotion of Civilized Behavior stipulates that "penalties for uncivilized behavior should be recorded into the credit information system [51]." One may also question the legitimacy and proportionality to punish the violators of HSW sorting decrees under the social credit system. Moreover, with the development of artificial intelligence enforcement tools such as facial recognition, which has been reportedly applied in regulating HSW sorting [52],

many fear that the social credit system would turn out to be a social control mechanism empowering the government to enhance surveillance and perpetuate authoritarianism [53].

Despite efforts to provide a legal basis for social credit systems, the social credit penalties remain largely unregulated. Among cities resorting to social credit systems to enforce HSW sorting, only Hangzhou, Shanghai, Xiamen and Wuhan have provided relatively comprehensive legal frameworks for social credit penalties with both higher-ranking local legislations and administrative rules (Table 5). Therefore, social credit penalties can raise concerns about the rule of law.

**Table 5.** Local legal frameworks for using social credit system to implement HSW sorting.

City	Authority of the Stipulation	Regulated by Higher Local Legislations	Regulated by Local Administrative Rules
Hangzhou	Local legislation	Zhejiang Province Public Credit Information Management Regulation	Hangzhou Public Credit Information Management Measures
Ningbo	Local legislation	Zhejiang Province Public Credit Information Management Regulation	None
Shanghai	Local legislation	Shanghai Social Credit Regulation	Shanghai Public Credit Information Collection and Use Management Measures
Taiyuan	Local legislation	None	None
Xiamen	Local legislation	Xiamen Special Economic Zone Social Credit Regulation	Interim Measures for the Administration of Public Credit Information in Fujian Province
Tongling	Local administrative rules	None	None
Fuzhou	Local administrative rules	None	Fuzhou Social Credit Management Measures
Qingdao	Local regulatory documents	None	Shandong Province Public Credit Information Management Measures
Wuhan	Local regulatory documents	Hubei Province Social Credit Information Management Regulation	Wuhan Public Credit Information Management Measures
Yichang	Local regulatory documents	Hubei Province Social Credit Information Management Regulation	None
Nanning	Local administrative rules	None	Nanning Personal Credit Information Collection and Use Management Measures
Guiyang	Local administrative rules	None	None
Lanzhou	Local administrative rules	None	None

### 2.2.5. The Legal Duties Imposed on Local Governments

As mentioned above, most Chinese cities lack adequate disposal infrastructure to deal with separated waste. The 2017 plan thus requires the pilot cities to “improve end disposal facilities that are connected to HSW sorting” [27].

This study finds that, while imposing sorting duties on the public and punishing violations, most local legislations seem to be lenient to the governments. They usually mention the need to improve disposal facilities in a general and superficial way, without explicitly obligating local governments to construct disposal facilities. For instance, Beijing’s local decree (Article 9) broadly stipulates that “the city shall . . . adopt advanced technology, adapt to local conditions, comprehensively use incineration, biochemical treatment, sanitary landfill and other methods to dispose HSW, and gradually reduce the amount of landfill” [54].

There are two exceptions. Guangzhou, one of the pilot cities, has legislated (Article 28) to mandate the government to build a “recycling economic industrial park that integrates harmless incineration, biodegradable waste utilization, recycling of renewable resources, and sanitary landfill” [41]. Changde, a non-pilot city located in Hunan Province, seems to be the most determined about disposal facility construction. The local decree passed by the People’s Congress of Changde (Article 15) not only

prescribes that the government shall construct a biodegradable waste treatment center as well as a waste incineration plant but also sets a three-year limit for the government to complete the constructions (Table 6).

**Table 6.** Typical stipulations pertinent to the government’s obligation of end disposal facility construction.

Type of stipulation	Example
Generalized stipulation	Beijing: “(Article 9) The city shall . . . adopt advanced technology, adapt to local conditions, comprehensively use incineration, biochemical treatment, sanitary landfill and other methods to dispose HSW, and gradually reduce the amount of landfill [54].”
Explicit requirements without a time schedule	Guangzhou: “(Article 28) The municipal and district people’s governments shall . . . establish a recycling economic industrial park that integrates harmless incineration, biodegradable waste utilization, recycling of renewable resources, and sanitary landfill [41].”
Explicit requirements with a time schedule	Changde: “(Article 15) The municipal and county (city, district) people’s governments shall, within three years from the date of implementation of this Regulation, build a biodegradable waste treatment center and a garbage incineration plant according to the disposal requirements of HSW [55].”

To summarize, while very uncommon, some local decrees do recognize local governments’ duties to improve disposal infrastructure, demonstrating corresponding local leaders’ commitment to implement HSW sorting policy.

### 3. How are the Local HSW Sorting Laws Made: The Guangzhou Model and the Shanghai Model

In the last part, we investigated the existing local legislative outputs on HSW sorting. How are these legislations made? In this part, we observed local HSW management policy-making models based on the experience of Shanghai and Guangzhou. If we look at the spectrum of local waste management law-making strategies in China, Shanghai’s model represents the relatively most authoritarian end, while Guangzhou’s sits at the other pole. The other cities’ approaches are scattered somewhere in between. The stories of Shanghai and Guangzhou may shed some light on the effects and dynamics of environmental authoritarian in a diverse and fragmented China.

#### 3.1. The Guangzhou Model

Guangzhou, the capital city of Guangdong (Canton) Province, sits at the Pearl River Delta Metropolitan Region which remains one of the wealthiest regions in China. One can hardly neglect Guangzhou when discussing the development of the rule of law in China. Guangzhou is known for being the cradle of the 1911 Xinhai Revolution, an armed rebellion organized by Dr. Sun Yat-sen that sought to overthrow the Qing dynasty’s rule and build a modern democratic republic [56] (pp. 21–44). At the frontier of the “reform and opening” since 1978, Guangzhou has a relatively active civil society and a relatively liberal political atmosphere as well [57].

According to the Annual Assessment Report of China’s Law-based Government conducted by China University of Political Sciences and Law [58], the government of Guangzhou has been ranked top five in law-based governance for six consecutive years.

During the implementation of the 2000 plan, after consultation with some scientific and technocratic elites, the local authority of Guangzhou was convinced that the development of disposal infrastructure shall be the priority instead of enhancing separation and recycle rates [59]. Accordingly, they decided to establish an advanced waste incineration plant first before introducing source separation regulations [60].

The plan encountered harsh resistance from the residents. The selected site of waste incineration plant was at the border of two villages that accommodated over ten thousand residents, mostly white-collar emerging middle-classes like lawyers and journalists [61]. From October to November

2009, these residents kept protesting via an online petition, secret gathering, collecting signatures and street performance art [62]. A peaceful protest was held with almost a thousand participants in front of the city hall on November 23, which attracted global media attention [63]. A petition letter was addressed to the National People's Congress, accusing the local government of violating due process during policy-making [64].

One month after the protest, the original incineration plant project was officially suspended. The government then took three steps to communicate with the public, from which many democratic features could be spotted.

The first step was to enhance transparency. The government explained to the public about the necessity and urgency of tackling waste management issues. A statistical report was released to the public which revealed that by 2015 the city's old waste landfill sites would run out of space. They also invited citizens and the media to visit the landfill sites and incineration plants to see how they worked [62].

The second was to restore due process. The government re-opened the site selection process. Three more candidate sites were discussed and debated this time.

The third was to enhance public participation. Since January 2010, the government hosted several public consultations online. In August 2012, a public advisory oversight committee on waste disposal constituted of 30 citizens was founded. The re-opened site selection process was also open to the public.

Meanwhile, the protest began to take a new direction. After learning more about the waste management problems, the protesters argued that, without proper source separation, the new incineration plant would produce harmful emissions no matter where it would be [62]. Thus the protesters demanded the government to implement HSW sorting rules for the sake of a more "livable and eco-friendly Canton" [65]. The core members of the protest founded an NGO named "Eco Canton" to advocate waste sorting and other sustainable solutions of waste management, which became one of the very first legitimate environmental NGOs in China [65]. Eventually, the government published a new plan, promising not only to build the new incineration plant at a more secluded area but also to take measures to control its emission levels.

In this way, the protest developed from a NIMBY (Not In My Backyard) incident into a broader environmental protection movement that swept Guangzhou. Some praised the Guangzhou protest as the "dawn of civic society" from a perspective of the government–citizen relationship [57]. After all, back then, common practices of local governments to deal with similar conflicts were delaying, buying off, cheating, soft-repression and hard-repression [66].

### 3.2. *The Shanghai Model*

Compared to Guangzhou, Shanghai has taken a more authoritarian approach. The frequently changing waste classification guidelines may be one reflection (Table 7). Reclassifications might be necessary as the city has been gradually upgrading its disposal infrastructure, starting with total landfill, then incineration a few years later. However, the residents' inconvenience in learning and adapting to new classification standards for six times during the last two decades should have been carefully considered.

**Table 7.** Shanghai’s HSW sorting methods since 1998 [67].

Time Period	Sorting Method	Categories
1998–1999	3-category	Organic waste, inorganic waste and hazardous waste
2000–2003	3-category	Dry waste, wet waste and hazardous waste
2003–2006	2-area/3-category	Incineration disposal area: noncombustible waste, hazardous waste and combustible waste Other area: compostable waste, hazardous waste and other waste
2007–2010	4-area/X-category	Residential area: hazardous waste, waste glass, recyclable waste and other waste Business area: hazardous waste, recyclable waste and other waste Public area: recyclable waste and other waste Other area: decoration waste, bulky waste, etc.
2010–2011	2+5 category	Main categories: decoration waste, commercial kitchen waste, bulky waste, etc. Subcategories: hazardous waste, waste glass, waste clothing, kitchen waste and other waste
2014–today	4-category	Recyclable waste, hazardous waste, wet waste and dry waste

Although Shanghai’s legislative process did allow public participation, the enactment of the new waste sorting decree seemed heavily influenced by political incentives [68]. In February 2017, Shanghai municipal people’s congress started a research project of drafting new waste sorting rules. In November 2018, during his visit to Shanghai, President Xi Jinping stressed that Shanghai should make sure its HSW management would be done well, leaving a frequently cited remark that “waste sorting is a new fashion”. Two months later, the new decree was enacted [69].

Compared to that of Guangzhou, the policy process of Shanghai’s waste sorting scheme was less transparent. The public in Shanghai, while bounded by the new legal obligation to sort HSW, have yet to be sufficiently informed about where and how the separated waste would be disposed of. A critic remarked that “when the citizens are overwhelmed by the new rules, trying to figure out how to sort HSW without being punished, the technical details about end disposal become unnoticeable [60].”

To enforce the newly enacted decree, the existing waste bins in the city were abruptly removed so that the residents would have to learn the sorting standards in a short period and to adapt to the new routine of throwing away the separated waste at fixed sites and at fixed times of the day. Many citizens have been unhappy about the inconvenience of the new system [70,71].

#### 4. Discussion

The following are the findings we draw from local legislations on HSW sorting in China.

##### 4.1. HSW Sorting Policy Process Has Been Dominated by the Central State

Consistent with the scholarly view that authoritarian environmentalism prevails in China, China’s HSW sorting policy process has been dominated by the central state.

The policy setting is done at the central level. The 2017 plan has made it mandatory for the 46 pilot cities to enact the local waste sorting decree or at least local administrative rules. The local law-making process under this backdrop is generally non-transparent and non-participative. For instance, Shanghai residents had yet to be informed about many important issues when the stringent new decree was promulgated. Did Shanghai have adequate facilities to properly handle the separated waste? How would the recycled waste be used and at what costs? Would the emissions of the new disposal sites pose a greater risk to human health or the environment? The non-transparent policy-making manifests paternalism—“Just sort your waste and leave all the other problems to the government.”

Public participation occurs at the implementation stage. The expected roles of the public are internalizing and obeying state policies. Though HSW sorting remains new to most Chinese citizens, local policymakers are not hesitant to include penalty rules in the HSW decrees (see Section 2.2.3.).

To avoid being fined, the public is compelled to quickly form a habit of waste separation. Many cities are planning to take away violators' "social credits" under the newly invented "social credit system", which will provide an even stronger incentive of compliance (see Section 2.2.4.).

When attempting to mobilize the public, local policymakers put more emphasis on educating the public about "how to" instead of "why to sort wastes". Going through existing local HSW decrees, one may wonder: why are many cities enforcing waste classification standards that do not correspond to the current capacity of local disposal infrastructure? Further, why do some local decrees require different groups of people in the same localities to follow different waste sorting standards? These seemingly puzzling practices could be explained by an aim to help the citizens to adapt to their waste sorting obligations (2.2.2.).

#### 4.2. "National Effective/Local Sabotage" Narrative Remains Largely Valid

This study finds that the central HSW sorting policy is undermined at local levels during implementation, which means the "national effective/local sabotage" narrative remains largely valid as to the effects of authoritarian environmentalism in China.

Although local decision-makers have been pressured by the 2017 plan to pass local HSW decrees through municipal people's congress, one shall be reminded that only 14 of 46 pilot cities have met their legislative obligations. Many pilot cities chose to issue local administrative rules or merely publish some governmental plans. Without local congress' legislation to clarify the responsibilities of various administrative agencies, local administrative rules let alone the governmental plans may not be effectively enforced.

Even for the 14 pilot cities that did enact their local decrees, many of them have yet to provide comprehensive implementation schemes. Who is responsible to oversee policy enforcement? Who is responsible to upgrade disposal facilities? When will the upgrade be completed? When these questions remain unaddressed, policy implementation will likely be hindered.

It is no surprise that many local officials lack incentives to implement the central waste sorting policy. After the Reform and Opening of 1978, China went through a phase of decentralization [72] (p. 152), during which localism had undermined the state power [73] (p. 30). It has long been identified that China's decentralized administrative structure has caused the so-called "implementation gap" in China's environmental governance [25] (pp. 5–7) [74–76]. While environmental targets have become more important in recent years, local decision-makers continue to prioritize economic growth over environmental sustainability [77]. In addition, the cost of developing a waste management infrastructure can be burdensome. It is reported that it will cost Beijing a total of 160 billion yuan to fully implement the waste sorting policy [78]. Poorer regions from inland China, with limited financial resources and under-developed disposal infrastructure, are very unlikely to respond to the central mandates whole-heartedly and push the HSW sorting policy through. The experience of Guilin and Shigatse has confirmed this suggestion (see Section 2.2.1.).

Singapore, whose success story has been cited to testify the effectiveness of authoritarian environmentalism, has a very much different policy background from that of China. The Singapore government recognized the need to balance economic growth and environmental protection very early on. As one of the first countries to form a ministry dedicated to addressing environmental challenges, Singapore has never adopted the "pursuing growth first and cleaning up afterward" policy [79]. As to policy implementation, Singapore's small size and population have facilitated the country's high degree of centralization, preventing provincial authorities from undermining central decisions [80] (p. 365). Therefore, Singapore's success is not readily available to China.

#### 4.3. Some Localities Do Show Positive Attitudes toward the National HSW Sorting Campaign

While the "national effective/local sabotage" theory remains largely intact, some sub-national governments do show positive attitudes toward the national HSW sorting campaign.

For example, to ensure better regulatory outcomes, the local decrees of Guangzhou and Changde obligate the local government to improve waste disposal infrastructure (see Section 2.2.5.). Jinhua's local decree explains the HSW sorting standard in layman's language to make waste classification guidelines easier to follow, which is very rare in China's formal legislation (see Section 2.2.4.). Local innovations to promote HSW sorting have been emerging: the "Smart Sorting Houses" of Guangyuan, the "Yellow Puppies" Recycling Machines of Deyang and the "green public procurement" of Yaohua are all examples (see Section 2.2.3.). Moreover, it is worth noting that, while many pilot cities are lagging behind, a few non-pilot cities moved ahead to enact their own waste sorting local decrees without being pressured by the 2017 plan.

Increased political recentralization may have contributed to the narrowing of the "local implementation gap" by reducing localism. Since Xi Jinping assumed office in 2012, China has undergone a phase of political recentralization. During the last decade, the central state has been making efforts to centralize environmental governance, establishing branch offices of the national State Environmental Protection Agency to oversee local enforcement of central laws. However, one shall not exaggerate the impact of political recentralization on overall environmental governance performance in China, when localities continue to show different interests and capacity for environmental regulation enforcement [81]. This article finds that all the non-pilot cities that have voluntarily enacted HSW sorting decrees are from richer regions in China (see Section 2.2.1.), which supports the existing studies which suggested that richer localities where conflicts between economic and environmental interests were less likely to arise, had more interest in improving environmental governance [18].

#### *4.4. Bottom-Up Environmentalism Did Emerge in Certain Localities*

We compared the cases of Guangzhou and Shanghai, two of the richest cities in China. Local authorities there shall have less incentive to sacrifice environmental objectives for developmental goals. Indeed, both Guangzhou and Shanghai have made local decrees on HSW sorting. Yet the lawmaking processes diverged sharply (see Section 3). In Guangzhou, to resolve the NIMBY protests, the local government took some measures to allow civil engagement. From 2009 to 2010, the self-interested NIMBY protests gradually turned into a grassroots environmental movement. Citizens with citizen consciousness and environmental awareness were the first to call for waste separation policy. NGOs were founded to promote eco-friendly lifestyles. When the public is allowed to voluntarily sort waste, the implementation costs of the HSW sorting decree can be lowered. By contrast, Shanghai took a top-down approach when enacting the new decree. Though 80% of the citizens were supportive of waste sorting according to the government's statistics [82], without aligning the perspectives of policymakers and citizens, whether the public support will be sustainable remains questionable [83].

#### *4.5. Questionable Effectiveness of Top-Down HSW Sorting Policy in the Absence of Certain Conditions*

The efforts to improve the waste management legislation underlines China's ambition to tackle the waste management problem. Some positive initial results have been reported. According to the Ministry of Housing and Urban-Rural Development, currently, in 18 cities including Shanghai, Xiamen, Hangzhou, Guangzhou, etc., more than 70% residential communities have participated in wastes separation [84]; in Guangzhou, the recycling rate of HSW has reached 35.6% [84]. According to Mr. Tang Zhiping, the vice mayor of Shanghai, the implementation of the new decree went better than expected. Tang reported that, during the first six months of the new policy, the "compliance rate" of local residential communities has increased sharply from 15% to 90%. By the end of October 2019, the recycled wastes reached 5960 tons per day, 46 times higher than the same period of 2018; the daily separated wet wastes reached 8710 tons, with a year-on-year growth of 100% [85]. As the calculation methods and indicators adopted by local governments to measure the "compliance rate" and "participation rate" have not been revealed, some cast doubts on the credibility of the data reported [86]. This study argues that, even if the aforementioned data was reliable, whether China's rigorous national waste-sorting campaign will be a success, in the long run, is doubtful.

For one thing, in a country whose governance structure is highly fragmented like China, localism will continue to undermine the national policy unless local leaders are committed to environmental protection. Like we have already mentioned, the “implementation gap” in China is far from being closed. In localities where policy implementation is weak, it will be difficult for local governments to attain credibility with its policy pronouncements. For instance, in Xi’an, a city located in western China, it was reported that, due to poor waste management coordination, the once separated wastes were often mixed again during collection and transportation [87]. Some residents thus complained to the local media that much of their labor was in vain [87]. Similar feedback also came from other cities, such as Beijing and Hefei [88].

For another, even if local leaders are committed to improving waste management, effective policy instruments are indispensable to bring out long-term change when public acceptance of waste sorting remains low. Public awareness of waste management issues in China remains inadequate [89,90]. A survey recently conducted in rural areas of China finds that only 23.9% of respondents knew waste classifications [91]. It is extremely difficult to achieve an overhaul in the habits of millions of households and businesses. So far, most local legislations take the command-and-control approach, incentivizing compliance by imposing fines to violators (see Section 2.2.3). The deterrence effect of a fine, however, is not only linked with the severity of punishment, but also with the certainty of enforcement [92]. It is worth repeating that to ensure enforcement, Shanghai conducted more than 18,000 inspections during the first month of the new decree [2]. This costly practice is unlikely to continue in the long term. Once the perceived level of enforcement decrease [84], whether the current “compliance rate” can be sustained is questionable.

Although making penalties harsher by utilizing the “social credit system” or detecting violations by deep face recognition (see Section 2.2.4) can increase deterrence effects, such measures will raise serious rule of law concerns. To ensure effective implementation of top-down environmental policies, different policy options shall be explored. In Singapore, where authoritarian environmentalism has generated positive policy outcomes, the government has been shifting away from its traditional command-and-control measures and increasingly relied on a market-based approach [93]. The local policy experiments that emerged in certain Chinese (see Section 2.2.3) cities shall be encouraged.

When the public is allowed to voluntarily sort waste, the implementation costs of the HSW sorting decree can be lowered. With China’s economic development and continuing degradation of the environment, it is argued that citizens from richer regions will become more vocal against pollution and thus create more pressure for local governments to take action. [18] However, whether the experience of Guangzhou can be replicated elsewhere in China remains questionable. Since the mid-2000, China has put more restrictions on public petitions, free press and freedom of associations, decreasing the regulatory potential of citizens in environmental governance [18]. As we have argued, the authoritarian environmentalism tradition still prevails in China today. Shanghai is but one example.

## 5. Conclusions

This study analyzes the effects of authoritarian environmentalism based on local legislations on HSW sorting throughout China. Consistent with the conventional view that China has taken an authoritarian environmentalism approach, we find that the policy-making process of local HSW sorting decrees is generally non-transparent and non-participatory. Based on our observation of local legislative outputs, we find that certain localities do demonstrate a strong initiative in promoting HSW sorting. The trend of political recentralization and changing dynamics of local interests may account for this pattern. Overall, however, localism has continued to undermine the outcome of authoritarian environmentalism.

Despite some initial good results, whether the top-down HSW sorting policy will be sufficiently implemented in a country like China remains questionable. When public awareness about waste separation remains inadequate in China, policy instruments prescribed in existing local decrees are costly and inadequate to generate long-term change. Guangzhou’s experience suggests that citizens

and civil societies could have played important roles in shaping local environmental regulations in an authoritarian state. Guangzhou's "democratic model", however, may be a flash in the pan as the state has put much more restriction on civic engagement in recent years.

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## Appendix A

Table A1. Legal documents on HSW sorting of 46 pilot cities in China.

City	Name	Date	Type
Nanjing	Nanjing HSW Sorting Management Measures	05-04-2013	Local administrative rules
Shenzhen	Shenzhen Measures for the Sorting and Reduction of HSW	23-06-2015	Local administrative rules
Shenyang	Shenyang HSW Management Regulation	27-11-2015	Local decree
Yichang	Notice on Comprehensive Implementation of HSW Sorting Management	03-02-2016	Local governmental implementation plan
Yinchuan	Yinchuan Urban HSW Management Regulation	02-12-2016	Local decree
Tai'an	Tai'an Implementation plan of the management of HSW Sorting	11-08-2017	Local governmental implementation plan
Guangyuan	Guangyuan Three-Year Implementation Plan for the Construction of Urban and Rural HSW Treatment Facilities	17-08-2017	Local governmental implementation plan
Xiamen	Xiamen Special Economic Zone HSW Sorting Management Measures	28-08-2017	Local decree
Deyang	Deyang Three-Year Implementation Plan for the Construction of Urban and Rural HSW Treatment Facilities	14-11-2017	Local governmental implementation plan
Nanchang	Nanchang Implementation plan of the management of HSW Sorting	14-12-2017	Local governmental implementation plan
Tianjin	Tianjin Implementation plan of the management of HSW Sorting	15-12-2017	Local governmental implementation plan
Changsha	Changsha Implementation plan of the management of HSW Sorting	22-12-2017	Local governmental implementation plan
Shijiazhuang	Shijiazhuang Implementation Plan of HSW Sorting	26-12-2017	Local governmental implementation plan
Nan'ning	Nan'ning Implementation plan of the management of HSW Sorting	26-01-2018	Local governmental implementation plan
Ji'nan	Ji'nan Overall Implementation Plan of HSW Sorting	28-03-2018	Local governmental implementation plan
Guangzhou	Guangzhou HSW Sorting Management Regulation	16-04-2018	Local decree
Lhasa	Lhasa Implementation Plan for Pilot Work on Separate Collection and Treatment of HSW	16-04-2018	Local governmental implementation plan
Chengdu	Chengdu Implementation plan of the management of HSW Sorting	20-04-2018	Local governmental implementation plan
Xi'ning	Xi'ning HSW Sorting Management Measures	27-04-2018	Local administrative rules
Tongling	Tongling HSW Sorting Management Measures	16-07-2018	Local administrative rules
Haikou	Haikou HSW Sorting Management Regulation	10-08-2018	Local decree
Chongqing	Chongqing HSW Sorting Management Measures	16-11-2018	Local administrative rules
Yichun	Yichun HSW Sorting Management Regulation	12-11-2018	Local decree
Guiyang	Guiyang HSW Sorting Management Measures	27-11-2018	Local administrative rules
Taiyuan	Taiyuan HSW Sorting Management Regulation	05-12-2018	Local decree
Lanzhou	Lanzhou Urban HSW Sorting Management Measures	13-12-2018	Local administrative rules
Kunming	Kunming Urban HSW Sorting Management Measures	18-01-2019	Local administrative rules
Wuhan	Wuhan Further Implementation Plan of HSW Sorting Management	24-01-2019	Local governmental implementation plan
Hefei	Hefei HSW Sorting Management Measures	29-01-2019	Local administrative rules

Table A1. Cont.

City	Name	Date	Type
Shanghai	Shanghai HSW Management Regulation	31-01-2019	Local decree
Dalian	Dalian Municipal HSW Sorting Management Measures	17-02-2019	Local administrative rules
Changchun	Changchun HSW Sorting Management Regulation	11-04-2019	Local decree
Xi'an	Xi'an HSW Sorting Management Measures	28-04-2019	Local administrative rules
Xianyang	Xianyang Implementation plan for promoting HSW Sorting Management	06-06-2019	Local governmental implementation plan
Ningbo	Ningbo HSW Sorting Management Regulation	13-06-2019	Local decree
Urumqi	Urumqi 2019 Annual HSW Sorting Implementation Plan	21-06-2019	Local governmental implementation plan
Hangzhou	Hangzhou HSW Management Regulation	01-08-2019	Local decree
Handan	Handan HSW Sorting Management Measures	01-09-2019	Local administrative rules
Hohhot	Hohhot Establishment and Implementation plan of HSW Sorting system	09-09-2019	Local governmental implementation plan
Fuzhou	Fuzhou HSW Sorting Management Regulation	26-09-2019	Local decree
Zhengzhou	Zhengzhou Municipal HSW Sorting Management Measures	26-09-2019	Local administrative rules
Beijing	Beijing HSW Management Regulation	27-11-2019	Local decree
Qingdao	Qingdao HSW Sorting Management Measures	05-12-2019	Local administrative rules
Harbin	Harbin Municipal HSW Sorting Management Measures	23-12-2019	Local administrative rules
Suzhou	Suzhou HSW Sorting Management Regulation	09-12-2019	Local decree
Shigatse	None	-	-

Note: In order of enactment date; data current to January 31, 2020.

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