2023

AIM Workshop

Korea's activities for Carbon Neutrality in 2050

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1. Carbon Neutrality & Green Growth Commission

1 History

1. Green Growth Commission

- Function: Establishment of basic direction of low-carbon green growth policy, green growth national strategy, basic plan for climate change response, basic plan for energy, and basic plan for sustainable development

2. National Climate Environment Conference for the Resolution of Fine Dust

- Collecting public opinions and proposing policies to solve fine dust problems

3. Carbon Neutrality Commission

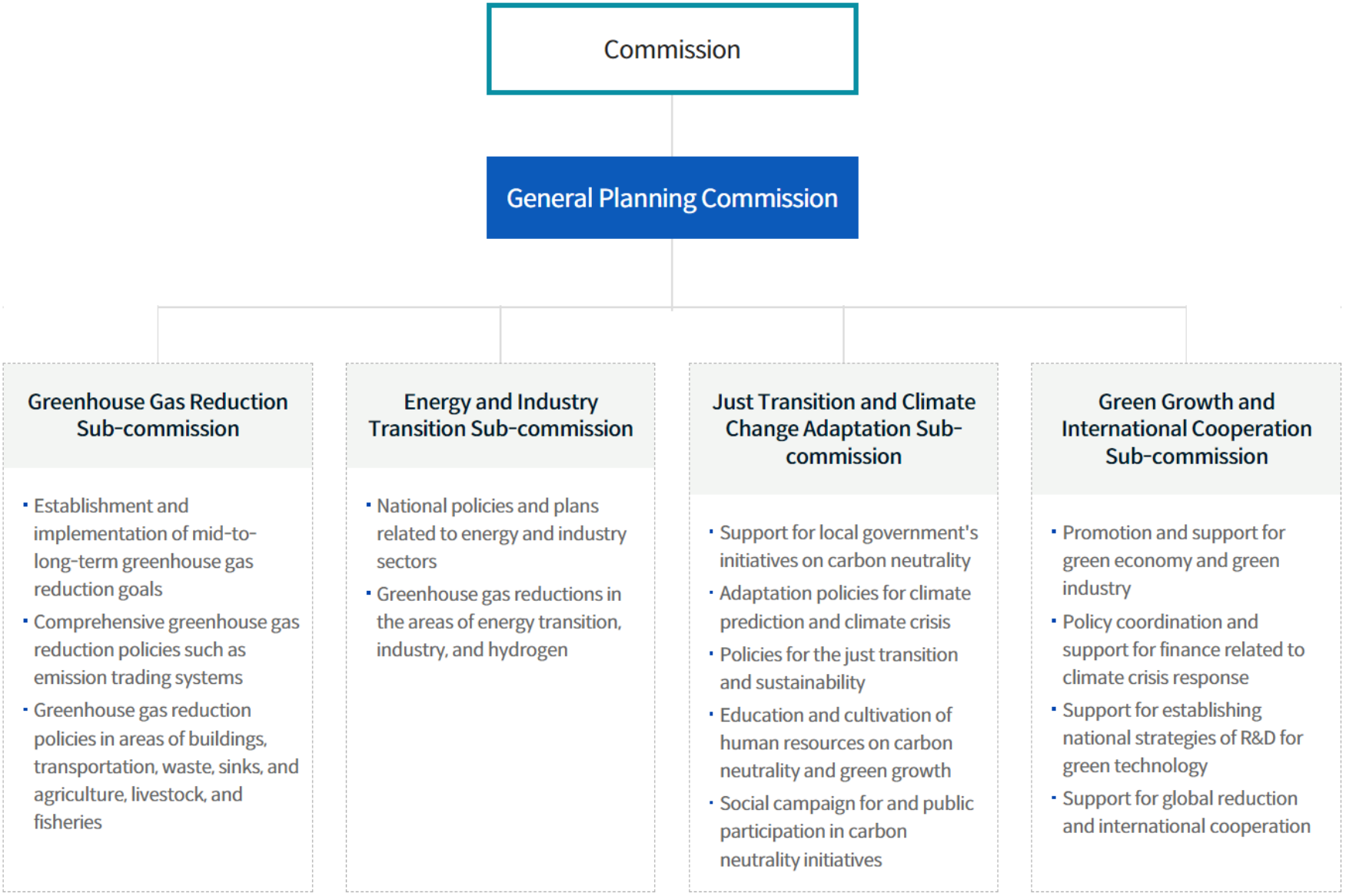
- Substantially responsible for the implementation of carbon neutrality in all sectors of our society, such as economy, industry, energy, environment, and culture (Construction and expansion of functions of the Green Growth commission + National Climate Environment Council)

4. Presidential Commission on carbon neutrality and green growth

- Re-establishment of the legal status of the Carbon Neutrality Commission based on the Basic Law on Carbon Neutrality and Green Growth.

1. Carbon Neutrality & Green Growth Commission

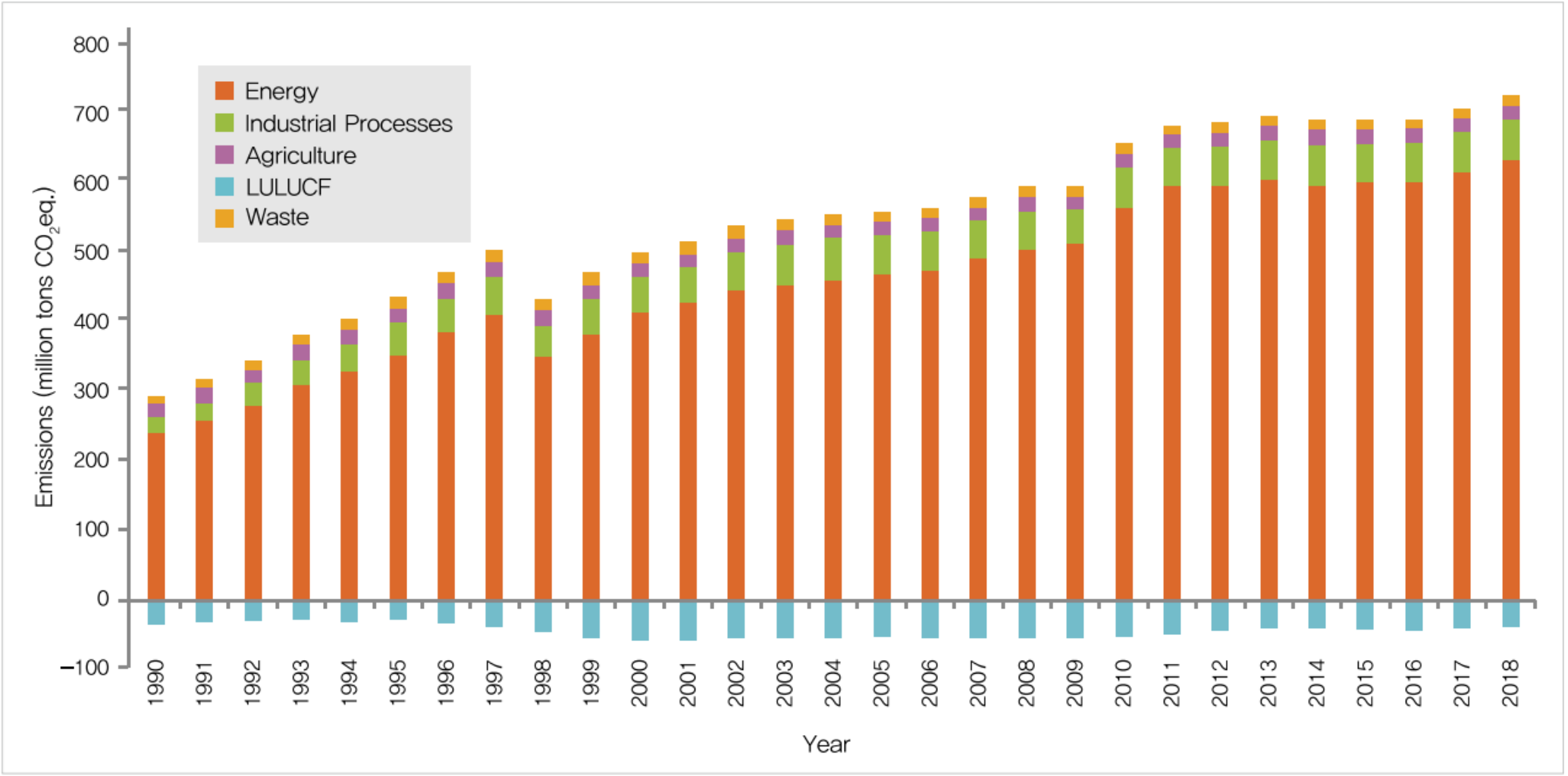
1 Organization



2. Carbon Neutrality

1 Trends in National Greenhouse Gas Emissions and Removals(1990–2018)

Energy sector accounts for around 86.9% of nation total emissions in 2018



2. Carbon Neutrality

② Amended NDC (2023.4.10)

- **Establishment of the 2030 NDCs (Nationally Determined Contribution) (June 2015)**
  Established a goal to reduce by 37% from the Business As Usual(BAU) level (851 million tons), by 2030

- **Amendment of the "Basic Roadmap to Accomplish the 2030 NDC(Nationally Determined Contribution)" (July 2018)**
  Increased domestic reduction (25.7%p → 32.5%p) in 37% from the BAU level

- **Amendment of the 2030 NDC (September 2020) and submission to the UNFCCC (December 2020)**
  Reduction by 37% from the BAU level by 2030 → (2030) Reduction by 24.4% from the 2017 levels (by 26.3% from 2018 levels)

- **Announcement of the 2030 NDC enhancement plan to the international community ('21.4 ~)**

- **Announcement of the NDC enhancement plan as a follow-up measure of the 2050 carbon neutrality declaration (October 2020)**

- **Operation of the Technical Working Group in preparation for the NDC enhancement plan and revision by the relevant government departments (~ August 2021)**
  Utilized the Technical Working Group* that was established for scenario preparation and discussed with relevant government departments to set goals in order to align NDC with the net-zero Scenarios

- **The minimum NDC standard (at least 35% from 2018 levels) is stipulated in the Framework Act on Carbon Neutrality and Green Growth (FACNGG) (August 2021)**

- **Establishment of the NDC enhancement plan, considering the purpose of the Framework Act on Carbon Neutrality and Green Growth, international trends, etc. (September through October 2021)**
  Reducing GHG emissions by 40% (291 million tons) from the 2018 levels (727.6 million tons)

- **Establishment of 1st national carbon neutral basic plan (Amendment of 2030 NDC, April 2023)**
  Reducing GHG emissions by 40% (291 million tons), Adjustment sub-sector targets considering possibility of implementation by measures

2. Carbon Neutrality

② Amended NDC (2023.3.23)

Sector	Baseline(MtCO2e)	Target(MtCO2e)		Reduction from 2018 to meet 2030 Target	
	2018	NDC ('21.10)	Amend NDC ('23.4)	NDC ('21.10)	Amend NDC ('23.4)
Total	**727.6**	**436.6**	**436.6**	**40.0%**	**40.0%**
Energy	269.6	149.9	145.9	44.4%	45.9%
Industry	260.5	222.6	230.7	14.5%	11.4%
Building	52.1	35.0	35.0	32.8%	32.8%
Transport	98.1	61.0	61.0	37.8%	37.8%
Agriculture and fisheries	24.7	18.0	18.0	27.1%	27.1%
Waste	17.1	9.1	9.1	46.8%	46.8%
Hydrogen		7.6	8.4		
Other	5.6	3.9	3.9		
Sink	-41.3	-26.7	-26.7		
CCUS		-10.3	-11.2		
Overseas		-33.5	-37.5		

② Amended NDC (2023.3.23)

Reduction Measures

Energy Transition

10th National Power Development Plan

	2022	2036
Nuclear	24.7GW	31.7GW (+7)
Coal	38.1GW	27.1GW (-11)
LNG	41.3GW	64.6GW (+23.3)
Renewable	29.2GW	108.3GW (+79.1)

Industry

- Reduce GHG through enhanced energy utilization efficiency by improving the efficiency of common devices by distributing Factory Energy Management System (FEMS) and that of processing facilities
- Support development of eco-friendly refrigerant technology for refrigerators and air conditioners, and promote use of alternative refrigerants
- Replace bituminous coal or bunker-C fuel oil used for manufacturing and independent power generation with LNG and biomass fuel
- Increase introduction of waste heat power generation facilities to cut energy consumption by recovering the heat generated from facilities to produce steam

② Amended NDC (2023.3.23)

Reduction Measures

Transportation

- Increase sales of new eco-friendly vehicles by 51% by 2025 and 83% by 2030; reduce 5.9 million tonnes of GHG by 2025 and 17.3 million tonnes by 2030
- Develop an eco-friendly vehicle oriented social & industrial ecosystem by 2025

Buildings

- (New Buildings) Establish strengthened policies as means to reduce GHG that include raising energy standards for buildings such as insulation requirements for passive buildings and mandating ZEBs by phases
- (Existing Buildings) Develop measures to enhance energy performance as means to reduce GHG such as mandating the conversion of high energy consuming public buildings to green buildings and facilitating green remodeling
- (Other) Expand the application of energy consumption efficiency grading and high-efficiency energy machinery/equipment certification system for home appliances, office equipment and facilities, and strengthen efficiency standards in phases

② Amended NDC (2023.3.23)

Reduction Measures

Forestry

- Promote virtuous carbon cycle in forest management by creating commercial forest complex, developing forest management plan considering carbon absorption capacity and forest trail system; increase carbon absorption capacity of forest tree species; create multi-layered/ mixed forest and functional forests
- Create new carbon sinks by expanding urban forests in residential areas, converting idle land (marginal land) to forest, and creating coastal forest belt
- Improve carbon storage effect by managing domestic lumber history and expanding lumber production, developing processing technology of lumber that stores carbon for long periods

Agricultural

- Most reduction in the agricultural sector is achieved through policy projects since institutional measures are most effective in the respective industry considering the nature of the sector in which small-sized, unspecified mass of households are the major source of GHG
- Create the environment for farmers to manage the agricultural water by providing training through Agricultural Technology Center and improving the irrigation facilities including waterway
- Enhance efficiency of livestock manure treatment and efficiency of bio-gas production by improving purification system and preprocessing procedure as well as developing digestion tank operation technology
- Use bio-technology to develop technology that reduces methane emitted by livestock from enteric fermentation, and supply low-methane feed
- Enhance energy efficiency of fishing boats by replacing engines in old littoral fishing boats

2. Carbon Neutrality

❸ Financial Investment Plan for 1st nation basic plan(2023-2027)

(Unit : millions dollars, %)

Sub Sector	2023	24~'27	Total	Ratio
Total	13,346	76,574	89,919	100.0%
Mid/Long-Term Greenhouse Gas Mitigation Plan	7,948	46,628	54,576	60.7%
Climate Adaptation Plan	2,986	16,421	19,407	21.6%
Green Industry Growth	1,046	5,445	6,491	7.2%
Just Transition	237	1,984	2,220	2.5%
Local Action for Carbon Neutrality and Green Growth	460	3,032	3,492	3.9%
Training of human resources and Rasing awareness	600	2,688	3,288	3.7%
International cooperation	69	375	444	0.5%

2. Carbon Neutrality

4 2050 Carbon Neutrality Scenarios

Type	Sector	2018	2050		Remarks
			Scenario A	Scenario B	
Emission Amount		686.3	0	0	
Emissions	Energy Transformation	269.6	0	20.7	(Scenario A) Complete discontinuance of thermal power generation (Scenario B) Partial generation of thermal power using liquefied natural gas (LNG)
	Industries	260.5	51.1	51.1	
	Buildings	52.1	6.2	6.2	
	Transportation	98.1	2.8	9.2	(Scenario A) Complete transition into electric vehicles, hydrogen vehicles, etc. in the road (Scenario B) Use of alternative fuels (e-fuel, etc.) for internal combustion engine vehicles in the
	Agriculture, Livestock, and Fisheries	24.7	15.4	15.4	
	Waste	17.1	4.4	4.4	
	Hydrogen	-	0	9	(Scenario A) Use of electrolysis for all domestic hydrogen production (green hydrogen) (Scenario B) Partial supply of domestically produced hydrogen using by-products/extracted hydrogen
	Omissions	5.6	0.5	1.3	
Absorption and Removal	Carbon Sinks	-41.3	-25.3	-25.3	
	Carbon Capture, Use, and Storage (CCUS)	-	-55.1	-84.6	
	Direct Air Capture (DAC)	-	-	-7.4	Assumption that the captured carbon is utilized as an alternative fuel for vehicles

5 Five Major Pillars of Carbon Neutrality

	Details
① Increase use of clean electric power and hydrogen	– (Industry) Fossil fuel → Electric power and Hydrogen[21] – (Transportation) Internal combustion engine → Eco-friendly vehicles and vessels – (Building) City gas → Electrification
② Improve innovative energy efficiency in connection with digital technologies	– (Industry) Increased supply of highly efficient equipment, factory energy management systems, and build smart green industrial complexes – (Transportation) Intelligent transportation system (C-ITS), autonomous driving vehicles (car accidents ↓, efficiency ↑), drone cabs – (Building) Existing buildings → Green remodeling, new buildings → zero energy buildings, LED lighting, highly efficient appliances
③ Facilitate the development and commercialization of carbon-free future technologies	– (Future technologies) Steel → hydrogen direct reduction steelmaking / petrochemicals → innovative materials, bioplastics / electric power → CCUS
④ Promote sustainable industrial innovation and circular economy (Input of raw material and fuel ↓)	– Maximized recycling, reuse of raw materials (scrap metals, plastic wastes, used concretes) and minimized energy input
⑤ Strengthen carbon sink functions of Nature and ecology including forests, mud flats and wetlands	– Increased afforestation of idle land (mud flats, wetlands, urban forests), facilitate forest management (forest age ↓, lumber use ↑)

※ Source: ROK's NDC and LEDS (Ministry of Foreign Affairs, 2020)

2. Carbon Neutrality

6 Procedure & Progress for 2050 CN

Preparation of basic data for the 2050 Carbon Neutrality Scenario Technical Working Group

10 Sub-commisisons and 72 experts (mainly consisting of personnel from government-run research institutes) participated in predicting the potential GHG emissions.

Launching of the 2050 Carbon Neutrality Commission (May 2021)

The 2050 Carbon Neutrality Commission is composed of experts from different sectors, specializing in areas related to the climate, energy, industry, labor, economy, conflict management, education, and communications, as well as the civil society, youth, workers, farmers, and local governments.

Revision of the Scenarios and Release of Drafts (August 2021)

Reviewed the draft net-zero Scenarios, prepared by the Technical Working Group.

Operated Citizens' Coucil on Carbon Neutrality

Held meetings and collected opinions from citizens and various sectors for two months.

Operated Citizens' Coucil on Carbon Neutrality

Selected 500 random people consisting of men and women aged 15 and over to organize the Citizens' Coucil on Carbon Neutrality and collected opinions through Council meetings.

Announcement of Scenarios (October 2021)

Deliberated and determined at a cabinet meeting.

3. Sub-national Carbon Neutrality

1 Local government carbon neutrality

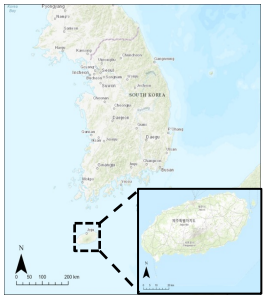
- Establishment of a carbon neutral support center
- Establish Local governments' carbon neutral green growth basic plan
- Measuring and monitoring progress

	Local governments	Ministry of Environment	Carbon Neutrality & Green Growth Commission
plan	Every 5 years with a 10-year planning period.	Synthesis, Reporting	Evaluating and monitoring

3. Sub-national Carbon Neutrality

② Local government carbon neutrality plan

Case study in Jeju island – Population : 695,500
Area: 1,849km2



Phase Ⅰ
National net-zero strategies to the subnational level

- National net-zero strategy scenario
  - apply to the subnational level
- Simulation with IAMs or energy system model ← Prospects of energy demand considering projection of population and regional GDP
- Feasible mitigation measures and pathways
- Communicating with local decision-makers and community

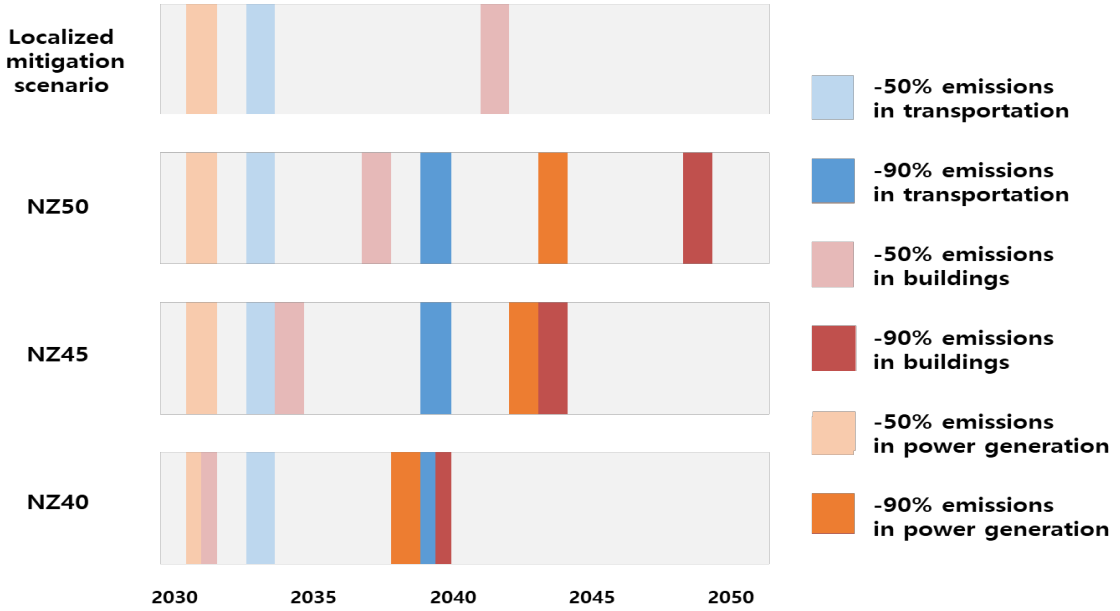
Modify the mitigation measures and pathways considering local issues

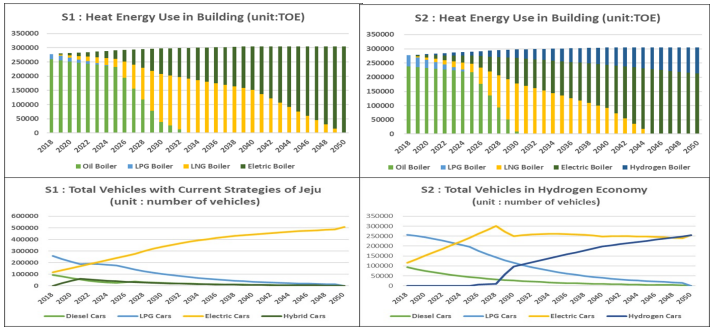
Phase Ⅱ
Subnational scenario with local issues

- Subnational localized scenarios
- Simulation with IAMs or energy system model
- Feasible subnational carbon-neutral pathways
- Communicating with local decision-makers and community

Phase Ⅲ
Adjusting short-term and long-term mitigation target

- Adjusted mitigation target scenarios ← 1. short-term mitigation goal ex) 2030 40% enhanced; 2. carbon-neutral target year ex) NZ45, NZ50
- Simulation with IAMs or energy system model
- Quantifying mitigation policies
- Establish subnational carbon-neutral plans and policies





3. Sub-national Carbon Neutrality

❸ Investment to stimulate local activities

Carbon Neutral City projects (50Mil-dollars each)

4. K-Energy Modeling Forums

1 About

》Activities

- Monthly Seminar (2021.4 ~)
- Model Intercomparison Project (Supported by GIR)

》Member

- University: UOS, KAIST, SNU, Sookmyung Univ., POSTECH, Yonsei Univ., Korea Univ., ChungNam Univ. …
- National Research Institute : KEI(Korea Environment Institute), KEEI(Korea Energy Economics Institute), KDI(Korea Development Institute), KICT(Korea Institute of Civil Engineering and Building Technology,), KIER(Korea Institute of Energy Research), KTI(Korea transport institute), …
- KPX (Korea Power Exchange),
- GIR(Greenhouse Gas Inventory & Research Center)
- Private research institute: Next Group, Samsung, …

Thank you