Korea's Policies on Climate Change

September 2018

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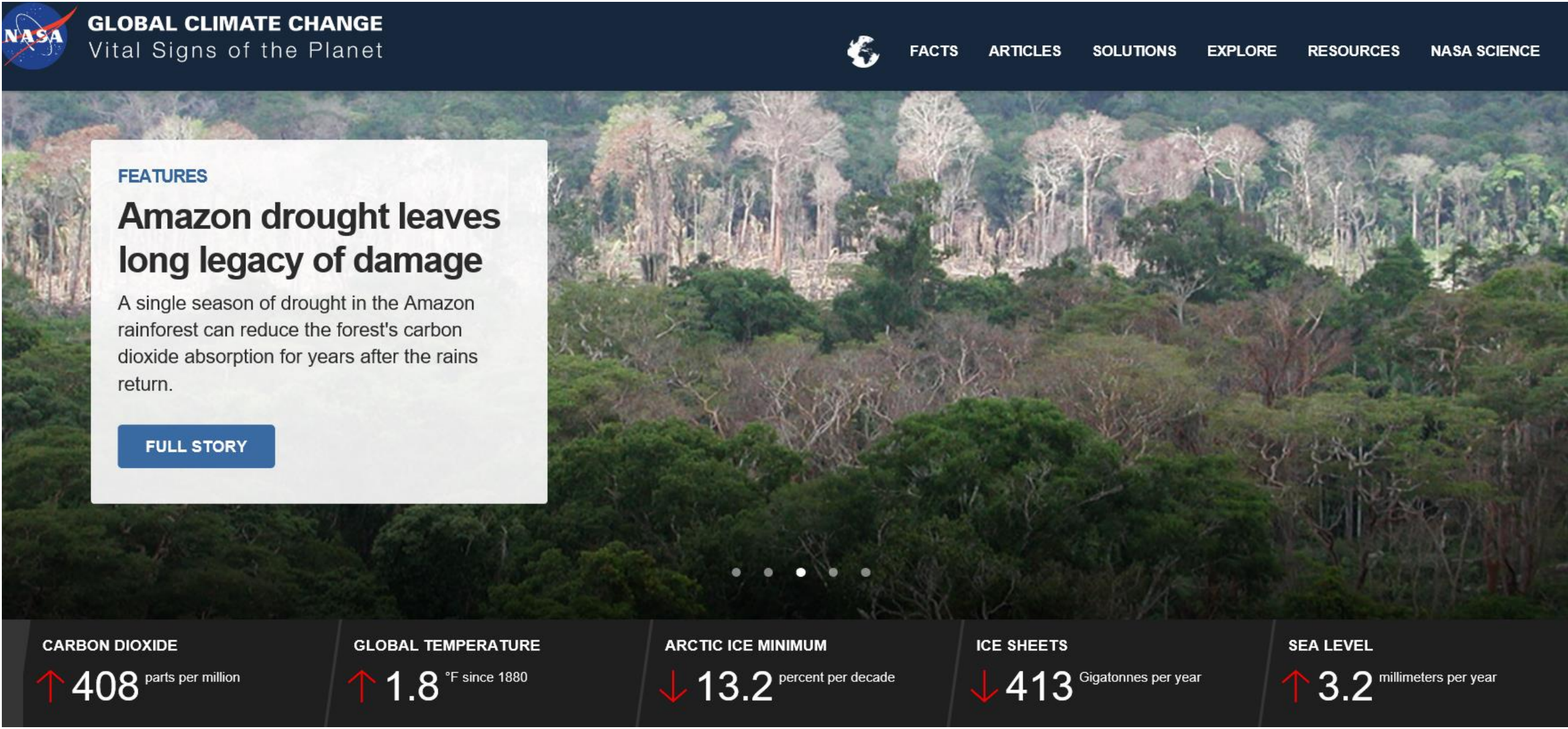
Climate Change Updates

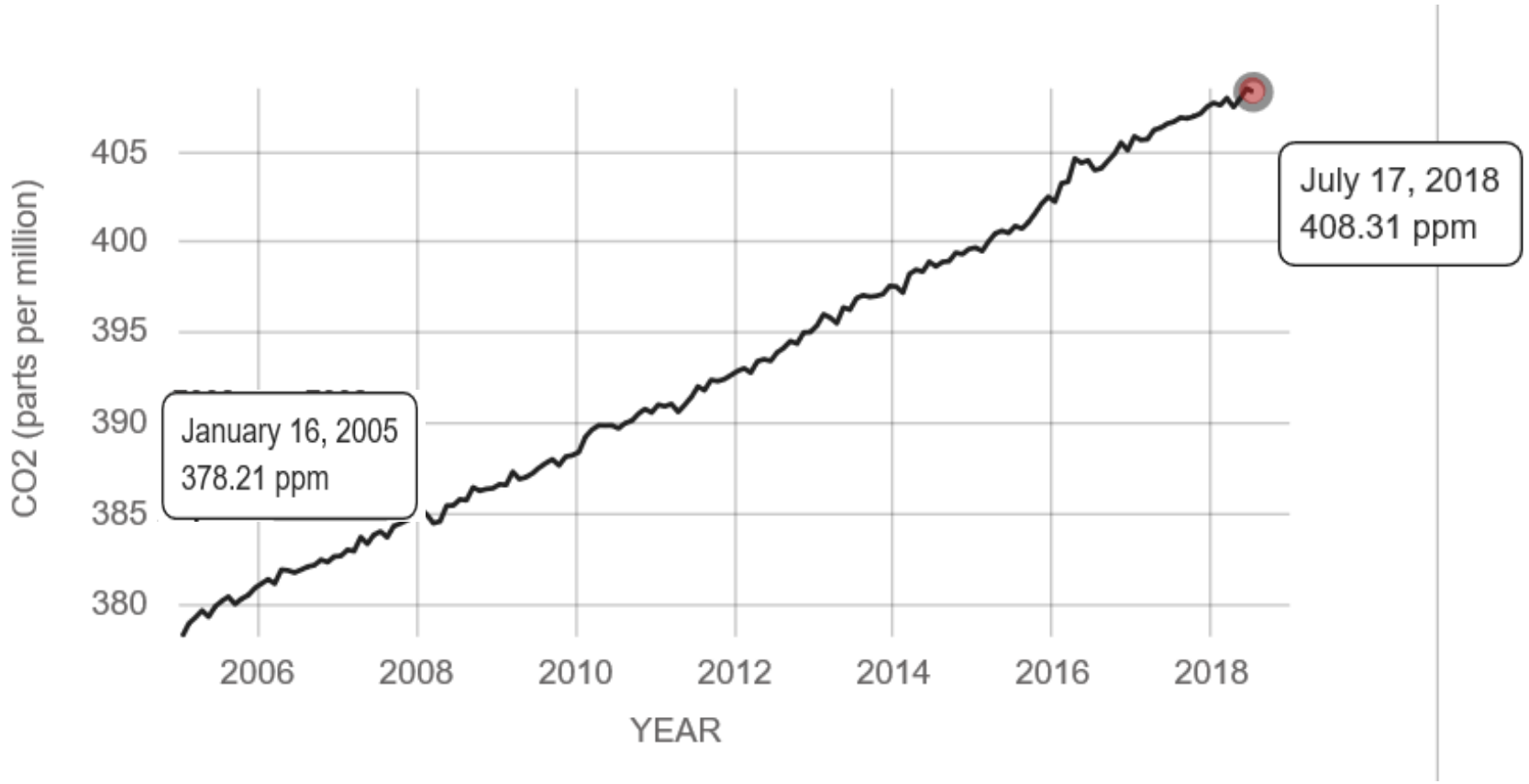


Source : NASA Homepage (16 Aug. 2018)

Carbon Dioxide

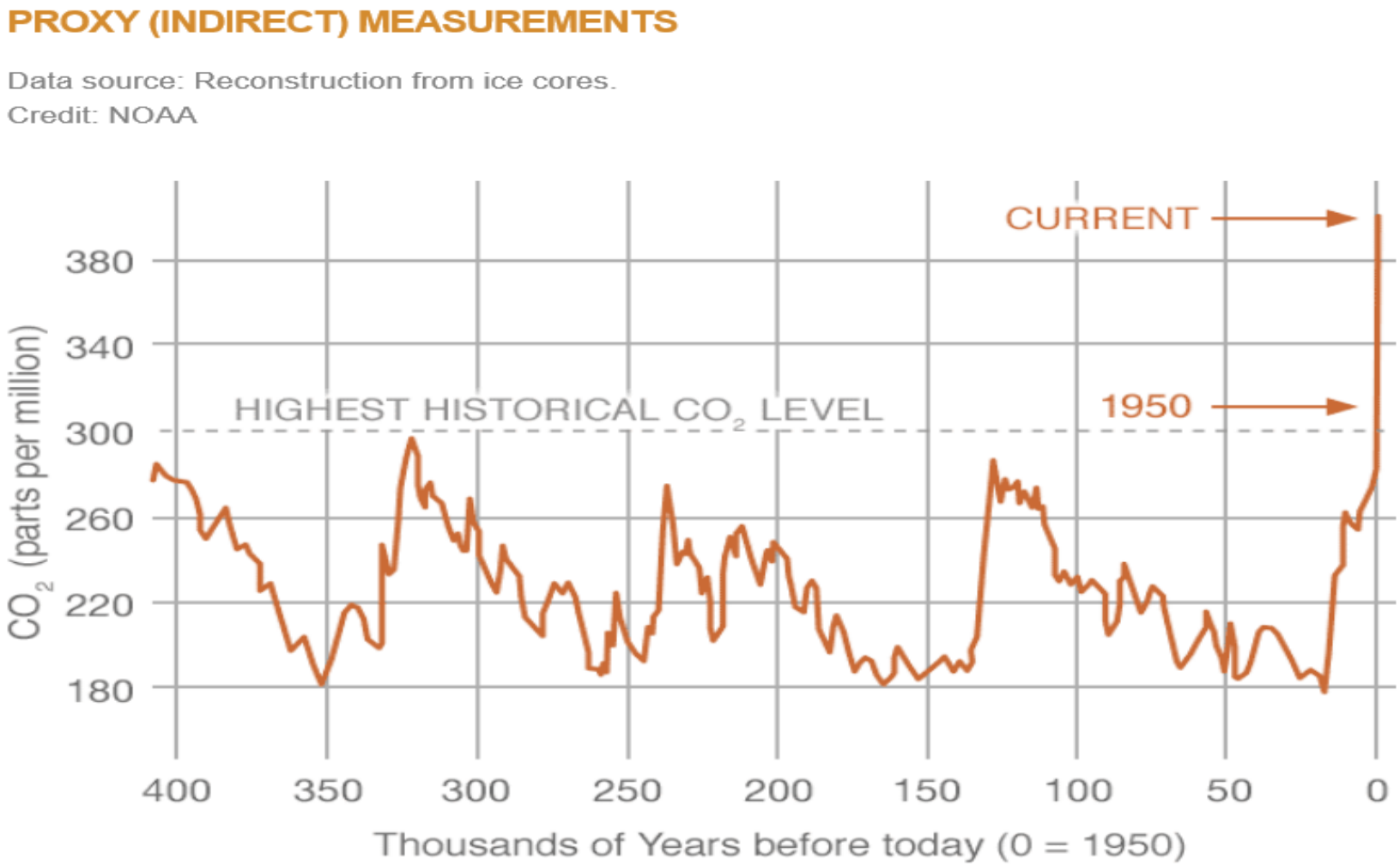
DIRECT MEASUREMENTS: 2005-PRESENT

Mauna Loa Obsevatory, Hawaii



Source : NASA Homepage

Change of Carbon Dioxide Level

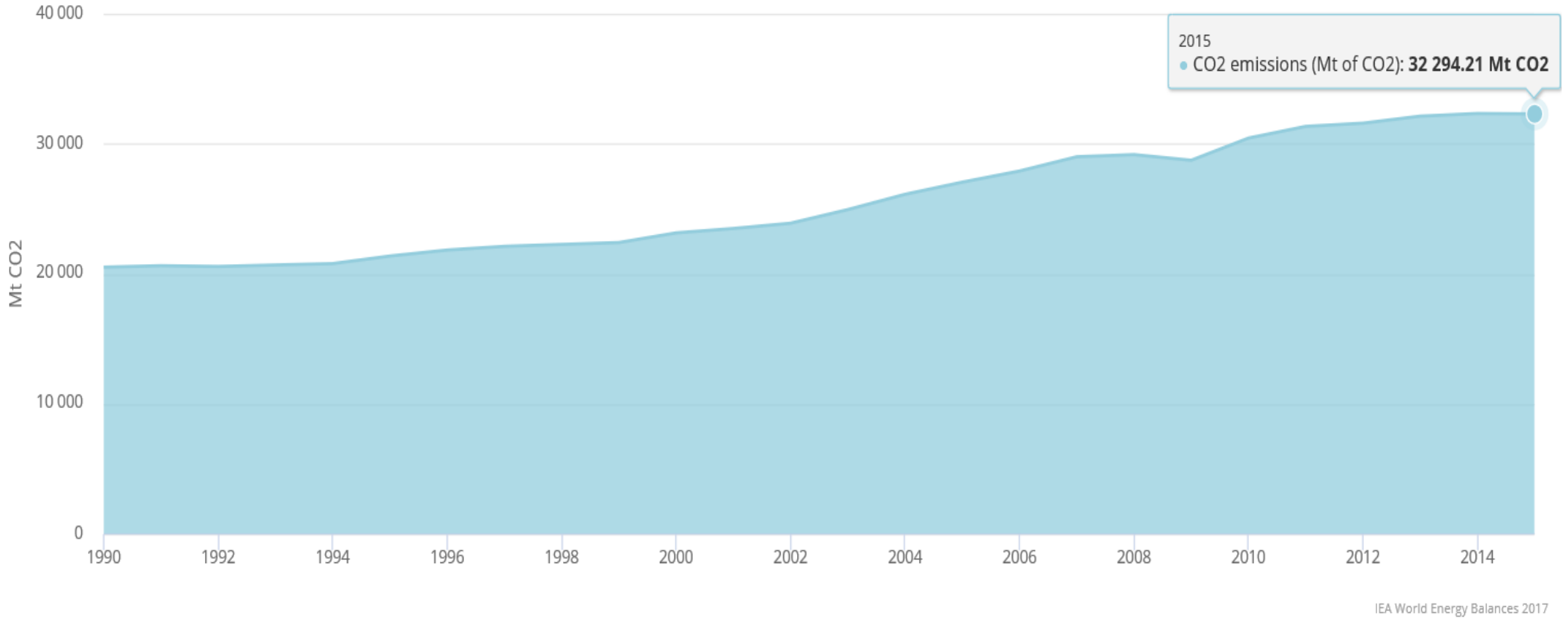


Source : NASA Homepage

"Scientific evidence for warming of the climate system is unequivocal"

- *Intergovernmental Panel on Climate Change*

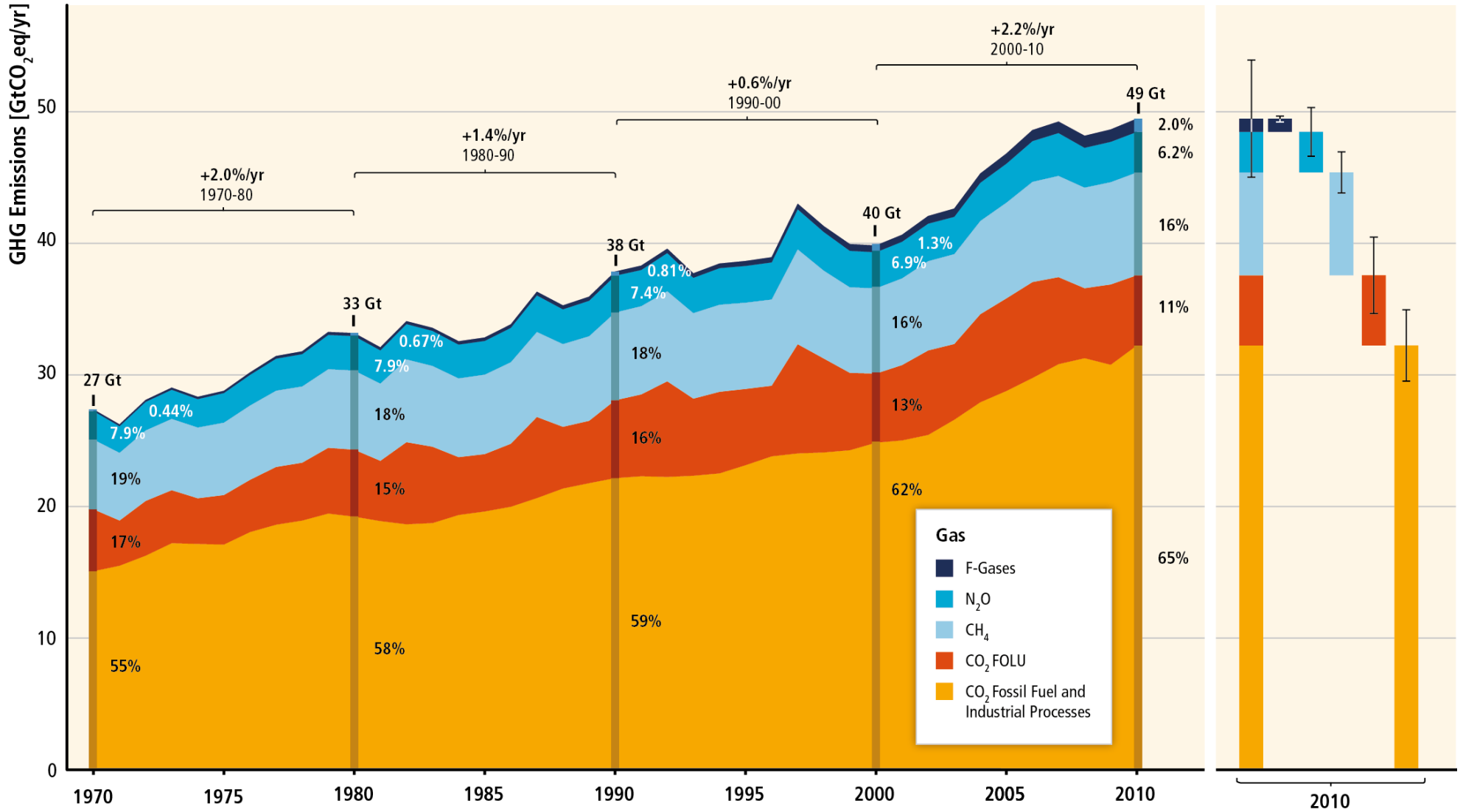
Global CO_2 Emissions (1990-2015)



** CO2 Emissions from fuel combustion only. Emissions are calculated using IEA's energy balances and the 2006 IPCC Guidelines.*

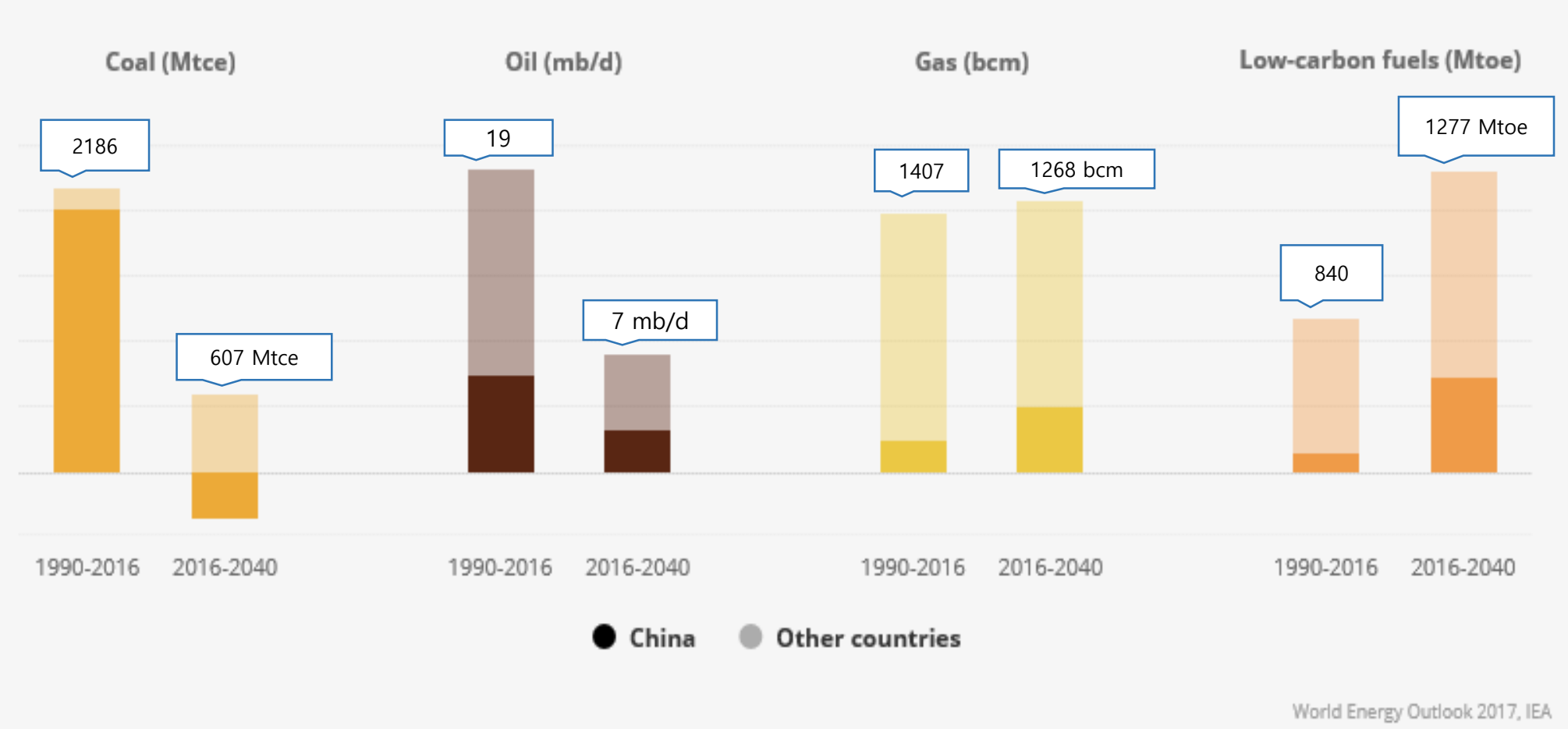
Source : IEA homepage

Total Annual Anthropogenic GHG Emissions by Groups of Gases



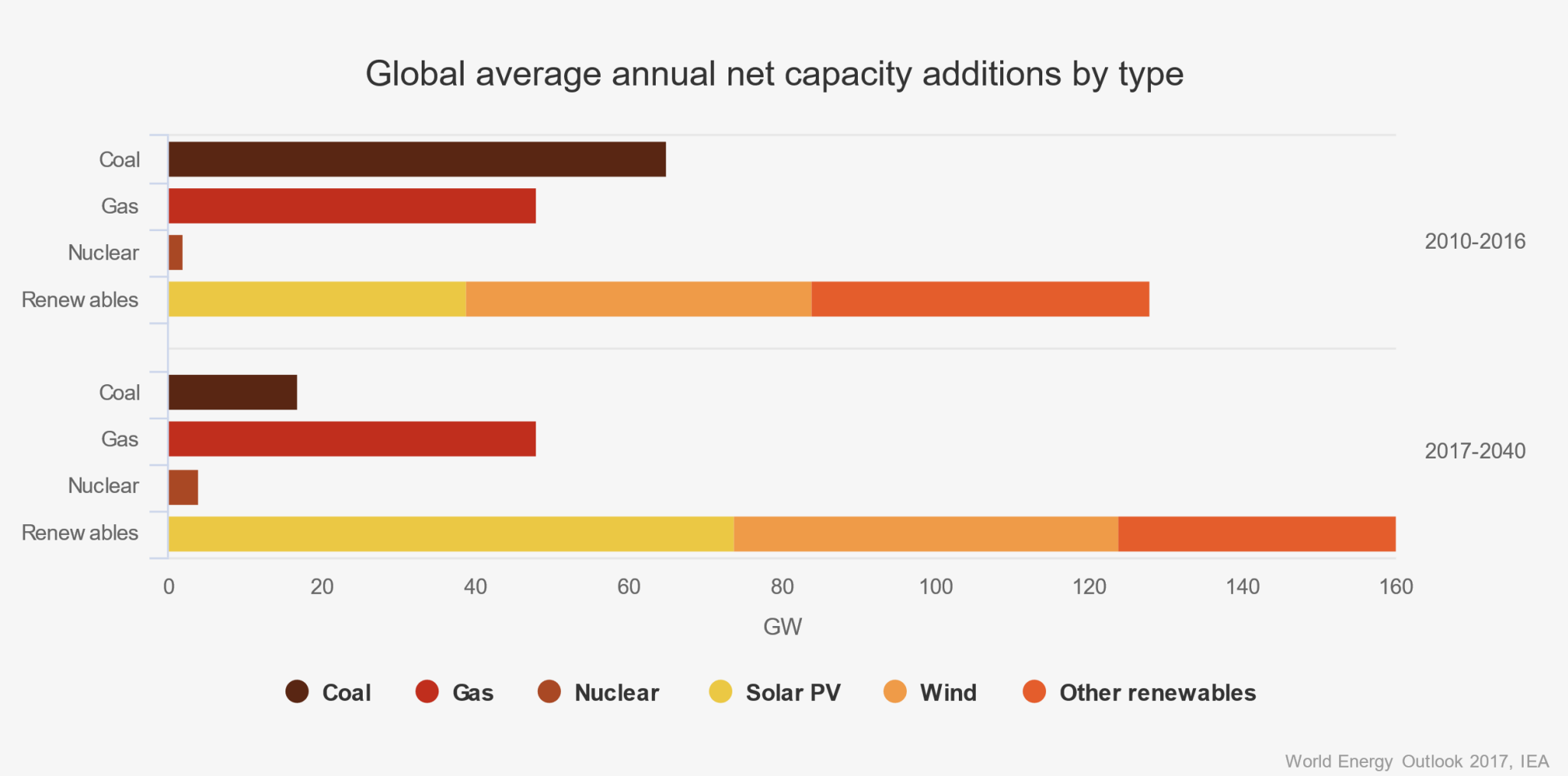
Source : IPCC AR5, 01_figure_TS.1

Change in World Primary Energy Demand by Fuel



Source : IEA homepage

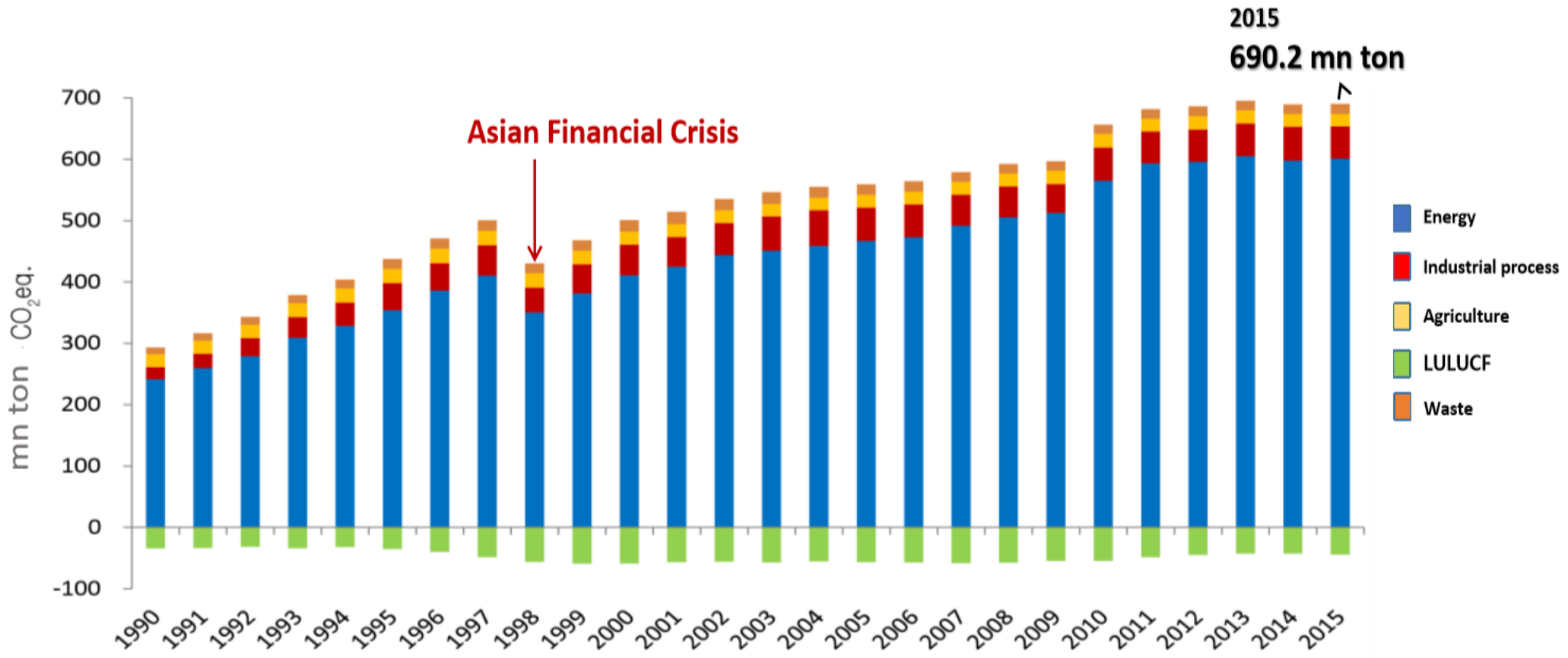
Global Average Annual Net Capacity Addition By Type



Source : IEA homepage

Korea's Policies on Climate Change

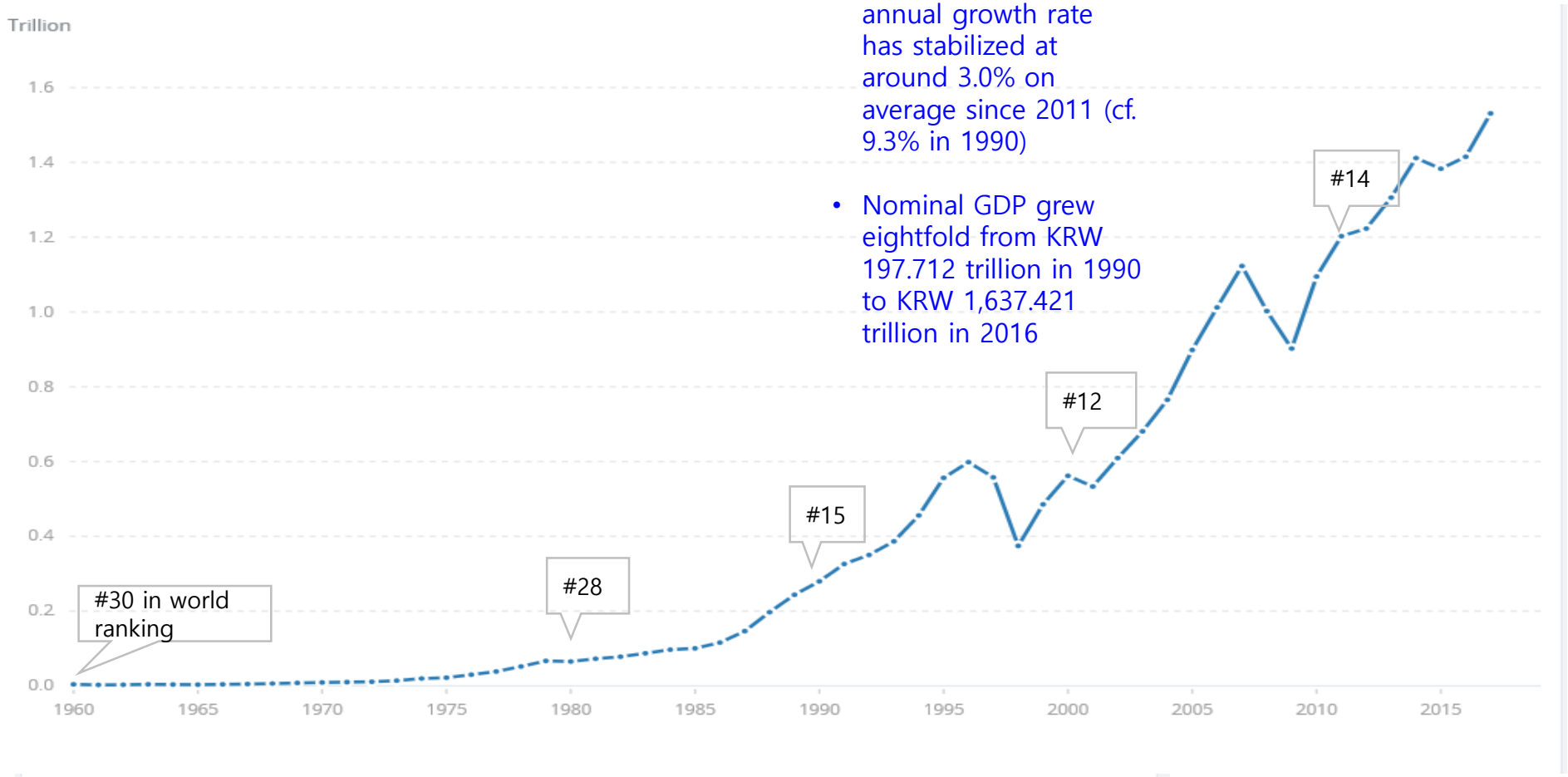
Korea's GHG Emissions by Sector (1990-2015)



Source : GIR, Korea

GDP (current US$)

- Korea's real average annual growth rate has stabilized at around 3.0% on average since 2011 (cf. 9.3% in 1990)
- Nominal GDP grew eightfold from KRW 197.712 trillion in 1990 to KRW 1,637.421 trillion in 2016

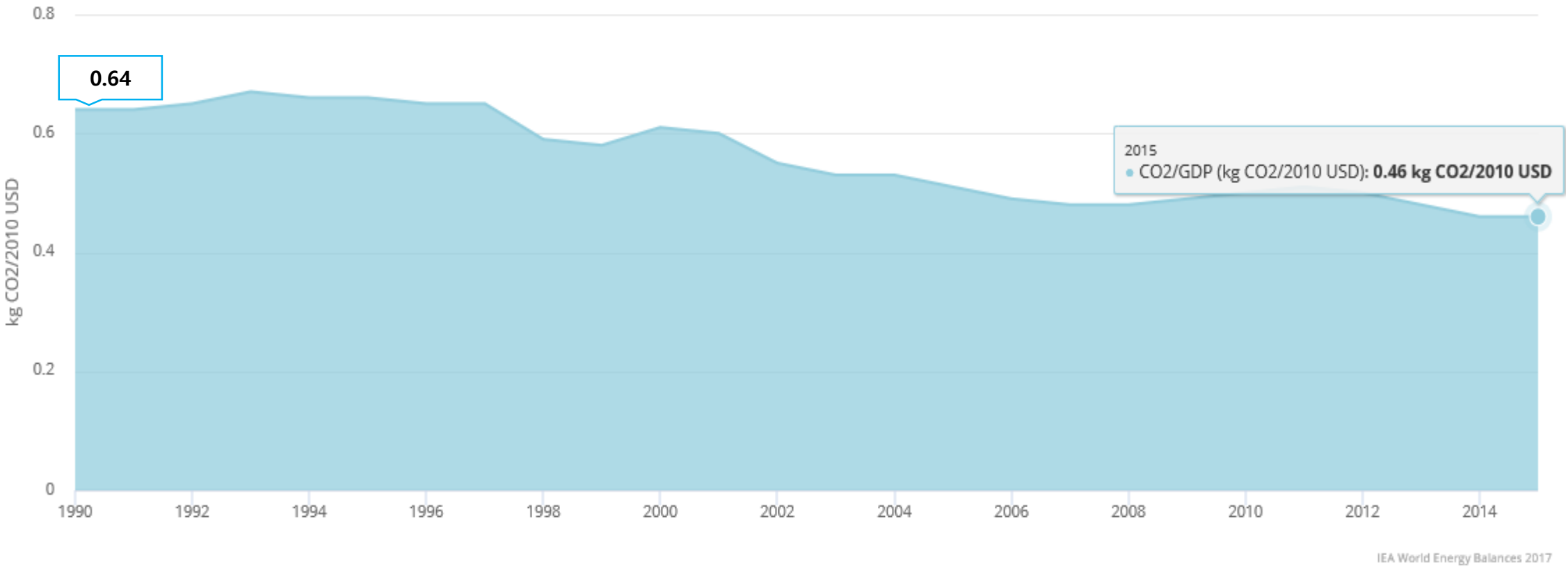


Country	1960 (million)	2017 (million)
Korea, Rep.	3,957.87	1,530,750.92

World Bank national accounts data / OECD National Accounts data files

Korea's CO2 emissions per unit of GDP*

* Fuel combustion only



Source : IEA homepage

Korea's Status in GHG Emissions

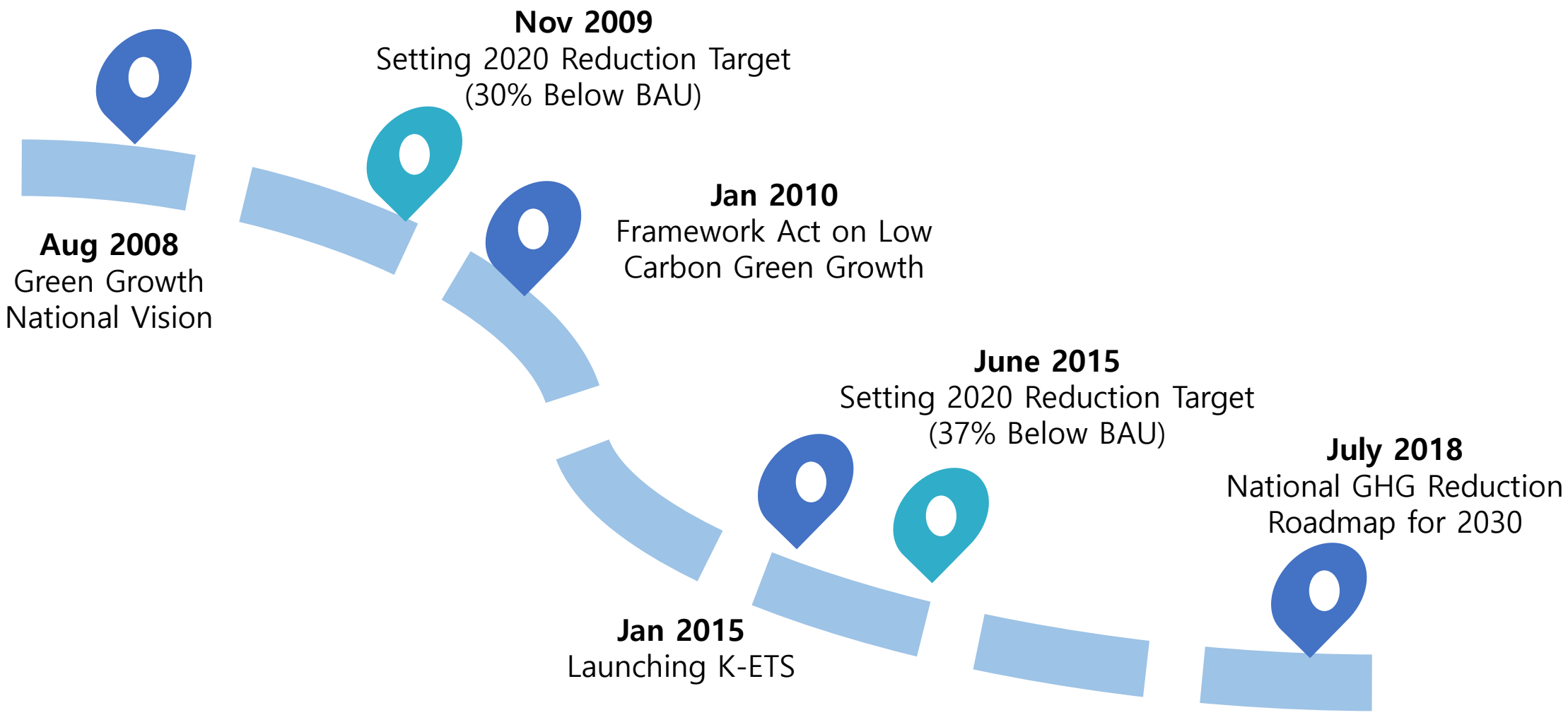
Unit : Million ton CO_2eq.

#	Country	2013 Total GHG Emissions by WRI- CAIT
1	China	11,735
2	US	6,280
3	India	2,909
4	Russia	2,199
5	Japan	1,353
6	Brazil	1,018
7	Germany	894
8	Indonesia	744
9	Canada	738
10	Mexico	733
11	Iran	717
12	Korea	674
13	Australia	580
14	Saudi Arabia	547
15	UK	546

#	Country	2014 CO_2 Emissions from Fuel Combustion (IEA, 2016)
1	China	9,087
2	US	5,176
3	India	2,020
4	Russia	1,468
5	Japan	1,189
6	Germany	723
7	Korea*	589
8	Iran	556
9	Canada	555
10	Saudi Arabia	507

** Korea's data is from its 2016 National Inventory Report*

Milestones in Climate Change Response



Framework Act on Low Carbon Green Growth

- **Article 1 (Purpose)** The purpose of this Act is to promote the development of the national economy by laying down the foundation necessary for low carbon, green growth by utilizing green technology and green industries as new engines for growth, so as to pursue the harmonized development of the economy and environment and to contribute to the improvement of the quality of life of every citizen and the take-off to a mature, top-class, advanced country that shall fulfill its responsibility in international community through the realization of a low-carbon society.

- **Article 9 (National Strategy for Low Carbon, Green Growth)** (1) The Government shall establish and enforce the national strategy for low carbon, green growth, which shall include the targets of the State's policies for low carbon, green growth, the strategy for promotion, and main tasks of promotion.

- **Article 39 (Basic Principles for Coping with Climate Change)** 2. It shall establish the State's medium and long-term targets for the reduction of greenhouse gases by analyzing costs of and benefits from the reduction of greenhouse gases in the economic aspect and taking domestic and overseas conditions into consideration and promote the reduction of greenhouse gases efficiently and systematically by introducing a cost-effective, reasonable regulation system based on pricing functions and market system 5. It shall be prepared against natural disasters on a large scale and changes in environmental ecosystem and the status of crops, minimize impacts of climate change, and protect the safety and property of citizens from such dangers and disaster

Governance

Committee on Green Growth

· Co-chair : Prime Minister, Private Expert

· Member : 17 Public Officials, 25 Private Experts

· Major Functions
- Review for Master Plan Establishment
- Promotion of Green Industries
- Education, Knowledge Sharing
- Int'l Cooperation

Secretariat of the Committee (Office for Government Policy Coordination)

· Head : Vice Minister
· Deputy Head : Director General

· Structure
- 3 Teams, 14 Gov't Officials

· Major Functions
- Management of the Committee
- Policy Planning
- Supervision of Law
- Evaluation of Policy Implementation
- Int'l Cooperation

Ministry of Environment, Greenhouse Gas Inventory & Research Center of Korea (GIR)

· MOE
- The Climate Change Policy Bureau with 3 divisions
- Climate Change Strategy Division
- Climate Change Economy Division
- New Climate Change Regime Response Team

· GIR
- 3 Teams, 50 Experts

Establishment of a Reliable National GHG Inventory System

- Sets legal foundation for GHG inventory
  - Framework Act on Low Carbon Green Growth (Article 45)
    - The Government shall establish an integrated information management system for greenhouse gases with which it shall develop, verify, and manage the State's quantity of greenhouse gases
  - Enforcement Decree of the Framework Act (Article 36)
    - There shall be established an Greenhouse Gas Inventory and Research Center as an affiliate to the Ministry of Environment
    - Any agency responsible for each sector shall submit, to the Center, greenhouse gas information and statistics of its sector during the previous year according to the following categories by not later than June 30 each year
- National GHG inventory improvement plan (2015~2019)
  - National GHG inventory management
  - Emission factors development, verification & management
  - Activity data management
  - IT System operation

GIR - GHG Inventory and Research Center

Goals

GHG Information Hub
Manage GHG Information with Efficiency

Accelerating Low-Carbon development
Respond to Climate Change through GHG Mitigation

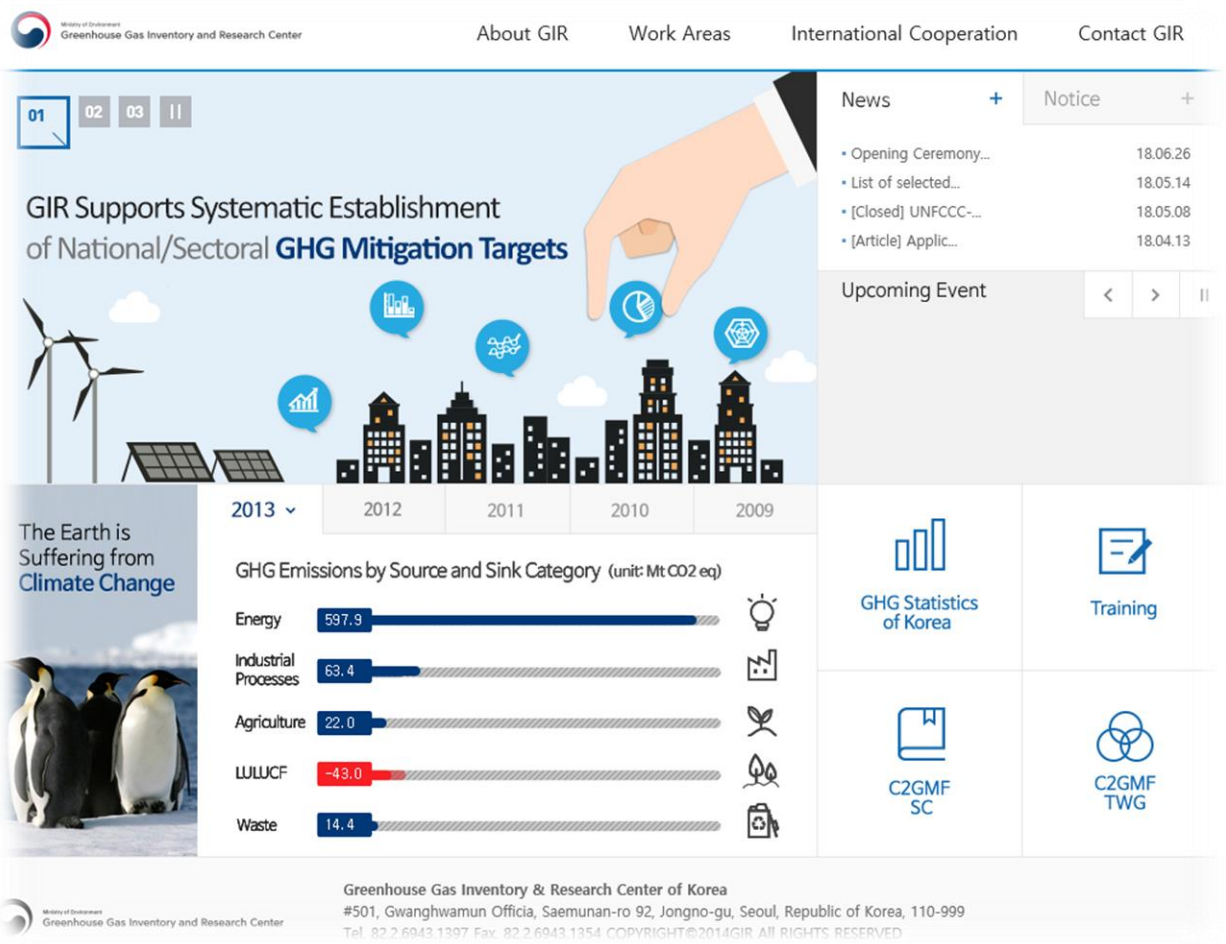
Expanding Global Networking and Outreach
Make contributions to International climate change mitigation efforts

Organization

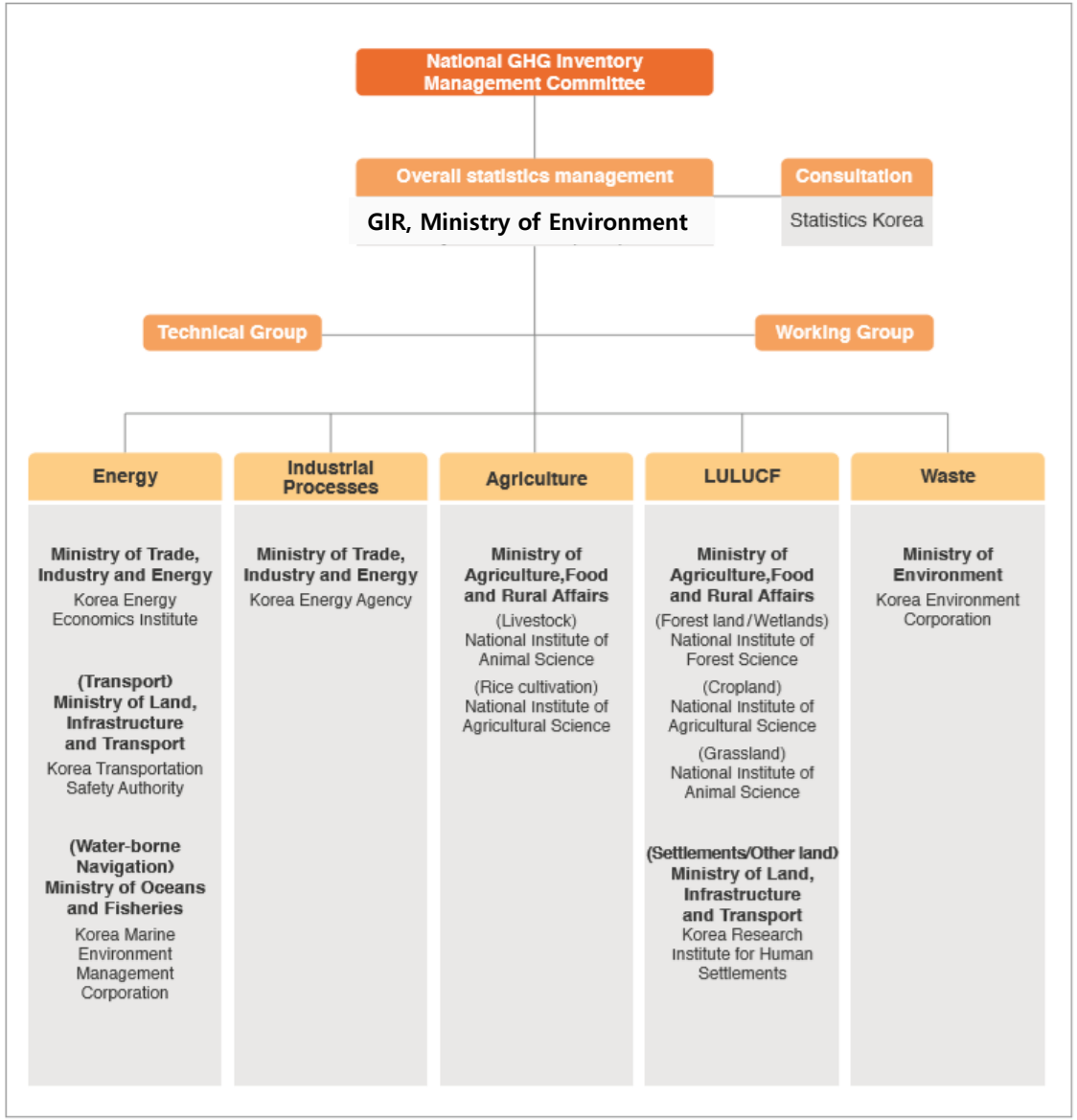
Planning and Administration Team
- Planning and administrative support
- International Cooperation

GHG Inventory Management Team
- GHG statistics and emission factors management
- Operation of National GHG Management system(NGMS) and Emissions Registry

GHG Reduction Research Team
- National & Sectoral GHG reduction target setting
- Research on Emissions Trading Scheme

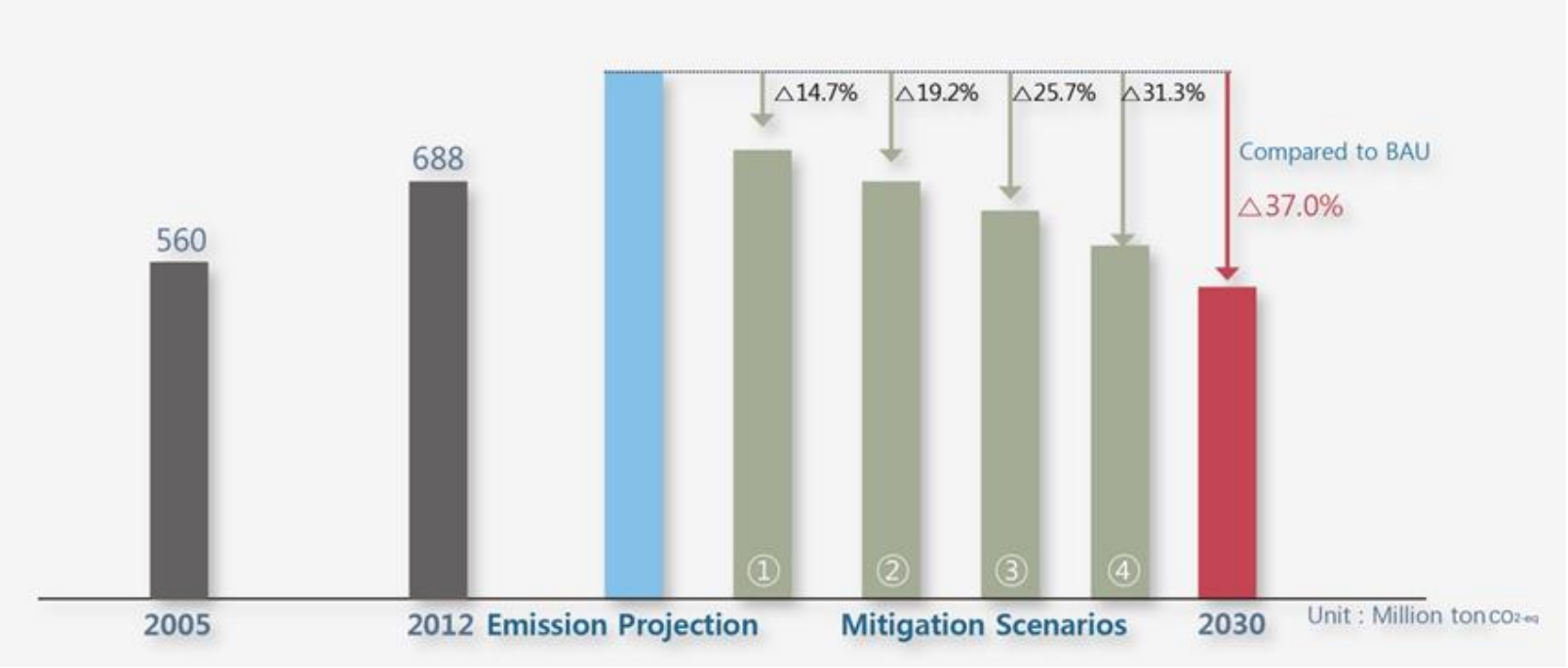


Preparation of National GHG Inventory



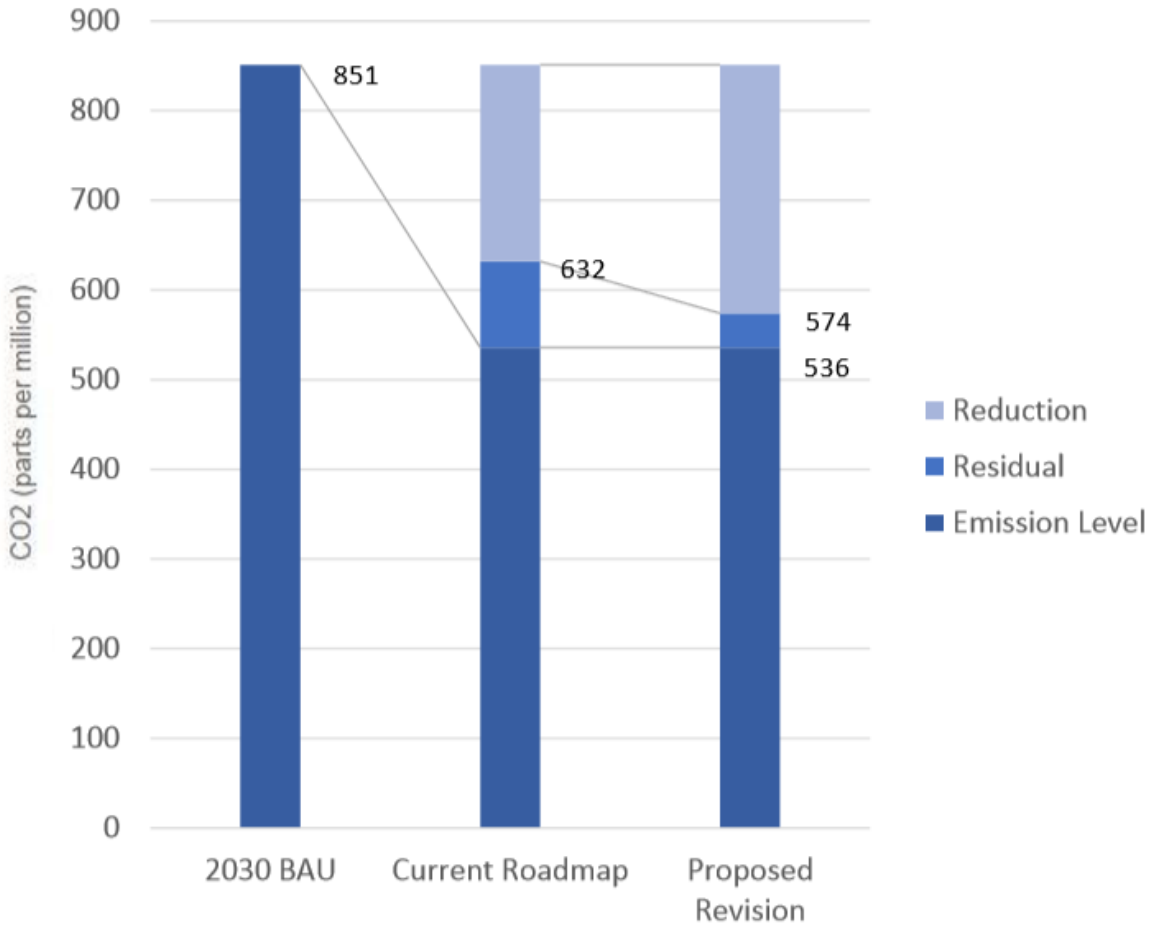
Mitigation Policy

Setting National GHG Reduction Target



37% reduction below BAU (851 million tons CO_2eq.) by 2030

2030 Reduction Roadmap (revised in July 2018)

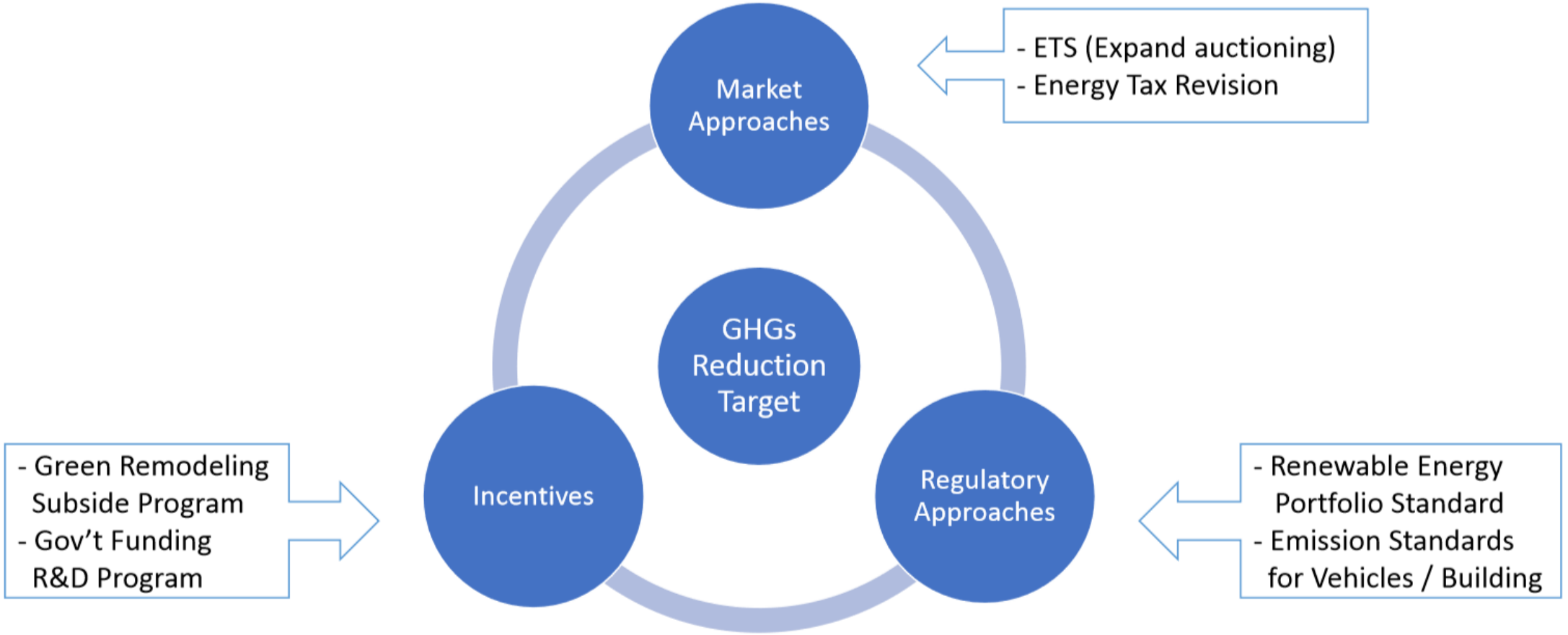


<Major Changes>

- Curb the increasing emissions by 2022
- Tighten the national energy saving goals
- Promote renewable energy up to 30% by 2020
- Enhance Non-CO2 reduction goals
- Increase low carbon vehicles (EVs, PHEVs, Fuel-cell, etc)
- Expand green building remodeling program
- Introducing LULUCF as a reduction strategy

Source : Ministry of Environment

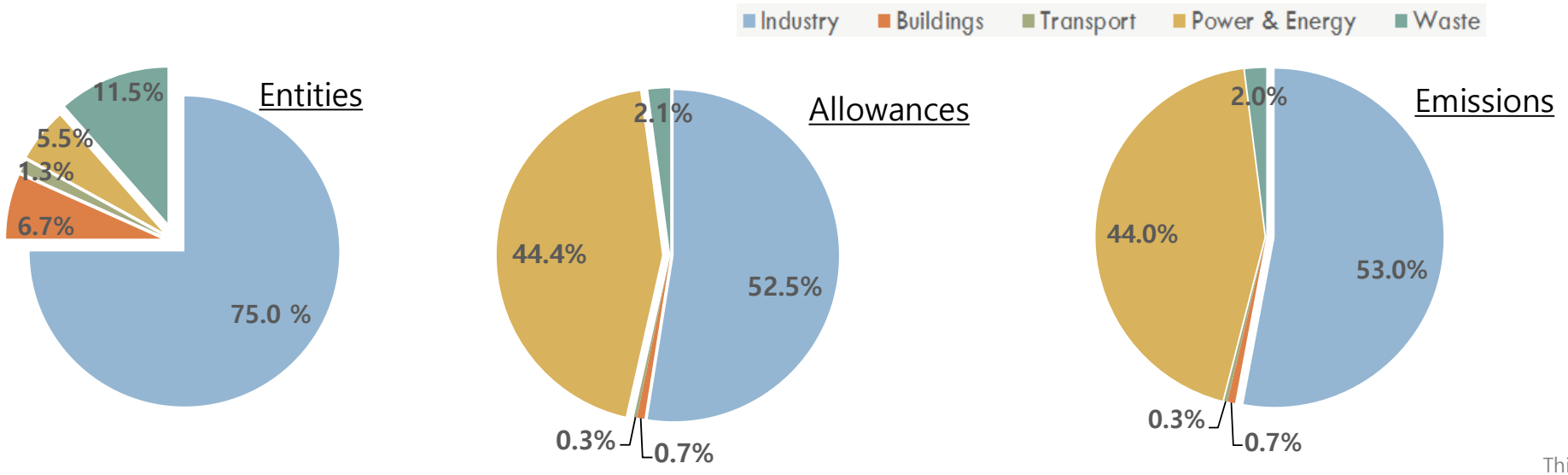
Implementation Tools



Source : Ministry of Environment

Korean Emissions Trading System (K-ETS)

- Sectors and entities covered: 5 sectors (26 sub-sectors) with 591 entities (as of April '18)
- Inclusion thresholds: companies ≥ 125,000 tCO_2/year or facilities ≥ 25,000 tCO_2/year
  ※ the average GHG emissions of the base years ('11~'13) for the 1st Phase
- GHGs covered: 6 Kyoto gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6)
- Emissions coverage: approx. 68% of national GHG emissions
- Allocation methods: mainly grandfathering (GF), and benchmarks (BM) for three sub-sectors (cement, aviation and refinery)
- Free allocation: 1st Phase ('15~'17) - 100%, 2nd Phase ('18~'20) - 97%, 3rd Phase ('21~'25) - less than 90%
- Flexibility mechanisms: banking, borrowing and offsets



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Initial Years' Trading Volume and Price

- (Trading volume) 12.27 Mil. tons traded(Jan 2015~ June 2016)
  - (KAU) 1.8 Mil tons, (KCU) 2.92 Mil tons, (KOC) 7.55 Mil tons
- (Price) 2015: under KRW 10,000 (≈ 8€), 2016 : up to KRW 20,000 (≈16€)

  ※ As of August 2018, the price is about KRW 21,600 (≈17€)
- (Total traded price) 169.75 billion KRW (≈136.1€) (For Jan 2015~ June 2016)
  - (KAU) 26.7 billion KRW (apprx. 21.4 mil. Euros)
  - (KCU) 44.18 billion KRW (apprx. 35.3 mil. Euros)
  - (KOC) 98.87 billion KRW (apprx. 79.2 mil. Euros)

K-ETS and Target Management System (TMS)

	K-ETS	TMS (2012~)
Type	Market Mechanism(Pricing)	Command and Control
GHG coverage	470.2 mil. CO2 ton **(67.7%, 2016)**	9.6 mil. CO2 ton **(1.5%)**
Regulated gases	6 GHGs	6 GHGs, energy consumption
Criteria	**Emitters of 25KtCO_2-eq or more** **Voluntary participants**	**>25ktCO_2 (~'11.12.31)** **>20ktCO_2 ('11.1~)** **>15ktCO_2 ('14.1~)**
Period	3~5 years	1 year
Allocation	Free allocation + auctioning (1st phase, `15~`17. free allocation)	Free allocation (Grandfathering, Benchmarking)
MRV	Operational guidelines, 3rd party verification	Operational guidelines, 3rd party verification
Early reduction offsets	Considering the total amount of permit, 10%	Determined by contribution factor, no guidelines
Banking /Borrowing)	Allowed (borrowing up to 20% only for 1st phase)	Not allowed
Trading	Allowed	Not allowed
Penalty	Penalty to the non- complied emissions	Penalty under 10 Mil KRW

K-ETS Latest Policy Developments

Allocation

- **BM-based allocation**: (1st Phase) 3 sub-sectors (cement, aviation and refinery) → (2nd Phase) 8 sub-sectors (max.)
- **Auctioning**: (1st Phase) 100% free allocation → (2nd Phase) 97% free allocation + 3% auctioned → (3rd Phase) less than 90% free allocation + more than 10% auctioned

Flexibility mechanisms

- **Banking**: (1st Phase) allowed without any restrictions → (2nd Phase) imposing disadvantages when banking more than the holding limit of permits* from one phase to the next
  ※ Holding limit: up to 10% of average allowances during the 1st Phase + 20,000 tCO_2e
- **Borrowing**: (1st Phase) allowed only within a single phase (maximum of 20% of entity's obligation), but not across phases → (2nd Phase) decreased to 15% and gradually reduced every compliance period*
  ※ Borrowing limit of the next CP: [borrowing limit of previous year - (borrowing ratio of previous year x 50%)]
- **Intl. offsets**: (before) allowed from the 3rd Phase → (after) allowed from the 2nd Phase* (but only credits from overseas CDM projects by Korean entities)
  ※ Quantitative limit: up to 10% of each entity's compliance obligation with a maximum of 5% coming from intl. offsets

K-ETS Operational Plan by Phase

	1st Phase ('15 ~ '17)	2nd Phase ('18 ~ '20)	3rd Phase ('21 ~ '25)
Allocation	▪ 100% free allocation, no auctioning ▪ mainly grandfathering-based allocation except for 3 sub-sectors (grey clinker, oil refineries and aviation)	▪ 97% free allocation, 3% auctioned ▪ wide application of benchmarks	▪ less than 90% free allocation, more than 10% auctioned ▪ mainly benchmark-based allocation
Offset projects	▪ diversifying domestic and CDM project methodologies ▪ promoting offset projects for small scale projects	▪ promoting domestic offset projects - developing more projects by sector ▪ promoting overseas offset projects	▪ drawing up guidelines on overseas credits guidance with the Paris Agreement negotiations ▪ diversifying methodologies for overseas projects
Trading market	▪ designating the Korean Exchange (KRX) as an allowance exchange ▪ implementing market stabilization measures	▪ launching regular auctions ▪ considering adopting a market maker scheme	▪ allowing third party participation in the trading market
Intl. cooperation and incentives	▪ international cooperation with the EU, China and Japan ▪ incentives for emission reduction facilities	▪ pursuing bilateral cooperation by developing local emission reduction projects ▪ investing auction profits into environmentally friendly projects	▪ considering ETS linkage ▪ diversifying investment portfolios

Expansion of Renewable Energy

Renewable Energy Share Target for Electricity Generation : **20% in 2030**

Renewable Energy Statistics (2014 and 2015)

Year	[A] Total Renewable Energy Supplied (thousand toe)	[B] Total Primary Energy (thousand toe)	[A/B] Share (%)	Renewable Energy Generation (GWh)
2014	10,956	283,092	3.9	14,695 (2.8% of the total power generation)
2015	12,839	287,705	4.5	20,904 (4.0% of the total power generation)
2016	13,575	294,654	4.6	**22,936** **(4.2% of the total power generation)**

Renewable energy Portfolio Standard (RPS)'s generation target (2012~2023 and beyond)

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
%	2.0	2.5	3.0	3.0	3.5	4.0	5.0
Year	**2019**	**2020**	**2021**	**2022**	**2023 and beyond**		
%	6.0	7.0	8.0	9.0	10.0		

This Page : Courtesy to GIR

Green Buildings

Energy Consumption Efficiency Standard / High Efficient Appliance Certification

[New] Building : Passive and Nearly Zero Energy Building Promotion

- **Enhancement of insulation performance**
- **Legal enforcement of Zero Energy Building by 2020 (public buildings), 2025(private buildings)**
- **Approval of Zero Energy Building (10% of construction area, annually)**
  → 670 thousand tCO2-eq. reduction

[Existing] Building : Green Remodeling Promotion

- **Actively implemented since 2013 according to "Green Building Construction Support Act"**
- **25% energy saving by replacing windows and doors and enhancing insulation**

Before project

After project

LED Lighting (including street lighting) Promotion : Prohibition of incandescent lamp production/import since 2014
LED lamp 100% diffusion in public sector by 2020

Solar PV, Solar Heat, Geothermal Heat Energy Promotion

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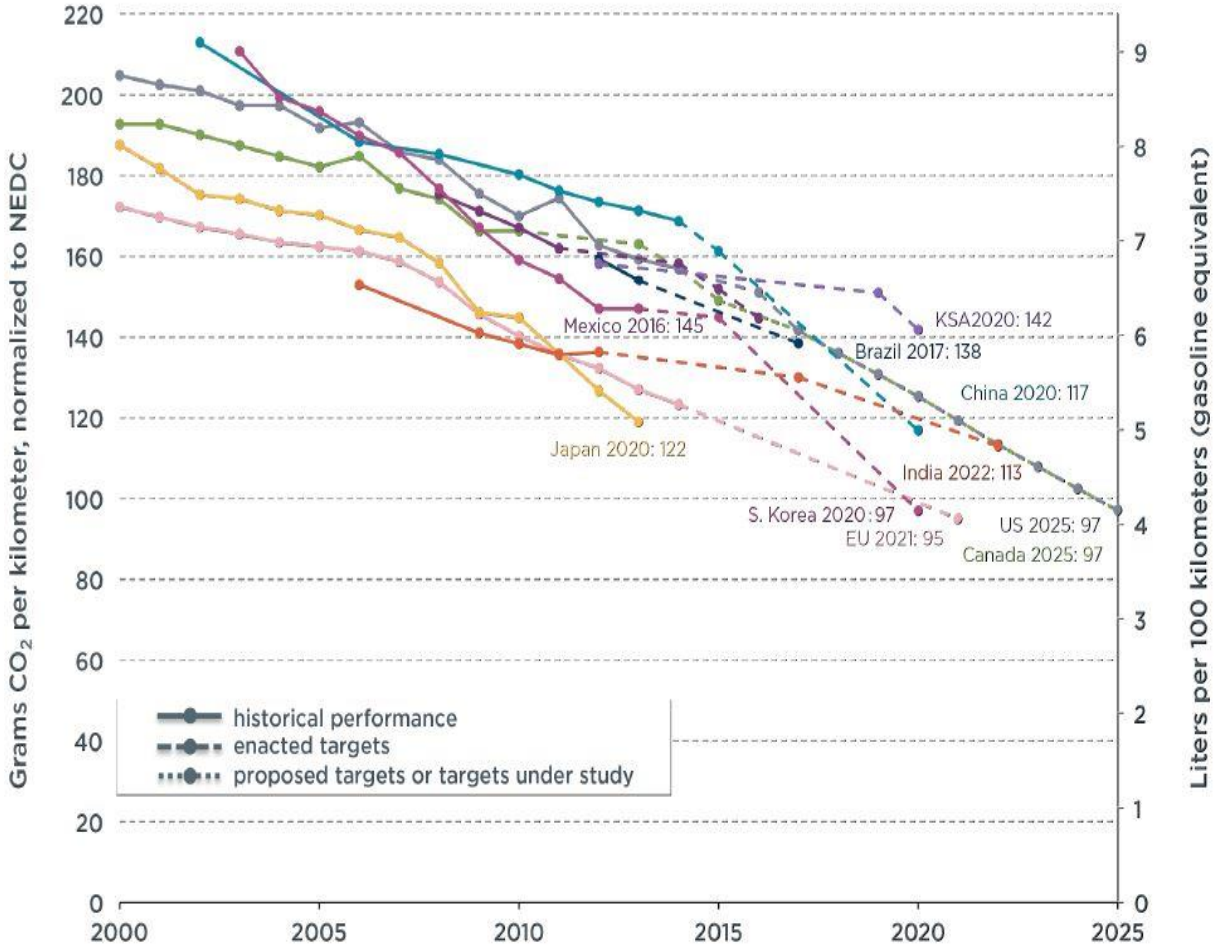
Transport

GHG emissions standards



Source : International Council on Clean Transportation, 2015

Average GHG emissions / Fuel-Efficiency Standard	• Establishment of average GHG emissions (g/km) or fuel efficiency (km/L) standard - GHG emissions standard : ('15) 140 g/km → ('20) 97 g/km - Fuel efficiency standard : ('15) 17 km/L → ('20) 24.3 km/L • Facilitation of low-carbon vehicles dissemination - Sales of a vehicle with no more than 50 g/km = Sales of **2** vehicles - Sales of a Zero Emission Vehicle (ZEV) = Sales of **3** vehicles
Eco-Friendly Vehicle Promotion	• Policy improvements and infrastructure expansion for Eco-Friendly Cars - Electric Cars: Reducing the price of battery and supplying **1,000,000** EVs by 2030 - Hybrid Cars: Diversification of models meeting various preferences and supplying **4,000,000** Hybrid Cars by 2030 - Fuel Cell Vehicles: Designating cities for disseminating fuel cell vehicles and expanding hydrogen refueling stations. The plan is to supply **640,000** Vehicles by 2030

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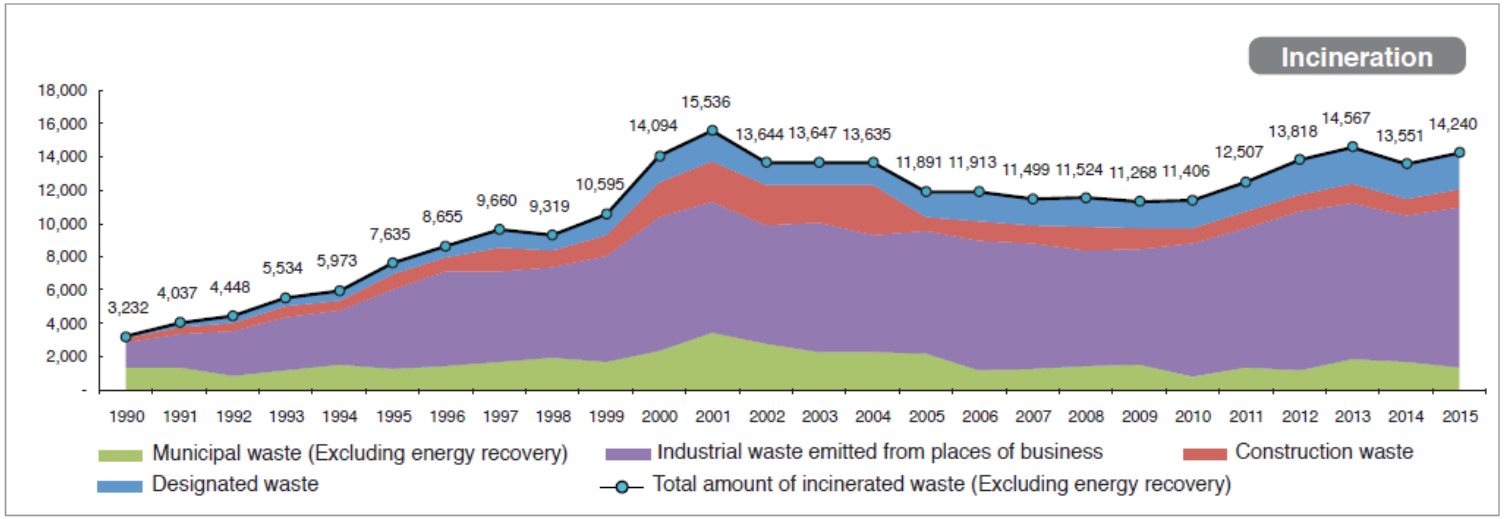
Waste

< Waste Disposal on Incineration Trends (1990-2015) >



※ Source: Status of Generation and Treatment of Wastes of Korea, Ministry of Environment, 2016

< Municipal and Industrial Waste Recycling Rates(%) and Methane Gas Recovery in Landfills (thousand tons) >

Type \ Year	2011	2012	2013	2014	2015
Municipal waste recycling rate	59.1	59.1	59.1	59.0	59.2
Industrial waste recycling rate	73.0	76.5	75.4	77.3	78.2
Methane recovered from landfills	139	153	153	142	-

※ [Recycling rate] Source: Status of Generation and Treatment of Wastes of Korea, Ministry of Environment, 2016
※ [Methane gas] Source: 2016 National Greenhouse Gas Inventory Report, Greenhouse Gas Inventory and Research Center, 2016

This Page : Courtesy to GIR

Green Consumerism

Carbon Labeling Scheme

- Labeling carbon footprint of the total carbon dioxide emitted from the manufacturing processes
  (from production, transportation, distribution, usage to disposal stages)

Carbon Points

- Points/Incentives for reduction of electricity, water, and city gas at residential and commercial buildings
  (reduction level compared between the current monthly usage and the monthly usage in the previous years)

Green Card

- Card giving points (5% of the price) given to the citizens purchasing eco-friendly products or eco-friendly companies

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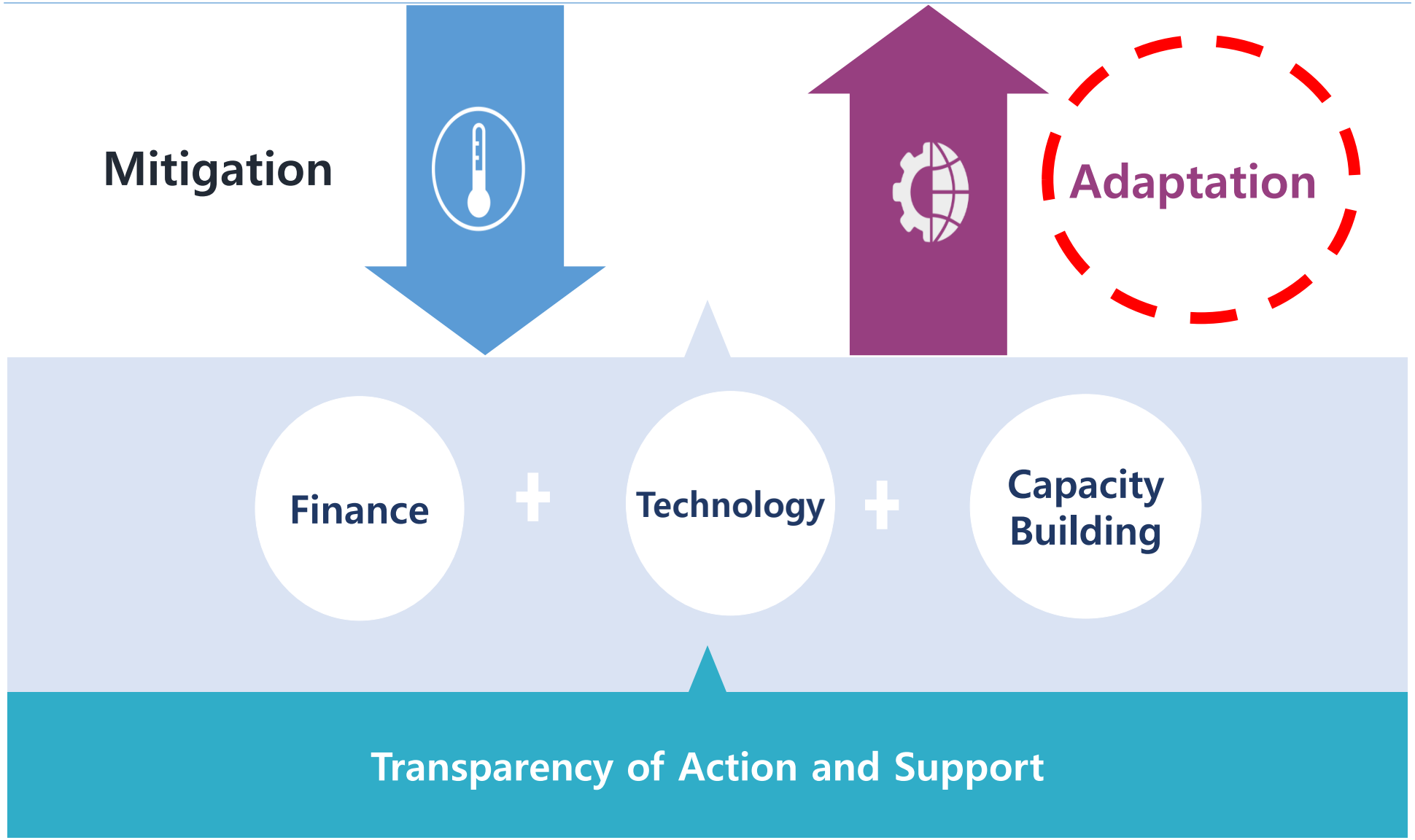
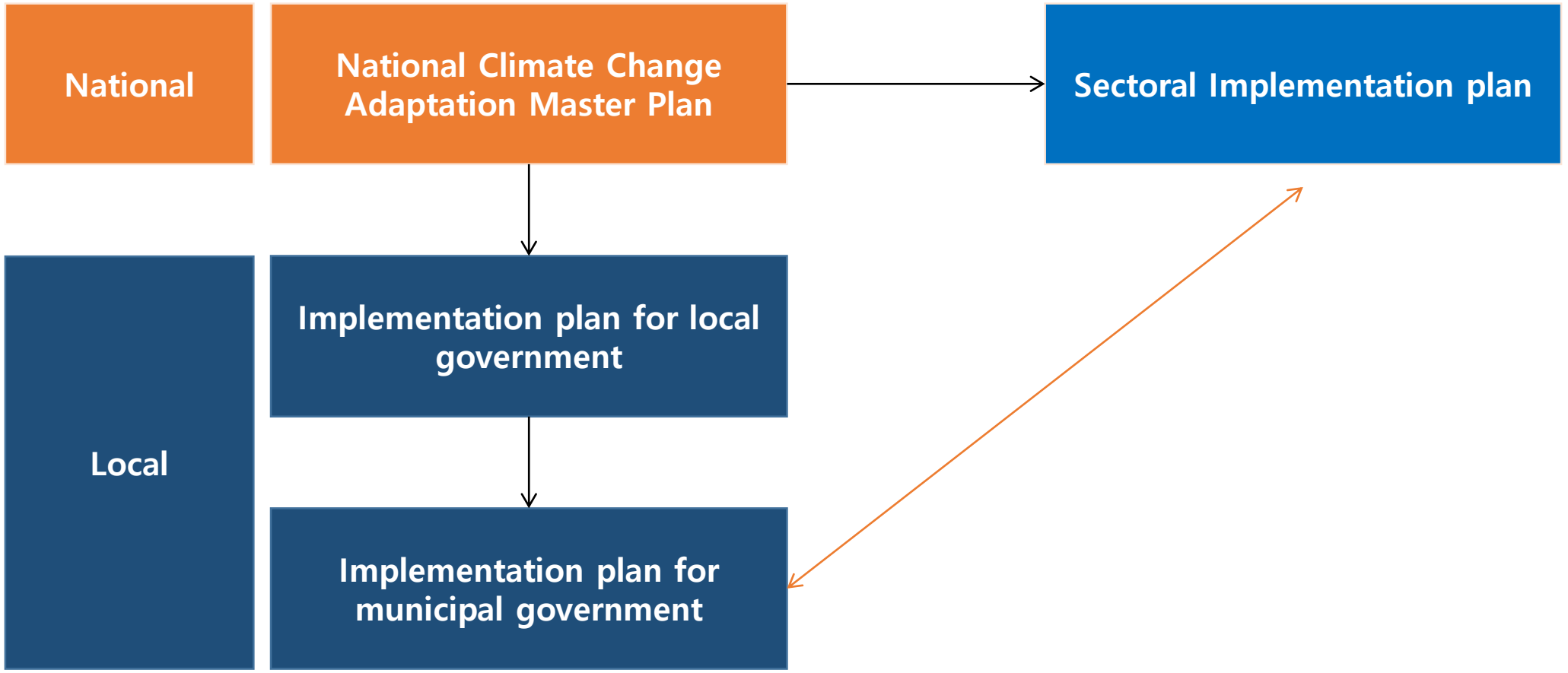
Adaptation

Balancing of the Key Components in Paris Agreement



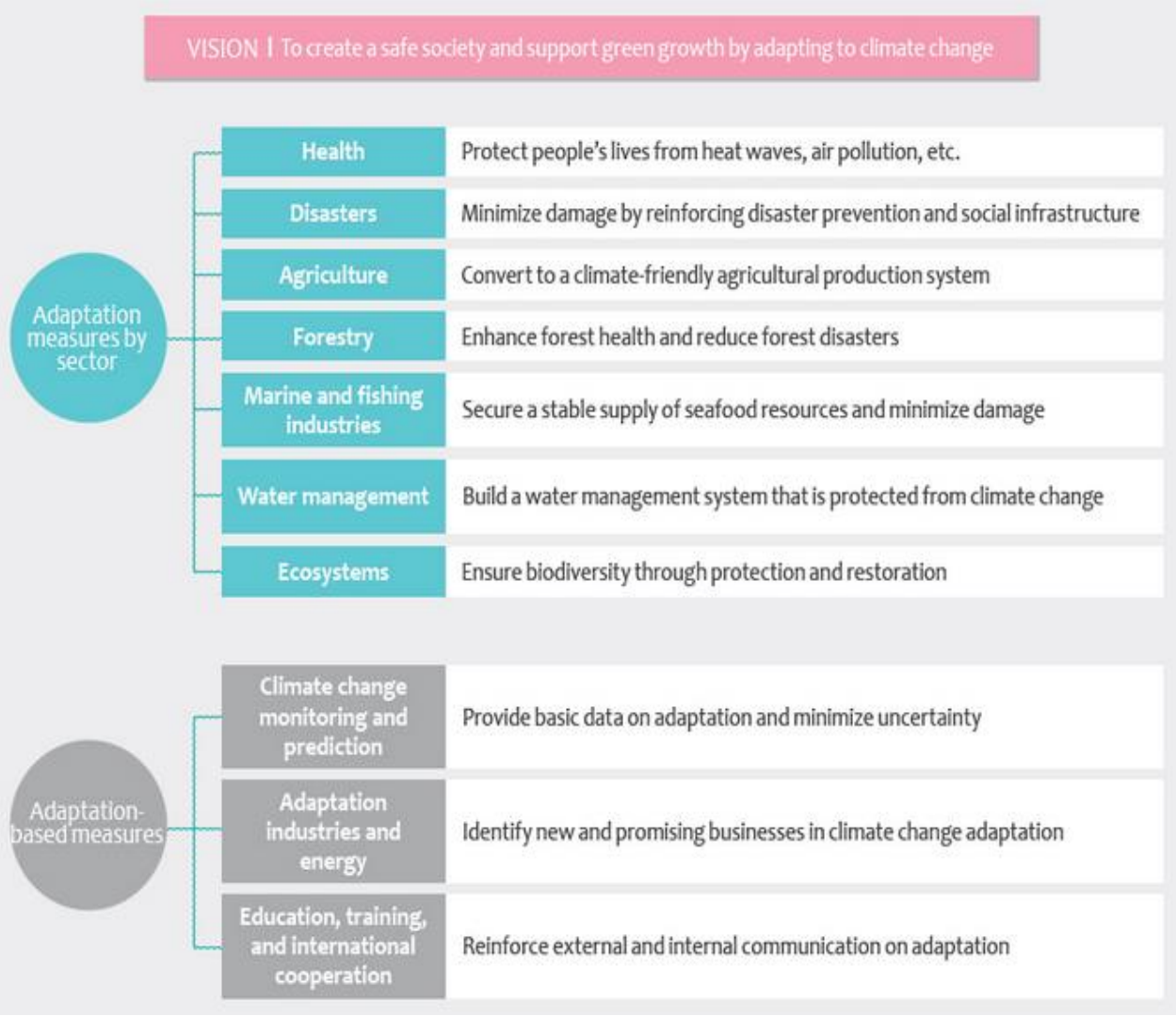
National Planning System for Climate Change Adaptation



1st National Climate Change Adaptation Plan (2011-2015)

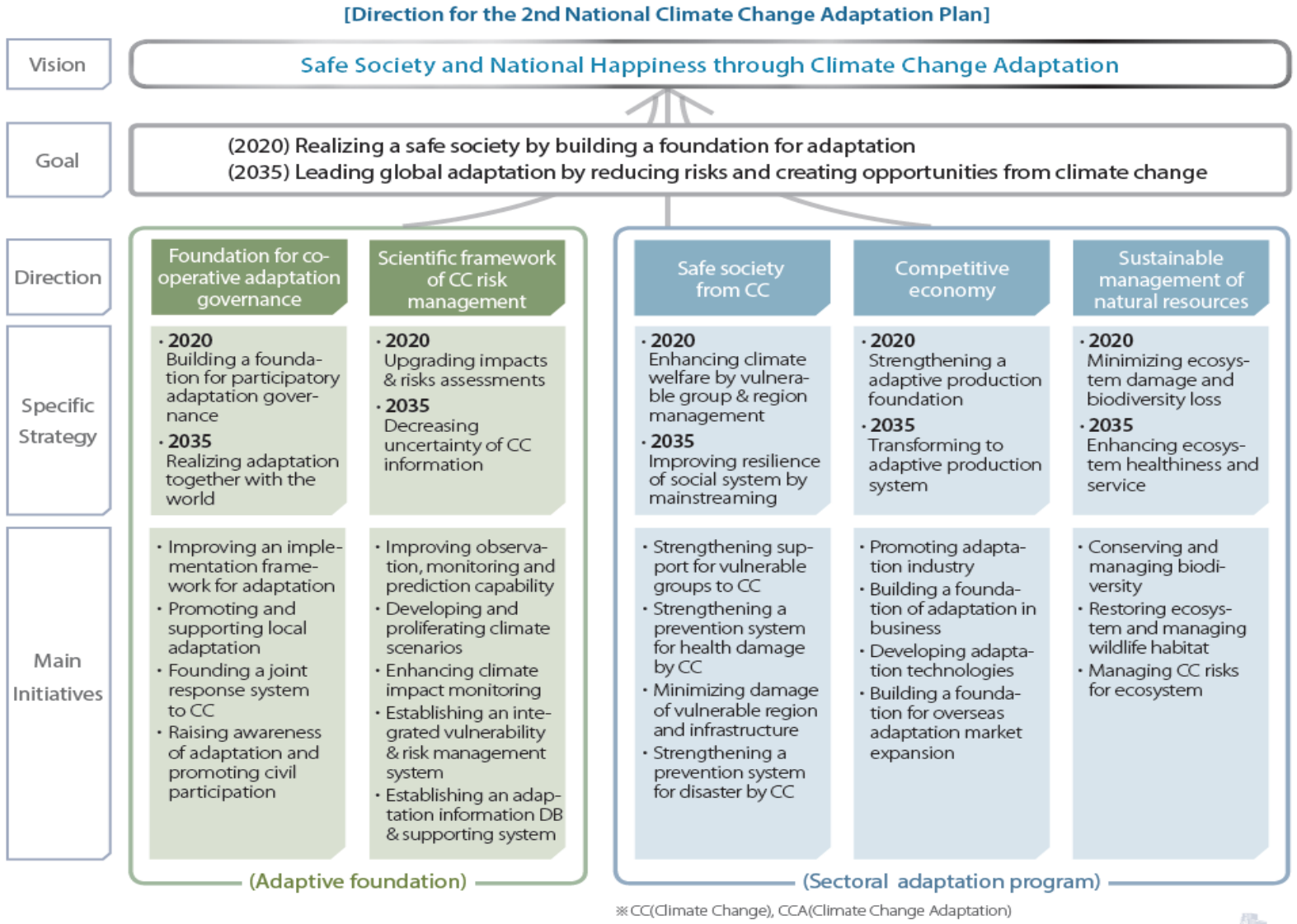
- The 1st National Climate Change Adaptation Plan('10.12)
  - To suggest a comprehensive national adaption plan, vision and direction of the national adaptation policies
  - 2 areas, 10 sectors, 87 measures of 13 ministries

  * Revision in Dec 2012 to reflect RCP scenario
- Achievement of the 1st Plan
  - National Level Climate Change Adaptation Framework
    - Local and municipal level adaptation plans, too
  - Scientific basis of climate change adaptation
    - standard and high resolution climate change scenarios, vulnerability maps, etc.
  - Increase climate change adaptation awareness and build an adaptation partnership



2nd National Climate Change Adaptation Plan(2016~20)

- 20 Ministries including Ministry of Environment
- Vision : Safe society and national happiness through climate change adaptation
- 5 years short term goal and 20 years medium/long term goal
- 5 direction·Specific goals, 83 measures



2nd Plan - Differentiation from the 1st Plan

- Reflection of internal and external policy environment changes
  - Add new measures for the risk which were previously not reflected
  - Based on CC risk assessment, set sectoral adaptation priorities and strategies
  - Explore co-benefit of climate change mitigation and adaptation
- A strategic adaptation framework including short, mid, long-term adaptation vision and goals
  - Climate change adaptation medium and long-term (20years) vision and goal
  - Actualized national adaptation strategies
  - Economic, social and environment virtuous circle through climate change adaptation
- Expansion of investment in climate change adaptation technology and international cooperation

Climate Change Adaptation Research

The progress of Korean Climate Change Assessment Report

1st National Climate Change Assessment Report publishing plan established

Research to publish the climate change assessment report (Literature survey and analysis)

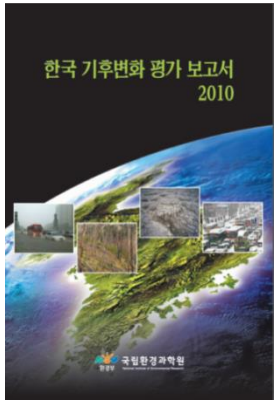
2nd National Climate Change Assessment Report publishing plan established

Research to publish the climate change assessment report (Literature survey and analysis)

Expert review for draft report, and revision

2009 2010 2011 2012 2013 2014 2015

『Korean Climate Change Assessment Report 2010』



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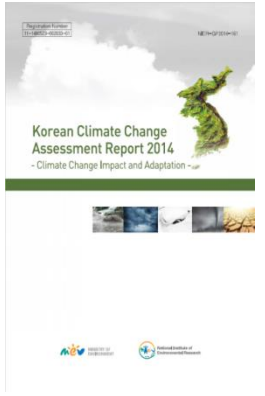
  - Part 1: Observation and prediction of climate change (6 chap.)
  - Part 2: Impacts, adaptation and vulnerability(8 chap.)
- Cited literature
  - Part 1: 1,003 Part 2: 732
- Participated author
  - Part 1: lead 12, contribute 27, review 7
  - Part 2: lead 7, contribute 25, review 34

『Korean Climate Change Assessment Report 2014』



- Contents
  - Part 1: The physical science basis (10 chap.)
  - Part 2: Climate change impact and adaptation (10 chap.)
- Cited literature
  - Part 1: ca 1,000 Part 2: ca 1,500
- Participated author
  - Part 1: lead 13, contribute 42, review 22
  - Part 2: lead 10, contribute 29, review 39

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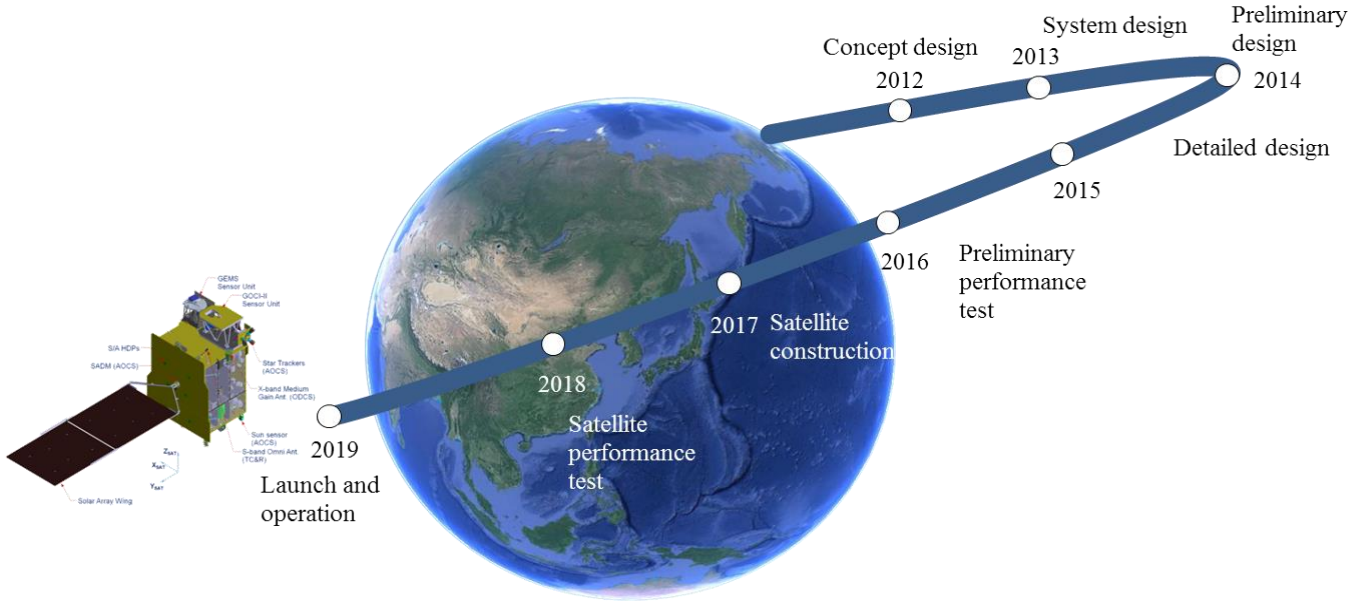
Climate Changes Monitoring

Progress of Geostationary Environment Monitoring Satellite

- National Institute of Environmental Research (NIER) is planning GEMS (Geostationary Environment Monitoring Spectrometer) program to be launched in 2019 onboard a GEO-KOMPSAT-2B (GEOstationary KOrea Multi-Purpose SATellite 2B)
- Air pollution (SLCPs : O_3, HCHO, Aerosol) with measurement of meteorological and oceanic variables will be monitored for better understanding of climate change and atmospheric environment



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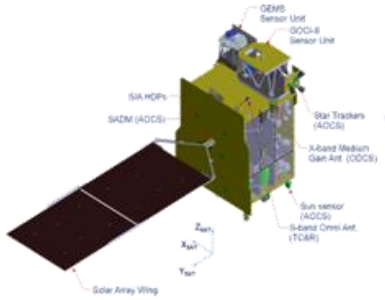
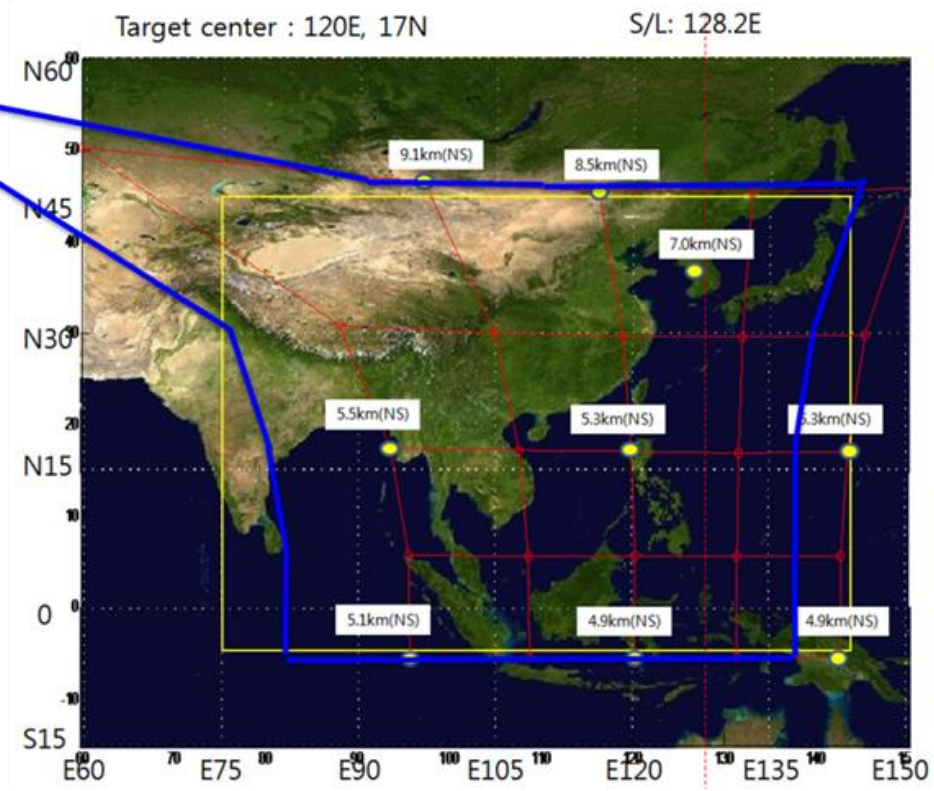
Coverage and Specification of GEMS





Targeted gases	O_3, SO_2, NO_2, HCHO, Aerosol
Lifetime	10 years
Spatial coverage	5,000 km × 5,000 km (5 ˚S - 45 ˚N, 75 ˚E - 145 ˚E)
Spatial resolution	Gas : 7 km × 8 km Aerosol : 3.5 km × 8 km
Spectral resolution	0.6 nm
Revisit Time	8 times/day (30min imaging + 30 min rest)
Wavelength	UV ~ VIS (300 ~ 500 nm)
Volume	1,050 mm × 1200 mm × 900 mm
Mass	160 kg
Power	200 W
Orbit	Geostationary orbit
Longitude	128 ˚E
Altitude	35,786 km

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Institutional Support for CC Adaptation Research

Korea Adaptation Center for Climate Change

- KACCC was established on July 1, 2009, based on MOE Instruction No. 850
- The items on the operation of KACCC was legalized by "the Clean Air Conservation Act" (revised on May, 2012)
- The center collaborates closely with the Ministry of Environment

Main roles of Ministry of Environment (KMOE)

- Make nationwide climate change adaptation policies development and implementation
- Establish and manage global and regional climate change adaptation networks
- Develop climate change vulnerability and risk assessment frameworks and tools
- Raise public awareness of climate change adaptation

Thank You