



CHINA'S SMART CITIES

The New Geopolitical Battleground

Alice EKMAN

December 2019

The **Institut français des relations internationales** (Ifri) is a research center and a forum for debate on major international political and economic issues. Headed by Thierry de Montbrial since its founding in 1979, Ifri is a non-governmental, non-profit organization. As an independent think tank, Ifri sets its own research agenda, publishing its findings regularly for a global audience. Taking an interdisciplinary approach, Ifri brings together political and economic decision-makers, researchers and internationally renowned experts to animate its debate and research activities.

A global leader in consulting, technology services and digital transformation, **Capgemini** is at the forefront of innovation to address the entire breadth of clients' opportunities in the evolving world of cloud, digital and platforms. Building on its strong 50-year heritage and deep industry-specific expertise, Capgemini enables organizations to realize their business ambitions through an array of services from strategy to operations. Capgemini is driven by the conviction that the business value of technology comes from and through people. It is a multicultural company of over 200,000 team members in more than 40 countries. The Group reported 2018 global revenues of EUR 13.2 billion.

This study has been carried out within the partnership between Capgemini and the Institut français des relations internationales (Ifri).



ISBN: 979-10-373-0073-7

© All rights reserved, Ifri, 2019. Cover: © helloabc/shutterstock.com

The opinions expressed in this text are the responsibility of the author alone. They do not represent the views of Ifri, Ifri's partner or the institution(s) the author may be affiliated to, being public or private.

How to cite this publication:

Alice Ekman, "China's Smart Cities: The New Geopolitical Battleground",
Études de l'Ifri, Ifri, December 2019.

Ifri

27 rue de la Procession 75740 Paris Cedex 15 – FRANCE

Tel.: +33 (0)1 40 61 60 00 – Fax: +33 (0)1 40 61 60 60

Email: accueil@ifri.org

Website: ifri.org

Author

Alice Ekman has been the Senior Analyst in charge of the Asia portfolio at the European Union Institute for Security Studies (EUISS) since September 2019. She covers foreign policy and security developments in the Asian region – including in China, the Korean Peninsula, Japan, India and ASEAN. Alice Ekman also manages regular ‘Track 1,5’ dialogues with the EU’s partners in Asia and coordinates the EU member committee of the Council for Security Cooperation in the Asia-Pacific (CSCAP EU).

Prior to joining EUISS, she was Head of China Research at Ifri in Paris, within its Center for Asian Studies (*this study has been carried out while still at Ifri*). She has also been Visiting Scholar at Tsinghua University in Beijing, at National Taiwan Normal University in Taipei and at the Asan Institute for Policy Studies in Seoul.

She holds a Master in International Relations, Economics, and Anthropology (China focus) from the London School of Economics and a PhD in International Relations from Sciences Po and is fluent in Mandarin Chinese.

Table of Contents

INTRODUCTION	7
CHINA'S SMART CITY: DOMESTIC AMBITIONS.....	9
China's "smart city" definition.....	9
China's safe city in concrete terms	10
CHINA'S SMART CITY: GLOBAL AMBITIONS	15
China's positioning itself as a global smart city provider	16
Concrete projects emerging abroad.....	17
SMART CITY: THE NEW GEOPOLITICAL BATTLEGROUND BETWEEN CHINA AND THE UNITED STATES	21
Emergence of a technological decoupling	21
US-China trade tensions: acceleration of China's technological independence?	23
Smart cities: diverging spheres of influence	25
CONCLUSION: EMERGENCE OF TWO COMPETING TYPES OF SMART CITIES?.....	29

Introduction

“Smart city” development has become a fashionable policy and research topic: a growing number of central and local governments in Europe, Asia, Africa or Latin American, in partnership with companies from a diversity of sectors (construction, transport, energy, water, etc.), consulting firms, NGOs and experts, are now developing “smart city” related projects. Smart city generally refers to the use of technology in an urban environment to enhance the quality and performance of a set of services (transportation, energy distribution and saving, security, etc.). The definition and perception of smart city may vary depending on the urban service considered. Among the myriad of reports and studies that now exist on smart city, most of them look at it from a sustainable development perspective (optimal use of technology for public transport/green mobility, energy and water saving, recycling, and overall economic and social attractiveness of the city). Others look at it specifically from a security perspective (optimal use of technology for public security, involving the use of cameras, sensors and other devices for police, firefighting purposes, etc.)

This report looks at it from a broader, geopolitical perspective, and considers, for the first time, smart city as a potential area of geopolitical competition between countries. This approach is relevant given the strategic nature of the infrastructure involved in smart city development (telecommunication and energy grids, mobile networks, data centers, etc.). It is also relevant at a time of prolonged tensions between China and the United States – period during which 5G and other technologies that are key to development of smart cities are generating a global debate and diverging positions across countries.

After an overview of China’s smart city developments on its national territory, the report analyzes China’s new global ambitions as a smart city provider to the world in a comparative perspective. To what extent China’s smart cities differ from others? Are China’s smart cities promoting a new type of urban governance model? At a time of reinforced tensions between China and the US, can smart cities still be developed jointly with technologies of both countries? The report addresses these questions in a prospective manner, considering that smart cities remain at an early stage of development, and that US-China rivalry is likely to last.

China's Smart City: Domestic Ambitions

China identified smart city development as a national priority in 2012, and since then has continuously invested in the integration of technology in urban areas of various size (first-tier cities as well as small- and medium-sized ones),¹ testing many of them in the form of pilot and experimental projects across the territory – in Wuhan, Shenzhen, Tianjin, Xi'an, among other cities. China has now the highest number of smart city pilot projects in the world: more than 500 “ready or under construction” as of January 2019, according to official communication.² Data from the China Academy of Information and Communication Technology indicates that, until 2016, China had 542 pilot smart cities under development, and that in 2018 the actual number of smart cities developed in concrete terms in China, was closer to 400, containing all the provincial and sub-provincial cities, prefecture-level cities and county-level cities. Although these figures remain difficult to verify, there is no doubt that the Chinese government has invested massively in the development of smart cities on its territory over the last seven years, and is still continuing to do so on a large scale. To date, China is the country with the highest number of smart cities on its national territory in the world – far ahead of the European continent, which ranks second.³

China's “smart city” definition

If China is considering a diversity of urban services in its smart city pilot projects, including pollution/waste management⁴ or transportation – smart transportation projects in Chengdu and Guangzhou, for instance –, the emphasis of most projects is on security, broadly defined – from traffic accident to firefighting, but also including crime prevention and overall preservation of “social stability”. The official definition of China's smart city reflects this focus: the Chinese government was initially calling them “safe

1. Confirmed by Xinhua (state-owned news agency) in various press releases in 2018-2019.

2. Xinhua news agency, January 2, 2019, www.xinhuanet.com.

3. According to the 2018 report “Super Smart City – Happier Society with Higher Quality” published by Deloitte Global and Deloitte China, Europe has 90 smart cities under construction, far behind China's 500.

4. On the topic, see this other recent Ifri report: T. Voita, “Going Green: Are Chinese Cities Planting the Seeds for Sustainable Energy Systems?”, Center for Energy, Ifri, February 2019, www.ifri.org.

city”, and more recently started to use the term “smart city” or, together “smart-safe city”. Still, the official China’s smart city definition is still very much emphasizing on the security dimension, in a broad sense (including both the “safety” and “security” dimensions – from fire risks to terrorist threats). This focus is also dominant in the discourse of Chinese companies, which are positioning themselves on the smart city market. Huawei is talking about “safe city” and “safety solutions”, a marketing term following the same line as other Chinese telecommunication companies, whether they are state-owned or private. In addition to the telecommunications sector, the Chinese defense industry is also investing in smart cities. For instance, Norinco, a Chinese military equipment provider, is now including smart city in its portfolio of products, using the term “Safe and Smart City”.⁵

China’s smart city definition takes also into account its broader approach towards urban planning. Pilot smart cities have been identified by the central government (list issued by the Ministry of Housing and Urban-Rural Development in 2013), and then local governments have been asked to implement. This type of centralized urban planning contrasts with other frameworks where local governments have a stronger say. For instance, in France, it is through the decision and impulse of mayors that some cities, such as the city of Nice, have launched a smart city strategy. Similarly, in Germany, local decisions shape the smart city landscape, and cities have so far developed different approaches towards China’s 5G network.

China’s safe city in concrete terms

China has now the largest surveillance system in the world. This is the result of significant investment in surveillance cameras (“CCTV”) throughout the period 2000-18, having now its national territory covered by a particularly dense network. By mid-2018, China had an estimated 200 million surveillance cameras (four times as many as the US) and will have almost 300 million by 2020.⁶ In order to build this national security network, named “Skynet”, which is still under development, China is now investing in a more intelligent and comprehensive surveillance system that includes facial recognition cameras, sensors, and other tools at the disposal of the Ministry of Public Security.

Indeed, a strong and direct connection exists between businesses (tech/artificial intelligence equipment in particular, in the case of smart cities) and institutions under the Ministry of Public Security, including the

5. Fieldwork and analysis of Norinco website and participation to international exhibition, 2018-2019.

6. P. Mozur, “Inside China’s Dystopian Dreams: A.I., Shame and Lots of Camera”, *New York Times*, July 8, 2018.

police. A record, which was publicly available on the Internet,⁷ showed a China-based camera able to detect a person's face whose information matched a local police watchlist. This means that each time a person was detected – and still is – by the AI facial recognition camera, various details, such as if a person's eyes or mouth are open, if he/she is wearing sunglasses, is smiling or even has a beard, were stored and crossed with data from the police, which in some instances include name, national identity card number, and reason why it is on the police record. The facial recognition system is also able to detect “ethnicities” and labelling them – such Han Chinese (main ethnic group of China) or Uyghur Muslim. The information contained in the system is sufficient to pinpoint where people went, when and for how long, allowing to draw a full picture of a person's daily life.⁸

The link between tech companies and police authorities appears in various products developed in recent years in Chinese cities. For instance, companies such as “Number 1 community” provides a facial-recognition system to enable residents to go through security gates more quickly, but the photos collected are shared with the police and added to its database. Other smart city companies underline openly the connections of their infrastructure with public security institutions. For instance, on its website, Inspur Group, one of China's top cloud computing and big data service providers, presents its “Smart city” solution in the following terms:

“Currently, the Inspur Safe City solution essentially involves CCTV and smart image analysis. The Safe City comprehensive monitoring solution is stipulated based on the actual demands and security and protection level, so as to provide the public security departments at all levels and other relevant departments to see the overall public security state of the monitoring region directly; and to prevent public security issues such as emergencies, crimes, mass conflict via intelligent analysis technique, which greatly improves the level of the social public security management.”⁹

These connections have been strengthened further in 2017, with the adoption of a new “National Intelligence Law” which compels individuals and institutions to collaborate with China's intelligence organizations whenever requested. These connections have so far not generated an open and public debate in China, in a context of strict censorship of topics considered sensitive by the government.

7. Z. Whittaker, “Security Lapse Exposed a Chinese Smart City Surveillance System: Thousands of Facial Recognition Scans Were Matched against Chinese Policy Record”, TechCrunch, May 3, 2019, <https://techcrunch.com>.

8. *Ibid.*

9. “Smart City Solution”, Inspur, <http://en.inspur.com>.

The situation in China sharply contrasts with smart city projects in democratic countries: in particular with the case of Toronto, where the smart city project proposed by the company Sidewalk Labs – affiliated to Google – to improve traffic, weather, waste management and other non-security services generated such a public debate and level of concerns on the privacy of the data collected from inhabitants that Sidewalk Labs had not only to prove that the data collected were anonymized from the very beginning, but also to propose tools and guarantees that would inform inhabitants about the collections of their data and how it is used.¹⁰ The project is still contested publicly and continues to be adjusted, according to latest reports.¹¹ Similarly, in France, the legal system – in particular the 1978 law “Informatique et libertés” – strictly forbids the implementation of identification of individuals (including those already filed by police/Ministry of Interior authorities) and therefore of any facial recognition system in a smart city context so far. Public and private institutions involved in smart city management can only use anonymized data and cannot track individuals by name/personal data. This situation is the complete opposite of the one observed in China, where the police is now working closely with tech companies to link - as early as possible - the data collected to names and ID numbers.

A feature that is currently developing in China's smart city is the use of technology to “name and shame”. For instance, at major crossroads and intersections of several big cities, police authorities have started to place cameras connected to a facial recognition system and a large outdoor screen: lawbreakers (such as jaywalkers) are appearing on the large screen, with their faces, names and ID numbers.¹² The Police is also currently experimenting the use of new technological devices, such as facial-recognition glasses that some of its staff is wearing in streets of a few cities (such as Zhengzhou or Luoyang, in Henan province, in the center of the country).

Nevertheless, these developments are so far still limited to a number of pilot areas and not always working smoothly. China's tracking network remains uneven on its territory – some areas being very well covered and some much less – and bureaucratic constraints seem to prevent the development of a homogenous nationwide network.¹³ From a technological

10. C. Legros, “À Toronto, la “ville Google” en quête d'une gouvernance de ses données numériques”, *Le Monde*, 14 juin 2019, www.lemonde.fr.

11. D. Rider, “Sidewalk Lab's Project in Toronto Could Be Dead by October if Disagreements Persist”, *The Star*, August 2, 2019 www.thestar.com. Joshua Oliver, “Sidewalk Labs reaches smart-city deal with Toronto - Alphabet subsidiary scales back ambitions for Canadian city's waterfront”, *Financial Times*, 31 octobre 2019. <https://www.ft.com/>

12. P. Mozur, “Inside China's Dystopian Dreams: A.I., Shame and Lots of Camera”, *op. cit.*

13. *Ibid.*

point of view, when looked at and tested in more details, some surveillance tools appear less advanced than initially assessed.¹⁴ The Chinese government itself is largely communicating about its surveillance system, sometimes with overstatements. This also applies to the smart city megaproject of Xiong'An, presented in official communications as “the city of the future” and “a model city in the history of human development”, but which is at a very early stage of construction and impossible to be assessed at the time being.¹⁵

Still, the situation may evolve quickly given the strong governmental ambition to invest in smart city development in the coming years, and the leading position that several Chinese companies are now acquiring in technologies that are at the core of smart city architecture: Artificial Intelligence (AI) and AI camera for video surveillance, facial recognition, data collection and big data analysis¹⁶ and management, sensors, 5G network, internet of things, cloud computing, etc. If these technologies are used for different purposes and situations, they are increasingly key to the development of smart cities. To support some of these technologies, China is also developing BeiDou, its own global satellite system, an alternative to GPS. The latest version (BeiDou-3) should be completed in 2020. Then, when linked to 5G, the satellite system should also be able to provide the Chinese government with access to smartphone geolocation and subscriber information on Chinese 5G networks and other data related to phones.

14. This is for instance the case of the Integrated Joint Operations Platform (IJOP), a smartphone app used to surveil the population in Xinjiang. According to a Human Rights Watch report and TechCrunch, the system does not appear so far to be cutting-edge or fully efficient, as its operation requires a large number of resources and police input”. See J. Russell, “Details Emerge of China’s ‘Big Brother’ Surveillance App Targeting Muslims”, TechCrunch.com, May 2, 2019.

15. Xinhua, August 22, 2019.

16. And in particular “big data and social management”.

China's Smart City: Global Ambitions

The domestic market remains by far the most promising one for the development of smart cities, in particular for companies working on the “safe” dimension – as China’s public security market is developing at a rapid pace under Xi Jinping, and most existing equipment (such as cameras) are still traditional (without any AI component) and therefore likely to be replaced or upgraded in the coming years.

But the global smart city market is also increasingly becoming a focus of China’s government and tech companies. According to official media, China is currently “striving to gain a lead in the global race toward building an intelligent and data-driven society”.¹⁷ The various planning documents issued by the government in the past years present China as a smart city provider to a diversity of regions. For instance, China hopes to develop smart cities in Maghreb and Sub-Saharan Africa. The action plan on China-Africa Cooperation for the period 2019-21¹⁸ clearly states smart cities as an area of future cooperation:

“The two sides will actively explore and advance cooperation in the application of new technologies including cloud computing, big data, and the mobile internet. China will support African countries in building "smart cities" and enhancing the role of ICT in safeguarding public security, counter terrorism and fighting crime and work with the African side to uphold information security.”¹⁹

17. Ma Si, “Nation Leads Race for Data-Driven Societies”, *China Daily*, January 2, 2019, www.chinadaily.com.cn.

18. The action plan was signed during the 2018 Beijing Summit and the Seventh Ministerial Conference of the Forum on China-Africa Cooperation (FOCAC) held in Beijing from 2nd to 4th September 2018.

19. Extract from the official English version of the Action Plan, as disclosed by the Ministry of Foreign Affairs. Full text available at: www.focac.org. On related topic, the plan also states: “Both sides encourage and support their companies to participate and partner in the building of ICT infrastructure of African countries, including optical fiber cable backbone networks, cross-border connectivity, international undersea cable, new-generation mobile network, and data center and cooperate in a mutually beneficial way in the construction, operation and service of relevant infrastructures. The two sides will enhance cooperation at the International Telecommunication Union (ITU) and other international organizations, and step up coordination on training, Internet connectivity and the building of innovation centers. Both sides are ready to cooperate on strategic consultations on ICT policy-making and development, and to work together to narrow the digital divide and promote the building of an information society in Africa.”

To export smart cities, China increasingly uses the framework of the “Belt & Road initiative”, the ambitious project launched by Xi Jinping in Autumn 2013, and which since then has enlarged to include, according to Chinese official communication, “more than 150 states and international organizations”.²⁰ A large range of Belt & Road projects go well beyond transport infrastructure (tourism, e-commerce, spatial projects, among other areas; creation of new multilateral institutions, promotion of norms and standards, etc.).²¹ The Chinese government has pushed for the development of a “digital silk road” since 2017,²² and this dimension of the Belt & Road is likely to develop in the coming years. Chinese cloud computing and big data service providers, such as Inspur Group, are already openly positioning themselves on the smart city market under the framework of the Belt & Road.²³

Beyond official communication, a series of recent actions confirm China’s ambitions. One of them is the organization of an increasing number of “Smart city expos” to bring domestic providers and international buyers together, and in broader terms to promote China smart city products and services to an international audience. This was the case for instance of the 2019 Smart City Expo held in Shanghai, among other events.

Another action is the promotion of China’s smart cities through training programs. In recent years, China has provided an increasing number of training programs to officials and engineers of developing countries. These programs include content specifically dedicated to “smart cities” and the use of telecommunications and advanced technologies in an urban environment.²⁴

China is positioning itself as a global smart city provider

China is not alone in investing massively in smart cities. In Asia, countries such as South Korea, Japan or Singapore also have their own ambitious national strategy on the topic. For instance, Singapore has promoted in recent years a comprehensive “Smart Nation” program, which is already

20. Xinhua, March 19, 2019.

21. On this, see A. Ekman (ed.), “China's Belt & Road and the World: Competing Forms of Globalization”, *Études de l'Ifri*, Ifri, April

22. See *People's Daily*, May 19, 2017, 中国互联网企业“出海造船”推动网上“一带一路”, <http://it.people.com.cn>.

23. See Z. Liying, “Building Smart Cities with Big Data along the Digital Silk Road”, April 25, 2019.

24. Analysis of the official 2019 catalogue of training programs offered by the Chinese governments to officials from developing and/or “Belt&Road” countries.

well-developed on its territory.²⁵ Nevertheless, among Asian countries, China seems by far the most ambitious one in becoming a smart city provider to the world, comparing current official objectives on the topic as well as levels of technological advancement.

Given the high level of advancement of Chinese companies in most of the technologies at the core of smart cities to date (AI camera, facial recognition systems, big data analysis, 5G network, etc.), China now enjoys a comparative advantage as a smart city provider. Its smart city development can already rely on a network of advanced sensors, complete wireless connectivity, significant cloud-based software services and the experience of smartphone/electronic payments (an area in which China is already the most advanced country in the world in terms of daily consumer use).

In addition to the high-level technological advancement, the strong role of the Chinese state in the economy – which has identified smart city as a priority on its territory and abroad – means, that China is able to support the development and the coordination of its various technological providers (be they state-owned or private actors) to offer a comprehensive and interoperable smart city package to foreign cities.

And the strong coordination of China's foreign policy, including its economic diplomacy, generates an asymmetry between China's central government, which supervises the promotion of its smart city abroad, and the local governments of foreign cities prospected, which often have limited capabilities to analyze economic offers from a geopolitical and security perspective. On the contrary, it remains difficult for foreign companies to seize opportunities with the fast-pace development of smart cities on the Chinese territory, due to the strong supervision of the central government over local governments (including municipal governments) – which has reinforced since the beginning of Xi Jinping's presidency in 2013 – and most of all a market context that is still unfavorable to foreign companies.

Concrete projects emerging abroad

It is hard to make a precise assessment of China's overall smart city exports in a comparative perspective to date, but analysis of recent projects and figures of companies proposing smart/safe city solutions, such as Huawei, show that China is step-by-step positioning itself as a key "safe city" provider in several regions of the world.

25. Interview with representatives from the Smart Nation and Digital Government Office, Prime Minister's Office, Singapore, May 2019, and observations on the ground.

Central Asia is one of the regions where China's smart city and associated surveillance technologies are becoming very popular. For instance, in April 2019, Huawei closed a \$1 billion deal with the Uzbek government to enhance its surveillance operations on its national territory.²⁶ Huawei is also present in Kazakhstan and Tajikistan, closely working with local telecommunications service providers to develop progressively 5G network and smart city surveillance system. So far, the number and overall density of CCTV cameras is far smaller than in China but it is likely to be develop in the coming years, and China's technological dominance is starting to be visible in Central Asia. This does not mean that it covers all Central Asian countries: in March 2018, the Kyrgyz government turned down Huawei's \$60 million "safe cities" project and opted instead for Vega, the Russian company, for the implementation of what can be called the first step of a smart city, a traffic monitoring system, in September 2018.²⁷

Ministries of Interior and police authorities of various African countries have also been developing their surveillance/police capabilities with the help of Huawei. This is the case of the Kenyan police, which has developed a partnership with Huawei in Nairobi and the surrounding area, where, according to Huawei's website, the company "provided a unified solution that integrates intelligent video surveillance IP contact centers, telepresence video conferencing and a geographic information system" since 2014.²⁸ Huawei is also helping the government of Zambia to develop its "smart Zambia" project, which aims, according to Huawei's website, "to ensure the development of secure, efficient and interoperable systems between departments" of the Zambian government. It also includes the creation and development of "The Zambia National Data Center project" since 2016. In concrete terms, Huawei has provided the physical infrastructure (cloud, data center) currently in use by the Zambia government, and is also developing the national broadband network (fiber optic cable, 3G, etc.).²⁹ If many African cities are still far from becoming "smart", given major lack of basic infrastructures, local government deficiencies in some instances and uneven use of technologies by the population, China's growing telecommunication and technological dominance in Africa poses a solid basis for the development of smart cities in the future, supported by China's tech companies and based on China's model on smart cities.

26. Y. Tsz Yan, "Smart Cities or Surveillance? Huawei in Central Asia", *The Diplomat*, August 7, 2019.

27. *Ibid.*

28. "Kenya Police: Constructing a Video-based Emergency Communication Network", 2015, <https://e.huawei.com>.

29. For more details, see Huawei's official website: "New ICT Helps Build Smart Zambia", 2017, <https://e.huawei.com>.

The fact that integration and interoperability are key to building an efficient smart city, means that the first mover gets an advantage, and that a city which develops a service through a specific provider is most likely to move on to its smart development through the same provider, or another one from the same company/country that is fully compatible. In addition to integration and interoperability of services and infrastructures, China's smart cities are often attached to other interoperable infrastructures that Chinese companies have been developed in its surrounding area, such as railways, roads, and ports – the Djibouti city-port complex for example.

Beyond Africa, Huawei has increasingly been cooperating with foreign Ministries of Interior to develop safe city capabilities. This is for instance the case in Saudi Arabia, where Huawei has helped the Ministry of interior police the Hajj, the annual pilgrimage in Mecca, since 2016.³⁰ Huawei has also announced in 2019 that it has been mandated to develop Saudi Arabia's 5G network.³¹ Overall, Huawei has rather successfully promoted its smart city solutions to foreign countries during the period 2014-17: it doubled the number of countries where its smart city technology is deployed, from 20 to 40.³²

30. "Huawei Helps the Ministry of Interior of the Kingdom of Saudi Arabia Police the Hajj", 2016, <https://e.huawei.com>.

31. "Huawei to Build Saudi Arabia's 5G Infrastructure", February 25, 2019, Caixing, www.caixinglobal.com.

32. According to Matt Schrader, "Huawei's Smart Cities and CCP Influence, at Home and Abroad", June 18, 2019. His estimate is based on Huawei's figures as disclosed on its corporate website.

Smart City: The New Geopolitical Battleground between China and the United States

Emergence of a technological decoupling

If Huawei has managed to promote its smart city solutions rather successfully until 2017, the situation is currently changing in the Sino-US trade war context. The United States has argued that Huawei poses a threat to its national security, and on the basis of this claim has banned the development of this company's 5G mobile network on its national territory, and urged its allies to do the same. As a result, Huawei products are progressively becoming incompatible with some of its US partner's products, such as Google. Given that Huawei smartphones run on Google's Android operating system and come with several popular Google apps (Google Maps and Gmail), Huawei's devices - without access to Google services - become a lot less attractive to users outside of China. In response, Huawei is currently trying to protect its smartphone business by developing its own operating system ("Harmony") which is designed to replace Google's Android in Huawei smartphones and other type of devices, according to its founder and CEO Ren Zhengfei.³³

The fact that a decoupling on 5G technologies is emerging, there is a direct consequence on smart cities, as 5G is identified as a technology that is – and will increasingly be – key to smart cities, given that it significantly improves data speeds and therefore the connection of urban services.³⁴

³³. As indicated, for instance, in various interviews given to French media in the period July-October 2019.

³⁴. As some representatives/experts from key companies are underlining in their "top smart city predictions for 2019: C. Bechhold Russ (from Samsung Next ventures): "As end points continue to multiply, a rapidly swelling volume of data will need more bandwidth. There will be additional urgency around 5G deployment, particularly case studies demonstrating its uses and value." S. Sharma (from Intel IoT's new markets, smart cities, and intelligent transportation): "5G infrastructure deployment will start changing the game. (...) 5G will make our cities smarter. From fully autonomous connected cars to

5G, with its capacity to connect a vast global network of sensors, robots or autonomous vehicles, represents a turning point for smart cities, which will be able to use and process a larger amount of data at a faster pace.

The 5G and smartphone case may be replicated in other technologies that are key for smart cities (facial recognition, data mining, cloud computing, etc.). Other Chinese tech companies may be tempted to follow the same path as Huawei, i.e. to develop strategies and products to bypass the use of the US – and in broader terms non-Chinese – products and services. If this is successful, this could lead to a full decoupling of smart city technologies and to the development by China of a fully autonomous smart city package. In the long term, this would reinforce the bipolarization of smart city systems, one suggested by the US and its allies, the other one offered by China and its partners.

This hypothesis is likely to be confirmed as the US government currently expands its blacklist of Chinese technologies that it considers as security threats. In response, China has already announced that it will issue a retaliatory blacklist of foreign businesses.³⁵ By mid-August 2019, the US government had expanded the ban to include Huawei and 118 of its affiliated businesses (the Chinese blacklist was not yet disclosed). As of the end of October, more than 200 Chinese companies and organizations were on the U.S. Commerce Department's Entity List.³⁶ The black list, which forbids transfer of technology, software and other equipment of US companies toward foreign companies considered as sensitive, includes Huawei but also many other tech companies whose products are at the core of the smart city architecture: Megvii, a leading facial recognition start-up, Hikvision, a leading video surveillance camera provider, Sugon, a producer of powerful server and calculator, and Chengdu Haiguang Microelectronics Technology, a microchip producer, among other companies. These companies may all follow Huawei's path and develop more autonomous products and a long-term R&D strategy to bypass the use of US/foreign products and services.

The technological decoupling is materializing in very concrete terms on the US national territory in recent months: U.S. federal agencies have been asked to remove Chinese-made surveillance cameras over the summer 2019

the explosion of potentially trillions of IoT devices that are expected to enter the network over the next 10 years, 5G has the potential to bring today's emerging technologies to the mainstream." See also T. Maddox, "Top Smart City Predictions for 2019", December 19, 2018, www.techrepublic.com.

35. See for instance: "China Creates Blacklist of 'Unreliable' Foreign Firms in Response to Trump's Huawei Attacks", *The Independent*, Mai 31, 2019, www.independent.co.uk. N.-B.: List of firms concerned was not yet publically available when the present report was written.

36 "Trump's blacklist squeezes 200 Chinese companies as net widens", *Nikkei Asian Review*, November 19, 2019.

in order to comply with the ban imposed by the Congress in 2018, in an effort to thwart what is perceived as the threat of spying from Beijing.³⁷

Nevertheless, the technological decoupling also has consequences on the Chinese territory. Skynet, the emerging national security network supported by camera, facial recognition and big data analysis capabilities that was planned to become mature by 2020 with 300 million cameras by then (as mentioned above) is now facing obstacles in the context of US-China trade tensions. The system still relies on components from the US and several European countries, and supplies are becoming scarce due to trade restrictions. Some components needed for AI cameras and critical to the development of Skynet are not shipped to China anymore. For instance, the Netherlands have stopped issuing an export license for one of the components of these cameras that a Dutch company used to ship to China, according to a September 2019 report.³⁸ Other components coming from outside China and used in the video surveillance system in China, such as graphic processing chips, may also be banned for sale in the coming months, if Sino-American trade tensions continue but also if concerns remain in the US and Europe regarding the current last-scale detention of Uygur Muslims and overall surveillance system in Xinjiang. Indeed, this is also the reason invoked by the U.S. State Department and a group of US lawmakers led by Senator Marco Rubio and Representative Chris Smith, in addition to unfair trade, to envisage potential export controls on items that can be misused by Chinese security authorities in Xinjiang.³⁹

US-China trade tensions: acceleration of China's technological independence?

As a consequence, the completion of the Skynet program may be delayed, with a network of AI camera less dense than initially planned for 2020. And the US call to its allies to ban Huawei 5G networks on their national territory has in the short term the potential to hurt Huawei's efforts to become the global leader of the next generation of wireless technology, as some countries, such as Australia have followed the US position to ban its 5G network on its national territory. In this context, the already fierce competition between Chinese tech companies and other advanced and well-established tech companies (such as Samsung) is reinforcing.⁴⁰ Like

37. "Banned Chinese Security Cameras Are Almost Impossible to Remove", Bloomberg, July 10, 2019, www.bloomberg.com.

38. S. Chen, "How Tensions with the West Are Putting the Future of China's Skynet Mass Surveillance System at Stake", *South China Morning Post*, September 23, 2019, www.scmp.com.

39. *Ibid.*

40. See on this "US-China Trade War: Huawei's Loss Is Samsung's Gain", May 21, 2019, www.dw.com.

Huawei, other Chinese tech companies are facing now, in the short term, direct negative consequences of the ban – for instance, Hikvision's shares significantly dropped after the US banned federal government from using their surveillance equipment in early August.⁴¹

But in the long term, they may indirectly benefit from US decisions, given that the crisis will lead them to accelerate R&D investments and the overall technological race with US/Western companies. Chinese companies are starting to prepare for the worst and taking measures to broaden their supply chain to reduce their dependence on US/European technological components in the coming years. It is most likely that this technological race will be highly supported financially and strategically by the Central government; given that the Chinese government considers that smart city development is a priority, and given the nature of the Chinese economy – which is still highly state supervised.⁴²

This financial support from the government is increasingly visible, either through direct subsidies or through state-backed investment fund. For instance, in May 2019, Megvii – the facial recognition start-up – raised \$460 million from investors, and one of them was a state-backed fund.⁴³ As the Chinese government has started to promote civil-military integration (or “fusion”) in the AI industry in recent years⁴⁴, and as smart cities are now entering the catalogue of the Chinese defense industry, research in the field will increasingly be supported by significant state funding, with a concrete focus on smart city development. In general terms, in China or other countries, smart city is increasingly developing with the powerful R&D support of the defense industry, which sees an opportunity to sell existing or new security equipment in this framework.

Compared to China, the US's smart city ambitions appear strong too. The U.S. Department of Commerce assists US companies to play a greater role in providing smart urbanization services to foreign cities, for instance under the program “Smart Cities, Regions & Communities Export Opportunities”.⁴⁵ So far, it seems that US companies are mainly supporting smart city development on the national territory. But cases of development of smart cities abroad exist – for instance, AT&T signed a smart city

41. L. He, “China's Two Largest Surveillance Camera Makers Take a Beating from US Ban”, *South China Morning Post*, August 3, 2018.

42. Including in the tech sector: several key Chinese tech companies – such as Hikvision, which is 42% controlled by the Chinese government, – are partly or wholly state-owned.

43. P. Mozur, “Inside China's Dystopian Dreams: A.I., Shame and Lots of Camera”, *op. cit.*

44. In April 2018, China organized its first “Military-Civilian Integration of the Artificial Intelligence Industry Development Forum” in Qingdao. The Forum's agenda including smart city development.

45. Official website : www.export.gov/Smartcities.

agreement with Mexico City in 2017⁴⁶ – but overall appear less numerous to date than the one developed by China.

Smart city “alliances” are emerging. Ericsson, for example, joined AT&T Smart Cities alliance in 2016.⁴⁷ In France, companies such as Thales, Bouygues, Keolis, Engie Ineo and others are currently considering ways to cooperate to jointly offer more interoperable technologies, and therefore a more comprehensive smart city package. For instance, Thales is currently leading a consortium of 15 companies specialized in geolocation, biometry, crowd management and others advanced tech niches for the development of “safe city” solutions in the southern city of Nice. Nevertheless, these alliances are first and foremost national⁴⁸ or between countries which are already traditional allies. Some partnerships and alliances were so far able to bypass an “East/West” divide. For instance, in November 2017, Inspur – the Chinese big data and cloud computing company – together with a group of global tech giants, including IBM, Cisco Systems Inc., Diebold Nixdorf and Ericsson AB, formed an alliance to “provide IT solutions for smart city building in BRI economies”, according to Chinese official communication.⁴⁹ But it is becoming more difficult for these companies to work together at a time of reinforced China-US tensions, and it is unlikely that new alliances of this kind emerge in the coming years.

Smart cities: diverging spheres of influence

The emerging technological decoupling is a challenge for the US and China, but also for the rest of the world, including Europe. Member states of the European Union have responded in different ways to the US warning on Huawei’s 5G network. Overall, Europe remains divided regarding the approach to adopt toward Chinese technologies and smart city offer.⁵⁰ This is due to different assessments of the security threat posed by the concerned technology, different types of relationship to China, but also different level of existing presence of Huawei technologies in European countries. While

46. AT&T corporate website, November 30, 2017, <https://about.att.com>.

47. See corporate press release of Ericsson company: “Ericsson Joins AT&T Smart Cities”, January 5, 2016, www.ericsson.com.

48. A growing number of countries are developing integrated national strategy to develop their smart city capabilities. For instance, in France, a “Made in France” safe city platform is emerging, co-sponsored by the public investment bank (Bpifrance), local governments, and encouraged by a comity representing the security industry, affiliated to the Prime Minister’s office.

49. Z. Liying, “Building Smart Cities with Big Data along the Digital Silk Road”, April 25, 2019, www.china.org.cn.

50. On this, see H. Clarke, “European Split over Huawei ‘Threat’ Risks Ruffling Western Alliances as EU States Build 5G Partnerships Despite Accusations of Spying”, *South China Morning Post*, December 11, 2018, www.scmp.com.

most European cities have not yet involved Huawei in their technological development, a few, but significant, exceptions exist, such as Valletta (Malta), Monaco, and Duisburg (Germany)⁵¹, which have all begun the construction of smart cities with Huawei.⁵² Divergences on Chinese 5G technologies exist within the EU, but also between the EU and its neighborhood: for instance, the city of Belgrade, in Serbia, is starting to develop a video surveillance system with the assistance of Huawei, although at the moment the cameras network is still small and incomplete.⁵³

EU institutions and several EU member states are now calling for the development of “strategic autonomy” in key technologies, from telecommunications to electric batteries. Major European companies positioning themselves on the smart city/sustainable urbanization niche⁵⁴ are also on the same line, considering that Europe should invest in its own technology and approach, in order not to be overly dependent on China or the US. This approach is likely to be developed in the field of smart cities, as Europe has already been investing in urbanization for decades, the EU Commission is currently thinking strategically about various connectivity projects on its territory, and, with Europe at large, already ranking second in terms of total number of smart cities⁵⁵ and having major companies increasingly investing and cooperating in smart urbanism.

On smart city specifically, the legal environment developed by the EU – such as the General Data Protection Regulation (GDPR, implemented since May 2018), on data protection and privacy for all individual citizens of the European Union (EU) and the European Economic Area (EEA), as well as on the transfer of personal data outside the EU and EEA areas – already shapes the way smart city will develop on the European territory, and how foreign smart city providers will have to adjust their product to the European market. This regulation is likely to shape smart city further in the future on the European continent, but other regions – such as Central Asia or Sub-Saharan Africa – are unlikely to adopt a similar path.

Meanwhile, in a context of step-by-step Sino-Russian rapprochement since 2014 in a diversity of sectors (traditional energy sector but also,

51. Huawei and the German city of Duisburg recently signed a memorandum of understanding for Huawei to provide Duisburg with “eGovernment” smart city solutions designed to make city bureaucracy work more effectively, according to Huawei in January 2018. See also M. Schrader, “Huawei’s Smart Cities and CCP Influence, at Home and Abroad”, Jamestown Foundation, June 19, 2018, <https://jamestown.org>.

52. For full analysis of Huawei’s European presence and projects, see M. Duchatel and F. Godement, “Europe and 5G: The Huawei Case”, Institut Moutaigne, June 2019, www.institutmoutaigne.org.

53. Informal exchanges with journalist having conducted fieldwork on the topic in Belgrade.

54. Such as the French company Veolia: see for instance the interview of Estelle Brachlianoff, Vice Director General of Veolia Group, France Culture, August 25, 2019, www.franceculture.fr.

55. According to Deloitte (90 on the European continent, after China’s 500 “pilot smart cities”). See 2018 report “Super Smart City – Happier Society with Higher Quality”.

increasingly, in the technology sector), China and Russia are likely to increasingly cooperate in the tech/smart city sector at various levels (research, development, implementation), in particular if Sino-American technological tensions remain. Signs are already pointing in that direction. In June 2019, while Xi Jinping was visiting Moscow, Russia's top cellphone operator MTS signed an agreement with Huawei to develop 5G technology.⁵⁶ And Russian-Chinese scientific cooperation is now emerging to jointly develop devices that are key to smart cities, such as new generation sensors.⁵⁷

56. "Russia's MTS Signs 5G Deal with Chinese Telecom Giant Huawei, Reports Say", *The Moscow Times*, June 6, 2019, www.themoscowtimes.com.

57. For instance, researchers of Peter the Great St. Petersburg Polytechnic University (SPbPU) in collaboration with the Physics and Technology Department of the Chinese Academy of Sciences have been opening in July 2019 a laboratory to develop nanostructured ultrathin sensors and other devices within the framework of the "Smart City" and "Smart Home" projects, according to the website of the University, July 26 2019, <https://english.spbstu.ru>.

Conclusion: Emergence of Two Competing Types of Smart Cities?

This first report looking at smart cities from a geopolitical perspective is calling for more detailed research in the coming years, as smart cities are still at an early stage of development. A significant gap currently exists between the large amount of announcements on the topic and the rather limited number of concrete projects completed on the ground, whether in China or in other countries. The majority of smart cities remain at the pilot/experimental stage to date, with further implementations planned for the coming years.

Nevertheless, current observations already show that different shapes of smart cities are emerging, depending on the country's urbanization stage and infrastructure landscape, technological capabilities, local regulation, or the nature of its political system. China is actively developing a specific type of smart city architecture, which places a strong emphasis on security and is based on a large amount of data collection and analysis, and a direct connection with the police and other public authorities. In this security dimension of smart cities, China is already gaining a leading position, due to large government investment and the dominant position of national companies in products and services that are key to smart city development.⁵⁸

China is also well-placed to gain a leadership position in the smart city market as a whole, as it is currently gaining leadership on security sensors – cameras and other surveillance tools –, which remain tools at the core of smart city development⁵⁹. Through these security sensors, a diversity of data can be collected for various purposes, not only related to security: car parking, transportation/mobility, public lighting, waste management, water and energy network, etc. At the same time, China is also massively investing in artificial intelligence and cross-analysis of big data – key technologies, without which video surveillance is largely useless. Chinese companies are increasingly able to aggregate data in a way that it generates a comprehensive

58. For instance, Chinese companies are now leading the global videosurveillance market: Hikvision, Dahua and Uniview Technologies – three Chinese companies – account for almost 30% of global video surveillance revenues, according to 2018 figures. R. Alalouff, "The Spectacular Rise of the Chinese Video Surveillance Industry", March 7, 2018, www.ifsecglobal.com.

59. G. Allix, "Comment des villes 'hyper connectées' contrôlent l'espace public", *Le Monde*, December 19, 2018, www.lemonde.fr.

smart city platform, with a centralized database. This is possible due to China's legal environment, which is significantly less constraining than in the US or the European Union, especially regarding data, and therefore makes massive data collection, analysis, management and identification possible. These features shape a specific model of smart city in China that is very different from smart cities emerging on the American or European continent.

In the future, China's smart city model is likely to differ further from the US or Europe's smart cities, for various contextual reasons. First of all, because the trend in Europe and other democratic areas is toward further regulation on the collection and use of data, in contrast to the Chinese context. But most of all, because the ongoing trade tensions between the US and China already have direct consequences on China's exports of technological devices (such as video surveillance cameras) and network infrastructure (such as 5G) that are at the core of smart city development. Trade tensions already became technological tensions and the US-China rivalry will shape the way that smart cities develop globally. It is unlikely that smart cities will be able to smoothly combine Chinese and US/Western technologies in the future. In a way, all the existing areas of competition between China and the US – 5G, AI, Big data – are aggregated and concentrated in the framework of smart cities. As such, smart cities are becoming the new battleground of China-US competition.

On the contrary, a more likely development is the emergence of two types of smart cities, with two types of infrastructures, networks, norms, standards, but also different definitions of smart cities and conception of an ideal urban governance model. Not only a bipolarization of globalization, but a bipolarization of urbanization that may lead to two different types of smart city architectures, but also two different types of urban life. From a geostrategic perspective, a bifurcated 5G/tech/smart city ecosystem could lead to the emergence of separated spheres of influence. Lack of interoperability between the two ecosystems may further deepen technological disconnections between countries but also between cities.

To sum up, this preliminary report shows that smart city is not just the battleground for **economic and technological competition between companies**. It is also the battleground for competition between **political and social systems**, as well as a new spheres of influence and **geostrategic competition**. Finally, as smart city is increasingly entering the catalogue of products and services of the defense industry – from China's Norinco to France's Thales –, it will increasingly be an area of **defense competitions between countries**, adding to other traditional areas of competition (planes, submarines, tanks, etc.).

