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Sector Report  
Smart Cities in China





## Smart Cities in China

*The Concept of Smart Cities and a Smarter Planet has been developed since around 2008 when underlying technologies including RFID sensors, wireless connectivity, electronic payments, and cloud based software services enabled new approaches to collaborative solutions for urban challenges based on extensive data collection. The concept was extensively developed by global technology companies, including IBM, and has been widely accepted by all levels of government in many countries, including China. Urban infrastructure projects, including significant Smart City elements in their construction, have been implemented in China since around 2010 and the market has recently been booming. In January 2013, the Ministry of Housing and Urban-Rural Development (MOHURD) formally announced the first list of national pilot Smart Cities. By April 2015, there were over 285 pilot Smart Cities in China, as well as 41 special pilot projects. There are currently no laws and regulations directly governing Smart Cities in China. The Chinese government has, however, introduced a number of guidance notices:*

- *Notice to Speed up the Project Implementation of Smart Cities<sup>1</sup>;*
- *National New Urbanisation Plan (2014-2020)<sup>2</sup>;*
- *Guidance on Promoting the Sustainable Development of Smart Cities<sup>3</sup>.*

*These policies aim to take a scientific and people-centric approach to developing Smart Cities in China. Data openness and the development of leading technologies is also a key target for these guidance notices.*

*Opportunities for EU SMEs in China's include:*

- *Smart Transport: real-time monitoring, transferring and analysing, internet of cars;*
- *Smart Water: pollution treatment, water quality testing and monitoring, waste recycling;*
- *Smart Energy: meter and remote monitoring, energy saving, new energy transfer;*
- *Smart Healthcare: operations and management (e-records), wearable devices, remote medical treatment, medicine e-commerce platforms.*

*The Smart Transport sector is relatively more advanced than the other three sub-sectors mentioned above, as it applied solutions earlier and the issues that triggered the requirement for solutions are people-centric.*

<sup>1</sup> [http://gjss.ndrc.gov.cn/zftp/xxhm/201401/t20140113\\_692263.html](http://gjss.ndrc.gov.cn/zftp/xxhm/201401/t20140113_692263.html)

<sup>2</sup> [http://www.gov.cn/gongbao/content/2014/content\\_2644805.htm](http://www.gov.cn/gongbao/content/2014/content_2644805.htm)

<sup>3</sup> [http://gjss.ndrc.gov.cn/gjsgz/201408/t20140829\\_684199.html](http://gjss.ndrc.gov.cn/gjsgz/201408/t20140829_684199.html)

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## 1. Definition for Smart Cities and its Subareas

### 1.1. Smart Cities

“IBM were one of the first to elaborate the concept of Smart City or “Smarter Planet” in 2008. According to IBM, Smart Cities are designed to utilise information and telecommunications methods to sense, analyse and integrate various pieces of key information from core systems used in city operations, and to respond intelligently to a variety of needs relating to the environment, public security, city services, commercial activities and citizens’ livelihoods. In recent years, Smart Cities have developed dramatically and the principles are influencing many city planning and development agendas at country, provincial and city level in China. Scholars, government officials and enterprises have various understandings and definitions of what Smart Cities are and should consist of. It has been most commonly recognised that Smart Cities operate under the basis of a ‘digital earth’, through creating an Internet of Things (IoT) connecting the virtual, digital world with the real, physical world, in order to build a visible, measurable, sensing and controlled intelligent city management and operation mechanisms to sense various changes in the status of citizens and other real world changes. This is often achieved through a central cloud data center; connecting a vast and sophisticated computing control system, which provides a range of intelligent services for city management and the public.<sup>4</sup>

The Smart Cities framework may be separated into three tiers from the bottom up: Data Acquisition, Service, and Application tiers.

- Data Acquisition tier is the basic condition for Smart Cities to be ‘smart’. Through sensors and sensor nets, a city’s infrastructure, environment and buildings can be monitored and controlled, to provide a number of information services and applications to citizens.
- Service tier provides important information infrastructure to future Smart Cities. Networks and data centres can be effectively integrated, and provide the capability to support wireless communication between humans and machines, machines with machines at anytime, anywhere, and used for any purpose.
- Application tier is used to build a number of application systems on top; for example including Smart Government and industries, which citizens can visit through various tangible terminals (such as smartphones, TVs, and tablets) at their convenience, with information available in real time.

### 1.2. Further Definitions

The following section provides definitions for applications of Smart Cities.

#### 1.2.1. Smart Water

Smart Water senses the real-time operation status of a city’s water supply and drainage systems through

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<sup>4</sup> [http://www.ibm.com/smarterplanet/global/files/nz\\_en/nz\\_health\\_ibmlbn0041\\_transtasman\\_book.pdf](http://www.ibm.com/smarterplanet/global/files/nz_en/nz_health_ibmlbn0041_transtasman_book.pdf)

online monitoring equipment including metres, wireless networks and pressure gauges. It also works to effectively integrate relevant management departments with live data on water supply and drainage facilities to build a water IoT, which is able to analyse and process vast amounts of information and data in-time, and make supporting suggestions corresponding to the data received. It is also able to manage entire water systems, including water treatment and services through various refined and dynamic approaches.<sup>5</sup>

### **1.2.2. Smart Energy**

Smart Energy is based on an open information network system like the internet, utilising Internet Protocol Version 6 (IPv6), big data and cloud computing, together with other internet-related technology. Smart Energy systems monitor, control, operate and manage efficiency, providing services to entire systems from energy generation, storage, usage and transmission. It also merges different areas between energy saving and environmental protection with information consumption to generate a new model, service and format for energy delivery.<sup>6</sup>

Smart Energy is not only providing and managing energy using Smart Energy technology, but also spans the entire process forming vast Smart Energy systems. From a content perspective, Smart Energy can manage energy development and applied technology, in addition to energy production and consumption mechanisms. Similarly from a technology perspective, Smart Energy is not simply the combination of a technology reformation with traditional energy but also includes the technology for new energy development and usage. From a system perspective, it could be referred to as an energy consuming system as it incorporates all energy related social systems. Furthermore, Smart Energy is not only referred to as a technological improvement, but includes the development and usage of new energy formats and technologies suitable for future civilisations, human life and production related systems.<sup>7</sup>

### **1.2.3. Smart Transportation**

Smart Transportation can easily be misinterpreted as Intelligent Transportation as the two share similarities; however Smart Transportation advances into many different areas.

Based on modern electronic information technology, Intelligent Transportation is a service system to the transportation industry. Its most prominent feature is to collect, process, publicise, exchange, analyse and utilise information in order to provide various services to all stakeholders in the transportation industry, including individual travellers, policemen and relevant government institutions.

Smart Transportation having been based on similar concepts to **Intelligent Transportation**, is developed as an advanced transportation format. Though the two formats are both outcomes of information technology, sensing, telecommunications and other technologies' applications in transportation, the two concepts do bear differences. **Smart Transportation** emphasises the data process and how it will be effectively utilised to support real-time operations and provide immediate decision-making guidance. In brief, Smart Transportation is more about the interaction between data

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<sup>5</sup> <http://www.gkong.com/item/news/2013/08/75299.html>

<sup>6</sup> <http://www.chinasmartgrid.com.cn/news/20150204/587908.shtml>

<sup>7</sup> [http://paper.ce.cn/jjrb/html/2013-05/29/content\\_157908.htm](http://paper.ce.cn/jjrb/html/2013-05/29/content_157908.htm)

and participants and how it will be effectively delivered and influenced.<sup>8</sup>

#### **1.2.4. Smart Healthcare**

Smart Healthcare is an emerging area that intends to achieve multi-interaction between patients& doctors, medical institutions and medical equipment to achieve informatisation (to turn something into information) by establishing a regional health records platform and leveraging advanced technology, such as IoT.<sup>9</sup>

Smart Healthcare mainly consists of three systems, including Smart Hospitals, regional health systems and family health systems.

- Smart Hospitals function through a digital system with enhanced applications:
  - A digital system helps with data collection, storage, processing, extraction and exchange to facilitate both outpatient and inpatient treatment, including admission, screening, diagnosis, treatment, prescriptions, records, Intensive Care Unit (ICU) transfer and surgery.
  - Enhanced applications, including remote image transfers, massive data computing and processing intended to enhance medical service levels, for example, remote visiting to avoid disease transmission and shorten recovery periods; remote consultation to support regions with less developed medical resources; auto alerts to remotely and accurately monitor a patient's vital signs data to lower the cost of intensive care.
- The regional health system consists of a regional health platform and public health system:
  - Regional health platforms help through concise information gathering, health record collection, processing and transferring among communities, hospitals, research institutions and health monitoring bureaus.
  - Public health systems include an epidemic response system, health monitoring and management.
- The family health system is similar to citizen's health security; for example, it provides support for individuals with disabilities and chronic diseases, children and the elderly. Family health systems can also help intelligently manage the timetable for taking prescription medicine and reducing the potential risk of taking too much medication.

## **2. Relevant Government Guidance**

At present, there are no laws and regulations directly governing Smart Cities in China. The Chinese government has however introduced a number of guidance notices.

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<sup>8</sup> <http://project.21csp.com.cn/C186/201308/5576.html>

<sup>9</sup> <http://www.iotworld.com.cn/html/Library/201411/c53a3865010206db.shtml>



- On 15<sup>th</sup> January 2014, the China National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT), together with other relevant departments, publicised a **Notice to Speed up the Project Implementation of Smart Cities**.<sup>10</sup> The notice identified several sectors and areas where people have common concerns, as well as calls for improvement, including healthcare, education, social insurance, employment and elderly care. Informatisation is the proposed and highlighted approach for problem solving and improvements in the above identified areas.
- On 16<sup>th</sup> March 2014, the National State Council of the PRC approved and published the “National New Urbanisation Plan (2014-2020)<sup>11</sup>”, which includes a chapter titled “Advance Smart Cities Development”. This chapter calls for an overall plan on urban development, promoting innovation on applications of newly-generated technologies, including IoT, cloud computing and big data. It also emphasises cross-regional and cross-departmental coordination and cooperation. Another relevant chapter on pilot projects also highlights the importance of continuing the promotion of pilot smart cities & low-carbon construction.
- On 27<sup>th</sup> August 2014, the NDRC, MIIT, together with the Ministry of Science & Technology (MST), the Ministry of Public Security, the Ministry of Finance, the Ministry of Land & Resources, the Ministry of Housing & Urban Development and the Ministry of Transport co-announced Guidance on Promoting the Sustainable Development of Smart Cities.<sup>12</sup> The guidance pointed out that by 2020 a select number of Smart Cities with distinctive features will be developed to further the spreading of development to other cities. Key targets are to make public services more efficient, enhance urban management, build a liveable environment, intelligent infrastructure and long-term network security. It also emphasises top-level design & scientific thinking and approaches; enhance information & resources development and openness; adopt new technology and models, strengthen network security management and development; further organisational management and mechanisms.<sup>13-14</sup>

## 2.1. Policy Implication

- ***The guidance notices aim to take a scientific, realistic and sustainable approach:*** The three guidance notices above have paved the way for Smart City development in China, with the overall direction, key objectives and principles placed for industry development. The national strategy solely aims to promote and guide Smart City development in a scientific, realistic and sustainable manner. The three guidance notices document and summarise basic and common requirements for the development and growth and call for alignment among all parties involved. As a few cities in China have already implemented efforts, time and finance to develop as Smart Cities, the guidance aims to identify problems, summarise common issues and avoid repeating

<sup>10</sup> [http://giss.ndrc.gov.cn/zttp/xxhm/201401/t20140113\\_692263.html](http://giss.ndrc.gov.cn/zttp/xxhm/201401/t20140113_692263.html)

<sup>11</sup> [http://www.gov.cn/gongbao/content/2014/content\\_2644805.htm](http://www.gov.cn/gongbao/content/2014/content_2644805.htm)

<sup>12</sup> [http://giss.ndrc.gov.cn/gisgz/201408/t20140829\\_684199.html](http://giss.ndrc.gov.cn/gisgz/201408/t20140829_684199.html)

<sup>13</sup> <http://www.d1net.com/scity/industry/323036.html>; <http://www.sheite.gov.cn/jjyw/665260.htm>

<sup>14</sup> <http://www.d1net.com/scity/industry/323036.html>



problems. The development of Smart Cities welcomes involvement from all sectors, including private businesses, rather than being solely reliant on government efforts, and each project will be targeted to be operated and driven by the market instead of a dominant government interest.

- **These guidance notices are not applicable to all cities in China:** due to the different economic and social status of regions and cities in China, not all cities are at an appropriate stage to be involved in Smart City development. Smart City development in China is also still in its early stages of development and exploration; therefore cities with less developed intelligent equipment, infrastructure and networks will not be applicable for Smart City development.
- **Smart Cities need to be people-centric:** Smart Cities however, do not specifically target cities with pre-existing well-equipped intelligent networks, infrastructure and devices. Smart Cities need to be people-centric; as the final aim of a Smart City project is to create a modern city environment which serves to make its citizens comfortable and happy. As China is now facing several challenges in education, healthcare, employment and housing, Smart Cities aim to ease the pressure in these areas. Each pilot Smart City should bear in mind the problem-solving and people-focused nature of the development rather than focusing on the design and integration of intelligent equipment into the urban environment, which has little real value to residents.
- **Data-openness:** Smart City development focuses on triggering data openness, integration and further utilisation among government departments and industries, not just a digital government, which was previously promoted heavily.
- **Key is developing leading technologies:** the leading emerging technologies are to be applied in Smart Cities development. Emphasised in the guidance notices are big-data, cloud computing, IoT and mobility as the key drivers; together with diversification of their application and the value added services possible.
- **Next steps:** A working mechanism to promote Smart Cities has been established, with a group of eight ministry departments, including MIIT and NDRC; which are now working together to promote and implement the Smart Cities initiative. Standardisation of Smart Cities development is underway; there are six standardisation projects currently in progress:
  - Application guide on Smart Cities SOA Standards;
  - Technology Reference Model for Smart Cities Build;
  - 1<sup>st</sup> Chapter of Smart Cities Evaluation Model: Information Infrastructure;
  - 2<sup>nd</sup> Chapter of Smart Cities Evaluation Model: Information Application and Service;
  - 3<sup>rd</sup> Chapter of Smart Cities Evaluation Model: Construction and Management;
  - Technology on Information Security.

## 2.2. Key Policy Makers

Policy makers for Smart City builds in China include the central government, various ministries and regional/city-level governments, especially in pilot cities.

As stated earlier, several ministries have been involved in developing policies, standards and the evaluation process, including:

- The **National Development and Reform Commission**<sup>15</sup> (NDRC), a key stakeholder in promoting and driving Smart City builds, from the perspective of new urbanisation.
- The **Ministry of Industry and Information Technology of the People's Republic of China**<sup>16</sup> (MIIT) has participated in the policy, standard and evaluation process from the informatisation and driving technology acceleration perspective.
- The **Ministry of Housing and Urban-Rural Development of the People's Republic of China**<sup>17</sup> (MOHURD) has led and organised pilot Smart City identification in China. The Digital City Engineering Research Center is managed by MOHURD, and has conducted a series of surveys and research to analyse common issues and has made suggestions to counter identified issues.
- The **Ministry of Finance**<sup>18</sup> assists with allocation, monitoring and control of budgets in Smart City builds.
- **Local/City Governments** also play an important role. For example, the Shanghai Municipal Government published its action plan for promoting and accelerating Smart City development in 2011. In 2014, the second edition of the action plan covering 2014-2016 was announced.

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<sup>15</sup> <http://en.ndrc.gov.cn/>

<sup>16</sup> <http://www.miit.gov.cn/n11293472/index.html>

<sup>17</sup> <http://www.mohurd.gov.cn/>

<sup>18</sup> [www.mof.gov.cn/](http://www.mof.gov.cn/)

### 3. Market Overview

#### 3.1. Size and Performance

Mr Lianfeng Wu, Assistant Vice President of International Data Corporation (IDC) stated in early 2014, that according to IDC's research, the total market size of China's Smart City build in 2014 would be more than USD 13 billion; this estimate only included traditional ICT, and related hardware and software services, infrastructure and equipment automation were excluded from the estimate. According to IDC, the market value for smart cities could reach more than USD 28 billion in 2020.<sup>19</sup>

The National Development Bank (NDB) made an agreement with MOHURD that in the three years after the "Twelfth Five Year Plan (2011-2015)", the NDB will work with MOHURD on national Smart Cities investment and the estimated investment scale will reaching EUR 11.8 billion<sup>20</sup> (RMB 80 billion).<sup>21</sup>

In January 2013, the Ministry of Housing and Urban-Rural Development (MOHURD) formally announced the first list of national pilot Smart Cities, which included an initial 90 cities; a further nine cities were added soon afterwards. Since then, the pilot Smart City projects have been rolled out yearly to help other Smart Cities build experience and knowledge.<sup>22</sup> New approaches and mechanisms are continually piloted and help to formulate new policies, regulations and standards for large-scale national development.

An additional 103 pilot Smart Cities were announced in August 2013, followed by a recent announcement in April 2015 that included 84 additional pilot cities, 13 cities for enlargement and 41 special pilot projects.<sup>23</sup>

#### 3.2. Smart Energy

According to research conducted by Essence Securities, the roadmap and high-level strategy for "Internet Plus Energy"<sup>24</sup> and Smart Energy is becoming clearer since an action plan was drafted and submitted to the State Council in June 2015 for review by the National Energy Administration<sup>25</sup>, together with MIIT and other ministries. According to Essence Securities research, at present, electricity user sales account for RMB 2.5 trillion; electricity user sales, construction investment, internet plus energy

<sup>19</sup> [http://news.xinhuanet.com/politics/2014-11/22/c\\_1113361293.htm](http://news.xinhuanet.com/politics/2014-11/22/c_1113361293.htm)

<sup>20</sup> RMB 100 = EUR 14.7 (Yahoo Finance, accessed on 28<sup>th</sup> May 2015).

<sup>21</sup> <http://news.xinhua08.com/a/20130129/1115997.shtml>

<sup>22</sup> [http://www.mohurd.gov.cn/wjfb/201308/t20130805\\_214634.html](http://www.mohurd.gov.cn/wjfb/201308/t20130805_214634.html)

[http://www.mohurd.gov.cn/wjfb/201308/t20130805\\_214634.html](http://www.mohurd.gov.cn/wjfb/201308/t20130805_214634.html)

<sup>23</sup> <http://www.50cnet.com/show-34-86651-1.html>

<sup>24</sup> "Internet Plus Energy": The Internet Plus strategy was used by Huateng Ma, CEO & Chairman of Tencent, during his proposal to the National People's Congress during its annual meeting in March 2015. The strategy intends to use internet as a platform and to adopt ICT to combine traditional industries with internet and to create a new eco-system. In March 2015, Premier Li Keqiang proposed to work out an action plan of Internet Plus on the 12<sup>th</sup> session of the 3<sup>rd</sup> National People's Congress. <http://finance.qq.com/a/20150305/019381.htm>

<sup>25</sup> <http://economy.caijing.com.cn/20150305/3832729.shtml>

and smart energy in China is estimated at RMB 5 trillion.<sup>26</sup>

In May 2015, semi-conductor chip manufacturer, Intel, announced that it will build a joint laboratory to promote 'internet connect energy' and to evaluate solutions in critical energy sectors, with the China Smart Energy Industry Technology Innovation Strategy Union<sup>27</sup>; this is considered a landmark in China's smart energy sector as a large international player is becoming involved in the market. Various other Chinese companies are looking for opportunities to enter the market by providing energy saving consultation, new energy development, cloud platform build, remote meter and monitoring and big data operation.

### **3.3. Smart Water**

Water pollution has become a major challenge for city development in China; many commercial companies involved in Smart Water focus on providing pollution control services; such as testing and monitoring water quality, data transfer and treatment. This has resulted in some areas taking less intelligent application approaches; such as water gathering, treatment, supply and charging.

At present, no single company is capable of providing total Smart Water solutions in China. Water plant and related equipment/infrastructure providers are currently looking for solutions to adapt intelligently to the market, in order to be more effective. Smart meters are therefore seen as a potential area of growth through enhancement, installation and utilisation.

Intelligent approaches are part of Smart Water development; however, how to advance water resources management in a smart way is another topic for country level design and execution.

### **3.4. Smart Transportation**

China's transportation sector was one of the first to take an intelligent approach; solutions have been applied to the overall operations and management of the sector and have created a smarter sector. Many cities, from large first-tier cities to infrastructural-advanced third-tier cities, have started to undertake smart transportation projects. A series of smart city developers, including top-level designers, system integrators and solutions providers, are capable of providing solutions for smart transportation projects in China. Expertise, experience and knowledge in the smart transport sector is more advanced than in other smart project developments; competition is therefore strong in the smart transport sector.

### **3.5. Smart Healthcare**

Smart healthcare is a highly topical initiative in China as the government takes steps to improve the country's healthcare system through reforms. To date however, the solutions that have been applied have not shown many results. The problems and challenges associated with reforming the Chinese healthcare system have triggered and generated opportunities to advance the industry to a smarter level. E-records, hospital informatisation, remote medical treatment (e-healthcare), medicine e-commerce and wearable devices, are areas where local and foreign companies are investing.

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<sup>26</sup> [http://finance.ifeng.com/a/20150601/13745436\\_0.shtml](http://finance.ifeng.com/a/20150601/13745436_0.shtml)

<sup>27</sup> <http://www.metering.com/china-and-us-partner-on-new-lab-for-smart-energy-development/>

### Case Study - Beijing

Beijing has been a leading example on the application of cutting edge technology in Smart City development, including smart transportation, electronic medical records, remote healthcare and smart homes.<sup>28</sup> By the end of 2015, the entire city aims to be covered by a basic network of IoT. For example, if a serious rainstorm is forecast, a network of monitoring devices and equipment will be able to monitor the city's drainage system and transfer all data back to the central control panel for corresponding analysis and decision making.

To stimulate the development of Smart Cities in Beijing during the 12<sup>th</sup> Five-Year Plan (2011-2015), Beijing made an action plan in 2012 with new objective setting. By the end of 2015 Beijing aims to advance itself from "Digital Beijing" to "Smart Beijing". Key areas identified in the action plan for development were:

- Intelligent city operation (accurate population management, intelligent transportation, intelligent monitoring on natural resources & environments, intelligent city security systems);
- Digital life (easy access to public services, mobile office, online-learning and digital consumption)
- Enterprise networks;
- Government services integration;
- Information infrastructure;
- Smart platforms.

### Case Study - Shanghai

Shanghai published its action plan for promoting and accelerating Smart City development in 2011. In 2014, the second edition of the action plan covering 2014-2016 was announced. Key developing areas during this period are:

- Building a liveable city to benefit citizens' daily lives in: transportation, education, healthcare, elderly-care, culture, tourism, employment and weather-forecasting. For example, Smart Transportation development planning includes the following aspects:
  - Building a public car park information platform to collect open real-time data and to provide information to provide real-time parking guidance;
  - Improve the existing public transportation service system, accelerate real-time data collection on the number of passengers and on electronic bus stop boards;
  - Promote Electronic Toll Collection (ETC) coverage on highways;
  - Enlarge the area of interconnection of the east China region including Zhejiang and Jiangsu provinces;
  - Enlarge the coverage of Wireless LAN (WLAN) in public transportation.
- Smart Education will mainly focus on the development in the following areas:
  - A stable smart-learning platform to facilitate residents online learning at all ages;
  - Set up an education data centre to integrate data statistics from schools to enhance teaching capabilities, research & development and public learning;
  - Accelerate smart campus development;
  - Encourage private companies and organisations to build online services;
  - Build platforms to offer Massive Open Online Courses (MOOCs) to enrich and improve online education products and services.

<sup>28</sup> 智能北京行动纲要.

- Development of an advanced Smart Economy to accelerate the integration of informatisation and industrialisation. Key areas to be developed are: internet banking, marine finance, e-commerce, manufacturing and enterprise reform.
- Enhance Smart City operation and management by fully utilising the information technology in data collection, storage, analysis to accelerate new applications in city operation and management. Key areas to be developed are: informatisation of city operation management, food safety, environmental protection, informatisation of public security and credit openness.
- Develop new landmarks in Shanghai by using Smart technology, including Smart clusters, communities, villages, commercial districts and new-towns.

To achieve these targets, Shanghai aims to focus on the construction and development of the following areas:

- Broadband;
- WLAN;
- Ipv6 access;
- Big data;
- Cloud-computing;
- IoT;
- Network security;
- Series of operational mechanisms enhancement and improvement.

### 3.6. Current Business Model - Public-Private- Partnership (PPP) Model

The model of rising funds for Smart Cities building has dramatically changed in recent years, as there was previously no developed model to identify and secure funding. At present, the Public-Private-Partnership (PPP) model, which is also known as the 3P model, has been widely promoted and accepted by various industry stakeholders. This new approach encourages private companies to work with government agencies to participate in infrastructure construction, which means the private companies and government bear equal risks, rather than the government transferring all liabilities and risks to private companies. A PPP agreement is signed at the beginning of a project to clarify the entire process, rights and liabilities.<sup>29</sup>

Ms Nan Huang, Vice President of Smart Cities Research Institute of Digital China (a leading Chinese company providing Smart Cities design consultation) holds the view that Smart City development differs greatly from other large construction projects.<sup>30</sup> Smart Cities unique features lie in the following three aspects:

- Smart City development involves multiple stakeholders, including the government, citizens, research institutes, operators, information infrastructure providers, IT services and internet companies. With so many stakeholders, it can be challenging and complex to coordinate each stakeholder's involvement and most importantly the benefits/return allocation;
- It takes a longer period of time for Smart Cities development to see a return, which requires

<sup>29</sup> [http://stock.stockstar.com/SS2014111800000519\\_2.shtml](http://stock.stockstar.com/SS2014111800000519_2.shtml)

<sup>30</sup> [http://news.cidnet.com/art/1032/20141127/5684413\\_1.html](http://news.cidnet.com/art/1032/20141127/5684413_1.html)

understanding, patience and enthusiasm from each stakeholder; therefore a healthy and long-term effective business model is essential to secure final benefits;

- Invisible return and benefits; most will be reflected more significantly in the macro economy and from a national/regional development perspective rather than a direct cash-back return like that of a traditional commercial construction project

In Ms Nang's opinion, PPP is the best approach for Smart City development. With the key steps to PPP application in Smart Cities projects being; mechanism design, compensation on operation, partnership and results evaluation. The mechanism design phase requires thorough planning throughout the entire process. The Chinese government has placed emphasis on the construction stage of projects rather than the operation stage. This has resulted in an imbalance of compensation in favour of construction companies. Few companies have therefore entered the operations services sector for Smart Cities, especially as key criteria for compensation relies on operating results.

While the PPP model has received strong support globally, it is not without its critics. One key challenge has been that service providers end up making a high rate of return despite most of the risk being held by the Government. The response has been further development of evaluation processes that emphasise value for money rather than a simple reduction of direct Government debt. The process is currently being played out in China as central departments look to balance the need for accelerated Smart urbanization and reduction of debt, with the need to ensure that Government funds are not misspent within a climate of anti-corruption and focus on Government waste.<sup>31</sup>

#### 4. Key Growth Drivers

Several key growth drivers are increasing the development of Smart Cities in China. This section briefly introduces them.

##### 4.1. National New Urbanisation Construction

New urbanisation was recently highlighted by the Chinese central government as a stated focus area. According to a December 2014 notice, on New Town Planning (2014-2020), a new administrative management model is required to be developed in pilot cities, prioritising administrative tiers, and district/region design and planning to increase effectiveness and lower costs.<sup>32</sup> Under the "New Normal" stage, Smart Cities Development is expected to support healthy and sustainable economy growth.<sup>33</sup>

In early 2015, the Chinese government created a new term to describe the economic development status of China, described as the 'new normal'. The economy's growth rate has slowed to around 7%, compared to its previous high-speed increases of double-digits; however China's rapid economic expansion has caused a series of social and environmental problems, which the central government has decided to take action against in order to formulate a healthy and sustainable way to develop instead. Several market insiders estimate that Smart Cities will become one of the key drivers to pave the way for China's future

<sup>31</sup> [https://en.wikipedia.org/wiki/Public%E2%80%93private\\_partnership#Controversy](https://en.wikipedia.org/wiki/Public%E2%80%93private_partnership#Controversy)

<sup>32</sup> [http://www.sdpc.gov.cn/zcfb/zcfbtz/201502/t20150204\\_663078.html](http://www.sdpc.gov.cn/zcfb/zcfbtz/201502/t20150204_663078.html)

<sup>33</sup> [http://www.chinadaily.com.cn/opinion/2014-10/10/content\\_18716671.htm](http://www.chinadaily.com.cn/opinion/2014-10/10/content_18716671.htm); <http://www.bloomberg.com/news/articles/2014-05-11/xi-says-china-must-adapt-to-new-normal-of-slower-growth>



healthy and sustainable economic growth. Key benefits of Smart Cities' developments are their people-centric and environmentally-friendly approaches; further targets include establishing a new eco-system of city development and operation, in order to assist with healthy and sustainable growth and development.

#### **4.2. New Generation of Information Technology Including IoT, Cloud Computing, Big Data, Mobile Internet, Sensor, 5G**

A new generation of information technology has recently developed dramatically, bringing Smart Cities' development into a new era described as the "four everywhere"; sense everywhere, connect everywhere, data everywhere and service everywhere. Intelligent devices including sensors, cameras, smart terminals, robots and IoT have been applied to water, weather, energy, environment and every corner in a city, making everything from objects to people sensible, connected and recorded. This has thus generated a vast amount of data, which could potentially feed into a series of services.

China Mobile's "Machine to Machine" (M2M) reached over 18 million transactions, internet devices owned per person has increased from 0.1 to 7 from 2007 to 2013 and it is expected to achieve 70 by 2020.<sup>34</sup> 5G is expected to assist users achieve a 10 millisecond connection, with 10G for downloads, dramatically improving the ability to transfer data. From 2012-2014, mobile internet flows have increased ten-fold. As of November 2014, the flow connected through China Mobile has achieved a year on year increase of 71.3%; the data flow via mobile APPs has for the first time surpassed that of the PC.<sup>35</sup>

Potential business opportunities lie in the data recorded and generated by sensors and connectivity concentrated in cities, which could be utilised to add value and advance an individual's life efficiency, city monitoring and operation.

## **5. Key Market Players**

### **5.1. Leading European Companies involving in China Smart Cities**

- NXP Semiconductors is one of the world's leading IC providers headquartered in Holland. NXP signed a strategic cooperation agreement with China leading Smart City turnkey solution provider Digital China to build Shanghai Pudong Smart City project. NXP is also exploring opportunities of partnering with Huawei on Smart Industry; Industry 4.0 is a key area where the two companies are exploring collaboration.<sup>36</sup>
- Schneider Electronics from France is a leading electronics product and solutions provider. Schneider has developed a series of turnkey solutions for Smart city projects; including water, energy, transportation and buildings.
- ARUP is headquartered in the UK and is a leading construction consulting firm; it has been involved in a series of Smart city projects in China. It provides top-level design and consultation,

<sup>34</sup> <http://economy.caijing.com.cn/20141107/3743253.shtml>

<sup>35</sup> <http://economy.caijing.com.cn/20141107/3743253.shtml>

<sup>36</sup> <http://www.bnext.com.tw/article/view/id/35906>

city/regional planning and operation advancement services.

- Siemens has developed solutions in China for Smart energy, transportation and buildings. Various smart project across different sectors have been developed, including its headquarter office building in Shanghai, which gained LEED Golden certificates. <sup>37</sup>
- Veolia has developed partnerships with many regional water treatment plants; its leading treatment technology has been widely used in industry waste water, drinking water, and city sewage fields in China.

## 5.2. Leading Smart City SME Players

Segment	Company
Network Services and broadband routers,	Electronic Media Services
Network Security	Websense
Education and Training	Online University Digital MOOC
IC design	ARM, Sondrel
High tech casings	Laird
Broadband routers	Electronic Media Services
HealthTech devices	TPP, Medpod
IoT systems including RFID, sensors, wireless, networking, embedded software	ARM, Neul
CCTV Cameras	Indigo Vision

## 5.3. Leading Chinese Smart City Solution Providers

- ICT Hardware providers (mainly refers to network equipment and data processing): ZTE, Huawei, FiberHome, H3C, Ruijie, Sugon, Inspur, isco, IBM, HP, DELL.
- Software providers (including operating systems and basic application): Microsoft, IBM, VMware, Oracle, Digital China, Neusoft, Chinasoft International, iSoftStone.
- Telecommunication Operators: China Mobile, China Telecom, China Unicom, China Radio and Television Network Co Ltd.
- System Integrators: Digital China, Enjoyor, Wonders Information, China Aerospace Science & Industry Corporation (CASIC), Sugon, Neusoft, Tsinghua Tongfang, eHualu, Yanhua Smartech

## 5.4. Leading Chinese Players in Smart Energy Development

- **Baosight** is a state owned software company that provides energy saving solutions and services.
- **IESLab** is an integrator involved in smart grids, water, energy saving, management and informationisation.

<sup>37</sup> <http://w1.siemens.com.cn/digitalization-zh/smart-city.html>

- **Smarter Energy** provides cable in China; it recently changed its company name and restructured to enter the energy management market.
- **Sungrow** previously focused on manufacturing power supply equipment for solar PV and wind power projects. It is currently involved in energy storage, electric vehicle and Related charging devices.
- **Acrel** focuses on power monitoring, electric management and is establishing a platform to offer energy management solutions.
- **Wiscom** is involved in power plant automation, smart substation, distribution together with new energy development.
- **NARI** is a solutions provider for grid upgrading and intelligent control systems in China. It built the first e-commerce platform for power exchange in China in 2014
- **Goldwind** is a wind power equipment manufacturer and turnkey solutions provider (including three informationised-platforms involved with monitoring and alerting, operation management and to promote responses, making it a leader in the smart energy market.

#### 5.5. Leading Chinese Players in Smart Water

- **Suntront** is a smart meter provider in China. Its products include measuring water, heat, gas and electricity via remote access. It also provides turnkey solutions for meter operation and management.
- **Tsinghua Tongfang** focuses on water treatment, specifically city water, sewage, industrial wastewater and the re-use of water.
- **Sanchuan** previously focused on water meters; its newly-developed IoT meter allows data transference between end-users and water service companies. It is also involved in water plant related services; its aims to provide an integrated platform with monitoring, sewage treatment and water dispatch.
- **Ictehi** provides IoT turnkey solutions; focusing on environmental protection and smart water. Key projects include IoT demonstration projects in Wuxi, and Jiangsu province on Tai Lake, where its water monitoring and pollution control products have been put into use.
- **Datang Software** provides integrated water management systems covering data collection, processing, management, application development and user management. Data centres for city water management offices can also be tailor-made.

#### 5.6. Leading Chinese Players in Smart Transportation

- **NavInfo** provides data, content and service for digital mapping, dynamic traffic information and internet of vehicle systems.
- **AutoNavi** provides digital map content and navigation positioning. Its clients include companies involved in internet, mobile internet, vehicle navigation, government departments and other enterprises.

- **Hikvision** provides video camera and video content services including, internet video cameras, virtualised video cameras, digital video monitoring and video analysis.
- **Dahua Technology** is a monitoring products and solutions provider. Its products have been used in various projects including London Underground construction projects.
- **Seisys** is a system integrator; its transportation systems, includes solutions for highways, tunnel and bridges through transportation monitoring, management and other services.
- **TIZA** is a vehicle information service provider focusing on construction machinery, commercial vehicles, agriculture machinery and passenger vehicles' platform development and operation.

### 5.7. Leading Chinese Players in Smart Healthcare

- **Biolight** focuses on wearable and portable medical equipment for use in hospitals and in the home.
- **Andon** provides blood pressure meters. It also provides an App for individuals to monitor their own health status and is involved in i-cloud health management development.
- **Alijk.com** is invested in by the Alibaba Group and focuses on electronically monitoring all processes of medicine distribution and sales.
- **WinningSoft** is a software provider focused on servicing the healthcare sector. It provides devices to assist with medical and health informationisation for hospitals and regions.
- **Searainbow** focuses on the establishment and operation of medical payment and medical insurance platforms.
- **Longmaster** provides software focusing on building e-health solutions and diagnostics.

## 6. Opportunities

### 6.1. Present and Future Opportunities for EU SMEs

#### 6.1.1. Professional Top-Level Designers Are Required<sup>38</sup>

One of the challenges faced by governments for Smart City development is to have professional and experienced consultation on top-level design. The Chinese government is open and welcomes commercial organisations, together with research institutions, to support and be involved with the top-level design, as top level design is one of the key processes in any Smart Cities project. Design companies are an integral part of any Smart City project; they require experience and must be capable of understanding high-level city planning, working with top-level government officials to identify solutions to problems and make practical suggestions. In China however, while companies have these qualities, they lack experience of providing top-level designs for large scale projects and only a few companies can provide such services at present. This therefore provides opportunities for EU companies.

<sup>38</sup> [http://nongye.ce.cn/czh/201412/01/t20141201\\_2135015.shtml](http://nongye.ce.cn/czh/201412/01/t20141201_2135015.shtml)

Mr Guangzhi Shan, Chief Scientist at China Smart City Development & Research Centre, highlighted and alerted all levels of government to the importance of top-level design in various areas and called for support during a speech in November 2014.<sup>39</sup>

### **6.1.2. Second & Third-Tier Cities and Districts**

At present, there are more than 300 pilot Smart Cities in China. In addition to Beijing, Shanghai, Guangzhou and Shenzhen (first-tier cities), many second and third-tier cities are working to build and further develop as Smart Cities. The long list of pilot cities also includes several districts in large cities<sup>40</sup>. Providing services in second and third-tier cities, as well as districts in large cities, might present opportunities for EU SMEs to pursue, based on the following key reasons:

- Relatively speaking, governors of small scale cities can typically make decisions more quickly compared with first-tier cities that have more complex internal governance structures;
- There is less competition in second and third-tier cities. Investment tends to focus on large cities; however smaller cities may also generate opportunities;
- There is an opportunity to start and build brand awareness, as well as accumulate experience, in working with various stakeholders in China.

### **6.1.3. Demand for the Best Technology and Applications**

As conditions vary from country to country, EU companies' successes/plans in other countries/regions across the world may not be appropriate to apply to China; however technology is universal. For EU SMEs that possesses advanced technology, especially companies with a ready-to-go application, opportunities may be present. As noted earlier, China's Smart City development is still at the stage of undergoing initial exploration and is developing a new mechanism of city operation and management. Concepts and practices from abroad may be too academically focused and/or not appropriate for the real application service/product need in China. However, if there are real applications based on leading technology, this may help drive the development of Smart Cities and further inspire the Chinese government to further its efforts, and will be welcomed

### **6.1.4. Demand for Project Measurement**

Although the three guidance notices outlined earlier are being put in place, over 300 pilot cities have been identified for development, the standards related to all aspects of Smart Cities development, as well as an appropriate monitoring and evaluation process and mechanism system, have not yet been completed. However it is critical that the success does not lie in the project construction itself, but on the return(s) and real long-term benefits (savings) to be generated.

How to measure a project from the initial top-level planning, execution to final operation is extremely

<sup>39</sup> <http://www.ccit.org.cn/news/yaowen/info1863.html>

<sup>40</sup> [http://wenku.baidu.com/link?url=L\\_PqF8JXCgtWrLxbmhNeMndLoXoNZhbfaIpr9zxsQjx5VZamRVmfqgn\\_q4XrM0q3Gj\\_mN7ZwmQsXXAFghcAK0qO2zwKZKNYFzQGm2JIYW3Su](http://wenku.baidu.com/link?url=L_PqF8JXCgtWrLxbmhNeMndLoXoNZhbfaIpr9zxsQjx5VZamRVmfqgn_q4XrM0q3Gj_mN7ZwmQsXXAFghcAK0qO2zwKZKNYFzQGm2JIYW3Su)

important for projects success and reporting upwards.

### **6.1.5. Working In Partnership with a Large System Integrator**

A large Smart Cities project may be separated into smaller projects and may generate more practical opportunities for EU SMEs. As these opportunities will be specific and can be easy to identify, in addition to requiring less communication with various stakeholders, and have a quicker investment return than involvement in an entire project.

### **6.1.6. Real Examples of Where Business Opportunities Lie Include**

- China has a large **agricultural sector**, which could benefit from the development of an integrated e-platform. This may aid be applied to the following aspects:
  1. During springtime before seeding to connect farmers with potential buyers;
  2. During the planting stage to provide real-time data on temperature, wind and humidity;
  3. Before harvest, offering delivery & transportation information.

Given the size and scale of China and differences from region to region, coordinating a more regional-focused and/or plant-focused platform would be appropriate and practical.

- At the Baidu Congress 2014, a series of smart devices were released; among these was a smart chopstick, which is capable of testing frying oil, water PH value, and the sweetness of fruit, thus allowing consumers to know if food is safe for consumption.<sup>41</sup>As China is still a developing country, though quite developed in certain regions and aspects, the country still suffers from food safety issues; this generates a series of practical opportunities to pursue in the **food & beverage production sector**.
- There are millions of **small to medium sized manufacturers** covering various sectors located across China. Most of these may not have heard or understand the concept of Smart Cities. However, if real savings can be demonstrated and gained by advancing their processes, operations and management through the application of new technologies such as big data and cloud services, this may present opportunities for EU SMEs to explore.

### **6.1.7. Opportunities in Cyber security**

In September 2014, the China National Computer Virus Emergency Treatment Centre publicised its survey results for the “2013 National Information Network Security Status and Computer & Mobile Terminal Virus Epidemic”. The report claimed that of those surveyed, the computer virus infection rate in 2013 was 54.9%, a year-on-year increase of 9.8%.<sup>42</sup>

According to a report in the Beijing Times<sup>43</sup>, as online banking and e-payment services are increasing in popularity, they are becoming prime targets for attacks. After the Snowden affair,<sup>44</sup> senior leaders in

<sup>41</sup> <http://www.theguardian.com/world/2014/sep/04/baidu-china-search-engine-smart-chopsticks-food-safety>

<sup>42</sup> [http://www.jjsga.gov.cn/fj/news\\_show.aspx?NewsID=48179&fjid=175](http://www.jjsga.gov.cn/fj/news_show.aspx?NewsID=48179&fjid=175)

<sup>43</sup> [http://epaper.bjnews.com.cn/html/2015-06/02/content\\_580023.htm?div=-1](http://epaper.bjnews.com.cn/html/2015-06/02/content_580023.htm?div=-1)

<sup>44</sup> The Snowden affair refers to M red Snowden’s leak of classified information from the National Security Agency (NSA) in

China started to pay close attention to cyber security. President Xi Jinping, at a conference in February 2014, stressed that network security and information technology are a matter of national security and development. With cyber security being a key issue for not only the government but companies also, this may present a series of opportunities for EU companies.<sup>45</sup>

#### **6.1.8. Opportunity in Water**

China is facing a water scarcity crisis; the country's water resources are primarily concentrated in the South and West. Water scarcity is therefore an issue in North China and shortages have increased in correlation with the country's economic development. In addition, water pollution and frequent severe flooding have resulted in many water resources not being fit for human consumption. According to the China Service Industry Development Trend & Prospect for Water Conservancy Informatisation, 2014-2019<sup>46</sup>, by the Zhiyan Consulting Group, intelligent water is still an emerging market in China, with a small number of companies capable of being able to provide total solutions. Chinese companies that have not previously used advanced smart technologies in the sector are however developing and exploring ways to advance their businesses to incorporate intelligent and smart technology. This has resulted in no one specific company having a dominant market position with the ability to provide full-packaged solutions. Opportunities in the market are therefore present as China lacks professional consultation on top-level industry design in addition to operation, utilisation and protection. Furthermore, companies that can provide total solutions to better utilise water, including hardware to test & monitor and software for data collection, tracking, as well as application may find opportunities in China.<sup>47</sup>

#### **6.1.9. Opportunity in Transportation**

Urbanisation is increasing in China as more people from rural areas move to China's large cities. This has resulted in social issues in some of China's largest cities. Transportation is a key area of importance for the future development of cities. For example, Hangzhou in Zhejiang province is a well-known city that attracts millions of visitors each year. The city has a long history and its construction has not been organised to meet the current needs of its citizens and visitors. Hangzhou's governor has therefore placed an emphasis on and finances into building a smart transportation network; the "1+3+4" system aims to ease transportation pressure.

In more detail, "1" refers to a data centre, "3" refers to three platforms including a telecommunications network, data exchange and traffic T-GIS geography platform. "4" refers to application systems including decision making, management, transportation services and simulation & evaluation. Hangzhou is also integrating its aviation and railway system to enhance the "1+3+4" project. This project aims to allow Hangzhou to integrate and share all transportation related data and information with the public security, city management and construction departments.<sup>48</sup>

Although Hangzhou has been highlighted as an example above, transportation issues are of key

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the US.

<sup>45</sup> [http://epaper.jinghua.cn/html/2014-09/17/content\\_127014.htm](http://epaper.jinghua.cn/html/2014-09/17/content_127014.htm)<http://news.sina.com.cn/o/2014-09-17/021030867877.shtml>

<sup>46</sup> <http://www.chyxx.com/industry/201403/230764.html> 2014-2019 年中国水利信息化服务行业发展态势及发展前景研究报告 <http://www.chyxx.com/research/201402/229052.htm>

<sup>47</sup> <http://www.chyxx.com/industry/201403/230764.html>

<sup>48</sup> [http://news.xinhuanet.com/info/2014-05/26/c\\_133361980.htm](http://news.xinhuanet.com/info/2014-05/26/c_133361980.htm)



importance to many rapidly developing cities in China and therefore may present opportunities for EU SMEs. While transportation issues are not new to many cities in China, cities have accumulated experience and failures in building systems to tackle transportation issues as they have lacked overall design and planning. Plans have also often lacked the realisation that the final goal is to make lives of citizens more convenient and to ease government management efforts through a more scientific approach. Therefore city governments that hold an in-depth understanding and realistic expectations in building smart transportation may provide opportunities for EU SMEs. Opportunities in Internet for cars is also a potential opportunity for EU SMEs.

#### **6.1.10. Opportunity in Healthcare**

The State Council's recently published National Health Service System Plan, 2015-2020, aims to integrate "internet + " into practice in the healthcare sector to assist with various aspects, including healthcare informatisation, remote healthcare, and mobile healthcare. Some experts hold the opinion that smart healthcare in China has surpassed the initial exploration stage and has entered the launch stage; resulting in a growing market and clearer business models. Commercial opportunities lie in various aspects of the healthcare sector, including wearable devices, e-commerce platforms, hospital informatisation and social healthcare insurance payment. The government is expected to help drive the development of electronic records, national-wide data sharing, as well as intercommunication in cities and regions.<sup>49</sup>

In summary, China presents various opportunities for EU SMEs to explore and pursue; these however lie in different regions, sectors and/or to-be-solved social issues. Technology, knowledge and experience are all required to be integrated into real conditions in China. The more integration, the greater synergy and success a project may generate.

## **7. Key Barriers**

### **7.1. Legal and Regulatory Issues**

Although the government guidance notice on Smart Cities development have been confirmed and publicised by many ministries, all documents demonstrate a concerted focus on strategy, vision and objectives on which Smart City developmental direction will feed into the entire country's development. Although the guidance provided by the government is helpful and provides an insight into its views and plans for development, Smart Cities' development is still in its early stages and there are few practical regulations in place.

In addition there is no standardisation of practice in place for many aspects of Smart City development, which leads to potential challenges on evaluation, project management and operation plans. The PPP model has been promoted as an innovative business model for Smart Cities development where all stakeholders involved can submit ideas on how each party will contribute and how each project will be effectively operated and enable local citizens to benefit from construction. However dates for implementation of regulations and standards in this area have not been confirmed and there is ongoing debate on the effectiveness of the model and suitability for infrastructure projects in China.

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<sup>49</sup> <http://stock.hexun.com/2015-04-08/174774562.html>; [http://www.gov.cn/xinwen/2015-03/30/content\\_2840331.htm](http://www.gov.cn/xinwen/2015-03/30/content_2840331.htm)

Critically, currently all guidance comes from ministries in the central government, there are few local/regional detailed policies in place at present. It is crucial to work with regional/city-level government, as all projects will be city-focused. Considering each region/city's features and differences, policy/regulation from local government will, therefore, be as important to understand as national and regional.

### **7.1.1. Policy Inconsistencies<sup>50</sup>**

There can be instances where inconsistencies appear among various government departments, and even within one department at different levels of office; this situation is not specific to Smart Cities' development and can impact on the commercial parties involved. As noted earlier, Smart City builds area long-term projects, with multi-stakeholders involved and potential benefits only generated after a project is delivered. The majority of Smart City projects aim to add benefits to citizens' lives and management of the city. If a change of policy, planning or view from government regarding certain parts of/or the entire project occurs, there is potential for project failure and even loss of original investment, which for a commercial company can be highly damaging.

Even a slight change in policy or direction, which may not impact the overall implementation of the project, may still require readjustment, revised budgeting or resource allocation; these are time-consuming and have financial implications. It is therefore important to be wary of such changes and be prepared for them.

Although there are certain policies/guidance in place, these provide an overall direction for development rather than well-established guidelines to follow. As projects continue to progress, the more regional/municipal governments, together with commercial parties, get involved, the more experience the central government gains out of both achievements and failures. Through this process, policy will either be established or change along the way.

### **7.1.2. No Clear Working Mechanism among All Government Departments**

To date, many ministries have been involved in Smart Cities' development projects, working on regulations, standards, promoting and accelerating the development at a regional-level, including the NDRC, MIIT, and MST. As mentioned in the guidance published in January 2014, the project is a joint effort of 11 ministries. Though it draws input from all involved ministries, there is no clear leading organisation in place at present. Although there are certain working mechanisms established, how these will come into practice is still at the "wait-and-see" stage, as coordinating ministry-level cooperation and alignment on resource allocation, and return generation is challenging. Each ministry has its own targets/objectives to reach, which helps keep each ministry in check with one another. However; this can cause difficulties when alignment, leadership and aligned responsibilities are necessary, such as projects like Smart Cities, especially if the terms of the cooperation are disputed or unclear.

Currently, the NDRC is driving the Smart Cities' development by accelerating New Urbanisation development, while MIIT takes a technology, network infrastructure-driven perspective. Regional governments also hold their own perspective from their own city development angle.

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<sup>50</sup> [http://www.chinadaily.com.cn/business/2012-11/15/content\\_15935688.htm](http://www.chinadaily.com.cn/business/2012-11/15/content_15935688.htm)

## 7.2. Market Barriers

### 7.2.1. *Lack of Overall Planning and Successful Case Studies*<sup>51-52-53-54</sup>

Due to a lack of recent development at a regional/city level, 11 ministries united to publishing the guidance regarding Smart City development. Many issues have already come to light and gained attention; including a lack of planning, replication of plans from one city to another and a focus on infrastructure construction rather than the ability to manage and operate in an effective manner. Although these problems may not be the responsibility of commercial companies, these commercial companies may suffer as a result.

Smart City projects are complicated, as they involve various players, including the government, which can take a long time to deliver projects and do not place an emphasis on return of investment over the short-medium term. More importantly, the concept of Smart City is still new to China, and is yet to develop mature business models and working mechanisms. There are only a few successful cases studies to demonstrate how the specified scientific approach, win-win model and sustainability in running a project would fare; thus no parties are willing to completely guarantee all the areas mentioned above. From a commercial company's perspective, facing this amount of uncertainty and potential changes along the way can make it difficult to commit to a project.

### 7.2.2. *Degree of Information Openness*<sup>55-56</sup>

From a technology and development perspective, the more real data, and information collected from real projects, the more diversified programmes and application can be created to offer to the market. However, in certain regions or in certain government departments, banks of data and information are being left unused; therefore they are not being used for evaluation and research.

Projects may require access to data gathered from various locations, which may be accessible to some key players, for example only certain government departments but not others.

Since the concept of data openness has been driven by the central government and there has been a drive towards openness and sharing, some departments have accepted the concept and started to consider openness. However, the fear of potential data theft, replication and general security issues makes complete data openness difficult to achieve in the short term. In addition, there is no existing mechanism in use, with some companies being charged high prices for data, resulting in many not being able to access data.

### 7.2.3. *Data and Privacy Protection*<sup>57</sup>

Given the many new terminals in place and accessibility to individual consumers through the nature of the IoT (object with object, people with people and object with people), a vast amount of data has been

<sup>51</sup> [http://news.xinhuanet.com/tech/2014-04/01/c\\_126339836.htm](http://news.xinhuanet.com/tech/2014-04/01/c_126339836.htm)

<sup>52</sup> [http://nongye.ce.cn/czh/201412/01/t20141201\\_2135015.shtml](http://nongye.ce.cn/czh/201412/01/t20141201_2135015.shtml)

<sup>53</sup> [http://news.xinhuanet.com/zhcs/2013-10/02/c\\_132768820\\_2.htm](http://news.xinhuanet.com/zhcs/2013-10/02/c_132768820_2.htm)

<sup>54</sup> [http://news.xinhuanet.com/zhcs/2013-10/02/c\\_132768820\\_3.htm](http://news.xinhuanet.com/zhcs/2013-10/02/c_132768820_3.htm)

<sup>55</sup> [http://news.xinhuanet.com/tech/2014-04/01/c\\_126339836.htm](http://news.xinhuanet.com/tech/2014-04/01/c_126339836.htm)

<sup>56</sup> <http://www.rmlt.com.cn/2015/0521/387714.shtml>

<sup>57</sup> [http://www.rmlt.com.cn/2015/0521/387714\\_2.shtml](http://www.rmlt.com.cn/2015/0521/387714_2.shtml)

and is being generated. As there is little experience and practice in managing and utilising this data, with a high level of attention and a strong push on data openness, the fear of privacy protection has been increased, which may put the drive towards data openness on hold to some extent.

#### **7.2.4. Technology Exclusiveness<sup>58</sup>**

Given the lack of top-level design and coordination, each party involved in a Smart City project may run its part individually with less direct involvement with other platforms, technology and systems. Also given that there is no standardisation in place, it may be difficult to make technology compatible. Each company/ technology/platform/system/device owner may prefer different project management systems; this may result in isolation for some and increase the potential to redo or develop workaround solutions to connect these to each other. This may also threaten companies that join a Smart City project late in the project and result in technology exclusiveness and monopolies, which could potentially harm overall project implementation and long-term development of Smart Cities.

#### **7.2.5. PPP Model Still Unclear**

The PPP model has been promoted as an innovative business model for Smart Cities development where all stakeholders involved can submit ideas on how each party will contribute and how each project will be effectively operated and enable local citizens to benefit from construction. However dates for implementation of regulations and standards in this area have not been confirmed and there is on-going debate on the effectiveness of the model and suitability for infrastructure projects in China.

### **7.3. Operational Barriers**

#### **7.3.1. Localisation<sup>59</sup>**

Smart City development involves an in-depth understanding of Chinese culture and society as the final benefits are to assist local citizens. From top-level design down to each project implementation, it requires the ability to think from the local citizens' perspective, such as current functioning, what current problems exist, and these could impact negatively on a citizen's daily life. Experiences, gained knowledge and skills acquired from other countries, and even other cities in China, will need adaption and re-application.

Besides a conceptual understanding of local culture and society, companies also require local awareness and team building to be able to identify opportunities, gain market trust and provide support.

Participating in entire projects may take years to complete and high costs may be incurred. Such long-term Smart City projects involve multiple stakeholders; therefore minor changes in one process may lead to further project delays and result in a re-evaluation from planning to execution. Even after project completion a total return on investment is not guaranteed.

### **7.4. Advice for EU SMEs**

As noted above, as well as opportunities in the Chinese market there are challenges. It is important for EU SMEs to understand the market as well as local cultures. Conducting research and identifying local

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<sup>58</sup> <http://www.rmlt.com.cn/2015/0521/387714.shtml>

<sup>59</sup> [http://www.chinadaily.com.cn/business/2012-11/15/content\\_15935688.htm](http://www.chinadaily.com.cn/business/2012-11/15/content_15935688.htm)

partners is therefore highly recommended. The best way to understand the market is by visiting various locations as regularly as possible in order to gain an understanding of the market.

#### **7.4.1. Identifying Local Partners**

It will be important for EU SMEs to partner with a local company when considering entering the Chinese market. A partner should be able to help with project identification or delivering local application support. Local partners should have a deep understanding of the market, stakeholders and experience in doing business in China. Local partners should also have a team based in China, which is more convenient and effective in terms of providing local applications, technical and maintenance support for projects.

While identifying partners, the key criteria should not be that they are large and well-known. It is important to choose a partner that shares a similar understanding of how to conduct business with an equivalent size/scale as an EU SME. Typically, large local companies are more attractive and can have many overseas companies looking to build a partnership with it, which can result in them standing in a higher position during negotiations and resulting in an unbalanced partnership.

A clear understanding of an EU SME's strengths and weaknesses are important when looking for a local partner. The world is becoming an ever more equal playing field due to how information, data and resources can be easily accessed, even from overseas markets. When approaching a potential partner, there will be various options for partnerships; therefore the better a company understands itself and its potential partners, the more suitable the partnership an EU SME will be able to set up. An equal and complementary relationship is the basis of an EU SMEs potential success on Smart City projects in China.

#### **7.4.2. Business Model/Selling**

It would be wise for EU SMEs to pursue a Business to Business (B2B) model rather than a Business to Government (B2G), especially at the early stages of entry when EU SMEs have less understanding and experience in dealing with government departments/officials. Working with a local system integrator on smaller operations may be easier, as these will be integrated into a whole project for completion, with a local systems integrator presenting an EU SME's work with relevant government representatives and stakeholders, as well as acting on its partners' behalf when dealing with the government.

Consultative selling is a very viable business method; leveraging expertise, knowledge and experience to work with a client to identify solutions to problems and selling in a consultative approach rather than exaggerating the strength of product and or services.

#### **7.4.3. Learn from Others**

Learning from others' failures, particularly overseas companies' experience in China is important to ensure EU SMEs avoid making similar mistakes; as sometimes an overseas companies' way of thinking, practices and logic may share some similarities to a certain extent. Therefore being aware of others' past mistakes can be very valuable.

#### **7.4.4. Product/Services Fit**

China's conditions and business environment may be different than that of other overseas markets. Previous products/services/solutions might not be appropriately directly applied to China. China is a large country geographically speaking; practice in one region might not be simply copied into other cities/regions. Smart City projects should be tailored specifically for the chosen location of that project/development created with local citizens in mind and benefiting that area.

#### **7.4.5. Be Flexible**

EU SMEs should be flexible and fully prepared for potential risks; Smart Cities development in China is still in its early stages though some key pilot cities may have already achieved positive results, there are still areas for improvement, including a standardised business model, standards and evaluation system. These areas require commercial players to be flexible to changes and well prepared for potential risks.

#### **7.4.6. Be Aware of Competition**

EU SMEs should be confident but not overly confident in the success of their operations; it is very important to be aware of the competition. Though the market is new and needs to be further developed, world leading companies together with Chinese companies have their own stake in the Chinese market. Furthermore, technology is globally accessible at present, even with a strong product/service at an entry level and the ability to block others copying and following high-tech product/service, it does not take long for others to catch up.

Protecting Intellectual Property (IP) in China also is also important. Companies should therefore seek legal advice before deciding to enter the market to identify how to protect their own IP.

#### **7.4.7. Start with Smaller Projects**

It is important to start with smaller projects to test the water. No matter how experienced and how knowledgeable a company is in an overseas market, it is wise to start with a small project or part of a large project to learn. This would provide EU SMEs with the opportunity to become familiar with how projects proceed, how to handle Chinese stakeholders, identify areas that require better preparation or be settled from an EU SME side, as all technical support and operation engagement will occur in China. Being involved in a small part of a larger project might enable an easier return on investment. Given that most Smart Cities projects take a long time to complete and an even longer time to be effectively operated, with current business models still needing to be further developed to guarantee commercial companies benefits and return, it is therefore advisable to be partially involved at the start of a project, if possible. In many cases, clients in China tend to trust and work with an overseas partner that has real experience in China. Therefore to kick off and start projects in local markets is important and often more meaningful for longer-term business engagement in China. Without an overbearing focus on gains, losses or financial return, it would be a good real practice and exploration to participate in a small project and/or take a supporting role in a larger project.

## 8. Conclusions and Recommendations

Although the concept of Smart Cities was originally raised by IBM in 2008, Smart City development in China has drawn high attention from the central government, including various ministries, departments and regional governments since 2010. Key reasons for this attention and promotion is China is increasing its new urbanisation construction and Smart Cities' development presents an opportunity to form new urbanisation, enhance city operations and management in a scientific approach. It has also been driven by new cutting-edge technologies including big-data, cloud-computing, IoT, and mobility. Transportation, energy, water, and healthcare are all key areas where a series of projects have been conducted to accelerate development in a smarter way.

Despite the level of attention and more than 300 cities identified for piloting Smart Cities development, Smart Cities is still a relatively new concept in China. More practical regulations, standards, evaluation methodology together with business models, are still works in progress or require further innovation. In addition, senior market insiders have already identified some problems, such as: replication of Smart City development from city to city; high attention paid to construction instead of the ability to manage and operate builds; individual non top-level design projects are isolated without a system in place to connect developments together; lack of break through developments on city operation and management mechanisms; and cyber security. These issues have been highlighted as they could potentially lead to wasted time, efforts and capital investment.

Opportunities in China however are still there to be created and captured, as practical applications of Smart devices/services needed to solve current social problems, together with regional and key sector projects providing scope for opportunities.

For EU SMEs, there are challenges as well as opportunities. The importance of gaining an understanding, insights, information, networks and contacts, forming an in-depth understanding are important to help EU SMEs succeed in China. It is also important to understand how to handle and work with various stakeholders and how a project or projects will bring gains and returns.

The process of building a partnership with a suitable Chinese company is worth investing significant efforts into. Local partners can come from any section of the market and any city or region, which may provide EU SMEs with different views and perspectives on their understanding/experience of being involved in Smart City development. In addition, being flexible and ready for potential changes is important, especially as guidelines for Smart City development are not yet established. There is the potential for many changes and revisions, but thinking positively about these changes can also generate more opportunities to pursue.

Last but not least, EU SMEs should not expect too much success during early engagements; early engagement in China is critical and more meaningful than the real returns earned out of the initial project itself.



## 9. Report Summary

Focus	Summary
<b>Main Regulation &amp; Policy</b>	<ul style="list-style-type: none"> <li>• In 2014, three guidance notices were published which have commonly been recognised by the industry as a driving force for the development of Smart Cities and have provided a framework and guideline for the development of Smart Cities in China.</li> <li>• These guidance notices:               <ul style="list-style-type: none"> <li>○ Set an overall direction for Smart City development in China.</li> <li>○ Aim not to trigger all cities' planning on Smart City development but for more advanced cities first.</li> <li>○ Highlight the final goal is to enhance people's lives, and to better manage and operate a city rather than hardware infrastructure development.</li> <li>○ Drive for data openness and application.</li> <li>○ Identify leading technology to drive and support Smart City development.</li> <li>○ Aim to establish further guidelines and evaluation mechanisms.</li> </ul> </li> </ul>
<b>Market Overview</b>	<ul style="list-style-type: none"> <li>• Over 300 cities have been identified as pilot cities for Smart City development; examples include Beijing and Shanghai.</li> <li>• Estimated potential market for China's Smart Cities' building could total EUR 591 billion (RMB 4 trillion).</li> <li>• Public-Private-Partnership model is currently preferred</li> </ul>
<b>Key Growth Drivers &amp; Players</b>	<ul style="list-style-type: none"> <li>• New Urbanisation Construction</li> <li>• "New Normal" stage</li> <li>• Cutting-edge technologies including big data, cloud computing, IoT, mobility, 5G.</li> <li>• Key players: government, system integrator, operator, end user.</li> </ul>
<b>Challenges, Opportunities &amp; Advice</b>	<ul style="list-style-type: none"> <li>• Key challenges:               <ul style="list-style-type: none"> <li>○ Still under initial exploration stage, standardisation, evaluation, business models, application, supply chain are still under development.</li> <li>○ Technology exclusiveness</li> <li>○ Localisation</li> <li>○ Long time to see commercial benefits.</li> </ul> </li> <li>• Key opportunities               <ul style="list-style-type: none"> <li>○ Top-level design consultation.</li> <li>○ Second/Third tier cities</li> <li>○ Ready-to-go application.</li> <li>○ Mechanism/evaluation to accelerate</li> </ul> </li> </ul>

## 10. Annexes

### 10.1. Exhibitions

Exhibitions
<p><b>Smart City Expo China 2015</b>  <a href="http://www.cnsce.net/">http://www.cnsce.net/</a>            In 2015 the Expo is organised by various organisations including the Chinese Academy of Science, China mobile and the Zhejiang Provincial Government amongst others. The Expo will focus on intelligent city, internet + and wearable device among other areas.            11<sup>th</sup>-13<sup>th</sup> September 2015, Ningbo            Email: <a href="mailto:info@cnsce.net">info@cnsce.net</a></p>
<p><b>2015 7<sup>th</sup> Asia (Beijing) Wisdom City &amp; IoT Application Exhibition</b>  <a href="http://www.wisdom-city.com/">http://www.wisdom-city.com/</a>            Wisdom city provides an opportunity for government agencies, associations as well as private companies to gather. 2015's exhibition will include an intelligent city round table and an intelligent building technology forum.            11<sup>th</sup> -13<sup>th</sup> November 2015, Beijing            Email: <a href="mailto:msbgjzyf@126.com">msbgjzyf@126.com</a></p>
<p><b>Smart City Expo &amp; Congress</b>  <a href="http://smartcitychina.com.cn/en/">http://smartcitychina.com.cn/en/</a>            Companies visiting the 2015 expo and congress are expected to include companies in the smart transport, green building, smart water, smart security and smart community. It is expected that 20,000 visitors will attend in 2015.            14<sup>th</sup> -17<sup>th</sup> November 2015, Shanghai            Email: <a href="mailto:smartcitychina@meorient.com">smartcitychina@meorient.com</a></p>
<p><b>Smartcity China 2015 Innovation Industry Conference</b>  <a href="http://www.smartcityexpo.net/english.html">http://www.smartcityexpo.net/english.html</a>            In 2014, over 10,000 professional visitors attended the exhibition and more than 100 companies showcased their products. Areas of focus for the 2015 exhibition include how to push smart city construction, how to solve smart city, finance, investment and operational issues and the scientific approach to smart city construction.            31<sup>st</sup> August-3<sup>rd</sup> September 2015, Shenzhen            Email: <a href="mailto:fendi.wang@cioe.cn">fendi.wang@cioe.cn</a> or <a href="mailto:it@cioe.cn">it@cioe.cn</a></p>
<p><b>China (Sichuan) International Smart City and Internet of Things Expo &amp; Conference</b>  <a href="http://www.wsciot.com/">http://www.wsciot.com/</a>            In 2015 the Expo covered approximately 20,000m<sup>2</sup> and was supported by MIIT.            Dates for 2016 not yet available, Chengdu            Email: <a href="mailto:sczhcswlw@163.com">sczhcswlw@163.com</a></p>

## 10.2. Industry Associations/Research Institutions

Industry Associations/Research Institutions
Digital City Engineering Research Centre of Chinese Society for Urban Studies under the Ministry of Housing and Urban-Rural Development of the People's Republic of China <a href="http://gczx.dcitycn.org/en">http://gczx.dcitycn.org/en</a>
China Information Technology Industry Federation <a href="http://www.citif.org.cn/">http://www.citif.org.cn/</a>
China Smart Cities Industry Alliance <a href="http://www.ccit.org.cn/">http://www.ccit.org.cn/</a>
Smart Cities Research Institution of China Academy of Science <a href="http://www.chinacity.org/qiantai/Index.aspx">http://www.chinacity.org/qiantai/Index.aspx</a>
Shanghai Internet of Things Industry Association <a href="http://www.shanghaiiot.org/">http://www.shanghaiiot.org/</a>
Shanghai Pudong Smart City Research Institute <a href="http://www.pdscri.com/">http://www.pdscri.com/</a>
Industry Promotion Association of Smart City of Shenzhen <a href="http://www.szipasc.org/">http://www.szipasc.org/</a>

## 10.3. Useful Websites

Useful Websites
China Smart City <a href="http://www.cns-cn.com.cn/">http://www.cns-cn.com.cn/</a>
Wulian China <a href="http://www.50cnnnet.com/">http://www.50cnnnet.com/</a>
China Telecommunication Net <a href="http://www.c114.net/">http://www.c114.net/</a>
EU-China Smart City Project <a href="http://eu-chinasmartcities.eu/?q=node/1">http://eu-chinasmartcities.eu/?q=node/1</a>

## 10.4. Further Reading

Further Reading
List of Pilot Smart City 1 <sup>st</sup> Edition (identified by MOHURD in 2013) <a href="http://www.mohurd.gov.cn/wjfb/201308/t20130805_214634.html">http://www.mohurd.gov.cn/wjfb/201308/t20130805_214634.html</a> Published by MOHURD Date accessed: 8 <sup>th</sup> July, 2015.
List of Pilot Smart City 2 <sup>nd</sup> Edition (identified by MOHURD in 2014) <a href="http://gczx.dcitycn.org/cn/show/11410">http://gczx.dcitycn.org/cn/show/11410</a> Published by MOHURD Date accessed: 8 <sup>th</sup> July, 2015.
Identified Pilot Smart Cities by MOHURD as of April 2015 <a href="http://www.50cnnnet.com/show-34-86651-1.html">http://www.50cnnnet.com/show-34-86651-1.html</a> Published by MOHURD Date accessed: 8 <sup>th</sup> July, 2015.
“Comparative Study of Smart Cities in Europe and China” <a href="http://euchina-ict.eu/wp-content/uploads/2015/01/Smart_City_report_draft-White-Paper--March-">http://euchina-ict.eu/wp-content/uploads/2015/01/Smart_City_report_draft-White-Paper--March-</a>

[2014.pdf](#)

Published by  
EU-China Policy Dialogues Support Facility II  
Date accessed: 21<sup>st</sup> September, 2015.

## 10.5. Relevant News

### Relevant Recent News

<http://info.chinabyte.com/360/13021360.shtml>

<http://www.chyxx.com/industry/201403/230764.html>

[http://news.xinhuanet.com/info/2014-05/26/c\\_133361980.htm](http://news.xinhuanet.com/info/2014-05/26/c_133361980.htm)

<http://www.chinasmartgrid.com.cn/news/20150204/587908.shtml>

<http://www.chinasmartgrid.com.cn/news/20141215/573156-3.shtml>

[http://www.qianjia.com/html/2014-12/31\\_243174.html](http://www.qianjia.com/html/2014-12/31_243174.html)

<http://news.163.com/15/0420/05/ANKE8JMU00014AED.html>

<http://fashion.sina.com.cn/l/fu/2014-10-31/0933/doc-iavxeifr4285272.shtml>

## 10.6. Referenced Companies

### Referenced Companies

Baosight [http://www.baosight.com/baosight\\_portal/index.jsp](http://www.baosight.com/baosight_portal/index.jsp)

IESLab <http://www.ieslab.com.cn/>

Smarter Energy <http://www.fegroup.com.cn/>

Sungrow <http://www.sungrowpower.com/>

Acrel <http://www.acrel.cn/>

Wiscom <http://www.wiscom.com.cn/>

NARI <http://www.naritech.cn/>

Goldwind <http://www.goldwind.cn/index.do>

Suntront <http://www.suntront.com/>

Tsinghua Tongfang <http://www.thtf.com.cn/>

Sanchuan <http://www.ytsanchuan.com/>

Ictehi <http://www.ictehi.com/>

Datang Software <http://www.cattsoft.com/>

NavInfo <http://www.navinfo.com/>

AutaNavi <http://www.autonavi.com/>

Hikvision <http://www.hikvision.com/cn/index.html?jmode=j1>

Dahua Technology <http://www.dahuatech.com/>

Seisys <http://www.seisys.cn/>

TIZA <http://www.itrackstar.com/>

Biolight <http://www.blm.com.cn/>

Andon <http://www.jiuan.com/>

Alijk.com <http://www.alijk.com/>

WinningSoft <http://www.winning.com.cn/default.html>

Searainbow <http://www.searainbow.com/home/index.htm>

Searainbow <http://www.searainbow.com/home/index.htm>

Longmaster <http://www.longmaster.com.cn/>

The EU SME Centre helps EU SMEs prepare to do business in China by providing them with a range of information, advice, training and support services. Established in October 2010 and funded by the European Union, the Centre has entered its second phase which will run until July 2018.

The Centre is implemented by a consortium of six partners – the China-Britain Business Council, the Benelux Chamber of Commerce, the China-Italy Chamber of Commerce, the French Chamber of Commerce in China, the EUROCHAMBRES, and the European Union Chamber of Commerce in China.

All services are available on the Centre's website after registration, please visit:

[www.eusmecentre.org.cn](http://www.eusmecentre.org.cn).

For this project the EU SME Centre has partnered with the China-Britain Business Council (CBBC) to prepare an introduction to Smart Cities in China. This report aims to help EU SMEs gain an understanding of China's Smart Cities and to identify opportunities that EU SMEs could consider exploring.

CBBC is the leading organisation helping UK companies grow and develop their business in China. We deliver a range of practical services, including: advice and consultancy, market research, event management, an overseas market introduction service, trade missions and exhibitions, and setting up rep offices. For more information about what CBBC can do to help your business develop in China, please visit: [www.cbcc.org](http://www.cbcc.org).

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