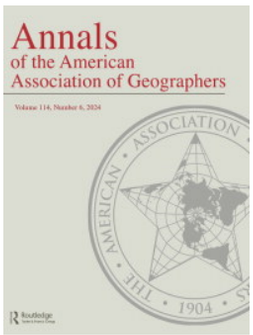

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Variegated Platform Urbanism: Social Credit and the City

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The development of a digital social credit system in China has sparked debates around urban governance and citizenship performance. Although China's social credit system is portrayed as a single technical system, the article offers a new perspective on digital social credit focused on geographical variegation. We analyze how variegation is manifested through use of multiple data streams and a diverse range of aims operationalized in various social credit systems at the municipal level. Social credit can be seen as part of algorithmic urban governance and an instrument of urban citizenship performance through scoring, ranking, incentives, and punishments. Analysis of social credit systems' development in Chinese cities contributes to debates around the role of the urban Global East and evolution of digital and algorithmic governance in and beyond China. *Key Words: algorithmic governance, citizenship, platform urbanism, smart city, social credit system.*

Dystopian narratives frequently portray China's social credit system (SCS) as a hegemonic, top-down, and centrally controlled system. These depictions are linked to apocalyptic imaginaries "of post-political urban societies sterilized by the use of smart technologies and devices for surveillance and disciplinary purposes" (Rossi 2016, 341). Indeed, in a speech on 4 October 2018, U.S. Vice President Mike Pence described the SCS as "an Orwellian system premised on controlling virtually every facet of human life" (Horsley 2018). More nuanced analysis grounds China's emphasis on digital social credit within the context of governance challenges (Dai 2020) and the geopolitical Digital Silk Road project (Creemers 2021). More broadly, scholars underline the need to analyze the impact of digital transformations in Asia's urbanization (Yeung 2011), challenging the assumption of Northern-style neoliberal urban trajectories (Müller and Trubina 2020; McGuirk, Dowling, and Chatterjee 2021). While acknowledging SCS surveillance capacities, we argue that the SCS is variegated and extends beyond them, encompassing various aspects of social life in China's cities.

We focus on the variegation of Chinese SCS projects by analyzing their applications in municipal settings, including city governments and the private sector. At the time of writing, multiple SCSs operate in the country (Liu 2019). Systems can be categorized as either municipal (governed by city authorities, focused on urban services and governance, limited to specific spatial jurisdictional boundaries) or private sector (organized by technology corporations, focused on consumption or financial transactions, in use nationally). Therefore, we use SCSs instead of SCS to underline that although there is a national social credit vision, there is currently no single overarching, monolithic SCS. SCSs can also be seen as examples of digital urban platforms, defined here as digitally enabled assemblages of actors in corporate, governance, and social fields. They perform intermediary functions focused predominantly on data (Caprotti, Chang, and Joss 2022) and potentially reshape power geometries between the state, corporations, and citizens (Webber and Han 2017). This is reflected in an emerging body of work on platform urbanism (Barns 2020; Leszczynski 2020; Sadowski and Maalsen 2020; Caprotti, Chang, and Joss 2022; Odendaal 2022;

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Shapiro 2022) and its development in China (Caprotti and Liu 2019, 2022; J. Zhang, Bates, and Abbott 2022; Chen 2024). Additionally, our analysis of variegated SCSs builds on Webster and Zhang's (2021) study of platform urbanism as producing hybrid physical and digital urban spaces, recognizing that digital systems intersect with the urban in multiple transformative ways.

We build on previous research highlighting the significance of platform economies (Moore and Joyce 2017; Srnicek 2017; Coe and Yang 2022) to demonstrate the role played by municipal governments in designing and operating social credit platforms, while a broader network of state and corporate actors establishes city-specific frameworks (Grabher and van Tuijl 2020). We focus on three specific cities to show how municipal governments, technology corporations, and national social credit regulators interact to shape SCSs in respective locations. Focusing on municipalities, our analysis reveals the spatial and networked dynamics of variegation that influence conceptions of urban citizenship, while avoiding treating "the urban" as a passive backdrop for disembodied technological and political actions.

The article is based on data gathered in Hangzhou, Tianjin, and Weihai during site visits between October 2021 and June 2022. Although Tianjin and Hangzhou are considered first-tier cities, the location of our research in Tianjin eco-city is approximately 40 km from downtown Tianjin. The cities were selected for comparative analysis because of their roles in developing and coproducing municipal SCSs. Each municipal administration elaborated SCSs with key specificities: The research aim was to capture ways in which variegation plays out with regard to both development and implementation of SCSs. Weihai was an early mover in SCS development, initiating the system in 2016. Hangzhou is one of China's key digital cities, known for its efforts to integrate the digital sphere into urban governance, as seen in its collaboration with Alibaba on the City Brain smart city management system (Zou and Zhao 2021) and integration of artificial intelligence (AI) into anticipatory urban governance frameworks (Xu et al. 2024). Tianjin is the location of Tianjin eco-city, a flagship national project. It became the site for an SCS trial linking the eco-city's founding eco-urban focus to smart and digital urban development trajectories (M.-C. Hu, Wu, and Shih 2016; Jiang, Geertman, and Witte 2019).

Our analysis is based on forty-nine interviews and a questionnaire, collected between October 2021 and June 2022: Sixteen interviews were carried out in Tianjin, sixteen in Weihai, and ten in Hangzhou. Additionally, a pilot series of seven face-to-face interviews with respondents from different cities (including Tianjin and Weihai) was carried out in October 2021 to calibrate interview questions and themes. Four pilot interviews were conducted face to face and three were done virtually. Overall, forty-five interviews were conducted in Mandarin Chinese; four of the pilot interviews were carried out in a mixture of Chinese and English. The timeline for data collection was affected by pandemic restrictions, limiting face-to-face interview potential. Interviews focused on the SCS and its operationalization in Chinese cities. Data were also collected on respondents' engagement with SCSs via Web, smartphone, municipal service centers, and other avenues. A nonprobability snowball sampling method was employed, with a key limitation being that older age groups were underrepresented. Face-to-face interviews were conducted in public places (e.g., community parks) and near public service facilities (e.g., credit shops, street-level government offices, public exhibition halls, and civic centers). Overall, eleven interviewees were municipal government staff or worked in public institutes. The others were residents of the three cities, and worked in a range of occupations including retail, nursing, and teaching, or were self-employed; still others were college students, and some were retired.

Data from an online questionnaire supported the findings. Questionnaires contained twenty-seven questions related to the respondents' engagement with the SCS in their cities. Although a total of 1,578 responses were collected between December 2021 and March 2022, only responses from the three cities were used to inform this research: ninety-two in Tianjin, seventy-two in Weihai, and sixty-two in Hangzhou. Respondents were residents of each of the three cities.

We first explain the role of genealogies, variegation, and the production of the urban Global East, before situating our analysis in the context of digital intermediation of urban life and citizenship. Then, a conceptual approach is outlined, predicated on engaging with three themes that cut across the SCSs under consideration: data sourcing, functionality, and the mode of governance. These themes were

derived from the process of research on SCS development in each city. They function across municipal SCSs but are performed differently in each city. These themes designate the key ways in which the variegation of platform urbanism linked to SCSs operates. We then outline the work of municipal SCSs in our three case study cities before offering a discussion.

Genealogies, Variegation, and the Urban Global East

We argue for the need to consider the role of genealogies and variegation and recognize the need to engage with the urban Global East. First, our study of China's SCSs is based on recognizing that discussing the intermediary role of platforms in producing SCSs without engaging with the ways in which power and politics intersect at depth in the production of sociotechnical digital life risks producing a flattened perspective. As Tompson (2017) argued, the smart city can seem "a pragmatic, non-ideological, common-sense approach—yet in practice it is everything but those things" (213). Indeed, the role of digital platforms and technologies such as SCSs are key components of the ideological, accelerated transformation of cities and urban society (Shelton et al. 2015; Alvarez León and Rosen 2020).

China's SCSs have deep historical roots linked to the notion of credit itself. In China, credit (*xinyong*) encompasses integrity, reputation, and moral values, connected to individual behavior and moral standards contributing to one's standing in society (Lin 2003). The concept of credit expanded from individual performance vis-à-vis the state to encompass legal, financial, and other credit forms (Liang et al. 2018). The present landscape of SCSs is technologically and digitally driven, yet firmly rooted in long-term trends linking credit to social stability and cohesion (Nolan 2007).

Moreover, the idea of technical systems' utility in achieving societal moral standards can be found across various Chinese government initiatives and discourses; for example, in the link between building an "ecological civilization" and morality (Rodenbiker 2021). Drawing on research highlighting the role of antecedents and historical trajectories that have led to contemporary smart urbanism (Kitchin 2015; Picon 2015), we argue that a historical perspective on cutting-edge, contemporary digital urban systems helps move past notions of social credit "systems" as purely techno-political and monolithic.

Second, drawing on research on the variegation of smart city projects and discourses (Rossi 2016; Caprotti and Cowley 2019), our analysis of three municipal SCSs recognizes their variegation across space, jurisdictional boundaries, and urban–corporate partnerships in their political, technological, and design elements. This is based on recognition of the connections between corporations, citizens, and planners in shaping smart cities. For instance, Sadowski and Maalsen (2020) demonstrated how variegation manifests through power dynamics and conflicting interests in different urban areas, whereas Cowley, Joss, and Dayot (2018) emphasized how municipal governance actors adopt entrepreneurial or service user engagement approaches in UK smart city projects.

Third, previous research highlighted the influence of power dynamics and neoliberal governance structures on the variegation and development of smart cities (Rose 2020; Kitchin 2022). This illustrates how smart city production involves a combination of physical and digital spaces influenced by the interplay of state and market interests, facilitated by digital technologies, platforms, and technical networks encompassing sensors, AI, the Internet of Things (IoT), automation, and robotics (Caprotti et al. 2024; Cugurullo et al. 2024). Links between cities, the state, and corporations, however, differ in Global East contexts. Underlining this, Chang, Jou, and Chung (2020) emphasized the importance of strong city–local partnerships, rather than links with international technologically advanced cities and global technology corporations, common to Northern contexts. Nevertheless, state steering remains a central factor in smart urbanism in the Global East. Zhen, Wang, and Wei (2015) demonstrated that government-related path dependence, participation in state-sponsored initiatives, and early investments in digital strategies shape the development of Chinese digital cities differently than in Northern settings (R. Hu 2019; Zhou, Xiao, and Deng 2022). As Cugurullo (2021) stated, when considering actual smart city development, it is difficult to pin down Northern or Southern contexts as the primary geographical areas of focus. We argue that this is especially the case given the rising prominence of Chinese, Indian, South Korean,

Singaporean, Japanese, and other Eastern locations as key sites for smart city development (Joo and Tan 2020; Curran and Smart 2021).

When examining Global East smart cities, research reveals differences in power dynamics in processes of variegation compared to Northern contexts. For instance, B. Wang, Loo, and Huang (2022) studied 2,080 smart city pilots across 136 Chinese cities, finding that, although national strategies play a crucial role in steering smart city development and implementation, there are notable divergences in trajectories, emphasis areas, and levels of progress at the city level. This aligns with research on Northern smart cities highlighting the variation of project development at the local level, from stalled projects to those attracting significant funding (Caprotti and Cowley 2019). Nonetheless, adopting a perspective on smart city and digital platform development that is less tied to definite political-geospatial land areas acknowledges the specificities of Northern, Southern, and Eastern contexts (Cirolia et al. 2023). For example, in the Global South, urban conditions such as high levels of congestion in South and Southeast Asia have given rise to unique smart-city-related platforms centered around motorcycles, distinct from car-sharing services in Northern cities (Caprotti, Chang, and Joss 2022).

Based on this, we contribute to developing agendas for provincializing urban research (Leitner and Sheppard 2016) focusing on ordinary cities (Robinson 2006) as a way of moving past North–South binaries while staying conscious of the need to avoid continental and national exceptionalism (Waley 2016). For example, Mouton's (2021) study of New Clark City, a smart city project in Manila, Philippines, shows how local political and infrastructural concerns are linked with international partnership formation and marketing of the smart city on "global" lines, underlining both place-specificity and connecting to globalizing smart city narratives, whereas Breslow (2021) highlighted key differences between Northern smart urban models in the Smart Dubai Initiative and those found in other contexts, underlining the city's smart surveillance focus, which is comparable with Chinese SCS projects. As Müller (2020) argued, an excessive focus on North–South dichotomies in urban research effectively erases the Global East, described as countries, places, locations, and cities that exist "in between" places defined as Northern or Southern. Our use of the notion of Global East is thus less tied to specific geographical "boundaries" and more focused on problematizing the static North–South binary prominent across much urban research (Shin, Lees, and López-Morales 2016).

Variegation Through Data Sourcing, Functionality, and Mode of Governance

Before considering the specific context of city-scale SCSs, it is important to highlight three distinct themes that are operational across each system and that form the conceptual framework for analysis. *Data sourcing* refers to the ways in which SCSs source multiple types of data and enable city authorities to make sense of these data streams. This is the mechanism through which city authorities access various types of data, including multiple areas of lived urban experience (transport, consumption, financial behavior, etc.), and interpret and use the data in more or less autonomous ways within the remit of an SCS. Data sourcing also implies selectivity, as certain types of data are treated as more or less appropriate for municipal data systems' purposes. Municipal SCSs exhibit variability in the number of indicator types and in the corresponding data streams analyzed by each system. For example, Ordos's SCS is based on forty-nine indicators, whereas Weihai's uses 1,503 (Liu 2019). Because SCS platforms have an intermediary function between different types of data, they effectively enable digital data to be integrated into the performance of specific types of algorithmic citizenship (Bridle 2016). In this sense, data environments in which SCSs operate are not just technical, but function to link technical frameworks with multiple social structures (Burrell and Fourcade 2021).

Functionality is concerned with the "end" of different SCSs. As highly complex digital systems designed to respond to central government and local authority imperatives, it can be assumed that the aims of SCSs are similar. As shown later, however, this is not the case. The variegated nature of SCSs means that their specific aims and priorities are different. Indeed, each SCS prioritizes different aspects of algorithmic urban and social life. The variegated forms of functionality involved in these systems are integral to the production of multiple iterations of SCSs in different urban contexts.

The *mode of governance* performed through each SCS is influenced by data sourcing. We use the concept of mode of governance to understand citizen-state relations (Przeybilovicz et al. 2022): in smart cities, it has been shown that specific actors (the state, corporations and civil society) interact in confronting governance challenges. In turn, this is informed by different types of governance "games," identified by Meijer (2018) as the politics of data collection, storage, usage, visualization and access, all of which are central to China's SCS development. We draw on Meijer's (2016) conceptualization of how modes of smart city governance can be seen on a spectrum between concentrated and distributed intelligence. The former is predicated on the link between new technologies and central government steering, with a level of partnership between government actors and private corporations. The latter relies on collaborative, networked forms of governance and involves more active participation of the private sector, including a role for social media and open data. Between these two poles, modes of governance focused on hybrid intelligence are situated on a spectrum between concentrated and distributed intelligence (Meijer 2016). The SCSs under consideration here are placed differently on this spectrum. In using this framework, we do not imply a normative understanding of how SCS development in China "fits" into abstract institutional organizational perspectives: Rather, our purpose is to underline the variegated complexity of design, operation, and materialization of digital governance as differently expressed in each city.

China's Social Credit Systems

In China, debates around SCS design and implementation at the state level go back to the 1990s, as seen in the 1999 publication of the National Credit Management System (国家信用管理体系) policy document on corporate behavior, as well as the subsequent (2002) Principles of the Social Credit System (社会信用体系原理). Much of the social credit focus in the 1990s and 2000s was on corporations and market behavior (US-China Economic and Security Review Commission 2020). In 2004, however, the Central Guidance Commission on Building Spiritual Civilization established by the Party Central Committee in 1997 instituted the first National Civilized Cities Assessment System, assessing cities on a yearly basis in terms of their environmental, social and economic progress. Additionally, it led to the introduction of the National Civilized Cities Award (NCCA) for city governments. The NCCA formed the envelope within which the more specific SCS program was eventually organized (Trauth-Goik 2023).

Some city governments started designing SCSs in the early 2000s. Hangzhou's government launched a system in 2002, involving sixty-nine government departments (Credit China 2018). In 2007, the national State Council established an Inter-Ministerial Joint Committee for the Construction of a Social Credit System, the precursor of SCS development. China's current SCS program began in 2014, initially aiming to enable the government to tackle corruption, among other issues. The article's remit is digital SCSs, focusing mostly on urban areas due to the preponderance of SCS activity in municipal locations. Nevertheless, it must be noted that rural SCSs were also piloted as part of the State Council's 2014 strategy of SCS experimentation nationwide (Trauth-Goik 2023). Rural SCSs were subsequently linked to the formation of "virtue banks" (道德银行) through which citizens could be ranked according to desirable moral and creditworthy qualities. Rural SCS pilots were welcomed because of their potential to help establish financial creditworthiness for rural residents (Shahin and Zheng 2020). SCS acceptance remains lower in rural areas, however (Kostka 2019).

Although other countries use credit scoring systems (notably, financial credit systems), China's credit focus represents, globally, the most comprehensive attempt to collect digital data about citizens to shape "a thick atmosphere in the entire society that keeping trust is glorious and breaking trust is disgraceful" (State Council 2014). As Orgad and Reijers (2019) noted:

> Western media portrays it as a means of surveillance, rooted in a history of social control in China. And yet, China insists that the goals of the national system are different—creating a culture of integrity and trust …. The system is mainly geared toward legal compliance … although it also concerns with a supposed moral decline in civic society and a rapid economic growth in China. (7)

The 2014 through 2020 SCS trial phase saw multiple SCSs launched in the municipal and private sectors. The country's municipal SCSs are

geographically specific, usually focused on a single city or urban area, although some municipal SCSs have been broadened beyond city boundaries. From 2017, trials were conducted in ten secondary-tier (Weihai, Suzhou, Hangzhou, Yiwu, Wenzhou, Xiamen, and Chengdu) or smaller (Rongcheng, Weifang, and Suqian) cities, although several cities and counties had started experimenting with SCSs in the early 2010s (Creemers 2018). Private-sector SCSs, on the other hand, were developed and run across the country by leading technology corporations, such as Tencent and Alibaba. These SCSs are not geographically specific, exhibiting national coverage ambitions: The corporation is the main designer and facilitator of each system. An example of a corporate SCS is Sesame Credit, a nationwide system developed by Ant Financial Services Group, a subsidiary of Hangzhou-based Alibaba. Private-sector SCS trials started in 2014 and involved Sesame Credit and other systems developed by Tencent, Didi Chuxing, and Baihe.com.

China's SCS program's key elements include (1) *data integration*, the aim of reconciling data from a multiplicity of sources (social media activity and network's consumer behavior, legal convictions, and financial creditworthiness) into a scoring system, and (2) *incentive creation*, such as through lower mortgage rates for high-scoring individuals. For example, Sesame Credit scores credit history, behavioral trends, ability to honor financial agreements (e.g., utility bills), personal information, and social relationships. Incentives available to Sesame Credit high-scoring individuals include expedited Singaporean and Schengen visa application procedures, reduction or waivers of deposits for a range of services, and access to fast lanes at airports. By 2017, more than 380 cities had recognized Sesame Credit's scoring system (Creemers 2018) and introduced incentives for high scorers in sectors including health care and social housing. Low scores are penalized: Financial arrears or dishonesty attract penalties, including not being able to leave the country or purchase airplane or first-class rail tickets, as well as being barred from automobile purchases. Furthermore, blacklisted individuals are barred from staying in hotels rated one star or higher, visiting nightclubs, purchasing or renovating a house, and enrolling their children into private schools. Additionally, blacklisted individuals are restricted in their online content consumption because financial credit data are shared with Sesame Credit (Chao 2020). This is an example of linking platformization, urbanization, and financialization (Wagner 2021). Therefore, although we focus on municipal social credit systems, China's variegated SCS landscape also includes corporate SCSs not limited to operation in one city.

Variegated Municipal Social Credit Schemes

Hangzhou and Weihai were part of ten municipal SCS pilot cities selected by the national government in 2017, whereas Tianjin pioneered its local system separately. The systems they developed and operate display both commonalities and a divergent set of aims and operational focuses. They also differ in how they engage with data sourcing, functionality, and modes of governance (see Table 1).

Hangzhou

Hangzhou, capital of the eastern coastal province of Zhejiang, became a smart city of national significance in the 2010s (Shen et al. 2018; Caprotti and Liu 2022) as a result of strong partnerships and networks between municipal and central state agencies, as well as technology corporations, such as Alibaba and Hikvision, based in and around the city (Argyriou 2019). Hangzhou's participation in the national SCS pilot was based on the Credit Hangzhou initiative (信用杭州) launched in 2002 (Credit China 2018), resulting in the 2018 development and implementation of the city-wide Qianjiang Credit (*QianJiang Fen*, 钱江分).

Qianjiang Credit was initiated by the Development and Reform Commission of the Hangzhou municipal government. *Qianjiang* references the Qiantang River (钱塘江) that runs through the city. The Hangzhou Citizen Card Company (a state-owned enterprise [SOE]) was entrusted to design the system using public data from the Hangzhou Public Credit Information Platform (in operation since 2008) and user data from the Hangzhou Citizen Card Company, which had data from nine million users spanning more than a decade. The data set for the SCS thus included more than 1.9 billion pieces of credit information on 29 million individuals.

Table 1. Key features of the social credit systems (SCSs) in Hangzhou, Weihai, and Tianjin

Location	Year	SCSs	Focus	Aims	Incentives	Key actors
Hangzhou	2018	Qianjiang Credit	Promote prosocial behavior	Compliance with the law, commercial integrity, prosocial behavior	Multiple, including renting, elderly care, medical services, dating, etc.	Hangzhou municipal government (NDRC), Hangzhou Citizen Card Company, city residents
Weihai	2016	Seashell Credit and Rongcheng Credit	Evaluate and promote "personal credit acts"	Increase public morality and social responsibility, increase juridical and contractual performance, improve public services	Incentives from multiple governmental departments (heating and water discounts)	Weihai municipal government, Weihai Citizen Card Company, city residents
Tianjin	2014	Recycle Credit	Promote residential recycling	Increase recycling through awarding credits for recycled waste	Credit exchange for goods	China-Singapore Tianjin Eco-City Administrative Committee, Tianjin Eco-City Investment and Development Corporation, JinShengHuanKe company, Keppel Corporation, city residents

The system is open to any Hangzhou citizen, regardless of their *hukou* (household registration) status. Users can check their Qianjiang Credit online, in person at the Citizen Card Center, or using one or more of three mobile phone apps: Credit Hangzhou, Citizen Card, and HangzhouMobileGov. By 2022, 4.73 million citizens had joined Qianjiang Credit: Our survey indicates a usage frequency of around five times per capita annually. Although this is less intense usage compared to private-sector SCSs like Sesame Credit (which averaged seventy-nine uses per year in 2021, according to the survey), it still indicates a basic level of SCS engagement. It is also worth noting that the 4.73 million citizens who signed up for the SCS were a part of the total of 11 million who worked or lived in Hangzhou, constituting a 43 percent participation rate among the urban population.

Tianjin

At the time of writing, Tianjin was about to launch Hai River Credit (*HaiHe Fen*, 海河分), a comprehensive municipal SCS. Here, we focus on the earlier SCS centered on recycling behavior that was developed and still operates in the Sino-Singapore Tianjin Eco-City (SSTEC) near Tianjin. The location of this SCS is significant: SSTEC has been a flagship site for model urban development since the late 2000s, when the Chinese and Singaporean governments established a joint venture to build a new eco-urban area (Pow and Neo 2015; Caprotti and Gong 2017). The urban development trajectory for the eco-city shifted during the 2010s, from eco-urban development to smart and digital technologies (Caprotti 2020). Thus, the recycling-focused SCS is an example of the intersection of eco-urban and smart/digital development priorities.

The eco-city's recycling program, financed by the SSTEC Investment and Development Corporation and led by SSTEC's Administrative Committee, a subdistrict-level government authority, has been active since 2014. It focuses on household-level recycling, using credit to encourage and incentivize participation. The recycling system aims to "enable residents' self-discipline and social participation and improve the level of waste resource utilization" (China Association of Circular Economy 2018). It has three main components: recycling sites in public community areas, credit exchange shops, and an app (Figure 1). There are sixty-five recycling collection sites in nineteen communities, each located no more than 150 m or a two-minute walk from housing (Sino-Singapore Tianjin Eco-city Management Committee 2021). Different types of waste can be recycled for a corresponding number of credits per

Figure 1. Three elements of Tianjin's eco-city recycling program: (A) recycling site, (B) credit exchange shop, and (C) app.

kilogram: Plastic earns eighty credits, metal earns sixty credits, and glass earns five credits. Data on weight and waste type is collected via a digital information management platform: Credits are awarded to residents' accounts automatically. A report on the eco-city's credit system celebrated the ease and efficiency of the process of waste-to-credit recycling:

> "Look, this is the household waste that I have sorted at home in advance," Liu Yunxiao, a resident of Building 11, Jingshan Community, Sino-Singapore Tianjin Eco-city, said while throwing garbage into the smart recycling machine. Liu Yunxiao put the point card in her hand and swiped it on the induction area of the machine. The machine quickly "spit out" a QR code, and the intelligent system filled the card with corresponding points. With the point card, she could go to the neighborhood convenience store to exchange for the corresponding daily necessities. (China Association of Circular Economy 2018)

Recycling facilities are accessed via credit cards, mobile apps, and facial recognition. In the app (Figure 1), residents check their recycling record, credit scheme rules, and the location of nearby recycling facilities. Earned credits can be exchanged for housewares in credit exchange shops, with 100 credits equal to CNY 1 (US$0.14). As an interviewee stated on 21 November 2021, 3,000to 5,000 credits (for an exchange value of CNY 30–50, or US$4.14–6.90) were awarded per capita per month via the system.

Weihai

Weihai, a northern coastal city with a population of around 2.8 million people in Shandong Province, initiated a municipal SCS system in 2016 as part of the national pilot. The initiative began as a small-scale pilot in Rongcheng (a county-level city in Weihai prefecture, population c. 800,000; C. Zhang 2020). In Rongcheng, scores ranked citizens according to their social credit quality, with the highest-scoring citizens ranked AAA and the lowest-scoring ranked D (Knight and Creemers 2021). In 2018, this was expanded when the Weihai Municipal Development and Reform Commission launched Seashell Credit (*BeiKe Fen*, 贝壳分), now operated by the Weihai Citizen Card Company. Key actors involved in its organization and management also include Weihai city government and the People's

Bank of China. Seashell Credit's main aims are to promote personal social credit while disincentivizing specific types of behavior. Since 2017, citizen data from forty-three municipal departments have been included in the system to calculate scores. By May 2022, Weihai's SCS had been ranked third among national-tier cities and first of 261 prefecture-level cities in a national-scale municipal SCS assessment by national institution Credit China (Weihai Social Credit Center 2022b).

Weihai residents can access the system via the Credit Weihai web portal, apps, or offline at the Government Service Hall building. Seashell Credit is available through two apps: Credit Weihai and the Weihai Citizen Card. Every user starts with a 1,000-credit score. There are 193 different types of behavior that increase this, such as charity, blood donations, and volunteering, and 2,652 behaviors resulting in deductions, including those linked to judicial judgments, commercial defaults and utility bill arrears, and acts such as traffic violations or jaywalking (Liang and Chen 2022).

To encourage active usage, Weihai's municipal government developed a system of rewards and punishments. For example, volunteering is rewarded, in line with the ideal of communal activism. On the other hand, residents with low credit scores are blocked from purchasing high-speed rail or flight tickets. The system was also tweaked to respond to the COVID-19 crisis and the need to govern urban areas in a pandemic context. As Knight and Creemers (2021) noted:

> In Weihai, 1,098 medical personnel were awarded bonus "Seashell Points" for their work in the pandemic. Meanwhile, two cake shops in the city's Wendeng District were each fined 10 credit points for remaining open during the pandemic, while a spot check of a local construction company found three employees working from the office, none of whom were wearing face masks, resulting in a 20-point deduction. (15)

Variegation Through Data, Functionality, and Operational Governance

Having outlined SCS structure in the three cities, we now analyze how the design and aims of each SCS display different elements of data sourcing, functionality, and governance. The ways in which these are materialized in the context of each specific SCS enables an understanding of variegation of social credit within the national landscape of continued central government interest in leveraging SCSs. We note that although this article focuses on variegation, multiple commonalities exist across all cases. Each municipal government developed a city-specific SCS, responding to local priorities and strategic objectives, but each project exists concurrently within the broader remit of a national strategic "move" toward systems of social credit with emphasis on scoring and valuation. At the same time, as noted by Brussee (2023) and Dirks and Fu (2023), the malleability of the complex collage of SCSs in the country also means that social credit can be used in multiple ways and city-level SCSs can respond to changes in national policy directions in the context of central mechanisms of flexible control. A further commonality across the three cities is the enrollment of private-sector actors in the design, development, and operationalization of SCSs. Although the specifics of data exchange between municipal and private-sector actors is difficult to assess (Hansen 2023), there are clear partnership links between municipal government and corporations in the emergence of SCSs. At a deeper level, this means that the private sector is intimately involved with systems of sorting, surveillance, and control (Liang et al. 2018).

Data Sourcing

SCSs in Tianjin, Weihai, and Hangzhou exhibit intermediary identities in enabling multiple types of data, from different sectors and sources (financial, consumption, and legal), to be integrated and interpreted in each system's algorithmic framework. Each SCS is characterized by variegated *data selectivity*, as different sorting of data categories is deemed necessary for credit scoring. Additionally, the sourcing of data by each system feeds into the performance of citizenship by city governments and citizens themselves. For example, Hangzhou's Qianjiang Credit was constructed by the Hangzhou Citizen Card Company, a municipal-level SOE, by aggregating data from multiple sources: governmental data from the Hangzhou Public Credit Information Platform (since 2008); a decade of data about 11 million users from the Hangzhou Citizen Card Company; and individuals' data from digital platforms including

dating sites, the Ziru rental site, and the Yunpinhui jobs Web site. To access, view, and use personal Qianjiang Credit scores, individuals need to authorize Hangzhou Citizen Card Company to use the data, even though data were aggregated, and scores assigned to individuals without prior consent. All residents over age eighteen can access their credit and are encouraged to score highly, "which helps you enjoy a much more convenient life and better service" (Ke 2020).

The intermediary function of each SCS is based on different *algorithmic logics* for generating scores. SCSs do not share a common algorithmic backbone, as each city prioritizes specific behaviors differently. Each SCS's algorithmic logic is central to the attempt to incentivize and nudge citizens to behave in specific ways. At the same time, citizens engage with each SCS's data sourcing through behavior that prioritizes digitally traceable and visible activities that are deemed worthy of credit rewards. An example of a highly selective algorithmic logic is seen in Tianjin eco-city: The focus of its pilot was exclusively on the green dimension, influencing pro-recycling behavior. Data were collected and used both through material inputs (recycling waste weight and type at recycling collection sites) and via the SCS's digital platform (enabling users to view their recycling activity and exchange credits for goods). Additionally, the SCS provides a constant data stream to the eco-city's administrative committee, facilitating responsive and adaptive governance using this system, involving sensors, recycling sites, a digital platform, and credit exchange shops. The impact of this algorithmic logic can be seen in the fact that by 2018, 16,145 households opened credit accounts in the eco-city, with an average recycling amount of 44.8 kg of metals and 29.8 kg of paper over three years per credit account. This resulted in an average of 2,686 credits accumulated over three years: an average of 1,791 were exchanged for housewares in credit exchange shops (Z. Wang 2018). Here, the algorithmic logic is both digital and material, forming a relationship between citizens, city government, and consumption patterns that can be described as metabolic (Moss, Voigt, and Becker 2021). Thus, algorithmic logics around social credit can be seen as integral to a metabolic urban process enrolling multiple spheres of life into governance systems that, in turn, translate data into more tangible forms of circulation and exchange.

Each SCS's algorithmic logic is in turn central to the attempt at *quantification*, understood here not simply as the numerical interpretation and scoring of specific behaviors, but as the "quantification of self," as "metrics are discursively constituted as key to enhancing the lives of individuals as well as improving bureaucratic efficiencies" (Wong and Dobson 2019, 226). Data sourcing is, indeed, linked to the construction of rankings enabled by social credit scores. This is key for citizenship: As Wong and Dobson (2019) noted, social credit score assignation through SCSs "determines the overall worth and value of an individual in Chinese society" (227). This is reflected in interviewee accounts of SCS engagement: An interviewee from Weihai (a twenty-three-year old college student) stated, on 29 October 2021, that a specific score "is related to your contribution to a city like Weihai … if normal people have normal behavior, they would not think about this kind of thing." This quote points both to the importance of scoring for social credibility and trustworthiness, and to the normalization of digitally sourced credit logics: The existence of the SCS is in the background, with only those falling afoul of the scoring system needing to worry about it. Thus, credit scoring and ranking are key to integrating data into citizenship through the SCS as a performative mechanism. As Credit China underlines in reference to Weihai's Seashell Credit, the benefits of a high score are beneficial, in contrast with the shaming effects of low social credit:

> With the Seashell Credit in Weihai, there is no need to pay a deposit for visiting the hospital, borrowing books from the library, and there are discounts on tickets for tourist attractions, etc., which has truly created a good atmosphere in the whole society of "honourable trustworthiness, shameful dishonesty." (Credit China 2021)

The link between prosocial algorithmic logics, prosocial behavior, and efficiency in the smart city was also underlined by this interviewee, who mentioned that, when using hospital self-service machines, paying for medical services via apps was experienced as a form of digitally mediated efficiency with clear societal benefits:

> You can leave some machines or windows for the elderly who are not likely to use them, without queuing. It will be much more convenient for everyone. In fact, it is tantamount to saying that efficiency is increased, and social efficiency is improved.

In contrast with Qianjiang Credit's semitransparent SCS construction, Weihai's Seashell Credit has a more explicit indicator system and regulations focused on changing scores, demonstrating a clear trajectory toward social regulation and performance of algorithmic citizenship. Weihai's Social Credit Management Center aggregates and analyzes data for the statistical modeling of credit scores on six levels, from AAA to D. Activities influencing positive scores are like those in other SCSs, but there are a large number (1,492) of behaviors that result in deductions. These include political misbehavior, administrative penalties (linked to food safety or environmental pollution), judicial penalties, social dishonesty (e.g., academic dishonesty), and utility, health, and parking charge arrears. Misbehavior records are kept for—three to five years. Some penalties greatly devalue credit scores: Drunk driving, for example, automatically lowers a user's score to the C category, in an example of the direct link between quantification and performance of citizenship. This clarity was reflected by the previously quoted interviewee, who noted that whereas Weihai's system "simply adds or subtracts points," Sesame Credit's scoring system was less clear: "The computer system of Alipay's Sesame points is not very well understood."

In Hangzhou's Qianjiang Credit, scores are based on data from across five domains: public administration, economic, judicial, everyday life, and nonprofit. Credit scores are differentiated into five levels: Scores less than 550 are classed as needful of improvement; those between 550 and 600 are average scores; 600 to 700 are classed as good scores; 700 to 750 are considered very good; and 750 and above are excellent. This is based on (1) demographic information, including household registration, education, employment, and so on; (2) compliance with the law, including public administrative records, judicial, and tax information; (3) commercial integrity, linked to contract fulfillment, credit loans, and other business activities including job seeking and recruitment; (4) livelihood, focused on payment of utility and other bills; and (5) prosocial behavior, defined as cooperation and mutual assistance (e.g., through volunteering, environmentally friendly acts, and social networking activities such as on dating Web sites). The fifth category is aimed at nudging a culture of voluntary social contributions in Hangzhou. Here, again, quantification is deeply interlinked not just with the performance of citizenship, but with the shaping of multiple areas of individual behavior to "fit" into a predetermined societal ideal of citizen behavior.

Functionality

All three SCSs differ in types of functionality characteristic of each system and visible in each SCS's aims and purpose. Differences contribute to the variegated landscape of urban social credit, as various aims and scope envelopes for each system influence how algorithmic urban life and citizenship are communicated, promoted, and performed in each city. The credit scheme in Tianjin is the most narrowly defined, with functionality focused on recycling and pro-environmental behavior. It uses both incentives in the form of exchangeable credits and disincentives such as publishing recycling blacklists on communities' electronic bulletin boards. For example, in Keppel-Jijin, a residential community, the blacklist relating to misbehavior in recycling and carbon reduction is publicized in the 5G big data service center.

In contrast, Qianjiang Credit has governance aims in areas including transport, housing, and medical services, but combines these with aspects of the system that closely emulate private-sector SCS providers, like Alibaba's Sesame Credit. An example can be seen in the way Hangzhou's SCS establishes partnerships with private firms and digital platforms, offering various incentives for engaging with the SCS. Incentives incorporate digital consumption and other activities, including shopping, house rentals, tourism, and social networking. For example, citizens whose credit scores are over 700 can access 50 percent discounts on the deposit needed to secure public rental housing. Qianjiang Credit also shares users' information with local dating platforms to match potential partners. In Hangzhou, functionality is linked not only to the performance of citizenship, but to the SCS's algorithmic enabling function, effectively giving preferential access to consumption and other market opportunities as a direct result of a constellation of "positive" individual behaviors spanning public and private spheres.

In comparison with Hangzhou's public–private social credit networks, Weihai's Seashell Credit is more centrally focused on municipal government services. Within this remit, thirteen municipal

bureaus encourage active credit participation. Incentives include ticket discounts on visitor attractions and exemptions from deposit payments in libraries and hospitals. In addition, in the winter of 2021, the Weihai Heating and Power Group Co., Ltd. (a municipal SOE) offered a fee deduction of CNY 300 (US$41.37) on heating bills to 500 residents with AAA credit scores. Nonetheless, there remains a public participation challenge: By November 2021, Seashell Credit only involved about 390,000 residents, a small proportion of the total 2.8 million population. An interviewee based in central Weihai commented:

> There are few residents in Weihai who know and use this Seashell credit, except those who work for the government, public institutes, or SOEs. Because they have been assigned the political task of adopting SCS, as well as advocating the SCS to the surrounding people … . Moreover, AAA-level is extremely hard to achieve, and one needs to do a lot of volunteering works to acquire credits, which makes most incentive policies ineffective for the majority.

This information was verified during field work in June 2022 in the Weihai Citizen Card Center. Staff appeared to be surprised at enquiries about Seashell Credit, and one staff member asked about barriers to participation in the credit scheme, including *hukou* status and social insurance payments. The thrust of SCS development in Weihai therefore involves incentivizing participation. Efforts involve face-to-face events: In June 2022 public SCS information events were held, involving digital information billboards, publicity materials, and staff answering questions and providing information. In an event on 14 June 2022, more than 100 residents spoke with staff and received more than 500 copies of SCS information (Weihai Social Credit Center 2022a). Thus, in terms of functionality, there is a clear differentiation in scope and aims among the three SCSs, which in turn, influences how social credit and (by corollary) urban digital citizenship are defined and performed in each location. These components of variegation, in turn, are intertwined with the ways in which social credit is governed.

Mode of Governance

Using Meijer's (2016) spectrum approach to modes of governance in smart cities, we argue that China's municipal SCSs operate under a hybrid intelligence framework, with different cities operating more or less closely to the concentrated intelligence pole, involving government central steering and varying levels of business partnership. Variegation in mode of governance can be seen in a more distributed approach in Hangzhou, where the SCS involves partnership with corporations such as Alibaba under a collaboration agreement to share part of the credit data between the municipal government and corporations. These partnerships are both technical (involving integration of private-sector offerings into the SCS platform) and consumption-focused (facilitating activities such as buying and selling). In Hangzhou, the most prominent SCS-focused partnership is with Alipay, a third-party digital payments platform. Furthermore, in the case of Qianjiang Credit, financial and other incentives are supplemented by governance-related rewards. For example, citizens can earn certificates in environmental protection, volunteering, or leading low-carbon lifestyles via SCS-accredited behaviors such as completing recycling lessons, using public transport, and becoming river water quality supervisors. In Hangzhou's social credit regulations (released in 2022), credit is used to define citizens as subjects who perform through participation in SCS activities. According to regulations, social credit relates to "natural persons, legal persons and unincorporated organizations with full capacity for civil conduct (hereinafter collectively referred to as credit subjects) who perform statutory and agreed obligations in social and economic activities" (Hangzhou Credit Office 2022). This indicates that even though Qianjiang Credit involves multiple partnerships, the shaping of citizens into performers of state-sanctioned citizenship behaviors remains the core aim of the SCS.

Weihai's SCS is more closely aligned with the concentrated intelligence governance mode (Meijer 2016) due to the prominent role of government steering and focus on government-led e-governance. The city, and Shandong Province more broadly, have actively published and produced policy documents on administrative measures relating to SCSs and the promotion of behavior change through credit. The city's government clearly regards the SCS as an innovative governance approach to addressing policy challenges and opportunities. Government steering is also seen in the fact that, although there were three rounds of public consultation at the beginning of the SCS, these were only conducted within government departments. The city

government, nevertheless, demonstrated intercity learning by including private-sector partnerships in the SCS. As a respondent stated:

> In 2021, the Weihai government started to learn from Hangzhou regarding the promotion and application approach of Qianjiang Credit. The government sorted out twelve issues linked to citizens' livelihoods. Over eighty enterprises and social institutes have been selected by the government to form partnerships aimed at constructing diversified scenarios of [the credit system].

These partnerships have enabled mechanisms to involve the private sector in activities like using social credit for discounts in shopping malls, "credit-easy parking" (park first, pay later), and credit-linked discounts on public housing rental (10 percent off rental price for AA-level scores, 30 percent off for AAA scores).

Meanwhile, Tianjin eco-city focuses on the concentrated intelligence pole, as the SCS's focus is on government services linked to recycling. Nonetheless, the SCS features partnership between the government and other actors, including the urban management bureau in charge of waste management, the Jinshenghuanke waste disposal corporation, real estate developers responsible for facilities within the eco-city's residential areas, and residents themselves. A key feature of the eco-city's SCS that puts a limit on governance, though, is the fact that participation in the SCS is limited to house owners in the eco-city. As a staff member working for the credit program asked us: "Are you a new resident here? You can easily register an account on your phone, or via our computer here. Please tell me where you bought the house. Did you bring your property ownership certificate?" This seems to indicate both a barrier to SCS participation and a limit to effective urban governance through the SCS, as residents who are not property owners in the eco-city cannot qualify for recycling credits. Although there are reasons for linking SCS participation to ownership, it results in the limitation of digital urban citizenship performance to those who own property.

Conclusion

We analyzed China's municipal SCSs to understand their variegated digital and urban landscapes, using an interpretive framework based on data sourcing, functionality, and mode of governance. The emergence of SCSs in China poses four important research questions for urban scholars. First, we showed that the variegation, relationality, and performativity of SCSs are expressed differently across urban contexts. Our study reveals variations in power dynamics and agency between the city and technology corporations, as well as their responses to state-level guidance. Additionally, variegation is observed at a microlevel, with each SCS and its underlying principles articulated uniquely in each city. This raises the question of how SCSs affect and shape concepts of citizenship at different scales: urban, provincial, and national. SCSs can be understood as operationalized to produce "absent citizens" (Shelton and Lodato 2019, 36), disempowered and excluded from processes informing the techno-economic frameworks within which they operate. The variegated operation of citizenship produces a variegation of notions of ideal or absent citizens depending on the operationalization of SCSs in related but distinct contexts.

Second, there remain questions about moving past characterization of SCSs as a hierarchical channeling of power from city administrations onto urban citizens often depicted by scholars as deprived of significant agency. In this context, it is useful to draw on recent smart cities research that critically unpacks the myth of smart as efficient, frictionless, and faultless (Leszczynski and Elwood 2022). Furthermore, a focus on junctures and fractures in urban digital systems, especially on glitchy iterations (Leszczynski 2020) within the operation and performance of platforms such as SCSs, helps reveal the expression of citizens' agency through malfunctions, unintended uses, disengagement, and other performances of SCSs in everyday urban life. This is underscored by one of our pilot interviewees, from Wuxi, who described a complex mix of governance-related digital systems that displayed limits to interoperability:

> All the departments are trying to develop their own app but they all have similar functions, they don't talk to each other, for example in my city I have six apps, for metro, hotel booking, food, bus system, this one is for digital ID driving license, registration … this one I don't know whether they need two apps.

Third, key questions emerge about how platform urbanism is shaped in a Global East context. Research on platform urbanism has extended smart city research but can also take Western and Northern models of transition to platform capitalism

for granted. Although these might describe a move toward a "new digital capitalism" (Grabher and van Tuijl 2020, 1011), it is increasingly recognized that (1) research based on urban processes in the Global North or South often overlook distinct urban configurations in the Global East (Müller 2020), and (2) platform urbanism is emerging globally but is developing particularly rapidly in China and other East Asian contexts (Caprotti and Liu 2019, 2022). Paying attention to these dynamics in the Eastern context will provide a richer understanding of urban development processes in the digital age.

Fourth, the development trajectories of Chinese SCSs can be interpreted not as examples of Chinese techno-urban exceptionalism, but as part of the continuing increase in technology in society (Ellul 1980). This is seen in the production of what Cheung and Chen (2022) called the emerging "data state": a governance arrangement based on systems like the SCS, involving limited citizen autonomy. A research imperative is to find ways in which governmental logics, constructions of citizenship, and state–market relations emerge through the increasing digitalization and platformization of hypercontrolled urban society. This has become apparent due to several countries' attempts to link individual digital data, smartphone-based platforms, and mass public health measures because of the recent COVID-19 pandemic. Additionally, the consequences of the pandemic, including the increasingly technocratic focus on the mediation of many forms of social life through digital platforms, enabled these changes, as seen in Tan's (2022) analysis of the link between digital payments and Singapore's Smart Nation strategy. As Curran and Smart (2021) reminded us, "Provincialising smart cities shows those of us in the Global North our possible futures, in a reversal of the ways that colonial and postcolonial cities have more commonly been shown their paths to their futures by the present of their colonisers."

China's SCSs demonstrate the growing trend toward technocratic, near-real-time, and analytics-based management of collectives through personalization and individuation (Barry 2020). Examining this trend requires a substantive and methodological "move" linking urban geographical enquiry with related themes, including automation, robotics, AI, and broader conceptual problematizations around the continued production of digitally mediated urban societies.

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References

Alvarez León, L. F., and J. Rosen. 2020. Technology as ideology in urban governance. *Annals of the American Association of Geographers* 110 (2):497–506. doi: 10.1080/24694452.2019.1660139.

Argyriou, I. 2019. The smart city of Hangzhou, China: The case of Dream Town Internet village. In *Smart city emergence: Cases from around the world*, ed. L. Anthopoulos, 195–218. Amsterdam: Elsevier. doi: 10.1016/B978-0-12-816169-2.00009-2.

Barns, S. 2020. *Platform urbanism: Negotiating platform ecosystems in connected cities*. Singapore: Palgrave Macmillan.

Barry, L. 2020. The rationality of the digital governmentality. *Journal for Cultural Research* 23 (4):365–80. doi: 10.1080/14797585.2020.1714878.

Breslow, H. 2021. The smart city and the containment of informality: The case of Dubai. *Urban Studies* 58 (3):471–86. doi: 10.1177/0042098020903233.

Bridle, J. 2016. Algorithmic citizenship, digital statelessness. *GeoHumanities* 2 (2):377–81. doi: 10.1080/2373566X.2016.1237858.

Brussee, V. 2023. *Social credit: The warring states of China's emerging data empire*. London: Palgrave Macmillan.

Burrell, J., and M. Fourcade. 2021. The society of algorithms. *Annual Review of Sociology* 47 (1):213–37. doi: 10.1146/annurev-soc-090820-020800.

Caprotti, F. 2020. Smart to green: Smart eco-cities in the green economy. In *The Routledge companion to smart cities*, ed. K. Willis and A. Aurigi, 200–09. London and New York: Routledge.

Caprotti, F., I.-C. C. Chang, and S. Joss. 2022. Beyond the smart city: A typology of platform urbanism. *Urban Transformations* 4 (1):4. doi: 10.1186/s42854-022-00033-9.

Caprotti, F., and R. Cowley. 2019. Varieties of smart urbanism in the UK: Discursive logics, the state and local urban context. *Transactions of the Institute of British Geographers* 44 (3):587–601. doi: 10.1111/tran.12284.

Caprotti, F., F. Cugurullo, M. Cook, A. Karvonen, S. Marvin, P. McGuirk, and A.-M. Valdez. 2024. Why does urban artificial intelligence (AI) matter for urban studies? Developing research directions in urban AI research. *Urban Geography* 45 (5):883–94. doi: 10.1080/02723638.2024.2329401.

Caprotti, F., and Z. Gong. 2017. Social sustainability and residents' experiences in a new Chinese eco-city. *Habitat International* 61:45–54. doi: 10.1016/j.habitatint.2017.01.006.

Caprotti, F., and D. Liu. 2019. Emerging platform urbanism in China: Reconfigurations of data, citizenship and materialities. *Technological Forecasting and Social Change* 151:119690. doi: 10.1016/j.techfore.2019.06.016.

Caprotti, F., and D. Liu. 2022. Platform urbanism and the Chinese smart city: The co-production and territorialisation of Hangzhou City Brain. *GeoJournal* 87 (3):1559–73. doi: 10.1007/s10708-020-10320-2.

Chang, I.-C. C., S.-C. Jou, and M.-K. Chung. 2020. Provincializing smart urbanism in Taipei: Smart city as a strategy for urban regime transition. *Urban Studies* 58 (3):559–80. doi: 10.1177/0042098020947908.

Chao, X. 2020. Legal consequences of the "blacklist" of dishonest persons subject to execution. Accessed June 7, 2023. https://zhuanlan.zhihu.com/p/109628558.

Chen, B. 2024. Performed imaginaries of the AI-controlled city: Conducting urban AI experimentation in China. In *Artificial intelligence and the city: Urbanistic perspectives on AI*, ed. F. Cugurullo, F. Caprotti, M. Cook, A. Karvonen, P. McGuirk, and S. Marvin, 223–39. London and New York: Routledge.

Cheung, A. S. Y., and Y. Chen. 2022. From datafication to data state: Making sense of China's social credit system and its implications. *Law & Social Inquiry* 47 (4):1137–71. doi: 10.1017/lsi.2021.56.

China Association of Circular Economy. 2018. Model significance of waste classification in Tianjin Eco-City. Accessed June 7, 2023. https://www.chinacace.org/news/view?id=8940.

Cirolia, L. R., R. Sitas, A. Pollio, A. G. Sebarenzi, and P. K. Guma. 2023. Silicon Savannahs and motorcycle taxis: A Southern perspective on the frontiers of platform urbanism. *Environment and Planning A: Economy and Space* 55 (8):1989–2008. doi: 10.1177/0308518X231170193.

Coe, N. M., and C. Yang. 2022. Mobile gaming production networks, platform business groups, and the market power of China's Tencent. *Annals of the American Association of Geographers* 112 (2):307–30. doi: 10.1080/24694452.2021.1933887.

Cowley, R., S. Joss, and Y. Dayot. 2018. The smart city and its publics: Insights from across six UK cities. *Urban Research & Practice* 11 (1):53–77. doi: 10.1080/17535069.2017.1293150.

Credit China. 2018. The demonstration cities of credit construction: Hangzhou, Zhejiang. Accessed June 7, 2023. https://www.creditchina.gov.cn/chengxinwenhua/chengshichengxinwenhua/201802/t20180211_108736.html.

Credit China. 2021. Weihai: Innovative application of "Hai Beifen" to implement "Xinyi+" project to benefit the people. Accessed June 7, 2023. https://www.creditchina.gov.cn/chengxinwenhua/chengshichengxinwenhua/202111/t20211124_249663.html.

Creemers, R. 2018. China's social credit system: An evolving practice of control. *SSRN Electronic Journal*. Accessed May 9, 2018. doi: 10.2139/ssrn.3175792.

Creemers, R. 2021. China's long and winding road in global cyberspace: Great Power relationships or common destiny? *SSRN Electronic Journal*. Accessed January 31, 2021. doi: 10.2139/ssrn.3776814.

Cugurullo, F. 2021. *Frankenstein urbanism: Eco, smart and autonomous cities, artificial intelligence and the end of the city*. London and New York: Routledge.

Cugurullo, F., F. Caprotti, M. Cook, A. Karvonen, P. McGuirk, and S. Marvin. 2024. The rise of AI urbanism in post-smart cities: A critical commentary on urban artificial intelligence. *Urban Studies* 61 (6):1168–82. doi: 10.1177/00420980231203386.

Curran, D., and A. Smart. 2021. Data-driven governance, smart urbanism and risk-class inequalities: Security and social credit in China. *Urban Studies* 58 (3):487–506. doi: 10.1177/0042098020927855.

Dai, X. 2020. Toward a reputation state: A comprehensive view of China's Social Credit System project. In *Social credit rating: Reputation und vertrauen beurteilen*, ed. O. Everling, 139–63. Wiesbaden, Germany: Springer Gabler.

Dirks, E., and D. Fu. 2023. Governing "untrustworthy" civil society in China. *The China Journal* 89 (January):24–44. doi: 10.1086/722908.

Ellul, J. 1980. *The technological system*. Paris: Le Cherche Midi Editeur.

Grabher, G., and E. van Tuijl. 2020. *Uber*-production: From global networks to digital platforms. *Environment and Planning A: Economy and Space* 52 (5):1005–16. doi: 10.1177/0308518X20916507.

Hangzhou Credit Office. 2022. Hangzhou social credit regulations. Accessed June 7, 2023. http://credit.hangzhou.gov.cn/art/2022/6/21/art_1229634358_30170.html.

Hansen, H. J. 2023. Governing through metrics in the digital age. *Globalizations* 20 (1):137–52. doi: 10.1080/14747731.2022.2156700.

Horsley, J. 2018. China's Orwellian social credit score isn't real. *Foreign Policy*, November 16https://foreignpolicy.com/2018/11/16/chinas-orwellian-social-credit-score-isnt-real/.

Hu, M.-C., C.-Y. Wu, and T. Shih. 2016. Creating a new socio-technical regime in China: Evidence from the Sino-Singapore Tianjin Eco-City. *Futures* 70:1–12. doi: 10.1016/j.futures.2015.04.001.

Hu, R. 2019. The state of smart cities in China: The case of Shenzhen. *Energies* 12 (22):4375. https://www.mdpi.com/1996-1073/12/22/4375. doi: 10.3390/en12224375.

Jiang, H., S. Geertman, and P. Witte. 2019. Comparing smart governance projects in China: A contextual approach. In *Computational urban planning and management for smart cities*, ed. S. Geertman, Q. Zhan, A. Allan, and C. Pettit, 99–114. Cham, Switzerland: Springer. doi: 10.1007/978-3-030-19424-6_7.

Joo, Y.-M., and T. Tan. 2020. Smart cities in Asia: An introduction. In *Smart cities in Asia: Governing development in the era of hyper-connectivity*, ed. Y.-M. Joo and T. Tan, 1–17. Cheltenham, UK: Edward Elgar. doi: 10.4337/9781788972888.

Ke, X. 2020. "Qianjiang Grade" makes credit valuable. *Hangzhou News*, December 2. Accessed June 7, 2023. https://en.hangzhou.com.cn/News/content/2020-12/02/content_7865465.htm.

Kitchin, R. 2015. Making sense of smart cities: Addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society* 8 (1):131–36. doi: 10.1093/cjres/rsu027.

Kitchin, R. 2022. Conceptualising smart cities. *Urban Research & Practice* 15 (1):155–59. doi: 10.1080/17535069.2022.2031143.

Knight, A., and R. Creemers. 2021. Going viral: The social credit system and COVID-19. *SSRN Electronic Journal*. doi: 10.2139/ssrn.3770208.

Kostka, G. 2019. China's social credit systems and public opinion: Explaining high levels of approval. *New Media & Society* 21 (7):1565–93. doi: 10.1177/1461444819826402.

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. doi: 10.1111/1468-2427.12277.

Leszczynski, A. 2020. Glitchy vignettes of platform urbanism. *Environment and Planning D: Society and Space* 38 (2):189–208. doi: 10.1177/0263775819878721.

Leszczynski, A., and S. Elwood. 2022. Glitch epistemologies for computational cities. *Dialogues in Human Geography* 12 (3):361–78. doi: 10.1177/20438206221075714.

Liang, F., and Y. Chen. 2022. The making of "good" citizens: China's Social Credit Systems and infrastructures of social quantification. *Policy & Internet* 14 (1):114–35. doi: 10.1002/poi3.291.

Liang, F., V. Das, N. Kostyuk, and M. M. Hussain. 2018. Constructing a data-driven society: China's social credit system as a state surveillance infrastructure. *Policy & Internet* 10 (4):415–53. doi: 10.1002/poi3.183.

Lin, H. 2003. The definition and attributes of credit and the construction of China's credit system. *Fujian Finance* 10:1–4.

Liu, C. 2019. Economic sociology: The European electronic newsletter. *Multiple Social Credit Systems in China* 21 (1):22–32. Accessed June 7, 2023. https://www.econstor.eu/bitstream/10419/223109/1/Econsoc-NL-21-1-04.pdf.

McGuirk, P., R. Dowling, and P. Chatterjee. 2021. Municipal statecraft for the smart city: Retooling the smart entrepreneurial city? *Environment and Planning A: Economy and Space* 53 (7):1730–48. doi: 10.1177/0308518X211027905.

Meijer, A. 2016. Smart city governance: A local emergent perspective. In *Smarter as the new urban agenda: A comprehensive view of the 21st century city*, ed. J. Gil-Garcia, T. Pardo, and T. Nam, 73–85. Cham, Switzerland: Springer. doi: 10.1007/978-3-319-17620-8_4.

Meijer, A. 2018. Datapolis: A public governance perspective on "smart cities." *Perspectives on Public Management and Governance* 1 (3):195–206. doi: 10.1093/ppmgov/gvx017.

Moore, P. V., and S. Joyce. 2017. Black box or hidden abode? The expansion and exposure of platform work managerialism. *Review of International Political Economy* 27 (4):926–48. doi: 10.1080/09692290.2019.1627569.

Moss, T., F. Voigt, and S. Becker. 2021. Digital urban nature: Probing a void in the smart city discourse. *City: Analysis of Urban Change* 25 (3–4):255–76. doi: 10.1080/13604813.2021.1935513.

Mouton, M. 2021. Worlding infrastructure in the Global South: Philippine experiments and the art of being "smart." *Urban Studies* 58 (3):621–38. doi: 10.1177/0042098019891011.

Müller, M. 2020. In search of the Global East: Thinking between North and South. *Geopolitics* 25 (3):734–55. https:// doi: 10.1080/14650045.2018.1477757.

Müller, M., and E. Trubina. 2020. The Global Easts in global urbanism: Views from beyond North and South. *Eurasian Geography and Economics* 61 (6):627–35. doi: 10.1080/15387216.2020.1777443.

Nolan, P. H. 2007. China at the crossroads. *Journal of Chinese Economic and Business Studies* 3 (1):1–22. doi: 10.1080/14765280500040327.

Odendaal, N. 2022. Splintering by proxy: A reflection on the spatial impacts and distributed agency of platform urbanism. *Journal of Urban Technology* 29 (1):21–27. doi: 10.1080/10630732.2021.2007204.

Orgad, L., and W. Reijers. 2019. *A dystopian future? The rise of social credit systems*. Badia Fiesolana, Italy: European University Institute.

Picon, A. 2015. *Smart cities: A spatialised intelligence*. Chichester, UK: Wiley.

Pow, C.-P., and H. Neo. 2015. Modelling green urbanism in China. *Area* 47 (2):132–40. doi: 10.1111/area.12128.

Przeybilovicz, E., M. A. Cunha, S. Geertman, C. Leleux, A. Michels, Z. Tomor, and W. R. Webster. 2022. Citizen participation in the smart city: Findings from an international comparative study. *Local Government Studies* 40 (1):23–47. doi: 10.1080/03003930.2020.1851204.

Robinson, J. 2006. *Ordinary cities: Between modernity and development*. London and New York: Routledge.

Rodenbiker, J. 2021. Making ecology developmental: China's environmental sciences and green modernization in global context. *Annals of the American Association of Geographers* 111 (7):1–18. doi: 10.1080/24694452.2020.1863766.

Rose, G. 2020. Actually-existing sociality in a smart city: The social as sociological, neoliberal, cybernetic. *City* 24 (3–4):512–29. doi: 10.1080/13604813.2020.1781412.

Rossi, U. 2016. The variegated economics and the potential politics of the smart city. *Territory, Politics, Governance* 4 (3):337–53. doi: 10.1080/21622671.2015.1036913.

Sadowski, J., and S. Maalsen. 2020. Modes of making smart cities: Or, practices of variegated smart urbanism. *Telematics and Informatics* 55:101449. doi: 10.1016/j.tele.2020.101449.

Shahin, S., and P. Zheng. 2020. Big data and the illusion of choice: Comparing the evolution of India's Aadhaar and China's social credit system as techno-social discourses. *Social Science Computer Review* 38 (1):25–41. doi: 10.1177/0894439318789343.

Shapiro, A. 2022. Platform urbanism in a pandemic: Dark stores, ghost kitchens, and the logistical-urban frontier. *Journal of Consumer Culture* 23 (1):168–87. doi: 10.1177/14695405211069983.

Shelton, T., and T. Lodato. 2019. Actually existing smart citizens: Expertise and (non)participation in the making of the smart city. *City: Analysis of Urban Change* 23 (1):35–52. doi: 10.1080/13604813.2019.1575115.

Shelton, T., M. Zook, and A. Wiig. 2015. The "actually existing smart city." *Cambridge Journal of Regions, Economy and Society* 8 (1):13–25. doi: 10.1093/cjres/rsu026.

Shen, L., Z. Huang, S. W. Wong, S. Liao, and Y. Lou. 2018. A holistic evaluation of smart city performance in the context of China. *Journal of Cleaner Production* 200:667–79. doi: 10.1016/j.jclepro.2018.07.281.

Shin, H. B., L. Lees, and E. López-Morales. 2016. Introduction: Locating gentrification in the Global East. *Urban Studies* 53 (3):455–70. doi: 10.1177/0042098015620337.

Sino-Singapore Tianjin Eco-city Management Committee. 2021. Small number, big data and zero-waste city. Accessed June 7, 2023. https://www.eco-city.gov.cn/p1/stcxw/20210517/43460.html.

Srnicek, N. 2017. *Platform capitalism*. Cambridge, UK: Polity Press.

State Council. 2014. Planning outline of the construction of a social credit system (2014–2020). June 14. Accessed June 7, 2023. http://www.gov.cn/zhengce/content/2014-06/27/content_8913.htm.

Tan, G. K. S. 2022. Citizens go digital: A discursive examination of digital payments in Singapore's Smart Nation project. *Urban Studies* 59 (12):2582–98. doi: 10.1177/00420980211039407.

Tompson, T. 2017. Understanding the contextual development of smart city initiatives: A pragmatist methodology. *She Ji: The Journal of Design, Economics and Innovation* 3 (3):210–28. doi: 10.1016/j.sheji.2017.11.004.

Trauth-Goik, A. 2023. Civilized cities or social credit? Overlap and tension between emergent governance infrastructures in China. *Global Media and China* 8 (3):305–26. doi: 10.1177/20594364231163444.

US-China Economic and Security Review Commission. 2020. China's corporate social credit system: Context, competition, technology and geopolitics. Accessed June 7, 2023. https://www.uscc.gov/research/chinas-corporate-social-credit-system-context-competition-technology-and-geopolitics.

Wagner, J. 2021. Circulating value: Convergences of datafication, financialization, and urbanization. *Urban Transformations* 3 (1):1–9. doi: 10.1186/s42854-021-00022-4.

Waley, P. 2016. Speaking gentrification in the languages of the Global East. *Urban Studies* 53 (3):615–25. doi: 10.1177/0042098015615726.

Wang, B., B. P. Y. Loo, and G. Huang. 2022. Becoming smarter through smart city pilot projects: Experiences and lessons from China since 2013. *Journal of Urban Technology* 29 (4):3–24. doi: 10.1080/10630732.2021.1962695.

Wang, Z. 2018. The model significance of the waste sorting eco-city. *Bincheng Times*, May 1. Accessed June 7, 2023. http://bhsb.tjbh.com/html/2018-01/05/content_9_1.htm.

Webber, M., and X. Han. 2017. Corporations, governments, and socioenvironmental policy in China: China's water machine as assemblage. *Annals of the American Association of Geographers* 107 (6):1444–60. doi: 10.1080/24694452.2017.1320211.

Webster, N., and Q. Zhang. 2021. Centering social-technical relations in studying platform urbanism: Intersectionality for just futures in European cities. *Urban Transformations* 3 (1):10. doi: 10.1186/s42854-021-00027-z.

Weihai Social Credit Center. 2022a. Weihai City held the theme publicity activity of "6.14 Credit Record Care Day." Accessed June 7, 2023. http://credit.weihai.gov.cn/home/detail.html?parent=7&menu=9&data=16333.

Weihai Social Credit Center. 2022b. Weihai Development and Reform Commission's "Four Grasp" to ensure that the comprehensive level of urban credit continues to move forward. Accessed June 7, 2023. http://credit.weihai.gov.cn/home/detail.html?parent=7&menu=9&data=16173.

Wong, K. L. X., and A. S. Dobson. 2019. We're just data: Exploring China's social credit system in relation to digital platform ratings cultures in Westernised democracies. *Global Media and China* 4 (2):220–32. doi: 10.1177/2059436419856090.

Xu, Y., F. Cugurullo, H. Zhang, A. Gaio, and W. Zhang. 2024. The emergence of artificial intelligence in anticipatory urban governance: Multi-scalar evidence of China's transition to city brains. *Journal of Urban Technology* : 1–25. doi: 10.1080/10630732.2023.2292823.

Yeung, Y. M. 2011. Rethinking Asian cities and urbanization: Four transformations in four decades. *Asian Geographer* 28 (1):65–83. doi: 10.1080/10225706.2011.577975.

Zhang, C. 2020. Governing (through) trustworthiness: Technologies of power and subjectification in China's social credit system. *Critical Asian Studies* 52 (4):565–88. doi: 10.1080/14672715.2020.1822194.

Zhang, J., J. Bates, and P. Abbott. 2022. State-steered smart-mentality in Chinese smart urbanism. *Urban Studies* 59 (14):2933–50. doi: 10.1177/00420980211062888.

Zhen, F., B. Wang, and Z. Wei. 2015. The rise of the internet city in China: Production and consumption of internet information. *Urban Studies* 52 (13):2313–29. doi: 10.1177/0042098014547369.

Zhou, Y., F. Xiao, and W. Deng. 2022. Is smart city a slogan? Evidence from China. *Asian Geographer* 40 (2):185–202. doi: 10.1080/10225706.2022.2052734.

Zou, Y., and W. Zhao. 2021. Neighbourhood governance during the COVID-19 lockdown in Hangzhou: Coproduction based on digital technologies. *Public Management Review* 24 (12):1914–32. doi: 10.1080/14719037.2021.1945666.

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