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# Advanced Technologies for Industry – International reports

Report on South Korea: technological capacities and key  
policy measures



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## Section

### Introduction

The objective of the international country reports is to explore the technology and policy landscape of selected non-European countries. Country performance in advanced technologies is presented based on patent, trade, and investment data. The reports provide also a concise and informative review of policies relevant for advanced technology development and deployment.

The starting point of this analysis has been sixteen advanced technologies that are a priority for European industrial policy and that enable process, product and service innovation throughout the economy and hence foster industrial modernisation.

Advanced technologies are defined as recent or future technologies that are expected to substantially alter the business and social environment and include *Advanced Materials, Advanced Manufacturing, Artificial Intelligence, Augmented and Virtual Reality, Big Data, Blockchain, Cloud Technologies, Connectivity, Industrial Biotechnology, the Internet of Things, Micro and Nanoelectronics, Mobility, Nanotechnology, Photonics, Robotics and Security*. The full methodology behind the data calculations is available on the ATI website<sup>1</sup>.

The report is structured as the following:

The first section outlines the capacities of South Korea in terms of technology generation (patent applications), followed by an analysis of international competitiveness in technology-based products (export shares) and, eventually, entrepreneurial dynamism (venture capital activities and investments in tech firms).

The second section analyses the main South Korean policy strategy in support of advanced technologies and provides an overview of some of the key policy initiatives and policy measures in the field.

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<sup>1</sup> [https://ati.ec.europa.eu/sites/default/files/2020-06/ATI\\_D1.2\\_Methodology\\_29052020.pdf](https://ati.ec.europa.eu/sites/default/files/2020-06/ATI_D1.2_Methodology_29052020.pdf)



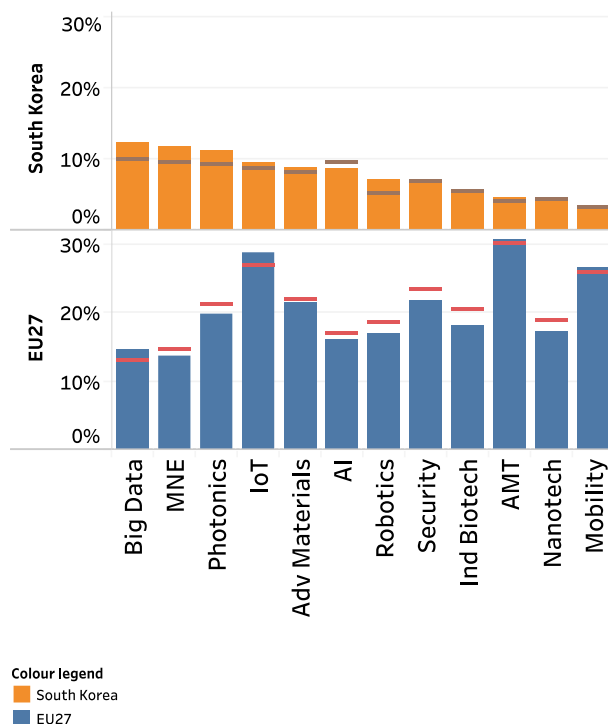
## Section 1

# 1. Activities and capacities in advanced technologies

## 1.1 Patent applications

Technological trends and development have been captured based on patent data. An analysis of South Korea’s current share of transnational patent applications helps to evaluate its current technological performance across different fields of advanced technologies. Figure 1 gives an overview of the South Korean share of worldwide transnational patent applications related to advanced technologies in comparison with the EU27 Member States in 2017-2018.

Figure 1: Share in global transnational patent applications in ATI fields (2017-2018) (bars refer to 2018 value and the green and red lines indicate the status in 2017)



Source: Fraunhofer ISI, based on EPO PATSTAT

As shown in Figure 1, South Korea holds lower shares of global patent in the advanced technology fields compared to the EU27. But taking account that the GDP and population of Korea amount to less than 15% of the EU, the shares of South Korea are quite impressive. In South Korea, the highest share of patent applications within the

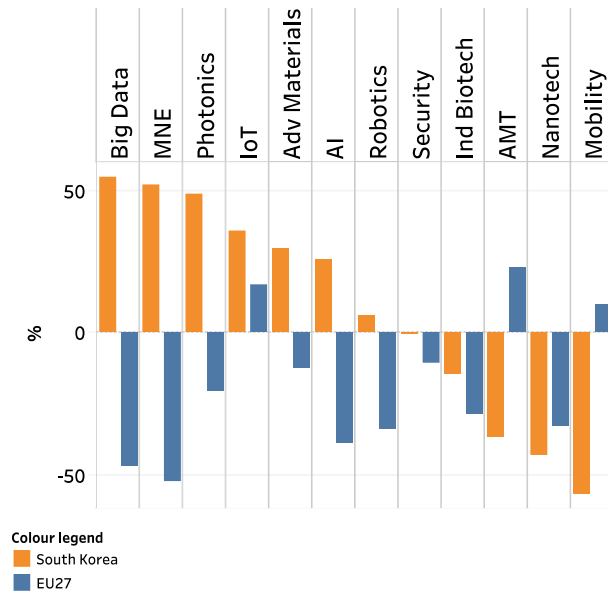
total number of transnational patent applications was recorded in the field of Big Data in 2018. Further technologies that played a relatively more important role were Microelectronics, followed by Photonics and the Internet of Things. In comparison with 2017, the global share of South Korean patent applications had grown slightly in most of the advanced technology fields in 2018. The fields where its global position slightly deteriorated over the period from 2017 to 2018 include Nanotechnology, Artificial Intelligence and Security. On the contrary, the shares of European patent applications displayed a 1-3% decrease in most of the advanced technology fields during the same period.

The analysis of the RPA-index<sup>2</sup> as visualised in Figure 2 displays the relative technological specialisation of South Korea in all twelve advanced technology fields in comparison with the EU27. The results confirm that Korea is highly/relatively specialised in several technological fields with outstanding specialisations in Big Data, Microelectronics and Photonics as well as - to a lesser extent - Internet of Things, Advanced Materials and Artificial Intelligence. On the contrary, the EU27 displayed weak/average specialisation in all aforementioned areas, except Internet of Things. The results of the RPA analysis indicate that South Korea has a rather strong specialisation in most of the advanced technologies.

<sup>2</sup> The RPA-Index illustrates the relative specialisation on a scale from -100 to +100, putting the share of a specific field in national applications in relation to the global average share.



Figure 2: Technological Specialisation RPA-Index of South Korea and EU27 (2018)

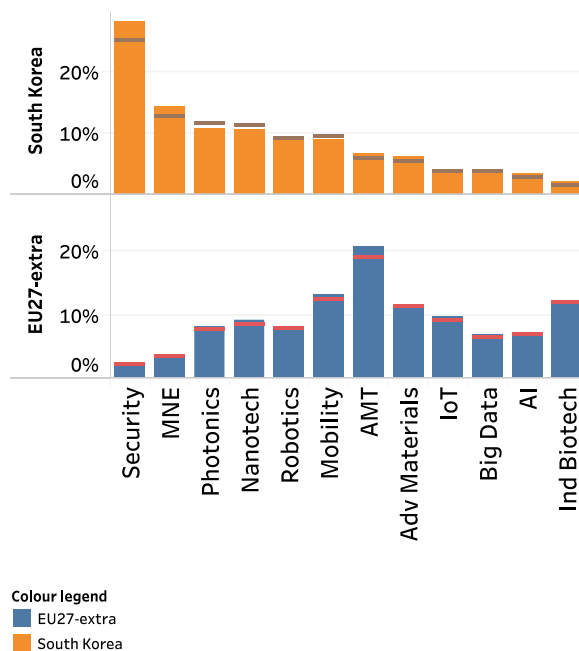


Source: Fraunhofer ISI, based on EPO PATSTAT

### 1.2 International competitiveness

Trade figures are a common indicator of global competitiveness, as they document the attractiveness of a country's products beyond the home market.

Figure 3: Export share in world total (2017-2018) (bars refer to 2018 value and the green and red lines indicate the status in 2017)



<sup>3</sup> Exports - Imports

Source : Fraunhofer ISI, based on UN COMTRADE

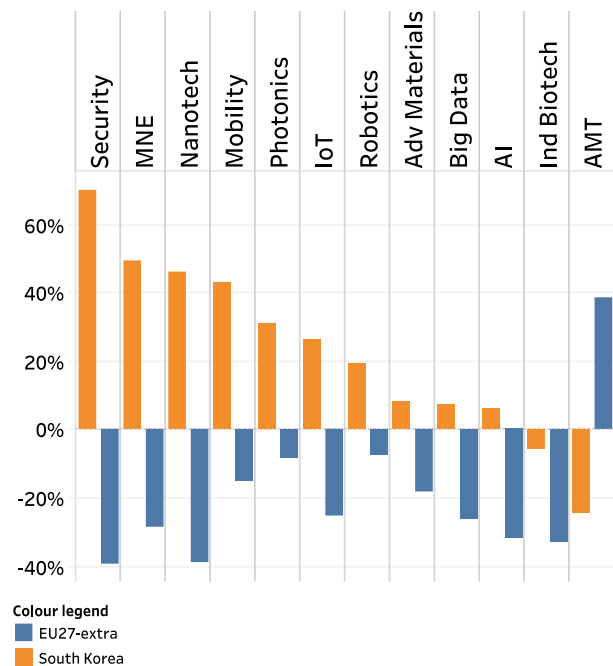
Note: "EU27-extra" refers to exports to non-EU countries, i.e. competitiveness-based exports outside the single market

Total exports provide evidence about a country's role as a producer and trade balance captures its sovereignty in certain areas of production.

Figure 3 displays the South Korean share of global exports related to advanced technologies in comparison with the EU27 for 2017-2018. The results demonstrate that the EU27 exports more products in most of the twelve types of advanced technologies than South Korea. However, South Korea displays a trade advantage in Security, followed by Micro- and nanoelectronics and Photonics compared to other fields of advanced technologies. In comparison with 2017, the global share of South Korean exports related to advanced technologies such as Nanotechnology, Photonics, Robotics, the Internet of Things, Big Data and Mobility, decreased. The shares of the European global exports displayed a slight drop down in half of the advanced technology fields during the same period.

Figure 4 visualises the trade balance<sup>3</sup> in relation to the total trade volume of South Korea and the EU27 countries in 2018.

Figure 4: Trade balance in relation to overall trade volume (exp. - imp.) (2018)



Source: Fraunhofer ISI, based on UN COMTRADE

Except for a marked export deficit in Advanced Manufacturing technologies, South Korea indicates a strong relative trade surplus relevant for all twelve advanced technologies. The results show a

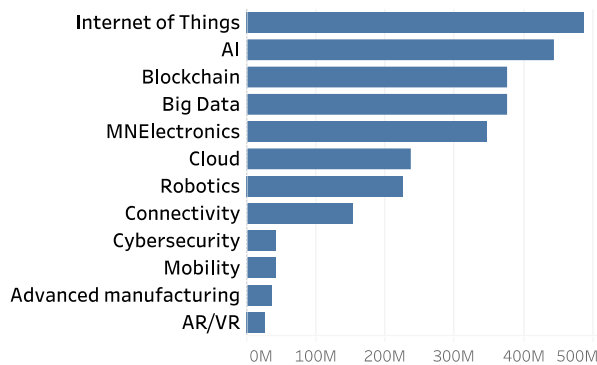


significant trade surplus in terms of total trade volume in Photonics, Micro- and nanoelectronics, followed by Nanotechnology. Meanwhile, the EU27 displays a strong trade deficit with regard to goods relevant for all twelve advanced technologies except for Advanced Manufacturing technology.

### 1.3 Investment activities

The following figures analyse private and venture capital (VC) investments in advanced technologies in South Korea. The results have to be interpreted with caution since the data from Korean startups and scaleups are limited. Figure 5 depicts the private equity and venture capital invested in South Korean firms over the period from 2015 to 2020.

Figure 5: Private equity and venture capital investment in South Korean firms (€ m) over the period from 2015-2020



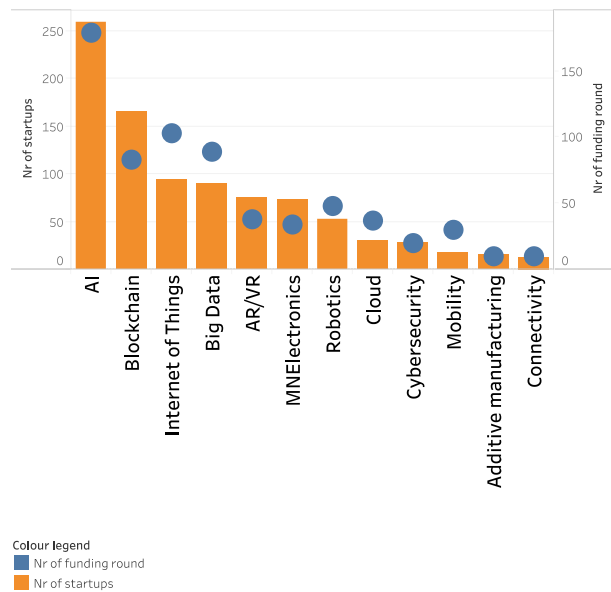
Source: Technopolis Group based on Crunchbase

Note: Data is not available for Advanced Materials, Nanotechnology, Industrial Biotechnology and Photonics.

The results indicate that South Korean tech firms received the highest private equity and venture capital investment in the fields of the **Internet of Things, Artificial Intelligence and Blockchain**. Some of the most relevant AI companies include for instance Riid which is an AI tutor solution provider that supports education and Daily Finance that is a FinTech company providing data tech solutions, digital wealth management and lead-generation services.

Figure 6 illustrates the number of VC-backed startups established after 2015 and the related funding rounds. The analysis shows again the strongest startup activity in AI, IoT and Blockchain.

Figure 6: Number of startups founded after 2015 and related funding rounds



Source: Technopolis Group based on Crunchbase

Note: Data is not available for Advanced Materials, Nanotechnology, Industrial Biotechnology and Photonics.

## Section 2

## 2. Key actors, policy and governance framework

### 2.1 Overview and policy context

Table 1: Overview of policy strategies and measures in support of advanced technologies

<b>Policy Strategy</b>		
<b>Title</b>	<b>Year</b>	<b>Funding</b>
Korean New Deal including:	2020 -2025	KRW 114.1 trillion (approximately €84.5 m)
Digital New Deal	2020 -2025	KRW 58.2 trillion (approximately €43.2 m)
Green New Deal	2020 -2025	KRW 73.4 trillion (approximately €54.5 m)
National Strategy for Artificial Intelligence, Ministry for Science and ICT	2019	
5G+ Strategy, Ministry of Science and ICT	2020	
Renewable Energy 2030 Implementation Plan (RE 2030)	2017	
Korea e-Government Master Plan 2020- ENJO	2017	
Manufacturing Industry Innovation 3.0 strategy	2017	
Creative economy action plan	2013	
Long-term Vision for Science and Technology Development Toward 2025- Vision 2025	1999	
<b>Policy Measures</b>		
<b>Title</b>	<b>Year</b>	<b>Funding</b>
Stronger Integration of DNA (Data, Network and Artificial Intelligence) throughout the economy with projects: Data Ecosystem; Expanding the integration of 5G and AI into industries; Making a smart government that utilises 5G and AI; advancing cybersecurity	2020-2025	KRW 38.5 trillion (approximately €29 m)
Digital Trade Foundation on Blockchain (Ministry of Finance and Ministry of Commerce)	2019	Funding of Blockchain platform to digitise finance and trade ecosystem in South Korea





Ministry of Science and ICT R&D Investments in Big Data, AI, 5G	2020	KRW 1.7 trillion (approximately €1.3 m)
Ministry of Science and ICT R&D Investments in semiconductors, bio-health, future cars	2020	KRW 3 trillion (approximately €2.2 m)
Ministry of Science and ICT investment in Level 4 automated vehicles	2021-2027	KRW 1.1 trillion (approximately €0.8 m)
ICT Growth Program/ Supporting ICT unicorns	2020-2025	Funding of 50 startups by 2025 to support their growth

Source: authors

Korea, as the rest of the world, was struck by the COVID-19 pandemic but was able to contain the spread of the virus and to limit the estimated fall in GDP to just over 1% in 2020, the smallest decline in the OECD countries. Activity is picking up on the back of a rebound in consumption, bolstered by large government transfers to households, and a recovery in exports, led by the production of semiconductors. GDP is projected to grow at about 3% per year in 2021 and 2022, if the vaccination campaign ensures the population against a new wave of the pandemic<sup>4</sup>.

In July 2020 the government announced a major new policy – the Korean New Deal<sup>5</sup> – with the goal to transform the country from a fast follower into a first mover and to address the structural changes driven by the pandemic. The New Deal is structured in 3 pillars, the Digital New Deal, the Green New Deal and the Stronger Safety Net, an overarching policy to strengthen the employment and welfare systems. The government announced plans to invest KRW 114.1 trillion (approximately €84.5 m) over 5 years to support the creation of 1.9 million jobs, of which 903 000 jobs from the Digital New Deal.

Korea is also remarkable for its swift and effective use of advanced digital tools to contain COVID-19 without shutting down the economy. The country used artificial intelligence to enable fast testing, mobile apps to provide real-time information on locations visited by patients diagnosed with COVID-19 and supported the diffusion of (contactless) lifestyle in order to limit the spread of the virus<sup>6</sup>.

South Korea is committed to a vision of technology-driven economic development<sup>7</sup> supported by strong scientific, research and innovation policies. Since 1999, when the first 'Vision 2025 for Science and Technology'<sup>8</sup> was

launched, the technology industry has helped driving economic growth. The country's investment in R&D is among the highest in the world: according to OECD<sup>9</sup>, gross domestic research spending was 4.64% of GDP in 2019 (against 2.1% in the EU27), with the lion's share generated by private research investment (3.73% of GDP in 2019, against 1.39% in the EU27). South Korea has a strong ICT industry located in the region around the capital Seoul, dominated by multinational conglomerates (the chaebol) such as Samsung. This is coherent with the high level of specialisation of the country in advanced technologies such as Big Data, Microelectronics and Artificial Intelligence shown by our patents' analysis.

## 2.2 Government policies towards technology development and adoption

With the Digital New Deal, Korea aims to further strengthen its digital capacity based on its competitive edge in ICT, thereby promoting innovation and dynamics throughout the economy. The goal is to promote the data-driven economy including the collection, standardisation, processing and combining of data, and ultimately to secure a competitive advantage for the country by creating new industries and accelerating the digital transition of key industries. The Digital New Deal is articulated in the following main domains implemented through leading projects:

- Stronger integration of DNA (Data, Network and AI) throughout the economy
- Digitalisation of education infrastructure
- Fostering the 'contact-free' (contactless) industries

<sup>4</sup> OECD Korea Economic Snapshot, December 2020

<sup>5</sup> Press Releases (moef.go.kr)

<sup>6</sup> Korea: Roadmap to narrow digital gaps – ECOSCOPE (oecdecoscope.blog)

<sup>7</sup> <https://k-erc.eu/for-european-researchers/korea-rd-policy-and-programmes>

<sup>8</sup> Public Policy in the Asian Century, Springer, 2017

<sup>9</sup> OECD, Main science and technology indicators database, 2021



- Digitalisation of Social Overhead Capital (SOC) (including smart logistics and digital innovation in urban spaces)

These projects build on and continue from the policy initiatives previously undertaken in the past years.

At the same time, South Korea's Green New Deal aims to achieve net-zero emissions and accelerate the transition towards a low-carbon and green economy. To this end, the government plans to build eco-friendly energy infrastructures that promote energy saving and an increased use of renewable energy. The mobility, energy, technology and other types of climate-friendly industries will be strengthened in all possible ways.

In parallel, the New Deal will invest in skills and training and in building a better social and employment safety net.

The Ministry of Science and ICT (MSIT) is the leading actor for technology policies, responsible for the new AI and 5G+ strategies as well as coordinating other ministries to foster industrial ecosystems for emerging technologies. The Ministry's R&D investment plans for ICT technologies in 2020 are very high<sup>10</sup> and do not seem to be threatened by the Covid-19 crisis. Priorities for innovation-led growth, confirmed also in the Ministry plans for 2021, center around DNA (data, network and AI) and BIG 3 (bio-health, future cars and system semiconductors)<sup>11</sup>. Research areas include 5G technologies (where Korea is a world leader) as well as next generation smartphones, network equipment, augmented reality and virtual reality devices, connected robots and data security. Korea is also starting research in 6G.

Korea participates in global research networks and the government has reached an agreement with the EU to cooperate on research related to ICT, nanotechnology, health/bio, energy and satellite navigation<sup>12</sup>.

### **Stronger Integration of DNA throughout the Economy**

The most important focus area of the Digital New Deal is the Stronger Integration of DNA throughout the Economy which aims at promoting the use and integration of data, the 5G network

<sup>10</sup><http://www.koreaherald.com/view.php?ud=20200101000085>

<sup>11</sup><https://www.msit.go.kr/english/msipContents/contentsView.do?cateId=tst56&artId=2869042>

<sup>12</sup>[http://ec.europa.eu/research/iscp/pdf/policy/korea\\_revie w.pdf](http://ec.europa.eu/research/iscp/pdf/policy/korea_revie w.pdf)

<sup>13</sup><http://www.koreaherald.com/view.php?ud=20200101000085>

and AI in all sectors to create new digital products and services and enhance the productivity of the Korean economy, with a total funding of KRW 38.5 trillion (approximately €28.6 m) of which 31.9 trillion (approximately €23.7 m) from the public treasury, with the expectation to create 567 000 jobs. The main strands of activity include:

- Developing the data ecosystem ('data dam' collecting, disclosing and utilising datasets);
- Expanding the integration of 5G and AI into industries;
- Making a smart government that utilises 5G and AI;
- Advancing cybersecurity.

### **National Strategy for Artificial Intelligence<sup>13</sup>**

The Korean government launched the National Strategy for AI on December 17th, 2019. With the vision of 'Toward AI World Leader beyond IT', South Korea aims to achieve digital competitiveness, create huge economic effect of AI, and improve the quality of life for people by 2030. The strategy consists of 100 government-wide action tasks under 9 strategies in three areas of AI ecosystem, AI utilization and people-centered AI.

The South Korean government will spend \$3.9 bn (approximately €3.3 bn) of its 2020 budget on AI to boost its R&D and infrastructural growth<sup>14</sup>.

In response to the shortage of AI engineers in the country, the Korean government plans to create at least six new AI schools by 2020 and educate more than 5 000 high quality Korean engineers<sup>15</sup>.

### **5G+ Strategy<sup>16</sup>**

South Korea was the first country in the world to provide commercial 5G services in April 2019<sup>17</sup>. In one year, 109 000 base stations have been installed and 5G subscribers have reached 5 million. Building on these achievements, the Ministry of Science and ICT launched in March 2020 a new 5G+ strategy with the goal to continue leading the global 5G market and create a safe and convenient 5G environment in South Korea. The strategy coordinates multiple actions lines with a focus on integrating advanced devices and innovative services connecting all things to the 5G

<sup>14</sup><https://www.globalgovernmentforum.com/south-korea-commits-us4bn-to-bolster-tech-sectors/>

<sup>15</sup><https://www.forbes.com/sites/cognitiveworld/2018/09/07/is-south-korea-poised-to-be-a-leader-in-ai/#3d4a7ccffa2f>

<sup>16</sup>[http://english.msip.go.kr/cms/english/pl/policies2/\\_icsFiles/afieldfile/2020/01/20/5G%20plus%20Strategy%20to%20Realize%20Innovative%20Growth.pdf](http://english.msip.go.kr/cms/english/pl/policies2/_icsFiles/afieldfile/2020/01/20/5G%20plus%20Strategy%20to%20Realize%20Innovative%20Growth.pdf)

<sup>17</sup><https://en.yna.co.kr/view/AEN20200402005100320?section=science/science>



infrastructure. Specifically, it plans to focus efforts on nurturing 10 core industries and 5 core services based on 5G networks with a goal of capturing 15 percent of the global 5G market and a production volume of KRW 180 tn (approximately €133 m) by 2026. To this end, the public sector will support the rapid growth of the 5G market and accelerate private sector investment. At the same time, it will assume an active role in addressing institutional barriers to innovative convergence services.

### **ICT Growth Plan to foster Korean ICT unicorns**

The Ministry of Science and ICT (MSIT) announced in February 2020 the programme 'ICT growth' with the goal to expand support to promising startups in ICT, such as the data, network and AI sectors<sup>18</sup>. The idea is to shift support policies from the early facilitation of startups, to fostering their development and helping them to grow into unicorns (€1 billion revenues companies) in the foreseeable future, which multiplies the job creation effect and economic impact.

To do so, MSIT signed memoranda of understanding (MoUs) with four institutions (Korea Credit Guarantee Fund, Korea Telecommunications Operators Association, Seoul Guarantee Insurance, K-ICT Born 2 Global Center). The program will select about 15 companies from 2020 and will select about 50 companies in total by 2025 to provide support. The selected companies will receive support for up to three years. Funding guarantees, support for global expansion, support for performance guarantee insurance, and investment promotion will be included in the support package.

### **Renewable Energy 2030 Implementation Plan (RE 2030)**

The Korean government announced the 'RE 2030 plan' in December 2017, with the goal to increase renewable energy's share of generation capacity to 20 percent from the current 7 percent by 2030<sup>19</sup>. This plan includes the goals of easing the dependence on nuclear power and coal power generation in the total power generation sources and increasing the proportion of eco-friendly renewable energy. Daejeon City collaborated with Korea Institute of Energy Research (KIER), which possesses its own independent technologies. KIER has developed a platform of solar energy estimator for Daejeon (SEED), which will be used by the citizens of Daejeon and solar photovoltaics (PV) companies conveniently as KIER can estimate

solar energy with the world's best accuracy from satellite observations<sup>20</sup>.

### **South Korea e-Government Master Plan 2020- ENJOY**

The 2020 e-Government Master Plan aims at leveraging intelligent information technologies to build a new ecosystem, allowing the government, businesses, civic groups and individuals to better collaborate, foster innovation and achieve sustainable development. A priority is the provision of 'enjoyable' services to citizens. The 'ENJOY' is comprised of 5 strategies corresponding to the 5 letters of the acronym, namely: E-Enhancing Digital Experiences, through the re-design of government services; N-New building Intelligent Government, through cognition and prediction-based intelligent public administration; J-Joining, that is creating a new e-Government ecosystem co-existing with private actors; O-Organising a Trust-based and future-oriented infrastructure for government; Y- Yes!, meaning Korea taking the lead in the global e-government environment.

### **Manufacturing Industry Innovation 3.0 strategy (Industry 4.0)**

The Manufacturing Industry Innovation 3.0 strategy was introduced in June 2014 as part of Korea's Creative Economy Strategy<sup>21</sup>. Manufacturing 3.0 (broadly corresponding to the European definition of Industry 4.0) focuses on the concept of a smart factory collectively embracing automation, data exchange and enhanced manufacturing technologies throughout the manufacturing process, incorporating both short- and long-term technological plans. By 2018, Korea accounted for roughly 4.1% of all installed additive manufacturing systems in the world<sup>22</sup>.

The strategy was revised in 2017, to keep pace with the fast progress of digitalisation and automation. The goal was increased from the development of 10 000 smart factories by 2020 to 30 000 smart factories by 2025, based on the agreement between the private and public stakeholders. Korea's Ministry of Trade, Industry and Energy (MOTIE) also increased support to small and medium-sized enterprises, with the view toward expanding smart factory technologies to local SMEs.

<sup>18</sup><https://www.msit.go.kr/english/msipContents/contentsVieW.do?cateId=tst56&artId=2805482>

<sup>19</sup> [https://www.renewable-ei.org/pdfdownload/activities/S3\\_Sanghoon%20Lee.pdf](https://www.renewable-ei.org/pdfdownload/activities/S3_Sanghoon%20Lee.pdf)

<sup>20</sup> (Kim, et al., 2019).

<sup>21</sup> [https://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/2014\\_Jul-Aug\\_p8.pdf](https://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/2014_Jul-Aug_p8.pdf)

<sup>22</sup><https://www.export.gov/apex/article2?id=Korea-Manufacturing-Technology-Smart-Factory>



In the context of the new AI strategy, South Korea has added plans to build 2 000 AI-based factories by 2030, which are a more advanced version of smart factories, and implement manufacturing innovation laws. By collecting data from smart factories, the government will build a data centre to support AI-based services and foster smart manufacturing facilities that embed key software, robots and sensors.

2.3 Government initiatives to foster specific advanced technologies

The national policy strategies for technology development are complemented by multiple initiatives and investments based on public-private collaboration, particularly at city level.

### Investments in 5G and self-driving Cars

In April 2020, the Ministry of science and ICT announced investments of KRW 1.1 trillion (approximately €0.8 m) in the development of technologies for level 4 automated vehicles that is self-driving cars, to lead growth in the automobile market. The Ministry plans to foster a supporting ecosystem of services through the collaboration between private and public actors, involving cities directly.

For example, the City of Daegu is participating in a government project that aims to develop services that would create high-tech infrastructure based on 5G technology, allowing autonomous vehicles that are equipped with AI functions<sup>23</sup>.

SK Telecom is planning to build '5G Cluster', an advanced 5G environment with cutting edge ICT including AR, VR and AI. The plan is to build '5G clusters' in business districts, parks and factories to provide differentiated services to consumer and business industries.

### Internet of Things (IOT) to deploy smart meters

The Internet of Things (IoT) is changing everything from utilities to subways to buildings as more municipalities and companies capitalise on new computing and network technologies in South Korea's small and big cities.

Gochang was the first city in South Korea to deploy smart water meters county-wide in one-go. The deployment began in the year 2017<sup>24</sup> in collaboration with Australia-based IoT firm Freestyle Technology, which supplied all the necessary equipment, from the smart meters to repeaters. Taebaek City and Yeongwol county of

the same province are also moving to install smart water meters.

In a similar move, the state-run Korea Electric Power Corporation's (KEPCO) Advanced Metering Infrastructure project monitors electricity usage in real time. The goal is to install around 22.5 million intelligent electricity meters in households with complete national coverage by 2020<sup>25</sup>.

### Digital Trade Foundation on Blockchain

South Korea is particularly active in the field of Blockchain technologies. In 2019, the Ministry of Trade announced a new initiative aiming to establish a digital trade foundation to reduce the costs of trade by using Blockchain technology<sup>26</sup>. Under the plan, technologies such as Blockchain, Big Data and AI, will be applied to digitise the entire Korean trade finance ecosystem by the year 2021. As part of this, the government is planning to build a digital trading platform that can be easily and conveniently used in all stages of export, such as contracts, customs and logistics.

South Korean major Banks, including Shinhan and NH Nonghyup, have joined Government-Backed Blockchain ID Initiative that aims to secure and share personal information using Blockchain. The project, which is backed by the Ministry of Science and ICT and the Korea Internet & Security Agency (KISA), aims to develop a mobile product that will allow for the secure storing of personal identification information with Blockchain technology<sup>27</sup>.

### Blockchain and Cryptocurrencies

In March 2020, the South Korean National Assembly passed new legislation that will provide a framework for the regulation and legalisation of cryptocurrencies and crypto exchanges<sup>28</sup>. South Korea was strongly involved in the cryptocurrency craze in 2017, with a high number of investors in cryptocurrencies, like Bitcoin, Ethereum and other systems. The country's largest city, Seoul, led a government initiative to introduce its own cryptocurrency — S-coin. At the time the government introduced regulations to control cryptocurrencies, but the new legislation shows a change and new acceptance of Blockchain-based currencies.

South Korean Internet giant Kakao has announced that Binance (leading crypto exchange) has joined the Klaytn Governance Council to partake in the

<sup>23</sup><http://koreabizwire.com/daegu-to-establish-5g-based-services/119140>

<sup>24</sup><https://utechnologies.co.za/wp-content/uploads/2019/01/IoT-ML-and-Big-Data.pdf>

<sup>25</sup><https://www.zdnet.com/article/arm-and-kepco-to-co-develop-secure-one-chip-for-iot-meter-project/>

<sup>26</sup> <https://blockpublisher.com/south-korea-to-launch-a-digital-trade-foundation-on-blockchain/>

<sup>27</sup> <https://www.cryptonewspoint.com/major-korean-banks-join-government-backed-blockchain-id-initiative/>

<sup>28</sup> <https://techcrunch.com/2020/03/05/south-korea-passes-one-of-the-worlds-first-comprehensive-cryptocurrency-laws/>



leading Blockchain project led by Kakao for further developments in bringing mass Blockchain adoption globally<sup>29</sup>.

### **Augmented & Virtual Reality (AR/VR) synergize with AI**

Korea is one of the pioneers in adopting technologies of virtual reality, augmented reality and artificial intelligence in the home shopping industry and has been significantly expanding over the past decade. The pioneers of the industry are mainly affiliations of local giants, such as Lotte and Hyundai. Among the major players Hyundai, in collaboration with the mobile carrier KT, revealed a 'VR fitting service' that enables customers to virtually try fashion items on. Hyundai also launched a virtual makeup service in collaboration with the China-based company of AR makeup app Meitu.

AR/VR technologies are also being applied in the cultural industry, finding new ways to provide access to cultural assets. For example, the Donuimun Gate of the Joseon dynasty in South Korea, destroyed in 1915, has been restored using augmented and virtual reality<sup>30</sup>. The Cultural Heritage Administration, the Seoul Metropolitan Government and Woomi Construction, together with Cheil Worldwide, have joined forces to implement AR to allow people to experience the digitally restored gate using a mobile app.

### **Improving leadership in Robotics**

South Korea was the fourth-largest market in the world for industrial robots in 2018, according to the International Federation of Robotics, with the second highest density of industrial robots installed<sup>31</sup> after Singapore. In the country, there are around 710 robots per 10,000 workers in the manufacturing segment, far above the global average of 85. The government plans to foster 20 major Robotics companies with the goal to transform the Robotics industry into the fourth-largest player in the world by 2023<sup>32</sup>.

The government's plan mainly focuses on using robots in a wider range of areas from non-manufacturing segments to service industries for the elderly and the disabled. In 2019, the government announced an investment of €231 m in developing service-oriented robots for areas

such as healthcare, rehabilitation, and disaster response. In addition, the Korean government plans to leverage the convergence of Robotics with new technologies, such as artificial intelligence and 5G.

### **Nano Technology for five major new industries**

The Ministry of Science and ICT plans to invest 600 billion won (€452 m) for 10 years from 2020 to 2030<sup>33</sup> in nanotechnologies, to implement the 'Third National Nanotechnology Map (2018-2027)' with the collaboration of 10 related ministries. In addition, the Ministry of Trade, Industry and Energy will go ahead with the development of nanomaterials and process technologies for the five major new industries such as electric vehicles, autonomous cars, IoT appliances, new energy industries, bio-health, semiconductors and displays. In the long term, the ministry will develop 30 future technologies based on nanotechnology. The 30 technologies include personal portable artificial intelligence at the level of human brains, a communication environment where speed is unlimited, a drone which flies without charge, an electric vehicle that can run from Seoul to Busan on a five-minute single charge, an explosion-free battery and artificial organs without a rejection.

### **South Korea Advanced Materials Plan**

South Korea's Advanced Materials strategy is being implemented through the Fourth Basic Plan with a timeframe of 2017-2021. The main goal is to position South Korea amongst the world's top exporters in advanced materials and components<sup>34</sup>. This is articulated in four main objectives as follows: a) Develop 100 new materials and component technologies by 2025 and be recognised as one of the top four materials and component exporters in the world, b) Enhance support for restructuring so that industry is ready for the 4th Industrial Revolution, c) Build a high efficiency, eco-friendly production system for the materials and component industry to support the efficiency of SMEs and the development of eco-friendly methods of sourcing core materials and finally d) Strengthen the global competitiveness of materials and component companies.

<sup>29</sup><https://www.binance.com/en/blog/393225578914873344/Ka-kaos-Klaytn-Welcomes-Binance-to-its-Global-Blockchain-Council>

<sup>30</sup> <https://www.thedrum.com/news/2019/09/17/south-korea-restores-historic-gate-with-augmented-and-virtual-reality-promote-lost>

<sup>31</sup> <https://ifr.org/ifr-press-releases/news/robot-investment-reaches-record-16.5-billion-usd>

<sup>32</sup><http://www.koreaherald.com/view.php?ud=20190322000576>

<sup>33</sup><http://www.businesskorea.co.kr/news/articleView.html?idxno=23570>

<sup>34</sup>[https://admin.ktn-uk.co.uk/app/uploads/2019/03/216\\_KTN\\_SouthKorea\\_AdvancedMaterialsV2.pdf](https://admin.ktn-uk.co.uk/app/uploads/2019/03/216_KTN_SouthKorea_AdvancedMaterialsV2.pdf)



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## About the 'Advanced Technologies for Industry' project

The EU's industrial policy strategy promotes the creation of a competitive European industry. In order to properly support the implementation of policies and initiatives, a systematic monitoring of technological trends and reliable, up-to-date data on advanced technologies is needed. To this end, the Advanced Technologies for Industry (ATI) project has been set up. The project provides policymakers, industry representatives and academia with:

- Statistical data on the production and use of advanced technologies including enabling conditions such as skills, investment or entrepreneurship;
- Analytical reports such as on technological trends, sectoral insights and products;
- Analyses of policy measures and policy tools related to the uptake of advanced technologies;
- Analysis of technological trends in competing economies such as in the US, China or Japan;
- Access to technology centres and innovation hubs across EU countries.

You may find more information about the 16 technologies here: <https://ati.ec.europa.eu>.

The project is undertaken on behalf of the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and SMEs Executive Agency (EISMEA) by IDC, Technopolis Group, Capgemini, Fraunhofer, IDEA Consult and NESTA.

