

# – **CONTESTING ECO-URBANISM FROM BELOW:** The Construction of 'Zero-Waste Neighborhoods' in Chinese Cities

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## **Abstract**

*How should we understand the recent rapid spread of eco-urbanism around the world and its move into the mainstream? This understanding has become increasingly dominated by narratives of the urban sustainability fix, which stresses the logic of capital accumulation. Within the broader structural processes of ecological modernization, such as transitioning to low-carbon growth, consideration of—let alone interest in—the diversity of local politics that shapes the practice and forms of contestation of eco-urbanism has often been relegated to a position of secondary importance. Meanwhile, investigations of the relationship between the growth of climate governance and grassroots environmental activism often ignore space production as an underlying process of political-economic transformation. Drawing on a detailed case study of the prevalence of zero-waste neighborhood experiments in many Chinese cities, which have recently become obsessed with low-carbon growth, this article underscores the potential of grassroots activism to change the nature, dynamics and landscape of eco-urbanism significantly. On the basis of the intriguing evidence presented here, it calls for a new understanding of eco-urbanism: one which is more attentive to the diversity, heterogeneity and contextual sensitivity of urban change at the grassroots level.*

## **Introduction**

Over the past decade, as governments around the world have begun to adopt concepts such as the 'eco-city' and 'smart city' in relation to environmental governance, the concept of eco-urbanism has likewise gained global momentum, both as a fashionable ideology and as a practice of urban transformation (Caprotti, 2014). On a wide range of scales, from macro-level urban planning and design for large cities with projects to house hundreds of thousands of residents (Joss, 2010) to sustainable housing projects (Golubchikov and Badyina, 2012) and the building of neighborhood gardens (Krusky *et al.*, 2015; McClintock *et al.*, 2016), eco-urbanism has gained a salient position in political discourses focusing on the environment and on economic and technological transitions.

The mainstreaming of eco-urbanism around the world is welcomed by many as a major step forward towards control of the perceived climate change (World Bank, 2010). Nonetheless, a number of concerns and questions have been raised regarding the reasons for the growing prevalence of eco-urbanism, the legitimacy of treating the city as a form of environmental technology, and the implications of the eco-urban turn for social equality and justice.

The normative reading of the eco-urban turn has been challenged by critical urban scholars who see the proliferating—and often globalized—actions of climate control as the project of social elites, brought about to create opportunities for growth. It has been argued that the recent rapid spread of eco-urbanism worldwide and its move into the mainstream reflects 'attempts to rework both the environmental and socio-technical characteristics of capitalist urbanization' (Gandy, 2015: 152). According to

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such narratives, social elites are using eco-urbanism for the purpose of helping to create new businesses and to justify urbanization and urban regeneration (see e.g. Hodson and Marvin, 2010; Cugurullo, 2013; Caprotti *et al.*, 2015). Furthermore, the vision of the urban future that eco-urbanism would bring about, according to these narratives, is a rather gloomy one. It is believed that those who would benefit the most from such place-making practices are most likely the already privileged few.

Although the critical urban scholars' reaction to the eco-urban turn has brought into focus the often hidden and yet important power relationships that shape and are shaped by eco-urbanization, much of its articulation has been based upon the assumption of an overly deterministic and unilateral relationship between eco-urbanism and the rise of climate governance. Other possible social and political forces are either completely ignored or dismissed as subservient to the top-down logic of low-carbon growth. Environmental struggles, for one, have always been a non-issue in popular narratives. The effect of this has been to downplay important stakeholders at the grassroots level, if not to victimize them. Moreover, existing analyses have tended to ignore what Leitner and Sheppard (2016) have called the 'variegated nature of urbanization', instead homogenizing the various possible meanings of the eco-urban turn within different political economies.

In this article we call for a perspective from the ground up, one which is more attentive to the diversity, heterogeneity and contextual sensitivity of urban change. We argue that the relationships between eco-urbanism and climate governance are not as straightforward, unilateral or reinforcing as popularly conceived. Instead, grassroots activism and practices which often involve non-state actors may challenge governmental/organizational solutions and hence significantly change the nature, dynamics and landscape of eco-urbanization. This is to open up a theoretical space for the voices of important stakeholders at the grassroots level, with the possibility of the relationship between eco-urbanism and climate governance turning antithetical.

The article elaborates the argument by drawing on a case study around a fever of zero-waste neighborhood construction that has recently swept across Chinese cities. In China, the 'neighborhood' is an institution of urban governance whose main function is to help the state implement policy programs and to deliver welfare services to urban residents (Ren, 2013). Since the late 2000s, a re-imagining of the neighborhood as an institution of environmental governance has emerged, with over a dozen neighborhood-focused waste-sorting experiments being implemented in major municipalities that include Beijing, Shanghai and Guangzhou (see Table 1 and Figure 1). Our research has found that this profound process of eco-urbanization has been driven primarily by a nationwide and bottom-up environmental activism that challenged the state's top-down imposition of waste-to-energy (WTE) incineration. Given the fact that WTE incineration has been promoted by the state as a technology for low-carbon transition, the zero-waste neighborhood (hereafter ZWN) construction fever has presented itself as a significant form of grassroots environmental activism illustrative of the heterogeneous nature of the eco-urbanization process.

Indeed, in the broader literature on climate governance, there have been calls to focus on the importance of grassroots environmental activism. It has been argued that climate policy initiatives are often shaped by diverse bottom-up actions and the messages of grassroots organizations (Doyle, 2009; Rootes *et al.*, 2012). Adding to this line of thoughts, we argue that grassroots activism's shaping of climate governance is oftentimes not only a political process, but also a spatial process. In our China story, the construction of ZWNs has helped grassroots anti-incineration campaigners to justify the practicality of their claims and ideals.

This article is organized in four further sections, beginning with a clarification of the key definitional and methodological issues of this research. The following section ('Eco-urbanism, global climate control and local environmental struggles') presents

**TABLE 1** The zero-waste neighborhood (ZWN) construction fever in Chinese cities

Year	Project Name (Project Organizer)	Location	Type of Project Organizer	No. of Neighborhoods Covered (start year/present)
2009	<b>Zero-waste Neighborhood</b> (Friends of Nature, Liulitun Anti-incineration Campaign)	Beijing	ENGO, local community	1/0
2010	<b>Green Family</b> (Panyu Anti-incineration Campaign)	Guangzhou	Local community	3/0
	<b>Neighborhood Waste-sorting Pilot Project</b> (Beijing Municipal Government)	Beijing	Government	600/1,400
2011	<b>Green House</b> (Asuwei Anti-incineration Campaign)	Beijing	Local community	1/0
	<b>Neighborhood Waste-sorting Pilot Project</b> (Shanghai Municipal Government)	Shanghai	Government	1,080/2,130
	<b>Neighborhood Waste-sorting Pilot Project</b> (Guangzhou Municipal Government)	Guangzhou	Government	28/421
	<b>Green Earth</b> (Green Earth Company)	Chengdu	Private business	28/421
	<b>Community Waste-sorting Project</b> (Aifen Environmental Protection Center)	Shanghai	ENGO	3/>100
2012	<b>Community Waste-sorting Project</b> (Eco-Canton)	Guangzhou	ENGO	2/4
	<b>Community Waste-sorting Project</b> (Global Village)	Shanghai	ENGO	2/22
	<b>Community Waste-sorting Project</b> (Guizhou Gaoyuan Environmental Resources)	Guiyang	Private business	NA/11
2013	<b>Cottage for the Environment</b> (Xicun Street Neighborhood)	Guangzhou	Local community	1/1
	<b>Sustainable Neighborhood</b> (Center for Social Innovations)	Beijing	ENGO	4/4
	<b>Green Account</b> (Friends of Nature)	Beijing	ENGO	2/2
	<b>Spring Soil</b> (Friends of Nature)	Beijing	ENGO	1/1
2014	<b>Community Waste-sorting Project</b> (Guihuayuan Neighborhood)	Shanghai	Local community	1/1
	<b>Waste for Goods</b> (NJZD Environmental Technology)	Nanjing	Private business	NA/280
	<b>Longshan Green Post</b> (Longshan Neighborhood)	Hangzhou	Local community	1/1

SOURCES: Global Village (2012), China Zero-waste Alliance, (2014; 2015), and various media sources

our critical engagement with ongoing theoretical attempts to understand the nature, dynamics and landscapes of the recent eco-urban turn in the practices of urban planning and development. The third part ('Low-carbon growth, anti-incineration activism and the fever of zero-waste neighborhood construction') interrogates the controversial theoretical issues through an empirical case we have investigated, while the final section ('The heterogeneous nature of China's eco-urbanization process') presents the findings of our research. The implications of these findings for further enquiry into the diverse patterns and processes of eco-urbanization among different world regions are summarized and elaborated at the end.

### Definitional and methodological issues

The concept of eco-urbanism has been defined and used in several different ways in the existing urban studies literature. It could refer to a model of urban development (see e.g. Hodson and Marvin, 2010; Caprotti, 2014; Chang, 2017) or a movement in urban



**FIGURE 1** Location of the Chinese cities where the zero-waste neighbourhood experiments identified in this research were carried out (source: produced by the authors)

planning and design (e.g. Caprotti, 2015; Sharifi, 2016). This study adopts the definition used by Mathew Gandy and understands eco-urbanism as the ideological and material processes of social change (Gandy, 2015; see also Adams, 2014).

Obviously, this definition goes beyond the classic definition used by Hodson and Marvin, which is mainly concerned with the construction of comprehensive and integrated responses to infrastructure that connects multiple networks. Initiatives with a single-issue focus such as energy-saving technology applications or waste reduction and recycling programs would also be considered to be important forms of eco-urbanism. Nonetheless, this definition of eco-urbanism is distinct from those urban environmental initiatives including the Not-In-My-Backyard (NIMBY) protests and campaigns that do not discursively construct the urban space (e.g. neighborhood, district, city) as an environmental solution.

The current research interrogates eco-urbanism's recent move into the global mainstream by examining its adoption and spread in Chinese cities. China's enthusiasm for eco-urbanism has already been well documented and critically evaluated (Caprotti *et al.*, 2015; Chang, 2017). During the short period between 2006 and 2011, over 300 eco-city and low-carbon city projects were either proposed or carried out in the country (CSUS, 2011). In this second decade of the new millennium, more and more new eco-urbanism concepts such as the 'resilient city', 'smart city' and 'sponge city' have enjoyed growing popularity among planners, designers, policymakers, central and local

officials and communities. Our research has been carried out essentially to examine the distinct nature and dynamics of the recent eco-urban turn in China's urban planning and development. How do we characterize the Chinese eco-urbanization process against what has already been elucidated elsewhere? How and why has eco-urbanism as an ideological and material process of social change found its way into and widely circulated among the Chinese cities under a distinct transitional political economy? What are the political and social ramifications of the eco-urban turn in Chinese urban planning and development?

In this article, we address the aforementioned questions by examining the ZWN fever that has recently affected many Chinese cities. We have chosen the ZWN initiatives for a focused study primarily because empirically this happens to be one of the most popular, influential and definitely fashionable initiatives currently being promoted in Chinese cities. Theoretically too, this is a recent local practice illustrative of the negotiation, contestation and mediation taking place among the key stakeholders involved in the eco-urban turn in planning and development. Moreover, we have found this eco-urbanization process peculiar because it can hardly be explained by the established top-down logic of climate control. Most of the ZWN experimental projects involved locally initiated programs or interventions that encouraged the practices of waste reduction and recycling among urban residents. These locally driven and practice-centered projects can hardly be described as growth projects. In this research, we thus further put forth the following three empirical questions: How and why has this intriguing practice of grassroots environmental activism as an important part of the eco-urbanization process come into being? Who are the main actors responsible for this practice and what are their motives? And what is the relationship between this fever of ZWN construction and top-down state advocacy for climate control?

Our empirical research was conducted from 2011 to 2018 through a multi-sited and mixed-method study designed and carried out to address the issues raised above. Data were collected through archival research, textual and discourse analysis, semi-structured and open-ended interviews and participatory observation in three cities: Beijing, Shanghai and Guangzhou. The archival materials included government publications, reports by environmental non-governmental organizations (ENGOS), press coverage, related online resources and academic publications. We examined these documents to assess the rationale and thinking behind the proposal and implementation of ZWN experiments. We also interviewed over a dozen urban residents, environmental activists and business people who were involved in the ZWN projects.<sup>1</sup> To ensure anonymity, pseudonyms are used in the article.

### **Eco-urbanism, global climate control and local environmental struggles**

With the expansion of the urban fabric across the globe and the challenges of what scholars such as Merrifield (2012) term planetary urbanization (see also Brenner and Schmid, 2014), concerns over the unsustainability of contemporary processes of urbanization have been voiced across a variety of disciplines, raising important questions with regard to the interconnections between urbanization and the transformation of

1 We took a snowball sampling method to recruit interviewees for this research. The very first group of people we recruited were staff and volunteers at the environmental NGOs in Beijing that were involved in the proposal, design and implementation of ZWN projects. These ENGOS include Friends of Nature, Green Beagle and Global Village. Through these connections we were later able to identify another two important groups of players in the ZWN construction fever—urban communities and entrepreneurs in the business of waste recycling—and set up interviews with them. For the urban communities, we visited Asuwei Anti-incineration Campaign in Beijing and Panyu Anti-incineration Campaign in Guangzhou. For the entrepreneurs in the recycling business, we held interviews with Green Earth (a Chengdu-based company) and Lucky Homeland (based in Beijing). Most of our interviews were conducted alongside a visit to the neighborhood where a zero-waste program had been implemented. All the interviews were structured around a set of open-ended questions to allow interviewees to provide more information such as their feelings, attitudes and understanding about the experiments in question.

economies, societies and environmental systems (While *et al.*, 2010; Reckien *et al.*, 2017). More recently, the study of urban sustainability has highlighted the sudden prevalence of the once peripheral idea of eco-urbanism that proposes to see the city as a solution to global environmental problems (Hodson and Marvin, 2010; Caprotti, 2014). What this body of research shows is that eco-urbanism has now become a global trend in urban planning, design and policymaking, with new settlements labelled as ‘eco-cities’, ‘low-carbon cities’, ‘smart cities’ and ‘resilient cities’ emerging across heterogeneous geographical spaces.

While writing about eco-urbanism has primarily been informed by the theory of ecological modernization that sees technological innovation as an equalizer for economic growth and environmental preservation (Roseland, 1997; Kenworthy, 2006; Yu, 2014), since the late 2000s a more critical approach to eco-urbanism—carried out by critical urban scholars—has started to emerge.<sup>2</sup> Critical urban scholars have re-built the eco-urbanism literature around the earlier intellectual foundation in urbanism research that concerns comprehensive issues about ways of life in cities, including urban responses to climate change (Bulkeley, 2010). These scholars see eco-urbanism as a product of the emerging, and often globalized, regimes of climate control. They observed that since the early 2000s a new claim to ecological dominance based upon the reduction of greenhouse gas emissions has gradually replaced the previous discourse of sustainable development. This new fashion of global climate governance requires governments across the world to play a proactive role in managing the flows of carbon whilst investing in low-carbon social and physical infrastructures. To the political economists, this transformation in environmental governance is nothing more than a ‘sustainable fix’ in response to the crisis of capital (over)accumulation, carried out by the social elites mainly for the purpose of safeguarding growth trajectories (Bulkeley *et al.*, 2014; Caprotti, 2014).

In other words, the popular project of a ‘low-carbon’ transition that has been pursued around the world has been perceived more as a project of development. The narratives go further to suggest that although the territorial form of climate control policy is most clearly expressed at the international level (where countries have set different emission limits following negotiations over the capacity for change and existing economic and social circumstances), it is at the urban and regional levels that international and national carbon-control regimes have become prominent (While *et al.*, 2010). As a result, urbanization and urban regeneration projects are increasingly treated as ‘experiments’ in which new carbon-control technologies, architectures, urban designs and environmental-economic reforms are put to the test (Hodson and Marvin, 2010; May, 2011; Cugurullo, 2013; Adams, 2014; Bulkeley *et al.*, 2014; Caprotti *et al.*, 2015).

Although climate change and carbon control are recognized by some as features added to the process of eco-urbanization (Joss and Molella, 2013; Chang *et al.*, 2016; De Jong *et al.*, 2016), much of the emphasis in current eco-urbanism enquiry has been placed on the climate regime’s top-down logic of capital over-accumulation, whereas local social, cultural and environmental forces are treated as a matter of secondary importance. Thus far, only a handful of case studies have paid attention to possible bottom-up, localized forces (Kronsell, 2013; Moessner, 2016). The result of this tendency is an overly deterministic interpretation of eco-urbanism’s spread and its characteristics. This lack of attention to possible casual relationships in the social, political and cultural arenas is particularly intriguing, given the widely recognized fact that the utopian idea of the eco-city has its roots in the 1970s counterculture movement. Until this awkward conceptual vacuum has been filled, no established proposition that eco-urban projects

2 The theory of ecological modernization was developed in the 1980s as a response to the failures of the old pollution control policies of the 1960s and 1970s. It rejects the zero-sum perception of the environment versus economic growth and replaces it with a perspective of the possible harmonization of industry with ecology (Andersen and Massa, 2000).



are growth projects to fix the crisis of capital accumulation can be free of the accusation of overstatement or incomplete interpretation.

Another effect of emphasizing the top-down logic of climate control has been to downplay the fact that eco-urban development often involves the interests of a number of different stakeholders. In the political economists' narrative, the state and corporations (especially those with a national or global influence) are the two dominant players. This may indeed be the case for the development of flagship eco-urban projects. However, as the research carried out by proponents of ecological modernization now increasingly suggests, eco-urban projects come in various shapes and sizes on various scales, from the city level all the way down to the district, neighborhood and even street levels (Saldivar-Tanaka and Krasny, 2004; Lawson, 2005; Pearson and Pearson, 2010; Hunter and Brown, 2012; Krusky *et al.*, 2015; McClintock *et al.*, 2016). It would therefore be logical to ask about the roles played by various actors and agents other than the state and large corporations, including urban communities, ordinary residents, civil organizations, non-governmental organizations (NGOs) and consumers. It may be the case that the actions of these stakeholders are not as strong or powerful as those of the state and large corporations. Nonetheless, any story about the dynamics of eco-urbanism and climate governance would be partial and incomplete at best—and biased and misleading at worst—if the interests, concerns and struggles of the many stakeholders other than the state and large corporations were not taken into account.

This article therefore adopts a more bottom-up approach to reveal the diversity, heterogeneity and contextual sensitivity of the practices of eco-urbanism. We argue that a top-down and unilateral relationship between climate control and eco-urbanism should not be taken for granted. Instead, it needs to be regarded as a hypothesis for rigorous empirical testing. Moreover, rather than positioning the sustainability fix narrowly as a top-down imposition, it is necessary to examine how it is contingent upon negotiation within particular local-national contexts. Under these terms, it is necessary to examine eco-urban projects that are smaller in scale or instigated by non-elite actors in society. From this perspective, such projects should not be dismissed as residual to the wider structural forces of carbon control. Instead, they need to be treated seriously as resources which help to contest established understandings about eco-urbanism's global spread and mainstreaming.

The scholarship on Chinese eco-city development (Chien, 2013; Hu *et al.*, 2015; Chang *et al.*, 2016; Flynn *et al.*, 2016) emphasizes the role of the state in the shaping of the emerging low-carbon urban landscape. It has been found that the growing difficulties with low-wage export-oriented manufacturing during the 2000s drove the Chinese central leadership to consider alternative models of development, including low-carbon growth<sup>3</sup> (Wu, 2010; 2015; Schreurs, 2017). This growth imperative subsequently propelled the central Party leadership to implement various eco-urban schemes (i.e. 'eco-city', 'low-carbon city' and 'low-carbon eco-city') to support the dissemination of low-carbon technologies at the local level. The local government, on the other hand, is understood as the 'entrepreneur city' that actively proposes and carries out eco-city projects to improve local economic competitiveness. According to such narratives, the spread of eco-urbanism is a state-led process, a process of urban sustainability fixes, and a homogeneous process that can be comprehended through the study of just a few cases.

3 Since the mid-2000s, the Chinese central leadership has taken greater efforts to tackle climate change. Notably, it introduced new policy frameworks to facilitate the country's low-carbon transition. Two of the most important of these are the 11th Five-Year Plan (2006-2011), which introduced the 'circular economy' as a goal for the nation's economic and social development, and the National Climate Change Program (launched in 2007), which placed an obligation on the government to carry out a range of greenhouse gas emission mitigation efforts. As a further step, the central leadership has undertaken policy initiatives to encourage the development and widespread introduction of carbon-cutting technologies. These measures have included various tax rebates and subsidies for businesses and individuals investing in clean energy. For detailed discussions, see Andrews-Speed (2012) and Lewis (2013).

However, based on the findings of the research that we conducted in Chinese cities, we argue, first, that the established relationships between eco-urbanism and climate governance are not as unidirectional, reinforcing or intertwined as popularly conceived. Instead, grassroots environmental activism may significantly change the nature, dynamics and landscape of eco-urbanism. As a critical engagement with current debates both conceptually and methodologically, we suggest an alternative view that sees eco-urbanism as a localized, socially as well as spatially sensitive practice and struggle to claim the mantle of environmentalism usually reserved for those who have control over and access to the urban space. This is to see eco-urbanism as an ‘approach’ towards environmentalism or a way of achieving certain ends by greening the urban space. No matter whether it is building an eco-city, creating a rooftop food garden or turning a community into a ZWN, it is always an act of telling others about one’s values and appropriation of the environment. This conceptualization does not reject the existing framing of eco-urbanism as a place-making project or solution to the growth crisis. Nevertheless, it does suggest an alternative perspective apart from the prevailing theoretical framework.

Our second argument is that eco-urbanization is a heterogeneous process. In methodological terms, many of the eco-urban narratives are based on a presumption of the existence of a worldwide ‘eco-city phenomenon’ whose complexity and dynamics can be unpacked through performing one single case study or a comparative study of a few selected cases. However, as Leitner and Sheppard (2016: 230, emphasis added) have recently suggested, it is necessary to take seriously ‘the possibility that no single theory suffices to account for the *variegated nature* of urbanization and cities across the world’. And for Peck (2015: 162–3), the construction of an urban theory must ‘occur across scales, positioning the urban scale itself, and working to locate cities not just within lateral grids of difference, in the “planar” dimension, but in relational and conjunctural terms as well’ (see also Robinson and Roy, 2016). In other words, what is really needed is a contextual sensitivity towards different meanings of the eco-urban turn in different political economies, and to become more attentive to spatial-temporal contingency and situatedness in the theorization of the current eco-urban turn.

In the broader literature about climate governance, environmental activism is often thought of as a force that drives institutional change. For Doyle (2009), climate policies should not be understood in isolation from grassroots organizations’ creative protest actions and messages. For Rootes *et al.* (2012), grassroots activism from without the formal political process is critical in sharpening the focus of formal political actors and increasing their willingness to act. In this research, we add space into this theoretical framing by showing how a new imagination of the ‘neighbourhood’ has been generated in China by a grassroots activism that is challenging the state’s low-carbon transition project. Environmental activism as a force that shapes climate governance therefore often has profound spatial implications.

In what follows, we examine the pursuit of a low-carbon transition in China, subsequent anti-incineration activism, and the fever of ZWN construction. Woven into the analysis are evidence and insights concerning the various stakeholders at the grassroots level, their different interests, interactions and contestations, and their effects upon the ongoing process and emerging landscape of eco-urbanization.

### **Low-carbon growth, anti-incineration activism and the fever of zero-waste neighborhood construction**

One of the landmark events in the recent history of global development has been the dramatic transformation of China’s economy—both its integration into an increasingly globalized world and the phenomenal urbanization of its population. These changes have had, and will continue to have, far-reaching impacts on the planet that



we all share. Because the Chinese economy is now firmly integrated into the world, any ideology and practice of ecological modernization initiated in the Western world has soon found its way through the bamboo curtain onto Chinese territory. The policy of low-carbon growth is no exception, although it has taken on some intriguing ‘Chinese characteristics’. One peculiar aspect of China’s current low-carbon transition project has been to promote waste-to-energy (WTE) incineration as a climate protection technology. In China’s first National Climate Change Program (NCCP), announced in 2007, the development, dissemination and localization of incineration technology was described as a ‘measure of green-house gas (GHG) mitigation’ that the government vowed to undertake.<sup>4</sup> Soon after, the central government classified incineration as a source of ‘renewable energy’, entitling incinerator operators to tax rebates and subsidies for every metric ton of waste burned and every unit of electricity generated.<sup>5</sup> Furthermore, also in 2007, the central government began to set regional and national incineration targets for the nation’s Municipal Solid Waste (MSW) Treatment Five-Year Plans, propelling local governments to adopt the technology.<sup>6</sup>

The relationship between eco-urbanization and ecological modernization appears particularly antithetical when we examine how the locally driven and bottom-up ZWN construction fever presented in Table 1 interacts with the state’s top-down imposition of WTE incineration. One important feature shared by the 12 community- and ENGO-initiated ZWN programs has been a strong critique of the state’s tendency to see incineration simply as a ‘method’ of waste management. The main argument that has been drawn by these initiatives is that because burning unsorted waste has been proven to increase the risk of dioxin emissions, incineration should instead be considered only as the ‘final step’ in a comprehensive and integrated waste management process predicated on waste reduction and sorting. The Green Family project carried out by residents of Panyu District in Guangzhou, for instance, was organized as part of a series of public demonstrations and involved depositing large quantities of ‘incineration unsafe’ items which had been collected through the program in front of Guangzhou City Hall.<sup>7</sup>

The rise of this anti-incineration activism in China reflects how the central state’s promotion of WTE incineration has profoundly changed the mode of waste management in Chinese municipalities, and how the shifting local environmental governance has transformed some Chinese urban residents into citizens. While landfill had been the primary method of municipal waste management in China at the start of the reform, the mid-2000s witnessed the emergence of a wave of WTE incinerator construction across the country, with 154 such facilities being built between 2007 and 2016. (In comparison, China commissioned only 66 incinerators between 1998 and 2007.)<sup>8</sup>

With these new facilities, the country’s daily incineration capacity nearly quintupled, from 44,682 metric tons in 2007 to 219,080 metric tons in 2015. The rationale for local officials to construct incinerators was twofold. First, the city’s landfill sites were either full or close to capacity. Therefore incinerators, which can burn waste for decades, are required to avoid the cities becoming ‘besieged by waste’. Second, incineration is more attractive than landfill because it requires fewer land resources, which have

4 See in particular pages 30 and 46–47. The NCCP is accessible online (at <http://en.ndrc.gov.cn/newsrelease/200706/P020070604561191006823.pdf>).

5 Renewable Energy Law of the People’s Republic of China released 28 February 2005 by the State Council. Available online (at [http://english.gov.cn/archive/laws\\_regulations/2014/08/23/content\\_281474983043598.htm](http://english.gov.cn/archive/laws_regulations/2014/08/23/content_281474983043598.htm)).

6 The National MSW Treatment Five-Year Plans are outlines of objectives and goals for building the country’s MSW treatment infrastructure. They are prepared by China’s State Council and released every five years.

7 Likewise, the Asuwei Campaign in Beijing—which organized the Green House program in 2011—released a policy-advocacy report entitled ‘Life and Death Decision of the Environment of Chinese Cities’, calling for investment in municipal recycling infrastructure (Asuwei Campaign, 2009).

8 Information from National Data is available at <http://data.stats.gov.cn/> (accessed 13 March 2017). China commissioned its first incinerator in 1988, in Shenzhen.

become increasingly scarce due to rapid urbanization. In addition, many have pointed to the lucrative revenue that local governments typically receive through such projects as being a motivating factor. The Hong Kong-based news magazine, *Asia Weekly*, explained that since incineration equipment is imported and its installation needs to be sanctioned by local government, there are substantial profits for local Chinese officials to gain, often personally, from these incinerator projects.<sup>9</sup> Moreover, with an average of 8 to 12 years to earn back the cost of building an incinerator, along with local build/operate/transfer (BOT) or build/own/operate (BOO) licensing that is normally granted for 25 to 30 years, incinerator investors can expect 13 to 22 years of comfortable profits (Yu, 2012). As some business insiders have commented, China's waste incineration sector has entered its 'golden era' (*ibid.*; see also Johnson, 2013).

Across the country, the rapidly expanding waste incineration capacity has provoked protests and opposition campaigns, mostly by local communities in fringe areas outside cities where such projects have been situated. Several dozen 'mass incidents' involving mostly middle-class homeowners in communities opposed to the construction of incinerators have been recorded in a number of Chinese cities.<sup>10</sup> Typically, the local communities' primary concern has been over the public health impact of incineration—particularly the high risk of dioxin emissions (Johnson, 2013; Lang and Xu, 2013). Although officials and industry representatives repeatedly assured the public that incinerator emissions can be controlled within 'safe' levels, often the perception of health risks has been enough to mobilize public demonstrations against incinerator projects. Many residents interviewed within Beijing and Guangzhou simply did not believe that local governments could be trusted to operate incinerators. An anti-incineration campaigner from Beijing's Liulitun neighborhood, for example, asked 'If the incinerator will be safe, why didn't they propose to build it in the city center?'<sup>11</sup>

Previously, incinerator projects were opposed by local residents primarily due to *siting* issues (Johnson, 2013; Lang and Xu, 2013; Wong, 2016). In such NIMBY-styled campaigns, local residents tended to base their opposition primarily on mistakes made or some form of misconduct during the site selection process by the local government. Their overwhelming objective was to prevent an incinerator from being built locally, and these campaigns seldom raised or engaged in wider debates over urban environmental governance such as the reform of a city's MSW management system (Lang and Xu, 2013).

The emergence of more policy-advocacy styled anti-incineration campaigns in the late 2000s was primarily driven by a drastic change in government tactics in regard to incineration protestors. In the late 2000s, as conflicts over incinerator construction continued to escalate and spread, officials in bigger municipalities such as Beijing and Guangzhou started to adopt a much softer line *vis-à-vis* local anti-incineration protestors (Johnson, 2013; Wong, 2016). Instead of sticking to the old ways of cracking down on public demonstrations or harassing protestors, they began to focus more on policy persuasion. This included citing expert opinion and making reference to successful experiences from advanced foreign countries such as Japan. One such example was Beijing's inviting anti-incineration campaign leaders to visit incineration plants in Tokyo and Osaka in an effort to overcome their concerns.

With officials now turning unusually 'rational' and patient, the onus increasingly fell on the local incinerator opponents to demonstrate that their concerns were genuine. This was because the pejorative NIMBY label had begun to spread, and it rendered any location-specific reasoning as being driven by localized self-interest. The tremendous amount of pressure to defy NIMBY accusations eventually propelled some local campaigners to search for alternatives. While some were drawn to the

9 'The chain of profits behind China's incineration' (*Asia Weekly*, 2010).

10 According to *Asia Weekly* (2010), in 2009 alone 9 anti-incineration protests occurred in 7 different cities.

11 Interview BJ160703.

more economic-centric solutions such as exporting waste to China's less developed regions (an idea which found many supporters),<sup>12</sup> many campaigns eventually adopted environmentalism-informed methods for the treatment of municipal solid waste.

The process of some of the anti-incineration campaigns moving towards a more policy-advocacy approach was facilitated by Chinese environmental NGOs. The Chinese NGOs usually refrained from engaging in grassroots protests and demonstrations so as to avoid confrontation with the government. Therefore, when conflict over incineration escalated between urban residents and local governments, most of the NGOs focused on more politically innocent activities such as environmental education to develop environmental awareness. For local campaigners, such a reputation was exactly what they needed. As one Asuwei campaigner explained, 'Nothing could have helped to defy those NIMBY accusations better than having environmental organizations standing next to the community'.<sup>13</sup> Another campaigner reasoned along similar lines by saying 'we wanted people to realize that what we were fighting about was a regional, national, or even global issue instead of exclusively a local one'.<sup>14</sup> Hence by adopting a recycling-centered policy-advocacy campaign strategy, many local campaigns had indeed acquired certain forms of 'backing' from environmental organizations. The Liulitun Campaign set up in Beijing was able to have Friends of Nature (FON) implement the ZWN project in one of the area's neighborhoods. The Panyu campaigners were invited by several NGOs to give seminar talks about their experiences in community-based waste reduction. The implementation of Asuwei Campaign's Green House project was greatly assisted by FON and another Beijing-based environmental organization called Green Beagle, both of which mobilized volunteers to support the operation of the Green House.

The late 2000s and early 2010s witnessed the nation's three leading policy-advocacy styled anti-incineration campaigns—Beijing's Liulitun and Asuwei Campaigns and Guangzhou's Panyu Campaign—starting either to undertake or to support a ZWN experiment in their own communities. In 2009, the Liulitun Campaign in Beijing started to collaborate with FON, China's largest environmental NGO, on the implementation of the ZWN project. This project involved regular monthly 3R (reduce, recycle and reuse) campaigns in one of the Liulitun neighborhoods. On the 3R campaign days, FON's volunteers would collect recyclables (including paper, plastic bottles and aluminum cans) from the neighborhood's residents. To encourage resident participation in the project, a gift reward program called the Green Account was later established.

The Green Family project established by Guangzhou's Panyu Campaign in 2010 was China's very first community-implemented ZWN experiment. Like the FON project, the Green Family ran on the basis of traditional 3R campaigns in the area's neighborhoods, but it relied more on moral persuasion than reward incentives to attract resident participation.

The most well-known local ZWN campaign, however, was Asuwei Campaign's Green House project in Beijing. This project involved setting up a one-floor recycling workstation equipped with a dehydration machine and a large waste-sorting table, among many other features. Campaigners claimed that this model workstation could help communities to streamline the recycling process.

The rationale for implementing ZWN programs was to prove to the public that municipal recycling could be a practical solution to waste problems. One of the major challenges faced by such campaigns, however, was how to convince others that this care for the environment by locals was genuine. One Liulitun campaigner

12 Interview BJ160703.

13 Interview BJ160802.

14 Interview BJ160812.

recalled the campaign being criticized by newspapers for ‘just “talking the talk”’.<sup>15</sup> ZWN experiments were being carried out by policy-advocacy local campaigns to claim the environmentalist tag. By engaging themselves in waste-reduction practices, they hoped to demonstrate that they genuinely cared for the environment. The relationship that eco-urbanism has with environmentalism, therefore, is a dialectical one. While environmentalism can provide a justification for accumulative projects (claiming the eco-city as an ‘environmental solution’, for example), practicing eco-urbanism can justify the environmentalist claim as well.

Hence our story thus far has shown that eco-urbanism’s relationship to processes of low-carbon transition is not mutually reinforcing or unidirectional. In China, smaller projects aimed at disturbing the consolidation of power by low-carbon regimes came about through the bottom-up activism of protesting communities and environmental organizations. Moreover, the transformation of climate governance by grassroots environmental activism is often not just a political-economic process, but also a spatial one. Grassroots anti-incineration activism has helped create a new meaning of Chinese neighborhoods as sites of environmental governance.

### **The heterogeneous nature of China’s eco-urbanization process**

In the previous section, through an examination of the community- and ENGO-initiated ZWN experiments, the influence of grassroots activism on China’s eco-urbanization process was revealed. In this section, we will continue by looking at the other stakeholders in the process, namely, the municipal governments and migrant waste dealers. The interests of these two stakeholders in ZWN construction developed within the wider context of anti-incineration activism gaining prevalence, which helped render waste sorting and reduction as politically correct practices. For the municipal governments, ZWN experimentation helped them to justify the continuing use of incinerator facilities, while for migrant waste dealers, it was about expanding business networks. Overall, then, this section reveals the heterogeneous nature of the eco-urbanization process, since to be truly valid, a study of eco-urbanization requires a contextual sensitivity towards different meanings of the eco-urban turn in different political economies. It needs to pay attention to spatial-temporal contingency and situatedness in the theorization of the eco-urbanization process.

#### – The zero-waste neighborhood as a project of the local state

At the start of the second decade of the new millennium both local Chinese officials and the central government began joining grassroots communities and environmental organizations in the construction of ZWNs. The country’s three leading cities, Beijing, Shanghai and Guangzhou, all started to implement their own ZWN experiments, called Neighborhood-based Waste-sorting Pilot Projects. The central government, on the other hand, created policy objectives to promote the construction of ZWN projects nationwide. The participation of the governments in the construction of ZWNs speaks to the multiple utilities that eco-urbanism can offer to its practitioners. While it was concern for growth that drove officials to build eco-cities, what has been driving them to construct ZWNs is the imperative to maintain their image as climate protectors.

In the late 2000s, during the widespread debate over WTE incineration—on top of issues such as people’s health, MSW management, the urban environment, or NIMBY-ism—discussions increasingly focused on the network of people whose interests were bound up with these lucrative incineration projects: officials, experts, universities, equipment importers, enterprises in the energy sector, etc. Suspicions of corruption and

rumors about bribery circulated widely around the country, as the following *Asia Weekly* extract from 28 February 2010 shows:

During the past decade, there has been seen the formation of an incineration lobbying group, whose key members include scholars, entrepreneurs, foreign equipment suppliers and investors. Among them, scholars are often the ones who take the initial lead. They would hold conferences and invite central officials and local governments to join. The whole point of these conferences is to ask officials to purchase incineration equipment from foreign suppliers ... All those 'experts' who were invited to speak in the conferences were paid lucratively, from RMB 15,000 to RMB 20,000. Not surprisingly, then, all those who attended such conferences spoke in favor of incinerator construction<sup>16</sup> (*Asia Weekly*, 2010).

Under growing anti-incineration sentiment such as this, local governments needed a way to reassert their environmentalist credentials, and the emergence of the NIABY (Not-In-Anyone's-Backyard) movement provided the means to do this. Many in the circle of China's environmental organizations believed that local governments, by aligning themselves with the advocacy of 3R, wished to appear rational and open to critique. Talk by NIABY opposition groups of recycling as a precondition for incineration meant that incineration was, in fact, acceptable to local communities. Since municipal recycling was not expensive, officials did not hesitate to follow this advice.

Local governments started to promote ZWN construction as a way to justify the expansion of WTE incineration. In the beginning, this eco-urbanization process was characterized by outward-expansionism and a lack of resident support. While it took months for FON to create the Liulitun project and almost a year for Asuwei's Green House, Beijing expanded its Neighborhood-based Waste-sorting Pilot Project from 600 to 1,400 neighborhoods during its first year of operation. Shanghai's program started with 1,080 neighborhoods and expanded to 2,130, also in just one year. Municipal governments expanded their programs because neighborhood coverage rates seemed to be the only measurable indicator for their performance. The higher the coverage rate, the better the local officials were able to assert their environmentalism.

One reason why their programs were able to grow so fast was that they wasted no time in encouraging residents to participate. Beijing's pilot project, for example, involved installing separate bins for waste in the pilot neighborhood and deploying two supervisors—with the title 'green sleeves'—to help residents develop the habit of waste-sorting. However, the program provided no incentives, nor any education or training. Therefore, because it took too much time and energy to teach people how to sort their waste, it was found that many 'green sleeves' (mostly retirees hired from their own neighborhood) in the end just gave up and did the work for their neighbors themselves.

During the 2010s, municipalities not only set up ZWN programs and expanded them, they also built or upgraded the municipal recycling infrastructure. Incinerator proposals for Liulitun, Panyu and Asuwei were either withdrawn or placed on hold (although additional factors such as residents' high socioeconomic background also influenced this decision). Local governments won much praise, while incineration capacity continued to expand. It is therefore important to note that the NIABY campaigns did not damage the low-carbon regime at all; in fact, their discourse of a dioxin crisis only made the regime grow stronger.

To press the government to focus on encouraging good practice, some Chinese ENGOs started to conduct and publish surveys of government ZWN programs. Both FON and Eco-Canto published such surveys yearly, which were carried out by volunteers in government pilot neighborhoods. In these surveys the ENGOs would identify problems

16 See also, for instance, Balkan (2012).



and shortcomings as well as offering suggestions for improvement. The purpose of such surveys was to point out to the government that it is ‘practice’ rather than the neighborhood coverage rate that matters.<sup>17</sup>

There were also ENGOs that went beyond environmentalism as such to put pressure on these government bodies by talking about neighborhood recycling practice as part of a wider, long-term social reform which they insisted the Chinese government should be responsible for. The Shanghai-based environmental NGO Aifen Environmental Protection Center (AEPC) undertook its own ZWN project (which has over 100 participating neighborhoods) to make such a point. Aifen’s project highlighted frequent and regular education programs, neighborhood activities and well-designed and maintained spaces in participating neighborhoods for waste sorting and disposal.

The governments’ response to such critiques reflected a much more practical, neoliberal way of thinking as regards urban development. From their perspective, if there was a need to encourage good practice, then a more sensible solution would be to open up that need as an opportunity for business. Shanghai thus established a reward program called the Green Account, which gives residents a cash reward or discount that can be used on Alipay, China’s largest third-party online payment platform. Beijing introduced ‘smart’ recycling bins that not only help residents accrue reward points on account, but which also have covers that open automatically so that residents do not need to worry about getting their hands dirty. Local governments in Chengdu and Nanjing have started to purchase neighborhood-based waste-sorting programs from recycling companies. With these recent developments, ZWNs now look increasingly similar to the eco-cities.

– Zero-waste neighborhoods as a business

In recent years, the ZWN construction fever has been increasingly characterized by the growing participation of private entrepreneurs. The two most noteworthy examples are the development of the Green Earth project in Chengdu and the rapid expansion of the Waste for Goods project in Nanjing (see Table 1). The Green Earth project was initiated in 2011 by the Green Earth Recycling Company in Chengdu. By 2015, the company had expanded the project to over 400 of the city’s urban neighborhoods. The Waste for Goods project was started by a local Nanjing recycling firm called NJZD Environmental Technology in 2014. Within two years, the project had expanded to over 280 urban neighborhoods.

The emergence of these for-profit ZWN projects is another example that speaks to eco-urbanism’s dispersed logic. Chinese cities have long been served by semi-formal networks of recycling businesses that include waste dealers, waste collectors (or ‘recycling companies’ if formally registered), waste pickers (who work on the street) and landfill scavengers. Most of the workers are migrant families from the distant countryside while most of the for-profit ZWN projects are run by migrant waste dealers and collectors. In other words, even China’s most vulnerable migrant population has been increasingly involved in the practices of eco-urbanism.

The use of reward programs by local protest communities to run their ZWN programs is what created new business opportunities for the migrant waste workforce. These reward programs usually began through ENGO sponsorship or a community fund but in the later stage most of the local ZWN projects brought in one or two waste collectors to make the program self-sustaining. This commercialization process led a small number of waste collectors to realize that environmental protection could be good business. More and more migrant waste dealers and collectors therefore started designing their own ZWN programs and selling them to urban administrations at the lowest level such as street committees or district governments.



The development of the ZWN construction fever as a bottom-up eco-urban process should not be taken simply as a profitable business benefiting the migrant waste worker, however. To begin with, the number of migrants in the informal waste network who can start up a ZWN project is very few. Only those in the position of dealers or collectors—which would normally take years (if not decade) to achieve—were found to have the capacity to carry out a ZWN project. The majority of the migrants in the waste networks are either street waste pickers or scavengers. For them, the ZWN construction fever has not helped to improve their livelihoods.

More importantly, the ZWN construction fever has proceeded through an environmental discourse that denies the value of migrant waste work. As Caprotti (2014) has pointed out, eco-urbanism's spread relied a great deal on the discursive construction of environmental crises. The crisis narrative constructed by the local protest campaigns tells of a foreseeable dioxin emissions crisis. According to this narrative, China was a country which lacked a waste management program. Yet this crisis discourse was in fact rather cruel to the thousands of informal migrant waste dealers, collectors and pickers (scavengers) in Chinese cities whose everyday labor greatly helped relieve pressure on landfill sites. Despite this, these informal waste workers did not appear in most of the local policy-advocacy campaigns. If questions were raised about this, some campaigners simply said that the informal waste workers only pick up what is valuable, and this is not enough.

The environmentalism promoted by local campaigns thus contained a certain degree of prejudice towards a city's migrant population. While these local residents called their own action of waste-sorting or reuse a 'waste reduction practice', they considered the same practice as 'just business' when carried out by informal migrant waste workers. While such local campaigns were painstaking in their efforts to advocate for recycling, their advocacy nevertheless seldom expanded into the issue of how to improve working conditions for the city's migrant waste workers.

The recent ZWN fever affecting many Chinese cities is clearly the outcome of contestation and negotiation by people who hold diverse interests but are invariably fighting for survival through climate governance and eco-urbanism at the grassroots level. It has evolved from contestation with low-carbon growth and anti-incineration activism on the one hand, to being operated as a local state project as well as a business encouraged by a neoliberal regime. This process of evolution demonstrates not only the influential forces working from the bottom up to remake and reshape eco-urbanism's course of action, but also the interplay among the diverse stakeholders involved in the reproduction of the eco-urban landscape.

### **Conclusion**

Over the past decade, the proliferation of climate governance, low-carbon growth, eco-cities and smart-cities across the globe and the eco-urban turn in planning and development have been topics of extensive documentations and heated debate. Despite the existence of a great variety and plurality of interpretations, the prevailing view is to take eco-urbanism as a temporal-spatial fix for the crisis of capital overaccumulation engineered primarily by neoliberal states and powerful corporations from above. The reaction and contestation of the powerless, the underclass and the marginalized struggling for survival remains poorly understood, if not completely ignored. This study provides a perspective that we hope will be taken as a valuable alternative to existing documentation and interpretations of the nature, dynamics and landscape of eco-urbanism in different regions.

We have made our case on the basis of a study of the ZWN experiments in China, with a focus on the form and character of contemporary eco-urbanism, the ways in which it has been used by actors to reclaim environmentalism, and the processes of low-carbon transition in which they occur. By revealing how this

particular eco-urbanization process is driven by local and non-state grassroots anti-incineration activism, which is critical of the state's top-down imposition of its low-carbon growth agenda, we have argued against approaches that reduce political, social or local forces to being simply a residual effect of the top-down logic of climate control. Instead, we have explored the main forces in Chinese cities that have shaped the ZWN phenomenon and the ways in which these have become bound up with a complex politics of legitimization.

In this article we have advocated for a more bottom-up approach to the study of eco-urbanism. This is a way of seeing theoretical value in the eco-urban projects of non-elites, so as to draw insights from a diversity of practices and imaginations. In our case of China's low-carbon urbanism, this method of enquiry enables us to look beyond eco-cities and to discover eco-urbanism's central place in China's recent WTE incineration debate. This approach and perspective from the ground up enables us to identify the origins of the view that eco-urbanism is a form of local struggle, as promoted by idealists such as Richard Register. In turn, this has three significant implications for understandings of eco-urbanism's contemporary move into the global mainstream.

First, there is a social, localized and grassroots dimension to the eco-urbanization process that has not been adequately addressed in existing theorization. This is to say that the upscaling of environmentalism to the realm of climate change control (globally) has increased the utility of eco-urbanism as a way of reclaiming environmentalism by the grassroots. In Beijing, ZWNs are not the only grassroots eco-urban project; on the city's outskirts, a number of eco-farming communities have recently been taking shape.

Second, an eco-state (While *et al.*, 2010) is a different kind of state from, for instance, urban entrepreneurship. It can be entrepreneurial in its actions or at its heart, but to claim its environmentalist credentials it will need to adopt certain practices such as turning the neighborhood zero-waste. This is because, in order to make the logic of low-carbon accumulation work (i.e. claiming technology as an environmental solution), constructing a discourse of crisis is not enough. An eco-state will need to engage in certain practices or acts. In methodological terms, it is essential, first, that researchers should not take all state eco-urban projects to be growth projects. We have demonstrated that the ZWN programs of Chinese municipal governments have never been a growth project. Second, most of the states in existing studies of eco-urbanism have primarily involved the entrepreneurial city and hence look no different to other states. Therefore it is necessary for studies about eco-urbanism to interrogate more seriously what an eco-state actually is and is not.

Finally, although the rise of climate control may have contributed to eco-urbanism's recent move into the mainstream, eco-urbanism lives on its own terms. It is about claiming legitimacy, and its relationship with global climate control does not have to be mechanistic, unidirectional or mutually reinforcing. While social elites can use eco-city projects as global investment strategies, smaller projects can also be brought about from the bottom up, which may or may not help the power consolidation of low-carbon regimes. In fact, as our case study has demonstrated, when a local environment is sacrificed for the sake of climate technology, turning 'eco' may just be the local's best way for self-defense.

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## References

- Adams, R. (2014) Natura urbans, natura urbanata: ecological urbanism, circulation, and the immunization of nature. *Environment and Planning D: Society and Space* 32.1, 12-29.
- Andersen M. and I. Massa (2000) Ecological modernization: origins, dilemmas and future directions. *Journal of Environmental Policy and Planning* 2.4, 337-45.
- Andrews-Speed, P. (2012) *The governance of energy in China: transition to a low-carbon economy*. Palgrave Macmillan, Houndmills, Basingstoke.
- Asia Weekly (2010) Zhongguo laji fenshao beihou de liyilian yu boyi [The chain of profits behind China's incineration]. 28 February. Available in hard copy only.
- Asuwei Campaign (2009) Zhongguo chengshi huanjing de shengsi jueze-laji fenshao zhengce yu gongzhong yiyuan [Life and death decision of the environment of Chinese cities] [WWW document]. URL [http://www.waste-cwin.org/sites/default/files/zhong\\_guo\\_cheng\\_shi\\_huan\\_jing\\_de\\_sheng\\_si\\_jue\\_ze\\_la\\_ji\\_fen\\_shao\\_zheng\\_ce\\_yu\\_gong\\_zhong\\_yi\\_yuan\\_.pdf](http://www.waste-cwin.org/sites/default/files/zhong_guo_cheng_shi_huan_jing_de_sheng_si_jue_ze_la_ji_fen_shao_zheng_ce_yu_gong_zhong_yi_yuan_.pdf).
- Balkan, E. (2012) The dirty truth about China's incinerators. *The Guardian* 4 July [WWW document]. URL <https://www.theguardian.com/environment/2012/jul/04/dirty-truth-chinas-incinerators> (accessed 14 May 2019).
- Brenner, N. and C. Schmid (2014) The urban age in question. *International Journal of Urban and Regional Research* 38.3, 731-55.
- Bulkeley, H. (2010) Cities and the governing of climate change. *Annual Review of Environment and Resources* 35, 229-53.
- Bulkeley, H., V.C. Broto and A. Maassen (2014) Low-carbon transitions and the reconfiguration of urban infrastructure. *Urban Studies* 51.7, 1471-86.
- Caprotti, F. (2014) Eco-urbanism and the eco-city, or, denying the right to the city? *Antipode* 46.5, 1285-303.
- Caprotti, F. (2015) *Eco-cities and the transition to low carbon economy*. Palgrave Pivot, New York, NY.
- Caprotti, F., C. Springer and N. Harmer (2015) 'Eco' for whom? Envisioning eco-urbanism in the Sino-Singapore Tianjin eco-city, China. *International Journal of Urban and Regional Research* 39.3, 495-517.
- Chang, I.C. (2017) Failure matters: reassembling eco-urbanism in a globalizing China. *Environment and Planning A: Economy and Space* 49.8, 1719-42.
- Chang, I.C., H. Leitner and E. Sheppard (2016) A green leap forward? Eco-state restructuring and the Tianjin-Binhai eco-city model. *Regional Studies* 50.6, 929-43.
- Chien, S. (2013) Chinese eco-cities: a perspective of land-speculation-oriented local entrepreneurialism. *China Information* 27.2, 173-96.
- China Zero-waste Alliance (2014) Shequ laji fenlei [Community garbage classification] [WWW document]. URL <http://www.lingfeiqi.org/node/25> (accessed 18 May 2019).
- China Zero-waste Alliance (2015) Ling feiqi zhi lu [Road to zero waste] [WWW document]. URL <http://www.lingfeiqi.org/node/12> (accessed 18 May 2019).
- Chinese Society for Urban Studies (CSUS) (2011) Zhongguo shengtai chengshi fazhan [The cases of Chinese eco-cities]. Paper presented at the press conference on Annual Achievements of Eco-city Assessment and Best Practices (2010-2011). Beijing, 29 March.
- Cugurullo, F. (2013) How to build a sandcastle: an analysis of the genesis and development of Masday City. *Journal of Urban Technology* 20.1, 23-37.
- De Jong, M., C. Yu, S. Joss, R. Wennersten, L. Yu, X. Zhang and X. Ma (2016) Eco-city development in China: addressing the policy implementation challenge. *Journal of Cleaner Production* 134.A, 31-41.
- Doyle, J. (2009) Climate action and environmental activism: the role of environmental NGOs and grassroots movement in the global politics of climate change. In T. Boyce and J. Lewis (eds.), *Climate change and the media*, Peter Lang, Bern.
- Flynn, A., L. Yu, P. Feindt and C. Chen (2016) Eco-cities, governance and sustainable lifestyles: the case of the Sino-Singapore Tianjin eco-city. *Habitat International* 53 (April), 78-86.
- Gandy, M. (2015) From urban ecology to ecological urbanism: an ambiguous trajectory. *Area* 47.2, 150-54.
- Global Village (2012) Lvse shequ zhidao shou ce [Green community guidebook]. Unpublished document.
- Golubchikov, O. and A. Badyina (2012). *Sustainable housing for sustainable cities: policy framework for developing countries*. UN-Habitat, Nairobi.
- Hodson, M. and S. Marvin (2010) Urbanism in the Anthropocene: ecological urbanism or premium ecological enclaves? *City* 14.3, 298-313.
- Hu, M.C., C.Y. Wu and T. Shih (2015) Creating a new socio-technical regime in China: evidence from the Sino-Singapore Tianjin eco-city. *Futures* 70 (June), 1-12.
- Hunter, M. and D. Brown (2012) Spatial contagion: gardening along the street in residential neighborhoods. *Landscape and Urban Planning* 105.4, 407-16.
- Johnson, T. (2013) The health factor in anti-waste incinerator campaigns in Beijing and Guangzhou. *China Quarterly* 214 (June), 356-75.
- Joss, S. (2010) Eco-cities: a global survey 2009. In C. Brebbia, S. Hernandez and E. Tiezzi (eds.), *Sustainable city VI: urban regeneration and sustainability*, WIT Press, Southampton.
- Joss, S. and A. Molella (2013) The eco-city as urban technology: perspectives on Caofeidian international eco-city (China). *Journal of Urban Technology* 20.1, 115-37.
- Kenworthy, J. (2006) The eco-city: ten key transport and planning dimensions for sustainable city development. *Environment and Urbanization* 18.1, 67-85.
- Kronsell, A. (2013) Legitimacy for climate policies: politics and participation in the green city of Freiburg. *Local Environment* 18.8, 965-82.
- Krusky, A.M., J. Heinze, T. Reischl, S. Aiyer, S. Franzen and M. Zimmerman (2015) The effects of produce gardens on neighborhoods: a test of the greening hypothesis in a post-industrial city. *Landscape and Urban Planning* 136 (April), 68-75.
- Lang, G. and Y. Xu (2013). Anti-incinerator campaigns and the evolution of protest politics in China. *Environmental Politics* 22.5, 832-48.
- Lawson, L. (2005) *City bountiful: a century of community gardening in America*. University of California Press, Berkeley, CA.
- Leitner, H. and E. Sheppard (2016) Provincializing critical urban theory: extending the ecosystem of possibilities. *International Journal of Urban and Regional Research* 40.1, 228-35.
- Lewis, J. (2013) *Green Innovation in China: China's wind power industry and the global transition to a low-carbon economy*. Columbia University Press, New York, NY.
- May, S. (2011) Ecological urbanization: calculating value in an age of global climate change. In A. Ong and A. Roy (eds.), *Worlding cities: Asian experiments and the art of being global*, Wiley, Chichester.
- McClintock, N., D. Mahmoudi, M. Simpson and J. Santos (2016) Socio-spatial differentiation in the sustainable city: a mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning* 148 (April), 1-16.
- Merrifield, A. (2012) The urban question under planetary urbanization. *International Journal of Urban and Regional Research* 37.3, 909-22.
- Moessner, S. (2016) Sustainable urban development as consensual practice: post-politics in Freiburg, Germany. *Regional Studies* 50.6, 971-82.
- Pearson, L. and C. Pearson. (2010) Sustainable urban agriculture: stocktake and opportunities. *International Journal of Agricultural Sustainability* 8.1/2, 7-19.
- Peck, J. (2015) Cities beyond compare? *Regional Studies* 49.1, 160-82.
- Reckien, D., F. Creutzig, B. Fernandez, S. Lwasa, M. Tovar-Restrepo, D. McEvoy and D. Satterthwaite (2017) Climate change, equity, and the sustainable development goals: an urban perspective. *Environment and Urbanization* 29.1, 159-82.
- Ren, X. (2013) *Urban China*. Polity Press, Cambridge.

- Robinson, J. and A. Roy (2016) Debate on global urbanisms and the nature of urban theory. *International Journal of Urban and Regional Research* 40.1, 181-86.
- Rootes, C., A. Zito and J. Barry (2012) Climate change, national politics and grassroots action: an introduction. *Environmental Politics* 21.5, 677-90.
- Roseland, M. (1997) Dimensions of the eco-city. *Cities* 14.4, 197-202.
- Saldívar-Tanaka, L. and M. Krasny (2004) Culturing community development, neighborhood open space, and civic agriculture: the case of Latino community gardens in New York City. *Agriculture and Human Values* 21.4, 399-412.
- Schreurs, M. (2017) Multi-level climate governance in China. *Environmental Policy and Governance* 27.2, 163-74.
- Sharifi, A. (2016) From garden city to eco-urbanism: the quest for sustainable neighborhood development. *Sustainable Cities and Society* 20 (January), 1-16.
- While, A., E. Jonas and D. Gibbs (2010) From sustainable development to carbon-control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers* 28.3, 549-69.
- Wong, N. (2016) Environmental protests and NIMBY activism: local politics and waste management in Beijing and Guangzhou. *China Information* 30.2, 143-64.
- World Bank (2010) *Eco<sup>2</sup> cities: ecological cities as economic cities*. World Bank, Washington, DC.
- Wu, F. (2010) Pathways and challenges to 'the workshop of the world': China's economic growth and urbanization in political economic perspective. Paper presented at the conference on Making Global Cities and the World Economic Crisis, Shenzhen, China, 1-8 January.
- Wu, F. (2015) *Planning for growth: urban and regional planning in China*. Routledge, New York, NY.
- Yu, D. (2012) Chinese wastes: the burning issue. *China Dialogue* 26 January [WWW Document]. URL <https://www.chinadialogue.net/article/show/single/ch/4739-Chinese-waste-the-burning-issue> (accessed 19 May 2019).
- Yu, L. (2014) Low-carbon eco-city: new approach for Chinese urbanisation. *Habitat International* 44 (October), 102-10.