Preparation of NDCs: Republic of Korea

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Sookmyung Women’s University
Convergence of Climate and Environmental Studies
Contents

- Paris Agreement and NDCs
- Experiences of NDCs Preparation in Korea
- Implementation of NDCs in Korea
- Tasks Ahead to Achieve 2050 Net Zero Goals
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Brings all nations into taking ambitious actions to reduce GHGs emission through submitting Intended Nationally Determined Contribution.

- 165 INDCs submitted, 197 parties to the convention as of March 2019
- Covering 99% of global GHGs emission

Aims to keep a global temperature rise this century well below 2 °C above pre-industrial levels and even further to 1.5 °C

- 74 Parties ratified, sharing 88.82% of Global GHGs emission. Entered into force on 4 November 2016
- 191 Members of UNFCCC are Parties as of February 2021
Types of Target

Types of Mitigation Contribution

- GHG target: 70.1%
- Non-GHG target only: 11.2%
- Actions only: 10.2%
- GHG target and non-GHG target: 8.6%
- Non-GHG target and actions: 8.0%
- No Document Submitted: 2.9%

Types of GHG Target

- Base year target: 40.6%
- Fixed level target: 31.0%
- Baseline scenario target: 18.8%
- Intensity target: 6.3%
- Trajectory target: 4.0%
- Intensity target and Trajectory target: 1.8%
- Not Applicable: 0.3%
- No Document Submitted: 0.0%

출처: https://cait.wri.org/indic/#/
Aggregate Effect of INDCs

- Full implementation of INDCs
  - Global GHGs Emission: 55GtCO2eq in 2025 and 56.2 GtCO2eq in 2030
  - 40% in 2025 and 44% in 2030 higher compared to emissions in 1990
  - 19% in 2025 and 36% in 2030 higher than 2°C least cost scenario emission

- Need to enhance mitigation action by 2030 beyond the action in INDCs to keep temperature increase below 2°C
  - Annual emission reduction rate of 3.3% starting in 2030

Source: UNFCCC, “Aggregate Effect of the intended nationally determined contributions: an update, 2 may 2016
## 2\textsuperscript{nd} NDCs or Updated NDCs

- Article 4, paragraph 12 of Paris Agreement
- 191 Parties Submitted 1\textsuperscript{st} NDCs, 64 parties Submitted Updated NDCs
- 8 Parties Submitted 2\textsuperscript{nd} NDCs
- 24 Parties Submitted Long Term Carbon Neutrality Goal Submitted

### NDCs Database

<table>
<thead>
<tr>
<th>Country</th>
<th>Type</th>
<th>Target Year</th>
<th>Source</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2021-2030</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>2030</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2025</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>2030</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>2025</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>2025</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indonesia</td>
<td>2030</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>2025</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>2025</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Korea</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>2030</td>
<td>Single-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2025</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>2030</td>
<td>Multi-year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Types of Target Year

- **Single-year**: 73 parties
- **Multi-year**: 1 party
- **Both**: 4 parties

### Target Types

- **Absolute**: 50 parties
- **BAU**: 22 parties
- **Intensity**: 0 parties
- **P&Ms**: 4 parties
- **P&M...**: 2 parties
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Analytic Framework for GHGs Target

Systematic Approach by Research Team, Review Committee and Public Hearing

Calculate Mitigation Potentials

Analytic Framework

GHGs Emission Projection

Mitigation Potential

Macro-economic Impacts

Projection in Principal Economic Variables (Oil price, GDP, Industrial Structure)

Review

Review Committee

Experts in Economics, Energy and Environment

Evaluate Modeling Process

Review of BAUs

Options to Propose National Targets

National Mitigation Targets

GIR, KEEI, KEI, KTI

Task Force
### GHGs Emission Projections (I)

#### Definition

- **BAU (Business As Usual)**: Emissions of GHGs in which trends of current policies and Efficiency Improvement continues.

#### Measures in BAU

- Mitigation Measures Already in Place or announced with Concrete Investment Plans such as Basic Plan for Rational Use of Energy, Waste Management Plan.

#### Principal Economic and Social Determinants in BAU Projections

- **Oil Price**: Projections of Imported Oil Prices with reference to Oil Price Projections of U.S. EIA.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil Prices</strong></td>
<td>98</td>
<td>84</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>48.6</td>
<td>48.9</td>
<td>49.3</td>
<td>48.6</td>
</tr>
<tr>
<td><strong>Economic Growth Rate (%)</strong></td>
<td>4.2</td>
<td>4.75</td>
<td>3.66</td>
<td>2.24</td>
</tr>
</tbody>
</table>

* Real Price in 2005
GHGs Emission Projections (II)

Key Drivers → Energy Demand Projection → Emission Project.

Key Drivers by Industry or Sector:
- Population, Households
- GDP
- Oil or Fuel Price
- Industrial Structure
- Production capacity or Investment Plan
- Market penetration Rate
- Policy and Measure
- Reference to cases

Activity: Efforts, Implementation, Production, Use

Energy Demand Projection:
- Activity: Efforts, Implementation, Production, Use
- Efficiency: Variable
- Energy: Total Energy

Energy use/KWh

Total Energy

Share of fuel types

GHGs Emission Projections (II)
GHGs Emission Projection

- Continuing Decrease in Annual Emission Growth Rate
- Decrease in CO₂ Intensity (ton CO₂/Million Korean Won)

**Total Emission (Mton CO₂)**
- 1990: 281 (0.76)
- 2005: 594 (0.73)
- 2020: 776 (0.54)
- 2030: 851

**CO₂ Intensity (ton CO₂/Million Won)**
- 1990: 99%
- 2005: 37%
- 2020: 10%
- 2030: 0.54
GHGs Inventories in Korea

Source: 2dn Biennial Update Report, Republic of Korea, p.21
Multi Scenarios of Mitigation Targets

Projection

Unit: MMT CO2-e

% to BAU

- 1: Δ21%
- 2: Δ27%
- 3: Δ30%

Year
- 1990: 298 MMT CO2-e
- 2005: 594 MMT CO2-e
- 2020: 813 MMT CO2-e

- 1: 642 MMT CO2-e
- 2: 590 MMT CO2-e
- 3: 569 MMT CO2-e

Multi Scenarios of Mitigation Targets
GHGs Mitigation Potentials : MAC Curve
Mid-Term Mitigation Goals and Major Measures

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Targets</th>
<th>Criteria in Policy</th>
<th>Exemplary Mitigation options</th>
</tr>
</thead>
</table>
| 1        | △21% 171 M ton CO₂ | Cost Effective Policy and Technology Option | • Promotion of Green Homes, Green Buildings  
• Rapid Penetration of Efficient Electric Equipments and Lightings (LED)  
• Shifts to Low Carbon – High Efficient Transportation System  
• Innovation in Manufacturing Processes into Green Process  
• Promotions of Renewables and Nuclear Power  
• Introduction of Smart-Grid |
| 2        | △27% 2.23MMT CO₂-e | Mitigation Cost Below $50/TonCO₂ | • Destruction of F-Gases  
• Promotion of Hybrid Cars  
• Increase in use of bio fuels  
• Application of CCS in Power Plants |
| 3        | △30% 2.44MMT CO₂-e | Upper Bound of Reduction Range by EU | • Introduction of Electric and Fuel Cell Vehicles  
• State of the Art Efficient Technology and Equipments in Households |

* Sinks are not included.

Impacts on GDP and Consumption

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>-0.29%</td>
<td>-0.37%</td>
<td>-0.49%</td>
</tr>
<tr>
<td>Consumption/Household</td>
<td>130,000 Won</td>
<td>166,000 Won</td>
<td>217,000 Won</td>
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</table>
Public Hearings

Enhanced Inter-Ministrial Consultations on Mitigation Goal

More than 80 Public Hearings with the Public, Industries, and Civil Societies

Before Announcement of Multiple Scenarios

Inter-Ministrial Meetings
- Vice-Ministers’ Meetings
- Briefings to the Ministers and the Prime Minister
- Joint Consultation with The Ruling Party

Industrial Sector: 30 times
- Consultation with the Industrial Experts on Emission Projection and Mitigation Technology such as Iron and Steel, Petrochemical Industry

After Announcement of Multiple Scenarios

Inter-Ministrial Meetings
- Vice-Ministers’ Meetings
- Agenda in Crisis Management Meeting
- High Level Joint Consultation with The Ruling Party

Public Hearings: 50 times
- Public Hearings by Presidential Committee for Green Growth
- Consultation Meetings with Industrial Representatives
- Open Forum hosted by National Assembly, Civil Societies
Figure S.2 Global weighted average total installed costs and project percentile ranges for CSP, solar PV, onshore and offshore wind, 2010–2018

Figure S.3 The LCOE for projects and global weighted average values for CSP, solar PV, onshore and offshore wind, 2010–2022

Notes: Each circle represents an individual project or an auction result where there was a single clearing price at auction. The centre of the circle is the value for the cost of each project on the Y axis. The thick lines are the global weighted-average LCOE, or auction values, by year. For the LCOE data, the real WACC is 7.5% for OECD countries and China and 10% for the rest of the world. The band represents the fossil fuel-fired power generation cost range.

Source: Renewable power generation cost 2018, IRENA
GHGs Reduction Revision and Pathways by 2030

- BAU in 2030
- Roadmap (2016)
- Revised

Emissions (~2015)
- Domestic Reduction
- ITMO

LULUCF and ITMO

- Emissions after Reduction
- Emissions (~2015)
- BAU Projection
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Institutionalize GHGs Management

GIR : Background and Status

Establish an Independent and Permanent research center that can strengthen the foundation and improve the overall framework to achieve national reduction target successfully (June 15th, 2010)

Background

- Aftermath of setting up national reduction target
- Framework Act on Low Carbon Green Growth

Affiliation and Legal Status

- Affiliate of: Ministry of Environment
- Now under Prime Minister Office
- Legal Status: Comprehensive entity to analyze and evaluate GHG emissions

While independent from a variety of stakeholders, GIR collects GHG related information, sets reduction targets and evaluates implementation.

GHG Inventory & Research Center of Korea

**Vision**
To Act as a Global Think Tank for GHG Reduction, in Support of Low Carbon Green Growth

**Goals**

1. **Information Hub**
   - Comprehensive and effective management of GHG inventory data

2. **Accelerating Green Growth**
   - Accelerating Green Growth through GHG reduction activities

3. **Global Networking and Outreach**
   - Enhancement of a cooperative network for GHG reduction

**5 Priority Areas**

1. Establish a nationally Integrated GHG information management system
2. Support GHG inventory and energy management by object
3. Support setting national and sectoral GHG emission reduction targets
4. Research and analyze GHG reduction within nation and beyond
5. Enhance global cooperation for green growth
Implementation of Mitigation Policies

**Target Management Scheme (2012~)**
- Large GHG emitting & Energy consuming firms are imposed GHG reduction & energy conservation targets since 2012
- 560 controlled entities are subject to reduction as of 2014 (excluding firms subject to ETS)

**Emission Trading Scheme (2015~)**
- Market-base policy to achieve GHG reduction targets through trading emission permits allocated.
- 525 companies in Emission trading Scheme in the Phase 1 period (‘15~’17)

### Industry
- Power: 426 entities
- Building
- Transport: 66
- Agriculture
- Livestock: 35
- Waste: 33

### Facility A
- Allowances > Emissions

### Facility B
- Allowances < Emissions
Coverage of ETS in National GHGs Inventory

Mton CO$_2$eq.
Summary of 2nd ETS Phase (‘18)

Trading market performance

<table>
<thead>
<tr>
<th>Year</th>
<th>Total trading volume</th>
<th>Average trading price</th>
<th>Total transaction value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>5.7 Mt</td>
<td>KRW 11,013</td>
<td>KRW 62.4 billion</td>
</tr>
<tr>
<td>2016</td>
<td>12.0 Mt</td>
<td>KRW 17,256</td>
<td>KRW 206.5 billion</td>
</tr>
<tr>
<td>2017</td>
<td>26.3 Mt</td>
<td>KRW 20,951</td>
<td>KRW 550.3 billion</td>
</tr>
<tr>
<td>2018</td>
<td>47.5 Mt</td>
<td>KRW 22,118</td>
<td>KRW 1,049.7 billion</td>
</tr>
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NDC of Korea by 2030

Tasks Ahead for 2050 Net Zero

Pathways to Net-Zero Carbon Emissions by 2050

- Current target: -24.4%
- Target: -35%
- Target: -45%
- Constant rate at -7.7%/yr

Greenhouse gas emissions in MtCO₂e

2017 2030 2050
Follow ups

National Emission Scenarios For 2050 Net Zero

- Scenarios to Net Zeros by 2050 Development
- Development of Strategy by Sector
- Legal Foundation
- National Planning

K-ETS Caps in 3rd Planning Period (2021~2025)

- With changes of National Allocation Plan, Adjustment Possible
  - With National Emission Scenarios and its follows ups completed by 2023, Changes in Caps in 2nd part P.P possible
- But, expect very strong oppositions from regulated entities
  - Lowered Cap in the 4th Planning Period (2026~2030)
  - More incentives and financial supports to entities Covered
THANK YOU for Your Attention!
(sjyoo@sm.ac.kr)