Key Knowledge from SAUW's Smart Cities Workshop in Seoul

Participants at the smart cities workshop in Seoul, Korea.

SAUW, IN COLLABORATION with the Republic of Korea's Ministry of Environment (MoE), Korea Environmental Industry & Technology Institute (KEITI), and K-water, organized a four-day knowledge and networking workshop in Seoul from 15 – 18 October 2018 on "Promoting Environmentally Sustainable Smart Cities."

SARD DG Mr. Hun Kim and MoE Director General Changheum Lee gave opening remarks at the workshop. Over 80 participants were in attendance, including SARD DMC officials, 8 smart city CEOs from India, Korean smart city experts, Korean private sector representatives, and SARD staff from HQ and RMs. At the opening, DG Kim emphasized the importance of the workshop for transfer of technologies and networking for building smart cities in South Asia. According to him, the workshop is a reflection of a deepening cooperation between Korea and ADB. It is also very timely because South Asia is the fastest growing region, receiving a total lending of $7 billion from ADB. The Republic of Korea can help by sharing their knowledge in smart city development.

What makes for a smart city?

Mr. Sang-Ho Lee, Director of IFEZ Smart City Integrated Operation Center, discussed how a smart city is built. According to Mr. Lee, in a smart city, urban services that used to be configured individually – water utilities, public transport, healthcare, and waste management – become integrated into one system.

He outlined a city's three core elements: services, platform, and infrastructure. Mr. Lee explained that a city evolves into a smart city when it adopts a smart-city platform to link services and infrastructure. The platform collects, stores, and manages data to help make decisions on refining the approach to service delivery.

SARD DG Mr. Hun Kim gives the opening remarks.

With infrastructure and services working together, a smart city can be achieved from both these ends. On the infrastructure side, the focus is on guiding urban planning and infrastructure building toward the smart city objective. From the services side, the smart-city platform makes use of feedback from smart devices to deliver smart public and private services (e.g., e-government, smart home IoT) and smart space (through GIS) tailored citizens' needs of its citizens. These two areas overlap in smart infrastructure, which refers to IT-powered infrastructure such as energy, traffic, and communications systems.

In the case of Incheon, Mr. Lee explained that the IFEZ Smart City Integrated Operation Center makes use of a technology-drive system "centered on core technology, data-driven system for integration between areas, and a governance system for continuous implementation." From the operation center, city managers can monitor and control the whole smart city network. Participants of the workshop visited this center on day 4.

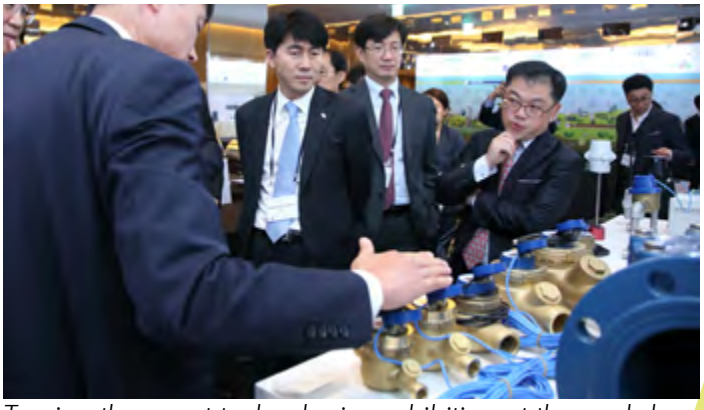
Another essential component of a smart city is a smart transportation system. According to Mr. Taehyung Kim, who heads the Korea Transport Institute's Division for Smart City & Transport, Korea has an ICT-enabled transport system, dubbed Intelligent Transport System (ITS), which covers city roads, expressways, and national highways. Included in Korea's ITS services are the Advanced Traffic Management System (ATMS), Advanced Traffic Information Service (ATIS), Electronic Fare Payment Service (EFPS), and Advanced Public Transportation Service (APTS). Among the last are an on-demand e-bus service and the Owl Bus, which is a night bus service in Seoul that uses information systems inside the vehicles to schedule bus intervals efficiently and provide passengers and drivers with real-time information.

Like Incheon, Anyang has a centralized operations center, the Ubiquitous Integrated Center, which was one of the sites visited during the workshop. The center collects, analyzes, and provides traffic information by "combining cutting-edge IT technology with traffic system components." The unique feature of this system is the monitoring of public spaces to enhance citizen safety and deliver timely responses during emergencies.

Korea's smart city development

Korea's smart city journey occurred in phases, which Mr. Joon Park of University of Seoul's International School of Urban Services explained during the workshop. Through shifts in institutional- and legislative-supported urban development, Korea saw the sustainable expansion of the Seoul Metropolitan Area (SMA) via land readjustment (LR) schemes in the 1960s, which provided space for much needed residential land (Gangnam, Gimpo areas). The next phase began in the 1980s focusing on developing new green field towns around key industrial towns of the country. This included the development of 5 new towns around SMA by bringing in private developers to convert green fields into serviced land.

Dr. Lee Jae Yong, Director of the Smart & Green City Research Center of KRIHS, pointed out that the development of the smart city approach started in the early 2000s and has been refined through successive phases. Phase 1 (2003 – 2014) focused mainly on smart city infrastructure construction of new towns and innovation cities such as Songdo and Pangyo. Phase 2 from 2014 – 2016 dealt with smart city platform-based integration, which decisively shifted the focus from construction to information technology, and the establishment of e-governance systems. Phase 3 commenced in 2016 and has further refined this approach by concentrating on (i) the promotion of new innovation industries through fostering urban testbeds and a regulatory sandbox, and (ii) finding effective solutions to urban problems, including expanding support for city regeneration.

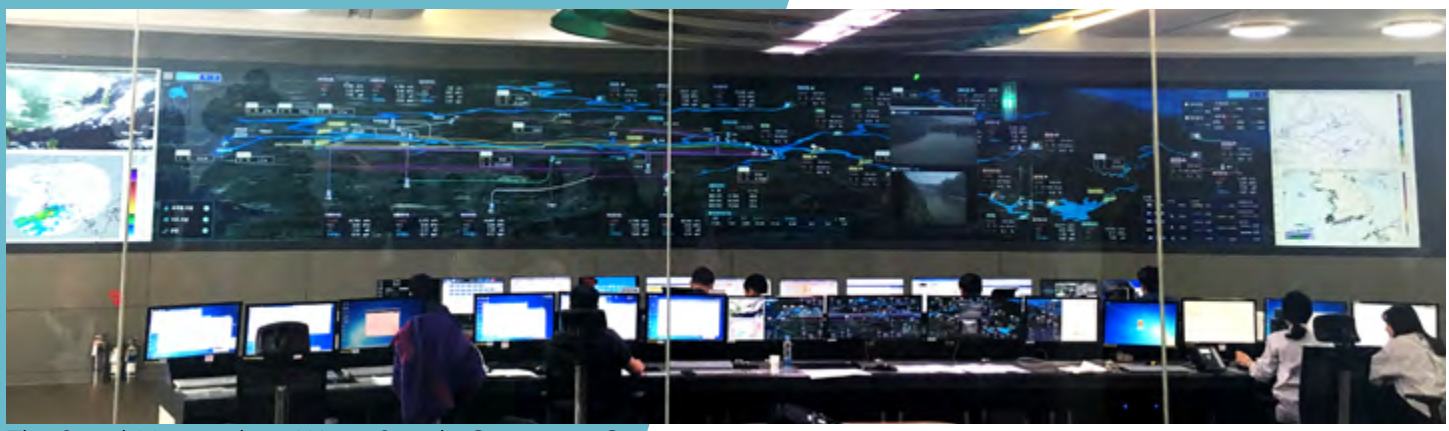


Touring the smart technologies exhibition at the workshop.

One of Korea's latest smart city developments is the Busan Smart Eco Delta City (EDC), which is currently under planning phase. According to Dr. Edward Yang, Director of the Centre for Future City, the concept of the Busan Smart EDC is based on the S.W.E.E.T. approach: Safety (without crime and accidents), Water (no need for water purifiers as spring water flows from faucets), Energy (use of new renewable city), Employment (job creation for young people), and Transport (autonomous vehicles and intelligent bus systems). One of Busan Smart EDC's core components is to be a research and development testbed that supports "all processes of development-verification-commercialization." With regard to water and the environment, the Busan Smart EDC will provide an environment-friendly waterfront space through low impact development, wastewater reuse, a smart water treatment plant, smart water supply, eco-filtering, and fine dust monitoring.

South Asia's smart city approach

SARD's Mr. Sanjay Joshi shared India's experience in transforming 100 cities into smart cities under the support of India's Ministry of Housing and Urban Affairs. A 2-stage selection process determined which 100 cities will receive investments. The strategy was to implement area-based development with three project focal points: redevelopment of cities, old slum areas, and core city areas; retrofitting through local area planning and city improvement works; and



The Seoul Metropolitan Water Supply Operation Center.

new development of areas in city extensions, satellite towns, and integrated townships (greenfield).

Each smart city will adopt at least one of five smart solutions for providing basic infrastructure and services: (i) electronic service delivery, (ii) intelligent traffic management systems, (iii) smart metering and management, (iv) integrated multi-modal transport systems, and (v) video crime monitoring. These will be operated from a command and control center. He shared examples of some of the projects that are implemented in these 100 smart cities.

Smart water

Using smart solutions in managing water services helps water utilities operate more efficiently and extract value from data, as explained by K-water's Dr. Eunher Shin. According to Mr. Shin, smart water management (SWM) is an approach underpinned by improving water loss control, water quality integrity, and the relationship with consumers. Water quantity management or water loss management, in particular, deals with assessment of performance indicators, detection of an event through smart meter data-driven methods, and control of pressure or flow.

Mr. Kwangsuhk Oh, Director of Total U-city Solutions (USOL) presented an innovative solution which installs acoustic (sonar) monitoring devices to 'listen' for leakage at night. The monitoring devices are georeferenced and communicate directly with a central system to map potential leakage areas in real time. Maintenance teams can then be deployed to repair and replace damaged pipes. The case study presented illustrates that NRW can be reduced rapidly by applying district metered area-based smart leakage detection solutions, quickly returning savings greater than investment. Once the infrastructure is in place, leakage can be managed at little cost.

From 2014 – 2017 Gonju City, with the support of USOL, invested around $2 million in deploying 7,000 leak sensors to identify and repair leaks in their water supply system. In 2014, NRW reduced from 36% to about 15%. This resulted in cost savings of around $3 million. The technology is currently being piloted in Colombo, Sri Lanka, in a small pilot DMA.

In South Asia, Bangladesh's Dhaka Water Supply & Sewerage Authority (Dhaka WASA) also uses SWM technologies, which Mr. Md. Mahmudul Islam, DWASA's Superintending Engineer and Project Director, shared during

the workshop. According to Mr. Islam, Dhaka WASA is implementing 145 DMAs in Dhaka City, including continuous real-time monitoring and efficiency optimization, maintaining pressurized water supply 24/7 and deploying smart metering devices that wirelessly communicate in real time.

Participants visited K-water's regional Hangang center which manages continuous supply of bulk water to the Seoul Metropolitan Area and other municipalities that comprise 55% of Korea's total population. The regional center remotely manages the operation of 13 dams and reservoirs and 5 water supply facilities. Real-time climate predictions and data are integrated into automated operational decision making to ensure drought and flood resilience of the water system by managing storage as well as optimal energy production at hydropower sites.

Participants also visited K-water's national operations center in Daejeon which oversees water resources operation at a national level, with a focus on data management and analysis. Big data is stored, integrated and analyzed for standardization and quality control, public accessibility, and enhancement of integrated water resource management operations.

The smart water panel answers questions from the crowd.

The center also houses the national water quality research which has the capacity to test for over 500 water quality parameters, including physical, organic, inorganic, and microbial. The center is also an R&D facility with research programs that include non-point pollution prevention, algae control, remote sensing for water quality monitoring, and enteric virus prevention.

Participants also visited the Daechung Multi-Purpose Dam operated by K-water as an integrated facility for water supply, flood control, and power generation. It is 84 m high and has a storage capacity of 1.5 billion m^3 and a power generation capacity of 90,000 kW – enough to supply electricity to around 40,000 households.

Smart wastewater

Korea's first sewage treatment plant (STP) was constructed in 1976. By 2016, Korea already had 625 STPs, according to Mr. Eun Namkung, President of the Korean Academy of Environmental Sciences and a professor at the Seoul National University. Through the years, STP effluent standards in Korea have become stricter and grown in number, leading to advancements in sewage treatment technology and to the deployment of Korea's Smart Water Management Initiative (SWMI), invariably closing the water cycle loop.

Mr. Jeong On Kim of Coway Entech presented an example of wastewater recycling using advanced filtration technologies (UF and RO systems) for supplying water for industrial uses. Coway Entech supplies treated waste water to two industrial facilities under 15- and 20-year contracts respectively: the Gajwa Reuse Plant in Incheon and the Pocheon Reuse Plant

The delegation in front of the Seoul Metropolitan Water Supply Operation Center.

inside Pocheon's Jangja Industrial Park. The municipality benefits from the asset at the end of the operation period.

SAUW's Ms. Neeta Pokhrel shared ADB's experience in waste water management in Kolkata by partnering with the city for nearly 2 decades. Through ADB support, the Kolkata Municipal Corporation has recently installed the country's first comprehensive city-level flood forecasting and early warning system (FFEWS). The FFEWS uses ultrasonic sensors that send real-time GIS data to a cloud-based system for analysis.

Solid waste management

Participants visited the Sudokwon Landfill Site in Incheon, a marvelous example of sustainable refuse management and resource recovery.

The complex extends beyond its waste management functions to address NIMBYism ("not in my backyard" mentality) by incorporating environmental and cultural attractions in the complex for use by residents. Part of the profits are also invested in community projects for the benefit of the local residents. The site's high-tech facilities for waste management and resource recovery include: (i) a 200 ton/day solid recovered fuel plant which converts wastes into fuel and energy; (ii) a 200 ton/day sludge recovery plant which converts sewage sludge into fuel; (iii) a 500 ton/day food waste effluent biogas plant which produces 25,000 m^3/day of biogas; and (iv) 6,700 ton/day leachate treatment system. The site has six 50 MW landfill gap power generators, which produce 340 million kWh each year, providing electricity to around 10,000 households. It also implements a clean development mechanism to recycle landfill gas through which it earns 900,000 CO_2 tons of certified emissions reductions (CERs) from the UNFCCC. To top it all, the site even has a golf course!

Workshop participants visited the Hanam Union Park & Tower, the integrated waste management facility housing a sewage treatment plant, sludge treatment facility, waste incineration plant, food waste recycling facility, and recycled waste sorting facility. To allay local residents' concerns over the siting of a waste management facility in their neighborhood, the facilities were constructed underground with a sophisticated odor management system. Communal amenities have been provided for free use by local residents, including a park, a multi-purpose gym, and other sports venues.

Interventions in solid waste management in ADB projects were also discussed by the participating DMC officials from Nepal and Maldives. In Nepal, towns are leveraging private sector participation (PSP) to implement integrated solid waste management at the grassroots level through three ADB projects. This includes the development of landfill sites and adoption of recycling processes. In Pokhara, for instance, a road made from recycled plastic has been built by the private sector. In Kiritipur, the private sector is operating a large-scale biogas plant.

In the Greater Malé region of Maldives, solid waste management improvements are also underway through the ADB-supported Greater Malé Environmental Improvement and Waste Management Project. The project will help establish a modern waste collection, transfer, and disposal system, and improve community-based outer island waste management systems.

Paving partnerships for Smart Urban Development in SARD DMCs

DG Kim also held meetings with MoE, KEITI, K-Water, and the Korea Research Institute for Human Settlements (KRIHS) to explore partnership arrangements for promoting knowledge exchange and the use of high technologies for smart urban development in SARD DMCs.

The workshop provided opportunities for DMC delegates and ADB staff to learn new technologies and innovations, interact with the Korean private sector, and share experiences and knowledge to meet urban challenges of South Asia.

SAUW in front of KEITI's incubation center, eTechHive, during the site visits.

The participants learned that smart city developments in Korea have been underpinned by long-term policy development and investment, utilization of smart technologies, and recognizing the value of the urban environment in delivering quality of life and inclusive growth. South Asian delegates also shared their own experiences in the development of smart cities in their respective cities, enabling the sharing of ideas, thereby accelerating the evolution of best practice strategies for smart city implementation in DMCs.

Follow-up work will be undertaken to facilitate the implementation of various agreements and decisions to strengthen cooperation with Korean public and private sector agencies to enable knowledge and technology transfer to South Asian DMCs.

Click to access workshop presentations and site visit presentations.

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