



Strategic Roadmap for Korea's Green Transition: Challenges and Pathways

Dr. Jungwook Kim

Executive Director
Center for International Development (CID)
Korea Development Institute (KDI)





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01

Background

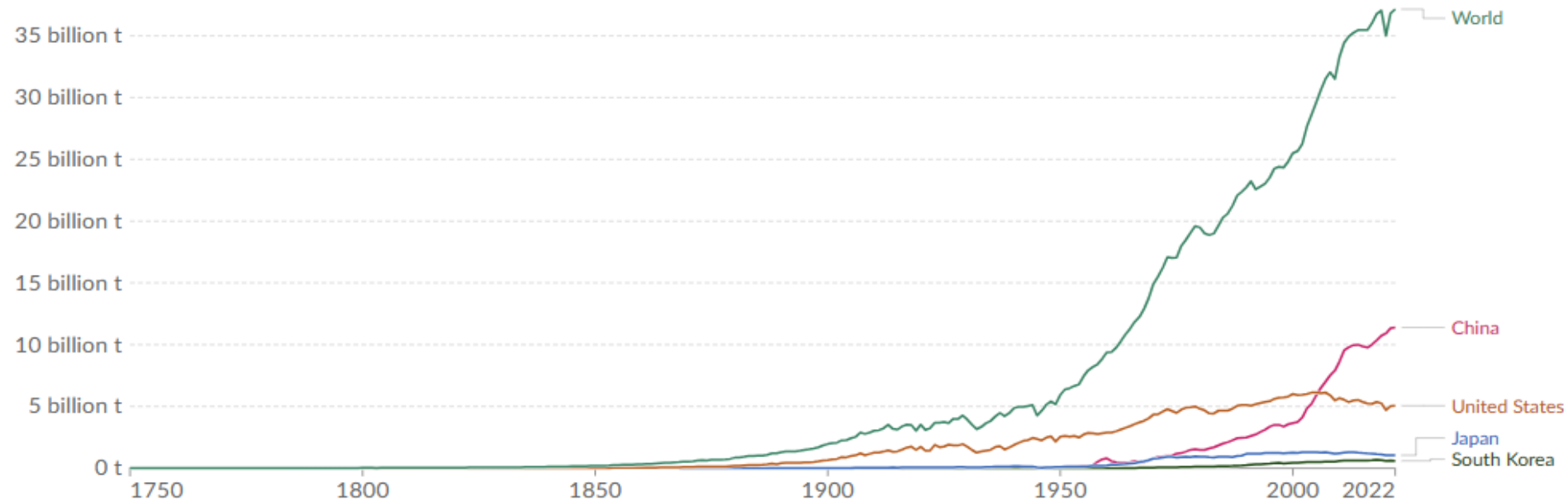


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01 Background

- Persistent greenhouse gas (GHG) emissions from human activities has brought about rise in the global temperature, increase in average sea levels, and heightened frequency of climate disasters, threatening all humanity.
- We are living on a planet that is 1.15°C warmer than in 1850-1990, with the sea-level rising 3.58mm annually over 30 years from 1993 to 2023.
- Climate crisis is no longer a problem of the future, but an **immediate issue of today.**

[Figure] Annual CO₂ emissions

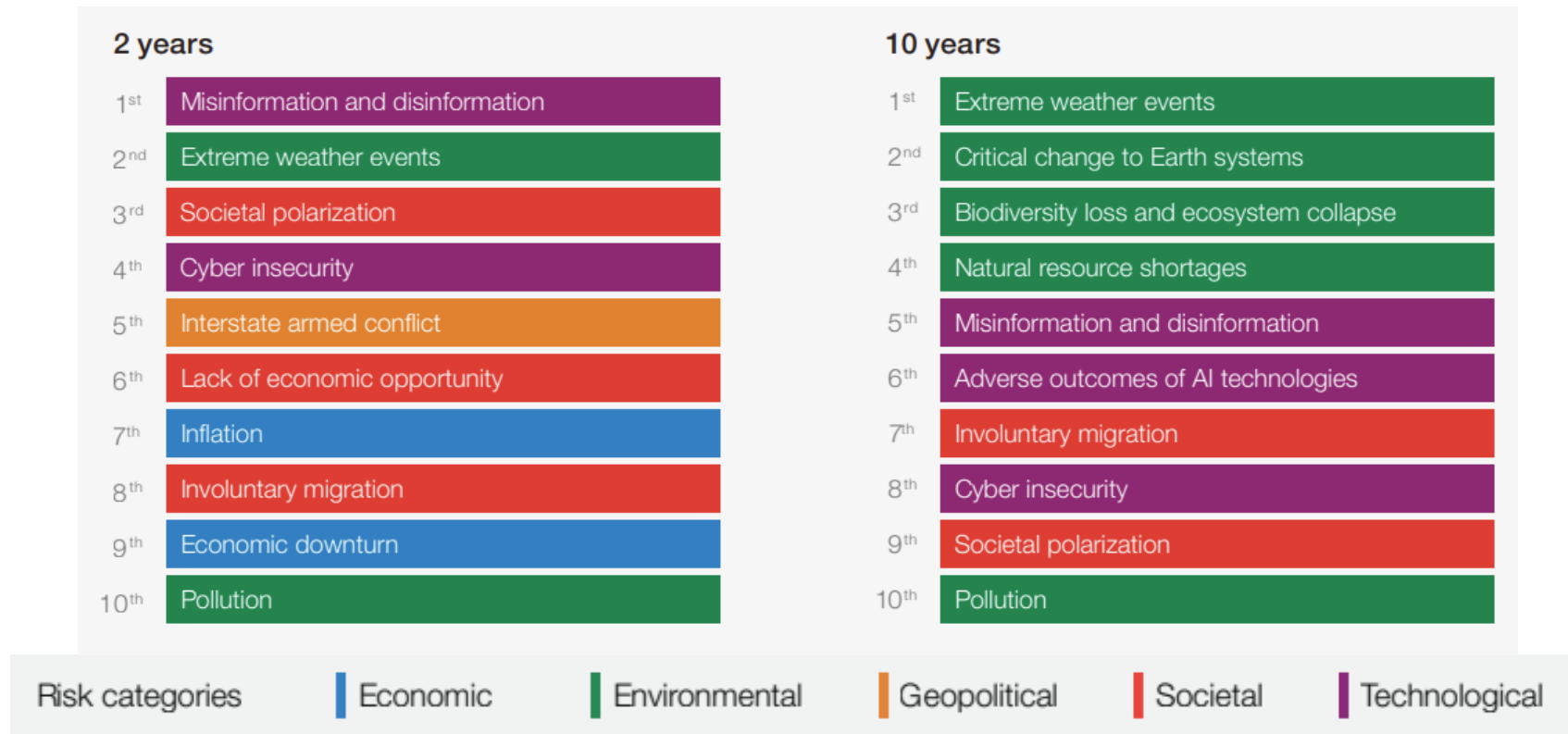


01 Background

- **Climate issues ranked the Top 4 Long-term Global Risks**

- According to current trajectories of global warming, at least one significant climate tipping point is likely to be crossed within the next decade.

[Global risks ranked by severity over the short and long term]



1990

IPCC AR1

IPCC's inaugural comprehensive assessment of climate change encompassed scientific, technological, and socio-economic dimensions.

1992

UNFCCC

An international treaty to mitigate climate change.
Common But Distinct Responsibilities (CBDR)

1995

COP1

1997

Kyoto Protocol

Introduces mechanisms such as **Emissions Trading** and the **Clean Development Mechanism (CDM)**.

2015

Paris Agreement

Mandates greenhouse gas emission reductions for all nations, including developing countries
Emphasizes each country having **Nationally Determined Contributions (NDCs)**, their own GHG emissions target, and regularly progress reporting

2018

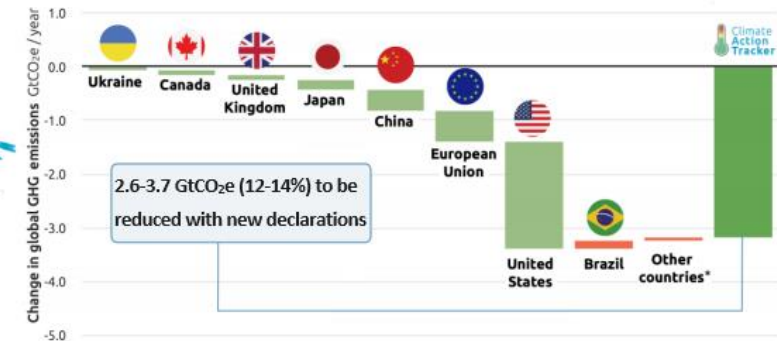
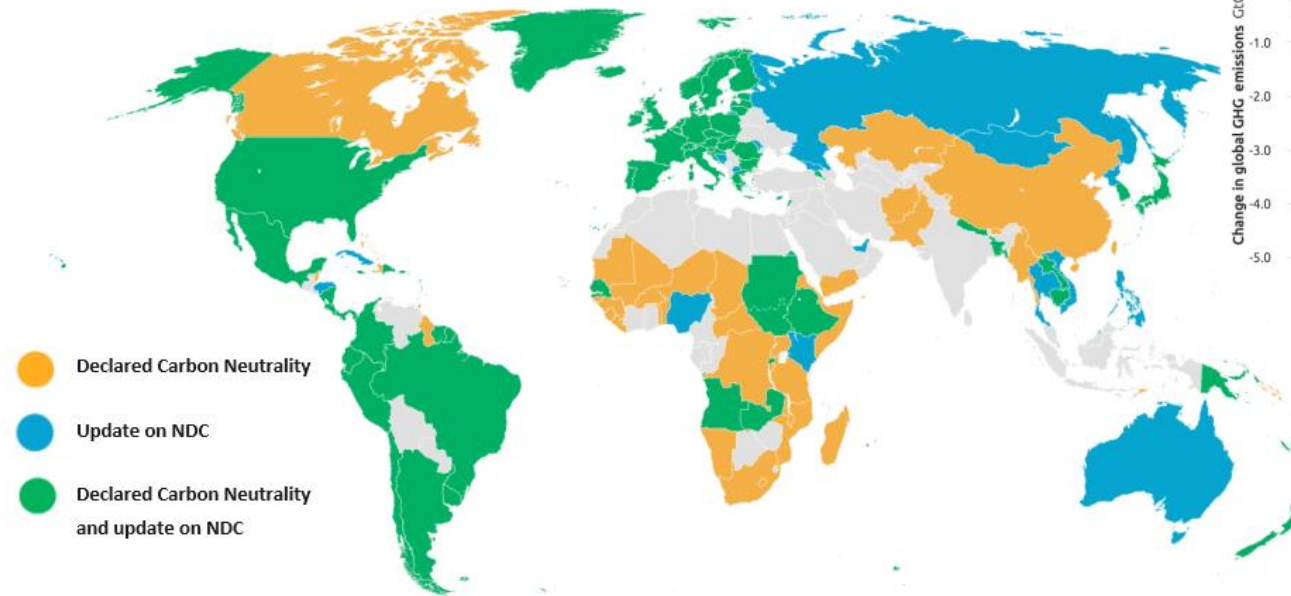
COP 24

「Global Warming of 1.5°C」, IPCC Special Report

Limiting warming to 1.5°C implies achieving global **net zero** CO² emissions **by 2050**.



- **Carbon Neutrality** refers to a strategy in which GHG emissions from human activities are offset to achieve net emissions of zero by using natural absorption and artificial removal measures.
 - At 2019 UN Climate Action Summit, 77 countries committed to carbon neutrality and countries including G7 rapidly prepared legislation enactment.



- EU - Reduce by 55% of 1990 levels
- Germany - Reduce by 65% of 1990 levels
- UK - Reduce by 68% of 1990 levels (78% by 2035)
- US - Reduce by 50% of 2005 levels
- Japan - Reduce by 46% of 2013 levels
- China - Reduce of GHG intensity by 18% and Energy consumption by 13.5% per GDP of 2020 levels by 2025
- Korea - Reduce by 40% of 2018 levels by 2030

02

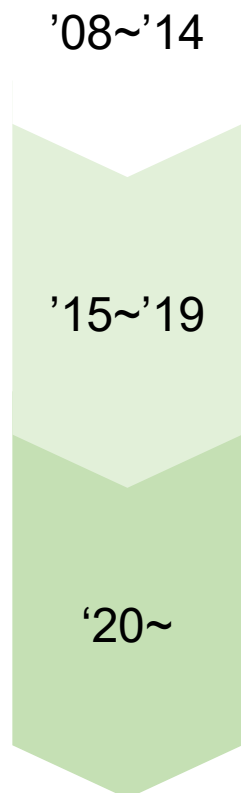
Korea's Green Growth Policy

- *Direction and Challenges*



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- South Korea was the first country to adopt **Green Growth** as the national priority, demonstrating a strong commitment to integrating environmental sustainability with economic development and leading global efforts to build a green economy.



Introduction of Korea's Green Growth Policies

- Presented **Low Carbon Green Growth as a New Growth Engine** ('08)
- **National Strategy and Framework Plan for Green Growth** established ('09)
- 「**Framework Act on Low Carbon Green Growth**」 enacted ('10)
- 「**Act on Allocation and Trading Of GHG Emission Permits**」 enacted ('12)
- COP18 decided to host **Green Climate Fund (GCF) Secretariat** in Incheon, South Korea ('13)
- **2020 NDC Target** (30% emission reduction compared to BAU level by '20) established ('14)

Scale-up of Climate Change Response Policies

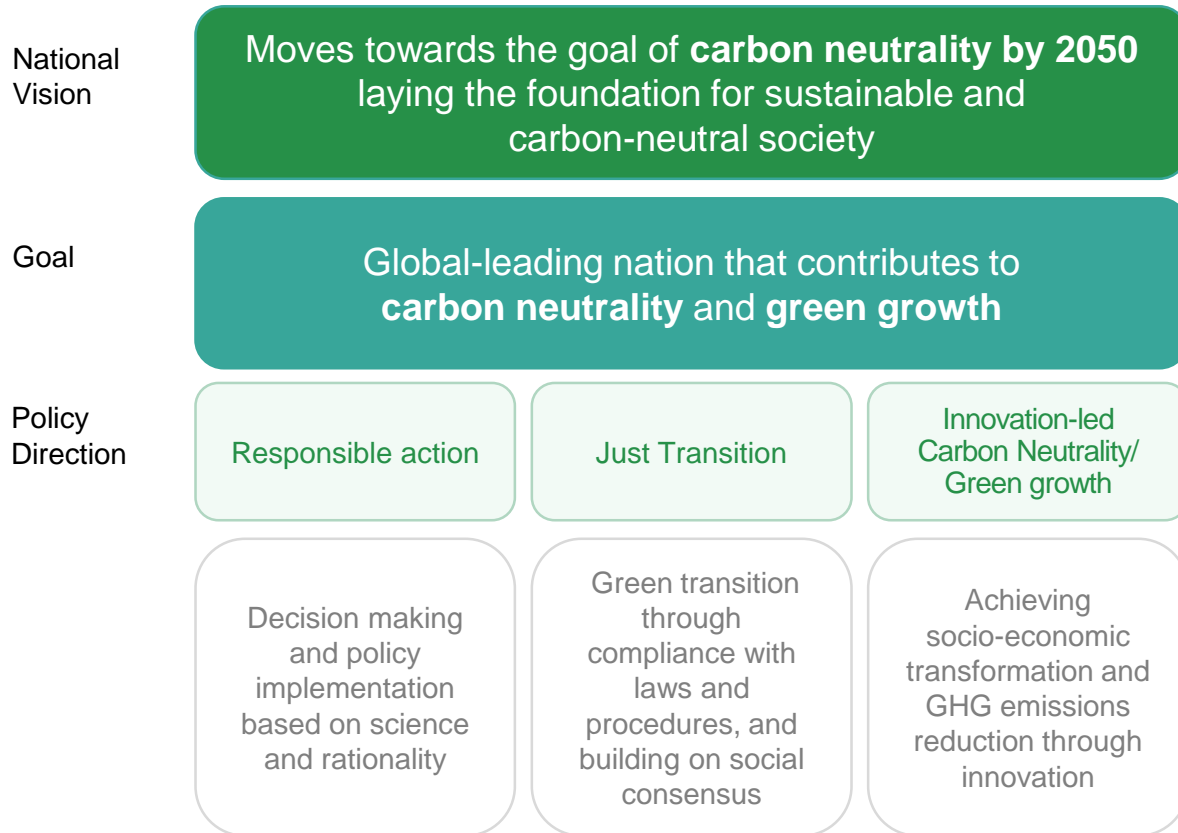
- **K-emission Trading Scheme** launched ('15)
- **2030 NDC Target & Roadmap** (37% emission reduction compared to BAU level by '30) established ('15-'16)
- **1st Framework Plan for Climate Change Response** established ('16)
- **2030 Roadmap** revised ('18)
- **2nd Framework Plan For Climate Change Response** established ('19)

Carbon Neutrality as a Major Agenda, laying Institutional Foundation

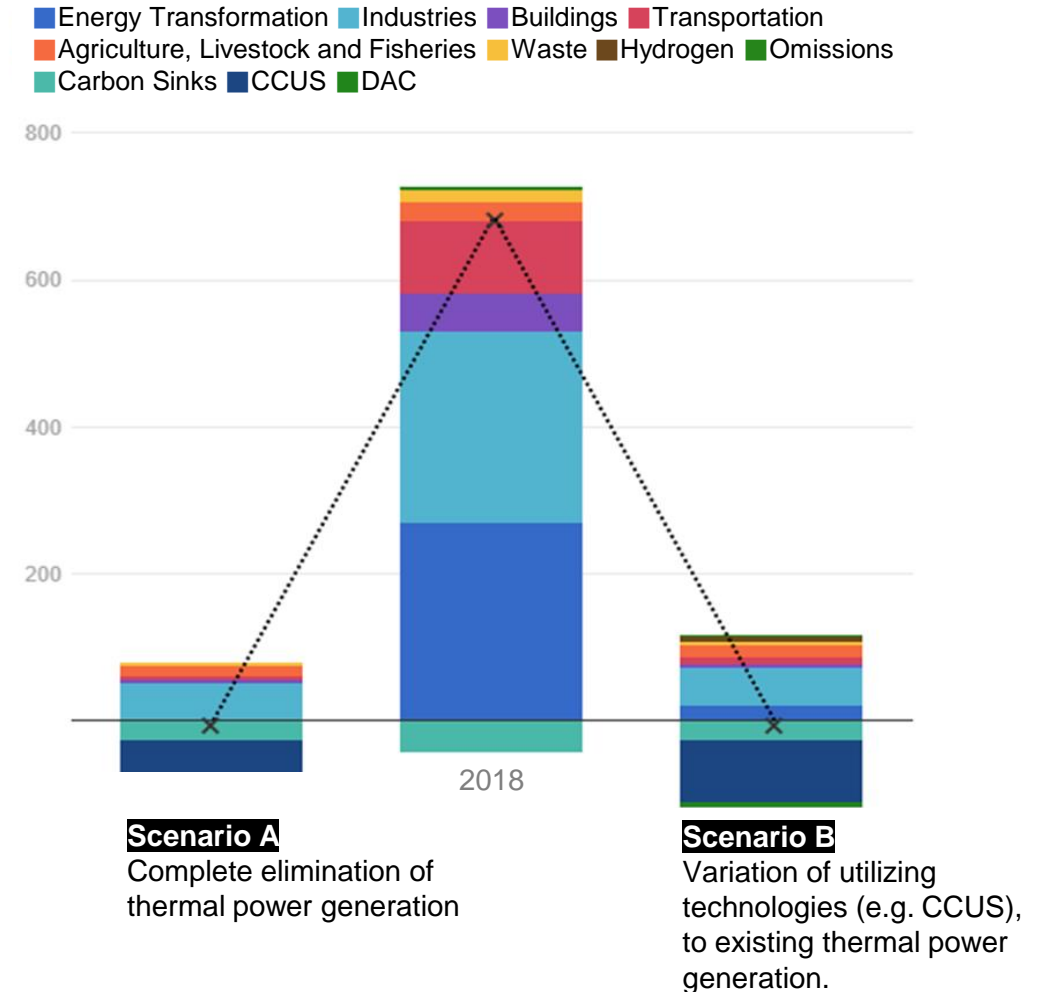
- **Korean New Deal (Digital and Green New Deal)** announced ('20)
- **2050 Carbon Neutrality Vision** declared ('20)
- **Carbon Neutrality Green Growth Framework Act** enacted ('22)
- **2050 Carbon Neutrality Scenario** developed and **2030 NDC Target** enhanced ('21)
(net zero by 2050, 40% emission reduction compared to level of '18)
- **Presidential Commission on Carbon Neutrality and Green Growth** established ('22)

02 Korea's Green Growth Policy - Direction and Challenges

• 2050 Carbon Neutrality Implementation Strategy



• 2050 Carbon Neutrality Scenarios



• Implementation Strategy and Actions to achieve 2050 Carbon Neutrality

01

GHG Emission-Responsible Action

- Action 1. Maximizing Use of **Carbon Free Energy Source**(eg. nuclear, renewable energy)
- Action 2. Transition toward a Low Carbon Industry and Circular Economy
- Action 3. Carbon Neutral Territorial Development

02

Private Investment for Innovative Green Growth

- Action 4. Promoting **Technology Innovation & Improving Regulation**
- Action 5. Developing Key Industry and New Markets
- Action 6. Carbon Neutral Financing Program Development

03

Cooperation and Empathy

- Action 7. Reduction of Energy Consumption and People's Action for Carbon Neutrality
- Action 8. **Region-led Carbon Neutrality**
- Action 9. Support **Transition of Industry and Job Market**

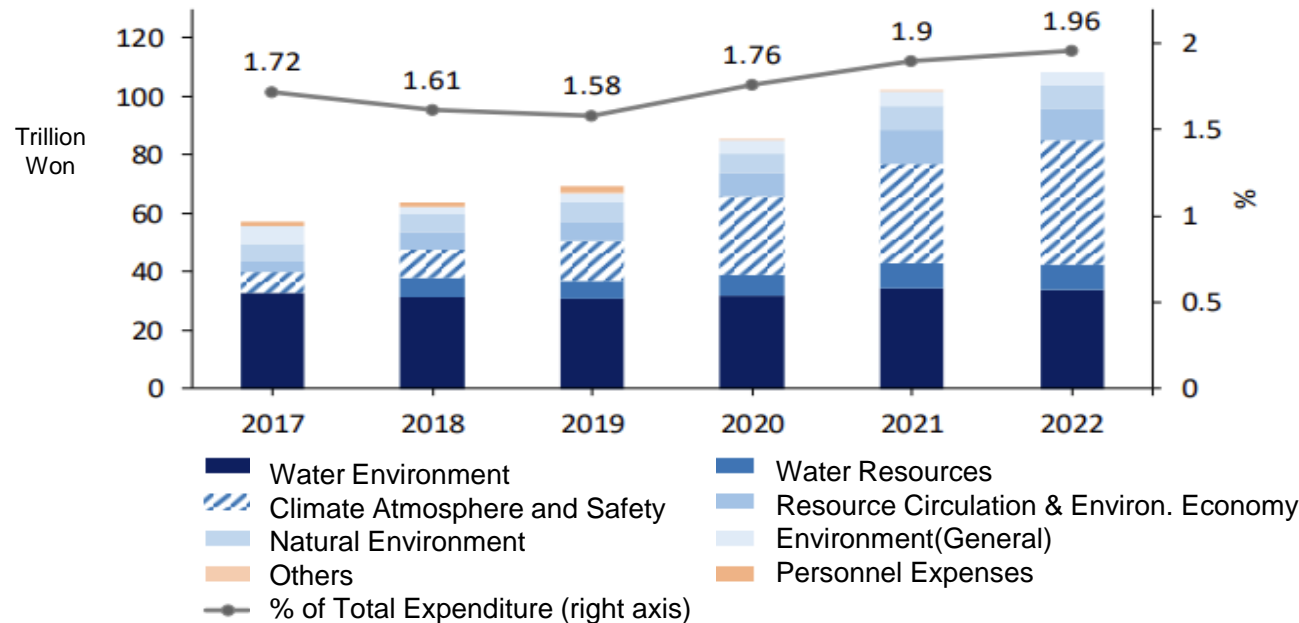
04

Climate Adoption and Global Society

- Action 10. Developing Foundation of Inclusive Climate Risk Adoption
- Action 11. Leading the **Carbon Neutrality in Global Society**
- Action 12. Developing M&E System for Carbon Neutrality

- Financial Plan** (National Fiscal Management Plan, 2022-2026)
 - The expenditure in the environmental sector is experiencing significant expansion, on the basis of 2050 Carbon Neutrality Declaration and the upward adjustment of the 2030 NDC target.

[Major expenditure trends in the environmental sector]



02 Korea's Green Growth Policy - Direction and Challenges

- **Financial Plan** (National Basic Plan for Carbon Neutrality and Green Growth, 2023)
 - An estimated total of **89.9 trillion won*** is expected to be required over the next five years (2023-2027)
 - *Sector-specific reduction measures (54.6 trillion won), Climate change adaptation strategies (19.4 trillion won), Green industry growth (6.5 trillion won)
 - **Annual average growth rate for 2023-2027 accounted for 11.5%**, exceeding the growth rate of total government budget over the past five years (annual average of 8.0%).

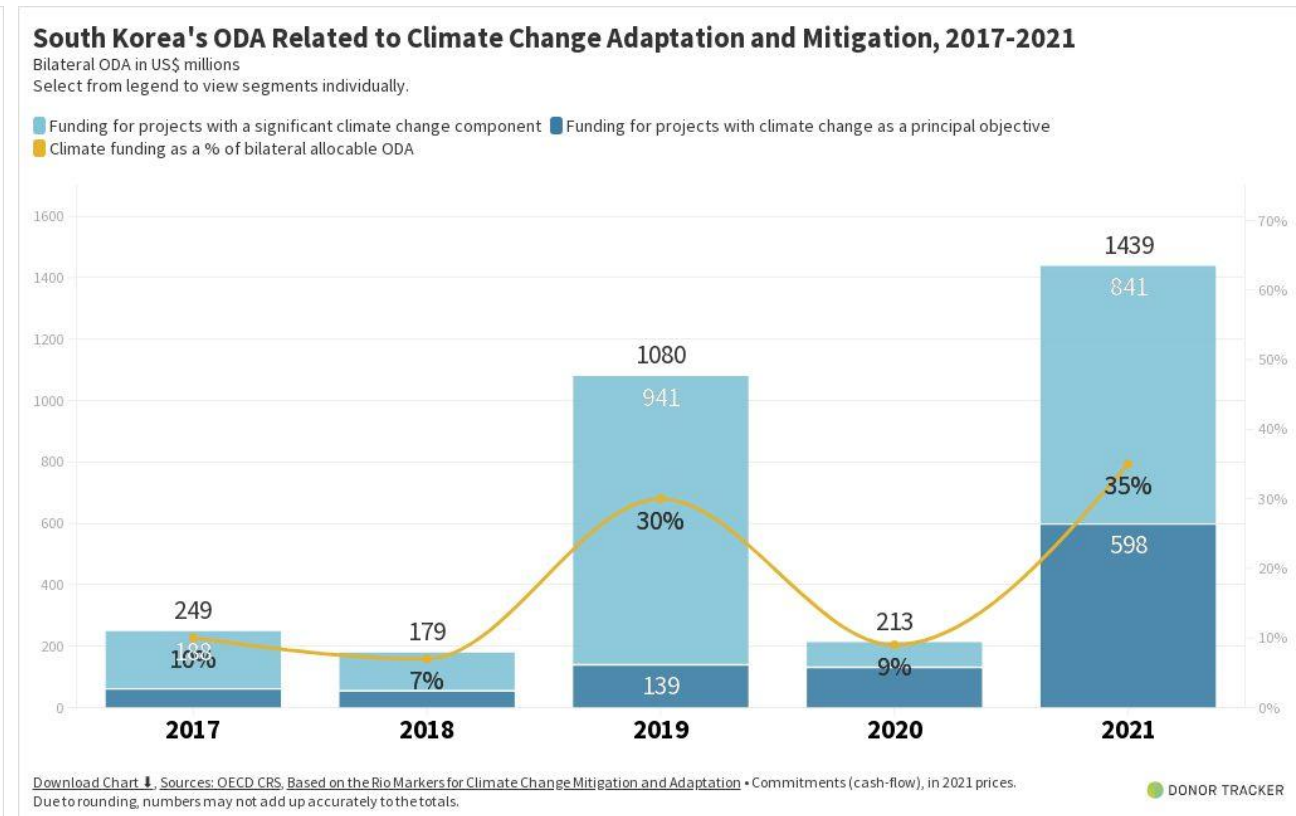
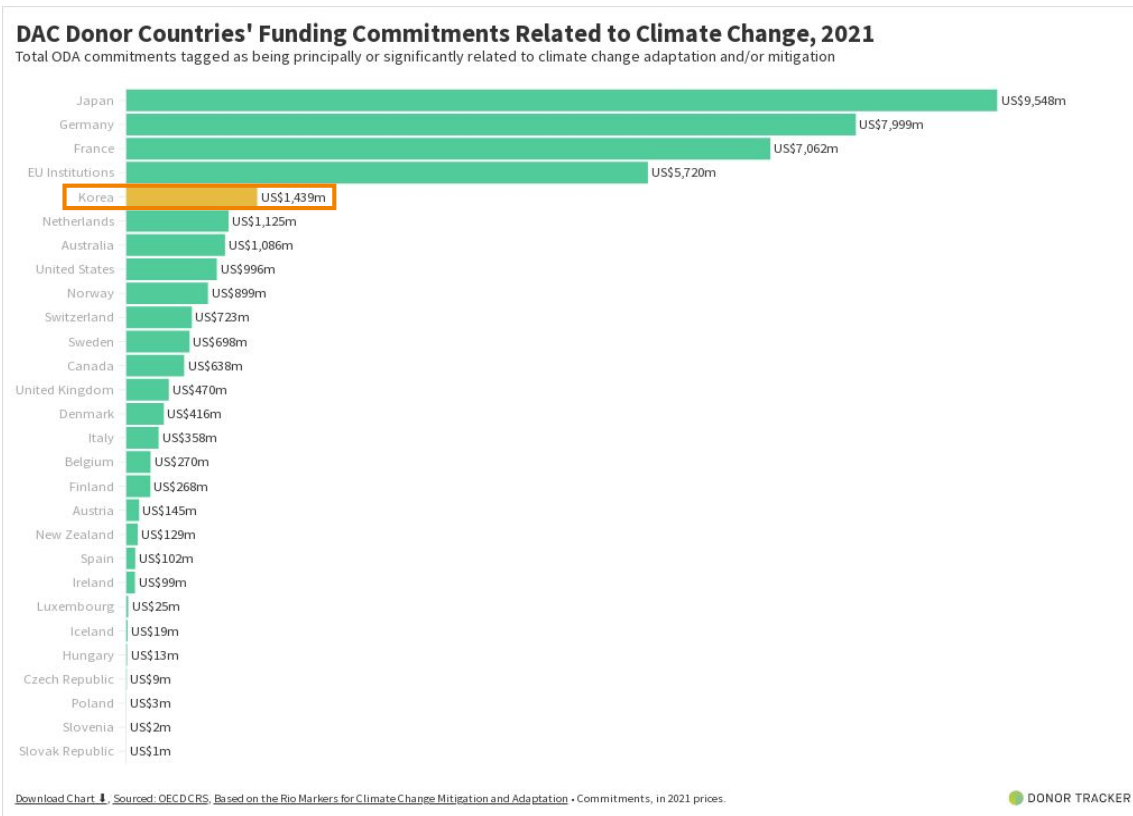
Unit: 100 Mil. won, %

Category	'23	'24 ~ '27	Total	Annual Average Growth Rate
Total	133,455	765,738	899,193	11.54
Sector-specific Long-term Reduction Measures	79,480	466,283	545,763	11.48
Climate Change Adaptation Measures	29,856	164,213	194,068	9.43
Green Industry Growth	10,459	54,453	64,912	7.34
Just Transition	2,366	19,837	22,203	37.57
Local Carbon Neutrality & Green Growth	4,602	30,319	34,922	25.36
HRD Development & Awareness Raising	5,999	26,881	32,881	2.11
International Cooperation	693	3,751	4,444	1.59

02 Korea's Green Growth Policy - Direction and Challenges

• International Cooperation

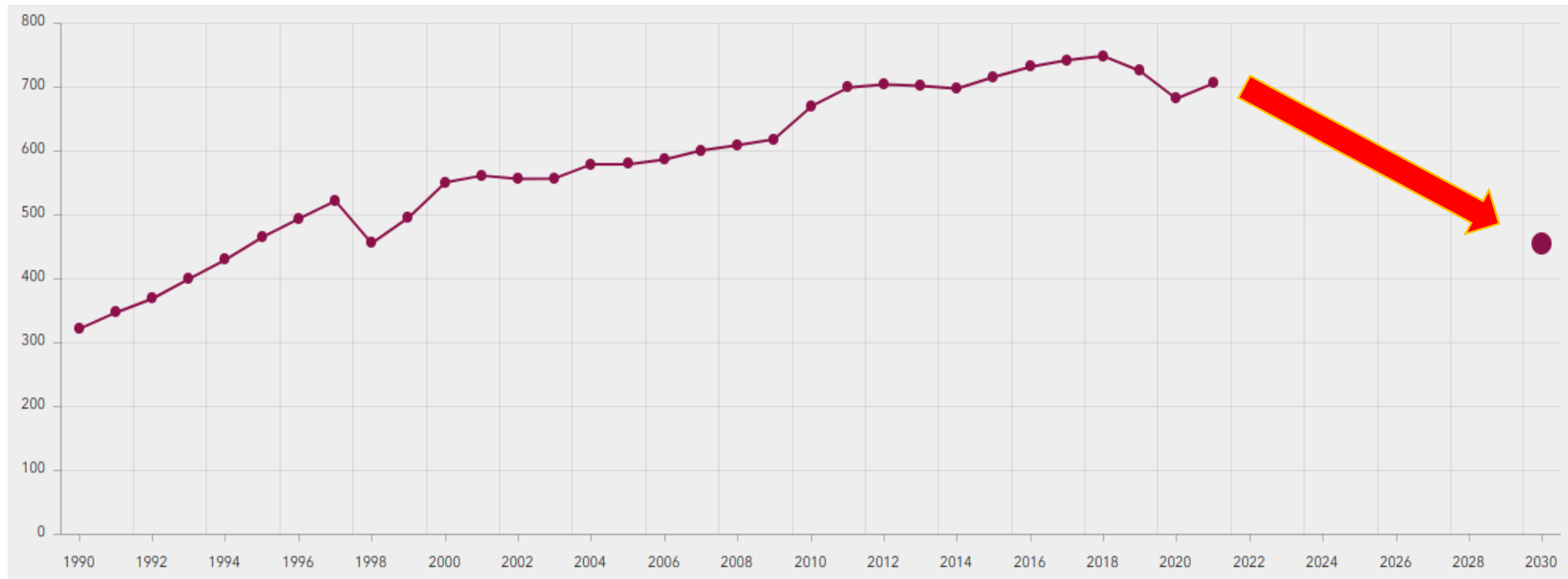
- South Korea is ranked as the 5th largest donor in the context of addressing climate change, allocating 35% of its bilateral ODA (equivalent to US\$ 1.4 billion) to projects on climate actions in 2021.



02 Korea's Green Growth Policy - *Direction and Challenges*

- **Gap between current GHG emission and 2030 NDC target**
 - Meanwhile, South Korea ranked the 13th largest GHG emitter as of 2021.
 - To achieve its 2030 Nationally Determined Contribution (NDC) goal, Korea aims to reduce its GHG emissions by 31.7% compared to 2021 levels, building on a targeted 40% reduction from 2018 levels.

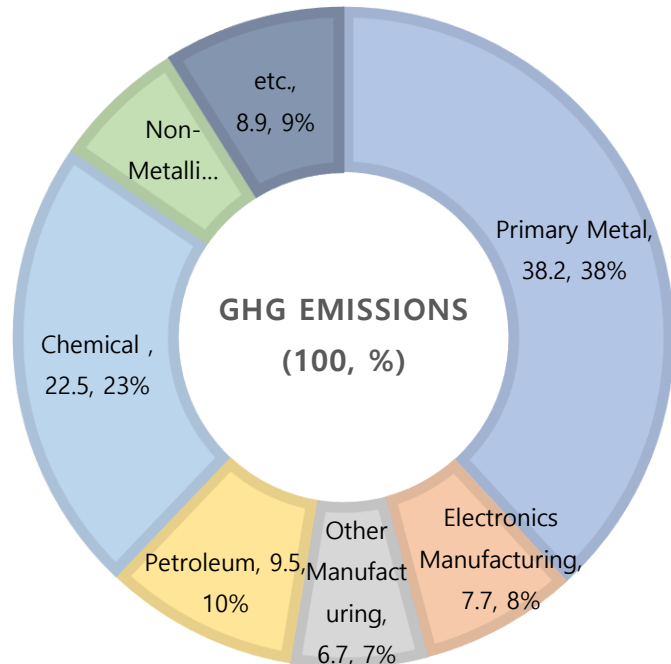
[Reported GHG Emissions vs NDC Targets]



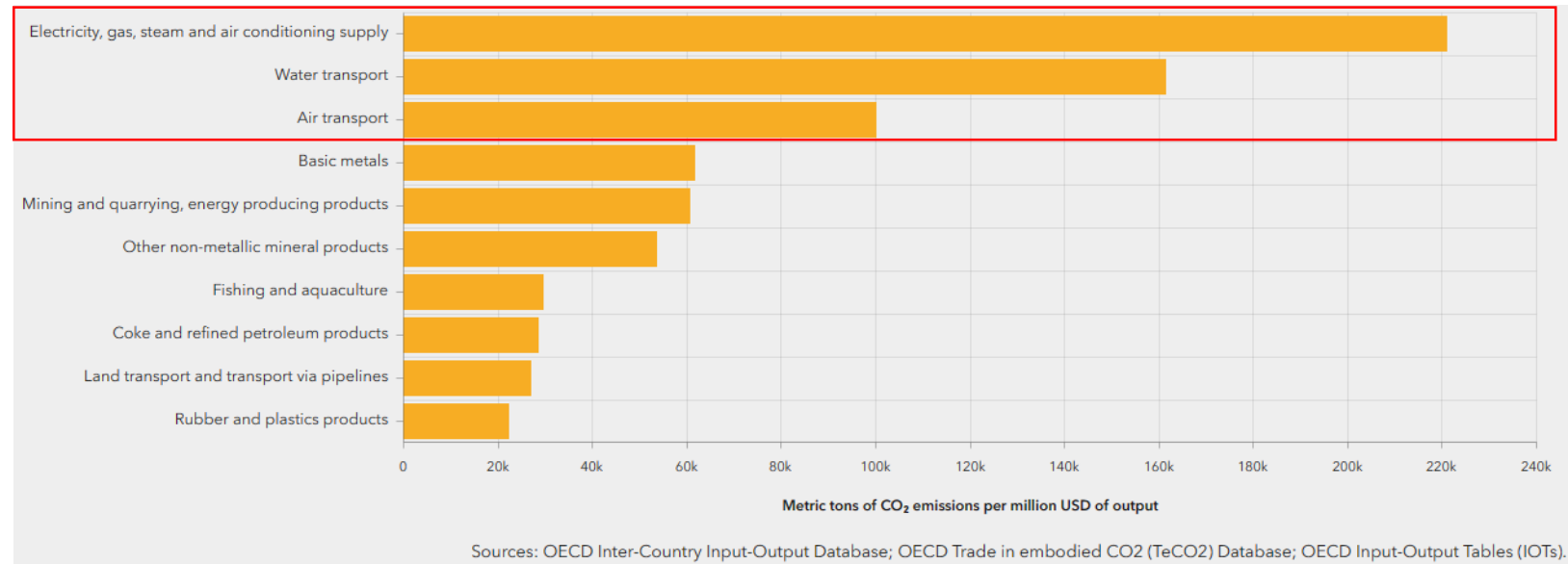
Challenges in Economic Perspectives

- South Korea's manufacturing-oriented economy has posed several challenges in its efforts towards decarbonization. In its regard, **fundamental shift in the energy structure within our economy is essential, and carbon neutrality is crucial** for sustaining Korea's national competitiveness.
- Global green transition might trigger both green and energy inflation. The low-carbon transition will have a significant impact on Korean economy, where fossil fuel consumption is high, especially in the manufacturing sector.
 - Green Transition Strategy and Implementation (KDI, 2023)

[Breakdown of GHG Emissions by Industry]



[CO₂ Emissions Per Unit of Economic Output by Industry]



02 Korea's Green Growth Policy - *Direction and Challenges*

- International climate actions, significantly influence Korea's policy on green growth. These actions serve as catalysts for Korea to align its policies and strategies with global efforts to mitigate climate change.



Inflation Reduction Act (2022)

Clean Energy Tax Credit



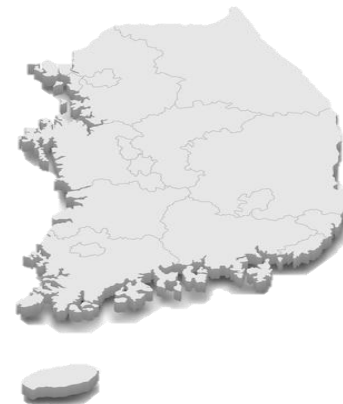
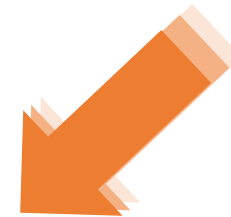
Fit-for-55 Initiatives

Cross Border Adjustment Mechanism



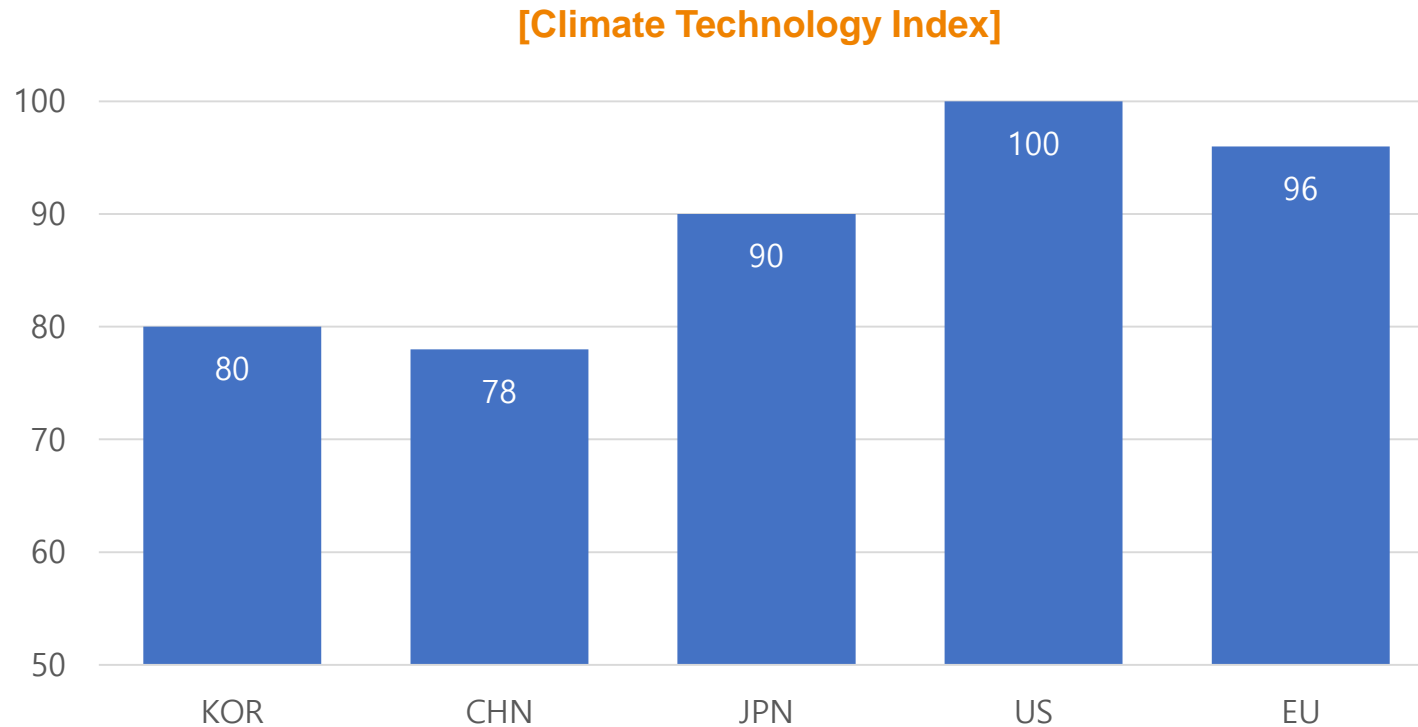
IMO Strategy on Reduction of GHG Emissions from Ships (2023)

IMO adopts new Net-Zero Plan for "Close to 2050"



- **Technological Limitation**

- The level of technology for responding to climate change in Korea is at 80%, and climate technology is three years behind relative to the frontier.



03

KDI's Research and Projects on Green Transitions



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- **Green Transition Strategy and Implementation (Yang, et al. 2023)**

- The report offers a thorough analysis of policy challenges and implementation strategies for Korea's green transition, including problem identification, policy evaluation, empirical analysis, and recommendations.

- Chapter 1: Introduction
- Chapter 2: Evaluation of Greenhouse Gas Reduction Plans and Future Directions
- Chapter 3: Challenges in the Power Industry for Low-Carbon Electrification
- Chapter 4: Improving the Operation of Emissions Trading Schemes for Low-Carbon Transition
- Chapter 5: Benefits for Latecomers and Early Commercialization of Carbon Capture and Storage (CCS) Technologies: A Review of the Need for Carbon Price Contracts
- Chapter 6: Analysis and Implications of the Relationship between Climate and Digital Technologies
- Chapter 7: Climate Change and Economic Vulnerability: The Impact of Heatwaves on Employment and Worker Health
- Chapter 8: Roles and Responses of Central and Local Governments for a Just Transition
- Chapter 9: Relationship between Greenhouse Gas Emissions and Industrial and Business Characteristics: Focus on the Manufacturing Sector
- Chapter 10: Climate Change Response and Job Loss: Impact of Emissions Trading Schemes on Corporate Financial Performance and Employment
- Chapter 11: Domestic Economic Implications of Global Low-Carbon Transition: Focus on Green Energy Inflation

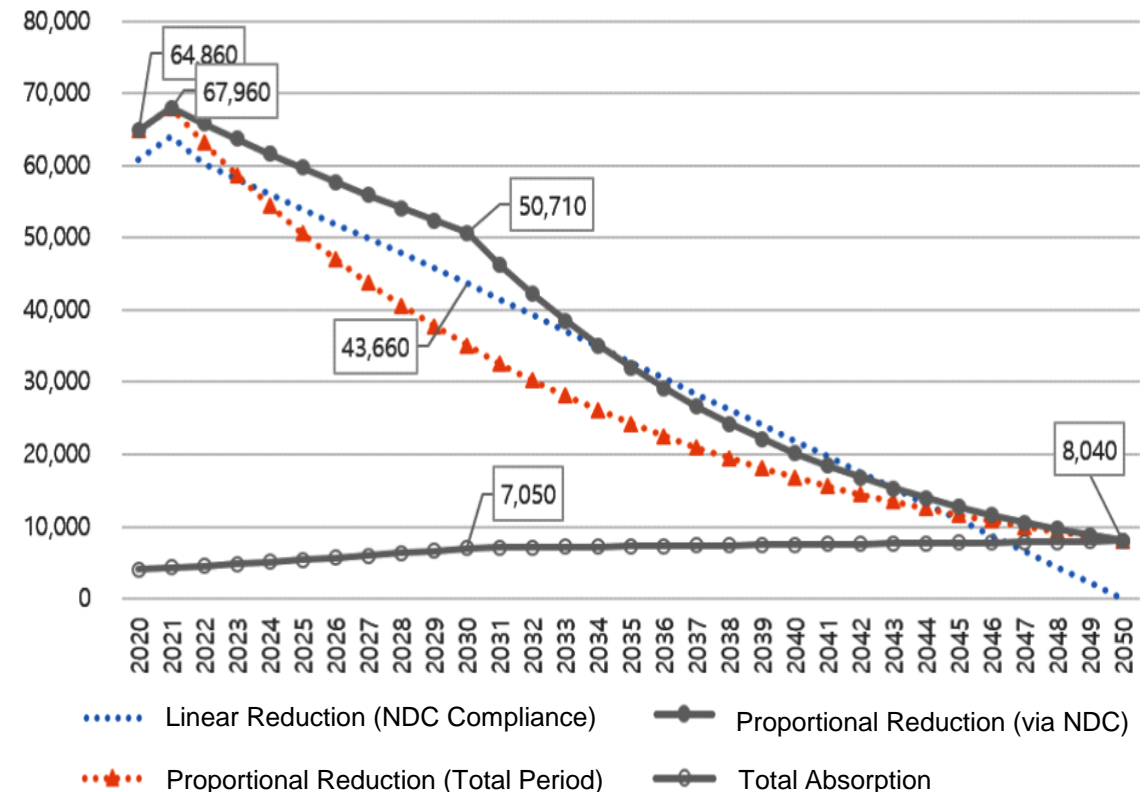


- Green Transition Strategy and Implementation (Yang, et al. 2023)**

Chapter 2. Evaluation of GHG reduction plans

- The study explores a reduction pathway to 2050 and assesses sectoral plans to meet the NDC.
- It proposes incrementally increasing reductions initially, maintaining consistency by 2030, and then reducing emissions steadily from 2043.
- In industry, buildings, and transportation, future electrification may be increasingly crucial due to various factors; this could require boosting electrification and adjusting generation capacity to meet sectoral reduction targets. Alternatively, reducing targets in these sectors while elevating them in transition sectors may also be necessary.

[Comparison of Linear Reduction and Proportional Reduction]

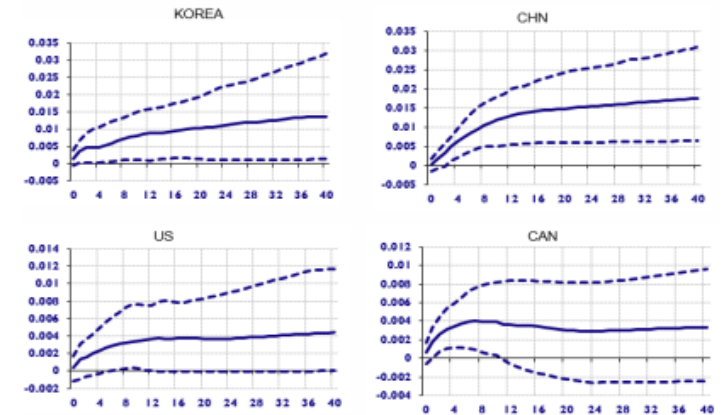


- Green Transition Strategy and Implementation (Yang, et al. 2023)**

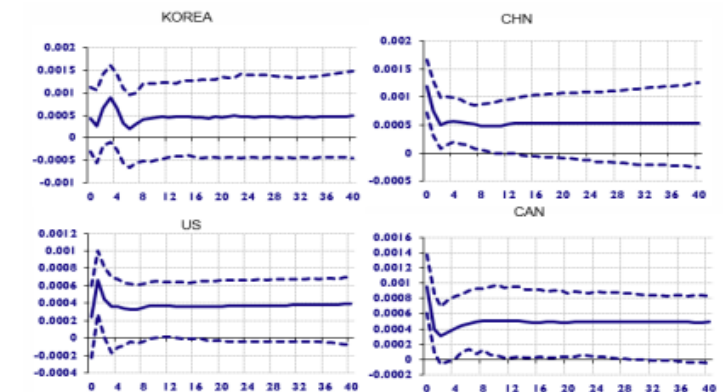
Chapter 11. Domestic Economic Implications of Global Low-Carbon Transition: Focus on Green Energy Inflation

- The study observes that the global green transition might trigger both green and energy inflation.
- Analyzing the effect of inflation factors on the Korean economy finds that such impacts vary based on whether inflation arises from demand and supply shocks.
- Accordingly, the Korean government should distinguish between demand-side and supply-side inflation factors in its responses.

[Domestic GDP Cumulative Response]



[Cumulative Inflation Response]

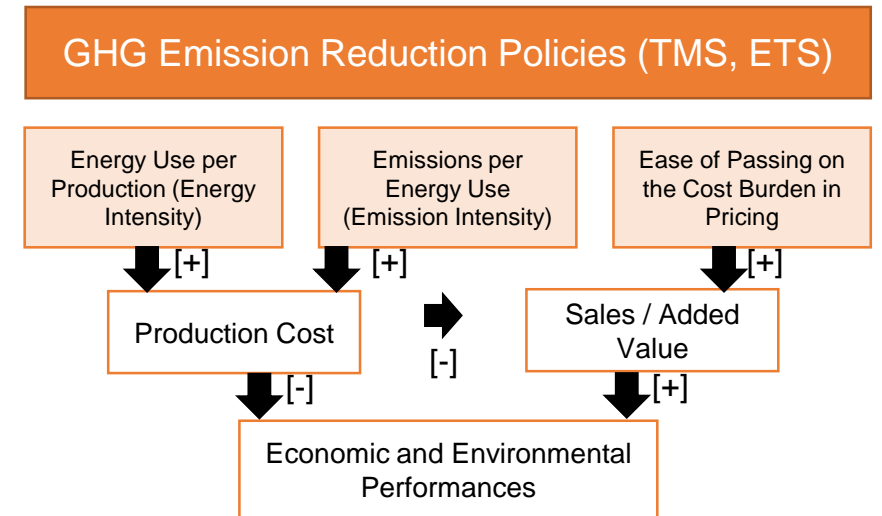


Note: The solid line shows the median cumulative impact response to 10% shocks in metal and oil prices using bootstrap, while the dashed lines denote the 90% bootstrap confidence interval.

Impacts of Climate Policies on Industrial Competitiveness in Korea (Kim, 2021)



- The study assesses the impact of two policies:
 - 1) Target Management System (TMS) for GHG and Energy; and
 - 2) the Emission Trading System (ETS), on industrial competitiveness in manufacturing sectors.
- It emphasizes the need to ensure manufacturing industry sustainability during decarbonization by appropriately allocating burdens to firms under TMS and ETS, while mitigating disproportionate burdens on firms outside the system relative to their emissions.



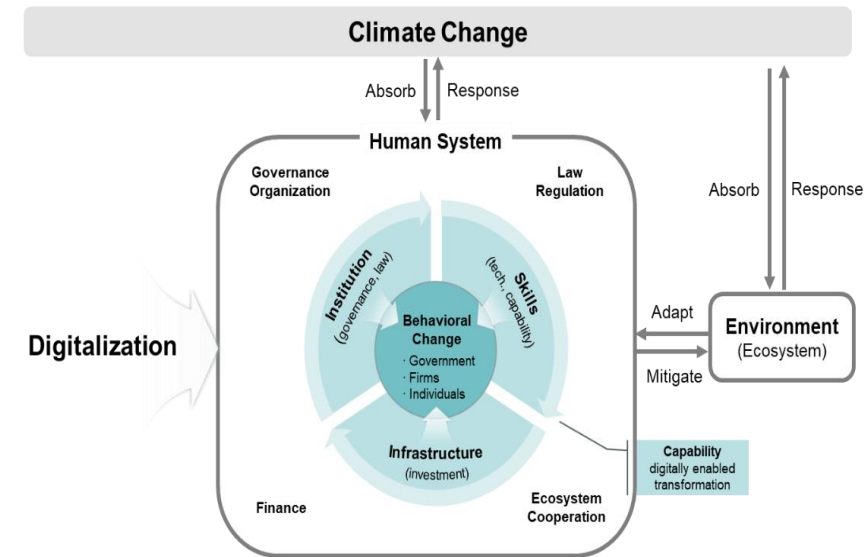
In manufacturing, abatement burdens may not align proportionally with emissions. Hence, a broader perspective considering production and supply chain impact pathways is necessary.

TMS targets and ETS allowances should be set using multiple indicators. Industries with high direct emissions, like fuel combustion, can reduce intensity through strategies such as switching environmentally friendly fuels.

For high indirect emission industries, adjusting energy intensity may be more effective than emission intensity.

• Towards Green Growth: Enhancing Climate Resilience through Digitalization (Kim & Pack, Forthcoming)

- This study highlights the following key findings and implications:
 - Digitalization influences climate resilience mainly through the changes in (i) managerial control, (ii) process efficiency, (iii) energy consumption, (iv) geographical barrier.
 - Evidence shows that the adoption of digital technologies alone does not guarantee overall improvements in climate resilience and green growth globally; behavioral changes of individuals, firms, governments resulting from such digitally enabled transitions may have both positive or adverse effects on climate resilience.
 - Digital policies and strategies should align with climate resilience strategies to ensure that the digitalization leads to desirable behavioral changes among various actors.
 - Specifically, enhancing climate resilience through digitalization depends on three key capabilities within the human system: **institutions, skills, and infrastructure**.
 - ✓ **Institutions** involves the strength and adaptability of governance structures for managing the environmental externalities of digitalization, information management and data governance.
 - ✓ **Skills** pertains to raising awareness and fostering responsibilities for digitalization, in conjunction with developing technical expertise.
 - ✓ **Infrastructure** requires investment in green infrastructure that connects digitalization and climate resilience.



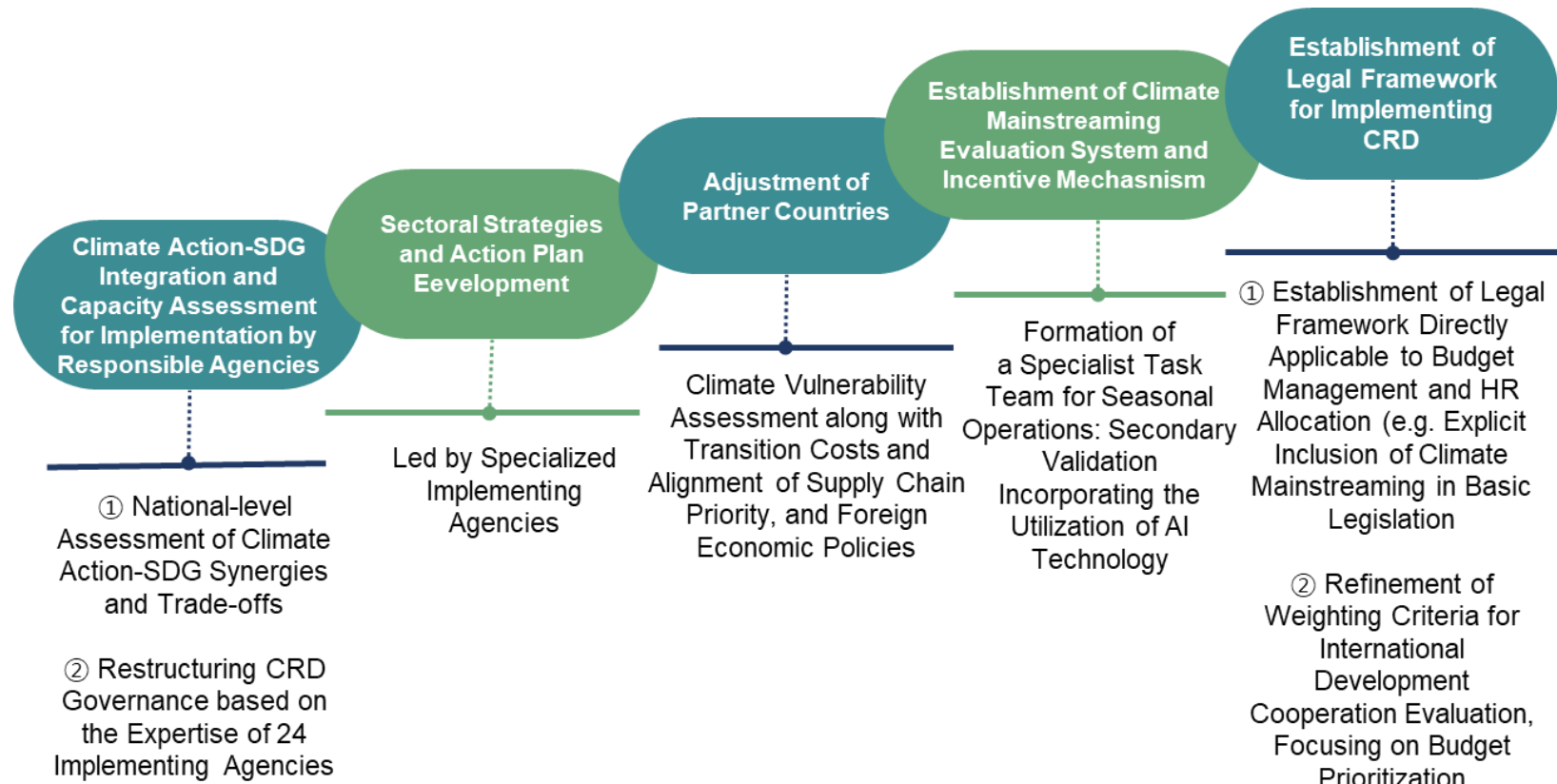
A comprehensive digitalization framework for enhancing climate resilience

• Mainstreaming Climate Change in ODA (Kim & Hwang, Forthcoming)

- The study emphasizes the importance of mainstreaming climate change considerations into Korean Official Development Assistance (ODA) to support Climate Resilient Development (CRD). It includes:

- i) showcasing international case studies of climate mainstreaming in ODA (eg. Advanced countries, International Organizations)
- ii) evaluating the extent of climate mainstreaming in Korea's ODA
- iii) proposing policy logic frameworks for climate mainstreaming in Korea's ODA, and
- iv) delivering policy implications for gradually integrating climate change considerations into Korea's ODA practices.

[Primary Actions for Climate Mainstreaming in ODA]



03 KDI's Research and Projects on Green Transitions

- International Cooperation Projects



- ### Knowledge Sharing Program (KSP)

KSP is a **Knowledge intensive Cooperation Program** sharing **policy experiences** and providing **policy recommendation** and partner **capacity building** opportunities (since 2004)



Jordan

Energy Efficiency Improvement in Buildings(2022-23)



Malaysia

Sarawak's Hydrogen Roadmap (2023-)



Lao PDR

Establishing Master Plan for Implementing Carbon Trading System(2022-23)



Mexico

Biogas from Food Waste (2019-20)
Sewage Management (2020-21)



Panama

[KSP-CAF] Public Management of the Forest Productive Sector(2022-23)



Rwanda

Facilitating the Use of ITMO through Electric Mobility(2022-23)



Mekong River Commission

Flood and Drought Risks Management (2020-2023)



Cambodia

SMEs and Large Factory Capacity on Wastes Management(2023-24)
Efficient Waste Management in Cambodia(2022-23)



Uruguay

Circular Economy and Digitalization (2022-23)
[KSP-IDB] Net-Zero Emission Strategy for the Energy Sector (2022-23)

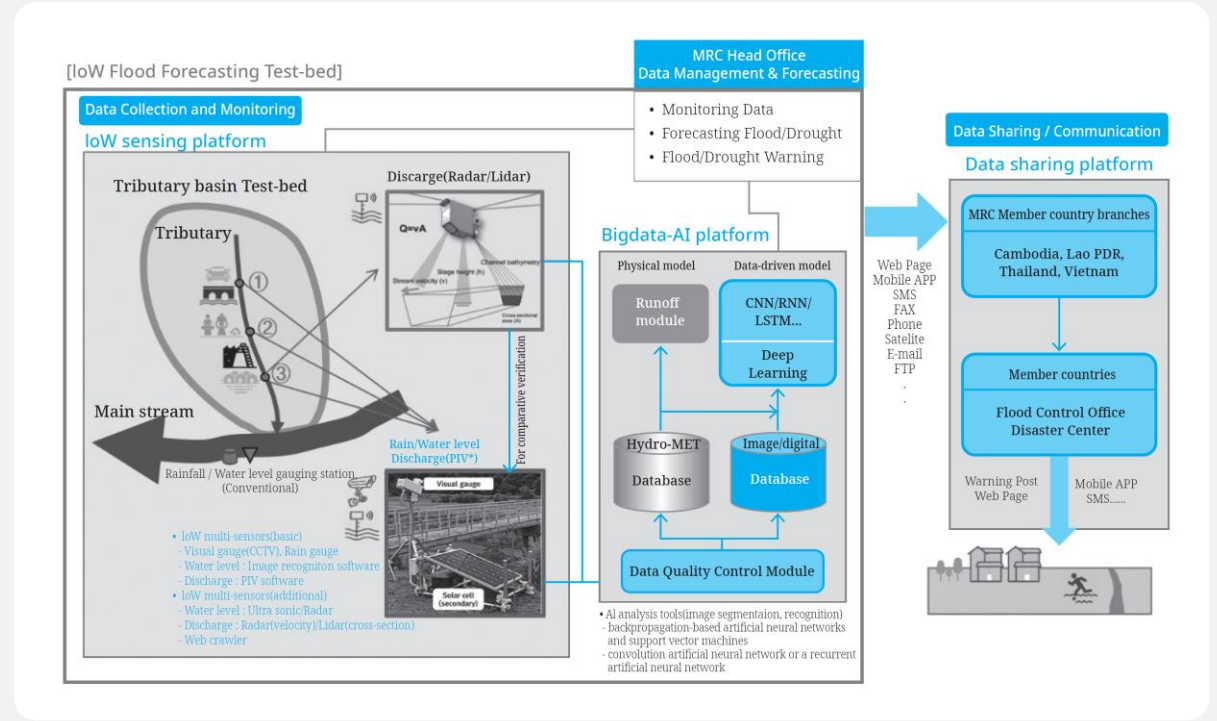
03 KDI's Research and Projects on Green Transitions

- International Cooperation Projects



KSP for Flood and Drought Management and Communication in the Mekong River Commission (MRC) Member States

- The Mekong River, vital to Southeast Asia, faces frequent flooding causing significant economic and human impacts, with an annual cost of \$60-70 million. The Mekong River Commission (MRC) endeavors to manage these floods but faces challenges in accuracy and stakeholder engagement.
- KSP focused on utilizing digital technologies, such as CCTV, IoT sensors, AI, and big data analytics, to improve flood and drought forecasting in the region. The project proposed a flood prediction technology and information sharing plan, aiming to enhance countermeasures for MRC member states by applying these advanced technologies for real-time data collection and more accurate predictions.



03 KDI's Research and Projects on Green Transitions

- International Cooperation Projects



Economic Innovation Partnership Program (EIPP)

A multi-year policy and technical cooperation program that aims to find solutions for sustainable development to introduce innovative technologies and enhance relevant infrastructure and systems

Key Sector

- Smart City
- Future Mobility
- Green Energy
- Innovative Industrial Complex

EIPP with Hungary



- Rapid increase in demand for EVs and related infrastructure
- Growing necessity for future mobility industry development

Contributing to achieving policy objectives

Strengthening Economic cooperation

- Enhancing G2G and private sector partnerships
- Opportunities for Korean companies to extend business in Hungary and build a network

- The 'Green Initiative,' a Europe-centered response to the climate change risk, brought major changes to key policies and industries since the Green Deal policy proposed by the European Commission in 2019.
- Hungary is rapidly introducing new industrial strategies (such as smart mobility, batteries, energy, etc.) in line with the Green Deal policy, and is actively cooperating with Korean private sectors in the field.
- From 2022, EIPP with Hungary will focus on Hungary's eco-friendly future mobility sector. In line with 'carbon-neutral Hungary', cooperation projects such as **developing of skilled workforce in EV-battery industry, smart EV charging facilities, and C-ITS environment** has been implemented.

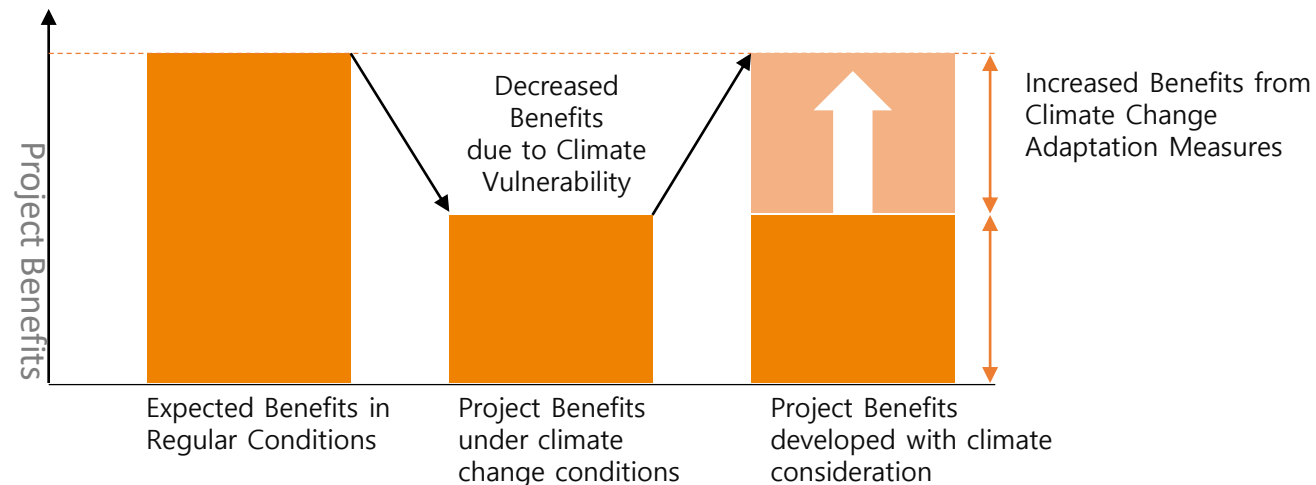
04

Conclusion



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- A **systematic policy research is needed** to rigorously formulate green transition strategies and policies.
 - Transitioning to a low-carbon economy for Korea requires a fundamental shift in economic structure, necessitating all activities to move away from fossil fuels. Also, encouraging participation of all economic entities and meticulous strategy and policy alignment would be vital.
- Mainstreaming climate **considerations throughout the project lifecycle**, including assessment, planning and implementation, and post-evaluation is critical.



- Integrated strategies for **climate change response and digital transformation** are imperative.
 - International community plays a crucial role in shaping policies and regulations to manage the impact of digitalization on climate resilience and prevent unintended adverse effects globally.
 - Advocating for comprehensive strategies to facilitate the integration of digitalization into climate resilience efforts, encompassing technology, infrastructure, institutional development, and capacity-building is crucial.
 - Addressing the escalating global inequalities and the digital divide is urgent to prevent exacerbation of climate vulnerability in developing nations. By working collectively and proactively on these fronts, the international community can better harness the potential of digitalization to build more sustainable and climate-resilient future.



Thank you