

Municipal Solid Waste Management in Beijing



A collector's truck in Yonghegong hutong, Beijing 2015

Marie Pla

“In the circle of Chinese environmental NGOs, **the year 2009 is often described as “Year One of the Garbage Era”** (laji yuannian). The description is quite literal. It was in the year 2009 when grassroots resistance against landfills and incinerators (Panyu and Napa Valley being the two best-known cases) began to emerge across the country. It was also in 2009 when major Chinese environmental NGOs such as Friends of Nature, Green Beagle, and Global Village began to take garbage seriously and put recycling and waste reduction on their agendas. However, the term laji yuannian also conveys a deep sense of unease. The expression brings back the year-counting tradition of dynastic China, according to which the beginning of each new emperor’s reign resets the calendar to “year one.” Laji yuannian is, thus, an announcement: **Garbage has now risen to power**. It governs, it conquers, and its empire is expanding. But what exactly does the reign of Garbage look like? Where is its territory? How does it redefine Chinese urbanism?”

Shih-yang Kao, *Beijing Besieged by Garbage: Photographing “Year One”*: Wang Jiuliang and the Reign of Garbage, Inaugural Issue of Cross-Currents E-Journal (No. 1), 2011

The challenges China has to face with regards to waste management are massive: the increase in municipal solid waste management throughout the country is the fastest ever seen in history (Bouanini, 2013), growing at a pace of 10% per year. China now produces about 30% of the world's municipal solid waste (Yi Xiao et al., 2007). Beijing produced 20,000 tons of garbage a day in 2009 and was on track to exceed its twenty-three waste treatment plants' capacity within the coming years (Shapiro, 2012).

Waste is an insightful topic, as it illustrates societal evolutions and lifestyle transitions, as well as the governance capacities that the latter demand. This paper aims at accounting for Beijing's municipal solid waste management at each step: generation, collection and transport, and disposal. This paper combines data from a month-long field research in Beijing with the existing literature on municipal solid waste management issues. Though literature on China's environmental issues is plentiful, data remains scarce: the Beijing Solid Waste Administration Department does carry out investigations on the composition of municipal solid waste but it is rarely shared with the public (Yi Xiao et al., 2007). I here use a restrictive definition of municipal solid waste by focusing on waste generated exclusively by households, which allows me to reflect upon a unique waste stream.

I deliberately chose to stay away from the "Integrated Sustainable Waste Management" framework that has been gaining momentum in the past decade (WASTE, 2004) in order to refrain from policy recommendations. Indeed, this grid of analysis is highly normative (Reduce, Reuse, Recycle, Return nutrients to the soil) and was not relevant to study the existing trends at play in Beijing. In order to conduct this analysis, I decided to follow the different steps of municipal solid waste management: waste generation and separation (1), collection and transfer (2), and the final disposal or treatment (3). This "chronological" analysis of waste management allows me to analyse the actors involved at each step, how they interact and the dynamics at play without imposing standards on this process.

field research methodology

I conducted a month-long field research in Beijing in July 2015 on environmental governance at the city-level. Due to my short stay, my research combines different geographic scales: the observations were done at the neighbourhood level in the Yonghegong area, near the 2nd Ring Road while interviewees draw conclusions for the whole city, and may even ground their analysis in other Chinese cities.

I interviewed different actors in a semi-directive manner: NGOs (Nature Resources Defense Council, Nature University), private companies (Suez Environnement, ENGIE, EDF), French institutions (French Development Agency and the economic division of the French embassy), think tanks (Sinapolis), university professor Zou Huan (Qinghua University) and government agencies (China Center for Urban Development).

waste generation

the evolution in waste output and the urban phenomenon

Waste generation is not a new phenomenon, however there has been a general increase in waste output over the last decades. Joshua Goldstein¹ indeed states that “there is a general sense that during the Mao-era, nothing went to waste”. In the early years of communism, the Chinese Central Government strongly promoted re-use, thus reducing the quantity of things that actually went to waste.

Since the 1979 economic reforms led by Deng Xiaoping, the country widened its economic goals from sole industrialization to actually promoting domestic consumption. The creation of Special Economic Zones (SEZs) in the early 1980s primarily aimed to attract foreign investment in China, but it also implied that private property was guaranteed to Chinese entrepreneurs, and even encouraged. SEZs were very successful in attracting investors as well as in enriching Chinese businessmen, thus leading to the formation of a Chinese middle class.

SEZs also contributed to promoting cities as places where higher – and unprecedented in communist China – standards of living could be attained. The internal migrations the country previously underwent were very destitute people fleeing poverty, during the Great Leap Forward for instance: people were running *away*, but the final goal was often blurry. The creation of SEZs in 1980 and the loosening of the hukou² system in the mid 1980s led to massive rural-urban migrations motivated by prospects of better employment opportunities.

Deng Xiaoping’s economic reforms ultimately led to the birth of the urban phenomenon in China. Indeed, the country’s urban population grew by about 440 million to 622 million people between 1979 and 2009: the volume of this rural-urban migration over the span of thirty years makes it the largest migration in human history (Chan, 2013).

Yet it is precisely in cities that waste management becomes a challenge, due to a change in lifestyle (“higher per capita waste generation rates as a result of the greater use of pre-packaged and convenience foods along with higher levels of personal consumption than in rural areas”³) as well as logistical issues (waste storage, collection, transport and space for disposal). Indeed, Chinese

¹ *The City Besieged by Garbage: Politics of Waste Production and Distribution in Beijing*, Joshua Goldstein, 2011, UC Berkeley

² The hukou is a residence registration system that was created in the 1950s in order to control internal migration and to fix the population to a given place.

³ GANDY, Matthew, *Recycling and the Politics of Urban Waste*, Earthscan Publications Limited, London, 1994

urban dwellers embracing consumer society translates into an increase of 8 to 10% per annum in waste output, amounting to 180 million tons of *collected* municipal solid waste in 2010 (Bouanini, 2013).

Beijing is a remarkable example of the trends that I just described. While the 2004-2020 Beijing Masterplan expected the city to reach 20 million inhabitants by 2020, the city's 2015 population has already gone over 22 million and keeps growing at higher rates than the national population. Moreover, as argued by Yi Xiao et al., "the correlation analysis conducted shows that the generation of municipal solid waste in Beijing has been growing steadily, showing high correlations ($r > 0.9$) to the total GDP, per capita income, and the population."⁴ This correlation seems to concur with the argument that the increase in waste output is an externality of the rise in buying power of Beijing urban dwellers. Indeed, the city produces an estimated 20,000 tons of garbage a day, a figure that increases by 10% every year.

It is essential to underline the fact that this growth in volume also goes along with an evolution of the content of the refuse: between 1990 and 2003, ash and woodchips dropped from 56% to 17% while paper and plastic increased threefold from 10% to about 30% of Beijing's solid waste (Yi Xiao et al., 2007). This analysis shows that the increase in waste output is not simply a matter of population growth, which would imply a linear increase in the different waste components, but rather that this trend reveals a significant change in urban dwellers' lifestyle.

source separation

In 2007, the source separation ratio of municipal waste barely reached 15% (Yi Xiao et al. 2007). Separate bins were then introduced in 2010, but according to my own research, it did not entail higher separation rates. Given the lack of available data on that matter, I here rely on an interview I conducted in Beijing in 2015: according to the interviewee, separate bins were provided to households but waste did not remain sorted in the collection process. The interviewee argued that inhabitants saw the different bins being emptied in the same truck, which induced mistrust between Beijingers and the municipality with regards to waste management.

Was this situation due to a lack of infrastructure to enforce waste segregation throughout the whole process? In any case, the municipality is now faced with a prisoner's dilemma: should it enforce a separate collection despite the absence of source sorting? Would educating the public suffice? Or is there an issue of lack trust preventing future successful implementation?

I am here trying to reason on the ground of a single interview, which thus implies that my argument's scientific value is questionable. Unfortunately, I was

⁴ Yi Xiao, Xuemei Bai, Zhiyun Ouyang, Hua Zheng, Fangfang Xing, *The composition, trend and impact of urban solid waste in Beijing*, Environmental Monitoring and Assessment, December 2007, Volume 135, Issue 1, pp 21-30

not able to gather enough information during my field research and the literature does not provide meaningful conclusions on source-separation in Beijing. However observations also led me to believe that there was very little – if none – source separation at the household level enforced by the municipality. On the other hand, as I will explain later, the informal waste collection system incentivizes separation of some recyclable materials.

When it comes to the production of waste, there is little incentive to consume less or pay attention to the packaging of goods, but there were numerous propaganda posters in Beijing pointing to reducing energy and water consumption, saving paper. The consumer society is not questioned and the municipality has not set goals of household waste reduction.

waste collection and informality

In this section, I intend to analyse the waste collection process in Beijing through Michael Mann's definition of the state's **infrastructural power** (Mann, 1984). Indeed, waste is an interesting lens to analyse the state's **infrastructural power**, defined as “[its] capacity to actually to penetrate civil society, and to implement logistically political decisions throughout the realm” (M. Mann, 1984).

I believe that it is the collection-level of waste management that demands the most extensive infrastructural power from the state. Indeed, collection requires an acute knowledge of your citizens' habits and lifestyle – which translates into, for instance, the size of bin will fit their need and the majority of accommodations, as well as a strong logistic capacity to ensure that both citizens and waste pickers comply with regulations.

In Beijing, there is a dual waste management system whereby rubbish is collected either by the municipality or by informal waste pickers.

public waste management system

The municipality has Beijing residents pay a garbage collection fee, but research argues that “the willingness to pay for solid waste collection and treatment is still low” (Yi Xiao et al., 2007). In order to dispose their waste, residents need to bring it to building or community bins, which are then collected by municipality trucks.

However according to my observations, this system does not penetrate the whole city. Indeed, in the Yonghegong hutong (which is within the 2nd Ring Road, so in Beijing's city centre), I did not find a community bin nor did I see official trucks pick up residents' waste. This points to the idea that the public waste collection system is rather weak.

an “informal” management of waste

According to a 2010 report by UN Habitat⁵, waste pickers provide 50 to 100% of waste collection in most developing cities in the world. In Beijing, it is estimated that 200,000 informal pickers collect and recycle 30% of the city's waste by weight (Li 2015). Indeed, pickers make their living on selling recyclable municipal solid waste to companies that then ensure treat them.

Waste pickers are generally very destitute people who resort to this job to make ends meet. Since it is informal and does not require a *hukou*, a number of waste pickers are migrant workers who perceive it as their only opportunity to make a living in the city.

Some waste-pickers collect recyclables from households and move around on tricycles, others rummage through community bins to find recyclables, and finally those that own trucks are posted in a defined area of the neighbourhood and residents come to sell their recyclable waste to them (see picture at the beginning of the paper). Unlike the municipal service that urban dwellers have to pay for, waste pickers actually buy residents' trash, thus creating a stronger incentive to go through their waste stream rather than through the official one.

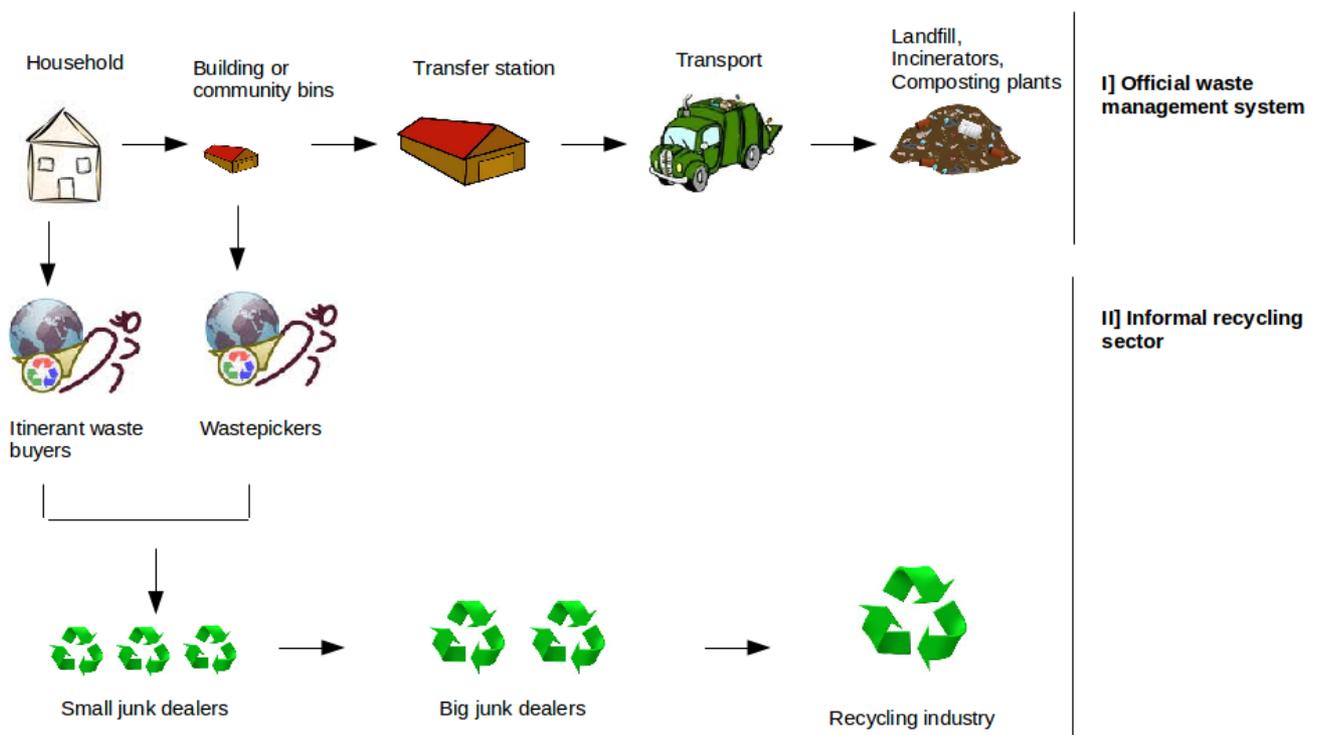


Figure 1. Waste Management in Beijing diagram according to the Global Alliance of Waste Pickers

As shown in the figure above, pickers then sell the collected waste either to a small junk dealer or directly to the recycling markets in Beijing's outskirts.

⁵ *Solid Waste Management in the World's Cities : Water and Sanitation in the World's Cities*, UN Habitat, 2010

The extent of informal waste picking in Beijing reveals the municipality's lack of infrastructural power over the collection and transfer of waste. Indeed, while public policies for source separation failed, the "informal sector" manages to collect and recycle between 20 and 30% of the city's solid waste.

disposal and the displacement of environmental harm

Down the waste stream is the disposal and final treatment of municipal solid waste. I here rely on Judith Shapiro's concept of *displacement of environmental harm*, which is extremely powerful to describe how Beijing disposes of its waste.

strategy: landfill and incineration

Municipal solid waste treatment has different options: incineration, composting, recycling and landfill. The method of choice depends on the share of organic waste in the refuse, which is quantified by its calorific value: waste with high levels of organic waste is more suitable for composting and incineration, for instance. The calorific value of Beijing's waste nearly doubled in the past twenty years, moving from 2,686 kJ/kg in 1990 to 4,667 kJ/kg in 2003 (Yi Xiao et al., 2007), reaching levels that qualify it for composting and incineration.

However this overall trend conceals the significant amount of recyclable materials that are still present in the refuse. Indeed, source sorting of the waste could prevent the combustion of material that could be reused. Reducing the amount of waste going to incineration is a means to mitigate greenhouse gases emissions.

China's goal is to increase incineration and to reduce landfill use, which amounted to 94% of solid waste disposal in 2007 (Yi Xiao et al., 2007). In 2013, Beijing announced its goal to "cut the share of landfills from 70% to less than 30% of the total waste stream" (The Huffington Post, 2013). In order to do so, the Chinese government heavily subsidizes the construction of incineration plants according to an interview.

Landfills are indeed a significant issue at the country-level: while China had 919 landfills that met environmental criteria in 2010, the UK had over 2,000 (Peggy Liu for the Huffington Post, 2013), which necessarily implies that informal dumps emerge to cope with the excess waste. In Beijing in 2004, there were only "22 treatment establishments for solid waste: 5 transfer stations, 13 sanitary landfills, 2 compost and 2 incinerators"⁶, all operating above their treatment capacity.

⁶ Yi Xiao, Xuemei Bai, Zhiyun Ouyang, Hua Zheng, Fangfang Xing, *The composition, trend and impact of urban solid waste in Beijing*, Environmental Monitoring and Assessment, December 2007, Volume 135, Issue 1, pp 21-30

informal landfills

Informal landfills thus emerged to welcome the refuse that could not be managed by the existing infrastructure. In 2006, about half of Beijing's waste was sent to dumps that did not meet sanitary landfill criteria (Xu, 2006). Wang Jiuliang documented the existence of these dumps around Beijing in his 2008 project *Beijing Besieged by Waste*. He spent two years photographing and pinning on a map the illegal dumpsites he encountered, amounting to the astonishing number of over 500 landfills. They formed what he ironically named "Beijing's 7th Ring Road".

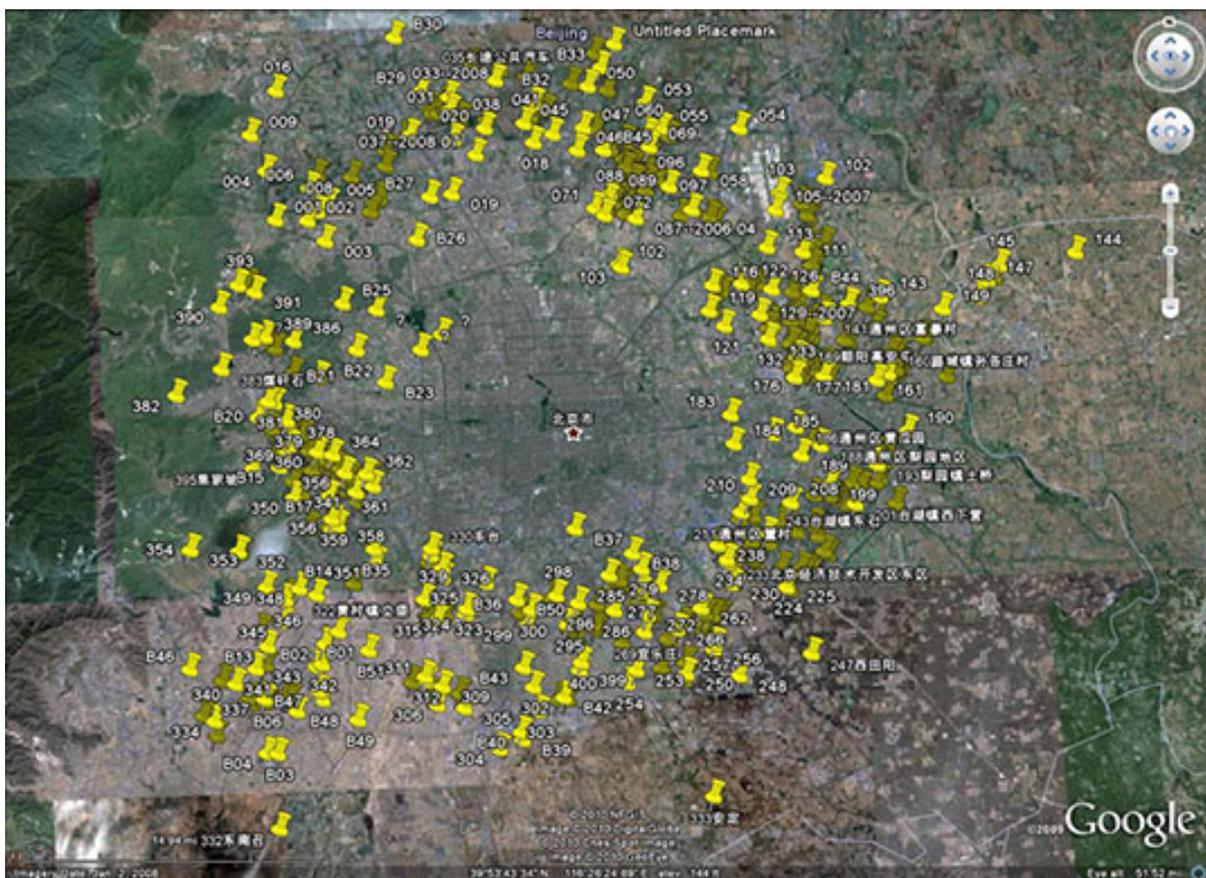


Figure 2. *Beijing Besieged by Waste*, Wang Jiuliang, 2008

The concept of displacement of environmental harm is here useful to analyse the formation of such a ring of waste around the city. Indeed Beijing's Waste Management Authority Department is well aware that waste output far exceeds its infrastructures' capacity, but the fact that there were so little attempts to cope with waste's pace is insightful. The WMAD aims at removing garbage from urban dwellers' sight but the health hazards that open dumps represent further away from the city is not on the institution's agenda.

These dumps even saw the emergence of scavengers literally living on the dumpsite to collect rubbish that could be sold to the recycling markets.

Despite the health hazards they were exposed to, the municipality did not promise to intervene until Wang Jiuliang's wake up call in 2008.

In July 2015, informal landfills still make it to Beijing newspapers' headlines like *Thatsmags* which investigates on the Asuwei landfill, showing that despite pledges of action, the situation remains largely unchanged.

Not only are dumpsites a hazard that is concealed far from the city, but recycling markets were also removed from inner Beijing. According to an interview, they used to be along the 6th Ring Road until 2008 when they were cleared out, most likely in the preparation of the Olympics. It is said that they resurfaced further away from the city but I did not find data on how this displacement affected the recycling economy and its organization.

Both phenomena illustrate the displacement of environmental harm at play in waste management: rubbish, and the transactions that come with it, are pushed away from the city. There is undeniably an issue of space: as the city expands, it is difficult to keep refuse within its walls for sanitary reasons. Yet, the destruction of recycling markets also shows a political will to remove the informal economy, even though there does not seem to exist a fit structure to replace it yet.

conclusion

A city's refuse and the way it is managed reveal urban dwellers' lifestyles and priorities. The ever rising mounts of trash that Beijing produces and disposes of as far away from the city as possible will sooner or later pose a problem that authorities won't be able to ignore. Beijing falls within global trends of waste management that can be observed throughout the world in so-called developing cities. Though I do not agree with the duality between developed and developing countries, I use it as a simplified intellectual tool to expose my argument.

The major difference between "developed" and "developing" metropolitan areas lies in the state's infrastructural power: in "developed" cities, waste-collection and disposal is largely taken care of either by public agents or private companies under the government's scrutiny. On the other hand, in developing countries, waste picking is a mean for social integration for under-privileged populations and newcomers in the city: migrant workers in China, low-casts in India, ...

However when it comes to the displacement of environmental harm, both developing and developed countries share the same practices – only at a different geographical scale. Cities in "emerging" countries tend to dispose their waste at their periphery where the population has little means of actions against the installation of a landfill, thus putting the "refuse burden" on a more marginalized population than the one in the city centre. Developed countries have developed a somewhat more sophisticated system of displacement,

which consists in exporting their waste: 70% of the world's annual 500 million tons of e-waste is shipped to China (Peggy Liu in the Huffington Post, 2013).

references

books

GANDY, Matthew, *Recycling and the Politics of Urban Waste*, Earthscan Publications Limited, London, 1994

SHAPIRO, Judith, *China's Environmental Challenges*, Polity, 2012

reports

Solid Waste Management in the World's Cities : Water and Sanitation in the World's Cities, UN Habitat, 2010

conference

GOLDSTEIN, Joshua, *The City Besieged by Garbage: Politics of Waste Production and Distribution in Beijing*, UC Berkeley, 2011

articles

ABARCA GUERRERO, Lilliana, Ger Maas, William Hogland, *Solid waste management challenges for cities in developing countries*, Waste Management No. 33, 2012

BOUANINI, Samiha, *Assessing Municipal Solid Waste Management in China*, World Journal of Social Sciences Vol. 3 No. 4, July 2013

CHAN, Kam Wing, *China, Internal Migration*, in Immanuel Ness and Peter Bellwood, *The Encyclopedia of Global Migration*, Blackwell Publishing, 2013

KAO, Shih-Yang, *Beijing Besieged by Garbage: Photographing "Year One": Wang Jiuliang and the Reign of Garbage*, Inaugural Issue of Cross-Currents E-Journal (No. 1), 2011

MANN, Michael, *The Autonomous Power of the State: its Origins, Mechanisms, and Results*, European Journal of Sociology, 1984

XIAO, Yi, Xuemei Bai, Zhiyun Ouyang, Hua Zheng, Fangfang Xing, *The composition, trend and impact of urban solid waste in Beijing*, Environmental Monitoring and Assessment, December 2007, Volume 135, Issue 1, pp 21-30

XU, Haiyun, *All the Waste in China*, Waste Management World, 2006

newspapers

LIU, Peggy, *If Trash Is Gold, China Is Very Rich*, The Huffington Post, August the 6th, 2013

movies

WANG, Jiuliang, *Beijing Besieged by Waste*

WILLIAMS, Sue, *China: A Century of Revolution, 1989-1997*

websites

LI, Judy, *Ways Forward from China's Urban Waste Problem*, The Nature of Cities, 2015

<http://www.thenatureofcities.com/2015/02/01/ways-forward-from-chinas-urban-waste-problem/>

The Global Alliance for Waste Pickers <http://globalrec.org/>