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Chiny są domem dla około ośmiuset projektów inteligentnych miast, które aspirują do wygrania globalnego wyścigu w kierunku zbudowania społeczeństwa opartego na danych – wywołując zarówno podziw, jak i niepokój na całym świecie.

Co powoduje że chińskie miasta są inteligentne? To porównywane do układu nerwowego miasta wszechobecne czujniki połączone z Internetem Rzeczy (IoT), które pozwalają na zdalne zbieranie danych, następnie analizowanych przez urbanistów i prawodawców. Ta nieustannie rozwijająca się sieć technologii jest połączona potężnymi komputerami, gromadzącymi informacje o zachowaniu miast i ich mieszkańców. Jednak chińskie inteligentne miasta to nie tylko nadzór i inwigilacja. Wykorzystując najnowocześniejsze rozwiązania technologiczne, dane są używane do integracji elementów systemów przestrzeni miejskiej czy rozwiązaniu problemów dotyczących zrównoważonego rozwoju.

Smart cities in China: sustainable or surveyed

China is home to some 800 smart cities projects aspiring to win the global race toward building advanced data-driven society – causing both awe and concern around the world. Often compared to the nerves of the body, omnipresent networked sensors in Chinese cities, powered by the Internet of Things (IoT), allow for remote collection of data, which can then be analysed by the city planners for insights. This relentlessly growing network of sensors and digital control technologies is linked by powerful computers, gathering information on how cities – and their citizens- behave. But Chinese smart cities are not only about surveillance – using cutting edge solutions, they are able to use said information to integrate urban development's essential elements while solving sustainability challenges.

Introduction

In its essence, *smart city* is a relatively modern concept – a response to the unprecedented urbanization and climate change challenges worldwide. Chinese leadership has been signalling the importance of smart cities development, to the point of including it in national strategy – over the past decade, China has become a global leader in smart city initiatives – advancements in big data and artificial intelligence (AI) powered analysis undoubtedly improved urban management and digital technologies are extensively interwoven into the everyday life of denizens of Chinese cities.

While many smart city projects predominantly focus on automation and infrastructure, without a strong understanding of how these projects will address human needs, Chinese government has been presenting initiatives related to smart city programme as a way of bringing the citizens closer to the state, building a "harmonious society" through a "culture of honesty". But what is the extent to which integration of citizen into smart systems changes life in data-enabled cities?

This paper will present an overview of the governmental strategies regarding the development of smart cities, while exploring the process of innovating smart applications and how it is intertwined with urban development. The characteristic of smart city initiatives in China will be further contextualised through the case study of Xiong'an. Subsequently, the role of surveillance in Chinese smart cities will be addressed. It will be also an attempt to highlight the elements of security in the context of the Internet of Things (IoT) and smart solutions employed in China. Finally, it will be an attempt to assess whether smart city solutions giving the CCP such extraordinary surveillance reach can be exported and implemented in other countries, considering the extraterritorial implications of exporting related technologies.

What are the smart cities?

In order to define smart city, one has to consider technological and sociological developments, against the backdrop of industrial revolutions and the efforts to achieve sustainability. Clarifying the commonalities and differences between definitions is not an easy task, however, most of the existing definitions consider the use of hardware and data as the means to solve

cities' sustainability challenges – economic, social and environmental issues. For example, Giffnger defines smart city by assessing 6 components, such as smart economy, smart people, smart governance, smart mobility, smart environment and smart living as a mean of a prospective performing of the city[1]. Harrison highlights that a smart city is able to capture real world as data pertaining to the environment, urban life and public service delivery through the use of sensors, making it an *instrumented, interconnected and intelligent city*[2]. Lee, Hancock and Hu defined smart city by considering four development paths, such as Digital City, Intelligent City, Ubiquitous City and Information City[3]. The British Standards Institute (BSI) defines smart cities as 'the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens'[4]. Cisco defines the term as those cities that adopt 'scalable solutions that take advantage of information and communications technology (ICT) to increase efficiencies, reduce costs, and enhance quality of life'[5]. Chinese government defined smart city as "a new concept and model which utilises the next generation of information technology, such as the IoT, cloud computing, big data, to promote smart urban planning, construction, management and services for cities[6][7].

1 R. Giffinger, C. Fertner, H. Kramar, R. Kalasek, N. Pichler-Milanović, E. Meijers, *Smart cities. Ranking of European medium-sized cities*, Centre of Regional Science, Vienna 2007.

2 C. Harrison, B. Eckman, R. Hamilton, P. Hartswick, J. Kalagnanam, J. Paraszczak, P. Williams, *Foundations for smarter cities*, "IBM Journal of Research and Development" 2010, 54(4), pp. 1–16.

3 J. H. Lee, M. Gong Hancock, M. Hu, *Towards an effective framework for building smart cities. Lessons from Seoul and San Francisco*, "Technological Forecasting & Social Change" 2014, vol. 89, pp. 80–99.

4 *Smart cities – vocabulary*, The British Standards Institution 2014, available at [accessed: 10 VII 2021]: <http://shop.bsigroup.com/upload/PASs/Free-Download/PAS180.pdf>.

5 G. Falconer, S. Mitchell, *Smart city framework. A systematic process for enabling smart + connected communities*, CISCO 2012, Available at [accessed: 10 VII 2021]: <http://www.cisco.com/web/about/ac79/docs/ps/motm/Smart-City-Framework.pdf> .

6 *The guidance on promoting healthy smart city development*, National Development and Reform Commission, Beijing 2014, accessible at [accessed 10 VII 2021]: <http://www.sdpc.gov.cn/gzdt/201408/W020140829409970397055.pdf>.

7 For the purpose of this paper, smart cities will be similarly considered as cities characterised by their capacity to measure, monitor and manage city services and

The theoretical framework developed by Pardo and Nam noted the following three main aspects of smart cities, depending on recurrent characteristics[8]:

1. Technology,
2. Human,
3. Governance and policy.

This framework, based on information and communication technologies (ICT)[9], can promote sustainable development practices to address various urbanization challenges. Whatever makes smart cities thrive successfully is therefore dependent on pervasive wireless connectivity, open data, security and smart payment and monetization schemes.

Smart cities with Chinese characteristics

China has attempted to promote specific models of urban development, including eco-cities[10] and low-carbon cities[11], aimed at stimulating the development of a national green economy[12], while increasingly shifting to digitally-enhanced urbanism[13]. The country has experienced rapid

utilities, and smart technologies will be classified, broadly, as ICT solutions, ranging from expensive smart grids and autonomous vehicles to low cost ones, such as smartphone apps, crowdsourcing and communication platforms for citizens.

8 T. Nam, T. A. Pardo, *Conceptualizing smart city with dimensions of technology, people, and institutions*, [in:] *Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times*, College Park, Maryland, USA 2011 , pp. 299–291.

9 ICT solutions ranging from hardware solutions, smart grids and autonomous vehicles to low cost solutions such as smartphone apps, crowdsourcing and communication platforms for citizens.

10 F. Wu, *China's eco-cities*, "Geoforum" 2012, vol. 43, no. 2, pp. 169–171.

11 M. de Jong, D. Wang, C. Yu, *Exploring the relevance of the eco-city concept in China: The case of Shenzhen Sino-Dutch low carbon city*, "Journal of Urban Technology" 2013, *20*(1), pp. 95–113.

12 C. Pow, *Building a harmonious society through greening: ecological civilization and aesthetic governmentality in China*. "Annals of the American Association of Geographers" 2018, vol. 108, no. 3, 864–883.

13 F. Zhen, B. Wang, Z. Wei, *The rise of the internet city in China: Production and consumption of internet information*, "Urban Studies", 2015, vol. 52, no. 13, pp. 2313–2329.

urbanization and unprecedented economic growth[14], accompanied by expeditious development of ICT, including digital technologies such as cloud computing and IoT. At the same time, China has implemented industrial and governance strategies aimed at moving away from technological and industrial dependence on wealthier countries in order to pursue a national developmental path and challenge the existing global economic order[15] [16] leaving domestic niche space for home-grown corporations[17]. China's private sector, including Baidu, Alibaba, Tencent, Huawei and ZTE, is driving the development of emerging technologies, such as facial recognition and 5G, by establishing innovation centres and funding technology startups[18]. Chinese technology companies are also expanding into overseas markets, in some cases, by offering smart-city technologies, a development that could increase their access to foreign talent and data.

Analysing the development of technological, urban solutions for Chinese smart cities, it is important to remember that smart cities are seen as a place of experimentation. In part, this continues a trajectory of urban experimentation promoted by the Chinese state since late 1970s, exemplified by the proliferation of Special Economic Zones (SEZ)[19] and associated boom of megacities such as Shenzhen. Smart city projects are evidence of a shift in approach to urban experimentation. Initially mostly focused on economic reform, currently Chinese cities are seen as a testbed of new techno-social approaches for steering urban processes[20] while city

14 F. Wu, *China's changing urban governance in the transition towards a more market-oriented economy*. "Urban Studies" 2002, vol. 39, no. 7, pp. 1071–1093.

15 Y. Hong, *Networking China. The digital transformation of the Chinese economy*, University of Illinois Press , Champaign, IL 2018.

16 X. Wu, G. Gereffi, *Amazon and Alibaba: Internet governance, business models, and internationalization strategies*, [in:] *International business in the information and digital age*, eds R. van Tulder, A. Verbeke, L. Piscitello, Emerald Publishing Limited, Bingley 2018, pp. 327–356.

17 X. Wu, G. Gereffi, *Amazon and Alibaba: Internet governance, business…*, pp. 327–356.

18 X. Wu, G. Gereffi, *Amazon and Alibaba…*, pp. 327–356.

19 Y. M. Yeung, J. Lee, G. Kee, *China's special economic zones at 30*, "Eurasian Geography and Economics" 2009, no. 50(2), pp. 222–240.

20 A. Karvonen, F. Cugurullo, F. Caprotti, *Introduction: situating smart cities,* [in:] *Inside smart cities. Place, politics and urban innovation",* eds A. Karvonen, F. Cugurullo, & F. Caprotti, Routledge, London 2018, pp. 1–12.

governments in China are key actors in the formation of digital urbanism. One of the most remarkable examples of such experiments is Alibaba's City Brain project[21], which started out in the city of Hangzhou in Zhejiang province, where Alibaba Cloud provides the software, but the city owns the data. City Brain responded, from its first iteration, to the needs and requirements of Hangzhou as the first place where the platform was trialled. Hangzhou was a controlled environment where City Brain was tested and assessed. Success of this project then justified the marketing of the City Brain product to other Chinese cities, and abroad, which is how urban experimentation connected both with the broader adoption of innovation, and with the processes of territorialisation of the smart city[22]. Projects like City Brain are generally defining urban citizens as either service users, or as entrepreneurial agents in the digitally-enhanced economy, while the big tech companies , profiting from building the infrastructure, are commodifying the entire smart city space. As a result, citizens gain some operational efficiency but at great cost to their liberty. With a clear security and surveillance aspects to smart urban platforms such as City Brain, the application of smart technologies is becoming increasingly more oppressive.

The Party's support for matters related to smart city development is substantial – the state has promoted this concept as a central part of its agendas since at least the early 2010s – while it was only in 2009 that local governments begun to embrace the idea of smart city. As Pardo and Nam suggest, "smart government" is a core enabler of smart city developments[23], playing a vital role in guiding and deploying IT systems, integrating system components, sharing information, providing strategic plans and coordinating all stakeholders. Smart cities need strong institutional support, as popularity of this concept resides in its technological promise to address wicked urban problems. Secondly, a strong leadership and institutional support are crucial for smart city development – but successful emergence

21 *Alibaba Cloud launched 'et City Brain 2.0' in Hangzhou*, Alizila, 20 IX 2018 [accessed: 2 IV 2021], available at: <www.alizila.com/alibaba-cloud-launched-city-brain-2-0-hangzhou/>.

22 A. Karvonen, F. Cugurullo, F. Caprotti, *Introduction: situating smart cities...*, pp. 1–12.

23 T. Nam, T. A. Pardo, *Conceptualizing smart city with dimensions of technology, people, and institutions...*, pp. 299–291.

of Chinese smart cities is additionally a result of shifting interactions between state actors, private sector, and State-Owned Enterprises (SOEs)[24].

Since 2013, to further promote and regulate the development of smart city initiatives, Chinese Ministry of Housing and Urban-Rural Development (MOHRUD)[25] has been selecting cities to experiment and implement smart city initiatives. Selected pilot cities were provided with funding and technical support, as well as monitoring, had their progress development evaluated.

Despite strong financial and institutional support from the central government, performance of smart city initiatives varied across pilot sites[26]. A performance index of smart city initiatives developed by a national smart city development evaluation project has been conducted annually since 2011 by the Chinese Academy of Social Sciences and Beijing Govmade Smart City Research Centre[27].

Highlighted in the 12th and 13th 5-years plan, smart cities became a political mission. But it was not until March 2021, when National People's Congress has approved the earlier Chinese Communist Party decisions (from October 2020) concerning new Fourteenth Five Year Plan (2021–25) and long-term Development Program, that a major strategic shift in China's approach to economic and social development has been signalled. Both documents are focused on technological advancement of the country and claim an "innovation independence" of China. They also include an open-stated main goal: until 2035 China intends to become an Innovative Society[28]. Four areas of change are particularly significant: autonomous technologies, a new way of urbanisation, equal

24 N. Zhong, X. Chen, G. Song, *An empirical research on key issues of smart city development in China*, "City Development Research" 2015, vol. 22, no. 6, 27–39.

25 MOHURD is the main authority in charge of the urbanisation, urban planning, urban management, and public housing in China.

26 W. Yu, C. Xu, *Developing smart cities in China*, "International Journal of Public Administration in the Digital Age" 2018, vol. 5, no. 3, pp. 76–91.

27 N. Zhong, X. Chen, G. Song, *An empirical research on key issues of smart city development...*, pp. 27–39.

28 N. Grunberg, V. Brussee, *China's 14th Five-Year Plan – strengthening the domestic base to become a superpower*, "Merics" [online], 9 IV 2021 [accessed: 10 VII 2021], available at: <https://merics.org/en/short-analysis/chinas-14th-five-year-plan-strengthening-domestic-base-become-superpower>.

provision of public goods, and greener production. It is expected that they will define China's economic future in the next 10–15 years[29]. China's 14th Five Year Plan puts technological autonomy as one of the country's top priorities. Indicating a shift towards a greener economy, this new urbanisation strategy promises a more equal distribution of public goods and increased investment in environmental technologies, which will can provide sources for sustainable growth.

The 13th National People's Congress announced strategies for the ongoing development of the Chinese economy in 2020 and beyond, which included measures such as boosting internal demand post-pandemic, strengthening innovation to achieve economic growth, new infrastructure investment, and new urbanization. Urbanization and regional development will be significantly encouraged by the implementation of the various measures and this will serve as a driver for future economic growth in China. In terms of the key focus for urban development, along with digitalization and greening, an emphasis will also be placed on the establishment of a public health system and ensuring the health and safety of city residents as important priorities.

Government innovation theories and collaboration theories all emphasize the important roles government executives play in leading and coordinating innovation adoption and collaboration[30]. Due to unique political system and central local government, local autonomy and inter-sectoral collaboration, China is using predominantly a top-down approach in introducing new technologies[31]. This is significantly different from European, predominantly bottom-up approach, where each smart city is using smart solutions to solving particular problems based on inference or needs of particular social strata and interest groups.[32]

29 B. Hofman, *China's 14th Five-Year Plan. First impressions*, "EAI Commentary" [online], 11 III 2021 [accessed: 10 VII 2021], available at: <https://research.nus.edu.sg/eai/wp-content/uploads/sites/2/2021/03/EAIC-26-20210311-1.pdf>.

30 G. K. Jones, H. J. Davis, *National culture and innovation. Implications for locating global R&D operations*, "MIR: Management International Review" 2000, vol. 40, no. 1, pp. 11–39.

31 R. P. Dameri, C. Rosenthal-Sabroux, *Smart city. How to create public and economic value with high technology in urban space*, Springer International Publishing, Heidelberg 2014, pp. 1–12.

32 R. P. Dameri, C. Rosenthal-Sabroux, *Smart city. How to create…*, pp. 24–88.

This can be illustrated by the case of Xiong'an, a brain-child of Xi Jinping. Expected to be transformed into an innovation-driven smart city, with a population of more than 5 million, its development coincides with a national drive to gain global leadership in future generation technologies

Xiong'an

During the 19th National Congress of the Chinese Communist Party held in October 2017, President Xi Jinping spoke about the importance of relocating the non-capital functions of Beijing by proceeding with the coordinated development of the Beijing, Tianjin, and Hebei region, with Xiong'an New Area to serve as a model city established with high standards. Based on this policy, the Leading Group for Coordinated Beijing-Tianjin-Hebei Development as well as the government of Hebei Province have convened the relevant committees and specialist advisory committees from central agencies to work on an in-depth investigation of the Xiong'an New Area plan. This "millennium plan", or a project with national significance, it is the first National New Area to be established on a national scale in the 21st century[33]. The city plan for Xiong'an New Area as a leading-edge future city is supposed to reflect the principles of innovative intelligence, green ecology, and wellbeing.

The Guideline for Planning of Hebei Xiong'an New Area[34] – was ratified and released in April 2018 by the Central Committee and State Council, providing the basic underpinning to guide the planning, construction and the role to be played by Xiong'an by 2035, along with a future development vision to turn it into a leading smart city in 2050[35].

33 E. Veglianti, E. Magnaghi, M. Marco, Y. Li, *Smart city in China. The state of art of Xiong an new area, lecture notes in information systems and organization*, [in:] *Organizing smart buildings and cities,* eds E. Magnaghi, V. Flambard, D. Mancini, J. Jacques, N. Gouvy, Springer, Cham 2021, pp. 81–97.

34 *Hebei Xiong'an new area plan outline,* Hebei Provincial People's Government 2018, available at [accessed: 10 VII 2021]: <http://www.xiongan.gov.cn/2018-04/21/c_129855813.htm>.

35 Full text of Xi Jinping's report at 19th CPC National Congress, [accessed: 10 VII 2021] available at: <https://www.chinadaily.com.cn/china/19thcpcnationalcongress/2017-11/04/content_34115212.htm>.

The document specifies 38 goals to be achieved by 2035 (9 pertaining to innovative intelligence, 17 to green ecology, and 12 to wellbeing). Because there is no precedent anywhere in the world that can serve as a model for the construction of a smart city from scratch, Xiong'an has undoubtedly undertaken pioneering measures in a number of areas. In particular, this has involved joint research into intelligent city construction standards in partnership with academia, including design institutions, as well as business representatives from sectors such as information, construction, transportation, and finance.

The objective of constructing a smart city in Xiong'an is to synchronise planning and construction of both a physical city and a digital city (*digital twin* which fuses the physical world and virtual space), supported by infrastructure that is appropriate to a new style of intelligent city and traditional urban infrastructure, which refers to the city-wide intelligent sensing systems (IoT), next-generation telecommunication networks (5G), cloud and big data platforms, urban computing capacity, and city brain (AI).

The mission of Xiong'an New Area as an innovation city is to achieve the position of innovation hub and to develop into a leading international region for science, technology and innovative industries[36] which includes the relocation of some of the functions of Beijing in the following six domains:

1. Scientific research institutions including major universities, laboratories of national importance, and innovation centres;
2. Healthcare institutions and medical research institutions;
3. Financial business headquarters;
4. Advanced service businesses headquarters (software, telecommunications, design, consulting, logistics, e-commerce);
5. Advanced technology industries dealing with the next-generation information technology, biomedicine, energy-efficient environment, and advanced materials;
6. Zhongguancun Science Park of Xiong'an New Area.

Xiong'an New Area is also expected to transform and advance urbanization in China. One of the aims of new area construction is to establish

36 *China approves 2018–2035 master plan for Xiong'an New Area*, "Xinhua" [online], 1 2019 [accessed: 10 VII 2021], available at: <http://www.xinhuanet.com/english/2019-01/02/c_137715153.htm>.

a pattern of urban spaces that integrate green development and adoption of water-saving mechanisms[37].

Along with work on the eco-friendly environment, works on the Xiong'an Citizen Service Center have also commenced. The center is the first large urban construction project for Xiong'an, which commenced operation in June 2018 for providing public and living services to residents, as well as to serve as a demonstration space where people can experience the future city for themselves[38].

In accordance with the construction plan, the digital infrastructure is proceeding on the basis of a "one center and four platforms" framework. This concept refers to the urban computing center (in cloud), data platform, IoT integrated open platform, video network platform, and construction information modelling (CIM) platform. Intelligent applications included in these comprise facilities management, transportation, distribution, and energy. Xiong'an is intended to create a model for future smart cities, that can be scaled to various scenarios

Surveillance

One large critique on the development of smart cities is the risk of creating a panoptic city[39], in which all information about citizens' lives are recorded and available for governments. Despite the fact that data sources in smart cities are directed, automated and volunteered, they are collected by surveillance on a large scale, using for example CCTV or passport controls.

It is considered that cities become smart due to the deployment and integration of surveillance technologies such as sensors and biometric data collection systems. Electronic, infrared, thermal, and lidar sensors form the basis of the smart grid, and they do everything from operating streetlights to optimizing parking and traffic flow to detecting crime. Some cities are adopting these platforms more quickly than others. Smart city

37 Z. Liu, M. de Jong, F. Li, N. Brand, M. Hertogh, L. Dong, *Towards developing a new model for inclusive cities in China – the case of Xiong'an new area*, "Sustainability" 2020, vol. 12, no. 15: 6195.

38 E. Veglianti, E. Magnaghi, M. Marco, Y. Li, *Smart city in China…*, pp. 81–97.

39 R. Kitchin, *The real-time city? Big Data and smart urbanism*, "GeoJournal" 2013, vol. 79, no. 1, pp. 1–14.

is increasingly a codeword for surveilled city. According to Comparitech, 18 out of the top 20 most surveilled cities are located in China. Over half of globally deployed CCTV cameras are located in China[40]. CCTV surveillance is deemed to contribute to improved crime prevention. In fact, however, more cameras don't necessarily reduce crime rates[41]. In a number of places, including Hong Kong, there are growing concerns about the ways in which surveillance is encroaching on privacy[42].

Unlike in Europe or in the US, government surveillance in China primarily targets domestic activity. Surveillance technologies are fast, cheap, and increasingly ubiquitous: those necessary for large-scale surveillance are rapidly maturing, with techniques for image classification, face recognition, video analysis, and voice identification. Digital surveillance resolves information problem of not knowing individual citizens' true anti-regime sentiments and enables the Party to substitute targeted repression for non-exclusive co-optation to forestall coordinated turmoil.

In 1998, the Ministry of Public Security in China proposed the Golden Shield Project–a digital surveillance system to improve the efficiency and effectiveness of the police. In 2001, the central government approved and started to fund the project, which was then implemented through several phases, focused on building population databases, ID tracking systems, Internet surveillance tools, street surveillance camera systems. Further advancements on this project integrated AI powered facial recognition. Due to the central ministry's strategy, implementation of these solutions varied across provinces. It was observed that the implementation of the Golden Shield Project increased local governments' targeted repression[43]. The Golden Shield Project, run by the Ministry of Public Security (MPS), is, in part, responsible for the country's strict internet censorship and

40 P. Bischoff, *Surveillance camera statistics. Which city has the most CCTV cameras?,* "Comparitech", 20 VII 2020 [accessed: 15 IV 2021], available at: <www.comparitech.com/vpn-privacy/the-worlds-most-surveilled-cities/>.

41 P. Bischoff, *Surveillance camera statistics…*.

42 R. Pringle, *Hong Kong protesters go offline to dodge China's digital surveillance,* CBC, 28 VI 2019 [accessed: 15 IV 2021], available at: <https://www.cbc.ca/news/science/pringle-hong-kong-protests-1.5192550>.

43 X. Xu. *To repress or to co-opt? Authoritarian control in the age of digital surveillance,* "American Journal of Political Science" 2020, vol. 65, issue 2, pp. 11–17.

physical surveillance[44], by creating robust databases with citizens' data. Such databases includes household registration information (hukou), as well as information on past travels and criminal history, according to a report from the Immigration and Refugee Board of Canada[45]. In 2013 new pioneering project was implemented: local government in Pingyi County began installing security cameras – more than 28,500 by 2016[46]. In 2015 the Chinese government announced roll out of a similar project across China, with a particular focus on remote and rural towns. In reference to a quote from communist China's former revolutionary leader Mao Zedong who once wrote that "the people have sharp eyes" when looking out for neighbours not living up to communist values, it was called the "Xueliang Project," or Sharp Eyes.

Having said that, accurate information about surveillance initiatives in Chinese smart cities is not easily available. It is also unclear which cameras are exclusively viewed by village, city, and provincial governments, and which by the central government. Cities can also add new technology to the mix at their discretion. For instance in Harbin[47] local government was trying to implement a predictive technology based on bank transactions, location history, and social connections, making a determination as to whether a particular citizen was a terrorist or violent criminal. Shanghai on the other hand, after achieving full 5G coverage in its downtown area and 99 percent fiber-optic coverage across the city, installed Alibaba's City Brain public surveillance system, which oversees over 1,100 biometric facial recognition cameras[48].

Chinese government agencies invest in further digital tools track and analyse online activities to contain threats before they spread – the mission

44 China: The Public Security Bureau (PSB) Golden Shield Project, including implementation and effectiveness; Policenet, including areas of operation; level and effectiveness of information sharing by the authorities, Canada: Immigration and Refugee Board of Canada, 7 III 2014 [accessed: 28 III 2021], available at: <https://www.refworld.org/docid/543ba3824.html >.

45 China: The Public Security Bureau (PSB) Golden Shield Project....

46 *临沂"雪亮工程":治安防控 群众真正参与进来了*, Chinapeace, 2 X 2016 [accessed: 15 IV 2021], available at: <https://archive.li/7gpbm>.

47 J. Batke, M. Ohlberg. *State of surveillance*, "ChinaFile"[online], 30 X 2020 [accessed: 28 III 2021], accessible at: <www.chinafile.com/state-surveillance-china>.

48 *Shanghai aims to have full 5G coverage by 2020*, "China Daily" [online], 6 VII 2019 [accessed: 28 III 2021], available at: <http://www.chinadaily.com.cn/a/201907/06/WS5d2094c0a3105895c2e7c08b.html>.

of Chinese smart cities is to enhance "social harmony" through technology. This process is closely connected to social credit score – a system implemented by the Chinese government based on big data. A number of companies, including Sesame Credit, associated with the corporate giant Alibaba, are collecting citizens' data, under the instructions of the authorities, with this objective in mind, directly affecting the management and regulation of society.

Chinese smart city technologies raise a number of ethical issues concerning privacy, profiling, and anticipatory governance, which has a significant consequence for how citizens are treated (e.g., as data points, subjects to be actively managed and policed, as consumers), and can work to reproduce and reinforce inequalities[49]. A range of abovementioned smart technologies has transformed and eroded movement privacy[50]. In a number of cities, sensor networks have been deployed across street infrastructure to capture and track phone identifiers. Within malls and shops corresponding solutions are tracking shoppers, capturing basic demographic information. Similarly, some cities have installed a public wi-fi mesh which can capture and track the IDs of devices that access the network, as well as GPS coordinates of connected devices. Predictive profiles created this way can be used to socially sort places to receive certain policy interventions or marketing as practiced by the geodemographics industry. co-proximity and co-movement with others might be used to infer political, social, and/or religious affiliation, potentially revealing membership of particular groups, as demonstrated in Xinjiang.

Connected cameras, intelligent road systems, combining embedded sensors, metering devices, and other monitoring technologies can provide an added layer of protection and emergency support to aid citizens when needed. This being said, cities around the world are becoming increasingly dependent on technologies which are opening them to cyber attacks. It is therefore vital to look into and constantly monitor potential threats, especially related to terrorism, as the network links critical and vulnerable infrastructures: transportation, health, finance and defense.

One of the paradoxes is that the smarter a city gets, the more exposed it becomes to digital threats. Smart cities are a target for cyberattacks,

49 R. Kitchin, *The ethics of smart cities and urban science*, "Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences" 2016, vol. 374, no. 2083, p. 20160115.

50 Ibidem, p. 20160115.

including data theft, all of which can significantly disrupt provision of essential services, posing existential threat. Chinese smart cities need to develop a robust capability to deter, respond to, and recover from attacks while ideally also preserving a level of data protection and privacy. To start, digital security needs to be designed into all domains of governance, including infrastructure. Ideally, smart city technologies should avoid disproportionate surveillance, as data driven initiatives that influence stakeholders' attitudes regarding smart city development include data ownership, data access, trust, and data privacy[51], but given the nature of Chinese governance model it is unlikely. Finally, it is essential that Chinese cities encourage digital literacy even further, since many potential digital harms can be reduced through precautionary measures.

To become smart, cities need to know their blind spots, which include mapping the vulnerability of wireless devices and their environment and routine monitoring and detecting data leakages. Cities will need to invest in automated incident response and in identifying and fixing their vulnerabilities in relation to networks and devices.

Extraterritorial implications of technology export.

Chinese government hopes to leverage new technologies for the Party's political agenda.

Under Xi Jinping, Chinese tech companies, supported by the Party's efforts, have been successfully exporting surveillance solutions to Latin America, other parts of Asia, and Africa, enabling what some call digital authoritarianism. If smart city technologies, such as City Brain, are successfully deployed and adopted, intelligence in PRC in possession would allow China to enforce its definitions of the activities that it's monitoring globally, potentially allowing it to implement PRC standards and definitions of illegality beyond its borders with greater effectiveness.

Chinese smart cities are setting off an industry competition worldwide. Research presented in the "Global Smart City Expenditure Guide" pointed out that by 2020, the total market investment in smart cities worldwide

51 A. Jr Bokolo, *Exploring data driven initiatives for smart city development: empirical evidence from techno-stakeholders' perspective*, "Urban Research & Practice" 2021, vol. 14, pp. 1–32.

will reach 114.4 billion USD. The scale of market spending in China's smart cities will reach 25.9 billion USD. It can be expected that these figures will continue to grow.

China is also aggressively exporting its digital infrastructure[52], attempting to establish dominance in the smart solutions ecosystem, playing a critical role in the development of technical standards globally[53]. For example the 14th Five-Year Plan for economic development, included intended next steps in technology[54], gearing up to ensure that Chinese vision of the internet goes global. China's National Informatization Strategy calls upon China's internet companies to promote the creation of a "Digital Silk Road" internationally. This initiative, understood as the export of Chinese technologies alongside the Belt and Road Initiative (BRI) is China's bet on a country-as-a-platform strategy[55]. Already in March 2017, Alibaba assisted in launching a digital free trade zone in Malaysia[56] , which included a regional logistics center serving Southeast Asia, an e-commerce platform[57], and a digital payments and financing service[58]. Since its launch, three more countries – Belgium, Rwanda, and Ethiopia – have joined. Alibaba and related Ant have also invested in e-commerce companies including Easy Paisa in Pakistan, Ascend in Thailand, GCash in the Philippines and PayTM in India[59].

52 M. Xie, F. Wang, *IDC全球智慧城市支出指南发布，2020年中国市场规模增速放缓，将逐步反弹*, International Data Corporation (IDC), 13 VII 2020, [accessed: 25 III 2021], available at: <www.idc.com/getdoc.jsp?containerId=prCHC46693520>.

53 J. E. Hillman, M. McCallpin, *Watching Huawei's "safe cities"*, "CSIS Briefs" [online], 4 XI 2019, [accessed: 10 VII 2021], available at: <https://www.csis.org/analysis/watching-huaweis-safe-cities>.

54 Y. Cheng, Y. Zheng, *China eyes 6G as next tech frontier*, "China Daily" [online], 20 III 2021 [accessed: 29 III 2021], available at: <www.chinadaily.com.cn/a/202103/20/WS60554052a31024ad0bab0636.html>.

55 S. P. Choudary, *China's Country-As-Platform Strategy for global influence*, "Brookings" [online], 19 XI 2020 [accessed: 29 III 2021], available at: < www.brookings.edu/techstream/chinas-country-as-platform-strategy-for-global-influence/>.

56 Alibaba Cloud Malaysia, available at: <https://www.alibabacloud.com/campaign/malaysia>.

57 Alibaba Malaysia website, available at: <https://malaysia.alibaba.com/index.html>.

58 Alipay website, available at: <https://intl.alipay.com/>.

59 S. P. Choudary, *China's Country-As-Platform Strategy for global influence....*

Furthermore, Chinese companies provide technology infrastructure for managing smart cities all around the world, including cloud-hosted services to integrate city management databases and AI capabilities to manage city operations. It is important to highlight that Chinese technology companies are building entire ecosystems – not only a feature or single services. Huawei smart city systems are active in more than 200 cities around the world. Alibaba provides a smart city management system and is currently piloting its "City Brain" project in Kuala Lumpur, including[60] traffic light information and traffic camera feeds, as well as data from the ride-hailing service Grab[61], to predict traffic patterns and reduce traffic congestion. Australian city of Darwin is attempting to adapt elements of Chinese social credit system[62], while advertised as a progress towards a digital future or a plan for a smarter city. In 2019 Australian Northern Territory budget earmarked over 1.4 million AUD for expanding the local CCTV system as part of "Investing in a Safer Territory[63]". In North America and Western Europe the concerns over smart city technologies imported from China pertain to how surveillance technology enables pervasive collection, retention, and misuse of personal data. The extent to which these tools undermine transparency, accountability, and trust is worrisome, as under Chinese law, companies delivering smart city solutions can be compelled to hand over that data to the ruling Communist Party. There are also concerns about how facial recognition technologies are racially biased and inaccurate when it comes to people of colour.

60 A. Kamarul, *Tech: Alibaba Cloud's City Brain could reduce KL travel time by 12%*, "The Edge Markets", 30 X 2019 [accessed: 29 III 2021], available at: <www.theedgemarkets.com/article/tech-alibaba-clouds-city-brain-could-reduce-kl-travel-time-12.>.

61 P. Bunia, *Malaysia City Brain initiative to use real-time, anonymised traffic data from Grab.* , "OpenGov Asia" [online], 20 IV 2018 [accessed: 29 III 2021], available at: <opengovasia.com/malaysia-city-brain-initiative-to-use-real-time-anonymised-traffic-data-from-grab/>.

62 M. J. Zeng, *China's social credit system puts its people under pressure to be model citizens*, "The Conversation" [online], 24 I 2018 [accessed: 18 III 2021], available at: <theconversation.com/chinas-social-credit-system-puts-its-people-under-pressure-to-be-model-citizens-89963>.

63 *Budget 19: Investing in a safer territory – more police and more resources*, Northern Territory Government Newsroom, 3 V 2019 [accessed: 29 III 2021], available at: <newsroom.nt.gov.au/mediaRelease/28990>.

Conclusions

Smart cities are no longer only a future aspiration in China, but even though China started piloting national smart city development in 2009, these initiatives are still heavily about the party's ability to exercise control and not about improving denizens quality of life.

Chinese smart cities used to be driven by a vision of technology not necessarily designed as resilient or sustainable. Having a particular understanding of the needs of the citizens and prioritising excessive security, the Party was struggling with solving urban problems. This issue was amplified by the fact, that Chinese smart cities lack policies to guide city applications against overreach when it comes to privacy. To become truly 'smart', Chinese cities need to sense and respond to the needs of its denizens. A new trend in smart city developments, represented by initiatives like Xiong'an, which is prioritising sustainability, is an attempt to response to critical challenges of dynamically changing urban population as well as its environment and safety, ideally driven by the creativity of the population and the collective intelligence of collaboration.

The concept of smart city intersects with China's ambitions to shape global technological standards, especially in the security sector, often along sites of the Belt and Road Initiative (BRI). Domestically, data-enabled control could radically shift away any form of power from publics, towards elites and especially leaders, making Chinese cities vulnerable to totalitarian backsliding, capture, and consolidation. Furthermore, consequences of conditioning that smart cities impose on people are hard to predict, and they might spill across the borders. Externally, in the long term, a successful export of smart city infrastructure, including surveillance or data analytics solutions could greatly expand the Party's ability to monitor and shape people's behaviours well beyond the borders of the PRC.

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