Korea Economic Institute of America

ACADEMIC PAPER SERIES

KEI KOREA ECONOMIC INSTITUTE OF AMERICA | 한미경제연구소

MARCH 23, 2020

SOUTH KOREA'S 5G AMBITIONS

By Clara Gillispie

Abstract

Under President Moon Jae-in, South Korea has set an ambitious target to move from being "first in the world" in the race to 5G to "first in global quality." Yet, while a range of industry and government stakeholders are investing heavily in making this vision a reality, a number of factors are likely to weigh on whether or not these efforts yield significant results. These include uncertainties about how to further accelerate development in ways that lead to better returns on investments, and about how to navigate complex geopolitical considerations, including ongoing debates about Huawei's involvement in 5G network infrastructure. Each of these areas will, in turn, require domestic stakeholders to make complex assessments about potential tradeoffs and risks. Thus, this paper assesses South Korea's emerging 5G era at the one-year mark, and highlights key successes, setbacks, and ongoing challenges. Building on these findings, the paper concludes by offering several potential scenarios for future development, and suggestions for ways forward.

Key Words: *Republic of Korea, 5G, global markets, innovation, Huawei*

Introduction

On April 3, 2019, South Korea became the first country in the world to launch a nationwide 5G network. In coordination with the Ministry of Science and ICT (MSIT), the country's three major telecommunication companies (telecoms)—SK Telecom, KT Corporation, and LG U+—had agreed to roll-out their services simultaneously; this was a move designed to "avoid heated competition" among the three firms while also sending a message internationally about the innovative strengths of South Korean industry.[1] Although critics initially derided the launch as relatively shallow, the interim months have seen these telecoms make substantial investments in additional infrastructure and extensive consumer marketing campaigns. As a result, South Korea now has close to 5 million 5G subscribers.[2] And building on this foundation, President Moon Jae-in has articulated an ambitious plan for the country to play an ever-increasing role in the global 5G market, capturing a 15% share by 2026.[3]

What is at stake in the race to deploy a new technical standard? As 5G has taken shape over the past decade, it has become increasingly clear that its capabilities could dramatically outstrip existing standards—under some conditions, delivering speeds 20 times faster than 4G LTE and with both greater capacity for managing concurrent tasks and for providing enhanced security.[4] Consequentially, several successive South Korean presidential administrations have expressed interest in its potential to spur new economic growth, better safeguard sensitive assets, and improve overall standards of living. As has been well-documented, President Moon Jae-in, in particular, has sought to associate 5G's potential with his policy agenda for inclusive economic growth;[5] this includes regularly noting the ways in which investing in 5G can contribute to creating high-quality, high-paying jobs, and even referring to the standard as "the infrastructure for innovative growth in the Republic of Korea. "[6]

Yet, it would be inappropriate to paint this picture as exclusively rosy, and in doing so ignore anxieties that have also influenced decision-makers. Despite the fact that South Korea regularly ranks as one the world's most innovative economies, over the past decade its top high-tech firms have experienced a number of market setbacks and (with a few exceptions) South Korean

Clara Gillispie is a Senior Advisor at the National Bureau of Asian Research. The views expressed are solely those of the author and do not necessarily reflect the views of any organizations they are affiliated with. This paper is the hundred-and-twelfth in KEI's Academic Paper Series. As part of this program, KEI commissions and distributes approximately ten papers per year on original subjects of current interest to over 5,000 Korea watchers, government officials, think tank experts, and scholars around the United States and the world. At the end of the year, these papers are compiled and published in KEI's On Korea volume. For more information, please visit www.keia.org/ aps_on_korea.

Korea Economic Institute of America
1800 K Street, NW, Suite 300
Washington, DC 20006
www.keia.org

applications developed for 4G LTE-enabled devices have failed to corner any notable share of the global market. As a partial explanation for this phenomena, a 2016 study by MSIT cited factors such as chronic industry underinvestment in research and development, an overly rigid regulatory environment, and a lack of quality data infrastructure as undermining the country's ability to take on leadership in emerging technology fields.[7] A slightly different (though not necessarily competing) explanation is that in a handful of important areas, South Korean industry and policy simply bet big on what was worth prioritizing, and ultimately bet wrong—with implications for lost time and market share.[8]

The collective result of the considerations above has been that by the time of the MSIT study's release in 2016, both government and industry in South Korea were already making sizeable investments aimed at gaining a competitive edge via an early bet on 5G. And for early adopters, the stakes of getting development choices wrong can be as high as getting them right.

Thus, this paper explores how South Korea is navigating its emerging 5G era. This paper begins by noting key considerations and stakeholders that have shaped South Korea's 5G development to date. It then explores early findings—including successes, challenges, and ongoing uncertainties—at the roughly one-year mark of the launch of the country's 5G network. In doing so, it seeks to identify potential bottlenecks to continued development and concerns that policymakers and industry may need to address over the coming year. It concludes by suggesting a number of scenarios for future development and potential ways forward.

Background & Key Stakeholders

South Korea officially entered the race to 5G in 2008. Over the next several years, successive governments entered into numerous memorandums of understanding (MOUs) and collaborative agreements with domestic and international counterparts, ultimately with the twin goals of exploring the technical standard's potential and promoting a globally agreed upon set of rules and best practices for its development.

This later idea—ensuring global interoperability—is especially critical in a South Korean context. South Korea has the world's twelfth largest economy despite accounting for less than 1% of the global population. This achievement is due in no small part to a multi-decade emphasis by domestic industry and policymakers on export-oriented growth strategies[9]—importantly, strategies that have matched the application of industrial policy with efforts to reduce trade barriers trade and to encourage the development of long-term partnerships with foreign counterparts.

Interoperability is especially vital over the coming decade as the vast majority of growth in demand for digital goods and services is anticipated to happen outside of South Korea. China, India, and the collective economies of ASEAN are all currently on track to realize exponential growth in the size of their respective digital economies, which could easily minimize the long-term benefit of investing in standards that are used in South Korea but fail to align with other markets. Meanwhile, while not experiencing the same overall growth rates, the United States, Japan, and the European Union are anticipated to remain at the forefront of developing and implementing next generation digital architecture; they, much like South Korea, also hope that this lends them some influence in shaping how adoption proceeds globally. Thus, part of the challenge for South Korea is not only being the first to market, but also making the case that South Korea's development path has the best potential for good outcomes.

Understanding this context, 5G development in South Korea functions as a complex interaction of a number of stakeholders. This includes a range of government bodies, telecoms, vendors, researchers, and other stakeholders working in industry, research, and civil society. Table 1 details these stakeholders in greater depth, while Table 2 highlights how Moon, in particular, has envisioned engaging these stakeholders in his own flagship 5G initiative, the 5G+ Strategy. Meanwhile, bringing together stakeholders from across each of these groups are a number of government-driven and industry-driven umbrella initiatives. These include the 5G Strategy Promotion Committee (which was launched in 2015 to discuss updates on the state of development as well as to hear private sector concerns) and the 5G Forum (which acts as a venue for public-private collaboration on specific projects). Seoul also regularly seeks to elevate attention to 5G issues within larger strategic dialogues, such as its recent ASEAN-Republic of Korea Commemorative Summit and during various APEC ministerials and working group meetings.[10]

Table 1. South Korea's domestic 5G ecosystem

Category	Roles and specific actors
Blue House	Agenda setting and strategic coordination. While research into 5G was officially launched under President Lee Myung-bak, Presidents Park Geun-Hye and Moon Jae-in have played important agenda-setting roles in how the country's 5G development has unfolded. Official committees championed by the Blue House, such as the Presidential Committee on the Fourth Industrial Revolution, have also adopted, advanced, and redirected 5G development priorities, such as by encouraging greater focus on needs linked to artificial intelligence.
Government Ministries	Grant making, regulation, external stakeholder coordination, and other development roles. The Moon administration has singled out that at least ten operate in this space, including the Ministry of Trade, Industry and Energy; the Ministry of Economy and Finance; the Ministry of Employment and Labor; and others, with the Ministry of Science and ICT often empowered as a coordinating body.
National Assembly	Over the past decade, South Korea's legislative body has played both a targeted role in 5G development (e.g. providing tax incentives for developers, allocating budgets for ministry projects) and a broader facilitating role, such as through passing or otherwise revising laws to address potential barriers to successful commercialization.
Carriers	Ultimately responsible for the physical infrastructure associated with 5G networks (such as base stations and core equipment) as well as operating data services and plans related to their use. KT Corporation, SK Telecom, and LG U+ are the three major players in this space for 5G.
Vendors	Produce base stations and other network equipment; vendors who provide various equipment for South Korea's 5G network architecture include Samsung as well as non-Korean firms such as Ericsson, Nokia, Qualcomm, Intel, and (more controversially) Huawei.
Research Institutes	Universities such as Seoul National University and Hanyang University are undertaking large-scale R&D projects related to 5G-enabled technologies, such as for digital healthcare. Think tanks such as KDI and KIEP also have formal and informal advisory roles in evaluating public- and private-sector approaches and offering their own recommendations.
Additional Private Sector Partners	Hyundai and other chaebols are investing heavily in developing specific products and services built on 5G, such as autonomous vehicles. While small and medium enterprises have long struggled to gain ground in South Korea's high-tech space, increasing their participation in and access to 5G technologies is a stated goal of the Moon administration's 5G+ Strategy. And, while many of the products and services currently on the market target business-to-consumer sales, business-to-business 5G products is anticipated to be an important growth area in the coming years, which could spur on new kinds of firms as well as creative partnership arrangements.
Others	Others with more episodic involvement include labor unions, trade associations, and civil society groups (who may have a specific focus on information technology or who are otherwise engaged in fields where new 5G-enabled technologies are being proposed to address systemic needs, i.e. eldercare and other healthcare). Examples include the Federation of Korean Industries, the American Chamber of Commerce in Korea, and the Korean Federation of Trade Unions, among others.

Table 2. President Moon's "5G+ Strategy"

FOCUS ON FIVE "CORE SERVICES" & TEN "CORE INDUSTRIES"

- *Services:* Immerse content, autonomous vehicles, smart manufacturing, smart cities, and digital healthcare.
- *Industries:* Next-generation smartphones, network equipment, information security, edge computing, vehicle-to-everything communication, robots, drones, intelligent CCTV, wearable devices, and virtual and augmented reality headsets.

AIMS	METHODS
Invest in the public sector	Support demonstration of the five core services
	Support demand creation
	Deploy 5G in public services
	Create a 5G-based smart city
Encourage private investment	Provide tax credits and other fiscal incentives
	Establish 5G testbeds and demonstration infrastructure
	Support SME efforts to deploy 5G technologies
	Support immersive content market
	Support productivity innovations in leading industries
Support greater utilization through "system maintenance"	Reduce costs and improve flexibility in service plans
	Secure radio wave resources and improve regulations
	Create safest user environment
	Support regulatory innovation
	Bridge digital divides and protect users
Establish a domestic 5G industrial base	Secure global leading technologies
	Strengthen the competitiveness of the information security industry in South Korea
	Establish a foundation for a 5G+ Korean Wave
	Support the establishment of a 5G startup ecosystem
Support South Korean industries in "going global"	Promote globalization of 5G services
	Take the lead in global 5G standardization
	Align 5G policymaking with international cooperation initiatives

Source: Ministry of Science and ICT, "Science, Technology & ICT Newsletter (NO.41)," https://english.msit.go.kr/english/msipContents/contentsView.do?cateId=msse44&artId=2009058

Collectively, these efforts represent what is to some extent a gamble. They are a bet on the idea that the time, effort, and resources spent on 5G development will be worth it given that, ultimately, there are no guarantees. And while South Korea has been criticized for not moving quickly enough on structural reforms that can help to better meet its development goals, even the most careful planning can be derailed or turn out to be based faulty assumptions. The next section, thus, examines the current state-of-play in this bet.

South Korea's 5g Era at the One-Year Mark

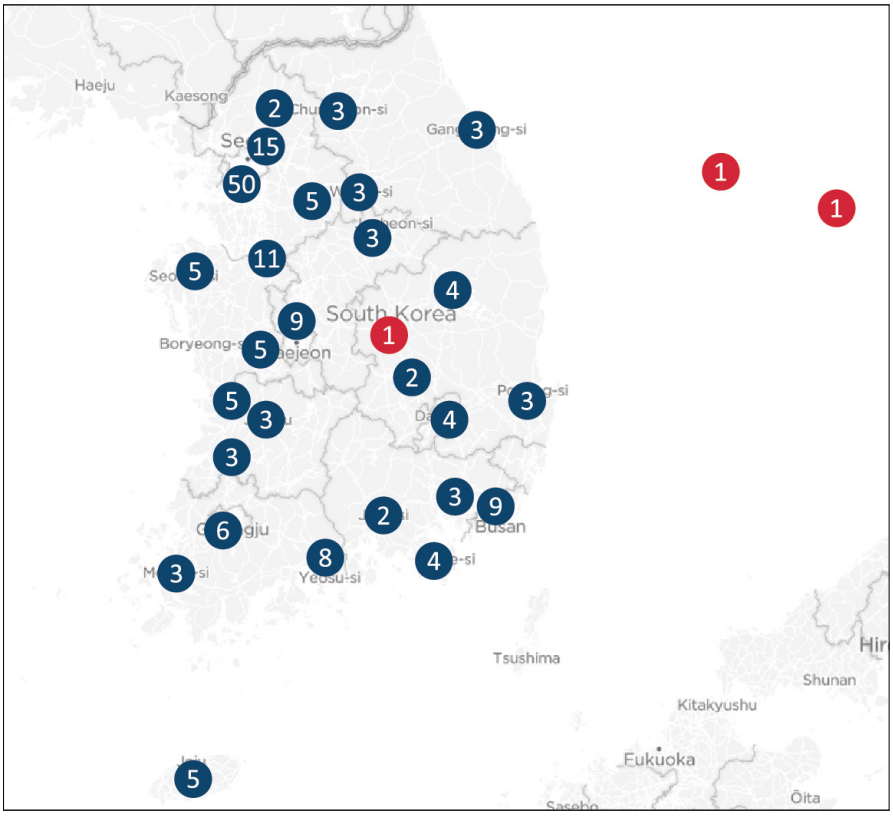
Bringing 5G to Scale

To date, has South Korea's early bet on 5G paid off? In terms of bringing a domestic network to scale, it has been a resounding success. As of the end of 2019, 5G services are available in 85 South Korean cities, and the Moon administration has set a target of reaching 100% domestic coverage within the next 2-3 years. And, as Map 1 illustrates, the country's major telecoms have rolled out significant infrastructure across areas of South

Korea, which Strategy Analytics has estimated covers areas where 90% of the country's population resides.[11] Though press reporting from the first six months in particular was beset with complaints of spotty coverage and lower-than-expected speeds, this is not necessarily unheard of in early stage deployment. Moreover, such shortcomings seem likely to decrease as developers follow through with additional planned investments in system improvements. Indeed, by 2023, the government alone is expected to have invested a total of 30 trillion won into South Korea's 5G ecosystem.[12]

Alongside this, KT Corporation, SK Telecom, and LG U+ have each reported that their commercial 5G subscribers are burning through data plans at significantly higher rates than their 4G LTE counterparts. An August 2019 report released by Strategy Analytics and based on data from MSIT noted that the average 5G subscriber in South Korea was using 2.6 times as much data as the average LTE user[13]—suggesting a substantial shift in behavior and a positive response to the new capabilities and content afforded by 5G plans and devices.

Map 1. 5G Deployments in South Korea as of January 2020



Source: Ookla, LLC, "Ookla 5G Map," Speedtest.net https://www.speedtest.net/ookla-5g-map

A critical caveat, however, is the extent to which South Korea's telecoms have sought to recruit early subscribers through heavily subsidizing unlimited data plans and new devices while also providing gaming and other services for free. As noted in several author interviews conducted in Seoul in October 2019, it is unclear how sustainable these subsidized benefits are for the major telecoms. It is also unclear if commercial subscribers might dial-back their usage absent these perks unless a new "killer app" emerges and which presents a compelling reason to pay a premium for unlimited 5G plans. Most analysts seem to agree that so far, we have yet to see such an app.[14]

Thus, while high early subscriber numbers can lead to knock-on benefits (particularly if developers view 5G as having an attractive, large consumer base worth catering to with investments in new products), it is far from certain what the continued speed and enthusiasm for additional consumer adoption might be. Meanwhile, scholars at the Asan Institute for Policy Studies have noted that a crucial next step in developing a healthy domestic foundation is seeing business-to-business related usage take off. According to a global survey of CEO views, business-to-business services are expected to be the most significant potential driver of returns on investment from the new standard, and so growth in the numbers of these kinds of market participants could read as a very positive sign.[15] However, while efforts to expand business-to-business usage are currently underway, they are assumed to be in initial stages and it is too soon to assess their progress.

Will 5G Usher in an Era of Inclusive Economic Growth?

South Korea's early bet on 5G was at least partially intended to advance a more positive narrative about the country's economic outlook and growth potential. Yet, in late November 2019, the *Financial Times* reported that South Korea was on track for "one of its worst two-year growth periods in more than half a century," with growth rates on par with those witnessed during the global financial crisis.[16] Even a narrower focus on sectors closely linked with 5G remains relatively discouraging. For example, while Samsung has touted that it shipped nearly 7 million Galaxy 5G smartphones in 2019, its own financial reporting through October nonetheless showed that year-on-year profits from its mobile business were continuing to decline sharply.[17]

Ultimately, a number of factors contributed to this overall picture—including ongoing fallout from the U.S.-China trade conflict, a depressed consumer chip market, and (debatably) domestic wage hikes and overtime restrictions that undercut private sector productivity.[18] Yet, the lack of a clear near-term economic bounce from the country's 5G launch does raise questions about whether the Moon administration's 5G+ Strategy will be enough to overcome these negative trend lines. This is perhaps particularly concerning as several elements of the strategy overlap with broader areas of economic policymaking wherein the Moon administration's approaches have been criticized for failing to deliver notable returns.[19] Meanwhile, with several other economies rolling out or expanding their own nationwide 5G networks in 2020, South Korea's relative advantage as a first mover is likely to diminish over the course of the year.[20]

It is perhaps deeply unfair to assess 5G's economic contributions at the one-year mark. Indeed, the Moon administration's own strategy sketches out a timeline that envisions the most dramatic results unfolding over a seven-year timeframe and with many of the government's big projects and other substantial pushes kicking off only during the 2021-23 period. However, as was underscored in numerous interviews conducted in Seoul in October 2019, the lack of obvious near-term financial returns along with a sense of already strained balance sheets among the country's telecoms and technology firms, undercut the private-sector case for taking big risks on long-term investments.[21] Such private sector investment is something that the Moon administration is counting on to set off a larger chain reaction that puts the country at the forefront of delivering innovative, globally competitive products, ultimately revitalizing the country's economic growth. And, as the next section will explore, this appetite for taking on new risks could be further undercut by several geopolitical factors that may weigh on 5G development.

Geopolitics Takes Center Stage

South Korea is one of the most trade-dependent country's in the world, something that comes into play on multiple fronts when it comes to the country's 5G strategies. Not only are exports envisioned as a critical engine of the country's economy, but South Korea also relies heavily on imports to meet its needs for various materials used in high-tech manufacturing. This means that when global geopolitics and trade seemingly come into conflict, Seoul can feel that it is between a rock and a hard place. And over the past year, three geopolitical topics in particular have loomed especially large: Huawei, South Korea-Japan trade tensions, and complicated South Korea-U.S. relations.

Wither Huawei?

A potentially severe challenge to South Korea's long-term growth and development strategy is the ongoing global debate about the role of Huawei in 5G development. In December 2018, the United States announced sanctions against Huawei, and since then has implored its allies and partners to not allow the company into their networks—even going so far as to suggest that the United States might scale back its information sharing and network integration with countries that did not comply. While the global response to U.S. advocacy has been varied (and undercut by inconsistent messaging from Washington), Japan and Australia have committed to similar bans. Several others have argued that technical safeguards short of an outright ban allow them to feel

secure in selectively using Huawei, with the United Kingdom in particular voicing strong opposition to taking further restrictive measures against the Chinese company.

Of South Korea's three major telecoms, only LG U+ uses Huawei base stations and equipment in its 5G infrastructure.[22] Although exact numbers are difficult to verify, the state-run China Internet Information Center estimates that 25,000 Huawei 5G base stations have been deployed within South Korea via the company's association with LG U+; other reporting has placed these numbers between 15,000 and 20,000.[23] And while it would be easy to interpret these numbers as suggesting relatively shallow ties, South Korean firms have a range of partnerships with Chinese stakeholders, in which being seen as publicly spurning Huawei could have ripple effects. In the past several years, China has emerged as South Korea's most significant trading partner, and Huawei in particular has made a large number of 5G investments that are either in South Korea or that involve purchases from South Korean firms. SK Telecom and KT Corporation are also currently pursuing ventures within China.[24] Understanding this, both advocates for and against South Korea reducing its trading reliance on China have argued that it is ultimately unclear if taking a harder national stance along the lines of what the U.S., Australia, and Japan have done could provoke Chinese retaliation against private South Korean firms—similar to what happened after the deployment of the Terminal High Altitude Area Defense (THAAD) missile defense battery in 2016.

In the meantime, both policy and industry leaders in South Korea have argued that the country's sensitive networks are isolated from commercial assets (which are the only assets currently using Huawei products), and Seoul has also committed to not using Huawei in defense and intelligence sharing systems. However, Trump administration officials as well as several Members of Congress have argued that such proposed in-between measures do not satisfy their concerns.[25] To that end, in early January 2020, Senator Tom Cotton introduced a bill into the U.S. Congress that would formally make good on earlier U.S. threats to prohibit intelligence sharing with countries that "allow Huawei to operate their 5G networks."[26] The prospects of this or a similar bill passing the U.S. Congress are unclear—though passage would represent a substantial blow to Seoul's efforts to maintain its tenuous status quo.

South Korea-Japan Trade Tensions

Another concern that could undercut South Korea's long-term competitiveness in 5G has been the general decline in South Korea-Japan relations over the past year. Amidst ongoing bilateral disputes over historical issues and a seemingly rising impasse between the Moon and Abe administrations on a number of fronts, in July 2019 Japan's Ministry of Economic, Trade and Industry removed South Korea from its list of countries that are exempted from requiring export approvals to purchase certain high-tech materials. Notably, these materials include those that are critical in the manufacturing of smartphone displays and semiconductor chips, two industries at the heart of Moon's 5G+ strategy.

Both sides dispute the proximate cause for the de-listing. And in December 2019, Tokyo walked back restrictions on some of the materials impacted by its original decision, and talks are ongoing on how to fully resolve the dispute between the two countries. However, Seoul has referred to these measures as a "low-level easing" rather than as a clear resolution.[28] Furthermore, if talks break down, a sustained de-listing could be devastating for South Korea: by some estimates, Japan is responsible for producing 70-90% of the critical materials that the original de-listing impacts.[29] This level of dependence makes it difficult for South Korean manufacturers to simply diversify their supply chains if Japan follows through with denying South Korean approval requests.

As stakeholders in both countries have been quick to note, an actual rejection of a South Korean approval request has yet to happen and may never happen. Industries are also assumed to have modest stockpiles that could temper at least the immediate impact of any rejection.[30] Still, this case once again underscores the vulnerability of South Korea's economy to international considerations that can shape the potential effectiveness of its development strategies. And it is also suggestive of a potential missed opportunity—an additional complicating factor that makes South Korea and Japan less likely to deepen their collaboration around shaping global norms and standards for how new 5G-enabled technologies are advanced and deployed.

Spoiler or Advocate? U.S. Engagement with South Korea on 5G

Tensions around Huawei represent only one facet of complex U.S.-South Korea relations. And undeniably, differences of opinion on political and economic issues have regularly found

these two allies at odds over the past half-century—even as the two have also found ways to expand the overall scope and depth of strategic collaboration. Yet, over the course of 2017-2019 in particular, deep divides among the Moon and Trump administrations have left some corners of Seoul concerned that the United States is pursuing an overly transactional approach to the alliance, one where disagreements over burden-sharing and the future of the Korea-U.S. Free Trade Agreement have limited the breathing room for pursuing Seoul's own ambitions for the alliance. Such concerns can raise additional questions about the extent to which the United States is truly a partner and ally in finding ways to address challenges specific to South Korea's interests, such as how the country might expand its share of the Indo-Pacific's emerging 5G market.

Yet when it comes to 5G in particular, the United States remains an essential partner in supporting South Korea's broader strategic interests. By some estimates, the two countries alone are anticipated to account for up to 75% of the world's 5G market by the end of 2020, and South Korean vendors such as Samsung enjoy a high degree of competitiveness within the U.S. market due in part to favorable bilateral trade conditions.[31] Meanwhile, both countries have looked to identify ways to support one another's interests in 5G via how they engaged with multilateral strategic fora. An example of this was when the United States joined with South Korea in focusing APEC's 60th telecommunications working group meeting to explore how regional partners might work together on reducing barriers to 5G deployment, including through championing new collaborations on bringing smart cities and autonomous vehicles to scale.

More work remains to be done, as was underscored in conversations with Gwanhoo Lee, Chair of the Department of Information Technology and Analytics at American University. While the United States and South Korea have a robust, extensive history of Track 2.0 dialogues and industry collaborations on technology and innovation policy issues, Track 1.0 dialogues have only begun to scratch the surface over the past decade.[32] Moreover, in some cases, these dialogues have also been allowed to atrophy. As South Korea turns its attention to the year ahead, both countries should identify ways to reinvigorate their partnership, and view 5G as not only a source of potential conflict or competition, but also as an opportunity to deepen their joint cooperation.

Looking Ahead

Ultimately, the landscape that South Korea's 5G ambitions are confronting in the Indo-Pacific and in the world more broadly is not all bleak. In his aforementioned plan to capture a 15% share of the global 5G market, President Moon singled out in particular the goal of continuing to leverage administration initiatives such as its New Southern Policy to expand into markets in Southeast Asia and other parts of developing Asia. And while some of these markets are closer to making the leap to 5G than others, industry and government officials are building long-term partnerships in Singapore, Vietnam, and other parts of the region that, if history is a guide, are likely to benefit South Korea both directly and indirectly. Meanwhile, despite the very real threats posed by ongoing tensions between Japan and South Korea, it is worth noting that Samsung's share of the mobile market in Japan hit a six-year high in 2019.[33] While this is still coming from a fairly modest base, it is nonetheless encouraging. It also suggests the potential for South Korea's high tech-products to increase their global competitiveness in the 5G era even in a complex, geopolitically fraught environment, if matched with the right industry and policy attention.

Still, debates surrounding Huawei, as well as other trade and geopolitical tensions, are likely to continue to loom large in the coming year. And on Huawei in particular, it is important to keep in mind that the risks that South Korea confronts via its continued reliance on Huawei equipment are not purely limited to how Washington or Beijing might react to South Korean policy on the issue. Even if commercial networks handle less sensitive traffic than intelligence sharing systems, that does not make the risk of them being compromised or subjected to cyber-attacks trivial, given the personal and financial data that transit these networks. To that end, several studies have found Huawei's general security practices and equipment safeguards to be severely lacking (even setting aside the question of who, specifically, might want to exploit these vulnerabilities).[34] Thus, even if Seoul is able to successfully skirt the issue of Huawei's involvement in their 5G network as a purely geopolitical issue, it might nonetheless be unable to skirt the reputational risks that reliance on this equipment creates (where data breaches can undercut trust in certain companies, and lead consumers to look for alternatives or to otherwise scale back their use of particular services).

Taken together, the above issues suggest a number of tasks that Seoul should consider prioritizing in the year ahead. These include:

Exploring how policy might play a more effective and substantial role in helping domestic developers bring new and novel 5G-enabled products to market. Although the Moon administration's 5G+ Strategy envisions taking on part of this challenge, much more could be done. This is particularly true when it comes to needs for reviewing regulatory bottlenecks or other barriers that might additionally explain why developers have struggled to break new ground, even with substantial policy support. Importantly, this process should also more directly and extensively engage the private sector, civil society, and international counterparts in these dialogues, to test assumptions. In turn, this is something that would be in keeping with the spirit of the country's earlier and successful approaches for bringing network infrastructure to scale.

A good next step here could then include a more in-depth focus on particular industries or services linked to 5G (such as artificial intelligence or digital healthcare) to identify where, if at all, South Korean developers might be struggling relative to their international peers. This is something that could occur either within the bounds of the 5G+ Strategy or through elevating discussions of 5G within various Presidential committees focused on trade and innovation policy issues. Continued discussion via APEC or other regional fora could also further bolster the international dimensions of this process.

Undertaking a comprehensive assessment of how South Korea's high-tech policies leave it exposed to various political risks, with the ultimate aim of crafting longer-term recommendations for public policy. Treating technology policymaking as a purely economic endeavor ignores the real ways in which choices can introduce or be shaped by political risks. This is not to say that South Korea should back away from international trade or otherwise pursue disengagement strategies. Rather, it is to say that South Korea could benefit from a more deliberate focus on how and when to promote diversification among its suppliers and supply sources—and integrate considerations about geopolitical risk into this process.

South Korea already has such a process in place when it comes to national energy policymaking. This process includes convening a range of stakeholders to produce a strategic national plan on energy, and regularly reassessing assumptions about costs, benefits, and downsides to particular approaches. Such a template could provide a natural framework for how South Korea engages with domestic stakeholders on articulating goals for how development strategies should reflect strategic, economic, and other social welfare considerations. And, even if ultimately at odds with the expressed goals of the United States or other major powers, it could provide a foundation for how Seoul might better engage with international counterparts on clarifying and advancing longer-term objectives.

Recognizing that Seoul cannot afford to go it alone. Seoul's relationships with Beijing, Tokyo, and Washington are likely to remain crucially important for any number of strategic and economic reasons. And its ties with Southeast Asia and other parts of the region are likely to grow. How it manages these relationships is of critical importance to not only how it can continue to harness significant domestic benefits from access to international resources, but also how it can maintain its competitive edge globally.

Yet the aim of engagement should not be just to address existing challenges or focus narrowly on problem areas. It should also cover more aspirational ambitions, which better reflect Seoul's leadership role at the cutting-edge of 5G deployment. With this in mind, several ongoing international discussions this year are likely to hold special relevance to South Korea's 5G ambitions. This includes ongoing conversations at the G20 on both cross-border data flows and on smart cities development strategies. These are dialogues that can only benefit from Seoul having a prominent, vocal role at the table—wherein Seoul might be able to teach and lead through sharing findings from South Korea's own experiences.

Conclusion

With South Korea nearly one year ahead of similar targets for 5G commercialization globally, Seoul is potentially well-positioned to help shape global norms and standards of 5G adoption. By and large, South Korea's achievement in rapidly bringing to scale its 5G network represents an incredible success story. And while the country faces a number of challenges in moving from "first in the world" to "first in global quality," its experiences to-date suggest a number of early lessons learned as well as areas in which the Moon administration should consider focusing additional policy attention in 2020. Yet, as has been suggested above, there are no guarantees in how this process might play out, even with the soundest and most forward-looking policymaking. Seoul's efforts, at the end of the day, are a gamble on its own potential to create, innovative, and adapt.

Endnotes

[1] Yonhap News Agency, "S. Korean mobile carriers join hands for 5G commercialization," Yonhap News Agency, July 17, 2018, https://en.yna.co.kr/view/AEN20180717006200320 (accessed January 20, 2020).

[2] Yonhap News Agency, "5G subscribers in S. Korea near 4 million in Oct.: data," December 2, 2019, https://en.yna.co.kr/view/AEN20191202004200320 (accessed January 1, 2020); Derrick A Paulo, "After Seven Months, Here's What South Korea Can Teach us about 5G," *Channel News Asia,* November 2, 2019, https://www.channelnewsasia.com/news/cnainsider/what-south-korea-first-country-launch-5g-network-can-teach-us-12056726 (accessed January 1, 2020).

[3] Moon Jae-in, "Remarks by President Moon Jae-in at Ceremony Celebrating Republic of Korea Launching World's First 5G Commercial Service," Cheong Wa Dae, The Republic of Korea, April 8, 2019, https://english1.president.go.kr/BriefingSpeeches/Speeches/566 (accessed January 1, 2020).

[4] Jessica Dolcourt, "We ran 5G speed tests on Verizon, AT&T, EE and more: Here's what we found," *CNET,* July 3, 2019, https://www.cnet.com/features/we-ran-5g-speed-tests-on-verizon-at-t-ee-and-more-heres-what-we-found/ (accessed January 1, 2020). Importantly, it should be noted that this 20 times differential was found in tests in the United States, where average internet speeds have long lagged behind those in South Korea; thus, perhaps not surprisingly, when similar tests were conducted in Seoul, switching to 5G was found to be only 4-5 times faster than 4G LTE. However, although experts continue to be divided on the best methodology for evaluating this differential, the 20 times estimate has been used by President Moon Jae-in in speeches where he gives his own views on the standard's potential, and is thus noted here.

[5] See, for example, Ashley Johnson, "Strategies, Challenges, and Considerations for Economic Growth in South Korea: an Interview with June Park," The National Bureau of Asian Research, November 16, 2017, https://www.nbr.org/publication/strategies-challenges-and-considerations-for-economic-growth-in-south-korea/ (accessed January 1, 2020); Kyle Ferrier, "South Korea Joins the 5G Race," *The Diplomat,* March 27, 2019, https://thediplomat.com/2019/03/south-korea-joins-the-5g-race/ (accessed January 1, 2020).

[6] Moon Jae-in, "Remarks by President Moon Jae-in at Ceremony Celebrating Republic of Korea Launching World's First 5G Commercial Service." Cheong Wa Dae, The Republic of Korea, April 8, 2019, https://english1.president.go.kr/BriefingSpeeches/Speeches/566 (accessed January 1, 2020).

[7] Republic of Korea Interdepartmental Exercise, *Mid- to Long-Term Master Plan in Preparation for the Intelligent Information Society: Managing the Fourth Industrial Revolution,* (Gwacheon, South Korea: Ministry of Science, ICT and Future Planning, 2017), http://english.msip.go.kr/cms/english/pl/policies2/__icsFiles/afieldfile/2017/07/20/Master%20Plan%20for%20the%20intelligent%20information%20society.pdf (accessed January 1, 2020).

[8] An example of this might be Seoul's earlier bet on smart cities, wherein the government invested significant time and resources into establishing Songdo as the world's first smart city, yet has struggled to foster the kind of community ecosystem that could convince people to voluntarily relocate there in significant numbers. See Linda Poon, "Sleepy in Songdo, Korea's Smartest City," *Citylab,* June 22, 2018, https://www.citylab.com/life/2018/06/sleepy-in-songdo-koreas-smartest-city/561374/ (accessed January 1, 2020).

[9] Ashley Johnson, "Strengthening the U.S.-ROK Alliance for Job Creation and Sustainable Development," The National Bureau of Asian Research, June 7, 2018, https://www.nbr.org/publication/strengthening-the-u-s-rok-alliance-for-job-creation-and-sustainable-development (accessed January 1, 2020); Sean Connell, "Exploring the Context for Innovation Policymaking in Japan and South Korea," in Connell et al, "Innovative Asia: Innovation Policy and the Implications for Healthcare and the Life Sciences," *Special Report no. 71* (Seattle: The National Bureau of Asian Research, March 2018), 1-19; "SeouLA Forum 2017," The Pacific Council, https://www.pacificcouncil.org/sites/default/files/related_resources_files/SeouLA%20Report%20-%20PDF_0.pdf (accessed January 1, 2020).

[10] See for example, "2019 APEC TEL Meeting is Held (Oct 14)," Ministry of Science and ICT, October 14, 2019, https://english.msit.go.kr/english/msipContents/contentsView.do?cateId=msse42&artId=2339769; "Co-Chairs' Statement of The 2019 ASEAN-Republic of Korea Commemorative Summit," Association of Southeast Asian Nations, November 26, 2019, https://asean.org/co-chairs-statement-2019-asean-republic-korea-commemorative-summit/.

[11] Klint Finley, "The Slow Rollout of Superfast 5G," *Wired,* December 13, 2019, https://www.wired.com/story/slow-rollout-super-fast-5g/ (accessed January 1, 2020).

[12] Eun-jin Kim, "Korean Gov't Determined to Foster Core 5G Services and Industries," *Business Korea,* April 9, 2019, http://www.businesskorea.co.kr/news/articleView.html?idxno=30733 (accessed 1 January 2020).

[13] Kendall, Phillip, "5G Data Use Surges in South Korea," Strategy Analytics, August 1, 2019, https://www.strategyanalytics.com/strategy-analytics/blogs/service-providers/mobile-operators/service-providers/2019/08/01/5g-data-use-surges-in-south-korea (accessed January 20, 2020).

[14] Author interviews.

[15] J. James Kim and Hong Sanghwa, "Opportunities and Challenges for South Korea in the New Era of 5G," The Asan Institute for Policy Studies, March 21, 2019, http://en.asaninst.org/contents/opportunities-and-challenges-for-south-korea-in-the-new-era-of-5g/ (accessed January 1, 2020); GSMA Intelligence, "The 5G era: Age of boundless connectivity and intelligent automation," GSM Association, 2017, https://www.gsmaintelligence.com/research/?file=0efdd9e7b6eb1c4ad9aa5d4c0c971e62&download (accessed January 1, 2020).

[16] Edward White, "South Korea set for one of worst growth periods in half a century," *Financial Times,* November 29, 2019, https://www.ft.com/content/17bc3560-1289-11ea-a225-db2f231cfeae (accessed January 1, 2020).

[17] "Samsung Brings 5G to World by Shipping More than 6.7 Million Galaxy 5G Devices in 2019," Samsung Newsroom U.S., January 2, 2020, https://news.samsung.com/us/samsung-galaxy-5g-devices-shipping-more-than-6-million-2019/; Saheli Roy Choudhury, "Samsung shares tumble after the company says its second-quarter profit fell 56%," *CNBC,* July 30, 2019, https://www.cnbc.com/2019/07/31/samsung-q2-earnings-operating-profits-fell-on-low-memory-prices.html.

[18] And with some of these factors, there are signs that 2020 might prove to be a better year. For example, *Wall Street Journal* and others have argued that there is strong evidence that the outlook for the consumer chip market is looking more optimistic. See, Eun-young Jeong, "For Memory-Chip Makers, the Worst Appears to Be Over," *Wall Street Journal,* January 8, 2020, https://www.wsj.com/articles/for-memory-chip-makers-the-worst-appears-to-be-over-11578487758.

[19] For example, in promising but failing to deliver on commitments related to supporting SMEs or helping the private sector to identify new business models.

[20] This is not to say that the potential for more customers isn't a good thing for South Korean firms, but rather that the nature of the competition is likely to morph (e.g. trying to craft products that appeal for a more international audience) and also become more intense and complex (as companies in other markets also have the chance to test out products locally and then sell globally, with only a modest lag behind South Korea).

[21] Author interviews in October 2019.

[22] Isao Horikoshi and Takashi Kawakami, "Telecom's 5G revolution triggers shakeup in base station market," *Nikkei Asian Review,* December 25, 2018, https://asia.nikkei.com/Business/Technology/Telecom-s-5G-revolution-triggers-shakeup-in-base-station-market (accessed January 1, 2020).

[23] Yiming Guo, "LG U+ edges out rivals with Huawei's 5G network," China.org.cn, August 15, 2019, http://www.china.org.cn/business/2019-08/15/content_75103241.htm (accessed January 1, 2020); ET Telecom.com, "Huawei to invest more in S Korea amid US sanctions," *Economic Times,* December 21, 2019, https://telecom.economictimes.indiatimes.com/news/huawei-to-invest-more-in-s-korea-amid-us-sanctions/72916557 (accessed January 1, 2020).

[24] Isao Horikoshi and Takashi Kawakami, "Telecom's 5G revolution triggers shakeup in base station market."

[25] Park Chan-kyong, "Using Huawei for 5G in South Korea presents 'little security risk,'" *South China Morning Post,* June 7, 2019, https://www.scmp.com/news/asia/east-asia/article/3013622/using-huawei-5g-south-korea-presents-little-security-risk; Author's interviews in Seoul, October 2019.

[26] Office of Senator Tom Cotton, "Cotton Introduces Bill Banning Intelligence Sharing With Countries Using Huawei," January 8, 2020, https://www.cotton.senate.gov/?p=press_release&id=1288 (accessed January 20, 2020.

[27] Both sides dispute the proximate cause for the de-listing. South Korean observers have argued that Tokyo's actions were in retaliation for a politically-charged and potentially highly damaging Supreme Court decision against Mitsubishi. Tokyo has argued that the decision to de-list South Korea was made on the basis of declining trust in the sufficiency of South Korean security safeguards, and that it had long sought and failed to be able to convince the South Korean government to take action. See Trade Control Policy Division, Trade Control Department, Trade and Economic Cooperation Bureau, "Update of METI's licensing policies and procedures on exports of controlled items to the Republic of Korea," Ministry of Economy, Trade, and Industry, Japan, July 1, 2019, https://www.meti.go.jp/english/press/2019/0701_001.html (accessed January 1, 2020).

[28] Ritsuko Shimizu, Makiko Yamazaki, and Hyunjoo Jin, "Japan partially reverses curbs on tech materials exports to South Korea," Reuters, December 20, 2019, https://www.reuters.com/article/us-southkorea-japan/japan-partially-reverses-curbs-on-tech-materials-exports-to-south-korea-idUSKBN1YO11L (accessed January 20, 2020).

[29] Makiko Yamazaki, "Factbox: The high-tech materials at the heart of a Japan-South Korea row," Reuters, July 2, 2019, https://www.reuters.com/article/us-southkorea-japan-laborers-factbox/factbox-the-high-tech-materials-at-the-heart-of-a-japan-south-korea-row-idUSKCN1TX12I (accessed January 1, 2020).

[30] Ibid.

[31] Joe O'Halloran, "US, South Korea to drive 5G to reach 1.5 billion users by 2025," *Computer Weekly,* January 13, 2020, https://www.computerweekly.com/news/252476613/US-South-Korea-to-drive-5G-to-reach-15-billion-users-by-2025 (accessed January 31, 2020); Sascha Segan, "Analyst: Major Carrier Stores Pretty Much Only Sell Apple and Samsung" *PC Magazine,* January 3, 2020, https://in.pcmag.com/samsung-galaxy-s10-2/134567/analyst-major-carrier-stores-pretty-much-only-sell-apple-and-samsung (accessed January 31, 2020).

[32] Author's interview with Gwanhoo Lee in Washington, D.C. in October 2019.

[33] Byung-yeul Baek, "Samsung's phone market share hits 6-year high in Japan," *Korea Times,* August 26, 2019, https://www.koreatimes.co.kr/www tech/2019/08/133_274572.html (accessed January 1, 2020).

[34] For more on this topic, see Ashley Dutta and Jonathon Marek, "A Concise Guide to Huawei's Cybersecurity Risks and the Global Responses," October 3, 2019, The National Bureau of Asian Research, https://www.nbr.org/publication/a-concise-guide-to-huaweis-cybersecurity-risks-and-the-global-responses/ (accessed January 20, 2020).

KEI KOREA ECONOMIC INSTITUTE OF AMERICA | 한미경제연구소

1800 K St. NW, Suite 300 | Washington, DC 20006
T.202.464.1982 | F.202.464.1987 | www.keia.org