S&E

Space & Environment
is a quarterly English magazine intended to disseminate research output and international activities of Korea Research Institute for Human Settlements

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Territorial Policy Responses to the COVID-19 Pandemic

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Korea Research Institute for Human Settlements · 국토연구원 ·

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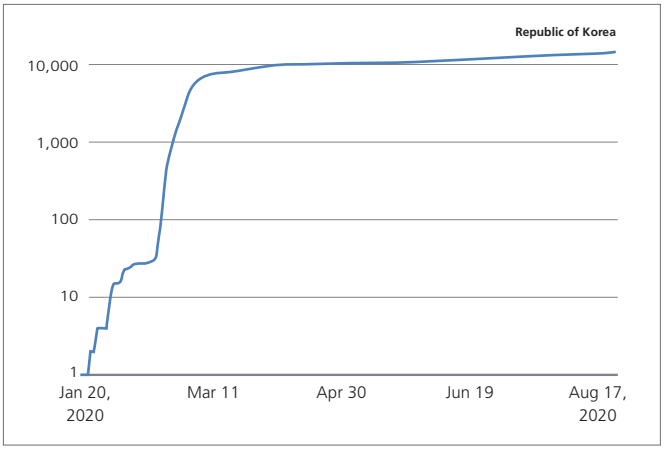
1 The COVID-19 Pandemic and the Worldwide Crisis

Young-mo Yoon

The number of confirmed COVID-19 cases worldwide has exceeded 12,400,000, and the death toll so far amounts to 560,000.[01] Due to widespread fear of COVID-19, daily activities have been largely reduced, and shops and stores are either ceasing operations or suffering from sharp declines in sales. The global economy is undergoing a serious crisis as consumption, production, and investment are all shrinking due to restrictions on the movement of people and goods, and unemployment rates are rising. The Organization for Economic Cooperation and Development (OECD) projects that the global economy will experience negative growth of -6.0%, which will go down to -7.6% if a "second wave" of COVID-19 occurs. Every country around the world is working hard to develop response measures to this uncertain situation; we do not know when COVID-19 will be eradicated or when the economy will recover from this recession.

Figure 1. Korea's cumulative number of confirmed COVID-19 cases



Source Our World in Data 2020.

1. Korea's efforts to overcome the crisis

Since the initial COVID-19 outbreak, the Republic of Korea has been controlling the spread of COVID-19 through measures such as social distancing, drive-thru testing, tracking the movements of confirmed patients, and self-quarantine. The country's number of COVID-19 confirmed cases is 262 per 1,000,000 persons, far below the figures of other major countries such as the US (9,812), the UK (4,256), and Italy (4,016)[02]. Korea's economic decline is also forecasted to be smaller than that of most other countries. The OECD projects 2020 economic growth of -9.1% in the Eurozone, -7.3% in the US, -6.0% in Japan, -2.6% in China, and -1.2% in the Republic of Korea. As a result, Korea is often held up as an example for its handling of the COVID-19 outbreak through effective containment measures.

The Korean government is strengthening its support for companies, unemployed people, and other vulnerable groups to overcome the economic downturn that has resulted from COVID-19, and the government is actively implementing economic stimulus plans. The country is also promoting a "Korean New Deal" to actively prepare for the post-coronavirus era while simultaneously addressing the current short-term crisis. "The Korean New Deal" aims at structural economic reforms to overcome the economic crisis through active fiscal spending; it is designed to allow Korea to take the lead in the post-coronavirus era. Key strategies of the plan include the "Digital New Deal," designed to help Korea take the lead in a new digital economy, and the "Green New Deal", which addresses climate change by shifting the nation to a low-carbon economy. The Digital New Deal includes the establishment of large-scale information and communications technology (ICT) infrastructure that can set the foundation for the Fourth

01. WHO. 2020. COVID-19 Dashboard. https://covid19.who.int (accessed July 12, 2020).
02. Our World in Data. 2020. The Coronavirus Pandemic. https://ourworldindata.org/coronavirus (accessed August 17, 2020).

Industrial Revolution, the development of "untact" industrial sectors, and the digitalization of infrastructure. The Green New Deal focuses on establishing green infrastructure to build a low-carbon economy, encourage widespread use of renewable energy, and support the development of green industries. Korea plans to invest 160 trillion won by 2025 in the Korean New Deal, which is expected to create 1.9 million new jobs.

2. Policy issues and directions in the post-COVID era

COVID-19 has impacted a wide range of economic and daily activities, and the dominant view is that, even after the COVID-19 crisis ends, society will establish a new normal that differs from the existing order in many ways. However, in reality, nobody is certain of the direction and scale of this change. To prepare for this uncertain future, Korea Research Institute for Human Settlements (KRIHS) is examining the concrete impacts of COVID-19 on national territory, regions, and cities and preparing studies on the changes caused by the virus and response measures to them. Specifically, KRIHS will focus on preparing active reform plans to promote sustainable development while restoring the damage caused by COVID-19. First, in the area of space and environment, we will examine key policy issues that affect national land, regions, and cities in the post-coronavirus era; we will also examine the measures used to handle various issues. To respond to new lifestyle patterns, consumption, and production systems in the new normal, we will look for new hope in the current crisis by providing insights and outlooks on a wide range of areas, including spatial structures, land use, transportation, housing, digital infrastructure, crisis management capacity, and resilience, as well as the roles of governments, businesses, and civil society. We expect this edition to provide some clues in our search for answers to the numerous outstanding issues and questions about the post-coronavirus era.

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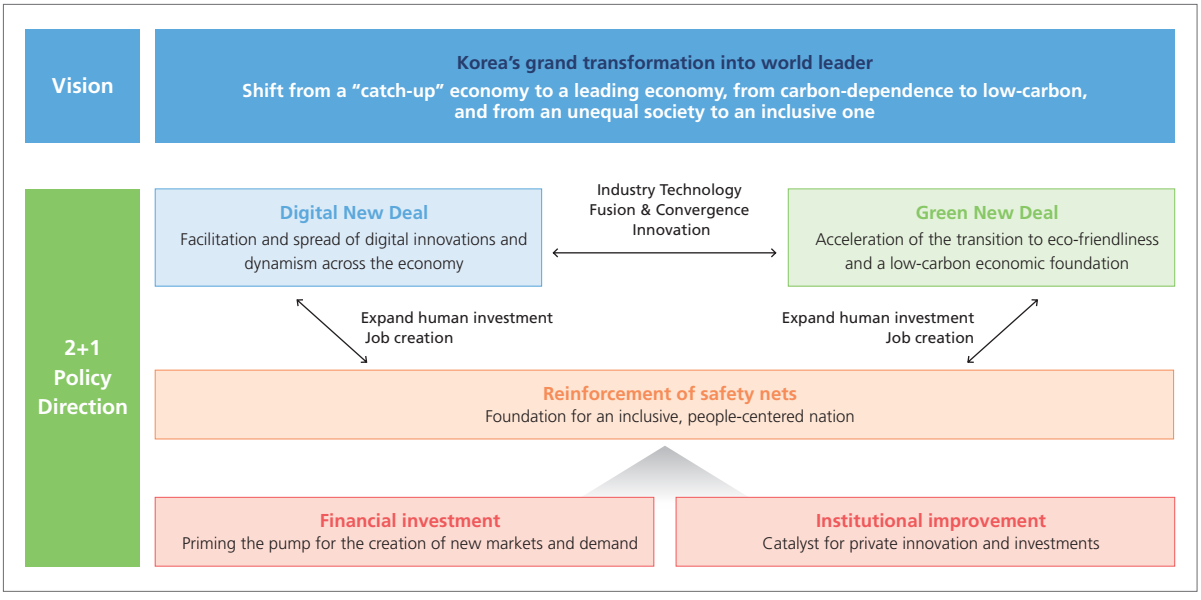
Figure 2. Main points of the Korean New Deal



Source
The Korean Government 2020.

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2 Inclusive and Balanced National Development in the Post-COVID Era

Kyunghyun Park

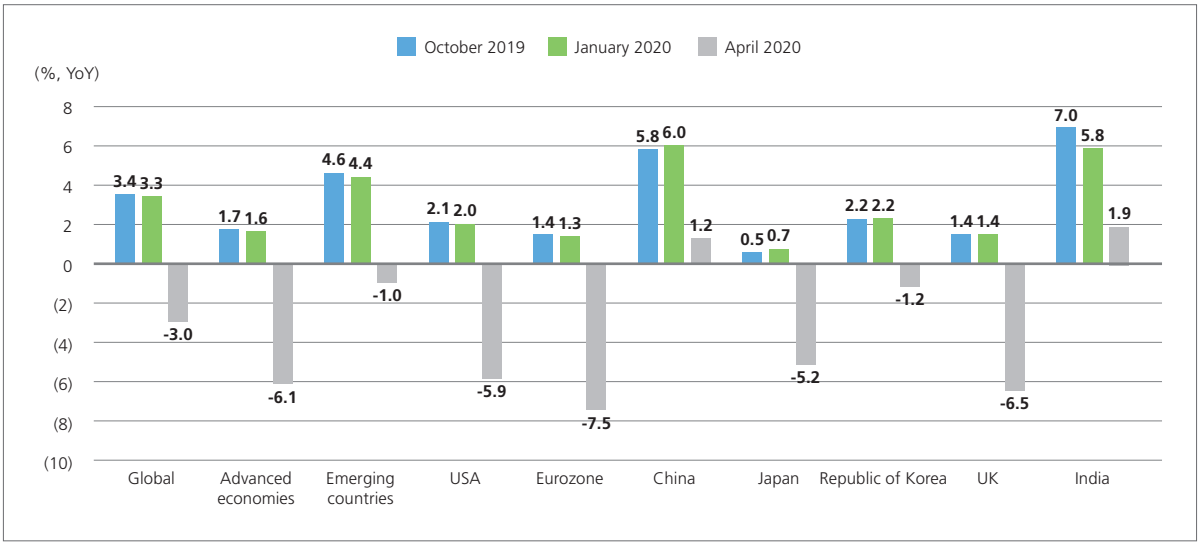
1. The worst economic recession since the Great Depression is projected

Infectious diseases without known causes or treatments deal a severe blow to large and densely populated cities. This may be why changes in urban ways of living, such as telecommuting and "untact" (un+contact: the minimization of face-to-face contact) work, are expected to occur after the COVID-19 pandemic. In addition, industrial restructuring centered on untact new industries is highly likely to accelerate. Telecommuting using video conferences and mobile devices will become more common, and in the medium to long term, the Internet of Things (IOT), artificial intelligence, and telemedicine markets are also projected to grow.

According to a survey conducted by the recruiting platform Saramin in March 2020, large companies have an overall higher telecommuting rate (60.9%) than small and medium-sized businesses (36.8%). This also varies by type of business; knowledge-based activities in large cities, such as finance and insurance (73.3%) and information and communications technology (ICT) (58.8%), also have high telecommuting rates, while types of businesses that require onsite work, such as machinery and steel (14.3%) and construction (20.8%), have lower telecommuting rates. The survey results suggest that large cities could overcome crises caused by infectious diseases by quickly adopting structural changes to lifestyle and industry. However, these findings also imply that regions that fail to react swiftly to changing times could deteriorate even more in the post-COVID era. Therefore, alternative solutions for inclusive national development are needed to address inequalities and economic instability in the post-coronavirus age.

The COVID-19, which first broke out in Wuhan, China, hit the global economy. The so-called Great Lockdown, which included restrictions on cross-border movement, the suspension

Figure 1. A large downward adjustment of the 2020 forecasts for the world's major economies, reflecting the adverse effects of COVID-19



Source
IMF 2020.

of economic activities, and social distancing, dampened economic activities in almost all countries. In April 2020, the International Monetary Fund (IMF) scaled back its projection of global economic growth rate to -3.0%, a marked reduction of 6.3%, to reflect the impact of the COVID-19 crisis.

The IMF predicts global economic growth of 5.8% in 2021, a relatively positive sign. However, this prediction is based on the hopeful premise that this infectious disease will dwindle and that lockdown measures in major countries will be lifted in the latter half of this year. Indeed, due to the Great Lockdown, the world economy is very likely to undergo the worst depression since the Great Depression this year. Although restrictive measures such as social distancing are essential for resolving the pandemic, the economic shocks resulting from the collapse of trade and global value chains have affected every economy around the globe.

2. Space has evolved against diseases

Jared Diamond, the author of *Guns, Germs, and Steel* (1999), pointed out the common features of infectious diseases that spread as epidemics. First, such diseases are quickly and efficiently transmitted from an infected patient to healthy people around the patient, which leads to the entire population's exposure to the disease in a short period of time. Second, since there are acute diseases, infected patients either die shortly or are completely cured. Third, because recovered patients acquire immunity through the formation of antibodies, they do not experience a recurrence of the disease for a long time or (sometimes) for the rest of their lives. Lastly, these diseases mostly develop only in humans. This is because the germs that cause epidemics cannot live in soil or in the bodies of other animals (Diamond 1999).

The history of humankind is fraught with battles against diseases. Diseases such as smallpox, influenza, tuberculosis, malaria, the plague, measles, and cholera have taken many lives. However, space has always evolved to fight dangerous diseases. Let us examine the cases of cholera and severe acute respiratory syndrome (SARS). The Industrial Revolution caused simultaneous population increases and worsening living conditions in urban areas. At the dawn of the Industrial Revolution, people had a weak concept of urban public health and hygiene. In the 19th century, some water sources became contaminated with the cholera bacterium, and people who drank this water were infected with cholera. The cholera bacterium causes severe diarrhea and spreads through drinking water. Due to an increase in exchanges between people and commodities in the wake of industrial activities, cholera spread at an unprecedented rate. Following numerous casualties due to cholera, cities improved their water supply and sewage systems and toilet facilities by overhauling laws and systems and through spatial planning. They fought the spread of cholera by renovating slum quarters, which were particularly vulnerable to infectious diseases.

SARS, which broke out in 2002, presents a similar case. In 2003, as SARS was spreading, Chinese consumers avoided going outside. Instead, online shopping grew rapidly. Alibaba led changes in online consumption culture by launching the online customer-to-customer (C2C) shopping platform Taobao. The SARS outbreak created an opportunity for people to accept untact spending as a new culture. Brick-and-mortar stores began to yield the market to their online counterparts. The physical design of department stores, retail outlets, and warehouses took on new forms. The development of information technology and the growth of online shopping malls led primarily brick-and-mortar businesses to modify their approaches to spatial locations, including warehouses, stores, and shipping. Alibaba's online e-commerce influenced consumption patterns and key market distribution channels. The company was listed on the Hong Kong Stock Exchange in 2007 and the New York Stock Exchange in 2014 and is currently expanding into various areas, including finance, distribution, convenience stores, and cloud services.

In the cases of cholera and SARS, cities eventually won the wars against formidable diseases through innovations in industrial and spatial structures. Cholera led to the repair of urban water supply and sewage systems, and SARS increased untact spending and reshaped the traditional structures of retail spaces. When infectious diseases with unknown causes and few treatments begin to spread, large, densely populated cities are significantly impacted economically and demographically. Ironically, however, diseases that pose serious threats to cities have often succumbed to urban creativity and innovation.

3. Infectious diseases deepen spatial inequalities

The most effective way to prevent the spread of infectious diseases is economic and geographic segregation. Constraints on cross-border movement, reduced physical transactions, and daily social distancing mitigate the direct spread of viruses.

However, large, high-density cities are more likely to see greater spread of diseases despite economic and geographic segregation. This is why high-density cities are often blamed as the causes of pandemics.

Density is important in the spread of contagious diseases. Cities that have seen faster transmission than others shed light on the mechanism by which this occurs. First, as people from around the world flocked to major cities that regularly host large numbers of visitors and tourists, such as New York and London, high-density residential areas in these cities were the first to suffer. Industrial hubs such as Wuhan in China, Detroit in the US, and northern Italy, all of which have active production sectors requiring face-to-face contact, became targets of COVID-19. Eventually, international tourist destinations such as Italy, Switzerland, and France also became victims of COVID-19 (Florida 2020).

Has COVID-19 spread at the same speed in every area of cities? To examine this, we must focus on different types of density within cities, defined by varying income levels, occupations, and areas of residence. Wealthy people living in large houses are relatively less exposed to infectious diseases. The same applies to those who can telecommute and purchase necessary items online. On the other hand, low-income residents or those who live closely together under poor sanitary conditions must often leave their houses for daily necessities. Despite the likelihood of infection, they have no choice but to use brick-and-mortar stores and public transportation. Areas that accommodate many residents with underlying conditions such as smoking, obesity, diabetes, and cardiac disorders, areas with large elderly populations, areas with many workers who cannot work remotely, and religious facilities used for group worship services are also highly susceptible to the spread of COVID-19 (Hendrickson & Muro 2020).

This concern about the spread of COVID-19 in low-income residents is becoming a reality. According to the New York State Department of Health, the COVID-19 fatality rate of the state's poorest neighborhood was about 15 times higher than that of its richest neighborhood. The region with the highest COVID-19 fatality rate was Starrett City in Brooklyn, with 444 deaths per 100,000 residents. In contrast, the area with the lowest death toll was Gramercy Park, an affluent white neighborhood in Manhattan, New York City, with 31 deaths per 100,000 residents (Pressian 2020). The Republic of Korea has successfully controlled the pandemic but is not free from the ongoing threat of the virus. Like affected workers at a call center in Sindorim-dong, Guro-gu, most workers at the Coupang distribution center in Bucheon, which had over 100 confirmed COVID-19 cases, were low-wage laborers who could not telecommute. These also included dayworkers and contract workers. Even within a large, high-density city, the spread of the infectious disease was concentrated in vulnerable neighborhoods. This explains why we should prepare for the deepening of spatial inequality, which has accelerated since the COVID-19 outbreak.

4. Inclusive and balanced national development is needed in response to deepening inequalities

Will changing lifestyles in the post-coronavirus era, including shifts towards telecommuting and untact activities, resolve urban concentrations? Some years ago, futurologists projected that digital revolution would cause "the death of distance" and increase residential dispersal and untact industrial activities such as telecommuting. Interestingly, this prediction closely resembles expectations for the post-coronavirus era.

However, contrary to expectations, the expansion of digital technology has increased the centralization of jobs and economic activities in large cities. High-tech companies and workers have become concentrated in a handful of large cities. This is because, over time, these cities have accumulated expertise, trusted relationships, administrative systems, and new technologies. In the Republic of Korea, the capital region's population has surpassed 50% of the country's total population. Companies in high-tech areas such as ICT services and new media have gathered around the Teheran Valley in Seoul and the Techno Valley in Pangyo. Even the 2008 financial crisis did not stop the growth of large cities. Shenzhen City in China is becoming the country's Silicon Valley, and Dubai is emerging as a global business hub.

It is hard to deny that large, high-density cities can be vulnerable to contagious diseases. However, in large cities, knowledge industry and high-quality workers exchange innovative ideas, and many diverse jobs are available. Historically, cities have also overcome crises more effectively than rural areas. High-tech enterprises in large cities can grow by turning the COVID-19 crisis into an opportunity, but traditional manufacturing businesses in provinces are more likely to deteriorate without creating new jobs due to path dependency and the lock-in effect. In one likely scenario, large cities with a number of high-tech conglomerates will grow further, and traditionally manufacturing-based regions

will decline, eventually exacerbating regional inequalities. The dilemmas facing our society, including regional extinction, low birthrates, population aging, low growth, and youth unemployment, may also be exacerbated further due to changes to industrial structures and lifestyles after the COVID-19 crisis. We should therefore proactively seek strategies for inclusive and balanced national development in preparation for the post-coronavirus era.

We face a mountain of tasks related to inclusive and balanced national development. These include developing competitive urban areas, supporting regions facing industrial crises, strengthening links between cities and their surrounding regions, developing regional growth poles like innovative cities, supplying clean and affordable housing, hiring more young talent in medium-size urban areas, and supporting the third sectors that connect urban and rural activities. Our approach to the COVID-19 crisis should not focus exclusively on urban density; infectious disease control centers should be present everywhere. We should not forget that, historically, infectious diseases have not always begun in large cities. The complete extinction of COVID-19 will take some years. The national policies for the economic responses should focus on resolving inequalities and economic instability, especially in places where the crisis is expected to deepen.

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3 The Post-COVID World: An Opportunity for Regional Economic Growth

Ki-Chan Nam

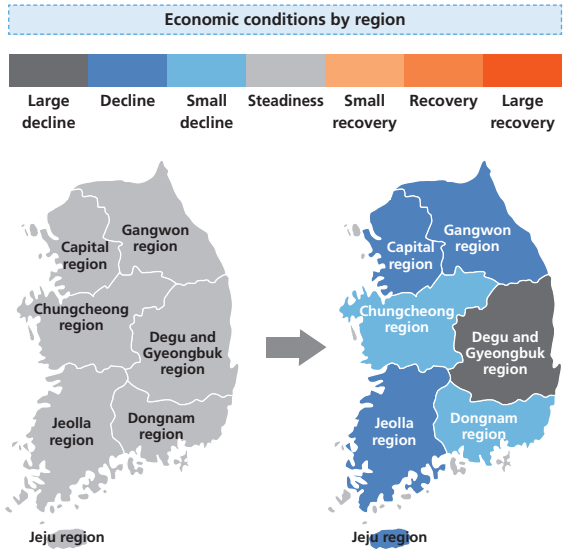
1. A new threat to the regional economy: The COVID-19 shock

The shock of COVID-19 is sweeping through the world. Although the direct damage dealt by COVID-19 is a tremendous loss of life, the next most-discussed aspect is national and regional economic depression. A so-called 'Black Swan'[01] event has arrived, and a 'Neon Swan'[02] cannot be ruled out. The dominant prognosis is that the global economy will reach its lowest point since the Great Depression of the 1930s.

Unlike previous economic crises, the COVID-19 crisis is characterized by its direct impact on the real economy. With a setback in the flow of economic activities caused by restricted access to people and resources, the current crisis involves production problems due to constraints on the labor supply, consumption problems arising from consumers' limited activities, and sluggish exports due to the cutoff of overseas and global supply chains. This makes it difficult to apply any measures to stimulate the economy.

While different economic institutions provide different outlooks on the stagnancy of national economies, the International Monetary Fund (IMF) has forecasted that the global economy will decline by 3% in 2020 due to COVID-19. The economic growth rates of the US, the Eurozone, and Japan are projected to be -5.9%, -7.5%, and -5.2%, respectively. Although the Republic of Korea is in a slightly better position

Figure 1. Regional economic trends in the first quarter of 2020



Demand by region

	Consumption	Equipment Investment	Construction Investment	Export (over the same quarter of the previous year)
Capital region	▼▼▼	◇	▼	▼
Dongnam region	▼▼	◇	◇	◇
Chungcheong region	▼▼	◇	◇	▲
Jeolla region	▼▼	▲	▼	▼▼
Degu and Gyeongbuk region	▼▼▼	◇	◇	▼
Gangwon region	▼▼	◇	◇	▼▼▼
Jeju region	▼▼▼	◇	◇	▲

Note The direction and change over the previous quarter (over the same quarter of the previous year for exports) are marked with symbols, and ▲, ◇, ▼ indicate an increase, no change, and a decrease, respectively.

Source The Bank of Korea 2020.

01. Black Swan is a phenomenon that occurs even though it had been thought to be impossible.
02. Neon Swan is an event that is unthinkably rare, immensely important and blindingly obvious.

than many other countries, its economy is also predicted to shrink by about -1.2%. The Korea Economic Research Institute is projecting declines in all economic areas, including consumption (-3.7%), exports (-2.2%), equipment (-18.7%), and construction investment (-13.5%).

This is a significant problem; not only the national economy, but also regional economies will be shaken. According to the First Quarter Regional Economic Report of the Bank of Korea, the Daegu and Gyeongsangbuk-do region has experienced serious deterioration, and other regions have also suffered economic shocks over the previous quarter. An examination of this situation by industrial sector can help illustrate its seriousness. In the manufacturing sector, Daegu and Gyeongsangbuk-do experienced downturns in subsectors such as mobile phones, steel, and auto parts; Gangwon-do saw slowdowns in subsectors such as medical devices and cement. The capital region stagnated in subsectors such as automobiles and displays. In the service sector, Daegu and Gyeongsangbuk-do, the capital region, and Jeju-do exhibited sharp declines.

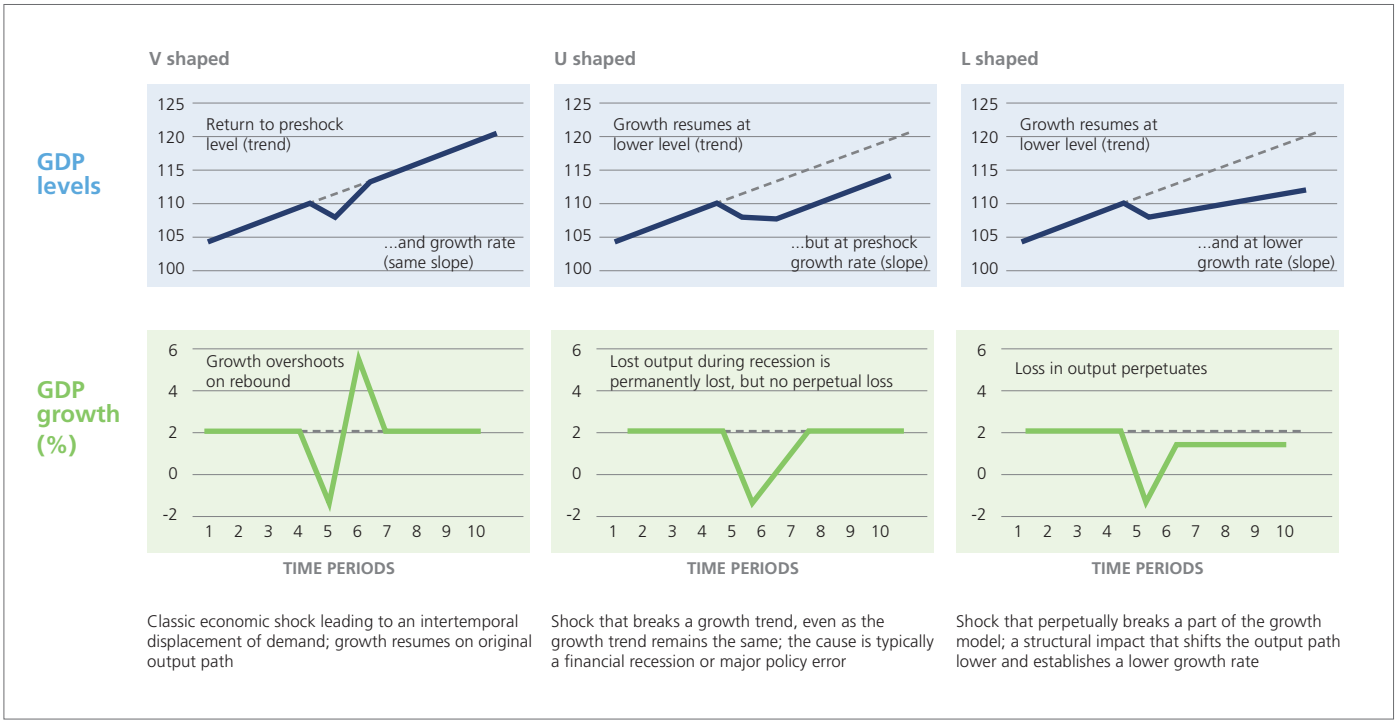
2. Faster than anyone, different from the rest: A V-shaped regional economic rebound

How will the world recover from this global economic shock? Possible scenarios of global economic recovery can be categorized as L-, U-, V-, and I-shaped. V- and U-shaped recoveries (described by Ben Bernanke, former chair of the US Central Bank) represent relatively short-term recoveries. An L-shaped recovery (described by Kenneth Rogoff, Harvard University professor) indicates mid- and long-term stagnation, and an I-shaped recovery (described by Nouriel Roubini, New York University professor) denotes a so-called double-dip recession. Different experts make varying predictions about the future of the global economic shocks attributed to COVID-19.

Apart from these shocking predictions by experts, there is no doubt that economic recovery should begin with short-term recovery. To promote this, Korea needs to minimize the current shocks and focus on creating conditions that support an economic rebound.

Historically, every crisis has created new opportunities. The active engagement of female workers was promoted after the Second World War, aviation security regulations were tightened after the 9/11 terrorist attacks, and online shopping

Figure 2. V, U, and L scenarios induced by COVID-19



Source BCG Henderson Institute's Center for Macroeconomics.

sites such as Alibaba became popular after the crisis caused by severe acute respiratory syndrome (SARS). In the Republic of Korea, it is also undeniable that corporate integrity increased after the 1997 foreign-exchange crisis and the 2008 global financial crisis, and the Middle East respiratory syndrome (MERS) outbreak in 2015 provided momentum for reorganizing the domestic quarantine system. The COVID-19 outbreak can also offer new opportunities to reshuffle physical infrastructures and systems to overcome the economic crises it has engendered.

The entire world is now testing on various solutions for stimulating regional economies. Recent moves include the commercialization of telecommuting, large-scale use of local currencies, and deregulations to foster the untact industry. These national efforts are equivalent to wartime solutions and can overcome the impacts of coronavirus and help new nations seize hegemony in the post-coronavirus era.

Information and communications technology (ICT) infrastructure lies at the core of the worldwide untact trend. In Korea's fight against COVID-19, national and individual efforts to support inclusive growth are combined with the world's best ICT infrastructure. Therefore, it can cautiously be said that Korea, which is coping relatively well with the COVID-19 crisis, is favorably positioned for success in the post-COVID-19 world, as it holds more cards than other countries.

3. Regional strategies for economic recovery in the 'untact' era

Regional strategies for economic recovery are urgent at the moment. Therefore, this topic will be examined in more detail, with a focus on the manufacturing and service sectors.

In manufacturing, regionalization strategies in the global market will be important. In 2019, China accounted for about 25.1% of Korea's total exports and 23.1% of its total imports (Korea Customs Service, 2020). As this illustrates, excessive reliance on specific export and import partners limits diversity in the global economy. The current COVID-19 crisis has emphasized this vulnerability in supply chains. This is also why decoupling from the Chinese market and the differentiation of global value chains are currently frequent topics of discussion. Furthermore, the location of the next hegemony in Asian manufacturing is a critical question.

To this end, it is essential to address the location requirements for the reshoring of "U-turn" companies, or foreign investment companies, after Korea decouples from China. Currently, Korea's regulations around location requirements are not easy to deal with. Although a considerable number of overseas firms entering the country want to focus on the capital region, this region faces various problems, including location-specific regulations and the absence of incentives. Other obstacles arise in other regions, including inadequate populations and workforces. Therefore, to promote reshoring

"The COVID-19 outbreak can also offer new opportunities to reshuffle physical infrastructures and systems to overcome the economic crises it has engendered"

and foreign direct investment in the coming years, we must reduce restrictions on imports to the capital region and improve conditions to support regional industries in other areas.

In the retail sector, it is necessary to secure urban supply chains and restore local markets. While many industrial sectors have suffered severely from the COVID-19 outbreak, one key sector that is experiencing rapid growth is ecommerce. The domestic retail market is already shifting at an alarming pace from large markets, such as department stores, to ecommerce competitors. The demand for this new market is likely to increase further in the post-coronavirus era. To respond to this trend effectively, in addition to offering distribution over large areas, location strategies centered on urban distribution centers should be developed. Coupang's "rocket delivery" and Market Kurly's "dawn delivery" have their own distribution networks centered in urban outskirts; BaeMin offers hourly delivery out of an urban distribution center that is about 100 pyeong (330m^2) in size.[03] When reorganizing delivery services, reshaping regional location strategies is the most important element.

Along with improvements in the existing distribution structure, currently centered on conglomerates, local markets that enable direct spending within each region should be encouraged. For example, during the Great Lockdown, consumer demand for fresh food increased. Therefore, regional agricultural production and distribution are emerging as important issues. The need for food security and food sovereignty offers new opportunities for non-capital regions where farming and fishing are primary production activities; it can also support the revitalization of local traditional markets and farmers' markets.

Certainly, COVID-19 presents a tremendous threat. However, the post-coronavirus era also promises many new opportunities. To greet this era, along with leveraging our ICT infrastructure, the Republic of Korea should realign and combine other internal infrastructures with ICT infrastructure. Now, it is more important than ever to stimulate coevolution between ICT and space.

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03. Coupang, Market Kurly, and BaeMin are the most popular food delivery-related applications in Korea. 'Rocket delivery', a delivery service of Coupang, provides a same-day or next-day delivery. Market Kurly's 'dawn delivery' guarantees that ordered products arrive by 7 a.m. the next day.

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4 Changing Patterns in the Use of Urban Spaces Due to 'Untact' Culture and Planning-based Responses

Jin Hui Lee

The worldwide spread of an infectious disease has triggered the full-scale adoption of untact modes, accelerating changes in our ways of life that began with the advancement of information and communications technology (ICT). In the coming years, the spread of untact modes is likely to bring about extensive changes in urban functions, movement, and space utilization. This necessitates responses to these shifts that involve urban planning. This paper examines changes in urban spaces after the outbreak of an infectious disease and considers preemptive urban planning-based responses to these changes.

1. Infectious diseases and 'untact' modes

In recent years, the frequency of outbreaks of new infectious diseases has been rising. COVID-19, a respiratory infectious disease that first broke out in December 2019, has spread drastically. As of May 14, 2020, approximately 4.18 million confirmed cases had been reported from 215 countries around the world.[01] Infectious diseases include pathogens that are transmitted via sources other than humans, such as air or soil, as well as from human to human (Hyeon Jeonghee 2017). The spread of infectious diseases means an increase in the transmission of pathogens between humans. Since the 2000s, the emergence of new types of infectious diseases has become frequent.[02] The most discussed possible causes of these pandemics[03] include high population densities due to urbanization, increased travel between cities due to globalization, the development of transport facilities, social and economic segregation, and a lack of public health infrastructure (Sung Hyungun 2016; Sung Hyungun and Kwak Myeongshin 2016; Choi Byungdoo 2015; Hyeon Jeonghee 2017). Notably, increased population density due to urbanization increases contact among people, and increasing air traffic facilitates exchanges between continents. These shifts enable infectious diseases to spread more rapidly, thereby inflicting greater damage (Beck 2006).

In response to this situation, the Korean government has recently recommended social distancing to reduce the spread of COVID-19 in communities. Social distancing means reducing contact between humans to curb the spread of infectious diseases; it involves maintaining distance during face-to-face contact and reducing occasions of direct contact, which may entail closing schools and cancelling meetings.[04] As social distancing continues, a transition to new ways of life is underway, including online schools, telecommuting, and untact recruitment and consumption. "Untact" is a word that combines the English word "contact" with the English negating prefix "un." It was first coined by Kim Nan-Do, a professor of consumer science at Seoul National University, to explain new consumption patterns that eschew face-to-face contact

01. According to the World Health Organization (WHO), as of May 13, 2020, a total 4,179,479 COVID-19 cases had been confirmed from 215 countries, and the death toll had reached 287,525. https://www.who.int/emergencies/diseases/novel-coronavirus-2019?gclid=CjwKCAjwte71BRBCEiwAU_V9h7oHM-GYtrJ1ZkLwKOXem-JTjMTj_uelBQuT1u2V36DpK6h9gsEZPARoCKzcQAvD_BwE (accessed May 14, 2020).
02. These include severe acute respiratory syndrome (SARS, which had outbreaks in 29 countries) in 2003, a novel influenza A (H1N1, outbreaks throughout the world) in 2009, avian influenza (H7N9, outbreaks in China) in 2013, the Ebola virus (outbreaks in Africa) in 2014, Middle East respiratory syndrome (MERS, outbreaks in 12 countries) in 2015, and the Zika virus (outbreaks in 43 countries, primarily Central and South America) in 2016. Over the last 15 years, outbreaks of various infectious diseases have caused global socioeconomic losses of 900 trillion won (Kim Juwon and Hong Meeyeong 2018).
03. The WHO classifies infectious diseases according to severity and spread. A disease classified as level 6, the highest level, is a pandemic (indicating global spread). The novel influenza A (H1N1), which first broke out in June 2009, and COVID-19, which began in March 2020, were declared pandemics. https://www.who.int/health- topics/coronavirus#tab=tab_1 (accessed May 14, 2020).
04. COVID-19. http://ncov.mohw.go.kr/shBoardView.do?brdId =3&brdGubun=32&ncvContSeq=1145 (accessed May 11, 2020).

(Kim Nando et al. 2017). The National Institute of the Korean Language recently defined "untact" as the act of purchasing goods or receiving services without face-to-face contact and suggested "non-contact service" as an alternative to "untact service". Public attention to and expectation of untact modes are gradually increasing, and in line with this, traditional lifestyles are likely to change going forward.

In fact, untact modes are not a new phenomenon. The term "ubiquitous," meaning "present everywhere and all the time," was introduced as soon as the early 2000s to describe advances in ICT. Therefore, many people have predicted changes in traditional ways of living that require face-to-face contact. Ubiquitous ICT means that users can access networks freely everywhere without worrying about the availability of computers or networks (Shin Donbin et al. 2018). In the Republic of Korea, the foundation for untact lifestyles that transcend time and space was established with the adoption of smart technologies in various city facilities and the enactment of "The Act on the Construction, etc. of Ubiquitous Cities" in 2008.[05]

2. Changes in urban space due to 'untact' modes

As untact modes are becoming more common, as are claims that high-density urban structures respond poorly to infectious disease outbreaks, the most vigorously discussed issue is whether cities will continue to exist at all in the future. As human and material damage from COVID-19 increased in large cities such as New York and Milan (Oh Miae et al. 2020), a question arose: Will cities continue to grow at today's levels in the post-coronavirus era? However, even before the COVID-19 outbreak, the argument had been made that the information era would enable people to perform most of their daily activities beyond the limitations of space, making urban areas meaningless and possibly leading to the dispersion and disintegration of cities. As early as the late 1900s, futurologists such as Berry (1973), Toffler (1981), Hwaley (1986), and Gordon and Richardson (1997) foretold that advanced technologies would enable the separation of residential areas from basic facilities such as workspaces and commercial, medical, educational, and public facilities. They also predicted that decreases in transportation and communications costs would accelerate this decentralization. In recent years, some urbanologists have argued that urbanization, which can also cause overpopulation, is vulnerable to infectious diseases and pathogens that can be transmitted via public transportation. Therefore, continuous outbreaks of infectious diseases threaten the continued existence of cities (Sung Hyungun 2016; Sung Hyungun and Kwak Myeongshin 2016; Lee Heejeong 2020). However, most experts predict that, even after the COVID-19 pandemic, the status of cities will not change significantly. Cities, which have already survived various disasters, will continue to attract people with personal and professional opportunities, high-quality jobs, abundant infrastructure, and appealing environments.[06]

Although cities' vulnerability to infectious diseases and continued existence or extinction are uncertain, we do know that technological advances are promoting the widespread use of untact modes. As untact modes become prevalent in society at large, individuals who have experienced the convenience of online-centered living are highly likely to cling to these new lifestyles even after the COVID-19 crisis passes. In other words, although untact modes may not result in urban declines, these lifestyle changes will also bring changes to urban structures (Graham 2002). If untact modes are established, most daily activities will be replaced by online activities, reducing physical traffic. Shin Dongbin et al. (2018) noted that, as ICT develops, virtual spaces will replace real spaces in various fields. Therefore, the need for one urban function—providing spaces for activities such as business, commerce and finance, culture and leisure, and medical care and wellbeing—is decreasing. This necessitates changes in the structure of urban spaces to support untact modes.

However, these changes will occur to varying degrees depending on which functions are most suited to untact modes and whether spaces for offline activities are still

05. Due to concern that the term "ubiquitous" might be difficult for the public to understand, this act was renamed "The Act on the Promotion of Smart City Development and Industry" in September 2017, and, in existing laws, the term "ubiquitous" was replaced by "smart."
06. Foreign Policy, a journal on foreign relations that the US Carnegie Endowment for International Peace has published since 1970, reported predictions about post-COVID urban lifestyles based on interviews with 12 experts in a range of areas, including cities, policy, history, and medicine. Many experts pointed out that cities have continued to grow even after widespread disasters, citing the Black Death in the Middle Ages, the Spanish influenza in 1998, and the 9/11 terror attacks as examples. https://foreignpolicy. com/ 2020 /05/01/ future-of-cities-urban-life-after-coronavirus-pandemic/ (accessed May 14, 2020).

necessary despite untact living. First, in the case of working spaces, increased telecommuting and untact meetings will reduce the demand for spaces such as office buildings and large conference halls. Kim Mihyeon and Choi Jinwon (2004) forecasted that the adoption of ubiquitous technology would change existing working spaces to allow users to perform work-related tasks in everyday life according to their needs. In commercial and financial activities, the spread of online shopping will shrink spaces such as traditional retail stores and banks. A study by Shin Dongbin et al. (2018) demonstrated similar results: Survey respondents indicated that many people would replace physical shopping or financial activities with online ones if ICT developed fully in the future. According to the Korean Federation of Banks, approximately 100 bank branches, accounting for 5% of the country's total branches, are disappearing every year. The survey respondents also indicated that, although online service is relatively convenient, public education would not see reductions in face-to-face activities despite technological advances (Shin Dongbin et al. 2018). However, currently, due to concerns about the spread of infectious diseases, untact modes are preferred in the education field as well. This opens the possibility of reducing physical spaces for educational facilities such as schools as well.

3. Urban planning-based responses to changing lifestyles

Even if the COVID-19 crisis passes, if people who have experienced how advanced technologies can replace traditional lifestyles centered on face-to-face contact adhere to untact modes, cities will not remain unchanged, if they survive at all. When face-to-face services are reduced, "the purpose of use" is likely to undergo the biggest change in the traditional urban structure. As untact modes become prevalent, the use-based zoning system, which strictly separates workplaces from residences and other urban functions, will become meaningless (Koo Jihee et al. 2009; Shin Dongbin et al. 2018). As mentioned earlier, the increase in remote working due to advances in ICT enables workers to perform job-related tasks at home or at any nearby location with easy access to technology. Therefore, we will increasingly see single spaces used for various functions, without the conventional distinction of residential spaces from working or leisure spaces (Shin Dongbin et al. 2018). Accordingly, the demand for converged- or flexible-use spaces, rather than single-use ones, will increase. However, the current zoning system sets standards for floor areas, building-to-land ratios, permitted facilities, etc., only for single-use spaces. Hence, to prepare for the growth of untact modes, we should consider a new zoning system that incorporates the fusion and convergence of spaces, three-dimensionalization, and multiple uses for single spaces. Untact modes allow humans to travel less and remove the limitations of time and distance through advances in ICT.

In addition, since untact modes reduce encounters between people, another question arises: What is the most efficient level of urban density? With recently mounting concerns about face-to-face contact due to the spread of COVID-19 and growing preferences for untact modes, Muggah et al. (2020) proposed the concept of "smart density," the optimal density for our changed environment that still maintains urban functions. Prior to COVID-19, when asked about ubiquitous or smart cities, experts projected that, if the demand for rigorously separated spaces reduced due to advances in ICT, urban density would either increase as spaces obtained a combination of uses (Kim Hyunsik et al. 2002; Shin Dongbin et al. 2018) or decrease due to decentralization and multi-centralization (Castells 1996; Graham 2002). In the Republic of Korea, although the concept of ubiquitous cities was introduced about 20 years ago, no significant changes in urban density have occurred. However, the recent acceleration of a transition into untact modes in the face of the COVID-19 outbreak suggests that demand for compressed development may decrease and that cities may shift towards multi-centralization. Since questions on the structure, use, and density of cities must be addressed in the framework of related legal systems, more research on this topic is required.

Future changes to the demand for spaces by function should be followed by corresponding changes in policies on infrastructure. Basic living infrastructure is defined as facilities that increase convenience or enhance or maintain residents' quality of life. It encompasses the areas of healthcare and welfare, medicine, care services, leisure and culture, education, and amenities. In 2018, the Korean government laid out the national minimum standards for basic living infrastructure based on time, distance, and demand for a given facility. However, since untact modes are designed to overcome the limitations of time and space, the current minimum standards based on time could become meaningless. For example, many people are already using ICT to receive telemedicine services, such as medical consultation, for minor issues, although this is currently limited to general medical care for minor conditions (Shin Dongbin et al. 2018).

However, in the future, the full-scale implementation of telemedicine will reduce the number of visitors to general hospitals and clinics while increasing the demand for care for severe conditions or convalescence. Moreover, if distance learning, which is currently underway, becomes more common, it will be necessary to reexamine the use of spaces for educational facilities such as schools and private institutes. Administrative services can also be smoothly converted into untact modes. However, care services inevitably require face-to-face contact; therefore, additional considerations should be made to secure proper physical space and accessibility for this sector. In the coming years, we anticipate the disintegration of commercial spaces following the facilitation of untact culture and changes in the demand for physical spaces for various public services such as education (Oh Miae et al. 2020). Therefore, urban planning-based approaches are necessary to efficiently distribute space according to urban function. These approaches may examine the types of infrastructure that require physical spaces and identify optimal locations to increase accessibility based on residents' changed lifestyles.

Finally, transportation systems are closely linked to untact modes. Above all, untact modes inevitably reduce human traffic because they reduce the need to physically move to engage in specific activities (Shin Dongbin et al. 2018). Some previous studies predicted that the establishment of a smart public transportation system due to ICT advancements would reduce the use of private cars and increase the use of green transportation such as bicycles and public transportation (Koo Jihee et al. 2009; Shin Dongbin et al. 2018; Benevolo et al. 2016). However, the COVID-19 outbreak has revealed the vulnerability of public transportation such as subways and buses. Accordingly, even if untact modes become common in the future, anxiety about public transportation and the sharing economy could cause a shift to individual-centric transportation systems (Sung Hyungun 2016; Sung Hyungun and Kwak Myeongshin 2016; Oh Miae et al. 2020; Muggah 2020). Even if total traffic is reduced by the prevalence of untact lifestyles, the use of private cars might increase due to basic movement and travel to access nature (Oh Miae et al. 2020). In view of this, cautious approaches are required to support an effective transition to future public transportation systems or roads that aligns with changed traffic volumes and travel patterns (Benevolo et al. 2016).

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5 Eco-Vaccines in the Post-COVID Era: Green Infrastructure and the Green New Deal

Jong-Soon Park, Eun-Joo Yoon, Sun-Young Sung, Dong-Kun Lee

1. Introduction

COVID-19, which hit our society in February 2020, is showing no sign of subsiding. Infectious diseases occur when pathogens from animals directly enter the human body or existing pathogens mutate within hosts and are reactivated. COVID-19 is a type of Anthropozoonosis, a disease that emerges from the interactions between humans, environments, and microorganisms[01].

With the outbreak of this infectious disease, every country is implementing border closures and imposing or advising restrictions on the movements of its people. This weakens economic activities and causes fear of mass unemployment. In the 1930s, the US created jobs through large-scale financial investments in the public sector to overcome the Great Depression. The Republic of Korea is forecasted to experience negative economic growth this year, which will lead to job losses. To cope with the infectious disease and the economic crisis, the country needs active investment in the renewable energy industry, eco-friendly remodeling of buildings, an eco-friendly automobile industry, and the expansion of green infrastructure at the level of national land and cities.

This paper considers how to implement green infrastructure in the national space to develop high-efficacy "eco-vaccines"[02] with the Green New Deal policy that pursues job creation and economic revitalization.

2. Policy directions for the national environment

1) National land

- **Conserving nature**

Regarding national land, first, the indiscriminate development of natural spaces should be discouraged, and superior habitats and ecosystems should be preserved to support ecological connectivity. In other words, the design of preservation areas should consider not only structural aspects such as vegetation and the size of forests, but also functional aspects such as the movement of wild animals. Even within one area, connecting two preservation habitats results in greater diversity and reduces the frequency of wild animals' exposure to the outside world. The edges of preserved habitats experience constant disturbance due to changes in the climate and population density and the invasion of exotic species. Failure to secure wild animals' pathways leads to local extinctions and animals' exposure to human settlements. Since a considerable number of infectious diseases originate in wild animals, the reasonable preservation of habitats and of ecological connectivity will also benefit humans.

- **Caution against excessive urbanization and the need for balanced national development**

In addition, we should avoid excessive urbanization through the proper dispersal of urban populations. Since 1960, the Republic of Korea has undergone rapid urbanization and industrialization in line with rural-to-urban migration. The country's proportion of urban population has increased

01. Microorganisms are very small organisms such as protozoans, germs, and viruses.
02. Vaccines are needed to prevent pathogenic viruses. There are three types of vaccines. Medicines and vaccines made by pharmaceutical companies are "chemical vaccines"; social distancing could be considered a "social vaccine." Lastly, "eco-vaccines" are intended to prevent infectious diseases using nature's disaster prevention and control functions (CBS 2020). Responses to disasters such as climate change and COVID-19 require the creation of multi-functional green infrastructure that is resilient to disaster at the level of national land space.

from 35.8% in 1960 to 91.8% in 2018. About 74% of the headquarters of the country's 1,000 largest companies and 50% of the national population are concentrated in the capital region, which accounts for 12% of national land (The Regional Development Committee 2018). Meanwhile, marginal and semi-marginal villages are emerging in the non-Seoul Metropolitan area due to population declines. Moreover, 37% of the country's cities, counties, and districts are in danger of extinction in the next 30 years. With the COVID-19 pandemic, the concentration of populations in large cities is likely to raise mass infection rates, whereas rural cities may need to worry about extinction due to low population densities. Therefore, when threatened by infectious diseases, balanced national development and population dispersal policies are still effective.

- **Climate neutrality and the Green New Deal**

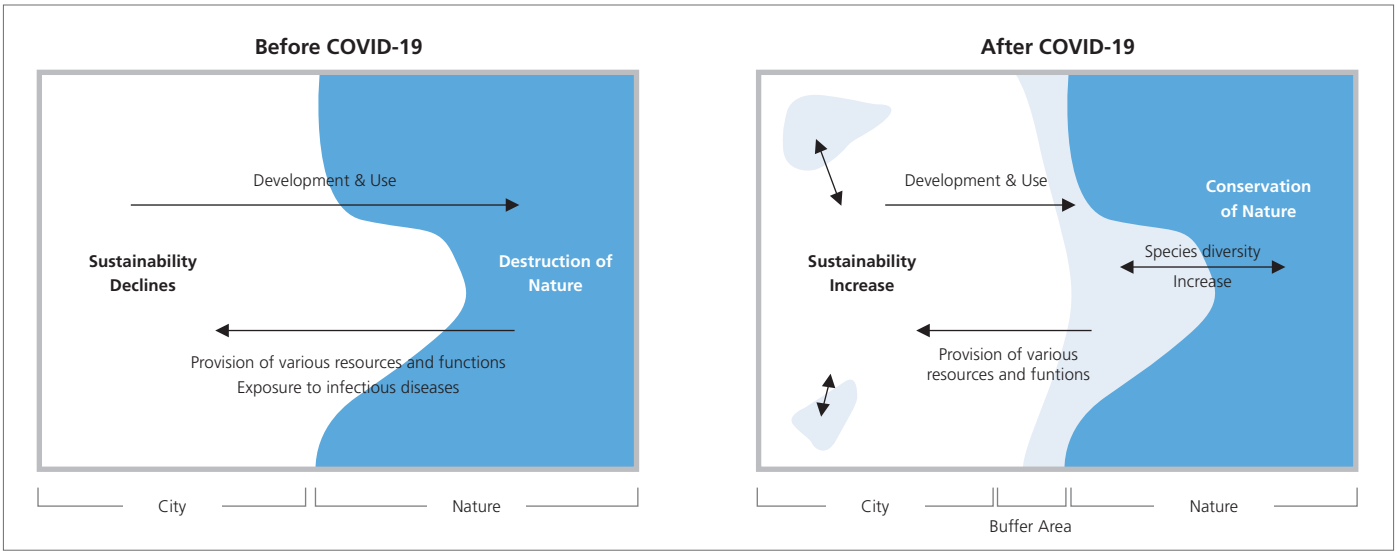
Countries around the world are proposing Green New Deals as a roadmap for a transition from fossil fuels to a zero-carbon green economy. Under a Green New Deal, reductions in greenhouse gases would not inhibit economic development, but rather create jobs and add value as well as minimize stranded fossil fuel assets[03] (Rifkin 2020). In Korea, greenhouse gas emissions have continued to grow, but the potential of the Green New Deal has been confirmed by the nation's response to COVID-19, which has included spontaneous cooperation, trust in the government, lifestyle changes, and the spread of new communications technologies (Go and Kim 2020). While implementing the Green New Deal, the country should simultaneously build strategies that enable flexible responses to national land spaces in the zero-carbon era after the Green New Deal has been implemented. During the land-use planning phase, smart grids, energy self-sufficient buildings, and reduced movement should be considered. After the demand for some physical spaces decreases as the Green New Deal is implemented, green infrastructure, which is a carbon sink and creates diverse benefits that will be discussed later, should be introduced. In addition, a transition into the zero-carbon green economy through the Green New Deal can create a virtuous cycle that lowers the likelihood of outbreaks of various infectious diseases due to climate change.

2) City spaces

- **The expansion of green infrastructure within the biotope**

Urban green infrastructure is a very broad concept; it encompasses the foothills of the Baekdudaegan Mountain Range, partial forests in developed areas,[04] urban parks, green roofs, green walls, and street trees. However, "green infrastructure," rather than merely "green," implies something that functions as an eco-space and, at the same time, as a basic

Figure 1. Functional spatial changes



03. Stranded fossil fuel assets can be defined as those assets that at some time prior to the end of their economic life, are no longer able to earn an economic return as a result of charges associated with the transition to a low-carbon (Carbon Tracker).
04. Commonly refers to hills behind villages.

facility for socioeconomic activities. During the rapid spread of COVID-19, there was an increase in the number of visitors to environmentally friendly spaces such as urban parks and hills behind villages as individuals avoided indoor spaces, where the risk of infection is higher. This is another example that shows the socioeconomic function of green infrastructure. Adequate green infrastructure should be available at the neighborhood level, just like other types of infrastructure such as water supply and sewage systems. First, the demand for green infrastructure should be determined based on population and the existing environmental characteristic for each life zone. Next, where, how much, and how to introduce green infrastructure within the neighborhood should be discussed. Because the expansion of green infrastructure at the neighborhood level reduces unnecessary movements between neighborhood, additional effects such as prevention of the spread of infectious diseases and greenhouse gas reductions can be expected as well.

- **The establishment of multi-functional green infrastructure**

Although a range of official plans and studies have proposed the expansion of green infrastructure, such infrastructure has been adopted only in very limited spaces due to costs and structural problems in urban areas. Therefore, when building green infrastructure, it is important to include multiple functions; these may include providing habitats for wild animals, mitigating heat islands and increasing water circulation, and aesthetic value. During the recent COVID-19 crisis, green infrastructure gained an additional function as a shelter from a disaster and a buffer that could minimize human contact with wild animals. Since it is certainly impossible for one space to fulfill all these functions, appropriate functions should be allocated to specific spaces as needed in each region. For instance, a buffer area is first defined by identifying the natural areas where many wild animals are observed. Then, the buffer area's size and shape and appropriate vegetation can be chosen considering in the distribution of fine dust concentrations or index of greenness around the area. In addition to their original roles, urban parks can also function as refuges in the event of disasters such as infectious disease outbreaks or earthquakes. Likewise, when planting street trees, the trees' spacing, height, and crown width should be chosen to improve pedestrians' thermal comfort, and the city's natural water circulation can be increased by connecting the lower section of trees to the low-flow tank system. However, because of trade-off and synergy effects between the functions of multi-functional green infrastructure, basic research should be done first to maximize the benefits of green infrastructure within a life zone.

> "There are several possible approaches to this problem, but the top priority should be to foster the environmental industry through financial investment in the public sector and to create new jobs through the expansion of green infrastructure"

- **Ventilation corridors, building arrangement, and height control**

A ventilation corridor is a space that connects natural resources such as rivers and streams, green areas, and open spaces to control urban climates; it can be viewed as a type of green infrastructure. Most existing ventilation corridors are designed to bring fresh mountain nighttime air into cities to reduce urban heat island effects and air pollution. In Hong Kong, the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003 caused 1,755 infections and 299 deaths. This highlighted the need to improve the country's urban ventilation environment, which resulted in the development of urban planning techniques and self-evaluation systems (Park et al. 2019). As this illustrates, careful consideration should be given to the creation of ventilation corridors by adjusting the arrangement and height of buildings within a city. Ventilation corridors can also quickly discharge downtown reservoirs of infection into the natural environment.

3. Healthy and safe national land

An urgent issue facing our society is the economic depression caused by the COVID-19 outbreak. There are several possible approaches to this problem, but the top priority should be to foster the environmental industry through financial investment in the public sector and to create new jobs through the expansion of green infrastructure. We should seek new economic opportunities while reducing greenhouse gas emissions. National wildlife preservation areas should be established, and the borders between human habitation and nature should be made thicker than before. The density of residential spaces should also be decreased through population dispersal policies. We will be able to create healthy and safe land when we fully understand the interactions between our economic and social activities, the natural environment, and the microorganisms inhabiting it.

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6 Laying a 'Flowery Path' for End Users in the Housing Market

Soo-Wook Lee

As stress is the root of all illnesses, real-estate speculation is the root of public anxiety about housing. Although many renter households wish to have their own houses, conditions for buying homes are not improving much. This is because of property speculation. The speculative force comes from unearned income. To ensure national housing stability, we should 'lay a flowery path'[01] toward a society in which end users have no concerns about housing by eliminating speculation through the thorough restitution of unearned incomes and achieving stable supply and demand for housing.

1. Short-term measures against the COVID-19 crisis and the shock to the real estate market

The word "crisis" means a turning point. If an important or decisive moment is a turning point, conditions before and after that moment should be very different. Currently, people are predicting that the pre-coronavirus order will be destroyed, but the coming new order is still unclear. Previous crises have also accelerated the pace of change, such as the International Monetary Fund foreign-exchange crisis of 1997. This crisis began on November 21, 1997 and lasted for 37 months, until December 4, 2000. Since then, Korean society has seen an increase in part-time and contract jobs and a decrease in permanent ones, along with declines in the number of marriages and total fertility rates at around one birth per woman. Many of today's households consist of one or two members, and income and asset inequality and polarization resulting from population aging, low growth, and low interest rates have become the new normal.

In *Upheaval: How Nations Cope with Crisis and Change* (2019), Jared Mason Diamond stated that the key for coping with an individual or national crisis is "selective change." Selective change starts with establishing clear-cut lines around what to keep and what to abolish to move towards desirable goals for society. To this end, we should first examine the shock waves that the COVID-19 outbreak sent to the real estate market.

The real estate market crisis attributed to COVID-19 likely stems from a combination of three factors: supply, demand, and household debt. Although low interest rates have been maintained, the impact of country's total household debt (1,600 trillion won) on the economic crisis cannot be ignored. At this point in time, however, it is not necessary to fuel anxiety by citing price drops or decreases in the amount of housing transactions, which are occurring in parts of the housing market. The real estate market is projected to remain weak or steady or to falter due to strict regulations and end users who are waiting to see how the market unfolds. However, this does not mean that we should delay our response to the economic crisis. Rather, it means that since the situation currently facing the real estate market differs from those of the 1997 and 2008 economic crises (thanks to abundant market liquidity and increased numbers of business owners with private leases), measures suited to this new situation are sufficient for now. In other words, strengthening weak links in the chain through which shocks are sent to the real estate market will suffice to defend the market.

The route by which COVID-19 affected the housing is as follows: The COVID-19 crisis caused unemployment, reduced consumption, and a lack of household liquidity. As a result,

01. In Korean, 'flowery path' implies a road filled with success, one that you can find happiness along the way. 'A bed of roses' in English can be a synonym for flowery path.

households that were short of cash began to sell their houses or put them up for auction, disrupting the housing stability of ordinary people. An increase in the supply of houses has led to more price drops. This supply shock results from the lack of new consumers in the market; more and more consumers are choosing to wait and see. Therefore, a proper response to the COVID-19 crisis is to implement policies that establish a buffer that can mitigate the supply shock. A "housing bank" could purchase houses put up for auction or quick sale and resupply them as rental housing.

2. The top priority in the post-COVID era: Anti-speculation measures and thorough restitution of unearned incomes

Since COVID-19 was declared a pandemic, some have insisted on the relaxation of real estate market regulations to overcome the economic crisis. However, this is the wrong step at the current stage, because our real estate market can absorb the COVID-19 shock, as discussed above. The side effects of speculation, inequality, and price surges, which also emerged after previous crises, also suggest the need to respond to the current crisis from a more cautious, long-term perspective.

The Moon Jae-In government's real estate market policies include the eradication of speculative demands, customized measures, and protection of end users. A framework for this policy direction was established by the August 2 Plan (2017) and the September 13 Plan,[02] and this approach will likely remain effective in the post-coronavirus era. Therefore, the top priority for the post-coronavirus era is also to realize a real estate market that is free from speculation. To this end, the generation of unearned income through real estate ownership should be eliminated.

Although there are varying opinions on the difference between investment and speculation, speculation is defined as the act of "owning with a focus on capital gains from sales rather than the profitable use of production" (Barlowe 2016) or as "making short-term investments in assets with unrealistically high profitability" (Botha 1970). However, every act designed to realize short-term capital gains eventually becomes a type of speculation. Real estate speculation is motivated by the higher returns on capital investment than those available via other alternatives. The generation of unearned income due to price increases has undermined the value of labor and created a social climate that takes social polarization and inequality for granted.

According to the 2018 Housing Ownership Statistics published by Statistics Korea, of the country's 14.01 million householders, 2,192,000 householders own two or more houses. The number of multi-homeowners has increased by 28,000 to 140,000 every year depending on housing market conditions. Around 40% of the country's new construction is purchased by multi-homeowners, half of whom reside in the capital region, including Seoul. As a result, we are living in a society in which one in three households live in rental houses. The average Korean household takes 7.1 years to buy its first house and must earn 6.7 times (the mean price-to-income ratio [PIR]) the annual mortgage to buy a house. Rents are also a marked 21.1% (the mean rent-to-income ratio [RIR]) of the average household's monthly income.[03] Amid the current slowdown of increases in household incomes due to reduced economic growth, it is almost impossible for hard-working citizens to keep up with soaring house prices. In the post-coronavirus era, reducing housing-related burdens such as the PIR and the RIR to less than half of current levels should become a policy goal. To this end, market policies aimed at dismantling real estate speculation and mitigating the concentration of home ownership should be expanded.

3. The 'untact' era: Laying a flowery path to housing stability for end users

With the full-scale implementation of social distancing amid the COVID-19 crisis, the untact era is approaching sooner than anticipated. Real-estate transactions normally take place face-to-face. However, even in face-to-face transactions, fake documents due to the misuse of information gaps or personal data, fraudulent transactions, exaggerated advertisements,

02. Major policies include blocking speculation by multi-homeowners and pseudo consumers, strengthening holding taxes to curb the expansion of asset inequality, expanding areas where house purchases are regulated, restrictions on house loans, strengthening transaction taxes, and tightening restrictions on monopolies.
03. According to the 2018 Korea Housing Survey, in the capital region, the mean PIR is 8.6 and the mean RIR is 24.0%.

defective houses, and insufficient information are common. In the coming untact era, potential buyers will be able to look at real estate information anytime and anywhere using virtual tours and virtual or augmented reality.

Society is a living organism. It is a shared organism that grows from trust and faith and demands sacrifice and concession. Although technical advancements have increased consumer access to real estate information, they have also created challenges. One of these is unequal access to and familiarity with technology; another is the potential violation of consumer rights due to release of personal information. In the real estate markets of large cities, ordinary people and end users cannot easily access housing. For a long time, urban housing has been a money-making channel for multi-homeowners, and residents' housing has determined their social status. Today, we need changes in housing, which has caused endless social conflicts. In the post-coronavirus era, real estate policies should enable end users to buy homes easily, and the burden of housing costs to ordinary citizens should be significantly reduced.

To this end, first, we should create a mechanism that accommodates social requests for the public concept of real estate. Every member of society should accept that housing, which is a necessity for human life, is not for buying and selling, but for living. This concept is based on the philosophy of fair ownership and distribution as well as sustainability. This concept therefore aligns with the values of the Green New Deal, which has recently come to the forefront of public discourse. In addition, the COVID-crisis has confirmed that housing today is not merely a living space but a small piece of society that can function as a workplace (telecommuting), an educational institution (online education), and a medical institution (quarantine facilities).

Given the rapid increases in one- or two-member households and the growth of untact modes, more discussion of publicness is needed. Publicness is key to developing housing with a range of functions and uses. Second, the idea of housing as a market good should be minimized to reinforce the publicness of housing. The number of houses owned by one individual should be strictly regulated through taxation, and financial regulations to control demand should strengthen the accountability of consumers and financial institutions, which are the source of housing supply. More prudent lending practices are required to stabilize the market. The problem of risks being shifted to consumers should be resolved through the establishment of limited liability (non-recourse) loans.[04] Moreover, the proportion of public houses should be increased and the occupants of such houses should be diversified to establish a culture that values publicness in the housing market. An integrated type of public rental house will begin to be

> "We should create a mechanism that accommodates social requests for the public concept of real estate... housing, which is a necessity for human life, is not for buying and selling, but for living"

04. When a debtor is unable to repay a limited liability loan, the borrower's responsibility for repayment is limited to a security (in this case, the house concerned).

supplied in earnest in 2020, and the target occupants of such housing should expand from low-income groups and ordinary people to the middle class, according to regional circumstances and characteristics.

Third, regulations should be strengthened and applied to larger areas. While the direction of real estate policies should be sustained, their implementation should be flexible. Customized, area-specific policies have side effects such as local anxiety and the balloon effect. The government should first define certain regulation levels and broad areas for regulation, looking at the entire country and at cities with populations of at least 200,000, and then apply stricter regulations to specific regions where real estate speculation is a concern. Of course, strengthened real estate market regulations will partly encourage evasion of the law and the development of cleverer ways to destroy the market order. However, this should not stop the government's drive to prevent speculation from taking root in the market through the strict claw-back of unearned income through taxation and regulations. Only then we will be able to "lay a flowery path" toward a society in which end users can live free from housing-related anxiety.

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7 Healthy Homes and Safe Neighbors in the Post-COVID Era

Mina Kang, Hoo-Bin Lee

1. Preparing to live together with an infectious disease

For the last couple of months, we have experienced the unimaginable due to COVID-19. The once-unfamiliar expression "social distancing" has replaced "Friday night out," and not only "performances and sports without an audience" and "Dalgona coffee[01] made at home," but also video conferences and online seminars, once very far from everyday business practices, have become routine. We have also experienced the progress of work without a gap even through telecommuting, a sense of guilt about a manufacturing-centered economic structure turning into a moment of relief, a sense of pride in our high level of medical care, and a deeper realization of the preciousness of everyday life. Some even joke, observing the return of blue skies and clear air, that humans might be a virus to the planet.

In the face of a global pandemic, we may need to prepare to "live together with an infectious disease," leaving a relative sense of relief behind. In this unprecedented crisis, it is time to consider who our neighbors are and how to utilize housing and space in response to changing lifestyles.

2. In the post-COVID era, vulnerable groups experience multiple and overlapping difficulties in employment, housing, and education

With the all-out implementation of social distancing, Koreans have undergone setbacks such as weakened consumer confidence and unpaid leave. Quiet streets, closed shops, empty stores, forced lay-offs, dismissals, joblessness, and bankruptcy have created greater concerns about economic deterioration and income declines than the earlier foreign-exchange crisis.

Those who are hardest hit by this external shock are often the most vulnerable social groups. For example, service workers such as day laborers at construction sites, young people working at part-time jobs or internships, housekeepers, cleaners, and sales workers will suffer most from the worsening employment situation and income reduction.

Table 1. The number of households of day laborers and small business owners by type of housing

(Unit: %, 1000 households)

Category	Day laborers				Small business owners			
	Total	Own house	Key money deposit	Monthly rent	Total	Own house	Key money deposit	Monthly rent
Proportion	11.3	4.2	1.4	5.1	15.6	11.3	1.5	2.4
Number of households	2,249	842	286	1,015	3,118	2,252	305	471
Number of households with children	235	76	42	103	686	457	105	92

Source
An analysis of the microdata from the 2019 Korea Housing Survey.

01. Dalgona coffee is a beverage made by whipping a mix of instant coffee powder, sugar, and hot water until it becomes creamy. During the COVID-19 pandemic, some Korean people trapped in their homes have joined a SNS 'challenge' to make dalgona coffee by stirring more than 4,000 times by hand just to spend some time. And the challenge became popular globally.

To make matters worse, renters who are unable to pay rent experience increasing housing instability. Families with children must bear additional costs for childcare and the purchase of computers for online classes. Without proper equipment or adults to instruct them, children inevitably fall behind in their learning. As a result, COVID-19 is likely to pose overlapping challenges to some households. According to the 2019 Korea Housing Survey, about 11.3% of the country's general households, around 2.25 million households, work as day laborers. Of these, about one million households live in houses that they rent by the month. Small business owners account for another approximately 470,000 households that pay monthly rent. Regionally, about 52% of households including day laborers reside in the capital region (Of them, 560,000 households make monthly rent payments from day labor), and 100,000 households that include small business owners reside in the capital region.

We should pay attention to the households of day laborers who pay monthly rent. These households will face multiple, overlapping challenges, and they are also a priority target in the urban quarantine system due to their high risk of exposure to infectious diseases. About 21.3% of these households live in housing that does not meet the country's minimum housing standards, and 16% and 15% live in homes that do not meet area and facility standards, respectively. This means that the probability of infection between family members and neighbors can increase due to residential areas marked by narrow spaces and poor ventilation and lighting. About 15% of monthly rent households that own small businesses also live in housing that does not meet the minimum standards.

Another vulnerable group comprises 370,000 households living in non-dwellings. These include people experiencing homelessness, students living in goshiwon (accommodations for students studying for exams), and those living in slice rooms. All of these residents are extremely vulnerable to exposure to infectious diseases. It is more urgent than ever to provide healthy dwellings and quarantine measures for those who have no place to stay and cannot practice social distancing, as well as for households living in goshiwon and slice rooms, where poor conditions can create a hotbed for infections. An additional 370,000 households live in underground or semi-underground homes with poor lighting and ventilation; these should also be the targets of government policy. In Singapore, COVID-19 infections spread rapidly among foreign workers, demonstrating that such problems cannot be solved when only citizens are quarantined. Measures to save everyone must include full-scale expansion of quarantine efforts to address group living facilities, including dormitories and nursing homes, and extending quarantine targets from citizens to all residents.

The issue of housing instability for vulnerable groups is the most basic starting point for addressing housing problems in the Republic of Korea. First, emergency housing support funds should be considered. The government might also use urban housing funds to provide an emergency safety net for those who have lost their homes due to non-payment of monthly rents. A second option is to shift toward buildings that allow green remodeling and healthy designs and that support social distancing. We could develop construction standards

Figure 1. Poor housing conditions in goshiwon and slice rooms

Source Gosiwon and slice rooms in Doneui-dong.[02]

02. Naver photo images. https://search.naver.com/search.naver?sm=tab_hty.top&where=image&query=%EA%B3%A0%EC%8B%9C%EC%9B%90&oquery=%EC%AA%BD%EB%B0%A9&tqi=UzyLTlp0YihssadWZtGssssstG-151042
https://search.naver.com/search.naver?sm=tab_sug.top&where=image&query=%EC%AA%BD%EB%B0%A9&oquery=%EC%95%88%EC%82%B0+%EC%99%B8%EA%B5%AD%EC%9D%B8&tqi=UrGqssp0J1ZsskDAWmGssssssTR-345574&acq=Whrqkd&acr=7&qdt=0#imgId=news52390000056734_1703478206&vType=rollout (accessed June 3, 2020).

and management systems, including ventilation and lighting standards, which can enable social distancing, and offer these healthy dwellings to unhoused households first.

We should also create a foundation for healthy residential lifestyles by nurturing the redevelopment and remodeling of green buildings. This should start with the most vulnerable households and then extend to others.

3. Changing residential styles due to COVID-19

The first step in social distancing to prevent the spread of infectious disease is "to stay home." Telecommuting and online learning require dwellings to host multiple functions; homes are not only a place to live, but also spaces for offices, schools, leisure activities, and cultural activities. There is also a growing demand for larger dwellings that allow more personal space within families to prevent infections. As people spend more time at home during the COVID-crisis, although it is expected that some families will develop a stronger bonds, arguments and conflicts have also increased. This highlights the need to reexamine the current minimum housing standards. Existing housing sizes and structures should be reconstructed so that each family member has enough space, rather than only shared spaces for family members living harmoniously.

On the other hand, new guidelines for soundproofing, ventilation, lighting, etc., will become stricter than ever before. According to the 2019 Korea Housing Survey, residents were least satisfied with the noise between floors, but the sound between rooms will be held to stricter standards and construction requirements in the future as well. In addition, there will likely be requests to switch from centrally controlled communal air conditioning systems to stand-alone ventilation systems. Moreover, the government will need to examine the standards for plumbing, drainage and sewage systems, responses to airborne viruses, and potential infections. Tobacco smoke and insects can currently move freely through apartment buildings via drainpipes, and we know nothing about the routes of viruses, which are much smaller than insects.

Eventually, along with the currently popular high-rise and high-density styles of mass housing, low-rise and low-density detached houses will reappear on the market. In the future, our shift from large housing complexes to small ones and dwellings with some separation between houses will be reappraised.

4. Spatial planning and measures for daily social distancing

At present, it is not certain when a viable treatment or vaccine for COVID-19 will be developed. This means that we should be prepared to continue daily life with an infectious disease, without knowing when another rapid spread might occur. A general view is that it is hard to return to life as it was

> "In this unprecedented crisis, it is time to consider who our neighbors are and how to utilize housing and space in response to changing lifestyles"

prior to the COVID-19 outbreak. Therefore, we should consider new lifestyles that can help us cope with new infectious diseases, even if COVID-19 is eradicated, and plan spaces suited to these lifestyles.

First, it is necessary to lower the density of multi-use facilities and to set up spaces and operating plans that allow quarantine. In addition, we must reduce the density of communal facilities such as schools and military facilities and limit the density of nursing homes, dormitories, confined boarding facilities, and foreign workers' residential facilities; quarantine measures should also be implemented in such spaces. Facilities that play an important role in the welfare sector, such as nursing homes, facilities for the elderly and homeless, and other types of shelters, should also be redesigned to reduce density. Welfare facilities can also consider adopting AI tools and modern conveniences, not only in their use of physical space, but also to replace or support facility operations and face-to-face services. In the field of care provision, which is a leading face-to-face service, remote health assistants, safety confirmation services, and untact life services are likely to become popular. The current situation may provide momentum for the arrival of a new era in which machines and robots supply many face-to-face services.

As a reaction to large-scale plans promoted under the logic of economy of scale, we can also imagine low-density utilization of national land, including small restaurants, small schools, and small distribution facilities. Even if density remains the same, the spread of infectious diseases can be reduced through improved ventilation. To this end, the current regulations on building ventilation should be overhauled. As discussed thus far, an important challenge in the post-coronavirus era is improving spatial regulations on social density to respond to the threat of infectious disease.

Meanwhile, social distancing promotes an individual shift "back to nature." As a result, unprecedented demand for natural greenery is expected. Outdoor activities such as walks along the waterfront, hiking, and bicycling have increased, replacing exercise in confined gyms. Now, it is time to examine spatial plans that account for density and human movement to enable all citizens convenient access to green spaces.

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8 The Development Direction of 'Untact' and Smart Construction Technology in the Post-COVID Era

Chijoo Lee

Although untact technology is attracting attention due to COVID-19, its application in the construction industry is more difficult than in other industries because of the frequent need for face-to-face communication and work in this field. The government is likely to promote policies on smart construction technology to support untact construction work. This study explores how smart construction technology could be applied to each phase of construction to highlight directions for the development of smart construction technology.

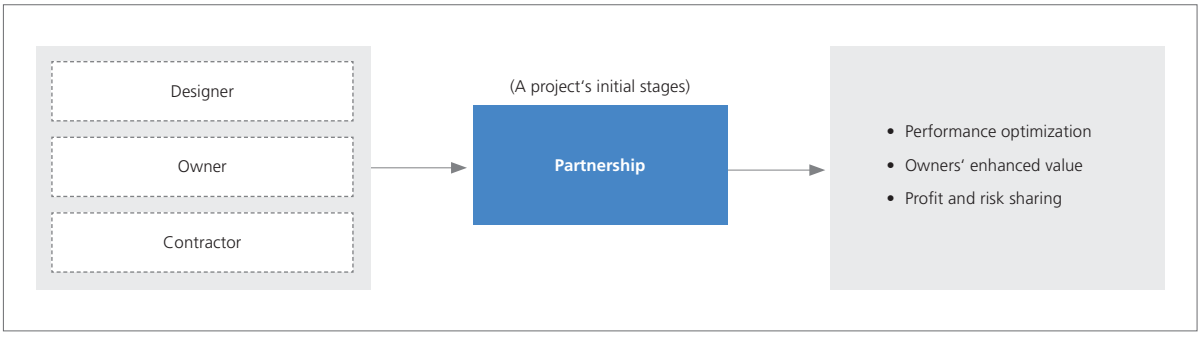
1. COVID-19 and the construction industry

The construction industry is predicted to suffer greater damage from COVID-19 than other industries because it is labor intensive and requires frequent contact between project participants. The current impacts of COVID-19 include prolonged construction periods due to delayed orders for construction projects, a decrease in foreign workers, and a decline in productivity due to reduced face-to-face contact between construction managers and workers. This paper considers how smart construction technology can be applied to construction work and examines the directions for the development of such technologies. The phases of construction are broadly divided into procurement, design, construction, and safety management and maintenance, and this technology is examined in the light of the government's policy to facilitate the development of untact technology (The Ministry of Land, Infrastructure, and Transport 2020).

2. The procurement phase

In integrated project delivery (IPD), a single team of project participants work together from a project's initial stages Figure 1 (AIA National 2007). Although the effectiveness of IPD has been demonstrated (Ma et al. 2018), it involves a practical challenge as it requires the early participation of various experts. Untact collaboration, which can be used when face-to-face collaboration is difficult or impractical, has not been actively applied to construction work due to technical limitations and negative perceptions of its effectiveness. However, as untact collaboration becomes more common in various fields in the wake of COVID-19, awareness of its applicability to construction is likely to increase. Given the potential for future technical improvements, the COVID-19 outbreak is expected to help promote IPD methods.

Figure 1. The concept of IPD



Source
Author's own diagram.

Virtual spaces can be designed to perform tasks without face-to-face contact, and Building Information Modeling (BIM) can be used to promote cooperation. Although BIM is currently used in about 15.4% of construction work, this is expected to increase to 67.2% within the next ten years (Lee et al. 2009). The growing need for untact work due to COVID-19 can also help facilitate BIM.

3. The planning and design phase

At present, in the planning phase, topographical surveys of construction sites are used to design topographic maps. In the coming years, drones will be able to produce 3D topographic information by scanning or filming the topography; this information will then be used to build BIM models Figure 2. The use of drones can enhance safety as they can be used to survey dangerous locations that workers cannot access easily; another benefit is their ability to automatically extract and distribute information. In the design phase, BIM will make it possible to integrate and utilize all the information generated during the life cycle of building and infrastructure. In particular, recent improvements in BIM cloud collaboration functions are likely to help promote untact collaborationFigure 3, Figure 4.

4. The construction phase

As technologies such as information and communications technology (ICT) and artificial intelligence (AI) are adapted in the construction phase, untact work will become more common at construction sites as well. Modular construction developed as the existing concept of mass production was transferred from manufacturing to the construction industry; it can be divided into the module production phase and the construction phase. In modular construction, 60% to 80% of the construction activity is performed in a factory; onsite construction work takes place at the same time as the factory work. It offers several advantages: enhanced productivity, shortened construction periods, and higher qualityFigure 5. Connecting modular construction to 3D printing is likely to offer even more benefits. 3D printing can be used to produce building components and moldsFigure 6. Since the COVID-19 outbreak caused frequent construction delays due to a lack of foreign workers, who normally do formwork at construction sites, modular construction and 3D printing technology may develop into major technologies in the post-coronavirus era. Lastly, the demand for unmanned construction equipment will also grow in the wake of COVID-19. Unmanned equipment can increase the amount of untact work, shorten the construction period, and reduce construction costs by enabling construction activity around the clockFigure 7.

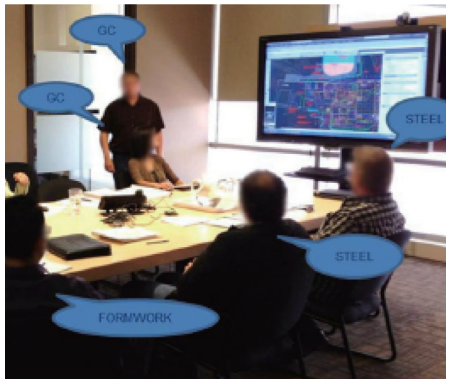
5. The safety management and maintenance phase

Advanced ICT and AI will enable real-time management of worker safety through the automatic collection of changes in workers' biometrics and location information; safety can then be further managed via face-to-face contactFigure 8. In the management and maintenance phase, drones can be employed

Figure 2. Drones for a topographic survey

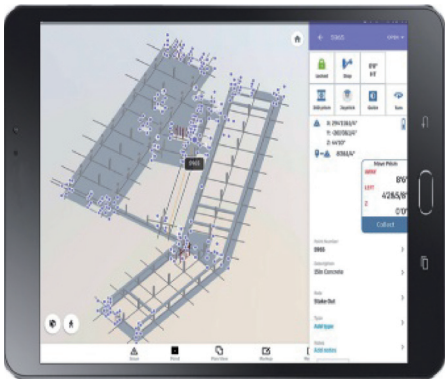
Source KOIT 2020.

Figure 3. A construction process meeting



Source Mehrbod et al. 2019.

Figure 4. Cloud BIM



Source CAD & Graphics 2019.

to identify buildings and infrastructures that need repair in locations that humans cannot easily reach or see. Specifically, when it comes to BIM model, drones can inform managers of each building component's characteristics, making repair and maintenance work more efficient Figure 9a, b.

6. Opportunities in the post-COVID era

The growing demand for untact technology will create more opportunities to apply smart construction technology at construction sites. This will provide momentum for more technical developments, and active technical development will help strengthen Korea's construction competitiveness by increasing productivity and safety. Therefore, it is time to foster small and medium-sized construction companies and venture businesses and to offer them more opportunities to promote the development of construction technologies.

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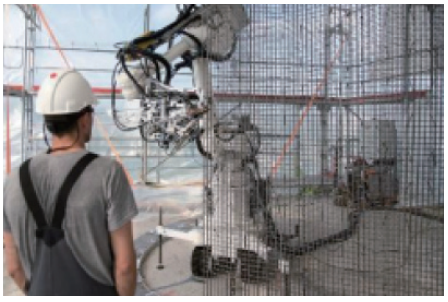
Figure 5. Modular construction

Source Yunwoo Technology 2020.

Figure 6. 3D printer mold

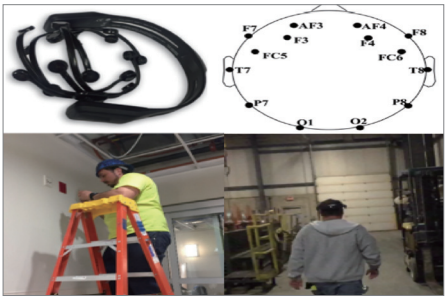


Source Hack et al. 2020.

Figure 7. Self-driving construction equipment

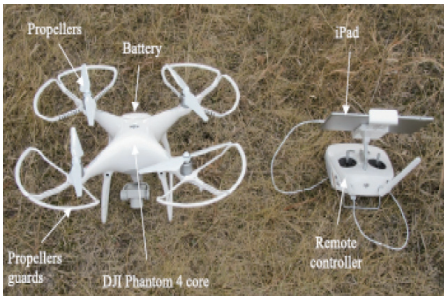
Source Built Robotics 2020.

Figure 8. Wearable devices



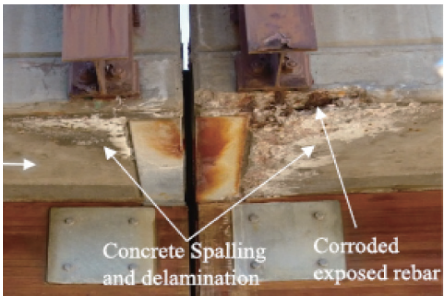
Source Jabelli & Hwang 2018.

Figure 9a. Maintenance drone



Source Seo Junwon et al. 2018.

Figure 9b. Maintenance



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9 The Direction for National Infrastructure Development in the Post-COVID Era

Seong-Ho Oh

We need investments in eco-friendly New Deal projects aimed at minimizing environmental damage such as climate change, with a focus on the untact industry, road transportation, and smartification projects.

1. The Korean New Deal and roads

On May 10, 2020, in his third anniversary speech, President Moon Jae-In stated that he would push ahead with "The Korean version of the New Deal" to reconstruct the national economy, which has been seriously impacted by COVID-19. He promised to actively develop large-scale job creation projects by intensively fostering the untact industry in fields including medicine, education, and logistics. The plan also involves combining national infrastructure, such as cities, industrial complexes, roads and traffic networks, and outdated social overhead capital (SOC) with artificial intelligence (AI) and digital technology and creating many jobs related.

This initiative focuses on three keywords: untact industry, road transportation, and smartification. First, the future of the COVID-19 pandemic is uncertain, creating a need for untact modes in sectors such as logistics and distribution. Therefore, their inclusion in the Korean New Deal is a matter of course. Second, once the necessities of life are taken care of, humans need mobility. While subway and express bus ridership fell by -35% and -60%, respectively, during the Great Lockdown, private car usage remained steady. This indicates that, as the war with the virus continues, people will travel more frequently in private cars—in other words, they will use roads. Thus, it is appropriate that the Korean New Deal includes road transportation at its core. Third, smartification will become a primary industry in the near future, as can be easily predicted from current trends in the Fourth Industrial Revolution.

This paper will describe various potential projects based on the keywords in Moon Jae-In's "Korean New Deal." It should be noted that the items proposed here are still only ideas; these suggestions should be followed by in-depth feasibility studies.

Figure 1. Electric-energy roads used exclusively for logistics

Source
Siemens eHighway Demo 2012.

2. Roads reserved for logistics to supply new energy sources

Sweden and Germany are demonstrating the practicality of reserving relatively short sections of roads exclusively for logistics. These roads are the target of new, eco-friendly road services; they implement smart technology that allows electric vehicles to charge on highways. The US is also developing roads reserved for freight transportation; one connects a railway station in Los Angeles to a harbor around Long Beach. The Republic of Korea should develop similar projects; roads that connect airports to ports or that surround logistic complexes in the country should be targeted, along with sections that see large amounts of freight traffic. One promising candidate is a smart highway on the West Coast that starts in Saemangeum in the Jeolla region, passes Boryeong, Taean, and Dangjin in the Chungcheong region, and currently ends at Incheon International Airport; this road is likely to extend to Gaeseong and Pyeongyang in the future.

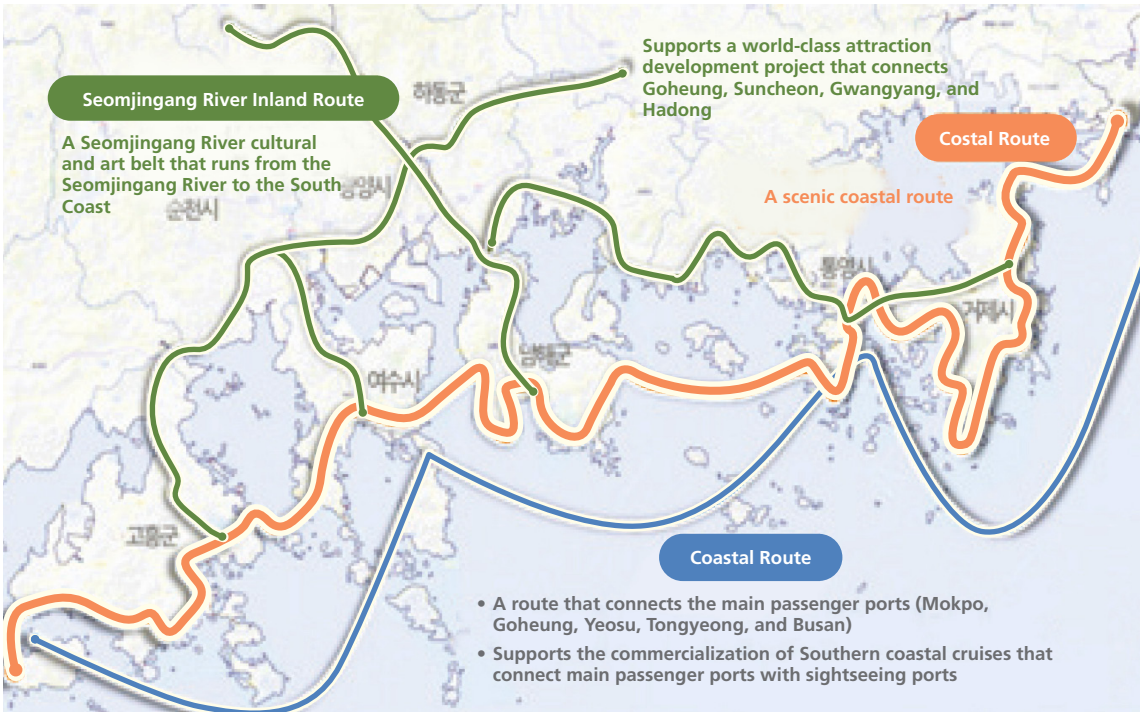
3. Sightseeing roads

Sightseeing roads could contribute to regional economic revitalization by attracting tourists; such roads could be linked to regional tourist attractions. According to Korea Research Institute for Human Settlements (KRIHS), one target for this project is an approximately 575 km coastal road that passes Dadohaehaesang National Park in the South Coast. This would facilitate tourism throughout the South Coast region through scenic overlooks and waterfront facilities along the coastal road. It could help revitalize coastal villages, beaches, docks, counties (eup), and towns (myeon) and connect shared ecosystems such as specialized roadside rest areas and cultural and art spaces.

4. High Definition (HD) digital road maps

The era of self-driving cars has already arrived. A key support element for self-driving cars is HD road maps; these are a new type of road infrastructure. So far, about 5,580 km of roads (including highways) in Korea have been mapped; this has been led by the public sector. However, 5% of Korean

Figure 2. A plan for tourist roads along the South Coast (draft)



Source
Cha Misook et al. 2017.

roads, or 111,300 km, have not yet been mapped. The country needs a system to create HD maps for a huge amount of roads efficiently. To effect this, the public and private sectors have signed a memorandum of understanding establishing a partnership for joint construction and road renewal. In the future, HD road mapping will not only prepare Korea for self-driving cars, a core technology of the future, but also directly create more jobs for young people.

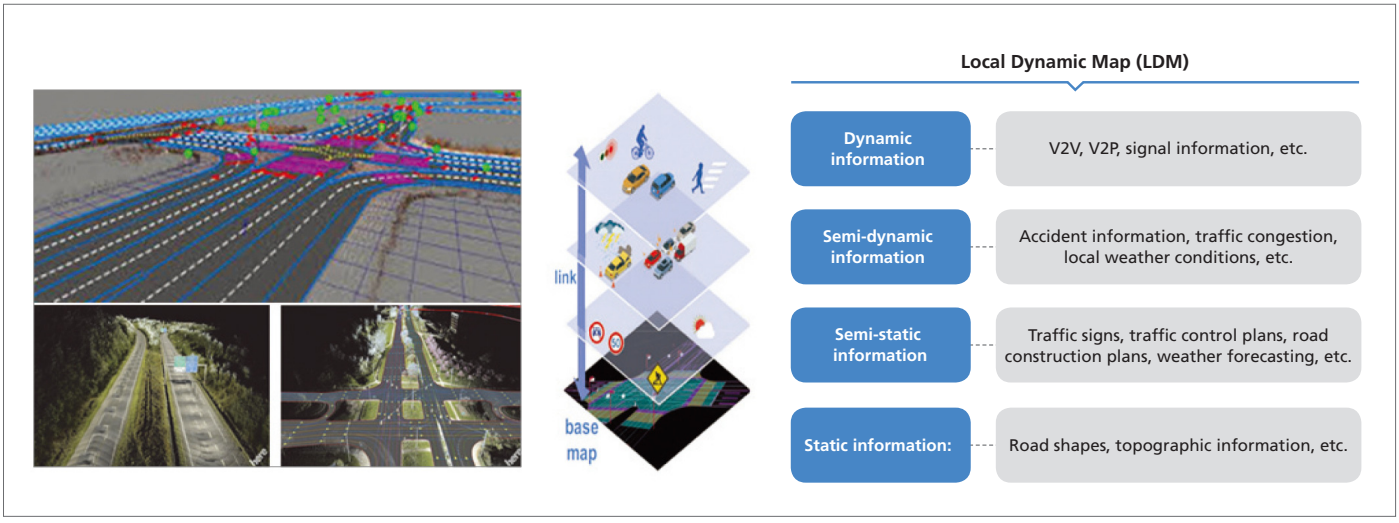
5. Eco-friendly hydrogen transportation systems

The continuing COVID-19 crisis is leading to an increase in studies on the correlations between climate change and disease. Scholars suggest that climate change increases the possibility of outbreaks of new viruses due to abnormal weather conditions. The transportation sector typically consumes large amounts of energy, so it should quickly switch to eco-friendly fuel systems to help limit climate change. While electric cars are replacing fossil-fuel transportation, they are not yet widespread, and power plants, including nuclear plants, cause additional environmental problems. As an alternative, fuel cell electric vehicles (FCEV) are being produced and distributed, but they face limitations due to a lack of charging stations. With the installation of adequate charging stations, hydrogen-powered cars can gather momentum. Currently, hydrogen fueling stations are being built at a very slow pace; this could be increased if we refer to the example of natural gas filling stations, which became popular about 15 years ago. At that time, as part of a policy to facilitate the use of natural gas, the government relaxed restrictions on the locations of filling stations,[01] making it easier to construct stations in cities. Though the government has been considering easing regulations on the locations of hydrogen fueling facilities since 2018, the current number of hydrogen fueling stations is still far below the goal. Accordingly, the Republic of Korea must take the lead in next-generation energy policy by integrating support for hydrogen-powered cars into the Korean New Deal.

6. Extensive renovation of industrial complexes and the SOC of road transportation

On May 7, 2020, five industrial complexes (Gumi in Gyeongbuk, Gwangju; Seongseo in Daegu; Namdong in Incheon; and Yeosu in Jeonnam) that are the pillars of Korea's manufacturing industry were designated as regional job creation complexes. They were then given intensive support as regional industrial innovation hubs. To help smooth regional operations and double job creation effects, Korea must develop

Figure 3. High Definition digital map



Source Yoon Seoyeon et al. 2019.

01. New regulations on housing construction standards allowed existing public garages for intra-city buses to take on a secondary role as natural gas filling stations. This was passed by the Office for Government Policy Coordination (and took effect November 24, 2004) to open up more locations for natural gas filling stations (an authoritative interpretation by the Ministry of Construction & Transportation on November 30, 2004).

industrial complexes. It must also connect cooperative road transportation infrastructure projects aimed at improving old infrastructure within these industrial complexes, promote advanced transportation systems such as smart distribution and cooperative-intelligent transport systems, and enhance these industrial complexes and make them smart; this will include, among other things, upgrading parking lots and commuter services. In other words, accessibility must be improved. This requires establishing access road networks between industrial complexes and rural regions, which will also drive industrial revitalization in the linked regions as development projects expand from key industrial complexes to the surrounding industrial complexes.

7. The road-construction New Deal

The road-construction New Deal will secure road safety and create jobs through large-scale improvement projects on road sections that do not meet design standards or that see frequent accidents. This project will identify and repair road facilities that are over 30 years old, including pavement, median strips, and guardrails. It will also repair sections whose curve radius or vertical alignment is below design standards. This project can make rapid progress by starting with sections that are candidates for the national expressway construction plan and the national roadway and national map construction plan, both of which are currently underway. Smaller improvement projects that encourage local residents' engagement and elderly-friendly job creation are also worthwhile. Other necessary projects include environmental improvement projects that will provide tangible benefits for residents; these will be targeted at facilities such as sidewalks, street trees, and flower gardens along the old national roadways and commissioned national roadways. Here, the effect will be larger under a new concept for facility improvement projects that combines a range of programs, such as sidewalk construction, repair of old bridges, installation of smart safety facilities, and regionally specific road beautification.

The Korean New Deal can include other initiatives as well. When the demand for cars in downtown areas becomes overwhelming, cities can secure healthy movement rights by restructuring inner-city road spaces into three dimensions. They can expand vertically with underground roads and horizontally with pedestrian spaces and bicycle paths, which can even secure the social distancing in the post-coronavirus era. Meanwhile, the use of plastic is likely to grow due to increased use of food deliveries and parcel services. The government should consider introducing plastic roads, such as those in the Netherlands, to recycle plastic materials. Of course, such plastic roads must also be smoothly integrated with existing asphalt and concrete roads.

8. Preparing for the resurgence of infectious disease

Although this topic is relatively distant from New Deal projects, based on our experience with the COVID-19 crisis, certain policy alternatives must be adopted if there is a resurgence of an infectious disease. These can be categorized as daily and regional tasks. First, one daily task deals with

Figure 4. Eco-friendly fuel cell electric vehicles (FCEV)

Source
(Left) Business+IT Journal.
(Right) HMG Journal.

masks and other necessities. During the mask shortage due to the pandemic, citizens lined up at pharmacies to buy masks, often waiting an hour or more. To resolve this, the government should introduce a measure that enables citizens to receive emergency public goods at home. Such an initiative could encourage active participation by logistics and distribution companies through various benefits such as discounts on fuel or tax cuts. Second, the issue of social distancing on public transportation should be resolved. During the Great Lockdown, 6,200 chartered buses nationwide stood idle, leading to a loss of about 77 billion won. Using these idle transport resources as emergency modes of public transportation will help citizens maintain sufficient social distancing on public transportation and relieve social shocks from job losses. Third, the government should seek to minimize declines in the consumption of agricultural and marine products by supporting the logistics systems that directly connect producers and consumers. If there is a resurgence of the virus, the country will be able to minimize the inconvenience to citizens by providing adequate support to means of transport to manage vulnerable road users and self-quarantined individuals through a thorough examination in advance.

The regional task is to develop policy measures establishing preemptive action against the uncertain future posed by COVID-19. Many people expect that COVID-19 will create repeated crises. Assuming that this is the case, adaptive (or transitional) policies should be considered along with policies for overcoming (or mitigating) the crisis on the regional level. First, regional crisis situations caused by the infectious disease should be considered, and quarantine routes should be planned to prepare for the extensive spread of COVID-19 between regions. Regular, transparent release of information should become a prerequisite for identifying crisis levels, which define the size, frequency, and persistency of the crisis. Third, policy-based response measures should be developed by identifying the causes of regional differences in the level of damage caused by the COVID-19 pandemic.

The dominant view is that the emergence of new viruses can be traced to climate change and thoughtless environmental damage. Because large-scale infrastructure investment projects (such as the Korean New Deal) are apt to cause social conflicts, including concern about environmental impacts, the Korean New Deal must establish eco-friendly projects to minimize environmental damage and Korea's contributions to climate change.

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10 The Need for Increased Public–Private Cooperation to Realize Smart Quarantine Cities: From Data Platforms to Onsite Control

Jae-Yong Lee, Young-Joo Lee

This paper examines the idea of smart quarantine cities. First, the successful role of data-based smart quarantine cities in the COVID-19 crisis is identified. Next, topics such as the utilization of personal data, privacy risks, cooperation between data subjects, the implementation of smart quarantine cities, and balanced job creation are discussed.

1. Data-based smart quarantine cities

Smart cities are a city model that emerged around 2015. The operational principle of smart cities is to ensure the convenience and safety of residents by providing them with personalized information via smartphones and various sensors. Therefore, the most basic condition of smart cities is that they use real-time datasets to provide customized information.

For example, a system that provides bus information at bus stations reduces my waiting time by informing me, in real time, when a bus will arrive at my location. It reduces the time I spend searching for an empty parking space by allowing me to check the availability of parking spaces around my destination in real time. From a city-wide perspective, such a system can also reduce traffic congestion because drivers do not need to roam the city to find a parking space. In other words, smart cities increase convenience and safety and resolve urban problems by combining service-related information (bus arrival times, empty parking spaces, service locations, etc.) with the real-time environment of service users (required services, users' locations, etc.).

Smart quarantine cities will provide basic information, such as service providers' environments, the distribution of infected people, and the availability of hospital beds, in real time. Service users will also be provided with information on the probability of infections near them. This is similar to other service models in smart cities. Domestically and abroad, smart cities have received a great deal of attention and are lauded as a new model for increasing convenience and safety and resolving urban problems. However, smart cities also have a limitation: They must access personal information in real time to operate effectively. Therefore, there are also concerns that smart cities may affect privacy and lead to misuse or abuse personal data. Some large smart city projects, such as Sidewalk Labs in Toronto, which was ambitiously pushed by Google's Sidewalk Labs, have failed because residents objected to providing personal information.

The benefits of smart cities include improved services thanks to precise, real-time personal data; their disadvantages, such the possible abuse of personal data, have been at the center of heated debates. In the Republic of Korea, particularly strong voices have argued that the country's strict personal information protection systems are hindering the development of smart cities. Specifically, Korea imposes much tighter privacy regulations than other nations in the areas of healthcare and medicine, including data related to the prevention and control of infectious diseases.

Nevertheless, the government is starting to realize that data are an essential asset in the Fourth Industrial Revolution, and, to this end, it is working to promote data-based urban and industrial policies, including amending three main Acts. Information protected under three main Acts includes personal, location, and financial information, all of which can be gathered in real time. One type of personal information that can be very useful to the public is closed-circuit television (CCTV) footage. In addition, private-sector organizations collect location information using smartphone location recognition and financial information using credit cards; these private data may also be provided to the public sector when necessary.

The recent COVID-19 pandemic has clearly demonstrated the usefulness of these datasets to the government during a crisis. Personal, location, and financial information can be used to quickly track the movements of confirmed patients. During the crisis, information such as the availability of hospital

beds and the distribution of ambulances has also been put to valuable use. During the COVID-19 outbreak, the country has actively utilized personal information. Since the COVID-19 outbreak, discussions of various smart quarantine city models that could support proactive prevention efforts have begun in earnest. This paper discusses various topics related to smart quarantine cities.

2. Realizing smart quarantine cities through data-based cooperation

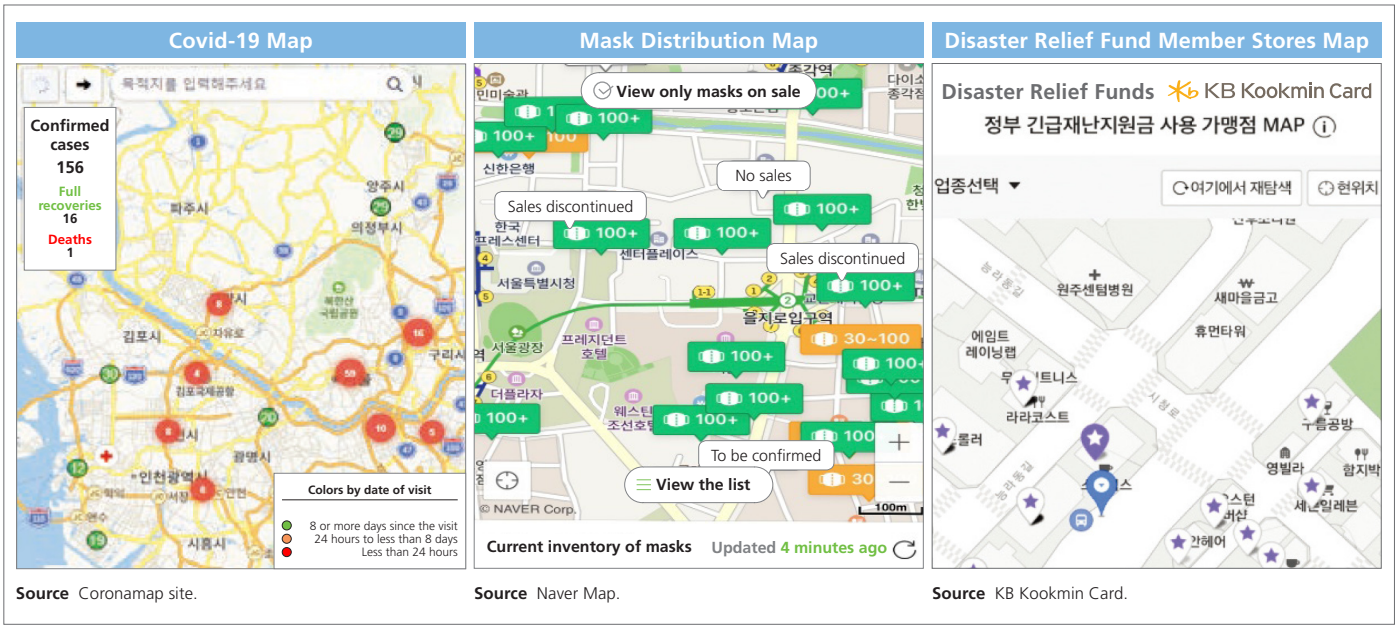
Korea's data accessibility and data literacy during the COVID-19 crisis have drawn worldwide attention. To enable all citizens access to the same information, the government has promptly released information related to the movements of confirmed patients, public relief hospitals, screening centers, sample collection centers, and public mask vendors either online or via emergency notification texts. This information sharing has helped minimize social unrest by providing individuals with basic data to make their own decisions rather than promoting fear driven by public opinion.

In the private sector, a range of COVID-19 information provision services and applications have been developed and introduced, including COVID-19 maps, Coronaita,[01] and maps of mask vendors and disaster relief funds. These were developed by modifying and combining established public and private data and map service platforms based on the information released by the government. Maps showing confirmed patients' whereabouts and real-time inventories of mask vendors received a great deal of attention, and a new culture in which such services are commonly used in everyday life is spreading. In the public sector, private Big Data such as floating populations and card data are actively used to analyze the impacts of COVID-19 on the regional economy and to identify regions that require policy attention.

Because infectious diseases such as COVID-19 spread via contact and through other methods of transmission such as people, air, and objects, data and analysis are important to understand the spatial connections or patterns of disease spread. When studying the spread of infectious diseases, it is necessary to predict their effects on real-life settings by analyzing a wide range of Big Data and city simulations. Governments must then develop and release data and analysis models to support swift responses to uncertain issues and establish data platforms that can use these models.

Public–private collaborations start with the release of data. Through these collaborations, the public sector establishes

Figure 1. COVID-19 related information services



Source Coronamap site. **Source** Naver Map. **Source** KB Kookmin Card.

01. Coronaita. http://coronaita.com/

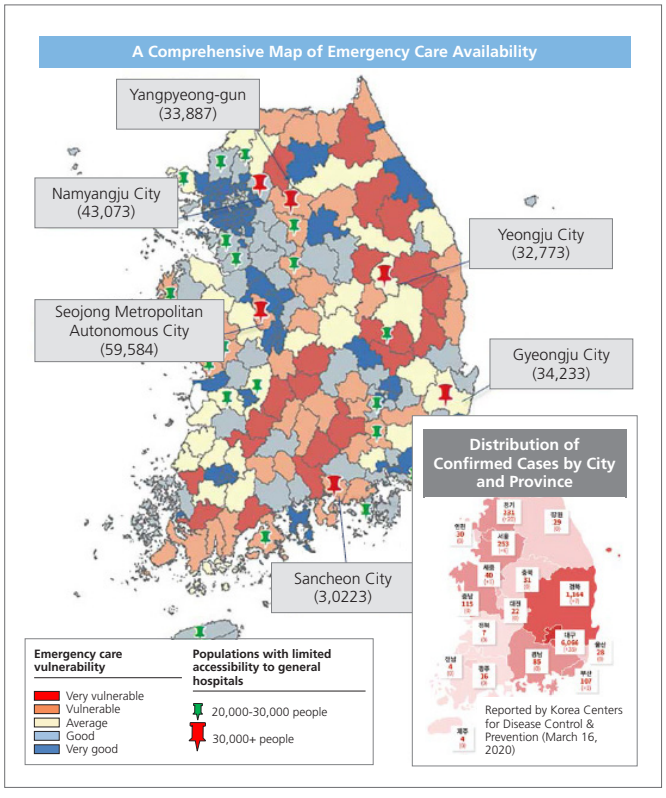
proactive, evidence-based policies, and the private sector creates value by developing new services and facilitating startups. Citizens confirmed early data-based social innovations, including information searches, on their own, and increased data-based social engagement and communication are leading to enhanced civic consciousness. This implies that the government, the public sector, and citizens are all becoming the producers as well as the users of information. The development of smart quarantine cities requires the reinforcement of this public–private cooperation and the creation of information production and utilization ecosystems.

3. Primary discussion topics around realizing smart quarantine cities

Real-time data have many uses beyond comparison with earlier statistical data. The use of real-time personal data in the public and private sectors is irreversible. These uses include the provision of personalized services, real-time responses to situations, the establishment of precise data-based policies, and the development of various innovative industries that use personal data. However, there are also some problems that must be resolved before smart quarantine cities can be realized.

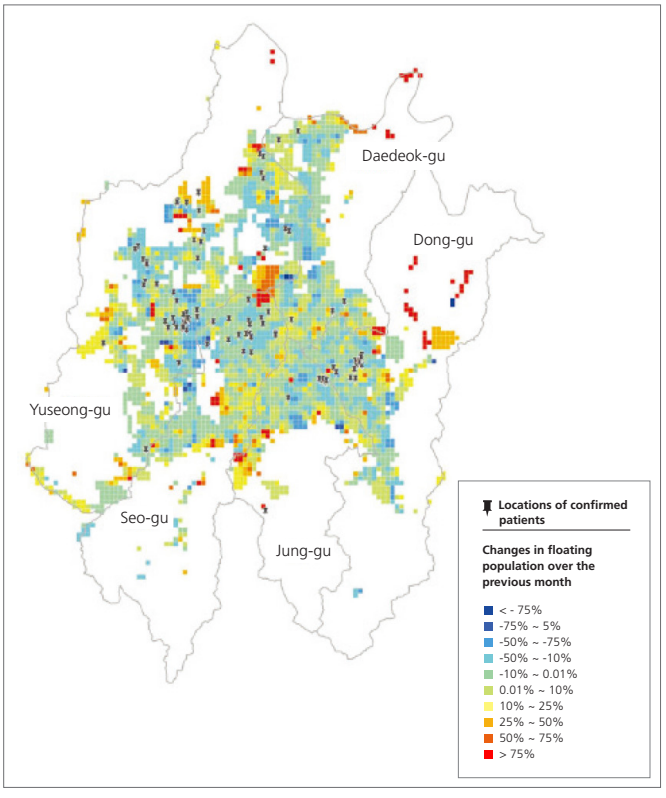
The first problem is the conflict between the use of personal data and the protection of individual privacy. During the COVID-19 crisis, early disclosure of patients' whereabouts certainly helped curb the spread of the disease. However, it is just as certain that confirmed patients experienced a serious loss of privacy resulting from this disclosure of their movements. In addition, the government's measures, such as the adoption of a tool similar to electronic bracelets to prevent confirmed patients from leaving their residences, raised concerns that individuals could be depersonalized to resolve national crises. Thus, although it is necessary to accurately determine the locations of confirmed patients using real-time personal data, further discussions about how such data are used are necessary. For instance, some smart cities in Europe make significant efforts to achieve the same results with minimal information. Unlike the Republic of Korea, most European countries (except the UK)

Figure 2. Regions with emergency care vulnerabilities



Source Son Jaeseon et al. 2020.

Figure 3. Floating population changes before and after the occurrence of confirmed cases



Source Jang Yohan et al. 2020.

are very sensitive about the use of personal information. As a result, they usually avoid using devices such as CCTV. To resolve this issue, attempts have been made in Europe to install sound-recognition sensors, instead of cameras, to solve crimes and reduce accidents through sound analysis. While all countries share the goal of minimizing crime and accidents, they should continue to think of ways to minimize threats to individual privacy at the same time. The use of real-time data offers many benefits, and it should not be banned only to protect privacy. Conversely, however, simply accepting a loss of personal privacy in the public interest is also undesirable. Hence, finding ways to minimize privacy risks is as important as creating new services using real-time personal data.

Second, when used individually, real-time personal data have very limited effects. These data gain synergy when individual datasets are connected and integrated. In such cases, rather than overcoming technical challenges, cooperation between the collectors of real-time personal data is key. Since real-time personal data are gathered separately in the public and private sectors in varying domains, cooperation between these collectors is not easy. In a national crisis such as the COVID-19 pandemic, prompt cooperation is possible. However, in ordinary circumstances, individual data collectors often use only limited data for specific purposes. This necessitates a body that can manage the data and provide support though ongoing consultations with individual database holders.

Furthermore, data collectors and users appear to be different parties. In normal times, even though data collectors release their data, data users are sometimes reluctant to change. In such cases, mediation between these two sides may be needed. For instance, when security CCTV first became widespread, the country made efforts to send real-time CCTV images to the police. However, although local governments collect security CCTV data and the police are data users, real-time use of security CCTV footage was initially rare due to institutional concerns and resistance to the introduction of new systems. Today, however, police regularly use these systems to resolve many incidents. For smart quarantine cities, cooperation between data users and data collectors such as hospitals, community health centers, telecommunications companies, and financial companies will be key to success.

Third, while efforts are underway to implement follow-up measures in response to the problems that followed the COVID-19 outbreak, discussions of proactive measures to establish smart quarantine cities are also proceeding gradually. Non-contact is the keyword of these proactive measures in smart quarantine cities, and various services that support untact interactions are under discussion. However, it is also problematic to create services that assume every activity will take place in untact modes to resolve a single problem—the prevention and control of infectious diseases. In particular, since untact services are likely to eliminate a significant number of jobs in the service sector, these services should be promoted based on a balanced consideration of service jobs in the perspective of quarantine.

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