GHG Inventory System Training Workshop
Bangkok, Thailand

# Setting the National Cap
## (NDC and GHG Reduction Roadmap)
## : The Case of Korea

2018.9.12.

Jongchul Bang and Daewook Kim

Senior Researcher, GIR

# Contents

# Contents

# 1 Profile of the Republic of Korea

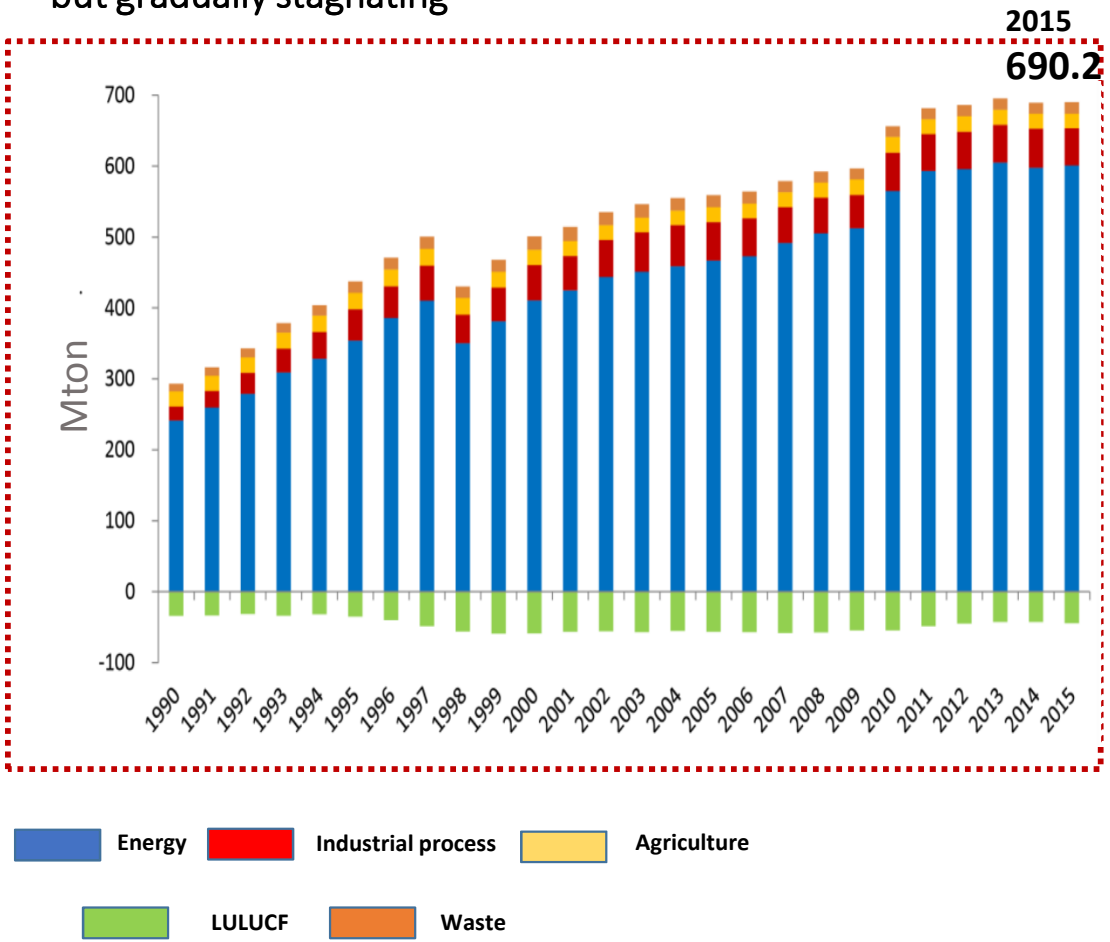

(picture: Ministry of Culture, Sports and Tourism)

- Total Area : 100,295 $km^2$ (ROK)
- Population : 50.8 million (current)
  (growth rate : 0.4%)

(source: Statistics Korea)

# 2 GHG Emission Trend of Korea

Korea's GHGs emission is on the rise,
but gradually stagnating




(source: National GHG Inventory Report 2017

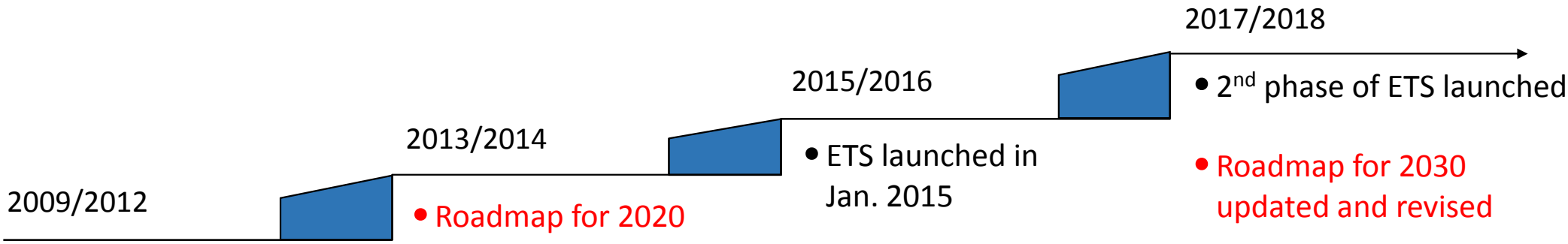
**6th largest emitter among OECD countries**
**7th largest emitter in the world**

**Korean NDC and its reduction target are "highly insufficient"**
**(Climate Action Tracker, 2017)**

**"Korea's current policy mix is unlikely to be sufficient to achieve its target"**
**(OECD, 2017)**

# Climate Policy Milestones and Framework

- Sustained progress in climate policy



**2009/2012**

- 'Low Carbon Green Growth Act' enacted
- 2020 National Reduction Target set *(30% from BAU)*
- 'Emission Trading Scheme Act' enacted

**2013/2014**

- Roadmap for 2020 established
- Formulation of 2nd 5-year National Strategic Plans for Low Carbon Green Growth

**2015/2016**

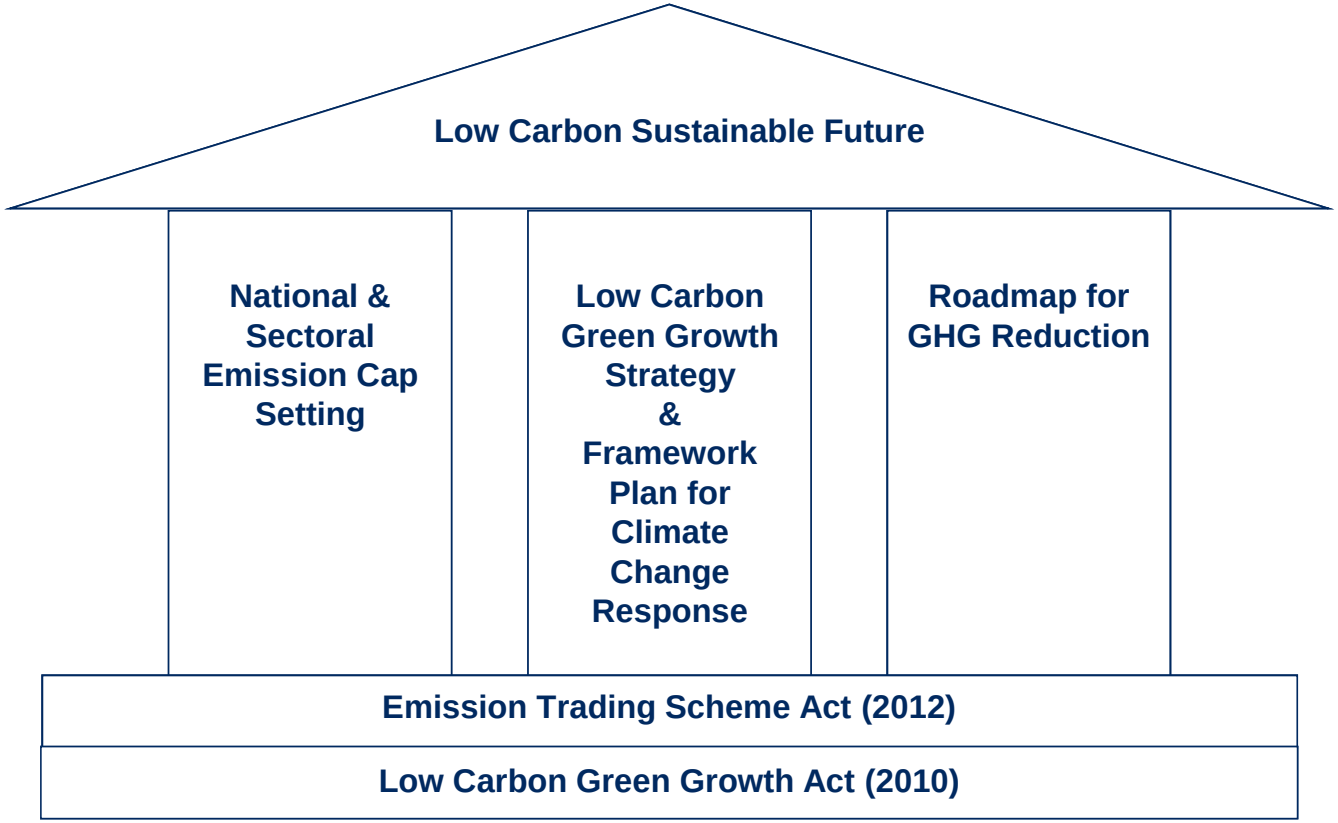
- ETS launched in Jan. 2015
- NDC for 2030 submitted *(37% from BAU)*
- Roadmap for 2030 established
- Formulation of Framework Plan for Climate Change Response

**2017/2018**

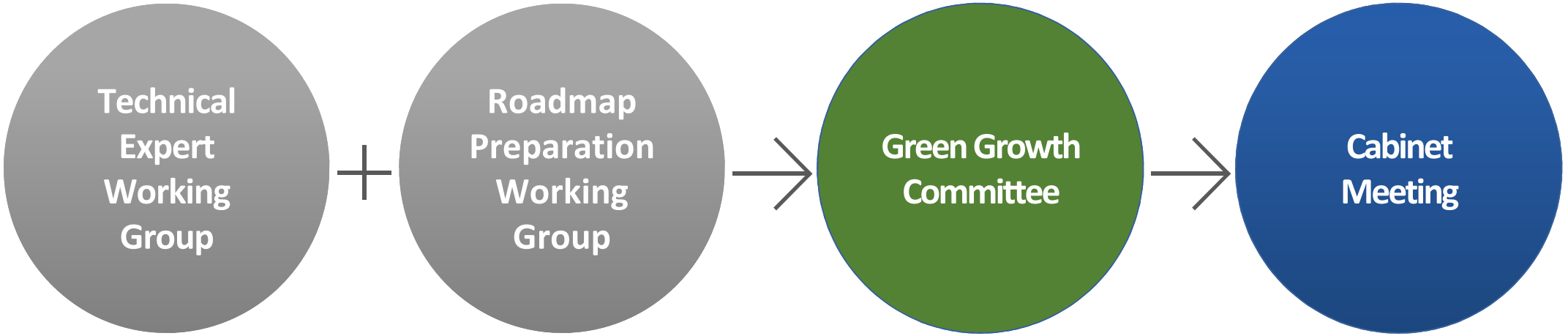
- 2nd phase of ETS launched
- Roadmap for 2030 updated and revised
- Framework Plan for Climate Change Response will be revised

# Climate Policy Milestones and Framework

- Climate policy supported by legal instruments and concrete implementation plans



# Workflow of National Emission Cap Setting




- Chaired by Head of GIR
- Preparation of Reference & Reduction Scenarios to Meet the National Emission Cap
- Modeling Analysis, Statistics, New Techs and Policies, Etcs.

- Chaired by D.G of MoE
- Finalization of Gov't Roadmap Based on the TEWG's Scenarios
- Debates b/n Relevant Ministries and Agencies

- Chaired by Chairman of GGC
- Review and Consultation on the Tentative Roadmap by Gov't

- Chaired by President
- Approval of the GHG Reduction Roadmap

# Workflow of National Emission Cap Setting

**Technical Expert Working Group**

- Chaired by Head of GIR
- Preparation of Reference & Reduction Scenarios to Meet the National Emission Cap
- Modeling Analysis, Statistics, New Techs and Policies, Etcs.

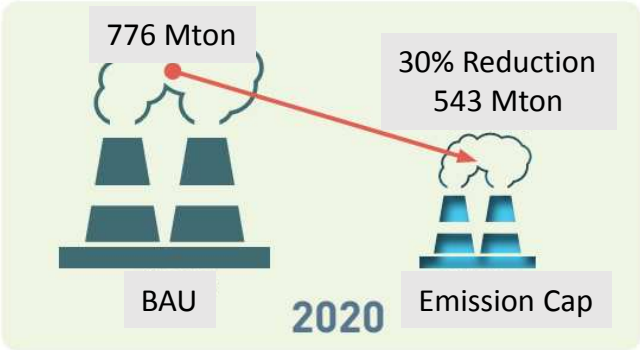
- 8 Sectors (+ LULUCF) are covered

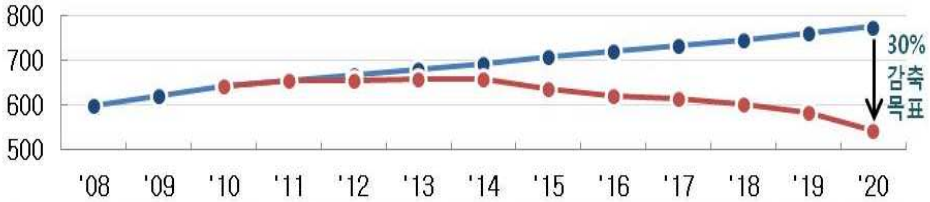
| | |
|---|---|
| - Transformation | : KEEI, KEA, KPX |
| - Industry | : KEEI, KEA, KIET |
| - Transport | : KOTI |
| - Building | : KICT |
| - Public | : KICT, KECO, KEA |
| - Agriculture | : KREI |
| - Waste | : KECO |
| - New Energy Ind. | : KIER, KETEP, KEEI, KEA |
| - LULUCF | : NIFOS, KOFPI |

- Nearly 20~30 experts from relevant institutes had participated in the WG
- Models – MESSAGE, TIMES, Self-developed Analysis Models

# Contents

# 1 2020 Mid-term GHG Reduction Target Setting


Total

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BAU(Mton) | - | - | 694.5 | 709.0 | 720.8 | 733.4 | 747.1 | 761.4 | 776.1 |
| Emission Cap(Mton) | - | - | 659.1 | 637.8 | 621.2 | 614.3 | 604.4 | 585.4 | 543.0 |
| Reduction Rate | 1.6% | 3.3% | 5.1% | 10.0% | 13.8% | 16.2% | 19.1% | 23.1% | 30.0% |

**Total**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 배출전망치[BAU] (백만톤$CO_2e$) | - | - | 694.5 | 709.0 | 720.8 | 733.4 | 747.1 | 761.4 | 776.1 |
| 목표배출량 (백만톤$CO_2e$) | - | - | 659.1 | 637.8 | 621.2 | 614.3 | 604.4 | 585.4 | 543.0 |
| 국가 감축률 | 1.6% | 3.3% | 5.1% | 10.0% | 13.8% | 16.2% | 19.1% | 23.1% | 30.0% |

**Industry**
- 배출권거래제 시행 → 1차('15~'17), 2차('18~'20)
- 연료대체(시멘트) → 유연탄 → 폐합성수지 ('12, 7.9% → '20, 30%)
- 폐열회수 설비 확대 → 철강,시멘트 폐열회수 설비 확대 → '20, 5,369천톤 $CO_2e$ 감축

**Transport**
- ITS 구축 → '13. 15.8%(9,763km) → '20. 25%(20,635km)
- 대중교통 인프라 확충 → 간선철도망 '20. 4,934km → 대중교통 수송부담률 '20. 60%
- 철도, 연안해운 → 철도 : '20. 18.5% → 연안해운 : '20. 21.2%

**Building**
- 에너지 절감 및 성능 향상 → 단열강화 : 주택('20. 30%), 건물('20. 25%)
- 가정 냉난방설비 및 열원 → 효율개선된 에어컨 보급 확대 ('15. 45% → '20. 80%)
- 그린리모델링 → 시범사업, 단열성능 개선 → 기존 건물 그린 리모델링 활성화

**Public**
- 공공 목표관리제 → 공공기관의 선도적 감축을 위한 제도 시행(778개 기관)
- 기존 및 신축건물 단열강화 → 단열 강화 건축물 보급(신규 : '20. 100%, 기존 '20. 60%)
- 전동기 효율 개선 → 전동기 효율 개선율 ('15. 11.0% → '20. 12.2%) 향상

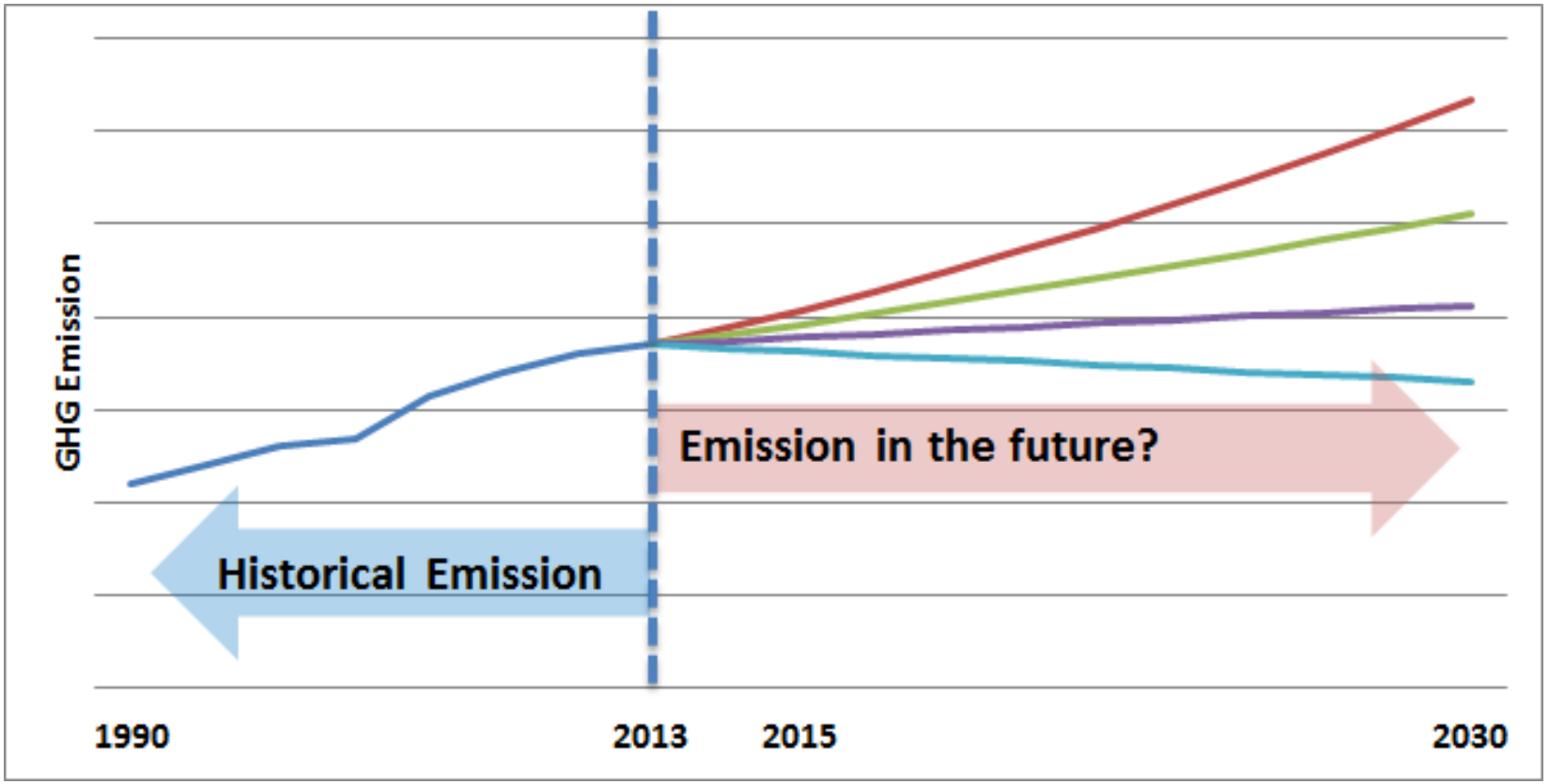
**Agriculture**
- 논물 관리 → 논 간단관개 면적 확대 ('13. 86% → '20. 90%)
- 화학비료 절감 → 화학비료 사용량 절감 ('13. 225kg/ha → '20. 188kg/ha)
- 가축분뇨 처리시설 → 에너지화 시설('20. 30개소), 자원화 시설('20. 180개소)

**Waste**
- 폐기물에너지화 → 유기성 폐기물 에너지화('12. 5.8% → '20. 44%)
- 폐기물에너지화 → 가연성 폐기물 에너지화 ('12. 1.8% → '20. 90%)
- 생활폐기물 감량 → 전자제품 재활용 확대 → 연도별 감량 목표('15~'20. 5%)

**Transformation**
- 신재생E 보급 → RPS제도 안착화로 신재생 발전 비중 '12(2.3%) → '20(7.2%)
- 지능형수요관리확대 → 스마트 그리드 : R&D 및 실증사업, '20(3.9%), 9.6백만 톤
- 지능형수요관리확대 → EMS 도입 : 대규모 공장 및 건물 설치, 新 시장창출

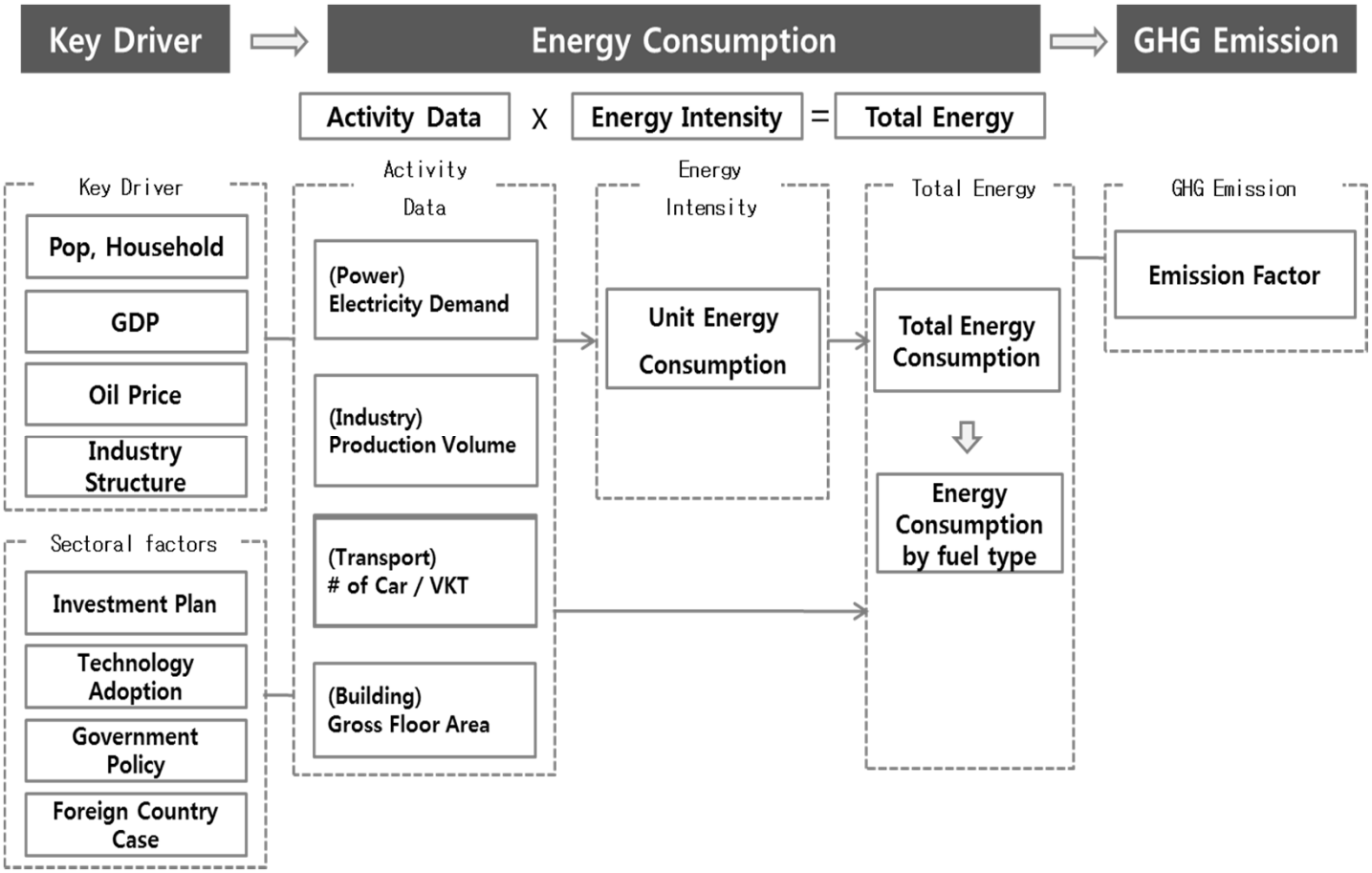
# Post-2020 GHG Reduction Target Setting - NDC

- Reference Scenario Emission Projection



# Post-2020 GHG Reduction Target Setting - NDC

- Schematic Diagram of Emission Projection Model



# Post-2020 GHG Reduction Target Setting - NDC

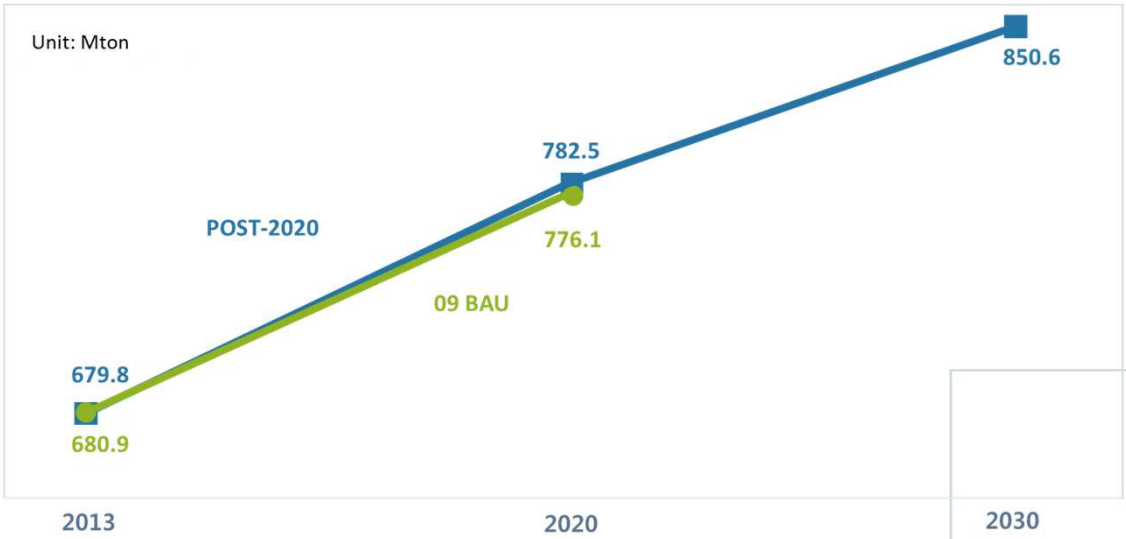
## Key Assumptions for Emission Projection

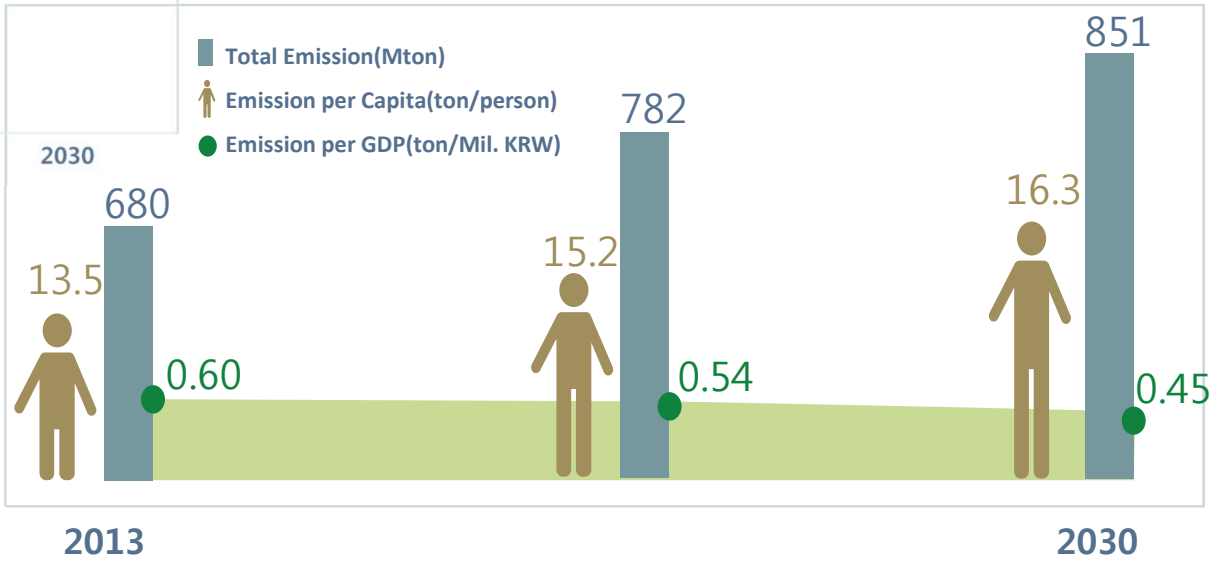
- **GDP** — 3.08% increase per year (KDI, ’13)
- **Pop** — 0.23% increase per year (Statistics Korea, ’11)
- **Oil Price** — 1.28% increase per year (IEA, ’12)
- **Shr of Mfc** — Increase to 36.1% by 2030 (KIET, ’13)

| | 2013 | 2020 | 2030 | Annual Growth(’13~’30) |
|---|---|---|---|---|
| GDP(Tril $) | 1,133 | 1,447 | 1,898 | 3.08% |
| Pop(Mil) | 50.2 | 51.4 | 52.2 | 0.23% |
| Oil Price(Dubai, $/bbl) | 109.7 | 123.7 | 136.1 | 1.28% |
| Shr of Mfc(%) | 32.9 | 35.0 | 36.1 | - |

# Post-2020 GHG Reduction Target Setting - NDC

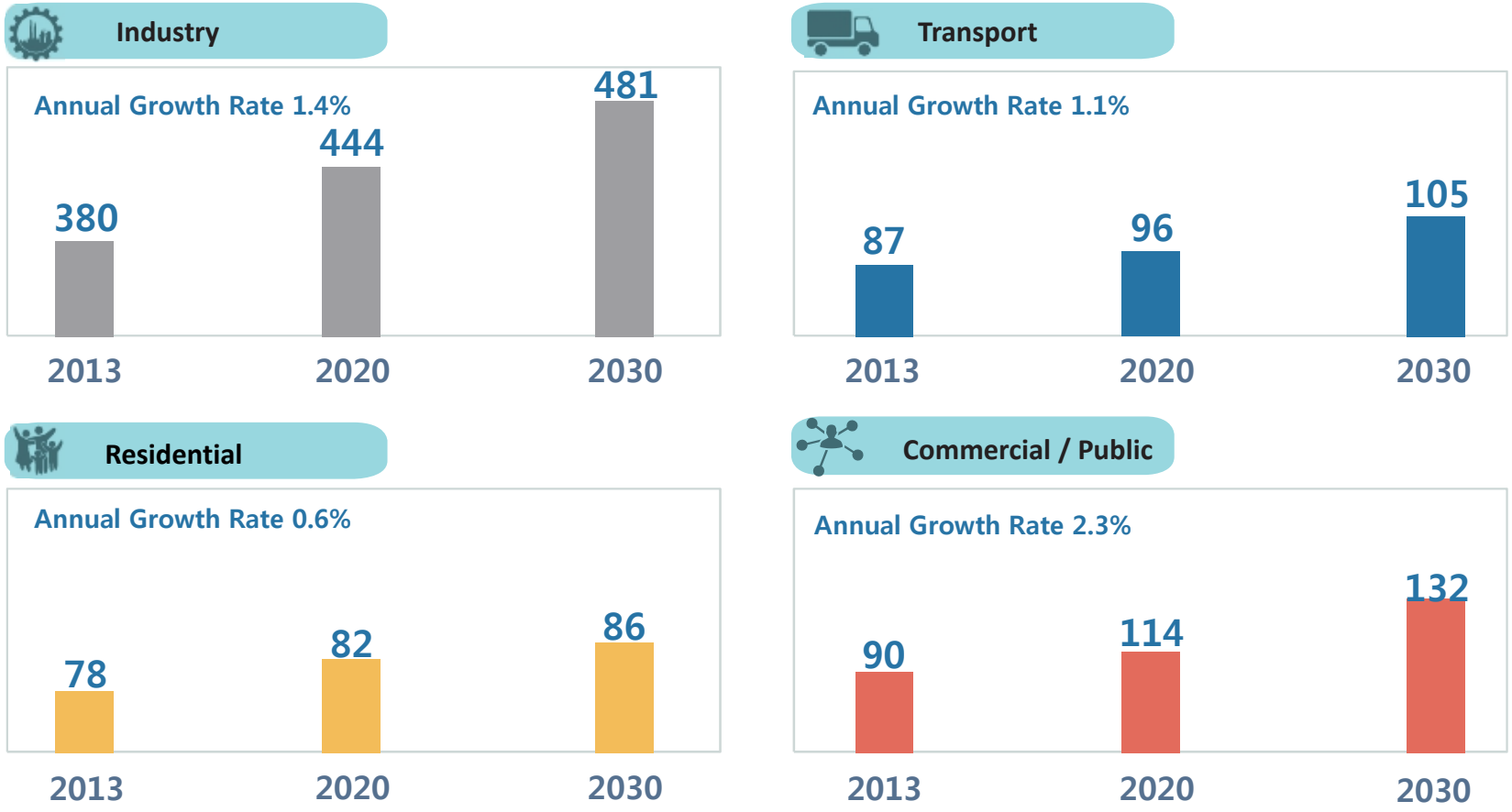
- Reference Scenario Emission Projection - Results



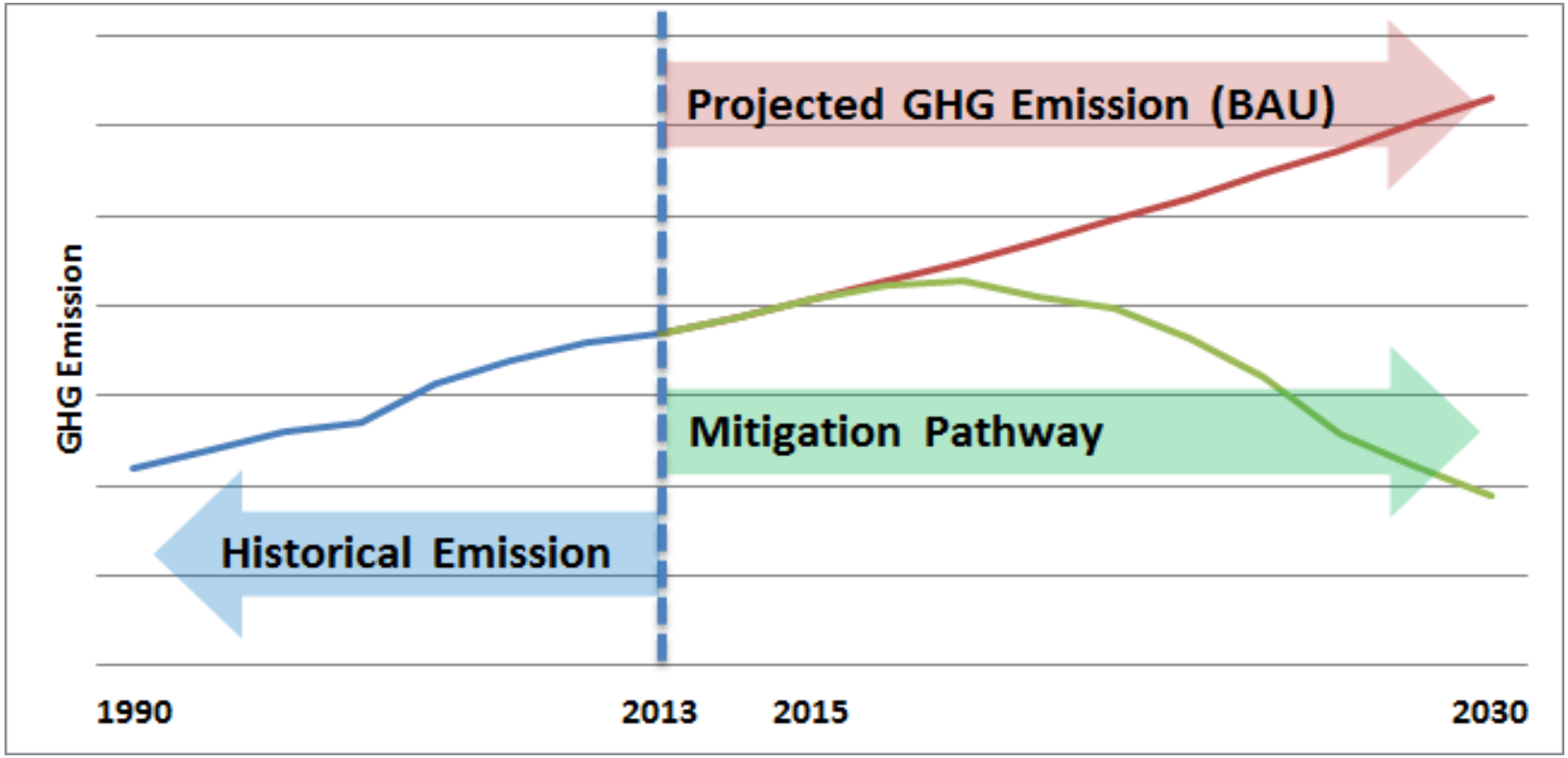
# Post-2020 GHG Reduction Target Setting - NDC

- Reference Scenario Emission Projection - Results



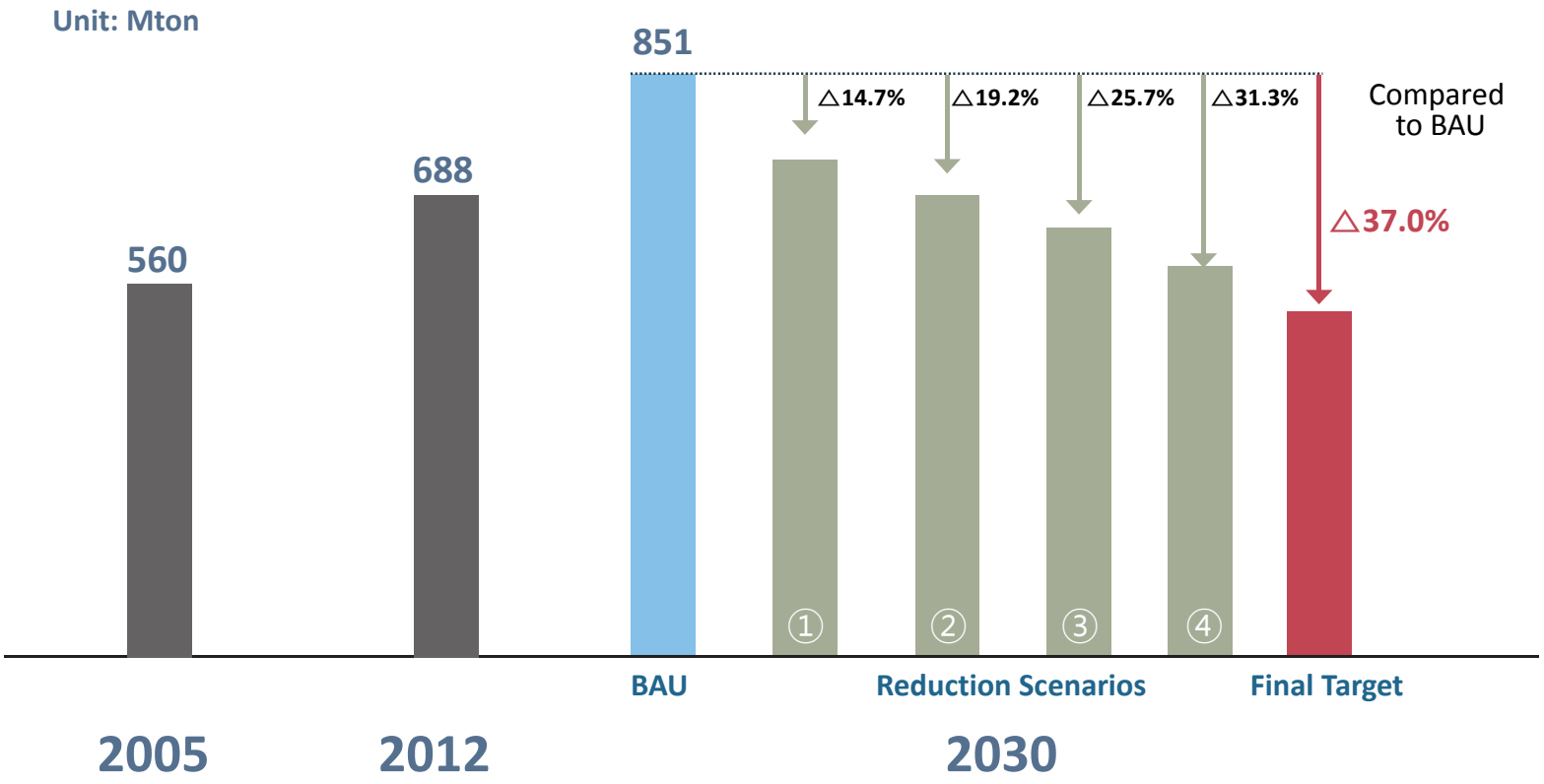
# Post-2020 GHG Reduction Target Setting - NDC

- Deriving GHG Reduction Potential



# Post-2020 GHG Reduction Target Setting - NDC

- Deriving GHG Reduction Potential – Scenario Analysis



# Post-2020 GHG Reduction Target Setting - NDC

## Nationally Determined Contribution of Korea

| | |
|---|---|
| Baseline | ($MtCO_2eq$)<br>Year: 2020 / 2025 / 2030<br>BAU: 782.5 / 809.7 / 850.6<br>The scenario is based on the BAU projection of KEEI-EGMS (the Korea Energy Economics Institute Energy and GHG Modeling System), taking into account projections for key economic variables, including population, GDP, industrial structure and oil price. |
| Reduction Level | Emission reduction by 37% from the BAU level by 2030 |
| Coverage | Economy-wide |
| Sectors | Energy, industrial processes and product use, agriculture and waste (A decision on whether to include land use, land-use change and forestry (LULUCF) will be made at a later stage.) |

| | |
|---|---|
| Gases | • Carbon Dioxide ($CO_2$)<br>• Methane ($CH_4$)<br>• Nitrous Oxide ($N_2O$)<br>• Hydrofluorocarbons (HFCs)<br>• Perfluorocarbons (PFCs)<br>• Sulphur hexafluoride ($SF_6$) |
| Metric | Global Warming Potential (GWP) values from the IPCC Second Assessment Report (1995) used to calculate $CO_2$ equivalents |
| Inventory Methodology | • Consistent with methodologies used in Korea's Biennial Update Report (BUR) submitted in December 2014<br>• 1996 IPCC Guidelines used in general to calculate greenhouse gas emissions and sinks<br>• 2006 IPCC Guidelines used to calculate greenhouse gas emissions from rice cultivation in agriculture (4C) and other waste (6D) |
| International Market Mechanism | Korea will partly use carbon credits from international market mechanisms to achieve its 2030 mitigation target, in accordance with relevant rules and standards. |
| Land Sector | In assessment of mitigation performance, a decision will be made at a later stage on whether to include greenhouse gas emissions and sinks of the land sector as well as the method for doing so. |

# Post-2020 GHG Reduction Target Setting - NDC

- Responses from Stakeholder groups – Environment NGOs


- Gov't withdraw Mid-term GHG Reduction Target by 2020
- GHG Reduction using IMM accounts for nearly 30% of total Reduction
- Reduction Rates of Industry is too low, considering "Polluter Pays Principle"

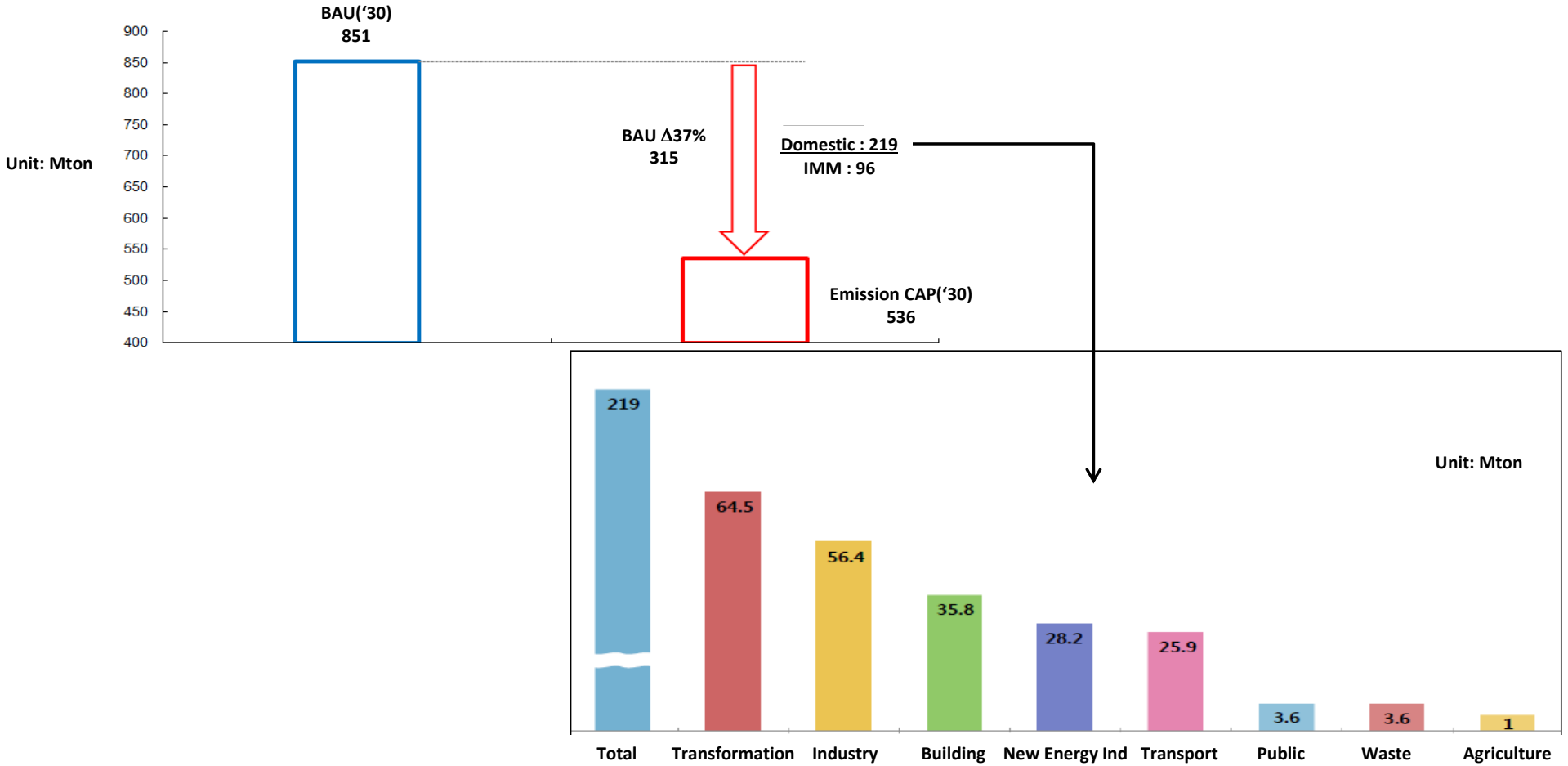
# Post-2020 GHG Reduction Target Setting - NDC

- Responses from Stakeholder groups – Business Associations


- Reduction Target did not Reflect the Economic Reality of Korea
- Might Give a Negative Impact on Nation's Economic Growth Rate

# Preparation of 2030 GHG Reduction Roadmap

- Setting Sectoral Reduction Target by 2030



# Preparation of 2030 GHG Reduction Roadmap

- Setting Sectoral Reduction Target by 2030 – Key Measures

**Transformation**

: Enhancing Low-Carbon Power Generation Mix

: Reducing Transmission/Distribution Loss Rate

**Industry**

: Improving Energy Efficiency

: Reducing usage of F-gases

**Transport**

: Strengthening of Vehicle Fuel Efficiency and Distribution of Green Vehicles

: Expanding the Operation of Public Transportation

**Building**

: Strengthening of Building Energy Performance Standards

: Zero Energy Building and Green Remodeling

**New Energy Industry**

: CCUS, ESS, Micro-grid, Smart Factory, Etcs

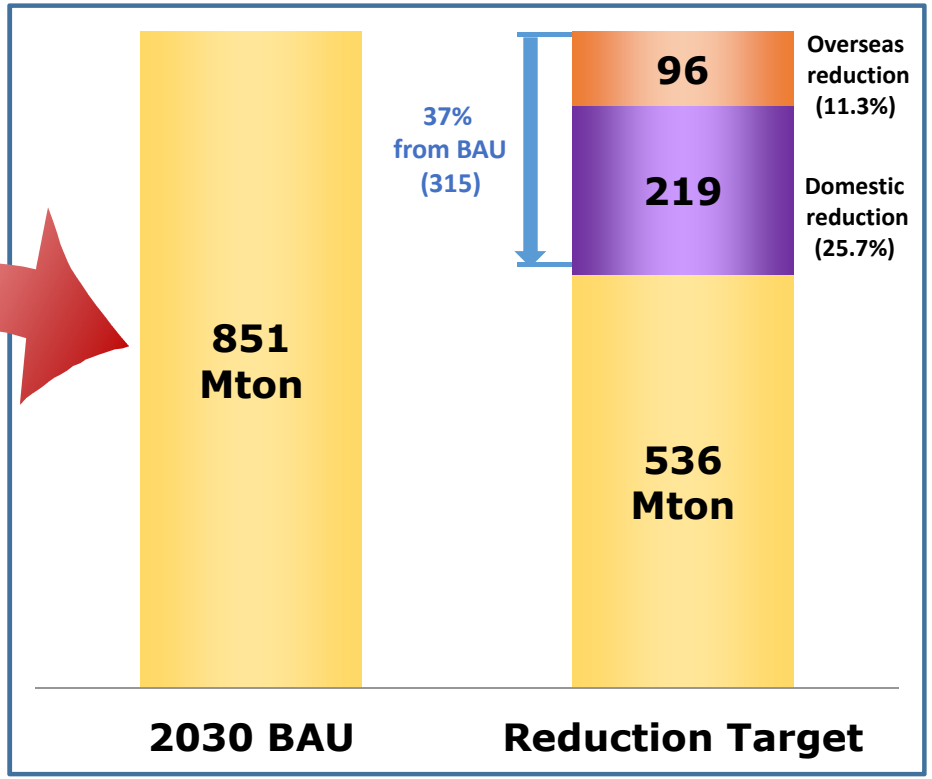
# Contents

# 1 Need for Roadmap Revision

## "Paris Agreement"

Holding the increase in the global temperature well below 2°C above pre- industrial levels
Pursuing efforts to limit the increase to 1.5°C above pre-industrial levels
(As of 2018, 196 parties participating)

To support the Paris Agreement,
**Korea** announced its national reduction target (June, 2015)
which is **to reduce 37% from BAU* level,**
followed by emission reduction roadmap (Dec. 2016).



# 1 Need for Roadmap Revision

## To give clear & concrete policy signal

- setting low-carbon path for companies' long-term investment plan (missing in current roadmap)

## To align the roadmap with major policy changes

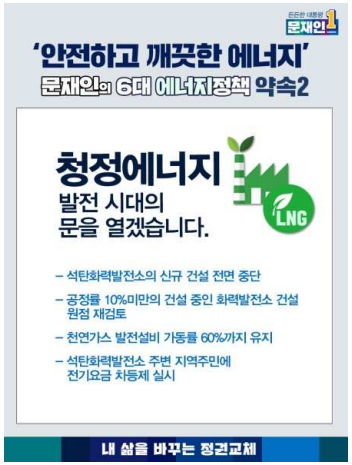
- maintaining coherence among newly introduced energy transition plans (e.g.RE 3020) and air quality policies (e.g. fine dust management plan)

## To enhance national credibility

- listening to criticism from international community and civil society in Korea
- enhancing national reduction policy

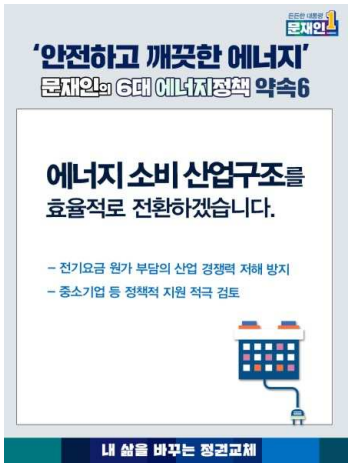
# Need for Roadmap Revision



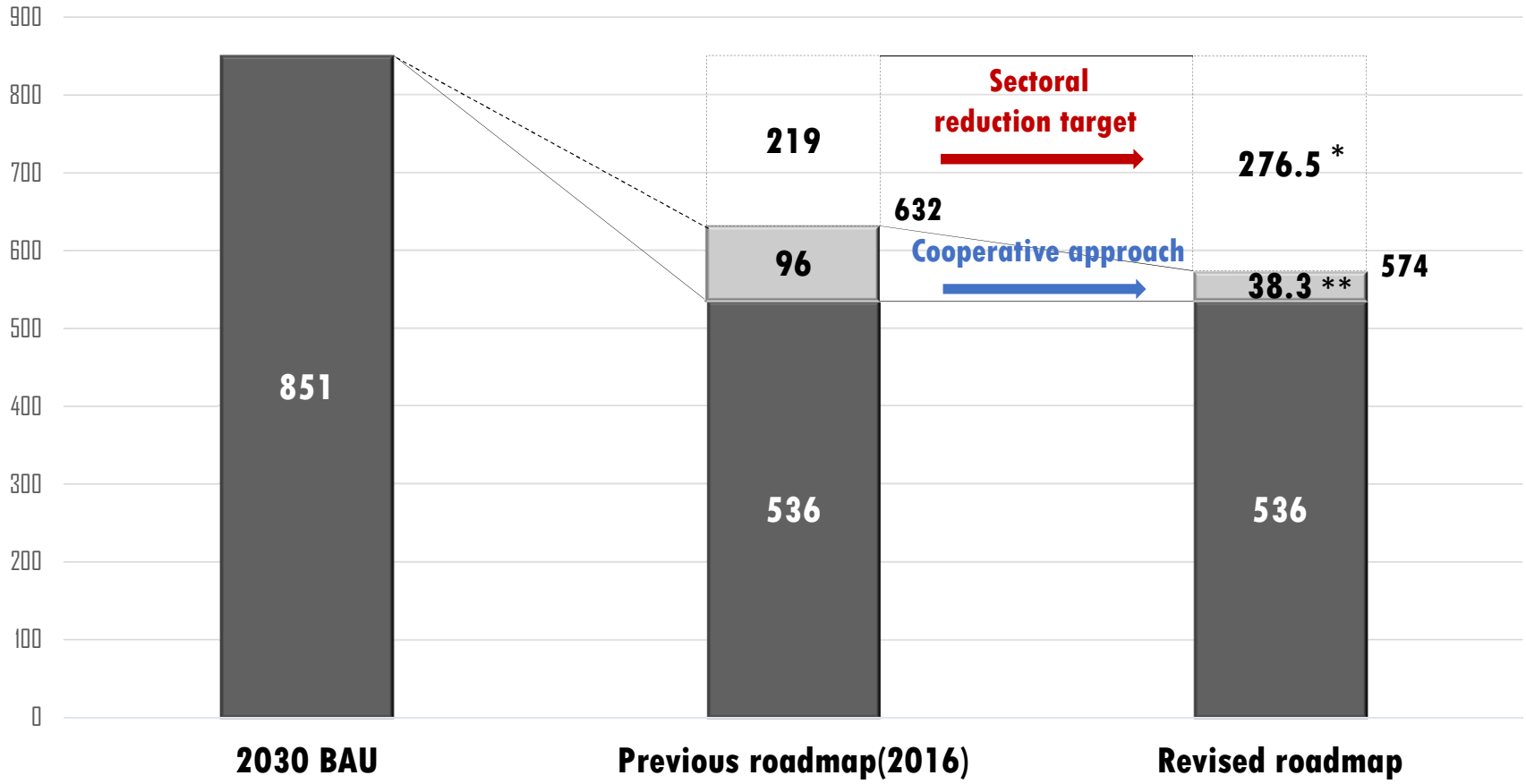








# Revised Roadmap Target (2018-2030)




* Final reduction plan for energy sector will be determined by 2020, the year for submitting revised NDCs (if necessary) to the UN.

** This target is subject to change depending on the result of Paris Agreement implementation negotiations.

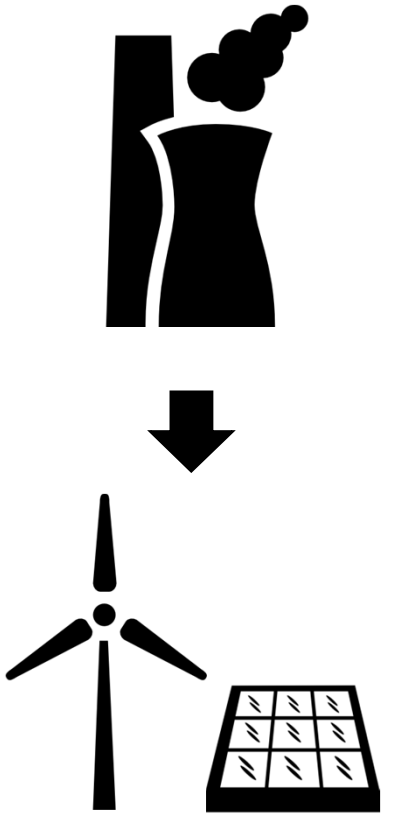
# 1. Energy

## Improve power generation infrastructure

- **shut down** 10 **old coal plants** by ’22 & **replace** 6 coal plants with **LNG** plants
- **stop** constructing new **coal** plants and **nuclear** power plants
  (LNG and hydraulic power to be used for new power sources)
- **retrofit** old coal plants in greater numbers

## Enhance low-carbon energy mix

- promote **renewable energy** (up to 20% by 2030) * previously 11%
- **shut down coal plants** from March to June (fine dust season)
- introduce **Environmental Dispatch**
  : include environmental & social costs in dispatch process
  * previously, fuel expenses and operating expenses were considered mainly



**Reduction : 57.8 Mton**

## 2. Industry

**Improve energy efficiency of industrial equipment**
: introduce the certification system for highly energy efficient equipment

**Introduce Factory Energy Management System (FEMS)**
: to be introduced to large-scale factories with policy incentives

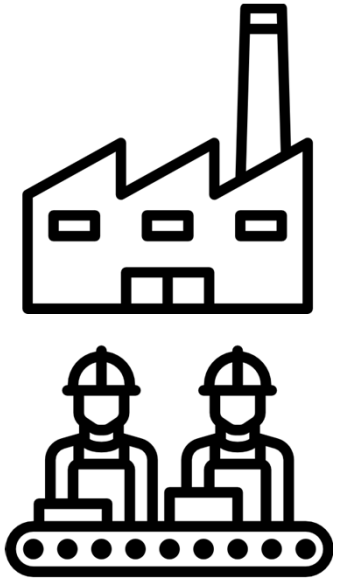
**Streamline factory facilities to improve energy efficiency**

**Develop new & innovative technologies to create added values**

**Develop eco-friendly gas for processes that will replace refrigerant**
: expand best practice technologies to entire industry by 2030

**Replace conventional power sources with low-carbon fuels** (LNG, biomass, etc.)

**Use waste heat and wastes**
: introduce more facilities using waste heat to produce steam



**Reduction : 98.5 Mton**

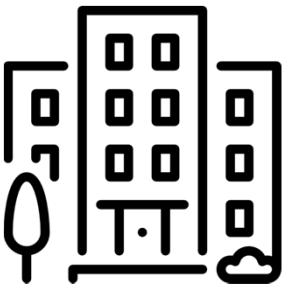
## 3. Buildings & Homes

**Enhance energy efficiency standard**

- tighten building energy standards on insulation
- amend relevant laws for certifying zero-energy buildings

**Upgrade existing buildings and homes' energy efficiency**

- require energy-intensive public buildings to change into green buildings
- establish mid-to long-term plan for green remodeling
- support planning and financing for retrofitting old buildings in private sector



**Introduce energy information system and change consumption pattern**

- develop customized energy saving service
- develop and monitor Building Energy Management System (BEMS)

**Reduction : 64.5 Mton**

## 4. Transportation

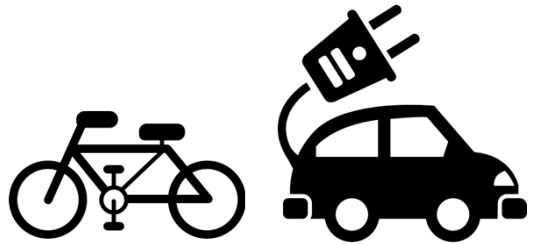
**Promote low-carbon vehicles** (incl. public transportation e.g electric bus, fuel-cell bus)
* up to 3 million EVs by 2030, tighten greenhouse gas emission standards

**Upgrade energy efficiency in marine transportation**

**Improve public transportation service**
+ expand inner and inter-city railways, BRT and improve transit system

**Promote eco-driving**

**Expand low-carbon logistics**
+ e.g. modal shift from road to railway



**Reduction : 30.8 Mton**

# Reduction Plans

## 5. Waste

**Reduction : 4.5 Mton**

waste reduction and recycling, minimize landfill,  methan capture and use

## 6. Public sector

**Reduction : 5.3 Mton**

enhance energy saving target, replace with LED lighting, promote renewable energy

## 7. Agriculture

**Reduction : 1.6 Mton**

encourage low-carbon irrigation, low-methane feed

## 8. CCUS

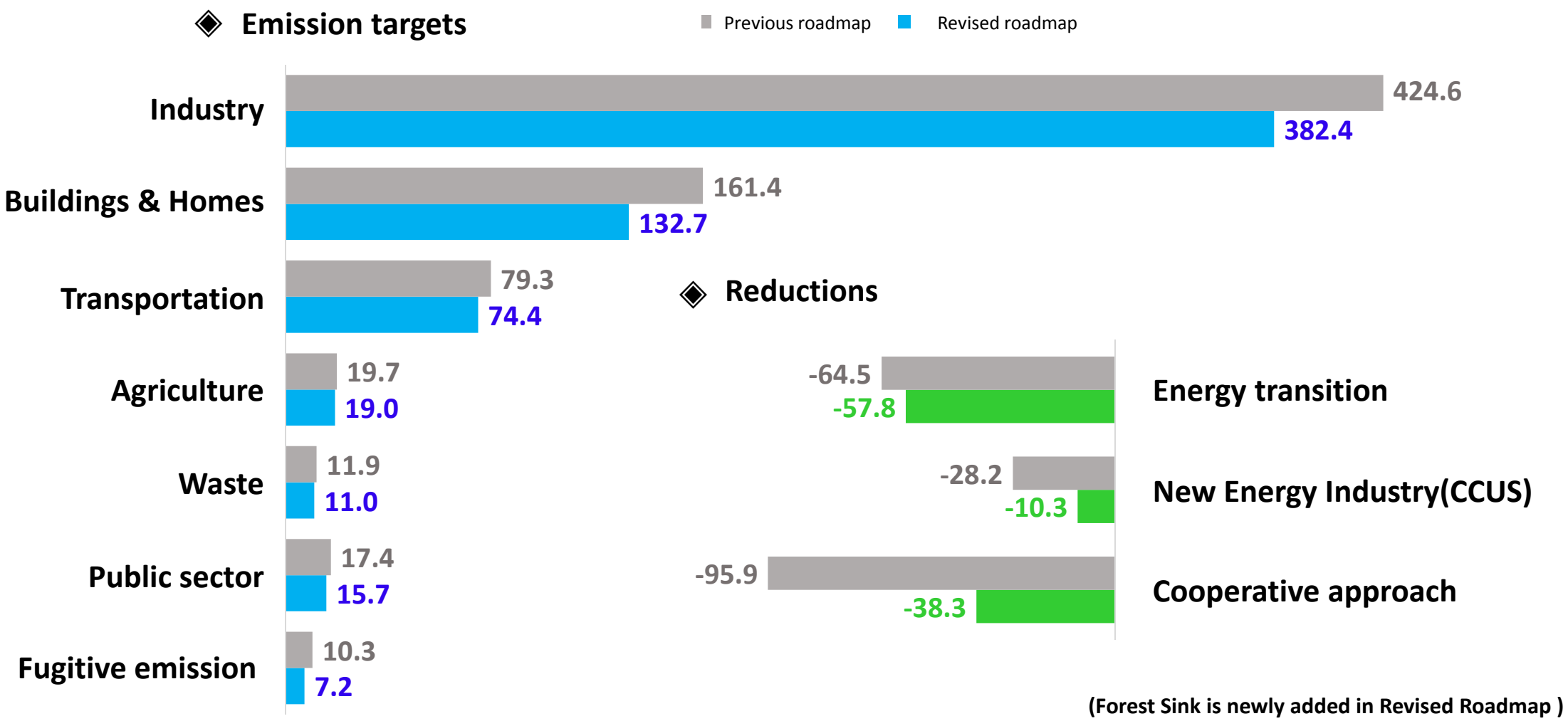
**Reduction : 10.3 Mton**

early commercialization by promoting R&D and public-private pilot projects

**∴ Total reduction : 276.5 million ton**

# 4 Comparison of Roadmap

(unit : million ton)




(Forest Sink is newly added in Revised Roadmap )

# Next Steps

**To continuously improve and revise** the roadmap before submitting the revised **NDC by 2020** to be fully ready for post-2020 climate regime

- **Revise the framework plan for climate change response** (by Dec. 2018)

**Connect implementation with evaluation**

- review sectoral strategies, mitigation tools and policies
- establish an evaluation system for national reduction implementation
- develop evaluation indicators to see if sectoral strategies are implemented

**Provide support for industries with tightened domestic reduction target**

# Next Steps

**To continuously improve and revise** the roadmap before submitting the revised **NDC by 2020** to be fully ready for post-2020 climate regime

- **Revise Enforcement Decree of the Framework Act on Low-carbon, Green Growth** (Dec. 2019)

  * To **change target-setting method**
  from **relative target** of *"37% reduction from BAU level by 2030"*
  to **absolute target** of *"536 Mtons of emission after reduction"*

- **Establish 2050 low-carbon development strategy and revise & submit NDC by 2020**

  * Confirm extra reduction potential allocated to transitional sector
  before submitting the revised NDC

# Thank you-!

clinky@korea.kr

Greenhouse Gas Inventory & Research Center of Korea
GHG Mitigation Research Team

http://www.gir.go.kr