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SOUTH KOREAN MARKET INTELLIGENCE REPORT 2022

SMART CITIES

Department for International Trade

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INTRODUCTION

Smart cities are a key part of the South Korean (Korean) government's industrial and broader economic policy. In 2018, President Moon Jae-in's government announced two smart city pilot projects in Busan and Sejong City worth a combined GBP 3bn, of which GBP 1.8bn is to be provided by national government funding. The Korean government sees smart cities as an essential component for improving the quality of citizens' lives and as a means to grow Korea's economy through the development and commercialisation of emerging fourth industrial revolution (4IR) technologies. Significant political support has been given to national smart city projects, which are now scheduled for completion by 2023.

The increasing prevalence of smart city technologies and general digitalisation across Korean society means there are now a wide variety of smart city projects. The government aims to deepen this trend with the ultimate goal of having the bulk of the Korean population living in smart cities by 2040. Two major projects worth a combined GBP 3.7bn are ongoing in the cities of Incheon and Guri, as well as a number of targeted projects at the national and local level across the country. The capital city of Seoul also announced plans to deliver administrative services, education and cultural programs via its own metaverse platform that will become operational in multiple phases by 2026.

The Korean government has eased regulations around the collection and usage of data, suspending regulations that previously hindered deployment of next-generation technologies from domestic and overseas firms. With such rapid change brought on by the 4IR, the Korean government has recognised that a more flexible regulatory approach is essential. To date, new and disruptive business models have required prior authorisation but the government is moving toward a negative-listing regulatory approach for technologies surrounding the 4IR whereby new solutions and business models are deemed legal unless specifically prohibited by law.

Key areas of opportunity for UK companies include the main components of smart city projects, such as autonomous vehicles, smart grids, renewable energy, drones and robotics, as well as the technologies enabling these services, such as data analytics, AI, blockchain and IoT. Major stakeholders, including the national pilot projects, major telecommunication service providers and the Presidential Committee on the Fourth Revolution (PCFIR), have confirmed an interest in partnering with UK companies in smart city projects.

Public sector procurement in Korea is not without its challenges, with large opportunities balanced by language barriers, differences in standards and a complex process that can be difficult to navigate from overseas. UK companies seeking to participate in Korean smart city projects should look to develop the market as early as possible to ensure that they are able to seize on opportunities and should consider working with local channel partners such as resellers or systems integrators. Joining the Smart City Convergence Alliance offers a crucial opportunity to stay abreast of upcoming projects and bids, as well as to build relationships with potential customers.

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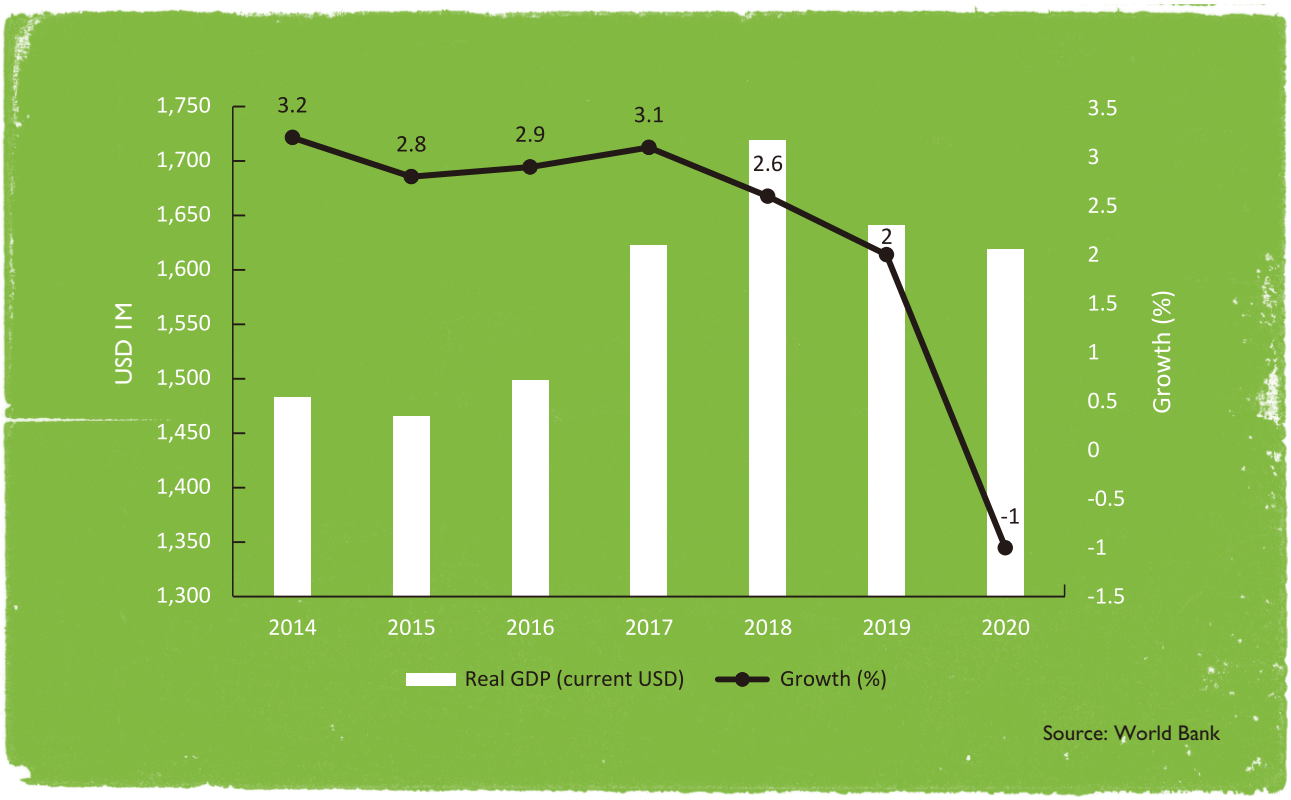
KOREA: AN OVERVIEW

In the space of just 60 years, Korea has transitioned from an agricultural economy to one driven by high value industries such as automotive, shipbuilding and advanced manufacturing. Perhaps most remarkable of all is the country's success in the area of information communications technology where the country has become world class in terms of semiconductor, consumer electronics and ICT infrastructure.

With a population of 51 million people, Korea boasts the 10th largest economy in the world, a GDP of GBP 1.21 trillion (USD 1.63 trillion) in 2020 and a per capita GDP of GBP 23,300 (USD 31,500) that same year. Whilst no longer experiencing the dizzying growth rates that characterised its early growth phase in the second half of the twentieth century, Korea has maintained strong growth for a developed economy of close to 3% in the years prior to the outbreak of the COVID-19 pandemic.

Total trade (exports and imports) between the UK and Korea was GBP 13bn in the four quarters to the end of Q2 2021, an increase of 6.1% or GBP 749m over the preceeding 12-month period. Of this, UK exports to Korea totalled GBP 7.5bn while its imports from Korea came to GBP 5.5bn. Korea is the UK's 22nd largest trading partner and accounts for 1.1% of total UK trade. The UK and Korea signed a continuity free trade agreement in 2019 which largely replicated the EU-Korea agreement.

Figure 1: GDP and Growth Rates (2014-2020)



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SMART CITIES IN KOREA

Smart cities are a strategic component of the Korean government's national economic policy for the fourth industrial revolution. The Korean government is seeking to grow Korea's economic competitiveness by taking a leading role in innovative technologies such as big data, artificial intelligence (AI), the Internet of things (IoT) and blockchain. Smart city projects offer a way for the Korean government to develop its strengths in these areas through the development and commercial deployment of these technologies, much as it did with the core ICT infrastructure in the late 1990s. The government forecasts a total of GBP 68bn in economic effects from smart city projects by 2030 out of a total of GBP 422bn from the fourth industrial revolution as a whole.

Korean smart cities have their roots in the U-City (Ubiquitous City) of the 2000s. The U-City was Korea's first attempt at the integration of different services in a city through ICT, with the benefits of greater convenience, better quality of life and savings through the integration of different systems. Early examples of services included real-time information on bus and train arrival for passengers, integrated traffic management, including the enforcement of traffic violations, as well as the ability to access government services online. A five-year U-City Master Plan was issued in 2009, along with GBP 332m in funding, and led to the nationwide development and adoption of U-city services.

Smart cities replaced the Korean U-City at the end of the five-year master plan, as the government shifted its focus towards a new model for connected cities that could take advantage of Korea's existing strengths in ICT, as well as promote the development of core technologies that would be crucial to the competitiveness of Korea's economy in the coming decades. There are now more than 70 smart city projects in progress nationwide, ranging from the national flagship projects worth billions of pounds to small, targeted projects in rural areas with budgets of less than GBP 1m.

GOVERNMENT INITIATIVES

The 2018 Act on the Promotion of Smart City Development and Industry, commonly known as the Smart City Act, creates an open-ended definition of a smart city as consisting of interconnected services and facilities that improve competitiveness and quality of life. This definition gives significant power to individual cities and projects to determine key components and themes, effectively making smart city initiatives a fluid platform for the delivery of diverse connected services.

Industry Insider's Thoughts

The overall position of the government is to provide the infrastructure and let citizens decide what they want to do with the technology. The spectrum of use scenarios is very wide.

- Prof. Kabsung Kim, Chief Advisor, Korean Smart Cities Special Committee, Presidential Committee on the Fourth Industrial Revolution

The Ministry of Land, Infrastructure and Transport (MOLIT) is the government body responsible for coordinating smart city policy along with the Ministry of Science and ICT (MSIT), the Ministry of the Interior and Safety (MOIS), the Ministry of Environment and the Ministry of Trade, Industry and Energy (MOTIE). Some aspects of project implementation, including site selection for pilot projects and the administration of the Smart City Convergence Alliance, will be handled by the Korea Agency for Infrastructure Technology Advancement (KAIA), a public research institute affiliated with MOLIT.

The Korean government is also eager to create an exportable model of smart cities by funding almost GBP 500m worth of projects overseas. These projects, delivered by major Korean players, include solutions such as transport, digital government, energy and data analytics. To date, almost 100 projects have been completed in 34 countries across Southeast Asia, South America and Africa. The K-City Network program was launched in 2020 to formally incorporate smart city models within development assistance, with 23 projects chosen in 2020 and 2021 out of 191 applications. The projects are in areas such as smart city planning, solution development and trial demonstrations of existing smart city solutions developed by Korean companies.

Gaziantep, Turkey stands out as an example of of exporting the Korean smart city model. First selected as a pilot project by the K-City program in 2020, Samsung SDS developed a data integration platform in Gaziantep. The city was again selected by the K-City program in 2021 for a larger project demonstrating solutions such as traffic control, crime prevention and general urban management. Samsung SDS will again take a leading part in this project by showcasing its smart city platform.

KEY PROJECTS

There are three categories of national smart city projects in Korea: pilot projects, R&D validation projects, and urban regeneration projects. National pilot projects are large-scale projects, effectively serving as real-life laboratories for the development and applicability of a model for smart cities.

Industry Insider's Thoughts

Today's cities are basically running on twentieth-century technologies and ideas, especially automobile-centred street systems. In the smart city, we want to push for a human-oriented and multi-mobility-centred city that uses twenty-first century technology to increase the sustainability of the city and the happiness of its citizens.

- Dr. Jaeseung Jeong, Master Planner, Sejong 5-1 Smart City

Individual municipalities are increasingly moving forward with their own smart city plans as smart city technology becomes more widespread, with a total of 18 cities announcing plans since 2020 according to information from MOLIT.

Pilot Projects

Two cities, Busan and Sejong City, were selected in early 2018 from a total of 39 candidate cities by the PCFIR. Greenfield sites in both cities, approximately 2-3 square kilometres, were selected due to the ease of development in terms of cost and time. Sejong City (officially known as Sejong Special Autonomous City) is Korea's central administrative city and is located 150 km south of Seoul, while Busan is located in the south-eastern corner of the country, 350 km from Seoul.

Sejong's smart city project, located in the northeastern 5-1 residential district, covers 2.7 km^2 and will have a population of 23,000 residents in 9,000 households upon completion. The Busan smart city project, located in its western Gangseo district, will be known as the Eco-Delta City (EDC). The core of the Eco-Delta City development is an area of 2.2 km^2, including a portion of the Nakdong River and its tributaries. Some components of the project will be spread out in the surrounding area, giving the project an overall size of 11.8 km^2.

R&D Validation Projects

The cities of Daegu and Siheung, a satellite city of Seoul, were designated as R&D validation cities in July 2018, acting as testbeds or "living labs" for a Korean smart city model.

The development of a Korean data hub model includes the collection, storage and sharing of data across an integrated city-wide platform, as well as its use in component services. The two projects have a combined budget of GBP 75m and will run for five years through the end of 2022. Research in Daegu will target intelligent mobility, crime prevention and resilience in response to natural and man-made disasters. Projects in Siheung will concentrate on the environment, welfare and energy.

Urban Regeneration Projects

A third category of national smart city projects are urban regeneration projects that are being positioned as an attempt to resolve the problems of older urban areas, such as lack of space for parking and potential safety issues in narrow alleyways, through the use of data connectivity, rather than large-scale redevelopment. The projects are small-scale and thematic in nature.

MOLIT announced 15 new urban regeneration projects in April 2021, each worth approximately GBP 600,000, with the national government paying approximately GBP 300,000 and local governments paying the balance. The projects are diverse, covering six of Korea's nine provinces, and three of its four largest cities, providing services such as healthcare, traffic, energy and safety. Examples include LED sensors for seniors in rural Goseong county that can alert first responders if no movement is detected, fire-detecting sensors in Daegu, smart trash management in Jeju and sidewalks in Seoul that light up with warnings for both drivers and pedestrians.

Municipal Projects

In addition to national projects, municipalities are increasingly moving forward with large-scale projects of their own. The Cheongna International Business Complex in Incheon, Korea's third-largest city, and the Guri smart city, located just east of Seoul, are two high-profile examples.

The Guri Han River smart city is a massive, GBP 2.5bn project that will integrate multiple services such as hydrogen fuel cells, smart farms and digital government under the DNA theme (data, networking, AI) that underpins the national economic policy of the Korean New Deal. The target date of completion for the project is 2027.

The GBP 1.2bn Cheongna project, located near the Incheon International Airport west of Seoul, will seek to create a mixed-use commercial and residential area with similar services to those found in Sejong such as car-sharing, smart parking and EV charging, but also ESS banks and the use of wearables to improve health outcomes.

The city of Seoul's announced in November 2021 that it will create its own metaverse platform over the next five years. This platform, part of the city's 2030 vision for increasing its global competitiveness and quality of life, will allow residents to access government services, educational and cultural programs in gradual phases. In just 2022 alone, Seoul will invest almost GBP 300m in digitisation of its services, with about a third of the money earmarked specifically for harnessing cutting-edge technologies such as a metaverse platform and delivery.

Table 1: Selected Smart City Projects in Korea

Location	Approval	Completion
Sejong City	2018	2023
Busan	2018	2024
Suwon	2021	2025
Cheongna	2021	2027
Guri	2022	2027

Source: MOLIT, PCFIR

TIMELINE AND BUDGET

Blueprints for the Sejong City and Busan projects were unveiled in late 2018. The original plans called for construction and development of services within both projects to begin in late 2019, with residents scheduled to begin moving in by late 2021. However, delays in planning, vendor selection and construction have delayed completion to 2023. Busan, in particular, will begin the vendor selection process once again in 2022 with the goal of completing it by the spring. Guri's smart city project, where a consortium led by the Korea Development Bank (KDB) has been tentatively selected for delivery, is expected to cost GBP 2.5bn with completion set for 2027.

The overall cost of the national pilot projects, including construction of the cities themselves, is expected to be approximately GBP 3bn. More than half of the funding is from government ministries, most prominently MOLIT and MSIT, as well as the lead developers of the projects, LH Corporation in Sejong and K-Water in Busan. Plans call for the government and developers to contribute GBP 1.8bn in support for the projects, with the developers expected to recoup their investment by selling the land upon completion of the projects. Private companies are expected to invest the balance of the development costs, either as part of an SPC or as individual entities.

Government funding for the pilot projects is restricted for use in developing the strategic services and technologies that are part of the pilot projects, such as autonomous vehicles and health services. Money from the developers will be used to build basic infrastructure such as roads, sewage systems and construction of residences.

REGULATIONS

The Korean government has recognized that regulatory reform is necessary to allow for the commercialization of strategic 4IR technologies. Existing regulations require prior authorization of new and disruptive business models, a process that can be lengthy and expensive. Burdensome regulations have led to specific examples of innovative Korean companies losing out to international competitors that were able to get to market quicker, unhindered by the need to secure licences for activities where there were no specific regulations in place. The Korean government is moving toward a negative-listing regulatory approach for technologies surrounding the 4IR whereby new solutions and business models are deemed legal unless specifically prohibited by law.

MOLIT updated the Act on Promotion of Smart City Development and Industry in March 2021, expanding the scope of the smart city regulatory sandbox to be nationwide. These sandboxes were created in response to concerns that regulations concerning the collection and use of data for IoT applications, particularly when involving public-private partnerships, would be an insurmountable barrier for smart cities in Korea. The need for regulatory reform was also cited as a tool for encouraging private sector investment in smart city projects by removing regulatory uncertainty surrounding commercial viability of smart city technology at large scale.

Regulatory exemptions for smart city projects are awarded on a project basis by the PCFIR and MOLIT. The regulatory sandbox covers six categories: personal data usage, autonomous vehicles, drones, private networks, software development and land use. A total of 25 cases have been approved so far through the smart city regulatory sandbox, including autonomous security robots, route guidance platforms for the visually impaired, and safety services using unmanned drones.

The specific regulatory exemptions are summarized below:

Table 2: Smart Cities Regulatory Sandbox

Category	Details
Sejong City	Personal informationRemoves data privacy protections under the Personal Information Privacy Act if data is stripped of identifying markers before processing
Autonomous vehicles	Lifts Road Traffic Act ban on use of video recording equipment in vehicles if utilized by an autonomous vehicle for R&D purposes
Drones	Requirements to report recording videos and images of aircraft to Ministry of National Defence are simplified if done for R&D and safety purposes
LAN	Expands ability of public telecommunications service providers to connect to a private network, presently restricted to highly specific uses under the Telecommunications Business Act
Software development	Allows conglomerates to bid on public tenders for software, presently restricted by the Software Industry Promotion Act
Land use	Allows developers to enter private contracts for the sale of land to companies

Source: Ministry of Land, Information and Transport (MOLIT)

VENDOR SELECTION

Larger projects such as the Sejong and Busan smart cities choose vendors through bids made by consortiums. Each consortium is led by an industry leader, LG CNS in the case of Sejong, working with many smaller companies to deliver a segment of services in the pilot projects. If a consortium is selected for a given project, it enters negotiations with the project developer to reach an agreement on the specifics of delivering services. An inability to reach agreement in this phase can lead to length delays, as seen in the case of the Busan Eco-Delta City project. The Guri Han River smart city is also proceeding on a consortium basis, with a KDB-led consortium beating out a bid from a consortium led by construction giant GS.

A Smart City Convergence Alliance consisting of 113 companies was announced in 2019. More than 350 companies applied for inclusion in the alliance, which was jointly headed by LG CNS, a large systems integrator under the LG group, and waste management start-up Ecube Labs. The alliance is now comprised of more than 500 companies, including major conglomerates, SMEs and startups. Sectors covered by the alliance members include pilot project component services such as mobility, education, healthcare and energy, as well as core technologies such as data analysis and security, blockchain and AI.

The Alliance acts in a communicative and advisory role with government agencies, helping to draft and coordinate smart city policy. The alliance recruits new members on a regular basis, with the most recent expansion having taken place in August 2021. Overseas companies are welcome to join the alliance by contacting the KAIA's Smart City Innovation Alliance Support Group (www.kaia.re.kr).

Industry Insider's Thoughts

We want to make it so that companies with disruptive technologies can find us, particularly those related to health, education and clean energy.

- Senior Executive Advisor, SK Telecom

KEY PLAYERS

The smart city ecosystem consists of government agencies and ministries at the national and local level, large conglomerates and a number of smaller start-ups with key technologies. Key players in the private sector include leading local telcos such as SK Telecom, KT and LG U+, as well as SIs like LG CNS and Samsung SDS. Innovative startups with core smart city technologies such as Stradvision and Ecube Labs also figure prominently. National-level government bodies such as MOLIT, MOTIE and PCFIR coordinate with municipal governments in Sejong City and Busan.

Figure 2: Smart City Ecosystem

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OPPORTUNITIES FOR UK COMPANIES

Industry Insider's Thoughts

Korean smart city projects are a good opportunity for UK companies. Once a decision is made, the process will move really quickly.

- Dr. Myounggu Kang, Director, Smart City Research Center, University of Seoul

This section identifies four areas within the Korean smart city projects that represent opportunities for British companies: mobility, energy, education and healthcare, and infrastructure. These industry verticals closely track the key themes of the Busan and Sejong flagship projects. These opportunities have been qualified by our interviews with key stakeholders from the public and private sector. In addition to the verticals discussed below, we have also identified opportunities for UK companies in core smart city technologies with multiple applications, such as AI, data analytics and management, IoT, and blockchain.

Table 3: Key Services in National Smart City Pilot Projects

Mobility	Energy	Education/Healthcare	Infrastructure
Autonomous vehicles	Hydrothermal energy	Drone first responders	Cloud-based logistics
Last-mile solutions	Solar generation	Edutech platforms	Smart factories
AI traffic control	Smart grid management	Blockchain EMR	Automated water meters

Source: Busan Metropolitan City, Sejong Special Self-Governing City

MOBILITY

Mobility is a key theme across Korean smart city projects, in particular the national pilot projects in Sejong City, where it has been identified as the priority. Mobility-related services in Sejong will be developed and deployed first ahead of other planned services. Sejong's master plan calls for providing door-to-door transportation solutions for residents that focus on next-generation technology such as autonomous vehicles, powered by both hydrogen and electricity, as well as last-mile solutions such as electric scooters. Car and ridesharing will also be a part of Sejong's goal of a two-thirds reduction in the number of cars used per capita by 2040.

Sejong and Busan will be making investments in the infrastructure necessary to support their transportation plans. Sejong will dedicate the centre lane on roads in the 5-1 district to autonomous vehicles and make EV charging stations widespread, interacting with the city's self-supporting smart grid system. Sejong and Busan will also seek to eliminate traffic congestion through AI that can analyse traffic flow and optimize traffic lights with the goal of reducing congestion by 30%. Busan predicts that its system will save residents up to 60 hours a year in reduced commute time.
The range of mobility solutions offered by smart city projects continues to diversify. An on-demand bus service, based on the number and destinations of riders, is under demonstration in both Incheon (I-MoD) and Sejong (Shucle). The average waiting time for the bus was reduced by 80% from 78 minutes to 13 minutes, and the travel time was also reduced by 40%.

The strongest opportunities for UK companies related to mobility are:

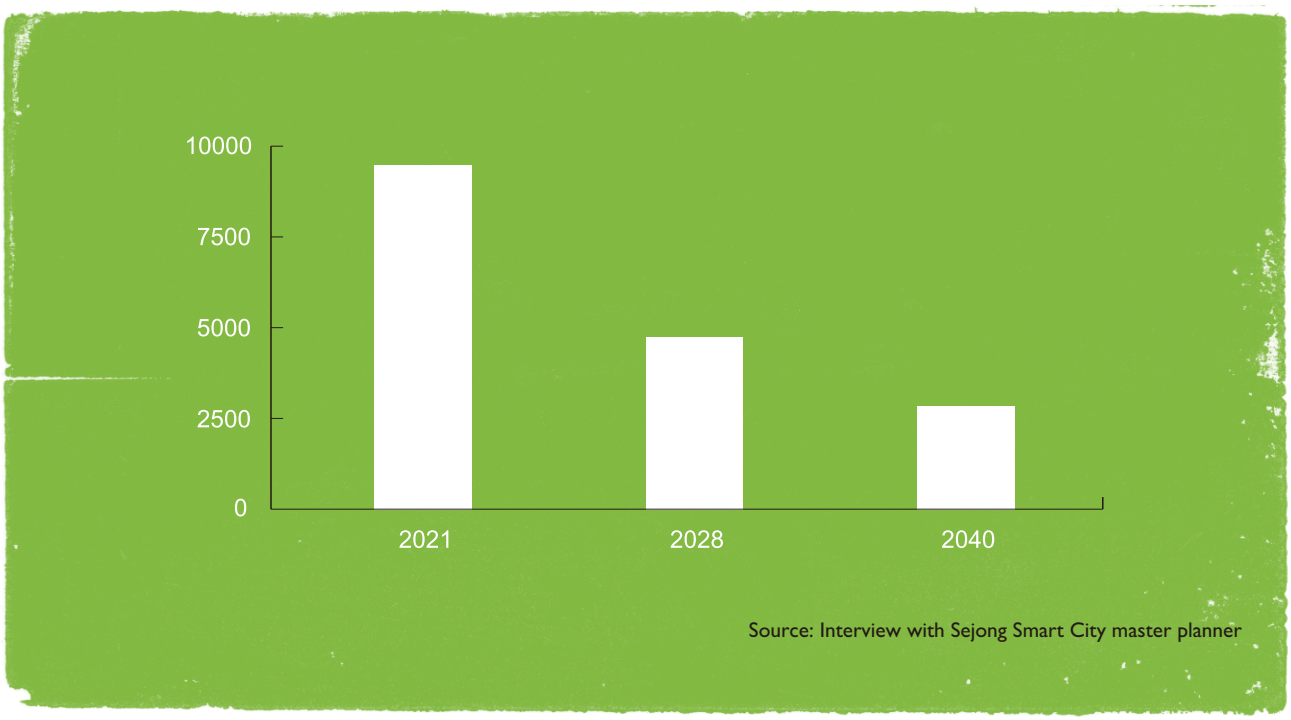
- Autonomous vehicles: Technologies such as autonomous driving platforms, AI, and machine vision will be in strong demand
- Hydrogen for energy: Hydrogen vehicle adoption is growing quickly, and companies in the hydrogen-to-energy field will be in demand more than ever, particularly those supplying hydrogen vehicle charging stations

Industry Insider's Thoughts

Mobility is the key to the Sejong City project. We are trying to construct cities that have very futuristic technology by attracting lots of investment.

- Dr. Jae Yong Lee, Presidential Committee on the Fourth Industrial Revolution

Figure 3: Projected Number of Cars in Sejong Smart City Project, 2021-2040



Source: Interview with Sejong Smart City master planner

Case Study

Stradvision	
Website	www.stradvision.ai
Application	AI machine vision systems for autonomous vehicles
Key Technology	Deep-learning software that identifies cars, humans, road signs and objects
Overview	Stradvision is a Korean startup spun out of POSTECH in 2014 that supplies deep learning-powered vision-processing software for use in ADAS (advanced driver-assistance systems). Stradvision's software is capable of detecting blind spots, pedestrians and potential collisions, with work ongoing to add capability for automated parking, acceleration, deceleration and lane changes. Headquartered in Pohang, North Gyeongsang province, Stradvision has more than GBP 50m in funding to date, with approximately 200 employees in Korea, the United States, China, Japan and Germany.

ENERGY

Busan will utilize energy management systems and emphasize the role of hydrothermal power generation for the Eco-Delta City. A 122,000-square-metre Geothermal Energy Cluster, including a hydrothermal generation plant, will utilize water from the Nakdong River and Pyeonggang Stream to increase the energy independence of the Eco-Delta City.

Sejong has set a similar goal of energy independence by utilizing its own smart grid that relies on renewable energy sources, in particular solar energy. In addition, Sejong aims to increase the efficiency of its energy supply through building management systems, electricity trading systems between consumers, and two-way energy exchanges between electric cars and the city's power grid.

Various smart energy projects are underway across different districts in Seoul as part of a citywide goal of making the city 30% energy independent by 2022 and reducing carbon emissions by 25% between 2019 and 2026. as well as reducing 180,000 tons of greenhouse gas emissions annually. A massive GBP 6.2bn investment from the city will help make 1 million buildings energy efficient. The centrepiece of Seoul's smart energy developments, led by LG CNS, will be the Magok district, already home to many corporate R&D centres utilizing building management systems. Features will include energy-saving technologies such as smart lighting, cooling and heating systems that use energy from the ground, solar panels and ESS.

Korea is moving towards the adoption of a national smart grid, but the significant cost of adopting advanced metering infrastructure (AMI) remains an obstacle. A second national smart grid plan from 2018-2022 aims to move Korea further along this goal, backed by GBP 2.8bn in funding. The national electric utility company KEPCO has installed 8.6 million next-generation meters, but many do not have the two-way communication capability required for a smart grid. Regulatory changes have allowed the growth of a nascent brokerage market, currently at 900 MW and expected to grow rapidly, and key players in the energy sector are exploring different ways to enter the growing smart energy segment, particularly as part of smart city initiatives.

Industry Insider's Thoughts

What can ICT add to the energy industry? We think it can provide stability as we adopt renewable energies, enhance operations through data analytics, enable a prosumer market and simplify maintenance.

- Vice President, Smart Energy, KT

Although attempts at a large-scale smart grid have failed to date, they are emerging at the local level, particularly in the national pilot projects. KT has emerged as a prominent player in the smart energy business through its MEG (Micro Energy Grid) platform, which provides four key services: generation, energy management, demand response, and EV charging stations. Its generation capabilities rely on solar panels and energy storage systems that store energy for use when output levels are low.

The biggest opportunities for UK companies related to energy are:

- Data analytics and energy management platforms: Korea is strong in the hardware of localised energy storage and distribution, but much less so in the underlying intelligence of distributed power
- Energy savings technologies: An area of true strength for the UK, Korea has not placed the same emphasis on energy efficiency as the UK, but this has started to change over the past few years

Case Study

LG CNS	
Website	www.lgcns.com
Application	Energy-efficient building management solutions
Key Technology	AI and big data-based energy management platform, microgrids
Overview	LG CNS is a subsidiary of the LG Corporation that specializes in providing systems integration and ICT services across a range of industries, including energy, transportation and finance. LG CNS has been active in early smart city projects such as Seoul's Magok district and is also the head of the consortium leading development of the Sejong smart city project. LG CNS has been deploying its smart energy building management solution globally as part of its smart city platform. With a combination of advanced meters produced by LG CNS, and ESS using cells produced by sister company LG Energy Solution, LG CNS is able to feed information to its big data platform and optimize energy consumption in real-time.

EDUCATION AND HEALTHCARE

Prior to the COVID-19 pandemic, the Korean education system was yet to fully exploit Korea's advanced ICT infrastructure due to policy and regulatory hurdles. In Sejong and Busan, however, planners have been given significant latitude to explore different technologies and designs to reform education in a way that could have nationwide implications through the establishment of special schools.

Existing plans for these special schools call for the implementation of technologies such as 3D printers and robot arms in the classroom in order to create experiential, creative learning environments. Sejong is aiming to diversify teaching methods and utilize edutech platforms that will allow for frequent assessment of students and greater equalization of classroom conditions through the use of data. This data-driven equalization opens the door to alternative methods of evaluation in a country that is dominated by the use of standardized testing. Sejong also aims to explore the use of neuro-architecture to design buildings in a way that takes into account the impact the design of a space will have on its users.

Healthcare components in smart cities will depend heavily on the freedoms offered by regulatory sandboxes as existing regulations are particularly onerous with regards to smart healthcare. Sejong and Busan are planning to use connectivity, wearable devices and robotics in the home, public spaces and medical facilities to improve the responsiveness and delivery of healthcare.

Sejong will use AI in the home to detect medical emergencies such as falls, injuries or illness and call emergency responders. Drones on call will be able to respond to emergencies within three minutes. Images, video and other data collected by the drones will be relayed to first responders and medical professionals in hospitals. First responders will also be equipped with wearable devices that collect data that is relayed to hospitals, enabling more seamless treatment.

The pandemic also spurred significant advances in digital health applications, which previously had been limited due to the regulatory environment. National and regional governments are able to not only handle contact tracing through data collection and analytics, but also handle treatment of quarantined or asymptomatic patients in certain cases. The use of robotics for disinfection, temperature detection and enforcing social distancing requirements has also become widespread. A number of local governments are experimenting with sensors and wearables that can help detect health issues with the growing number of people over the age of 65, especially those who live alone. Microsoft Korea, local AI startup BRFrame, Yonsei University Hospital and Seoul's Mapo district collaborated in 2020 to develop a service that uses sensors and wearables to address mental health and dementia in seniors.

The biggest opportunities for UK companies related to education and healthcare are:

- Drones: both Sejong and Busan will rely extensively on drones which will open up opportunities for companies with specialized UAV hardware and software
- Robotics: COVID-19 has furthered demand and applications for robots in public health and welfare settings, as well as technologies such as synchronization and autonomous control capabilities
- Edutech: Rapid growth in online education has created demand for platforms and technology that can facilitate delivery and management

Case Study

Conus	
Website	www.conus.kr
Application	'Smart plug' solution for detection of medical emergencies
Key Technology	Healthcare IoT, sensors
Overview	Conus is an IoT startup established in 2011. It manufactures the IoTap, a smart plug that utilizes a sensor to detect the usage of electrical appliances and heating systems. Applications include energy and enterprise solutions, as well as detecting medical emergencies in the homes of seniors based on power consumption patterns. A prolonged period without changes in power consumption leads to an automatic welfare check by a social worker. Conus' IoTap has been incorporated in the smart home offering of major telcos.

INFRASTRUCTURE

A diverse range of projects have sought to further improve Korea's already strong infrastructure through the addition of connectivity, particularly in areas related to logistics, factories, utilities and waste management. Some municipalities have also tried to link the automation of public services to broader social welfare and public health initiatives. Korea is already in the midst of a GBP 29bn digital transformation of its ports to improve their regional competitiveness. About one-third of the money (GBP 9bn) is earmarked for the Busan Port, the fifth largest in the world, into a smart port through the use of AI and connectivity, reducing energy costs while improving efficiency.

The Eco-Delta City intends to similarly develop a cloud-based port and logistics platform that utilizes blockchain to share data between manufacturers, shipping companies, freight forwarders and customs to maximize the efficiency of the port in moving goods. Services included in the existing plan are location-based tracking of cargo and a secure platform for processing transactions, as well as sharing relevant documents. Sejong is also considering the use of blockchain to facilitate transactions, including the possible use of a local cryptocurrency called Sejong Coins.

Busan has invested in a smart water management system, which includes smart water meters, automated detection and drainage of pollutants, a water reuse system and a response system for natural disasters. Busan follows a number of municipalities across Korea that have started the process of automating water meters. These municipalities include Taebaek, Pyeonchang and Yeongwol in Gangwon province, Gimje and Geochang in North Jeolla province, and Jecheon in North Chungcheong province. Gimje and Geochang worked with Australian firm Freestyle Technology between 2014 and 2018 to automate the collection and reporting of data from water meters, install a water management platform providing visibility into all water assets, and add the capacity to detect leaks and trigger welfare checks in households without water usage.

Local and national governments are also making major investments in smart factories, leveraging technological capabilities to address an aging, shrinking population. Within 2022, the government is on track to establish 10 smart industrial zones and 30,000 smart factories, defined as connected and digitised manufacturing facilities. Government incentives of approximately GBP 310,000 per company and a pool of GBP 250m in funding support these initiatives, which are fulfilled by major telcos and companies like POSCO ICT and Samsung SDS.

Efficiency in the waste collection system has been a target for existing projects in Seoul and Songdo. Seoul has installed public trash cans in the central Bukchon neighbourhood that send a signal when full, optimizing the collection frequency and the routes made by garbage trucks. Seoul has also made efforts to automate the sorting of recycling waste at apartment complexes, while Songdo has gone a step further by utilizing waste collected in each building to generate energy. Waste is collected in the basement of each building by

a vacuum system, which captures the heat from the waste and distributes it around the Songdo district.

Opportunities for UK companies related to infrastructure are:

- Sensors: Specialized sensors for devices in a range of settings, such as industrial facilities, waste receptacles, and energy/utility management, will be used to provide real-time connectivity
- Smart factories and logistics: Loading, dispatching, inventory management and traffic optimisation technologies will be in demand across smart port and smart factory applications

Case Study

Ecube Labs	
Website	www.ecubelabs.com
Application	Smart waste management and solar-powered waste compacting
Key Technology	IoT container monitoring, solar panels, data analytics platform and fleet management solution
Overview	Ecube Labs is a Korean start-up that provides smart waste management solutions to more than 100 municipalities worldwide, including in Korea, the UK, US and France. It seeks to address inefficiencies in waste collection, such as infrequent or unnecessary collection trips, by installing ultrasonic sensors in trash bins indicating when the bin is full. Sensors transmit data in real time to a waste analytics platform, which is able to calculate the most effective route for collection vehicles, reducing costs. Ecube also offers a solar-powered trash compactor that reduces collection frequency by up to 80%.

05 MARKET ENTRY STRATEGIES

Key Points

- Partnering with local distributors or resellers is strongly advised for foreign companies
- Using a sales team based outside of Korea is difficult due to language and cultural barriers and high expectations of after-sales support
- Foreign companies can apply to participate in government-led projects but there are barriers:
  - Culture, language, business environment, etc.
  - Preference for local businesses adding at least some value to products or services

Korea offers strong opportunities for UK companies across the range of services planned for smart city projects, most notably the national pilot projects in Sejong City and Busan. The significant amount of funding has been approved for the national pilot projects, coupled with the short timeline for completion and hunger for commercial-grade technologies ready for deployment in smart cities, makes Korea an attractive market for UK companies. However, UK companies looking to introduce their technology to Korea should take into account both business-related and cultural factors. UK businesses can approach the Korean market through direct sales from the UK, by appointing a partner or by setting up an office in Korea.

Direct Sales from the UK

The simplest market entry option is for UK companies to sell or license a particular smart city technology directly to Korean end-users. The main downside of a direct sales approach is the lack of local language and time-zone support, as Korean customers tend to be particularly demanding of their suppliers. This can be mitigated by using a local agent or business development consultancy capable of bridging time-zone, language and cultural gaps without the long-term commitment of local incorporation and hiring. Market-specific factors to consider include:

- Do we have a strong differentiator – something that sets us apart from our competitors in the market?
- Do we have a strong track record in other major markets? Korean companies are not easily convinced to use a new, disruptive technology as a first-mover without case studies
- Are we willing to localise the product for the market and/or for local regulations, if necessary?
- Are we ready to provide a Proof of Concept (PoC) at little or no cost to the customer? Korean companies will look to drive the price down and will not commit before proving the value through testing
- How do we provide after-sales support? Korean customers expect high-quality, local-language support
- Do we understand the local regulations, particularly in relation to data? Do we need to adjust our business model to adapt?

Appointing a Reseller or Distributor

A more common way to approach the market is to seek a partnership with an established local company which complements your product, has experience in the target sector and can help navigate the legal environment. A local channel partner can provide services such as certification, registration, pre-sales, sales, consulting, installation, technical training, service maintenance and technical support in the Korean market. Even large multinationals take this route in the early stages of market entry. Market specific factors to consider when seeking a partner include:

- Does the partner already serve the type of customer that we do?
- Does the partner have a good understanding of the market in general and my particular application?
- Does the partner already offer solutions similar or complementary to our offering?

- Is the partner focused on short-term wins or will they be able to drive our business in the long run?
- Does the partner have specific experience with public sector projects?
- Are we comfortable communicating with the local partner and are they transparent with us?

Establishing a Local Presence

There are broadly three ways of establishing a local presence: (1) a liaison office, (2) a branch office or (3) a local corporation through foreign direct investment (FDI). Setting up a liaison office is a simple process; but a liaison office can only perform non-profit generating activities in Korea such as market surveys, research and development and quality assurance. Setting up a branch office can be a complicated process that requires documentation to be translated, but it allows for sales activities and the exchange of revenues with the head office. The most common process for an overseas company to open a branch office in Korea is through FDI, where an initial investment exceeding approximately GBP 68,000 is made by the head office, which in return owns stock in the branch. The local corporation leads independent activities and is authorised to perform direct transactions. Market-specific factors to consider when establishing a local presence in Korea include:

- Is our business generating enough revenue in Korea to consider a local presence? Businesses usually consider establishing a local presence after several years of sales (either direct or through a partner)
- Is Korea a strategic market for us, either in terms of securing use-cases or securing further funding?
- Do we need to engage in profit generating activities?
- Will we transfer staff from our head office or hire local staff? In Korea, visas can be difficult to secure for foreign employees and social insurance contributions and severance pay must be paid to all staff that complete one year of employment. An employer's share of these costs equates to 18% of salary
- What location shall we pick for our local presence? Scouting, negotiating, and conclusion of contracts are time-intensive processes that often are hard to conclude without local support.

For further information please contact:

Hyunji Han
Research Analyst, Intralink Korea
hyunji.han@intralinkgroup.com

Adeel Ahmad
Director of Operations, Intralink Korea
adeel.ahmad@intralinkgroup.com

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