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APPROACHING
SUSTAINABLE URBAN
DEVELOPMENT IN CHINA
THROUGH A FOOD
SYSTEM PLANNING LENS

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Abstract

After more than two decades of rapid urbanization, Chinese cities now face severe sustainability challenges in terms of balancing economic viability, social justice, and environmental protection goals. While various types of planning have long been adopted to cope with these challenges, food as a centrepiece of daily life and of social and economic activity in cities has rarely been considered as a focus of urban planning in China, despite a lot of recent attention to food waste and food safety concerns. China's food policy is largely fragmented in terms of its multiple regulatory agencies and diverse policy goals. Amid this complexity, there has been little attention to using the food system as a lens to understand and tackle the various social, economic health and environmental challenges in cities. This discussion paper argues for the integration of food issues into urban planning in Chinese cities. Drawing on survey data and specific observations from Nanjing, it shows that China's urban planning has inadvertently addressed a number of important aspects of sustainable food systems. The paper provides a preliminary analysis of various priorities for food system planning and identifies strengths and challenges in terms of achieving sustainability goals in Chinese cities. The analysis highlights various priorities for future urban food policy making including fostering the development of diverse food procurement channels and short food supply chains, strengthening the role of the informal food sector for urban food security, promoting healthy, sustainable diets and ethical consumption, and reducing food waste.

Keywords

food security, food system, food waste, urbanization, environmental, green cities

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Introduction

There is a widespread consensus that our contemporary food system is under great pressure and is not sustainable socially, economically, or environmentally (FAO 2011, Godfray et al 2010, IAASTD 2008, Satterthwaite et al 2010, UNDP 2012, UNCTAD 2013, Weis 2010). Food systems in China, as elsewhere, face challenges to become more resilient. On the one hand, although China is categorized as “moderately low” in terms of food insecurity levels in FAO’s Hunger Map in 2015, 9.3% of its population (133.8 million) is still undernourished (FAO 2015). Hunger still prevails among its poor. On the other hand, obesity and diet-related health epidemics such as diabetes and hypertension are rising significantly (e.g. Cui and Dibley 2012, He et al 2014, Yu et al 2012). About USD32 billion worth of food is thrown away annually (Zhou 2013), which generates tremendous environmental, economic and managerial costs. Problems within the agriculture system are also urgent as the depletion of soil and water resources has been jeopardizing both the quality and quantity of the country’s food supply. Along with the widening income gap between cities and the countryside, Chinese farmers are struggling to make a decent living from farming their small plots (Huang et al 2012, Su et al 2015). As urbanization continues and the consumption of animal products increases, these tensions will be further exacerbated.

It is clear that cities will increasingly play a role in delivering sustainable ways of providing the basic essentials of food (Donald 2008, Morgan and Sonnino 2010, Pothukuchi and Kaufman 1999, Rosegrant and Cline 2003). The role of cities will be enhanced as China becomes more urban. However, food policies are often not considered an urban issue because (1) food is seen as an issue that needs to be addressed at higher (i.e. national and supra-national) governance levels; and (2) the conventional definition of “urban” as “non-agricultural” has conceptually distanced food as an urban issue (Sonnino 2009: 431). Research and planning in urban settings have more typically focused on food access, whereas agriculture has often been

approached in biophysical terms, and thus the elements of food consumption and food production – and everything in between – are typically treated as distinct planning processes. A further challenge that has dogged urban food system strategizing is the inconsistency between administrative boundaries and food system boundaries. These factors have delayed research and action enhancing the role of cities as food system innovators (MacRae and Donahue 2013, Mendes 2007).

Meanwhile, there is increasing acknowledgement of ecological concerns within urban development, particularly around pollution, biodiversity, water and energy (Lye and Chen 2010, Seitzinger et al 2012). Various efforts have been made in city planning and governance to address these ecological challenges. But there is a clear disconnect between the drive for “greener” cities and the importance of food and food systems in this process. “Green” (and eco-city) urban planning efforts (in China and elsewhere) have focused on renewable energy, building infrastructure, and transportation, while food as a crucial ecological, economic, and socio-cultural element of urban systems is typically ignored (Imura 2010: 31).

Based on these understandings, this discussion paper provides a preliminary analysis of food system planning efforts in China. It incorporates results from a city-wide survey of 1,200 randomly sampled households in Nanjing in 2015 by the Hungry Cities Partnership (HCP). By applying a food system lens to examine urban China, the paper identifies strengths and challenges in terms of achieving sustainability goals. This analysis also sets the stage for future research in urban food system planning in China.

A Food System Lens for Urban Sustainability Planning

A wide range of urban planning issues – from public health to poverty, energy, water, transportation and economic development – are intimately linked with food systems (Morgan 2009, Pothukuchi and

Kaufman 2000, Raja et al 2008). Dubbeling et al (2015) highlight the direct connections between food and other urban domains, which include transport (including transport of food), health (issues of malnutrition, obesity, food at schools and institutions), land-use planning for agricultural and multifunctional areas, community development and revitalization, employment (in food production, processing and retail), waste management (productive use of waste water and management of food waste), and climate-change adaptation and disaster risk reduction (e.g. local food production's role in mitigating climate-related disruptions in food supply).

Examining food-related issues through a food system lens entails an understanding of the various players involved in the food value chain and the components of a sustainable food system. Food is increasingly an urban issue, for planners, community-based organizations, the private sector, consumers and researchers. Cities have opportunities – and a responsibility – to develop more sustainable food systems (Dubbeling et al 2015). These opportunities include, but are not limited to, reducing food waste and providing viable livelihood opportunities for those who produce, process and sell food. As cities are centres of consumption (in China and elsewhere), food becomes a driver for other sustainable urbanization policies. In a healthy, just and sustainable food system, “all residents have access to, and can afford to buy, safe, nutritious, and culturally acceptable food that has been produced in an environmentally sustainable way, and that supports rural communities” (Waterloo Region Food System Roundtable 2013). Such a food system promotes social justice, population health and profitable farms, reflects and sustains local culture, and supports ecological viability.

The Absence of Food in China's Urban Policies

China faces significant food security challenges in feeding 20% of the world's population with less than 10% of the world's arable land, and even less

of its water (Brown 1995, FAO 2010). In addition, China's population is urbanizing rapidly. In 1990, only 30% of China's population lived in urban areas. By the mid-21st century, an estimated 73% of the country's 1.4 billion people will live in urban areas (UNESA 2009). Rapid urbanization and late industrialization in China has exacerbated pressures on the food system through loss of agricultural land and of farmers. The accelerated modernization of farming over the past three decades in China has implied greater energy and chemical inputs (for fertilizer and pesticides) and reductions in organic fertilizer. Intensive agricultural production, combined with proximity to industrial areas, has led to water, soil and air contamination. Changing dietary preferences – declining consumption of grain, and a rising proportion of meat, fruit, and processed foods (Schneider 2011) – have led to larger per capita carbon footprints.

Despite the importance of food in urban planning, and the potential of a more sustainable food system for realizing urban sustainability goals, studies and practices of Chinese cities and urban planning have not integrated food into their schemes (McGee et al 2007, Wu 2007, Wu et al 2007). Even Han et al's (2015) work examining low-carbon economy development in cities ignores the food system as a key contributor to carbon emission in cities. Yet, according to FAO's report on the environmental consequences of the livestock industry, livestock causes more greenhouse effects than cars (FAO 2006). This absence of food is also found in China's “Liveable City Standards” – only one of over 100 indicators relates to food, which is a “sufficient and quality food supply” (Wang and Shao 2010: 145).

As a matter of fact, food policy in China is strongly rural-biased and production-focused. Food security, in many cases interpreted as self-sufficiency in food supply, emphasises policies that support agricultural development, food reserve, and farmland protection. While food safety has increasingly become a policy focus, both the regulatory responsibilities and the implementation capacity are limited and unclearly defined (FORHEAD 2014, Xiu and Klein 2010). The fragmented regulatory bodies take different shares of the responsibility

and treat the food system as separate segments and in many cases, reduce food system regulation to simple monitoring tasks.

This significant gap reveals the need for revised planning approaches through a food system lens that address food security within ecological constraints, the capacity to deal with food system shocks (such as price volatility) and global environmental change (such as climate change). There is an urgent demand in China to develop ecologically sustainable urban planning models that also ensure food security and safety.

Assets for Sustainable Urban Food Systems in China

By analyzing China's food system through the lens of sustainability, we can identify some of its advantages compared to other countries. First, there is some recognition that "relocalizing" food systems can potentially reduce food supply vulnerabilities. In the late 1990s, the Chinese government began to rein in the rampant loss of agricultural land, and initiated an approach to regionalize food system planning – having provincial governors coordinate grain supply and city mayors coordinate vegetable supply for their local areas (see State Council 2014). As a result, analysts have turned to China as an insightful example of food self-sufficiency, peri-urban agriculture, and city-scale food security. As one impressive example, in 2007 Nanjing supplied 44% of its own grain crops; 40% of its vegetables; 20% of its pork; 10% of fisheries; 30% of poultry; and 15% of eggs (Lang and Miao 2013).

Second, models and strategies are emerging for feeding growing urban populations in China more "sustainably". These include alternative food networks and ecological food production (Scott et al 2014, Si et al 2015); urban residents growing their own food; community-supported agriculture programs (CSAs) (Shi et al 2011, Si et al 2015); farmers' cooperatives (Chen and Scott 2014, Zhou and Jin 2009); institutional procurement and local food branding (Marsden and Smith 2005); organic

agri-food processing clusters (Marsden et al 2011); and other infrastructure for local food systems and supply chains for small- and medium-scale food producers and processors (Huang et al 2007a, 2007b, 2008). Yet, these strategies have not been systematically analyzed in terms of their contributions to the ecological sustainability of the food system.

Third, there are key features of the institutional context in China that set it apart from North America (where more assessments of urban food systems have been conducted). Some of the key features are (1) greater food localization, although more limited urban agriculture and community gardens; (2) an extremely diverse range of food outlets and easier access to fresh produce and other healthy food in cities; (3) differences in leadership and planning – and more limited civic engagement (Boland and Zhu 2012, Xie 2011, Yong et al 2009); (4) greater socioeconomic disparities within rapidly urbanizing Chinese cities and between urban and rural areas, and greater challenges for food access and affordability among low-income populations, particularly rural migrants; and (5) widespread concerns about unsafe food (food adulteration and pesticide residues) (FORHEAD 2014).

Opportunities for Sustainable Urban Food Systems in China

Despite the various assets of China's food system in terms of sustainability, opportunities are abundant along the food supply chain (cf. Aubin et al 2013). These opportunities for building a more sustainable urban food system are tactics that an integrated urban planning approach could employ and also set the future for urban planning research. Based on our research in China, particularly Nanjing, we will illustrate these opportunities in food production, processing, distribution and exchange, retail and food access, consumption, and management of food waste. These opportunities can be categorized into three major dimensions – social wellbeing and health, the economic and the environmental (Table 1).

Table 1. Assets and Opportunities for Sustainable Urban Food Systems in China*

	Social well-being & health	Economic	Environmental
Food production	<ul style="list-style-type: none"> • Loss of engagement of urban residents with food production • Integration of small-scale producers • <i>Need for 'redignifying' farming</i> • <i>Need for more land for recreational gardening (urban agriculture)</i> • <i>Need for socializing and community building (urban agriculture)</i> 	<ul style="list-style-type: none"> • Considerable (though declining) extent of local/peri-urban food production • Integration of small-scale producers (agglomeration can lower the cost of marketing and logistics) • Investment in agriculture • Promotion of multi-functional agriculture—for education, food production and leisure (agritourism) 	<ul style="list-style-type: none"> * Agricultural land protection policies • Eco-agriculture standards & support for organic/green food production • <i>Need soil rehabilitation for urban & rural agriculture</i> • <i>Need to address biodiversity threats from urbanization</i>
Processing	<ul style="list-style-type: none"> • Reduce production of highly processed, non-nutritional food products • Expand healthier options 	<ul style="list-style-type: none"> • Local food processing infrastructure 	<ul style="list-style-type: none"> • Local food processing
Distribution & exchange		<ul style="list-style-type: none"> • Short food supply chains (provide employment) • Diverse food distribution channels: local wet markets, convenience stores, supermarkets 	<ul style="list-style-type: none"> • Less reliance on long-distance transportation and refrigeration than in North America • <i>Opportunities for sustainable institutional food procurement</i>
Retail & food access	<ul style="list-style-type: none"> • Access to fresh produce 	<ul style="list-style-type: none"> • <i>Informal food sector/street food vending: needs to be strengthened, not eliminated—as a basis for 'inclusive growth'</i> 	<ul style="list-style-type: none"> • Emerging 'alternative food networks': ecological farmers markets (need stronger support), CSAs, buying clubs
Consumption	<ul style="list-style-type: none"> • Rate of poverty and malnutrition has dropped steadily since early 1980s • Walkable access to buy fresh produce • <i>Need to promote healthy diets & ethical consumption</i> • <i>Promote school gardens</i> • <i>Address food safety concerns by rebuilding trust, esp between consumers and producers, & reconnecting people to their ecosystems through food</i> 	<ul style="list-style-type: none"> • High demand for healthy/safe/clean food • <i>Need to make (certified & non-certified) organic food more affordable</i> 	<ul style="list-style-type: none"> • Good walking & public transit infrastructure for food shopping • Political will: e.g., eco-city, low-carbon/planning • <i>Need to promote sustainable diets (e.g., less meat/seafood)</i> • <i>Address consumer confusion about labels & standards</i> • <i>Need to build food literacy (roles for the state, private sector, and community organization)</i>
Management of food waste	<ul style="list-style-type: none"> • <i>Could redistribute unsold food to disadvantaged groups</i> 	<ul style="list-style-type: none"> • <i>Employment opportunities in recycling food waste and packaging</i> 	<ul style="list-style-type: none"> • Starting to tackle food waste (consumer-level) • <i>Need to reduce food packaging</i> • <i>Need for better waste separation (recycling, biodegradable), re-directing 'waste' for composting</i> • <i>Could redistribute unsold food to disadvantaged groups</i>

* Opportunities are highlighted in italics

Opportunities Related to Social Wellbeing and Health

Wide-ranging studies have documented the various roles of urban agriculture in fostering food security (see Zezza and Tasciotti 2010). Yet, urban agriculture is not widely-practised in China. The HCP 2015 survey in Nanjing found that although 56.8% of surveyed households are interested in growing food, only 20.8% of households are practising urban agriculture and most of them are located in peri-urban districts. A major problem that needs to be addressed here is the low social status of farmers in China. Farmers in China are discriminated as a backward social group with a “smallholder mentality” (*xiaonong yishi*), which entails a series of negative connotations (i.e. conservative, short-sighted, selfish) (Schneider 2015). This pervasive understanding of peasants and farming is fortified as the country is increasingly urbanized and thus hinders the growth of urban and peri-urban agriculture. Therefore, there is a strong need to “re-dignify” farming through policy changes and education.

The HCP survey in Nanjing found that having no access to land was the top reason (92.6%) hindering participation in urban agriculture. However, the 2013 Regulations of City Management of Nanjing (*Nanjing shi chengshi zhili tiaoli*) specify in clause 35 that growing vegetables or fruit trees in public green space in residential neighbourhoods is strictly prohibited. Such regulations create barriers to urban agriculture. Facilitating access to land within Chinese cities (for example, in the form of community gardens) or in peri-urban areas will greatly boost the development of urban agriculture.

On the issue of food consumption, China has been experiencing a rapid increase of food-related chronic disease such as diabetes, obesity, heart problems and high blood pressure. Yet, public knowledge of healthy eating (such as the advantages of brown rice and whole wheat) is limited, and consumption of fast food is booming. Moreover, campaigns promoting public awareness about healthy and environmentally-friendly food choices are lacking. Our previous research in Beijing and

Nanjing found that most people are confused about the differences between three main types of food quality certification and labelling in China: organic, green and hazard-free food (Scott et al 2014).

Meanwhile, despite the high level of household food security in urban China, there is a striking lack of trust in food quality (Wang et al 2015, Zhang et al 2015). The HCP survey in Nanjing found that the average Household Food Insecurity Access Scale (HFIAS) score in Nanjing is only 0.6109, which signals extremely low food insecurity (on a scale of 0–27). At the same time, however, 74% of surveyed households worried that they might not be able to get safe food to eat everyday. This “trust deficit” partly results from the distance between people and food, and between consumers and producers. This creates a significant social and public health problem. Addressing food safety concerns requires rebuilding trust and reconnecting people to the ecosystem through food (Wang et al 2015). Although the Chinese government has been employing various approaches to foster “food integrity” (for example, with a black list of food safety violators), the potential contribution of grassroots organizations is enormous. Grassroots initiatives such as school gardens and CSA farms, which are thriving in Beijing (Si et al 2015), are some of the promising strategies to achieve this goal.

Another urban sustainability issue relates to the management of food waste. On the one hand, many studies found increasing food waste in China (e.g. Liu 2014, Liu et al 2013). Approximately USD32 billion worth of food is thrown away annually in China (Zhou 2013). On the other hand, supportive organizations to redistribute unsold food to hungry people in Chinese cities are absent. A food redistribution network needs to be incorporated into urban planning (see Warshawsky 2010).

Economic Opportunities

As OECD has noted, “it would be misleading to address food security without taking into account a large part of the economy that provides jobs, incomes and essential services for the urban population. Despite its important role, the informal

economy is still poorly defined, poorly measured and consequently poorly taken into account in food security policies” (Hitimana et al 2011: 1). Since the beginning of economic reform in 1978, street vendors have become a “ubiquitous and integral part of China’s urban streetscapes” (Swider 2015: 707). Yet, for many years in the long history of China’s urban planning, informal food vendors were ignored. The struggle of vendors fighting for their “right to the city” against government’s efforts to eradicate them have generated various conflicts (Caron and Thornally 2013, Swider 2015, Zhang and Pan 2013). In 2009, Nanjing became the first municipality in China to officially allow the operation of street vendors with the enactment of the Regulations on the Management of Temporary Street Vendors in Nanjing (Nanjing City Management Committee Office 2009). However, only Nanjing residents with Nanjing residential registrations are eligible to apply for licences. Migrant workers are excluded in this regulation. In many other cities in China, street vendors are operating in grey areas of the policy, strictly controlled, or driven out of the city. As a basis of inclusive growth (Crush et al 2015) and a critical component of urban food system, the informal food sector and street food vending need to be strengthened, not eliminated. Urban planning in China should be more inclusive to incorporate supportive policies for the livelihoods of informal food vendors.

Regarding the development of organic agriculture, our interviews in China in 2012 and 2013 found that the high cost of organic food is the major obstacle to the growth of the sector. While the price of organic food is 47% higher than its conventional counterparts in the US (Consumer Reports 2015), this price premium can be more than 10 times the price of conventional foods in China. A major reason for this is the costly certification fees. For example, the organic certification cost in China for one type of vegetable is about CNY15,000 (USD2,274), and the certification cost increases by CNY3,000 (USD455) for each additional type of vegetable (China Organic Life 2015). Organic farmers we interviewed always paid more than CNY100,000 (USD15,220) for certification per year, which was several times more than small-scale organic farmers

paid in Canada and the US (Schumilas 2014). Reducing the cost of organic food certification and making organic food more affordable is important for fostering cities as sustainable food hubs.

Environmental Opportunities

Along the food supply chain in Chinese cities, opportunities can be identified to mitigate the environmental impacts of people’s food behaviour. First, the ecological benefits of urban and peri-urban agriculture ought not be overlooked. Urban planning needs to address biodiversity threats from urbanization by encouraging the development of, and rehabilitating soil for, urban and peri-urban agriculture. Second, there is a huge potential of institutional food procurement (for example, governmental agencies, universities, schools, hospitals and companies) in Chinese cities in terms of food system sustainability. Promoting institutional purchasing of sustainably grown/raised food from local producers through urban planning would greatly stimulate the development of a sustainable food system. Third, there is a strong need to promote sustainable diets among urban consumers as the consumption of meat and dairy products has been rising rapidly in China, with consequences for land use competition (growing feed crops instead of food crops), increased water use for livestock, and increased greenhouse gas emissions from raising livestock. Public education about the intimate connections between food and the environment is critical. Collaborative efforts between the state and private sector ought to be in place to build food literacy. Fourth, over-packaging of food is another issue that demands more attention. Last but not least, a better waste separation system is needed for re-directing biodegradable food waste for composting (Leung 2015, Liu et al 2013).

Urban Planning Through Food System Lens

The above analyses of the assets and opportunities in the current urban food system in China call for an interrogation of urban planning. Urban

planners, consciously or not, often work directly on the design and implementation of urban food policies (De La Salle and Holland 2010, Mendes 2012: 292). This implies that various types of planning in cities, such as development planning – for example, infrastructure planning, land use planning and landscape planning – need to move beyond their current goals and tactics and include new goals, strategies and programs to achieve a sustainable and resilient urban food system. Four key elements that can be considered for food system sustainability, which also serve as the basis for some major objectives and strategies that urban planning should incorporate, are the following:

- *Basic needs (accessibility and adequacy of food)*: availability, affordability, food resources; health and nutrition, food safety, sufficiency;
- *Food economy and infrastructure*: farm profitability, distribution, farmer workforce, regional production and consumption, market profile, processing, urban agriculture;
- *Public investment/support*: food and farm support policies, research;
- *Environmental stewardship and impacts*: energy and carbon footprints, agricultural land base and production practices, seeds, fisheries, soil, water, air, and waste.

There are many opportunities for urban planners to make improvements in these four major elements (see De La Salle and Holland 2010, MacRae and Donahue 2013, Mendes 2012).

First, to improve accessibility and adequacy of food, land use planning should make more land available for urban agriculture. For example, community planning could intentionally include community gardens in residential areas. Public green spaces such as parks could also designate spaces for recreational gardening. Transportation planning could provide cycling facilities or public transportation to community gardens or peri-urban farms. Building and housing design regulations can be adapted to enable rooftop or balcony gardening. To improve availability of healthy food, land use planning should

incorporate retailers of fresh, safe and healthy food into residential development projects to promote mixed-use neighbourhoods. Public transportation routes should be designed to improve accessibility to retailers that sell fresh produce and other healthy food. Food redistribution organizations such as food banks should have space in urban planning as well as addressing food insecurity and food waste concerns.

Second, urban planners play a vital role in facilitating a viable local food economy and the development of food infrastructure. For instance, regional land use planning aimed at farmland protection provides opportunities for local food production. Transportation planning could potentially improve transportation between farms, food processing and retailing facilities and thus reduce the operating costs of local food businesses. As recreational gardening becomes popular in Chinese cities, urban planning that facilitates the development of recreational gardening would make peri-urban farms more profitable. Planning venues for local farmers' markets and making local food processing facilities available are other issues that could be included in city planning.

Third, urban planning could enhance regional food security by encouraging funding agencies to provide more support for a more vibrant agricultural sector. This includes direct subsidies for the ecological services of agriculture and funding for research in the development of sustainable agriculture and agricultural technologies. Support could also include investment in student nutrition programs and public education to improve skills and knowledge about food and healthy eating. The establishment of farmers' markets and community gardens also requires financial support for access to land, technical assistance and infrastructure.

Fourth, urban planning is an effective instrument for a better environmental stewardship related to food. In national agendas of building of a green economy or low-carbon cities, the energy and carbon footprints associated with the food system are critical components. Facilitating a sustainable food system is also a way for China to meet

its international commitments in climate change and biodiversity conservation. Industry planning, for example, should provide more incentives for the development of sustainable agriculture and fewer incentives for the expansion of the chemical fertilizer or pesticides industry. Land use planning should support composting and food waste disposal as important activities in land use designations. Transportation planning should encourage the use of biodiesel from food waste as a transportation fuel. Housing policies should ensure that composting facilities for food “waste” are available in residential neighbourhoods, to redirect these nutrients (not in fact waste) back to the soil.

Besides the various initiatives that each type of urban planning could take, urban planning through a food system lens also requires collaborations among various planning departments to enhance synergies and resolve conflicts. Therefore, an integrated and comprehensive food strategy or food policy will be of great help. Hundreds of cities in the US, Canada and Europe have developed their own locally adapted food strategies, food policies or programs (Baker and Zeeuw 2015, Blay-Palmer 2009, City of Vancouver 2013). The administrative responsibilities to implement these food strategies could be organized as an inter-department food agency or food policy council or designating food as a responsibility of the planning department (Baker and Zeeuw 2015, Wiskerke 2015). In Chinese cities, agriculture committees and land and natural resources bureaus are in charge of the governance of the agriculture sector. Yet, a complementary or interdisciplinary agency that considers issues beyond agriculture is necessary to develop, implement, monitor and evaluate a municipal food policy or strategy. There is much to learn from experiences of other countries, and build on existing assets in China’s urban food systems.

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