Smart Carbon Neutral City, Case of Seoul

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Junyoung CHOI, Ph.D.
Director, Center for Data Science
Seoul Institute of Technology(SIT)

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1. WHAT IS SMART CARBON NEUTRAL CITY

"2018, Heatwave", Joongang news paper (2021), https://news.joins.com/article/24065042

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LEDS: Long-term greenhouse gas Emission Development Strategies

- The Paris Agreement calls for efforts from countries around the world to reduce the temperature below 2℃ compared to pre-industrial levels and to achieve 1.5℃ to respond to the global climate crisis
  - By the end of 2020, a long-term low-carbon power generation strategy (LEDS) containing a vision for climate change and energy policy direction from a long-term perspective should be submitted.
- The Korean government also announced the long-term low-carbon power generation strategy (LEDS) and the national greenhouse gas reduction target (NDC)

Source: Seoul 2050 GHG Plan(2021)

LEDS: Long-term greenhouse gas Emission Development Strategies

〈 Five Basic Directions for Korean Government Carbon Neutrality 〉

❶ Expansion of use of cleanly produced electricity and hydrogen

❷ Innovative energy efficiency improvement in connection w/h digital tech

❸ Promote development and commercialization of future decarbonization techs

❹ Promote sustainable industrial innovation through circular economy (raw material and fuel input ↓)

❺ Strengthening the carbon absorption function of nature & ecology such as forests, tidal flats and wetlands

Source: Seoul 2050 GHG Plan(2021)

Response to climate crisis led by local governments

- Growing demand for local governments to take the lead in responding to the climate crisis
  - Urban response, with more than half of the world's population (55%), accounts for more than 70% of energy-related greenhouse gas emissions, is important (C40).
- Building a consensus on climate crisis response through Green New Deal
  - A policy that can simultaneously achieve job creation and economic recovery by converting to a decarbonized economic society to reduce greenhouse gases in response to the climate crisis.

〈Green New Deal〉

- Green: Establishing and implementing a decarbon greenhouse gas reduction strategy that responds appropriately to the climate crisis.

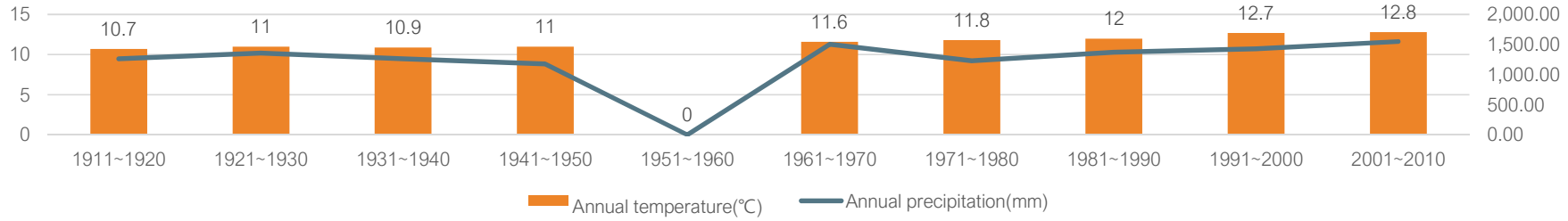
  * It does not support destructive infrastructure that causes environmental problems, and includes the meaning of escaping from the unfair method of driving profits to the few at the expense of the poor and workers

- New Deal: Policies to create productive jobs with large government investment projects to help the economy recover.

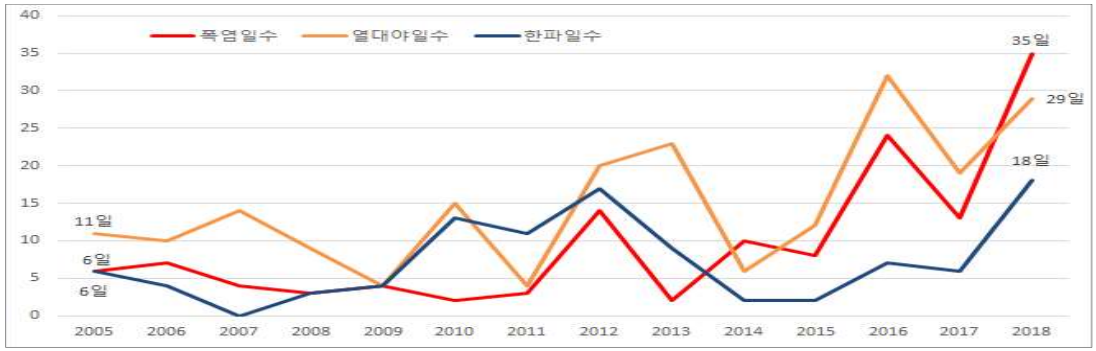
Source: Seoul 2050 GHG Plan(2021)

Climate Change in Seoul

The average temperature in Seoul is 2.1℃, and the annual precipitation has risen by 287.2mm (Korea Meteorological Administration)



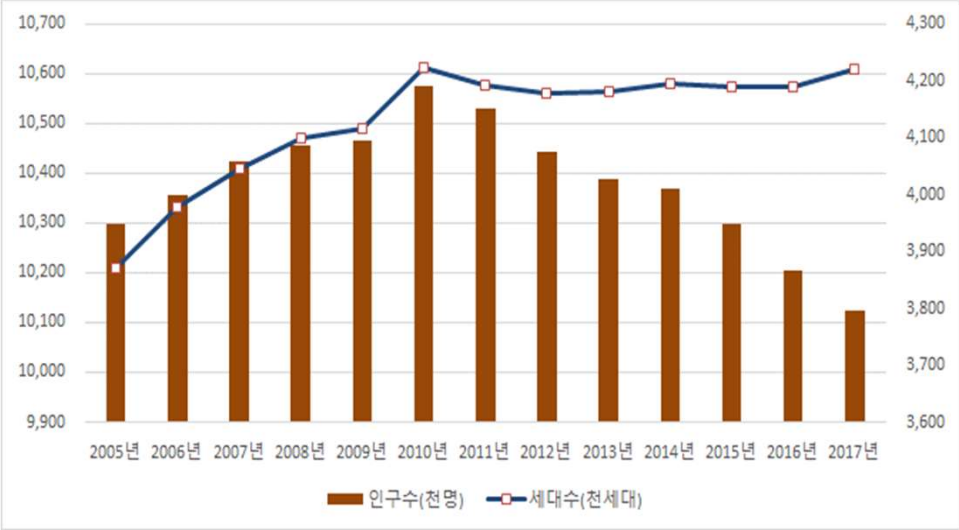
The number of days with extreme weather such as heat waves, cold waves, and tropical nights is increasing



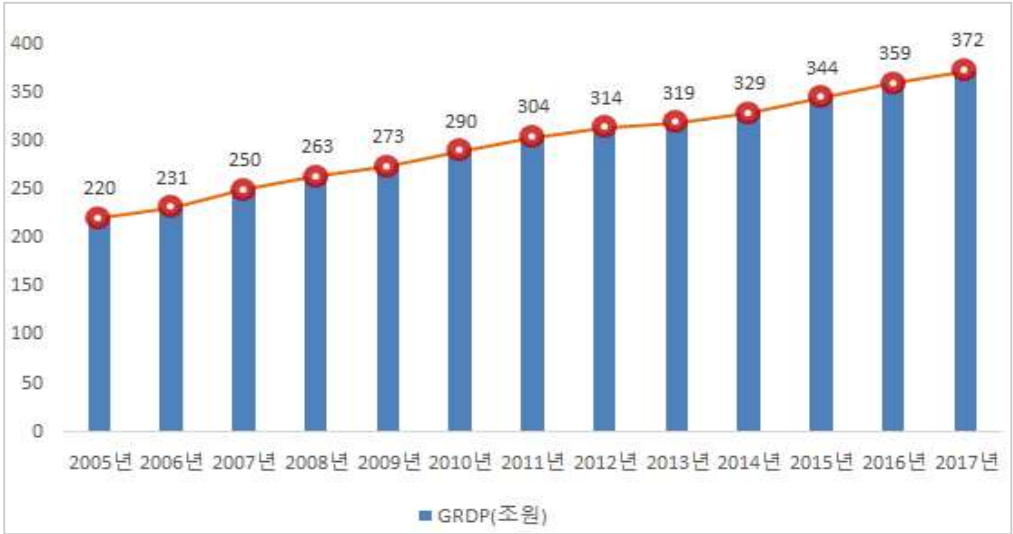
Source: Seoul 2050 GHG Plan(2021)

Major social changes in Seoul

Although the population is decreasing, the number of households is increasing due to the increase in single-person households



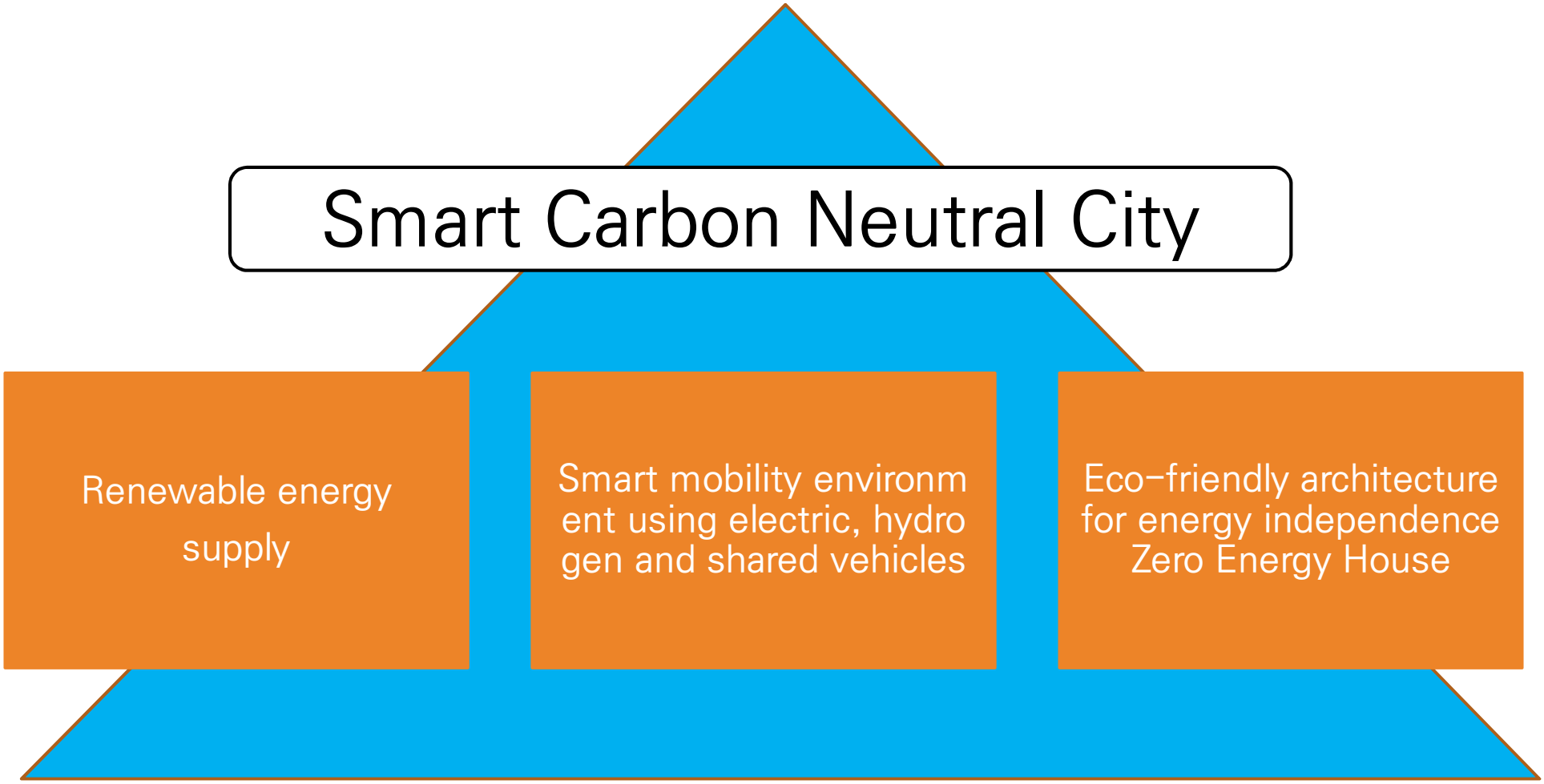
Despite population decline, regional gross domestic product continues to increase



GHG emissions are continuously increasing due to social structural factors such as an increase in single-person households and an increase in economic activity in the region

Source: Seoul 2050 GHG Plan(2021)

Smart Carbon Neutral City



2050 Carbon Neutral Strategy

Net Zero

Carbon Net Zero is the process of re-absorbing carbon dioxide emitted by an individual or organization, thereby reducing actual emissions to zero.

In order to absorb greenhouse gases, it is necessary to plant trees equal to the amount of carbon dioxide emitted or invest in clean energy fields such as wind and solar power generation.

Carbon Neutral Strategy

The government aims to reduce the carbon of the economic structure and create a new promising low-carbon industrial ecosystem.

Announcement of 2050 carbon-neutral promotion strategy including process transition to a carbon-neutral society

Seoul 2050 GHG Reduction Plan

Seoul Announces ‘Achieving Carbon Neutrality by 2050’ Plan for Carbon Neutral and GHG Reduction

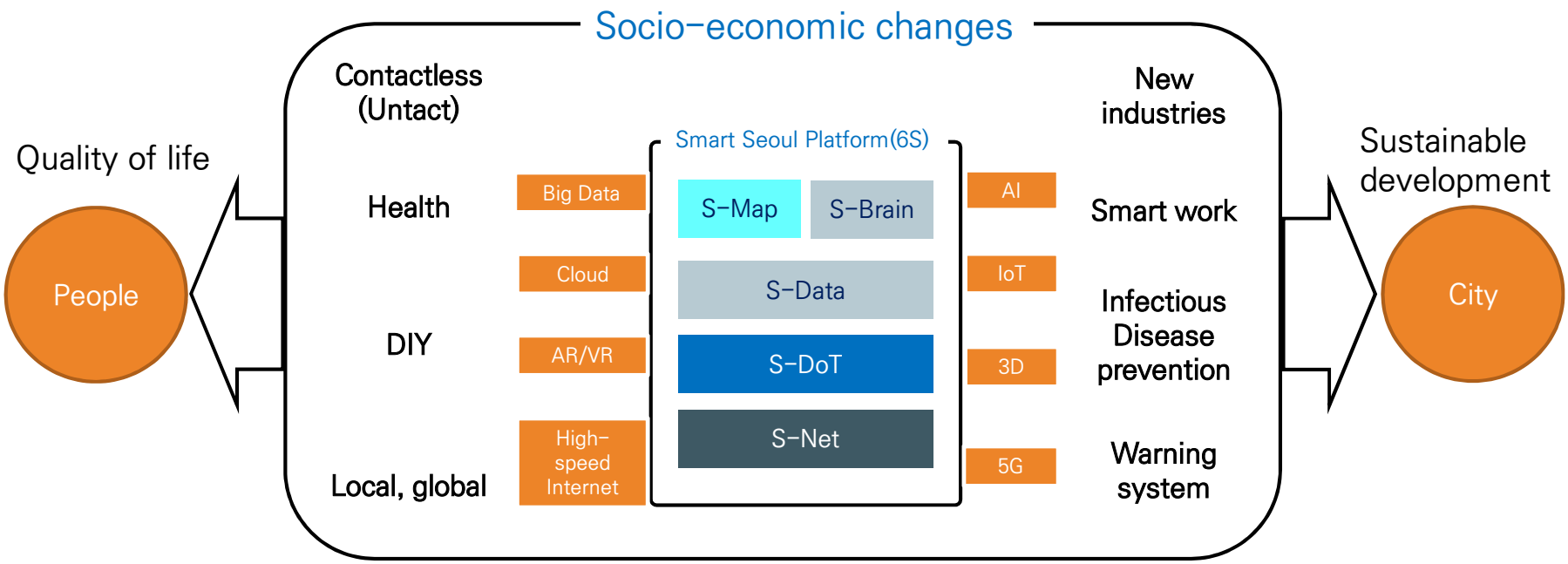
Domain	Project
Green Building	Green Remodeling of Public Building
	Mandatory ZEB for new building construction
	Total Building Green House Gas Load System
Green Mobility	Ban on Registration of Internal Combustion Engine Vehicles
	Expansion of Public Electric Vehicle Charger Supply
	Urban Road Space Reorganization
Green Forest	① Seoul as a Park through the Expansion of Urban Forest
Green Energy	② Expansion of Solar Power Generation Facilities
	Spread of Fuel Cells
Green Recycle	Zero direct landfilling of household waste
	Spread of recycling/upcycling culture

☞ Smart Moss Tower

☞ Seoul, City of Solar Power

Seoul Smart City

- Utilization of innovative ICT technology (6S) to bring about change in society



In a smart carbon-neutral city, S-dot & S-net will be shown on the case studies. S-dot is measuring fine dust by installing IoT-based environmental sensors all over Seoul. By providing public Wi-Fi in S-net, data sharing through IoT sensors free of charge.

2. SMART MOSS TOWER PROJECT

Comparison of fine dust, Hankook-ilbo (2018) https://www.hankookilbo.com/News/Read/201803261431456752

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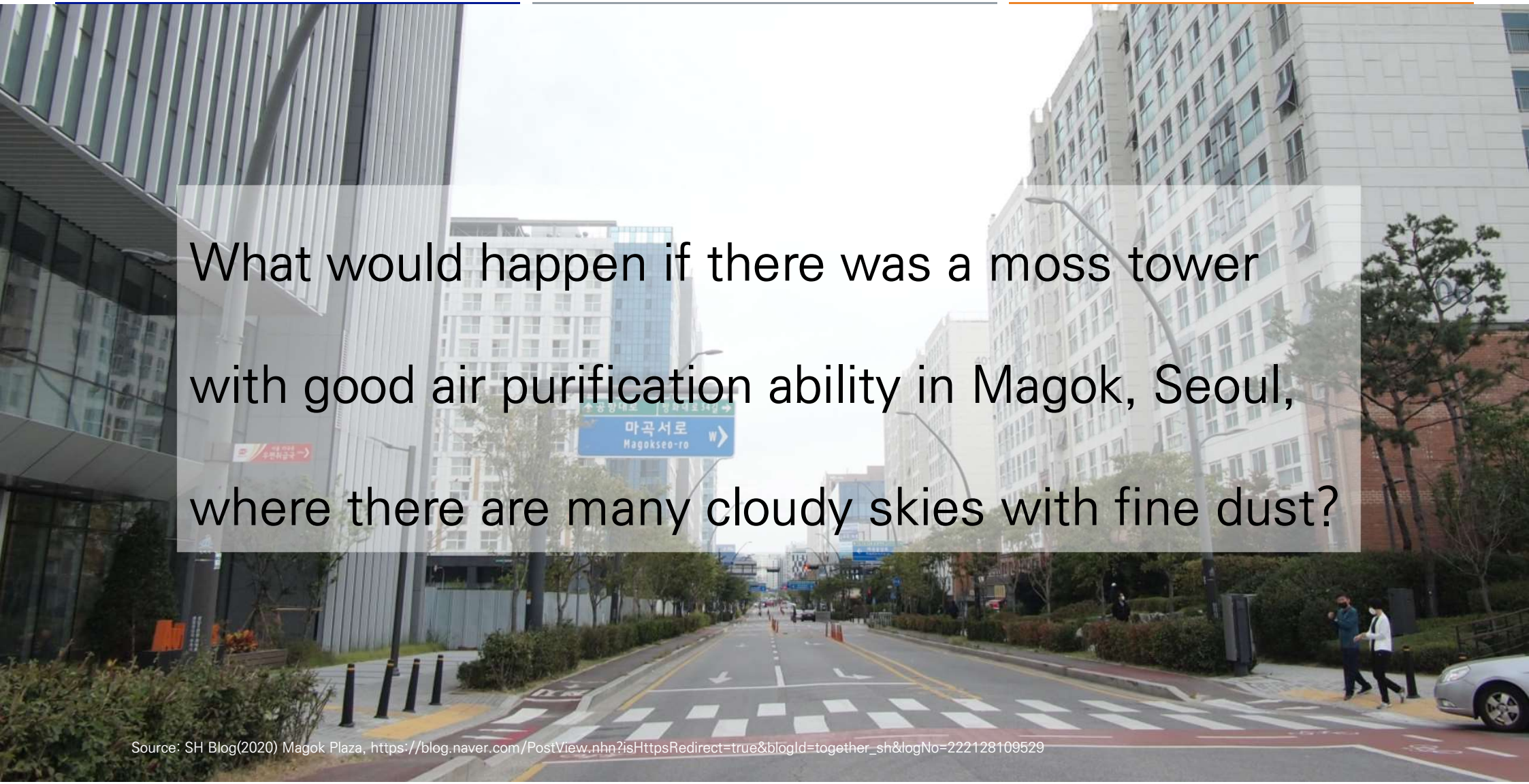
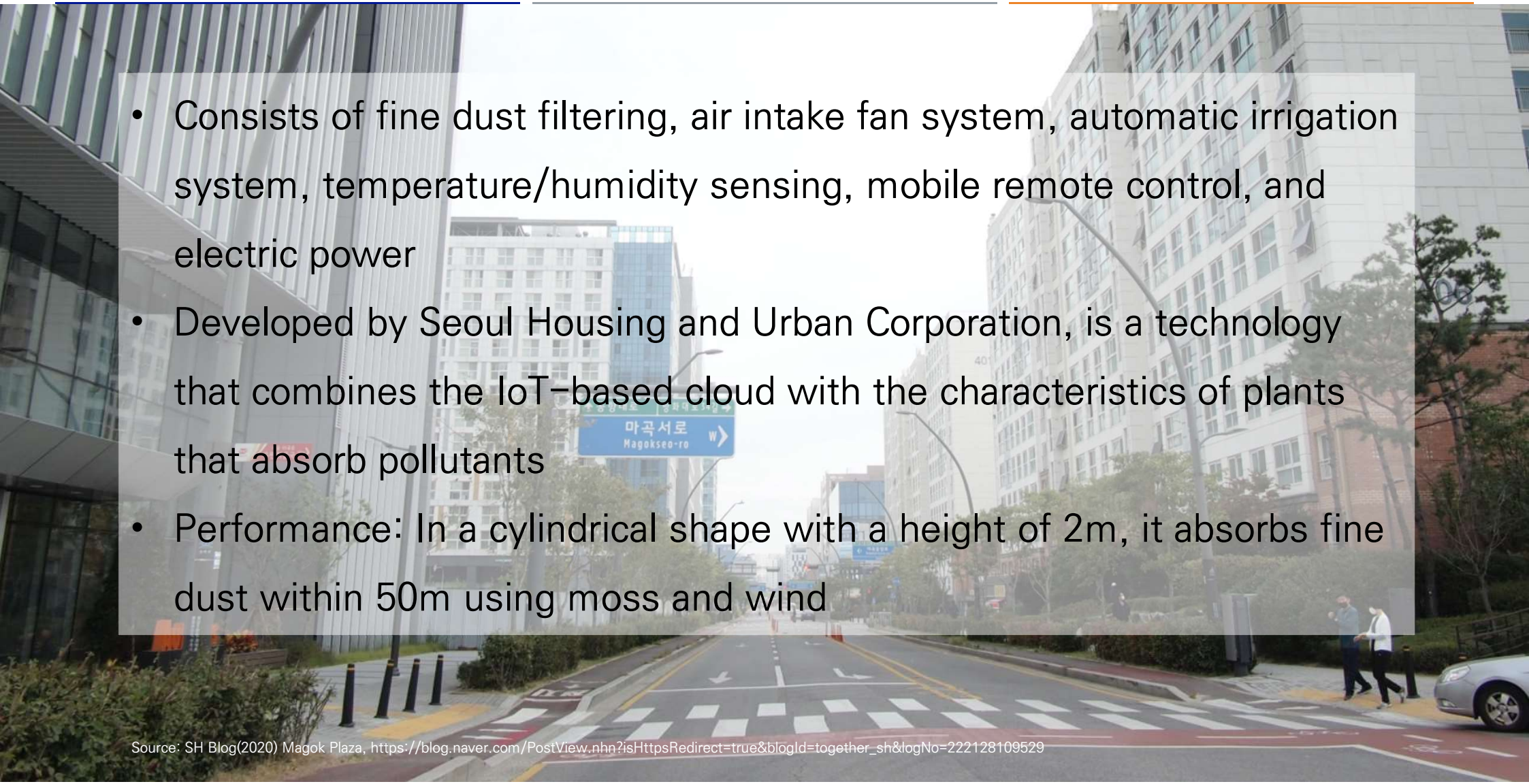
Good air purification ability in Magok, Seoul



What would happen if there was a moss tower with good air purification ability in Magok, Seoul, where there are many cloudy skies with fine dust?

Source: SH Blog(2020) Magok Plaza, https://blog.naver.com/PostView.nhn?isHttpsRedirect=true&blogId=together_sh&logNo=222128109529

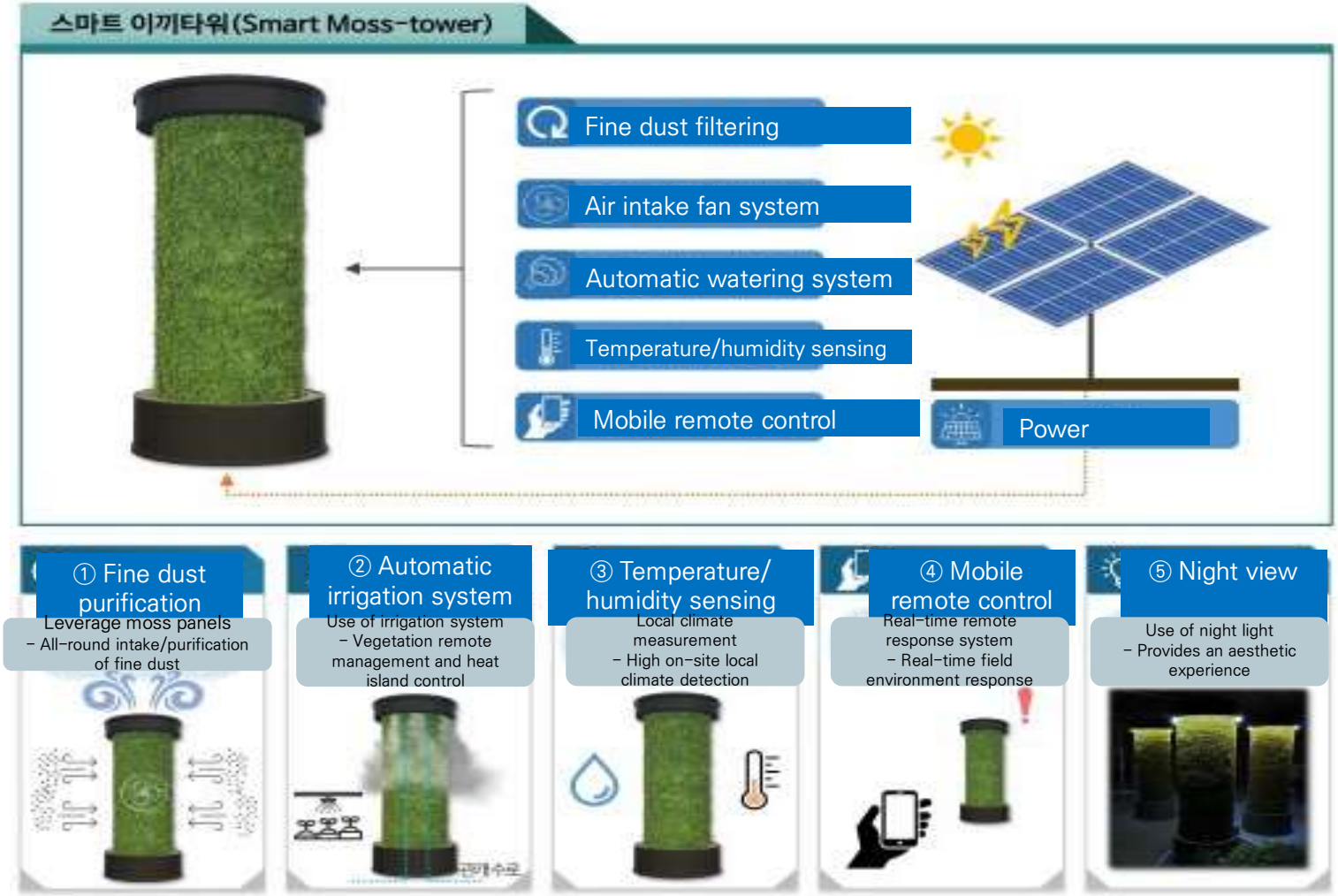
Good air purification ability in Magok, Seoul



- Consists of fine dust filtering, air intake fan system, automatic irrigation system, temperature/humidity sensing, mobile remote control, and electric power
- Developed by Seoul Housing and Urban Corporation, is a technology that combines the IoT-based cloud with the characteristics of plants that absorb pollutants
- Performance: In a cylindrical shape with a height of 2m, it absorbs fine dust within 50m using moss and wind

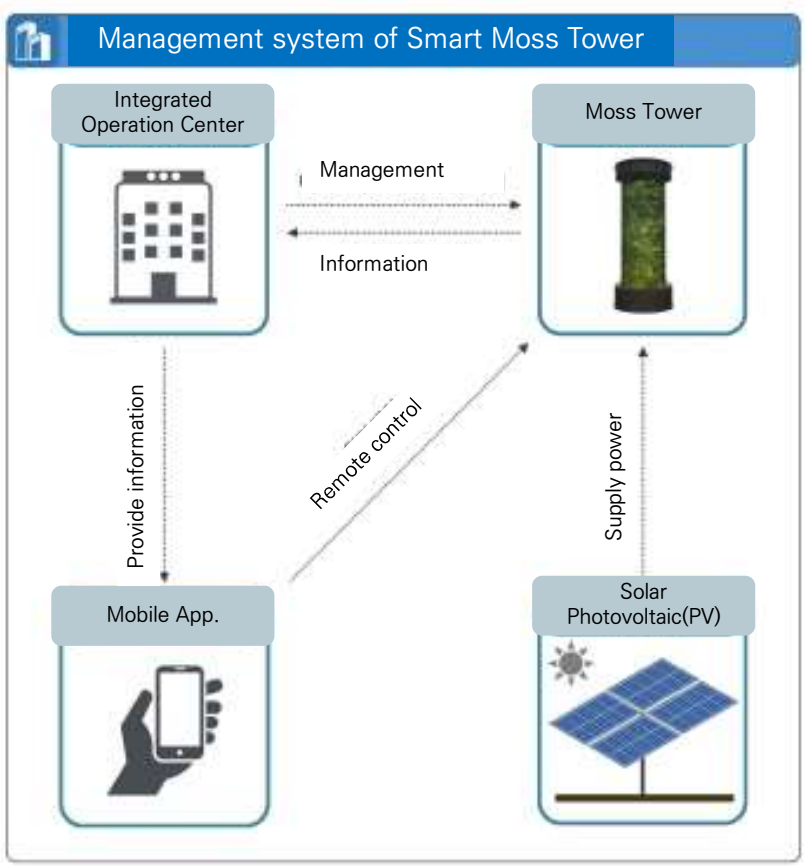
Source: SH Blog(2020) Magok Plaza, https://blog.naver.com/PostView.nhn?isHttpsRedirect=true&blogId=together_sh&logNo=222128109529

Component of Smart Moss Tower



Source: Maekyung (2020) Smart Moss Tower, https://www.mk.co.kr/news/realestate/view/2020/07/672671/

Management of Smart Moss Tower



Source: Maekyung (2020) Smart Moss Tower, https://www.mk.co.kr/news/realestate/view/2020/07/672671/

Outcomes from the installation of Smart Moss Tower

- Characteristics
  - ✓ The smart moss tower installed in Magok is characterized by being developed and operated based on IT such as IoT and cloud compared to the moss tower installed in a German cities

- Construction and operation cost
  - ✓ The smart moss tower in Magok costs about 10 to 40 million won ($8,900 to $34,000) per unit depending on the size of the installation
  - ✓ Structure construction costs account for most of the cost, and operating costs such as data transmission through IoT are operated free of charge through Seoul's public Wi-Fi, etc.

- Outcomes from Magok
  - ✓ Effect of reducing 70% of fine dust
  - ✓ Since it is installed on the sidewalk on the road, the reduction effect of PM2.5 caused by vehicle traffic is greater than PM10
  - ✓ Moss is a plant that can be easily obtained anywhere in the world. Distribution of smart moss towers adapted to the area to solve fine dust


3. SEOUL, CITY OF SOLAR POWER
LESSONS LEARNED
Seoul Institute of Technology
Source: http://english.seoul.go.kr/policy/environment-energy/seoul-city-of-solar-power/

City of Solar Power, Seoul

What would happen if we could use our imagination to supply solar power to various spaces?

People who invest in roofs, why?

[Creating the City of Solar Power, Seoul] A neighborhood space turned into a solar power plant

▲ A very special roof: Nanum Power Plant No. 1 installed at the Amsa Arisu Government Center in Seoul produces electricity that can be used for one month by 14% (26,378 households) of 186,508 households in Gangdong-gu

▲ Dazzling sky blue roof: If you go to the Guro Digital Complex area, there is a very special roof. The electricity that was sent to the Korea Electric Power Corporation by using electric cables for two years is the amount of electricity that 882 households can use for one month.

▲ Nanum Power Plant No. 1 Nanum Power Plant located in Amsa-dong, Seoul

▲ Seoul Solar Power Plant A solar power plant built by the city of Seoul with citizen funds. The photo shows the Seoul Sunshine Power Plant located in Gangdong-gu (Godeok)

▲ Solar Power Plant Wind~Wind~Wind~ Solar and wind energy builds solar power generation in abandoned spaces in the neighborhood by forming a cooperative of residents.

Source: http://m.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0002180118

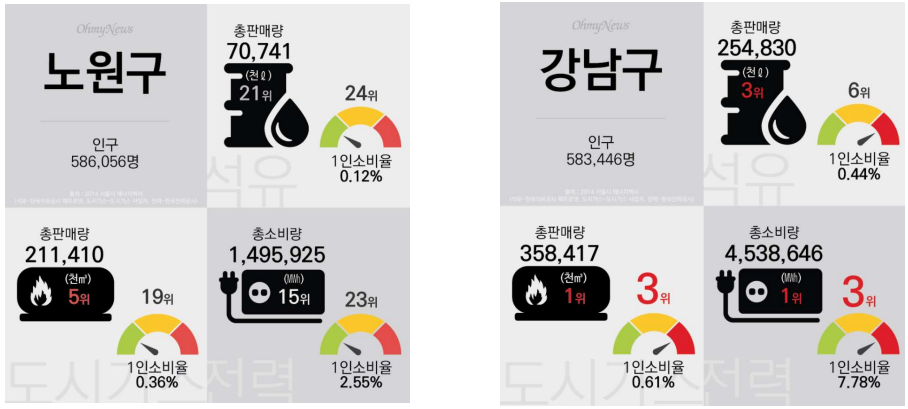
Energy consumption of buildings

[Creating the City of Solar Power, Seoul] Energy Battle: Large Buildings and Local Governments

▲ Nowon-gu Zero Energy Experimental House.

▲ The monitor screen in the Zero Energy Experimental House. It represents '0'.

▲ A view of Gongneung Health Center in Nowon-gu.



Energy report card for each of Seoul's 25 autonomous districts

Source: http://m.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0002184967&SRS_CD=0000011471

Half-price electricity price - Maintenance cost, saving 1 million won / year

[Creating the City of Solar Power, Seoul] Go to Sindaebang-dong Energy Independent Village

▲ Energy Self-Reliance Village This is an Energy Self-Reliance Village located in Sindaebang-dong, Dongjak-gu, Seoul.

▲ Is the balcony a power plant? Mr. Heo installed a 100wh class solar panel on the veranda of his apartment. After that, the two refrigerators started running, but the meter stopped. Electricity bill has been cut in half.

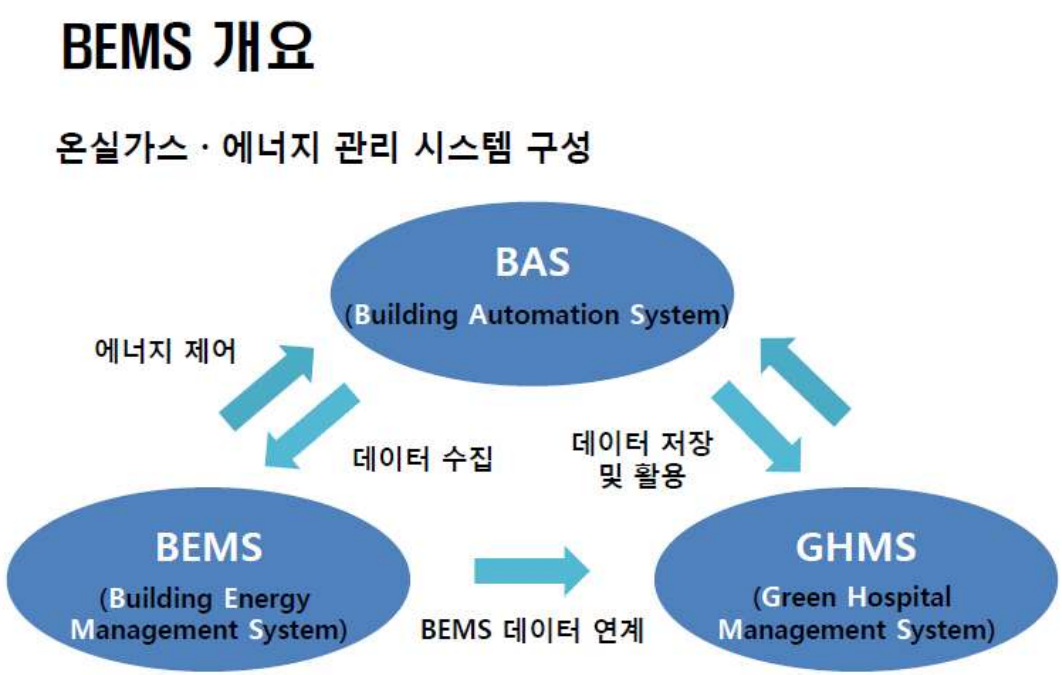
▲ Rooftop solar power of the first apartment in Korea Mr. Heo's apartment is the first in Korea where he rented solar power. 76,179 kWh of electricity was generated from the 103kW class solar panel for 6 months. In terms of money, it is about 1743 million won.

▲ Map of Energy Independent Villages There are 35 energy independent villages across Seoul. As of 2014, 15 villages saved 67694 kWh of electricity. Considering that 20 more villages have been added, it is estimated to be around 250,000 kWh.

Source: http://m.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0002191284&SRS_CD=0000011471

2.5 billion in cost savings, the hospital has a 'special' computer

[Creating the City of Solar Power, Seoul] Reducing building energy with BEMS



- BAS (Building Automation System): Controls machinery, electricity, and equipment in buildings such as air conditioning, power, and lighting
- BEMS (Building Energy Management System): Energy management based on BAS data
- GHMS (Green Hospital Management System): CO2 management by linking BEMS data

▲ BEMS system computer in the power control room of Sinchon Severance Hospital.

Source: http://m.ohmynews.com/NWS_Web/View/at_pg.aspx?CNTN_CD=A0002205426&SRS_CD=0000011471

Lessoned Learned: Transformation into a smart carbon neutral city

- Although Korea still has many benefits from cutting-edge technologies in its smart city, it is now focused on sustainability based on the harmony between people and the environment

- Establish smart city goals and strategies to realize carbon neutrality in response to climate change at the planning stage so that the convenience pursued by smart cities does not have the adverse effect of increasing carbon emissions

- It is considered necessary to share and spread the results through voluntary participation and practice by local governments, private companies, and citizens

THANK YOU
감사합니다.

If you have any questions about the Smart Moss Tower project in Magok,
You can contact the Dr. Jeongon Kim, Director of IUBS, jkkim@iubs.co.kr

Case of Seoul
Smart Carbon Neutral City

Junyoung Choi Seoul Institute of Technology
Junyoung.choi@sit.re.kr