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

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Korea’s Green Growth Policy - Direction and Challenges

KDI’s Research and Projects on Green Transitions

Conclusion
Background
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 CO\textsubscript{2} emissions

Source | Global Carbon Budget (2023).
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]

IPCC AR1
IPCC’s inaugural comprehensive assessment of climate change encompassed scientific, technological, and socio-economic dimensions.

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

COP1
Kyoto Protocol
Introduces mechanisms such as Emissions Trading and the Clean Development Mechanism (CDM).

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

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.

**Source** | Report of the Secretary-General on the 2019 UN Climate Action Summit (2019).
Korea’s Green Growth Policy
- Direction and Challenges
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)

**Source** | The Presidential Commission on Carbon Neutrality and Green Growth.
02 Korea’s Green Growth Policy - Direction and Challenges

- **2050 Carbon Neutrality Implementation Strategy**
  
  **National Vision**
  - Moves towards the goal of **carbon neutrality by 2050**, laying the foundation for sustainable and carbon-neutral society

  **Goal**
  - Global-leading nation that contributes to **carbon neutrality** and **green growth**

  **Policy Direction**
  - Responsible action
  - Just Transition
  - Innovation-led Carbon Neutrality/Green growth

  - Decision making and policy implementation based on science and rationality
  - Green transition through compliance with laws and procedures, and building on social consensus
  - Achieving socio-economic transformation and GHG emissions reduction through innovation

- **2050 Carbon Neutrality Scenarios**
  
  - Scenario A: Complete elimination of thermal power generation
  - Scenario B: Variation of utilizing technologies (e.g. CCUS), to existing thermal power generation.

**Source**: The Presidential Commission on Carbon Neutrality and Green Growth.
Implementation Strategy and Actions to achieve 2050 Carbon Neutrality

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

**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

**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**

**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

*Source | The Presidential Commission on Carbon Neutrality and Green Growth.*
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.

**Financial Plan** (National Fiscal Management Plan, 2022-2026)

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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%).

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

Unit: 100 Mil. won, %

Source | National Basic Plan for Carbon Neutrality and Green Growth.
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.
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]
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)

**Challenges in Economic Perspectives**

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[Breakdown of GHG Emissions by Industry]

[CO₂ Emissions Per Unit of Economic Output by Industry]
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.

Source | NIGT, Climate Technology Assessment (2020)
KDI’s Research and Projects on Green Transitions
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

Source | 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.

Source | Green Transition Strategy and Implementation (Yang, et al. 2023)
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.

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

1. National-level Assessment of Climate Action-SDG Synergies and Trade-offs
2. Restructuring CRD Governance based on the Expertise of 24 Implementing Agencies
3. Led by Specialized Implementing Agencies
4. Climate Vulnerability Assessment along with Transition Costs and Alignment of Supply Chain Priority, and Foreign Economic Policies
5. Formation of a Specialist Task Team for Seasonal Operations: Secondary Validation Incorporating the Utilization of AI Technology
6. Establishment of Climate Mainstreaming Evaluation System and Incentive Mechanism
7. Establishment of Legal Framework for Implementing CRD
8. Establishment of Legal Framework Directly Applicable to Budget Management and HR Allocation (e.g. Explicit Inclusion of Climate Mainstreaming in Basic Legislation)
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)

- 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)

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

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

- Uruguay
  Circular Economy and Digitalization (2022-23)
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.
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.
Conclusion
• **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