

# **Carbon Neutrality through Digital Transformation**

## **Korea's Perspective**

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# Climate Change in 2023–2024

- WMO, confirmed 2023 as the hottest year on record
- COP28, showed too slow progress across all areas of climate action
- CCPI 2024, left top3 vacant, no country achieved an overall very high rating
- The climate impact of ICT, heightened expectations and concerns



Digital technologies can contribute roughly 24 percent to the 2030 climate targets ('24)



Digital solutions can reduce global emissions by up to 20% ('23)



AI has the potential to unlock insights that could help mitigate 5% to 10% of global greenhouse gas (GHG) emissions by 2030 ('23)



AI is expected to reduce GHG emissions by 16% and improve power efficiency by 15% in the next three to five years ('21)



ICT sector needs to reduce the total emissions by 45% from 2020 to 2030 to follow a 1.5°C trajectory ('23)

But, ICT global emissions remained the same and electricity increased by 8.2% in 2022 compared to 2020

Industry	Emissions (MtCO2e)			Electricity (TWh)			Change 2022/2020 (%)	
	2020	2021	2022	2020	2021	2022	Emissions	Electricity
Telecommunications operators	135	134	133	239	255	258	-1%	8%
Colocation data centers	36	40	43	89	100	109	20%	22%
Cloud & content	22	27	32	54	70	85	46%	63%
ICT equipment & product use	375	388	359	712	771	741	-4.2%	4.1%
Total	568	589	567	1094	1196	1193	-0.2%	8.2%
% of world	1.8%	1.7%	1.7%	4.6%	4.7%	-		

Source : Measuring the Emissions & Energy Footprint of the ICT Sector – Implications for Climate Action (ITU/World bank, '24)

# Korea and Climate Action

- **Pledged to reach net zero by 2050 ('20.10)**
- **Committed & updated its NDC to cut GHG emissions by 40% of 2018 levels by 2030 ('21.10)**
- **The 7th largest GHG emission country and ranked 64th in the CCPI 2024**
- **Called urgency to accelerate practical and effective climate actions through digital transformation**

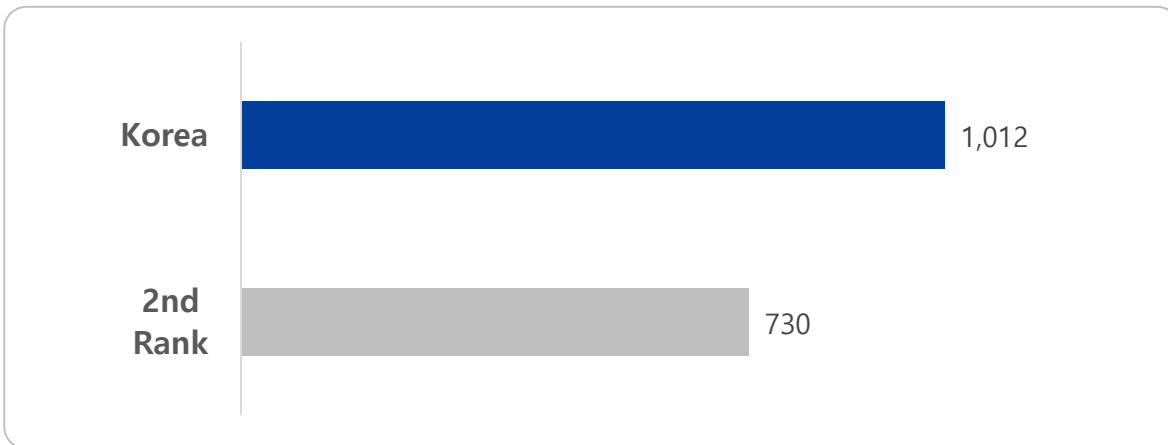
# Korea and Digital Competency

➤ One of world's highest internet penetration, fastest internet speeds, highest industry robot density, largest market share in memory semiconductors, etc

❖ The ICT Development Index 2023 (ITU, '23) : 93.8

	Individuals using the internet(%)	Households with Internet access at home(%)	Mobile broadband subscriptions per 100 inhabitants	Population covered by at least a 3G mobile network(%)	Population covered by at least a 4G/LTE mobile network(%)	Mobile broad-band internet traffic per subscription(GB)	Fixed broad-band internet traffic per subscription(GB)	Mobile data voice high consumption basket price(% GNI p.c)	Fixed broad-band internet basket price(% GNI p.c)	Individuals owning a mobile phone(%)
Indicator values	97.6	99.9	117.2	99.9	99.9	146.1	3889.0	0.9	1.1	97.6
Normalized Progress Score (1-100)	97.6	100	78.1	99.9	99.9	80.3	89.7	100.0	99.7	100.0

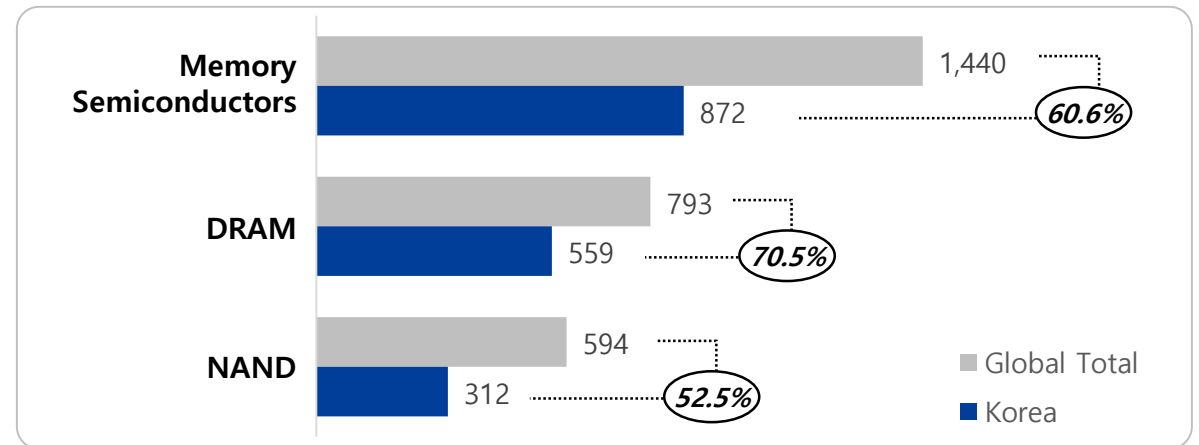
❖ Robots installed per 10,000 employees



Source : International Federation of Robotics ('23)

❖ Market Share of Semiconductors

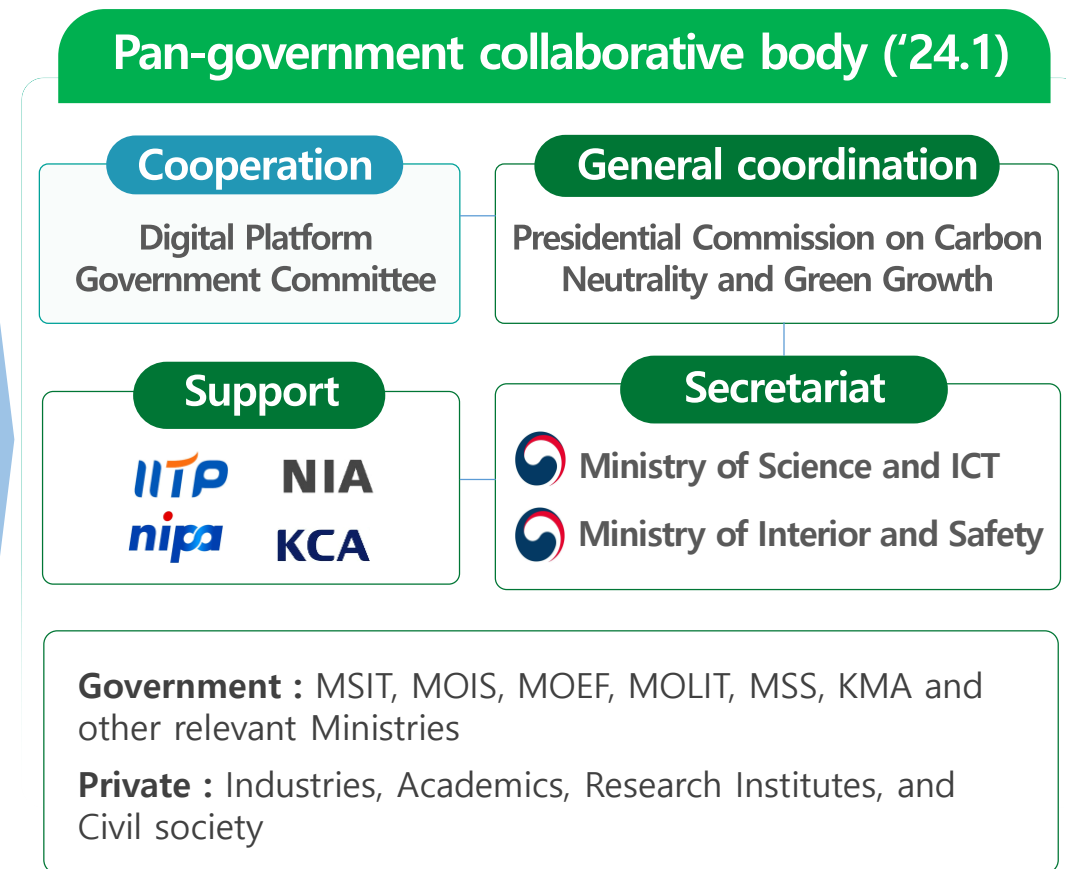
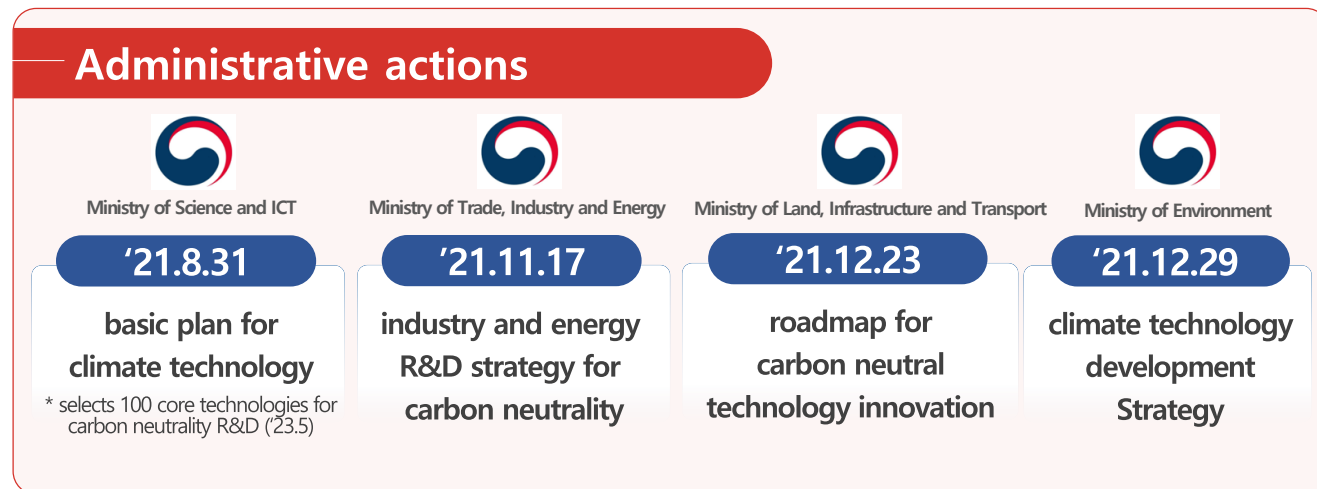
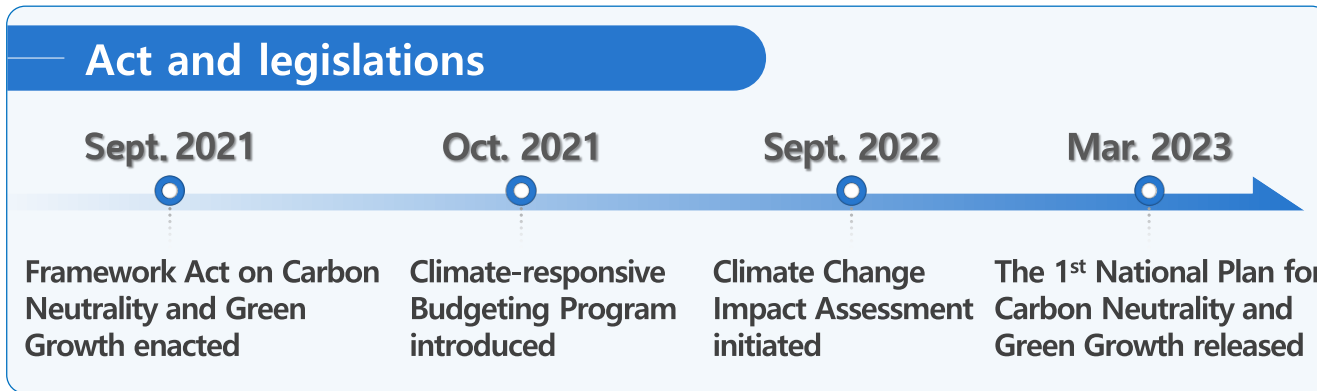
(Million US\$, %)



Source : OMDIA ('23)

# Green Digital Transition : Governance

- Set up a pan-government collaborative body to accelerate 'green by digital' and 'green of digital' initiative ('24.1)
- Bring together the digital and green capabilities of the public and private sectors



# Green Digital Transition : Action Areas

- Referring to the ITU's green digital action areas, the pan-government collaborative body specified strategic technology plans

**GHG  
Emissions**

**Digital Solutions for  
Energy Efficiency**

**Digital Technologies for  
Mitigation and Adaptation**

**Energy Efficiency + e-Waste  
of Digital Infrastructure**

**Green  
by  
Digital**

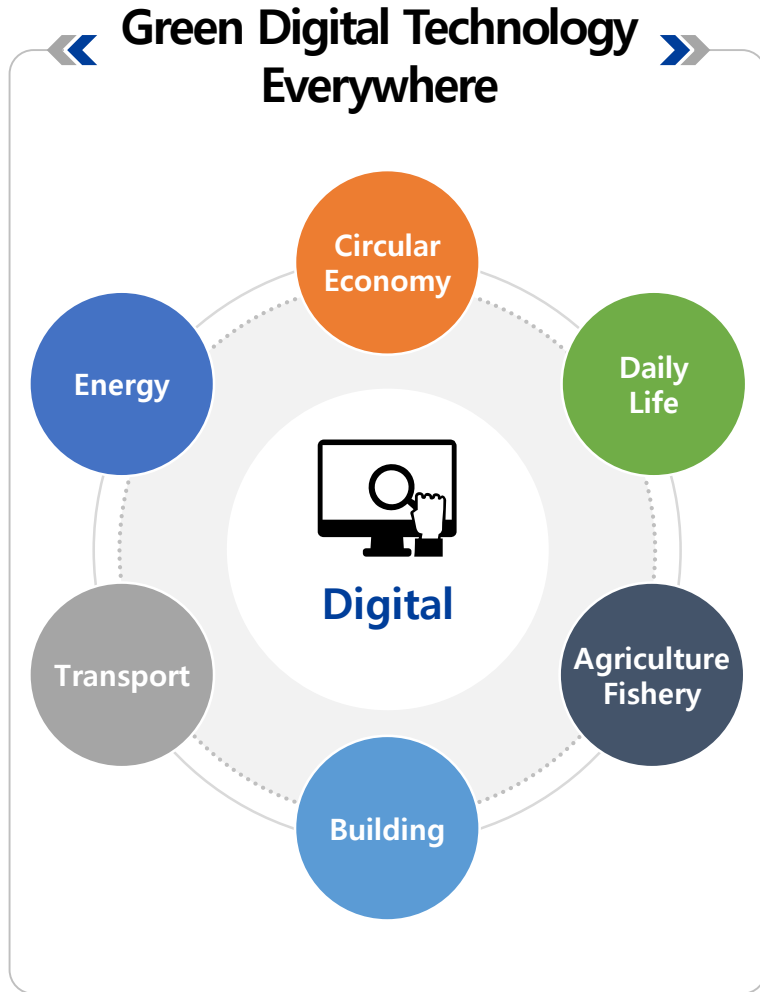
**Green  
of  
Digital**

- ✓ Develop Sector-specific technologies for carbon emission reduction
  - ✓ Incentivize green digital transformation (SMEs, Start-ups, local entrepreneurs)
  - ✓ Develop technologies for MRV\* and track carbon footprint
- \* MRV : Measurement, Reporting and Verification
- ✓ Lay the foundation for utilizing carbon neutral data

- ✓ Develop and deploy energy efficient datacenter technologies
- ✓ Develop core technologies for energy efficient network
- ✓ Specify guidelines and methodologies to MRV energy efficiency of digital infrastructure
- ✓ Develop technologies, metrics and database for waste management of digital infrastructure

# Green by Digital : Strategic Plans and Technologies (1/4)

## ➤ Develop sector-specific digital technologies for carbon emission reduction



### Energy

#### Ministry of Trade, Industry and Energy (MOTIE)

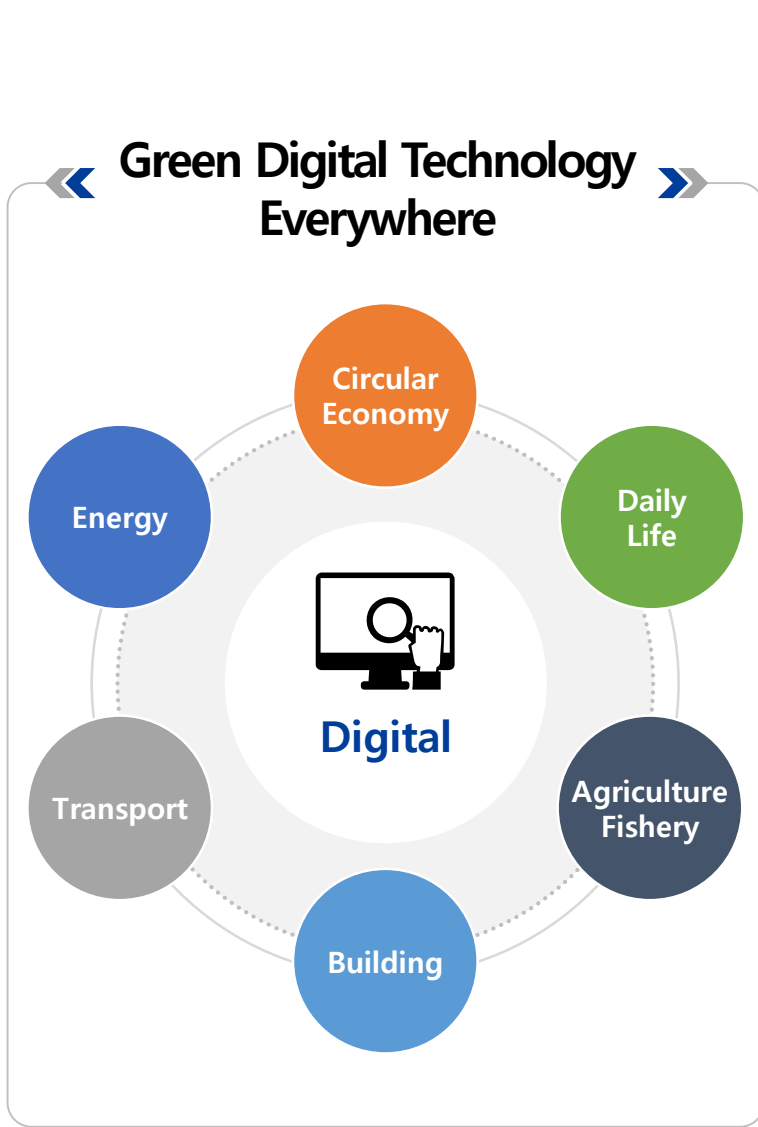
- ✓ **(Distributed Energy Resource )** ICT based smart technology to enhance operational efficiency of DER transmission and distribution
- ✓ **(Renewables)** Digital Twin based renewable energy forecasting, Digital O&M technology for Solar and Wind Power Plant

#### Korea Meteorological Administration (KMA)

- ✓ **(Weather)** Provision of customized forecast data to Eco-friendly energy business

- ❖ The Fifth Basic Plan for New and Renewable Energy ('20.12) : implemented 2021-2025
  - Establish foundations for five innovations in renewable energy distribution, market, demand, industry, and infrastructure to meet the target of 25.7% from Renewable Energy by 2034
- ❖ The Third Basic Plan for an Intelligent Power Grid ('23.2) : implemented 2023- 2027
  - Develop technologies and mechanisms to increase the proportion of distributed energy resources and expand consumer participation
- ❖ The Special Act on the Revitalization of Distributed Energy ('23. 5)
  - Focus on proper compensation for the distributed energy resources

# Green by Digital : Strategic Plans and Technologies (2/4)



## Transport

### Ministry of Land, Infrastructure and Transport (MOLIT)

- ✓ **(C-ITS)** Deploy C-ITS based transport services
- ✓ **(Aviation Platform)** Build an Integrated Aviation Information Management System

### Ministry of Oceans and Fisheries (MOF)

- ✓ **(AI Vessel)** Develop AI route optimization solution
- ✓ **(Smart Port)** Enhance its operational efficiency, safety and sustainability by using AI, IoT, Digital Twin, Blockchain, and 5G technologies

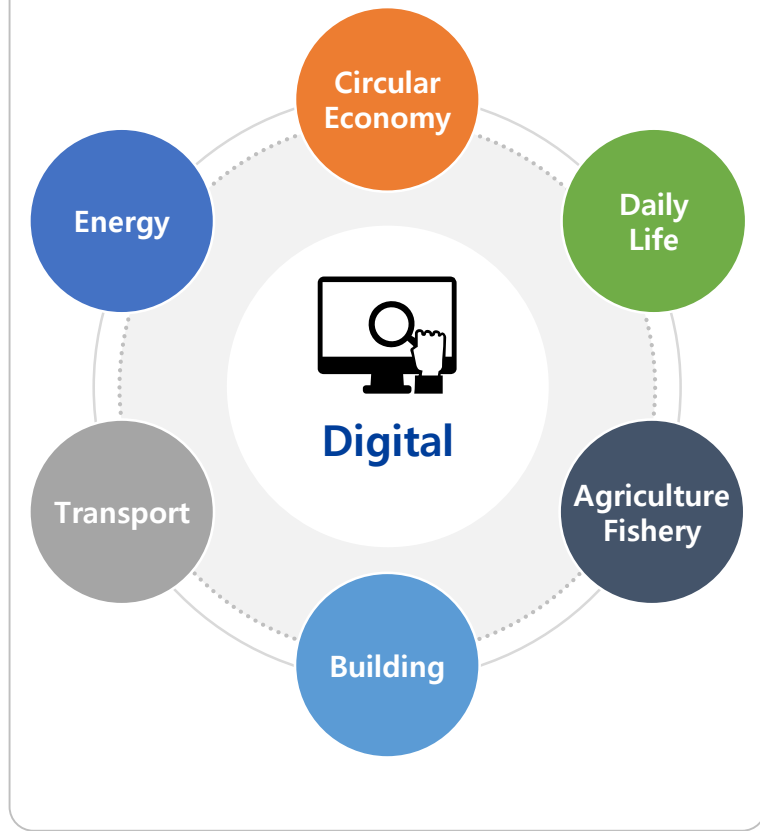
- ❖ National Integrated Transport System Efficiency Act ('09.6)
  - 1st Intelligent Transport System (ITS) Basic Plan was set in 2010 in accordance with the Act
    - \* 500 Million US dollars of R&D was invested during the 1st ITS Plan (2011-2020)
- ❖ Intelligent Transport System Master Plan 2030 ('21.10) : implemented 2021- 2030
  - Vision : "Providing eco-friendly, safe and uninterrupted people-centered C-ITS services"

Strategies	Tasks
Establish infrastructure for new means of transportation	- Develop secured LTE-V2X, UAM boarding facilities, 3D city map for autonomous cars and UAM
Resolve blind spots in traffic safety with advanced technologies such as AI	- Expand AI based smart monitoring system detecting unexpected situations such as reverse driving, real-time road surface conditions (icing, etc.) and obstacles (falling rocks, etc.) - Introduce an electronic warning system judging jaywalking, traffic flow of a railroad crossing - establish a linkage system with traffic signals on adjacent roads
Lay the foundation for providing user-customized services	- implement a customized virtual assistant service providing the optimal travel route from home to the airport gate and expand autonomous passenger luggage carrying cart robots



# Green by Digital : Strategic Plans and Technologies (3/4)

## Green Digital Technology Everywhere

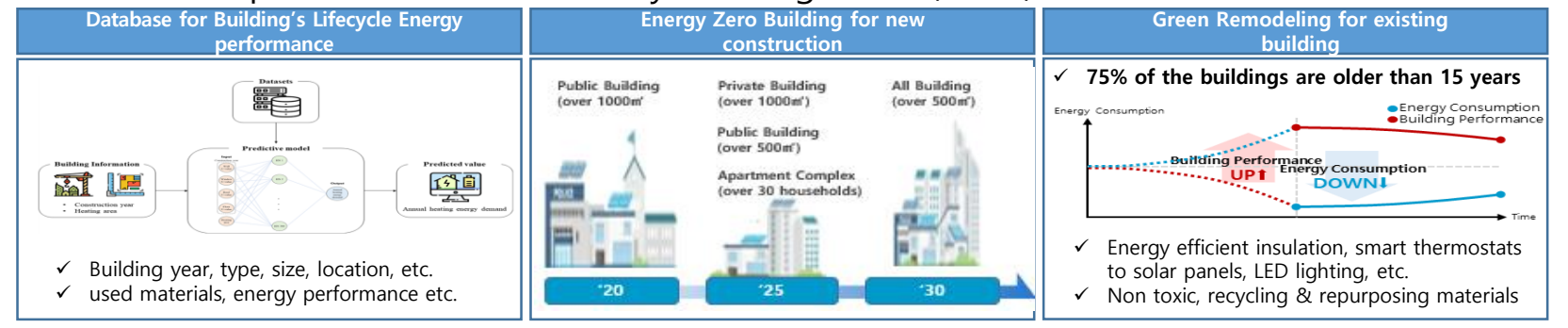


## Building

### Ministry of Land, Infrastructure and Transport (MOLIT)

- ✓ **(Sustainable remodeling)** Develop building selection AI for remodeling and automate eco-design

### ❖ The roadmap for 2050 carbon neutrality : Building Sector ('22.12)



## Agriculture, Livestock, Fishery

### Ministry of Agriculture, Food and Rural Affairs (MAFRA)

- ✓ **(Smart Farm/Barn)** Develop energy saving technology and digital control system

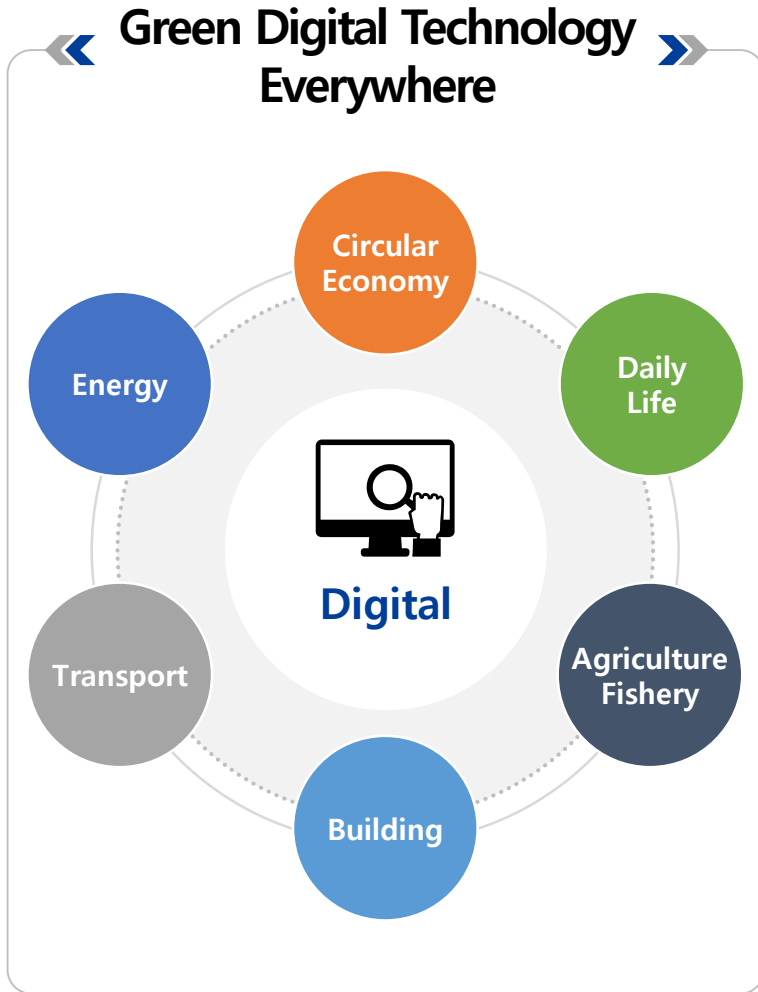
### Ministry of Oceans and Fisheries (MOF)

- ✓ **(Smart Fish Farm)** Develop digital based energy management system

## Green Digital Life

- ✓ Digital points for food waste reduction
- ✓ Lifecycle analysis and digital alert of household carbon emission
- ✓ Zero waste online exhibition, etc.

# Green by Digital : Strategic Plans and Technologies (4/4)



## Circular Economy

### Ministry of Trade, Industry and Energy (MOTIE)

- ✓ **(Monitoring)** Develop management systems for value chain carbon emission and resource circulation

### Ministry of Environment (ME)

- ✓ **(Automated processing)** Develop AI sorting machines for waste plastics and disassembly robots for waste batteries

### Ministry of Oceans and Fisheries (MOF)

- ✓ **(Smart Collection)** Build smart collection center and automate pre-processing of Marine Waste

- ❖ The Waste Control Act (ME, '87), Act on Resource Circulation of Electrical and Electronic Equipment and Vehicles (ME, '10), the Transition to a Circular Economy Promotion Act (ME, '22)
- ❖ Strategy for Industrial New Growth through Invigoration of Circular Economy (MOTIE, '23.6)

#### promote a circular economy across nine major industries

<ul style="list-style-type: none"> <li>• increase the use of by-products of production processes</li> <li>- expand pyrolysis oil production</li> <li>- expand infrastructure to secure plastic waste resources</li> </ul>	<ul style="list-style-type: none"> <li>• create a resource efficiency rating system and a renewable raw material certification system</li> <li>- develop technology for purifying and extracting environmentally-friendly, high-purity rare metals</li> </ul>	<ul style="list-style-type: none"> <li>• expand eco-design in the electronics and textile industries</li> </ul>
<ul style="list-style-type: none"> <li>• support the setting up of domestic and foreign renewable raw material supply chains</li> <li>- develop technologies such as waste plastic depolymerisation and plasma pyrolysis</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and support companies that embody circular economy practices to lay the foundation</li> </ul>	<ul style="list-style-type: none"> <li>• boost production of remanufactured products in the auto and machine industry</li> </ul>
<ul style="list-style-type: none"> <li>• advance a national integrated resource management system</li> <li>- advance technology involved in the scrap recycling process and securing overseas scrap</li> </ul>	<ul style="list-style-type: none"> <li>• develop technology to recover lithium and nickel from used batteries</li> <li>- implement a reusable battery safety inspection system and electric vehicle battery history management system</li> </ul>	<ul style="list-style-type: none"> <li>• secure alternative fuel and raw materials in cement production</li> </ul>

# Green by Digital : Inclusive Economy

## ➤ Support green digital transition of start-ups, SMEs and local entrepreneurs

- ✓ Foster Green Digital Entrepreneurs (MSIT)

- ✓ Facilitate Green Digital Markets (MSIT)

- ✓ Expand green digital projects to regionally specialized industries (All)

- ✓ Create local government's PPP model specified for digital carbon neutrality (All)

Green Digital Entrepreneurial Ecosystem

Green Digital Transition of SMEs

Local Link for Green Digital Transition

- ✓ Support partnerships between large businesses and SMEs to implement Scope 3 (MSIT)

- ✓ Support SMEs to MRV environmental activities (ME)

- ✓ Support SMEs to digitize operation (MSS)

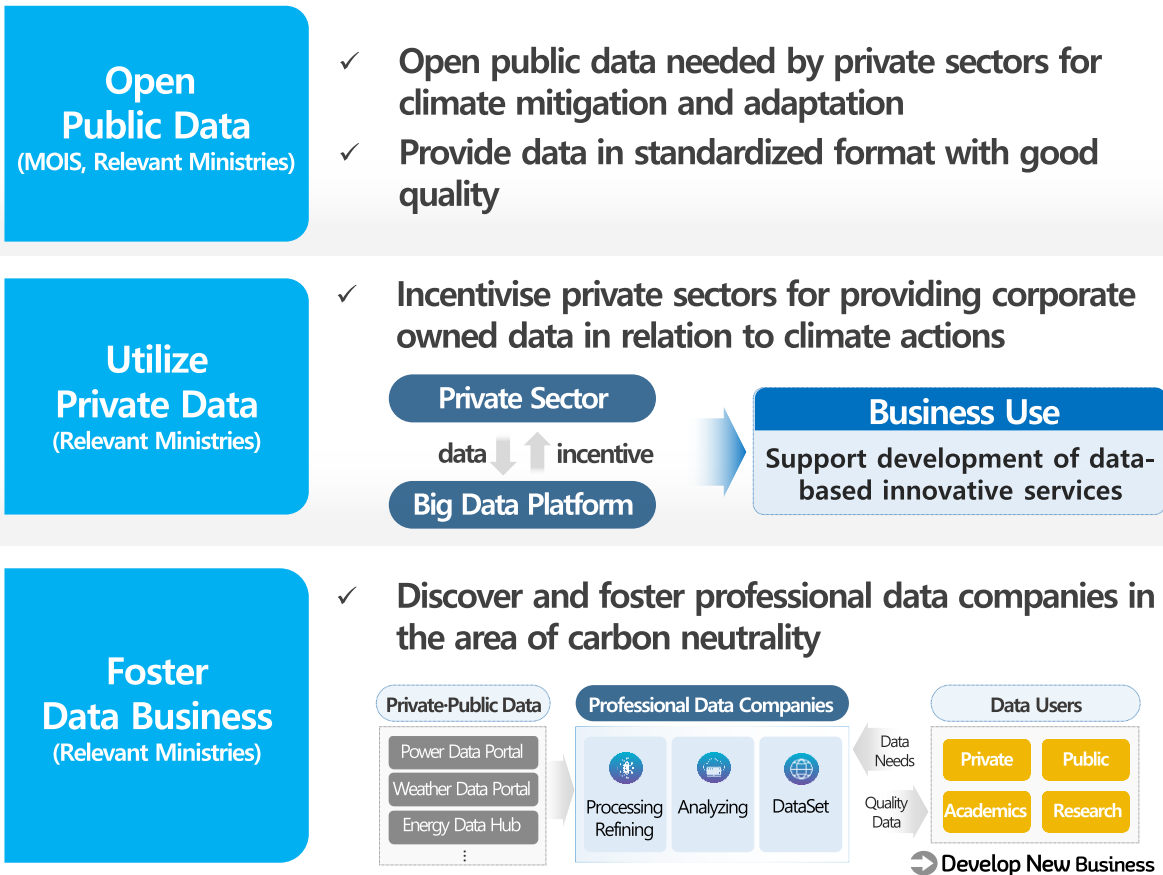
- ✓ Support SMEs to build smart eco-factory (MSS)

- ✓ Support to build collaborative virtual factories between LEs-SMEs, SMEs-SMEs within a value chain (MOTIE, MSS)

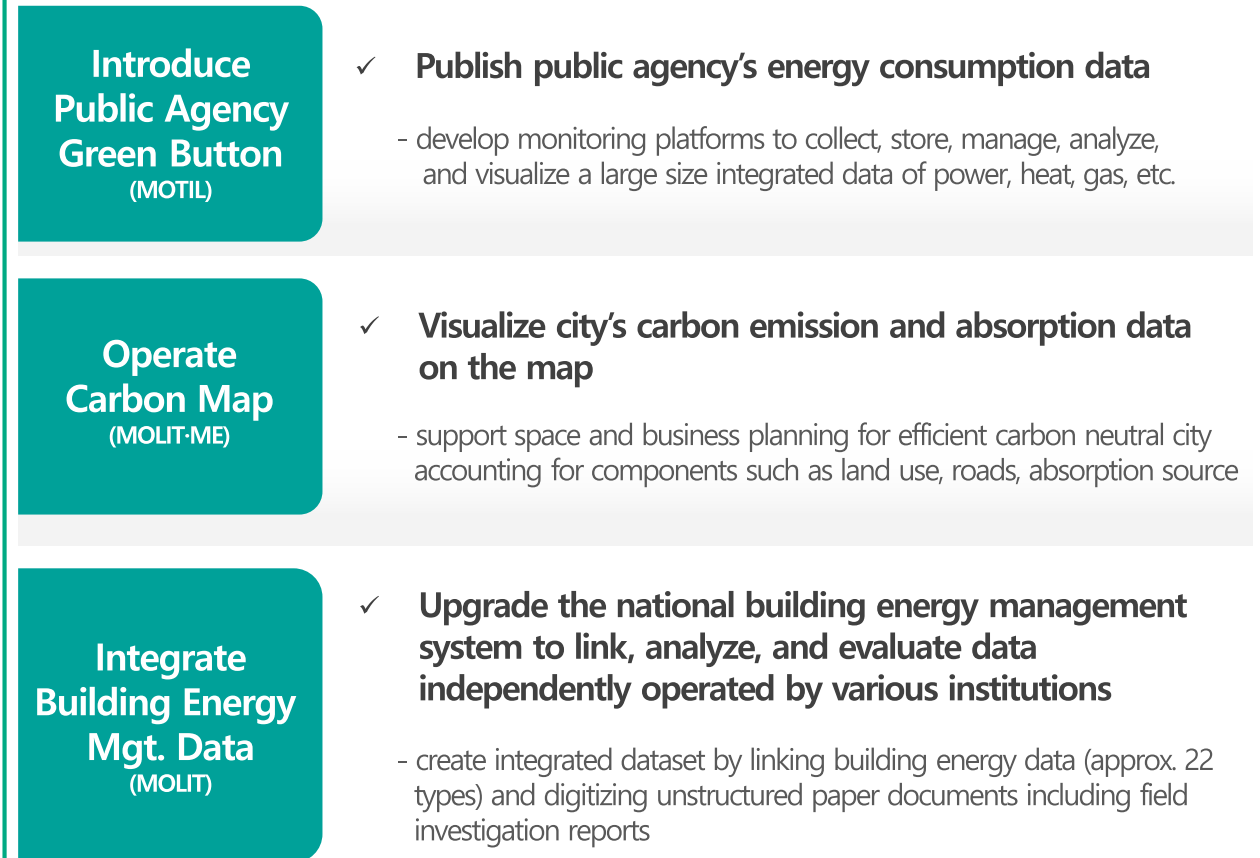
# Green by Digital : Data

## ➤ Lay the foundation for utilizing data for carbon neutrality

### Opening and Sharing Data



### Building Data Platforms



# Green by Digital : Decision Support System

➤ Transform decision support system to digitally quantify and track carbon footprint over whole lifecycle of product and service

## Build digital MRV\* platform (MSIT · ME)

- ✔ Digital infrastructure and datasets are leveraged to enable digital MRV to monitor and track carbon footprints across value chains

Traditional MRV	Paper-based standards	Linear, Milestone, end of cycle verification
	Manual data collection	Push button issuance
	Soft copy reporting	Data credit tracking
Digital MRV	Digitized standards	Streamlined & accelerated data verification
	Automated data collection	Tokenized real time issuance
	Digital access to database	Real time tracking of GHG inventories

IoT  
Remote Monitoring

Cloud  
Data Storage & Management

Big Data  
Calibration Record, Integrated GHG Calculation

AI, Digital Twin  
Forecasting, Decision Support

Blockchain  
Preventing Forgery & double counting

## Support product-level carbon emissions measurement (ME · MSIT)

- ✔ Responding to EU CBAM\* and Scope 3 regulations, government supports companies to measure product/service level carbon emissions throughout the value chain

## Renovate EPD website (ME)

- ✔ Korea's public EPD\* website, ezEPD, is renovated to enhance accuracy and transparency of LCA

## Strengthen MLA in the area of EPD (MOTIE · ME)

- ✔ MLAs are to be adopted for harmonization, comparability and acceptance of Korea's EPDs on a global scale

# Green of Digital : Data Center

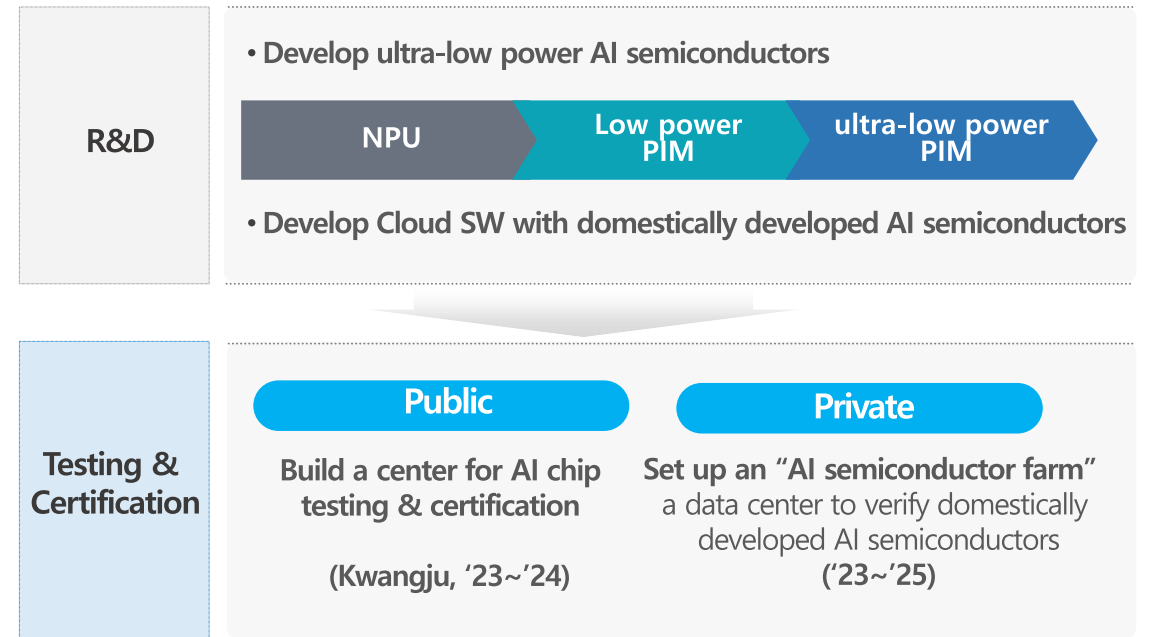
## ➤ Build Energy Efficient High Performing Data Center (MSIT)

### Develop Equipment & Solutions for Green Data Center

Server	heat resistant server, liquid cooled server
Storage	energy efficient computational storage
Network	Low power converter chips
Refrigerator, Ventilation	Air cooling system based on LNG cold energy utilization
Power	Intelligent power distribution unit
EMS	renewable energy power conditioning system, digital twin EMS

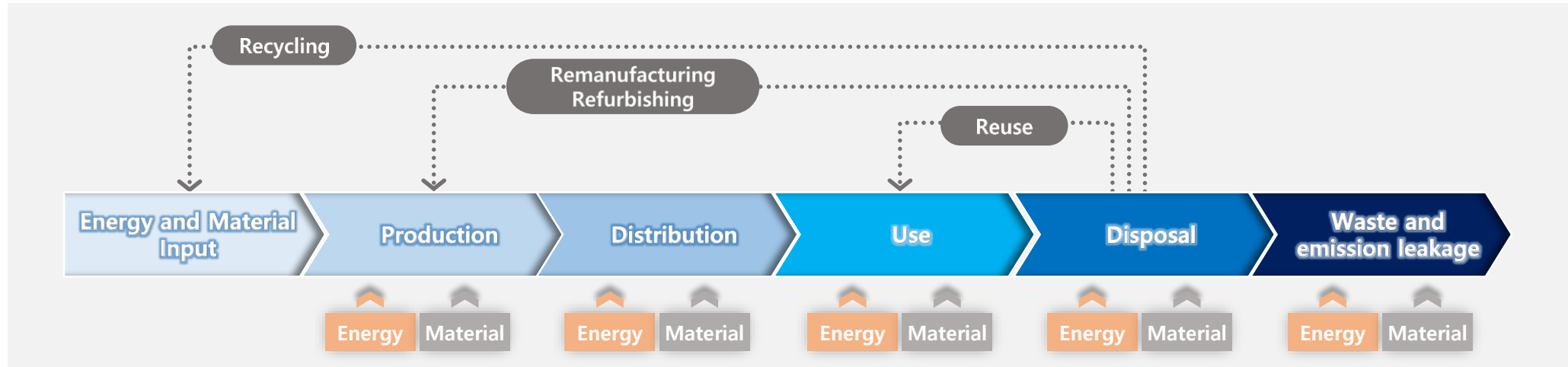
### Develop Low Power AI Chips for Data Center

#### Low Power AI Chips



# Green of Digital : Telecommunications Network

- Develop frameworks for energy efficiency and circular economy of digital infrastructure including telecommunications network and data center



## Energy Efficiency of Digital Infrastructure

- ✓ Develop energy efficiency directives and guidelines for digital infrastructure (ie., telecommunications network, data center)
- ✓ Conduct energy efficiency testing and certification
- ✓ Support development & deployment of energy efficient equipment and solutions (ie., power amplifier, AI chipset, passive beamforming, Integrated EMS, AI SW for BTS operation)
- ✓ Build common database

## Resource Circulation of Digital Infrastructure

- ✓ Develop circular economy directives and guidelines for digital infrastructure (ie., telecommunications network, data center)
- ✓ Develop unified environmental metrics, benchmark methods and measurement tools for equipment
- ✓ Assess environmental impacts of resource circulation
- ✓ Build common database

# Thank You

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