

# Low Carbon Development Strategy and Cities

Gwangzhou

2019.01.24.

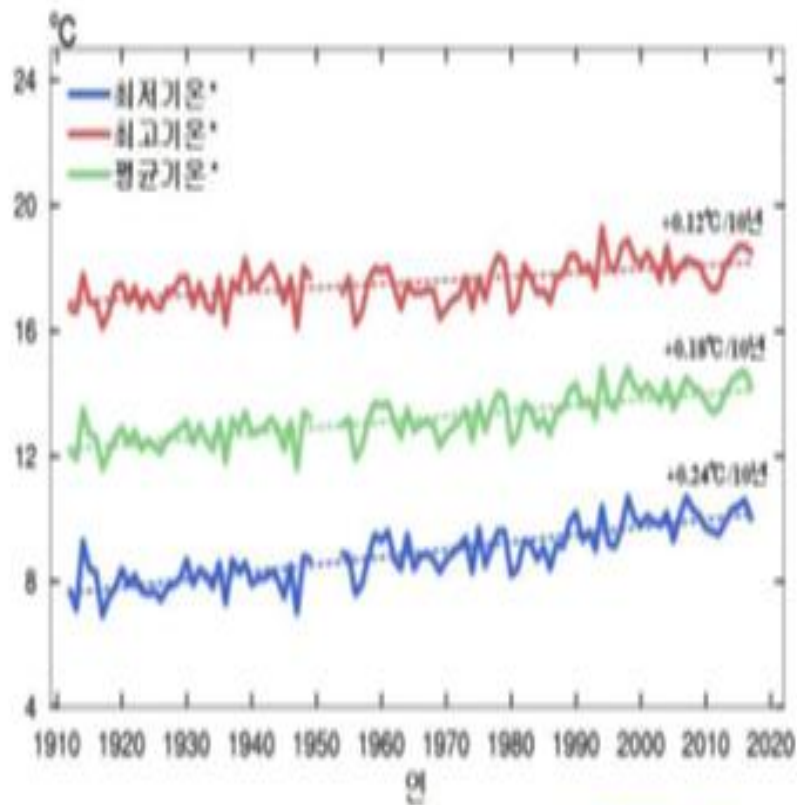
Dr. Sang In KANG(sikang@kei.re.kr)

# Contents

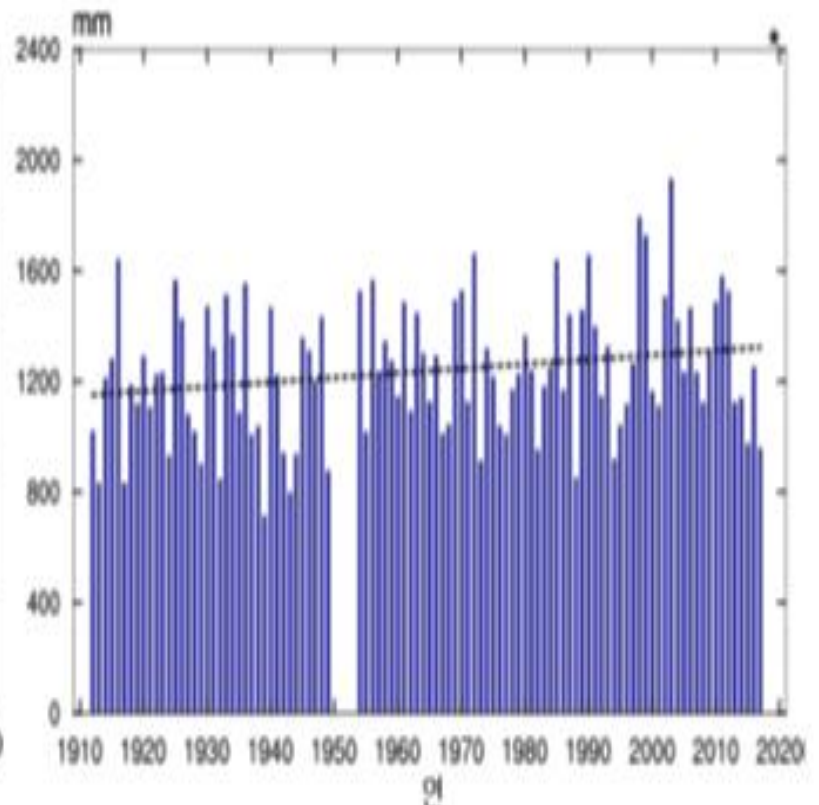
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- I. **Major Trends**
- II. **Low Carbon Actions: National and Local**
- III. **Challenges**

## 1. Major Trend \_ changes

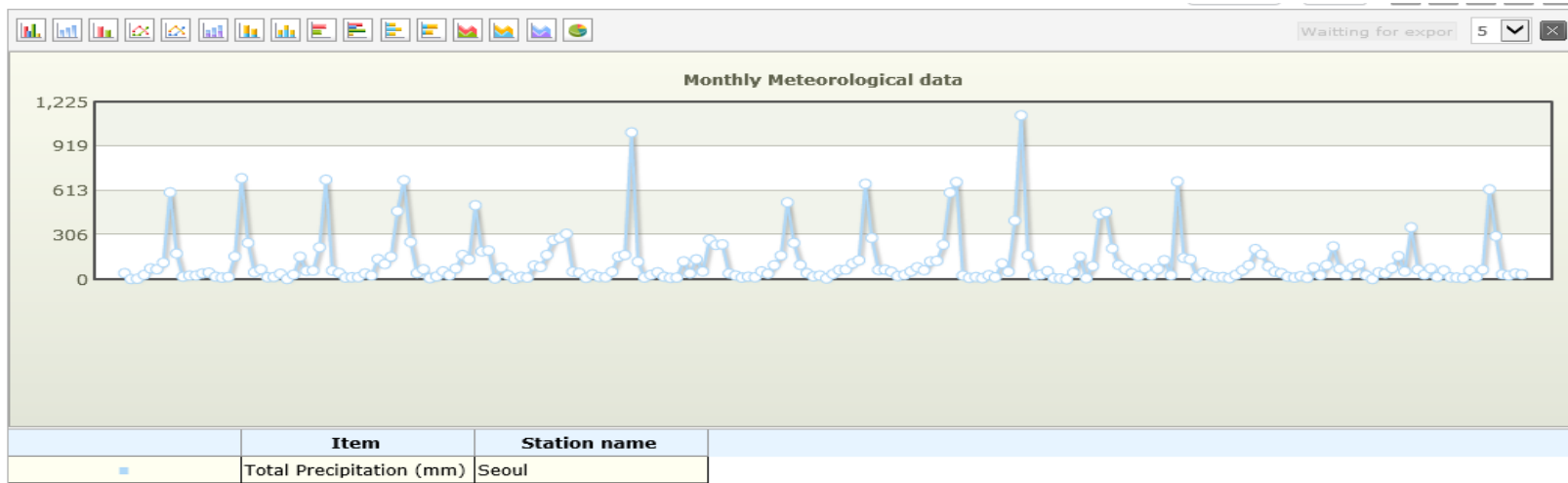
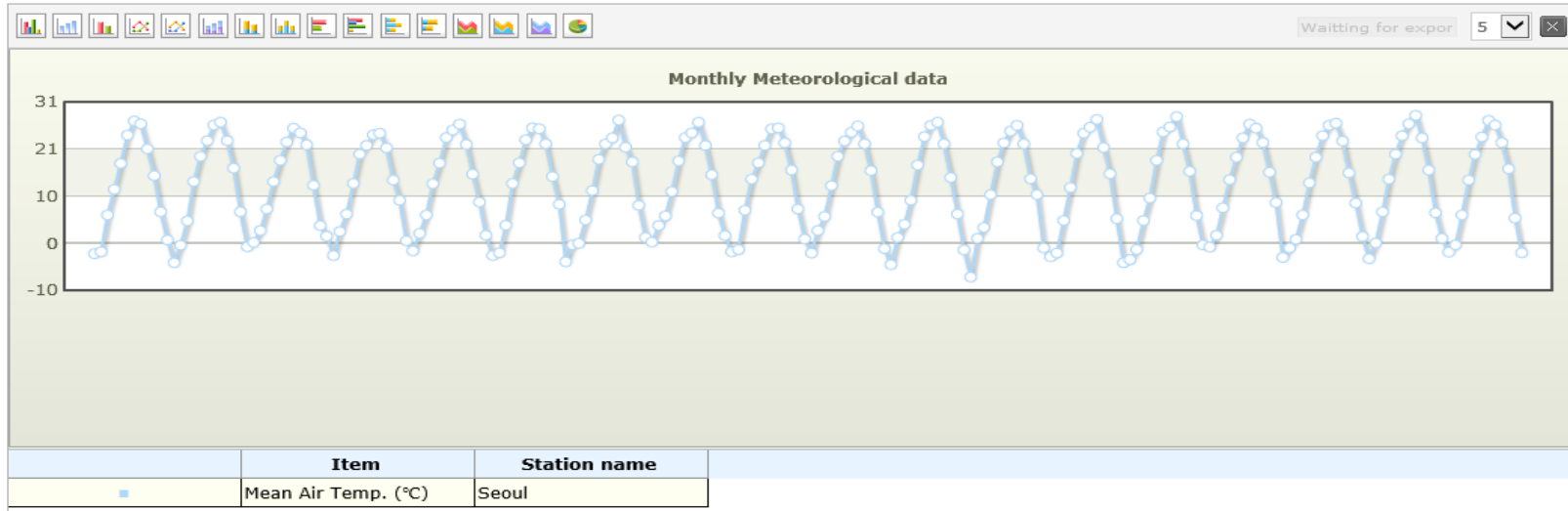


annual temperature (max, average, min, 1912~2017)

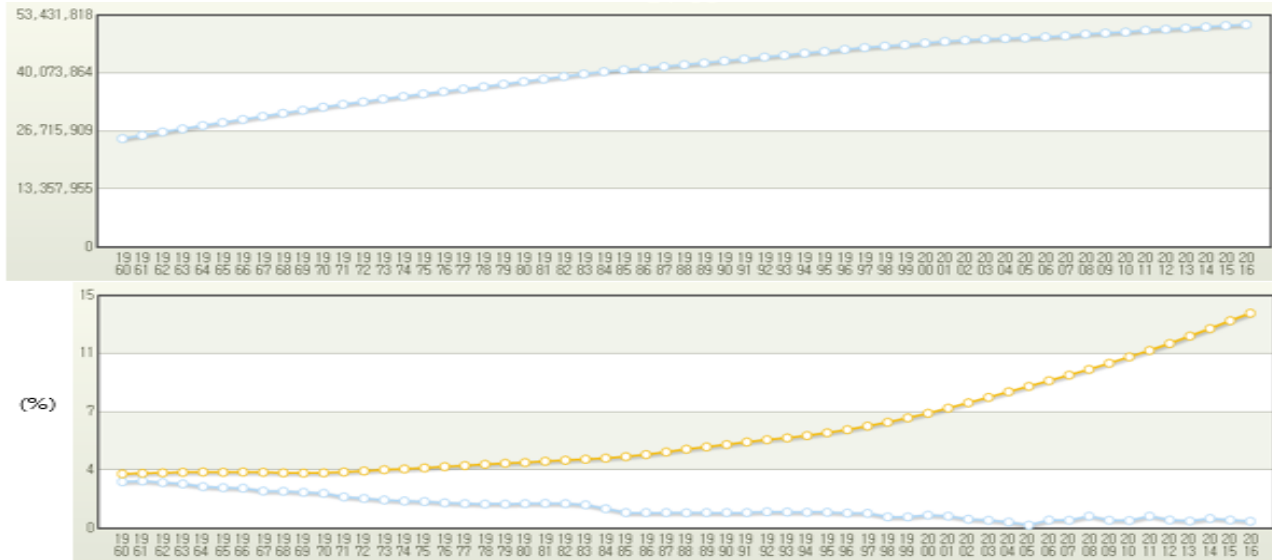


annual precipitation (1912~2017)

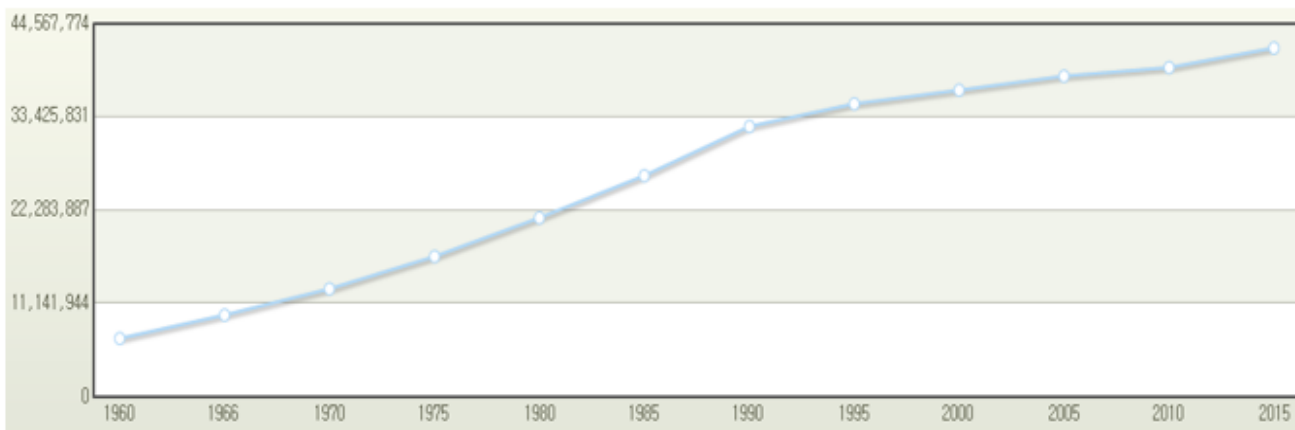
# Mean Temperature and Precipitation 2000~2017



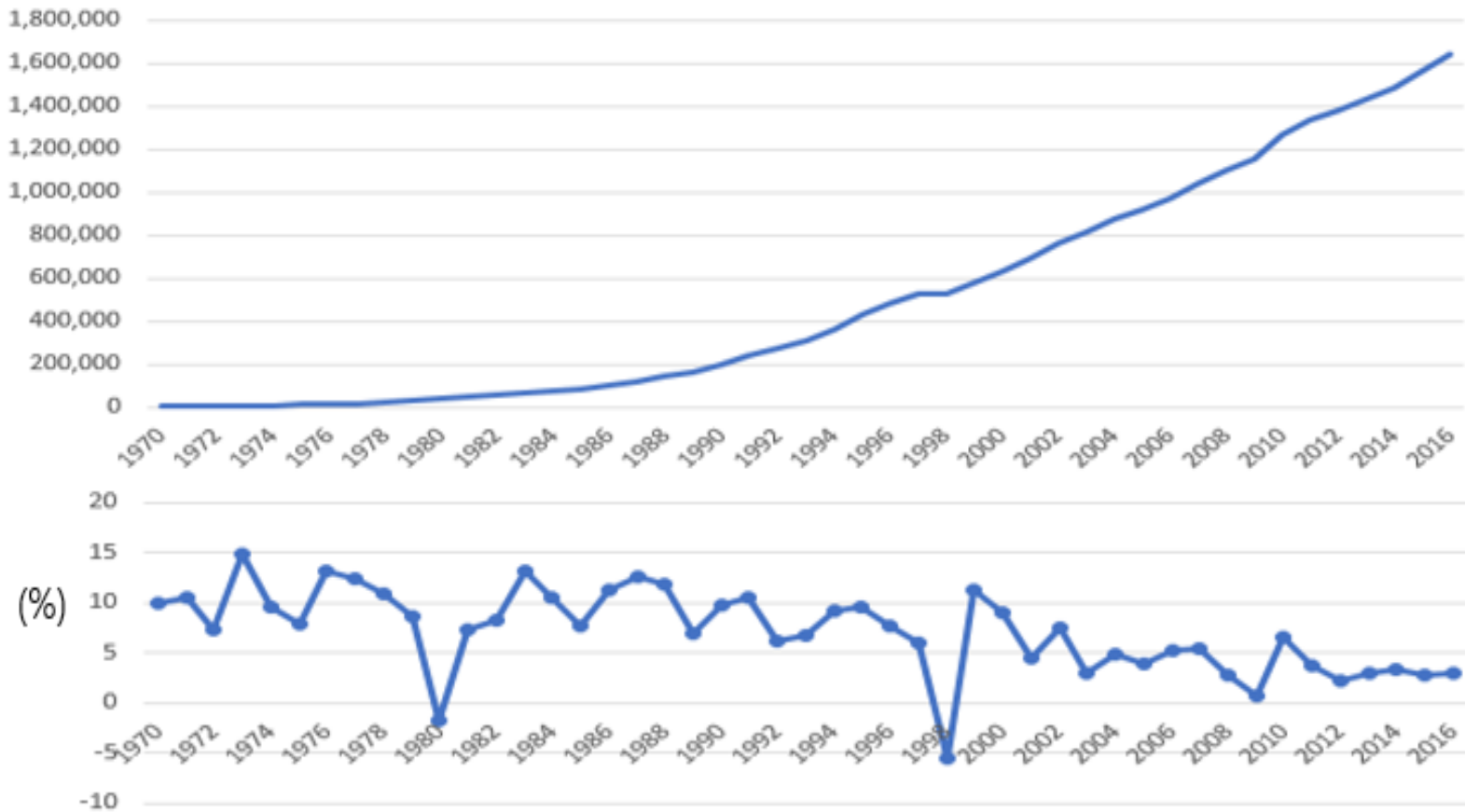
## 1. Major Trend \_ driving forces



Population Demographics (total population, population share over 65 years old, population growth rate, 1960~2016, KOSIS)

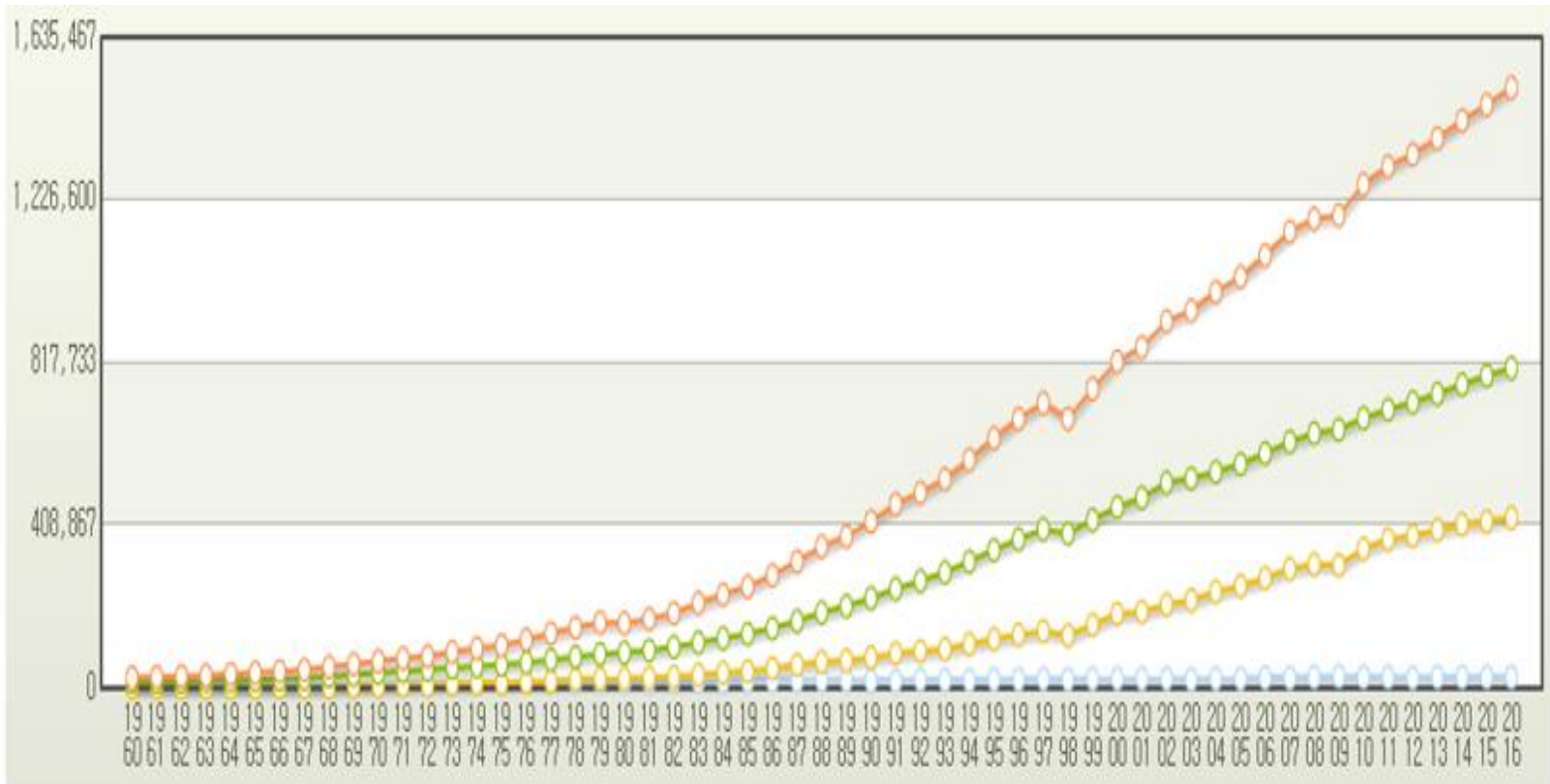


Urban Population (1960~2015, KOSIS)



Nominal GDP(billion Korean won), Real GDP Growth (%), (1970~2016, Bank of Korea)

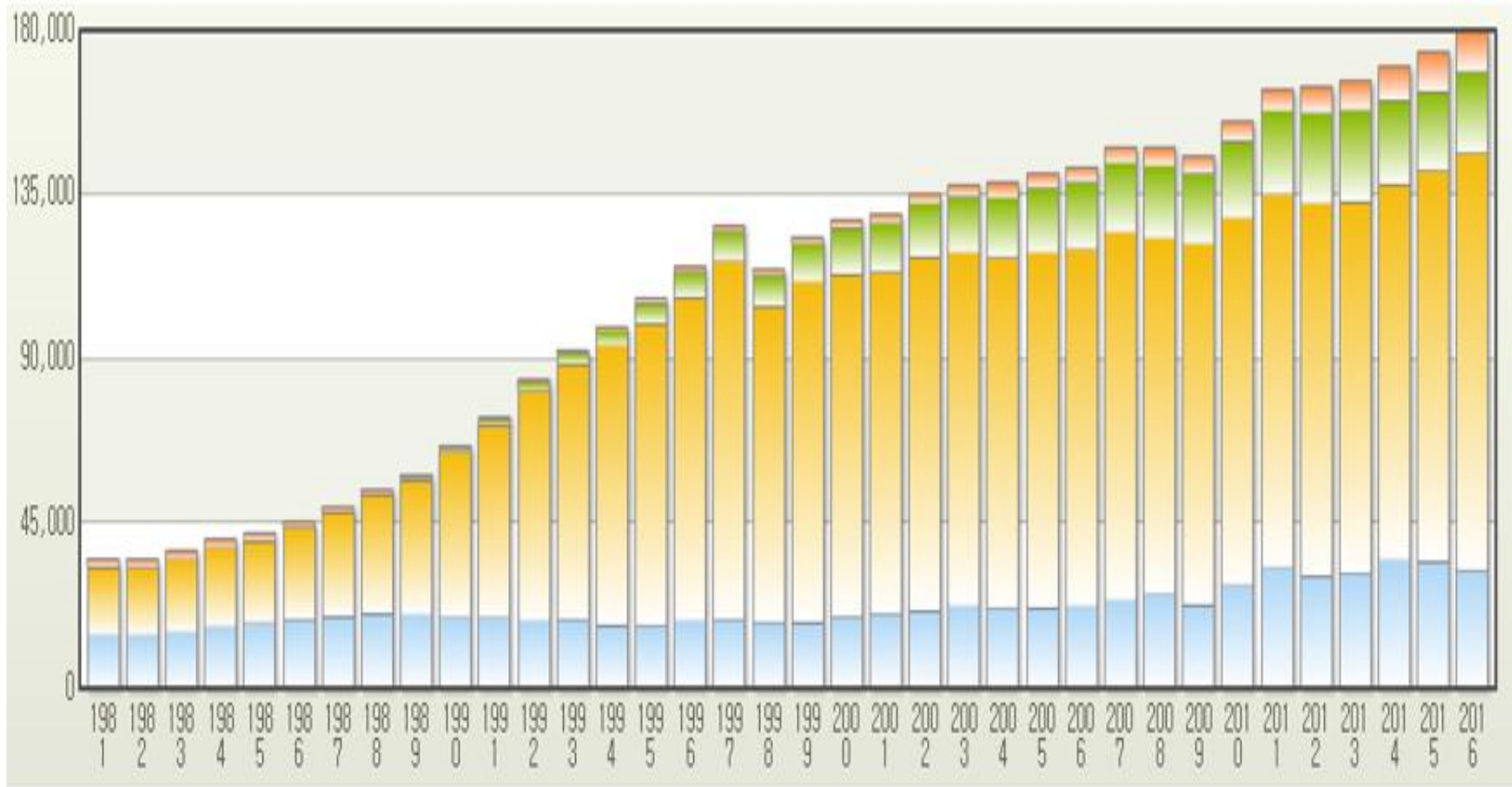




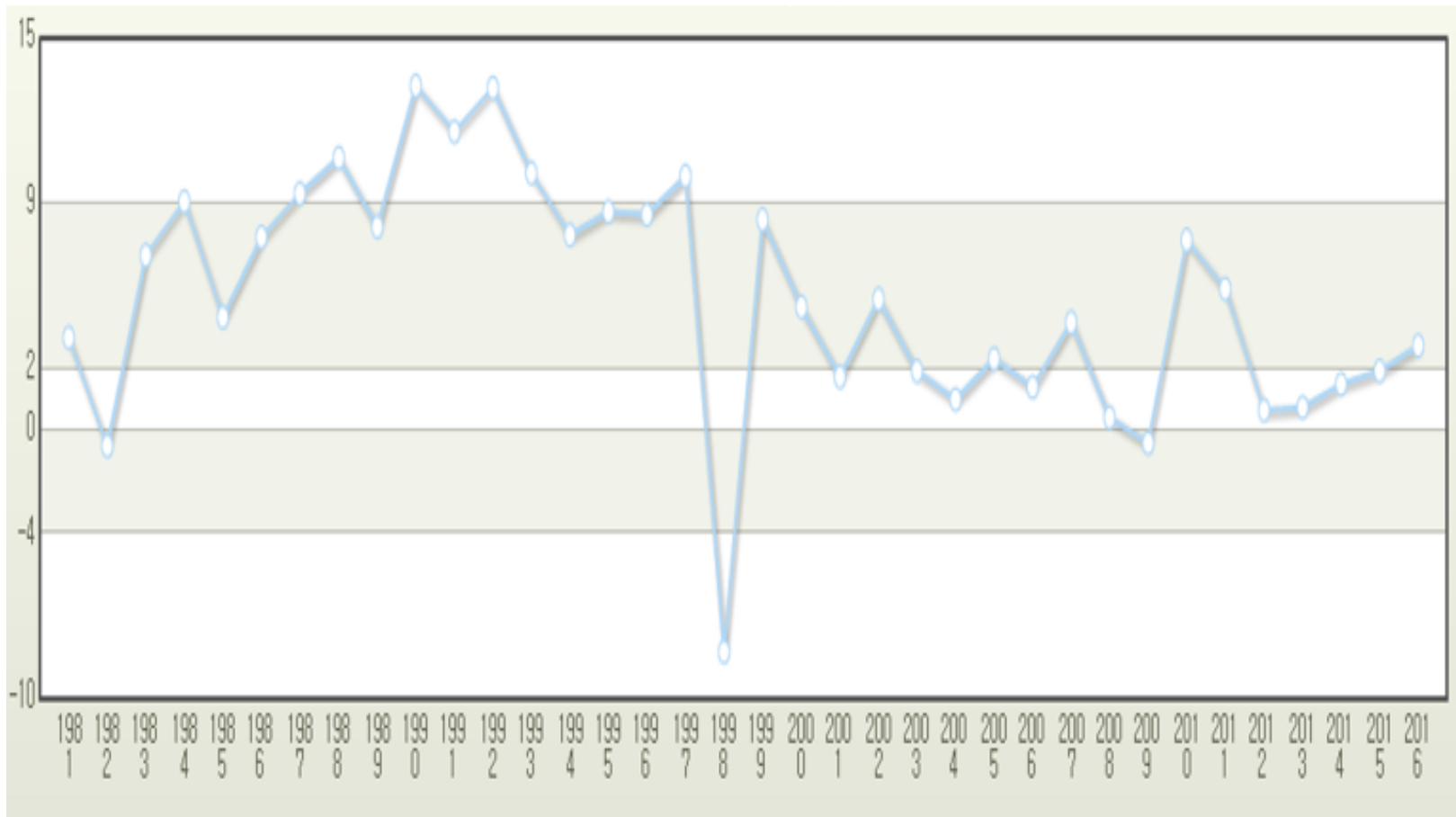
## Industrial Structure

(GDP in billion KRW, Total, Services, Manufacturing, Agriculture and Fishery, 1960~2016, KOSIS)

Major Trend \_ energy



Final Energy Consumption (1000 TOE, Renewables, Natural Gas, Oil, Coal, 1981~2016, KOSIS)



Annual growth of final energy consumption (% , 1981~2016, KOSIS)

# Final Energy Consumption 1997.1-2018.9

( Unit : 1,000TOE )

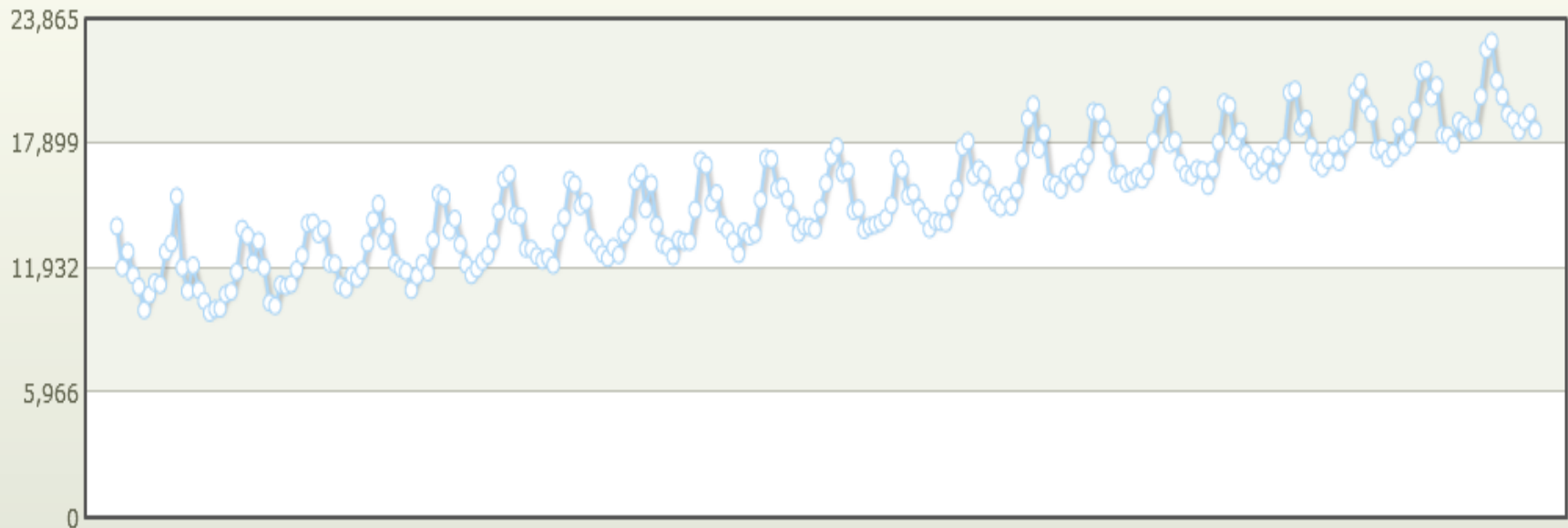
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### Final energy consumption by sector



	Classification(1)
■	Total(1,000 toe)

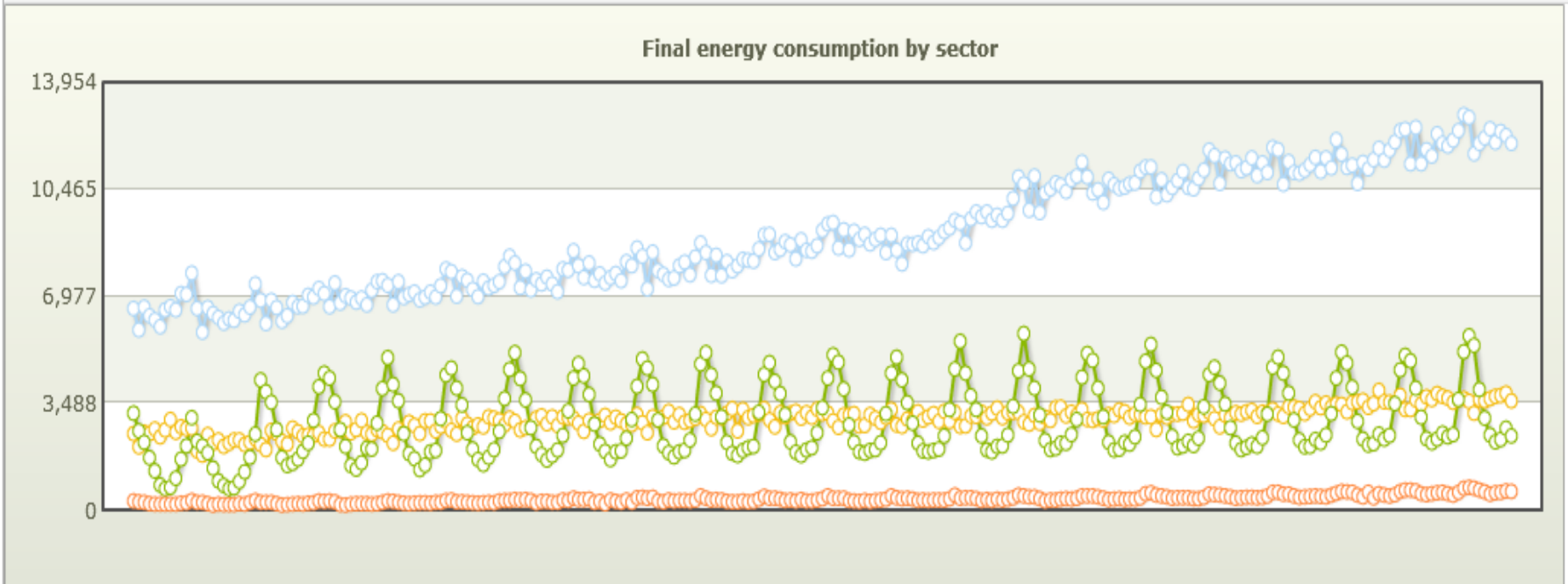
# Final Energy Consumption by Sector, 1997.1`2018.9

( Unit : 1,000TOE )

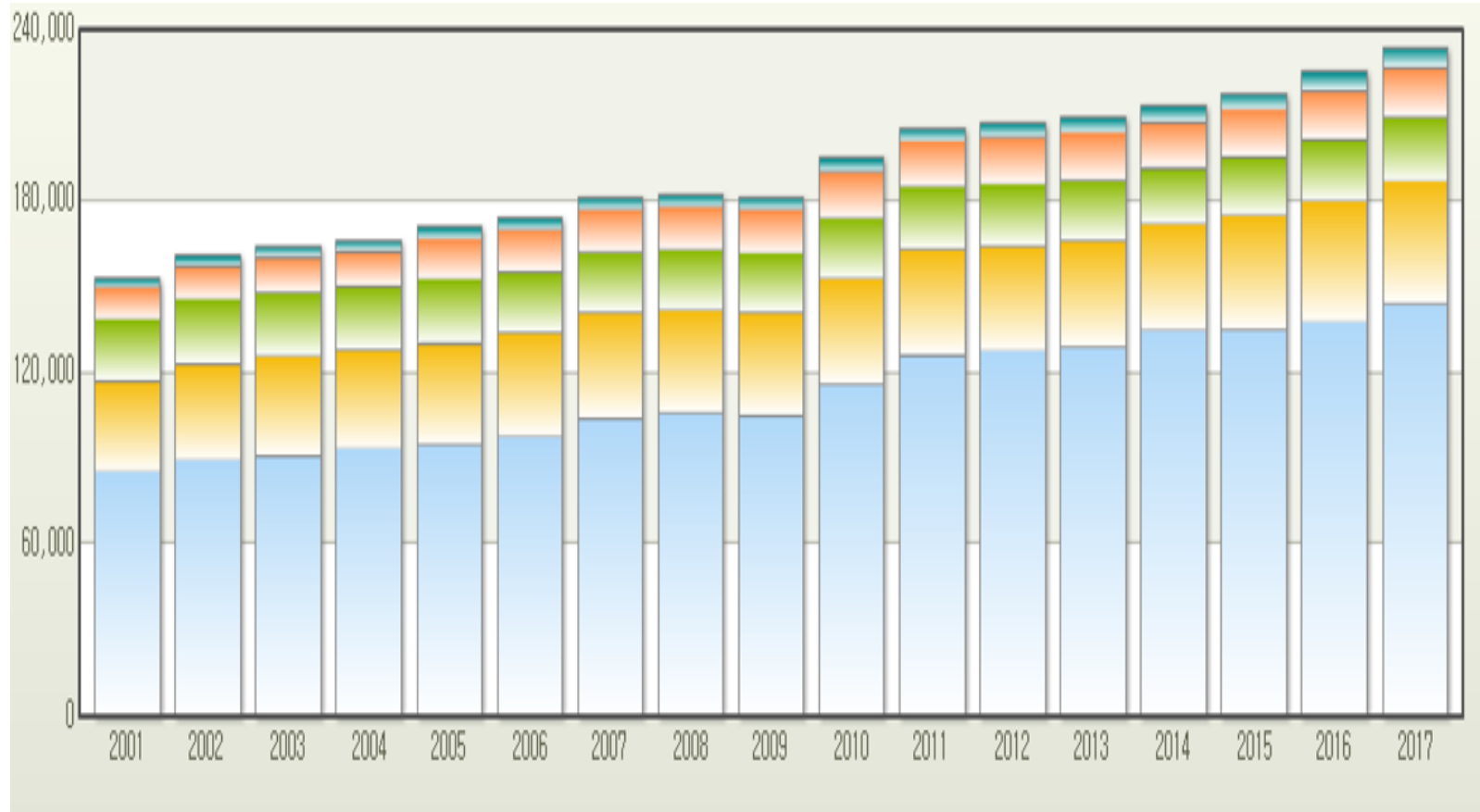
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	Classification(1)
■	Industry(1,000 toe)
■	Transportation(1,000 toe)
■	Residential-Commercial(1,000 toe)
■	Public(1,000 toe)



Sectoral Primary Energy Consumption (1,000 TOE, **Public**, **Commercial**, **Households**, **Transportation**, **Industry**, 2001~2017, KEEI)

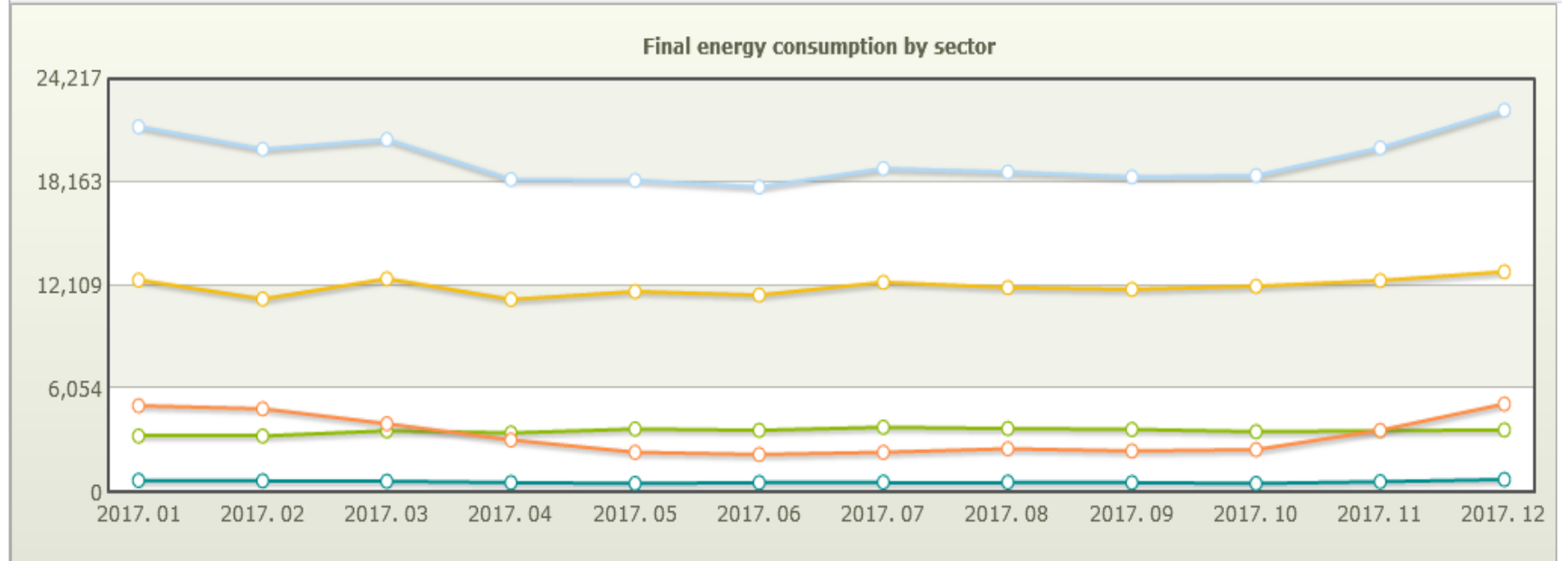
# Final Energy Consumption by Sector, 2017, Monthly

( Unit : 1,000TOE )

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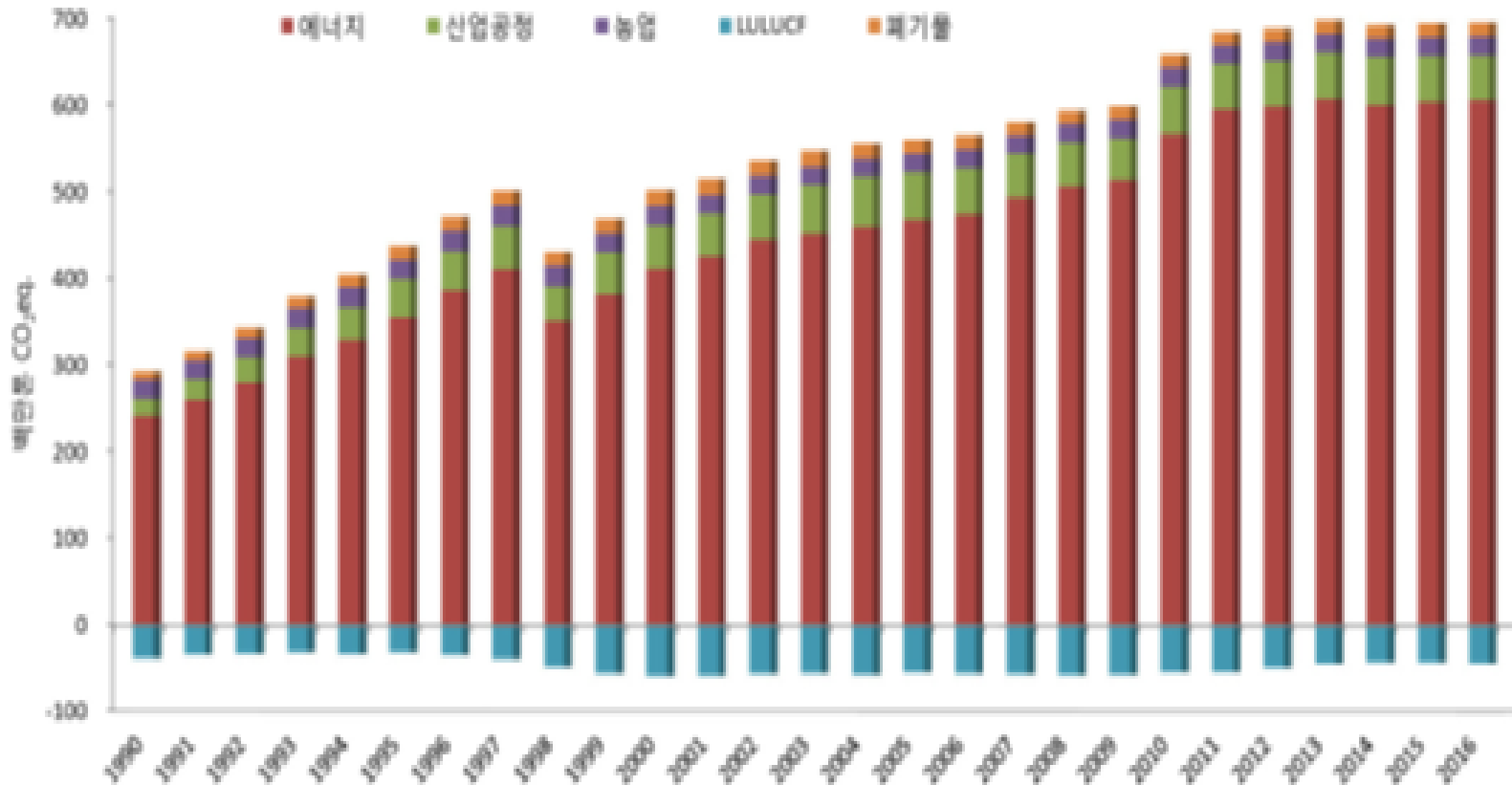
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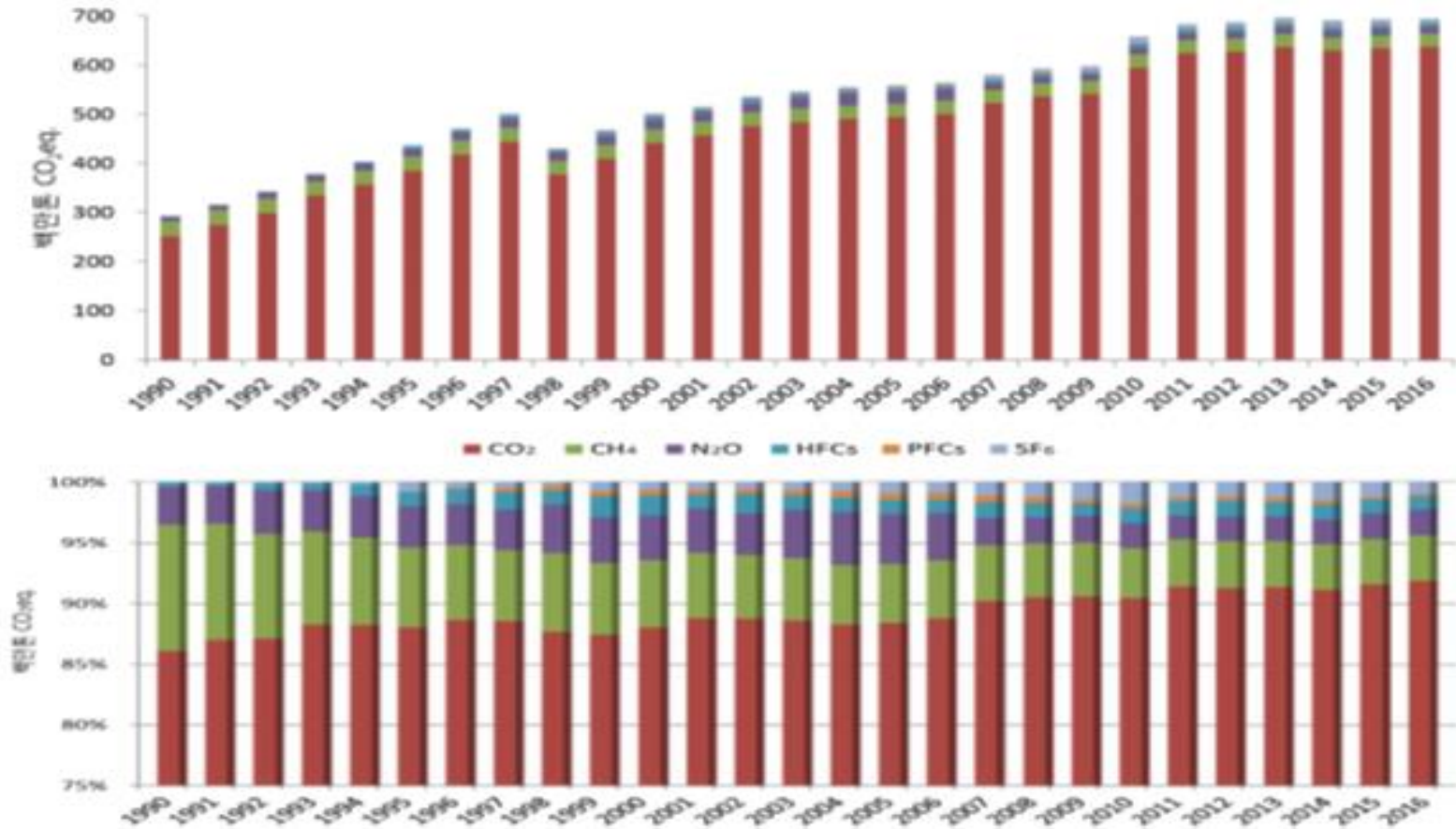
	Classification(1)
■	Total(1,000 toe)
■	Industry(1,000 toe)
■	Transportation(1,000 toe)
■	Residential-Commercial(1,000 toe)
■	Public(1,000 toe)



## 1. Major Trend \_ emissions



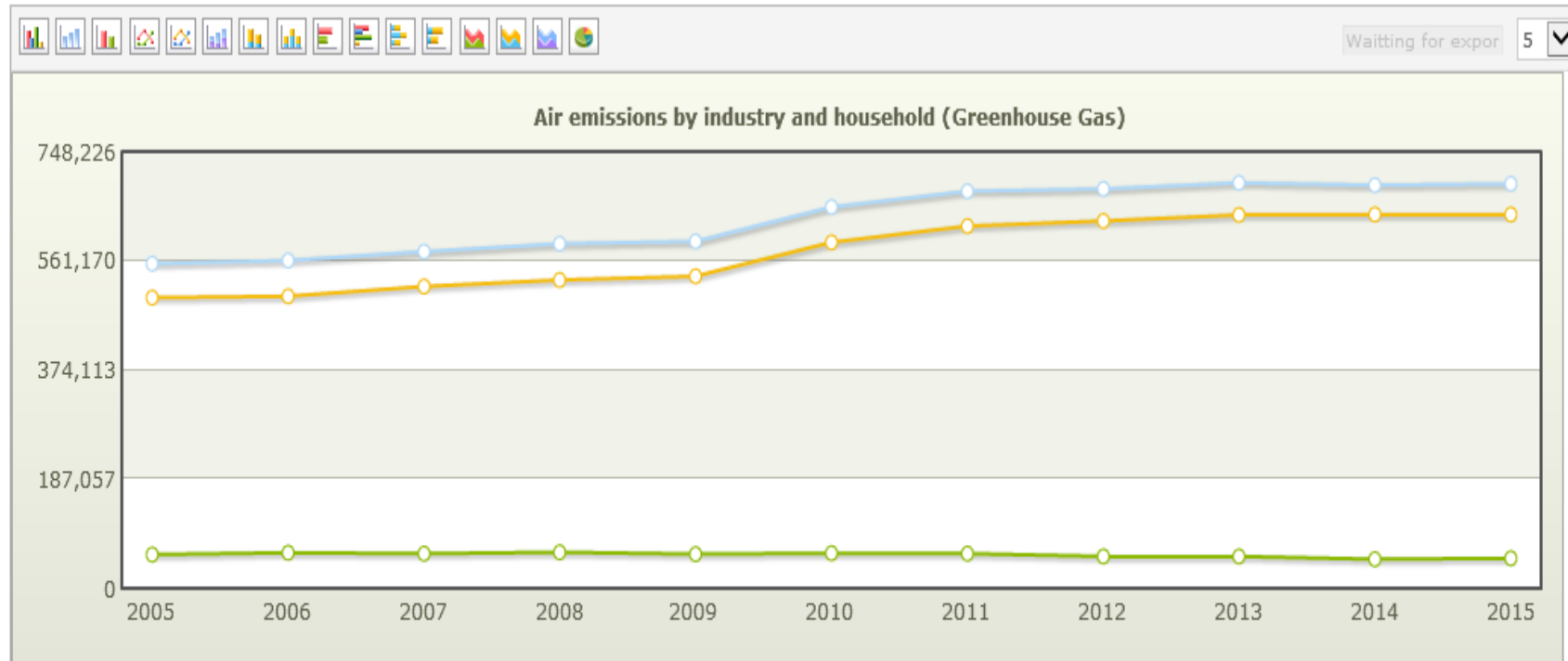
National GHG Inventory (LULUCF, energy, industry, agriculture, waste, 1990~2016, GIR)



National GHG Inventory by Gases  
 (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>, million ton of CO<sub>2</sub>eq, 1990~2016, GIR)

# Emission from Industries and Households 2005-2015

( Unit : 천톤 CO2eq. )



	by Industry & Househ	by Material
■	TOT	TOT
■	All industries	TOT
■	Households	TOT

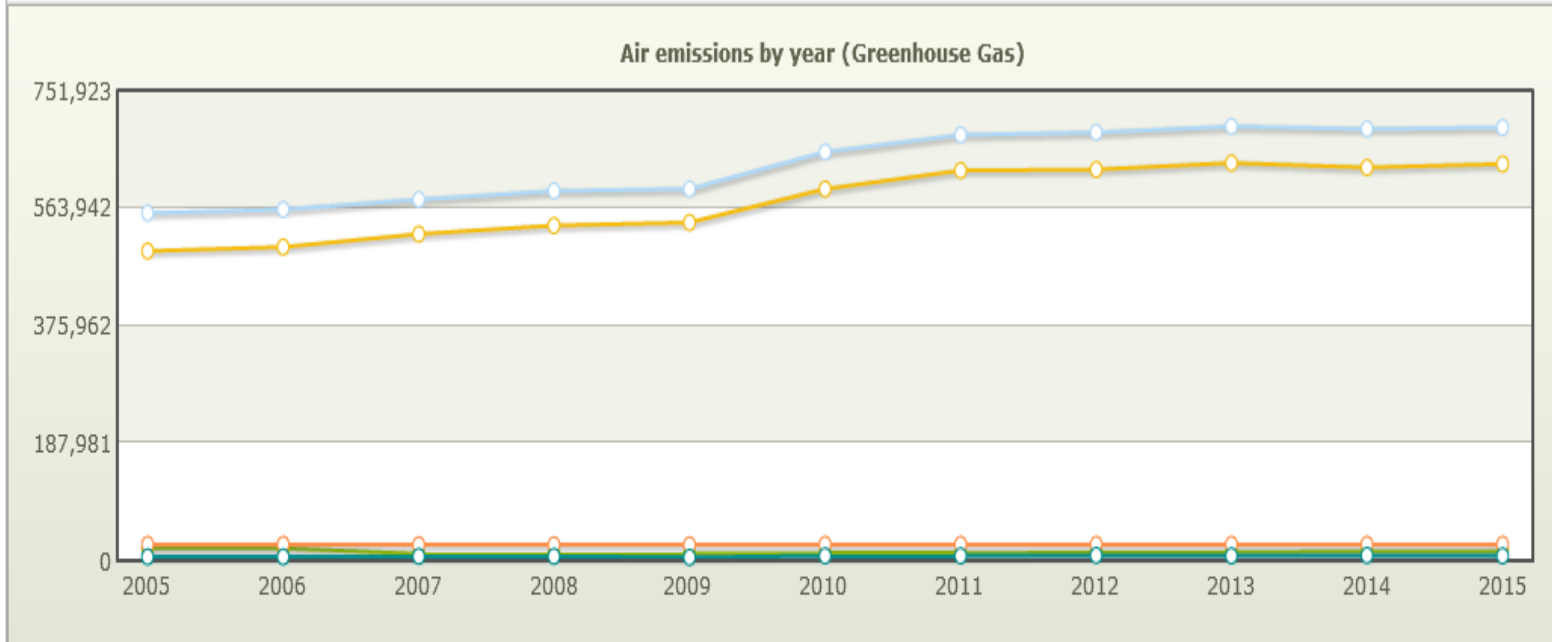
# GHGs Emission trends by gas 2005-2015

( Unit : 천톤 CO2eq. )

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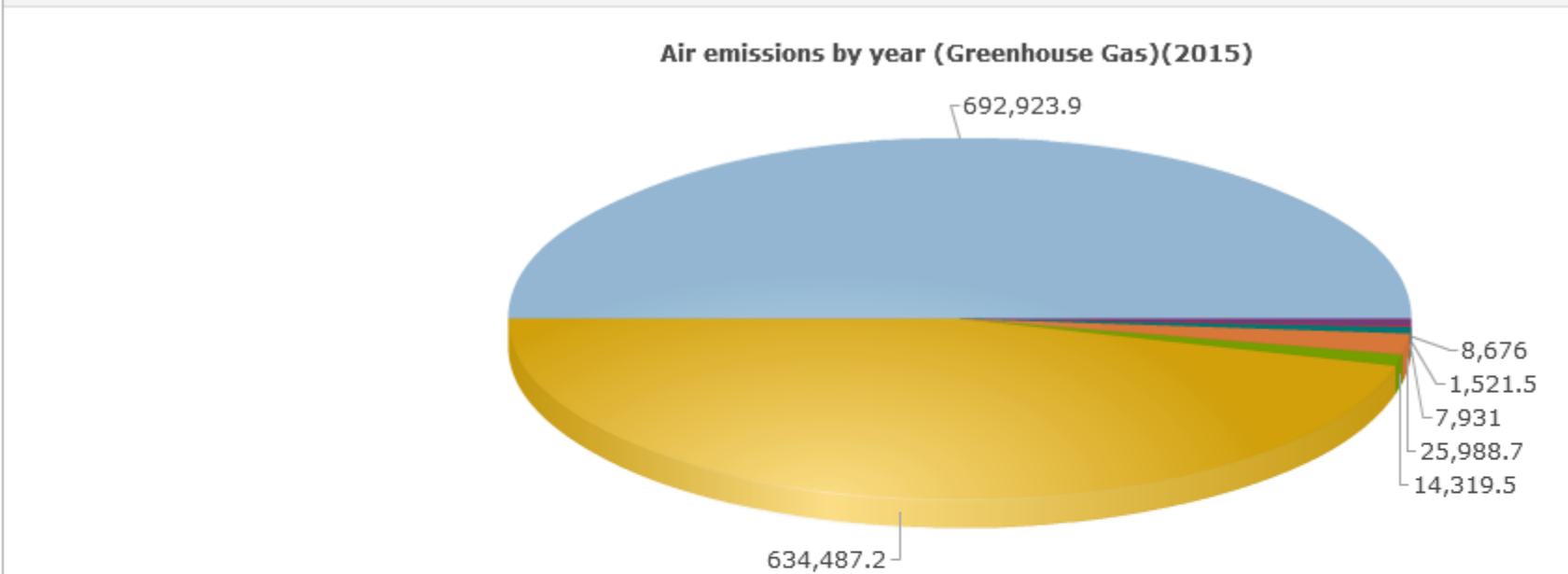


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by Material	
■	TOT
■	CO2
■	N2O
■	CH4
■	HFCs

# Composition of GHGs 2015



by Material	
■	TOT
■	CO2
■	N2O
■	CH4
■	HFCs
■	PFCs
■	SF6

# Sectoral emission(transportation) from Industry and Household by gas

( Unit : 천톤 CO2eq. )

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by Industry & Household	by Material	2015	2014	2013	2012	2011
TOT	TOT	90,125.1	85,446.2	88,261.37	86,338.3	85,014.3
	CO2	89,424.5	84,765.8	87,547.49	85,632.1	84,306.8
	N2O	207.4	194.9	210.98	205.1	203.1
	CH4	493.2	485.5	502.9	501.1	504.4
	HFCs	0	0	0	0	0
	PFCs	0	0	0	0	0
	SF6	0	0	0	0	0
All industries	TOT	68,756.1	65,161.4	65,491.52	64,462.4	60,030.1
	CO2	68,221.6	64,642.5	64,973.29	63,936.9	59,553.9
	N2O	158.2	148.6	155.87	151.5	144.4
	CH4	376.3	370.2	362.36	374	331.7
	HFCs	0	0	0	0	0
	PFCs	0	0	0	0	0
	SF6	0	0	0	0	0
Households	TOT	21,369.1	20,284.8	22,769.85	21,875.9	24,984.3
	CO2	21,202.9	20,123.3	22,574.19	21,695.2	24,752.8
	N2O	49.2	46.3	55.11	53.6	58.7
	CH4	116.9	115.3	140.54	127.1	172.7
	HFCs	0	0	0	0	0
	PFCs	0	0	0	0	0
	SF6	0	0	0	0	0

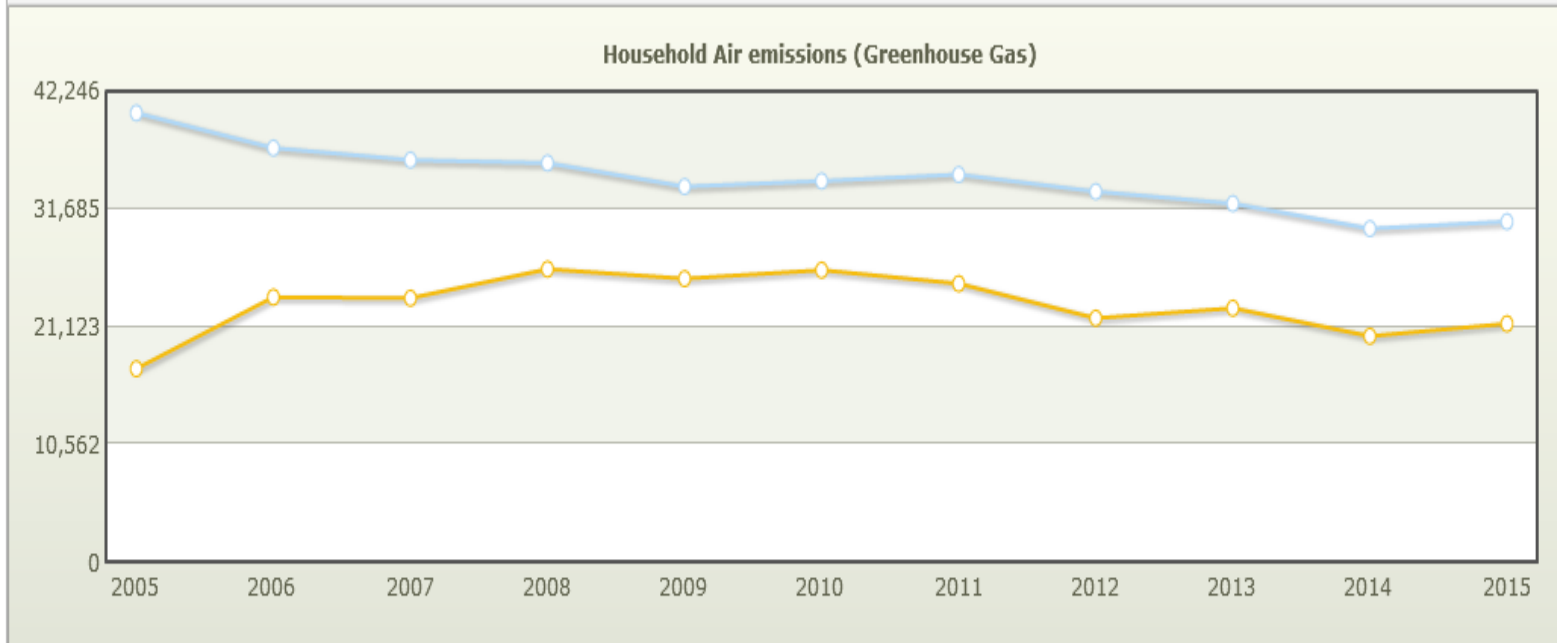
# Emission sources from households 2005-2015

( Unit : 천톤 CO2eq. )

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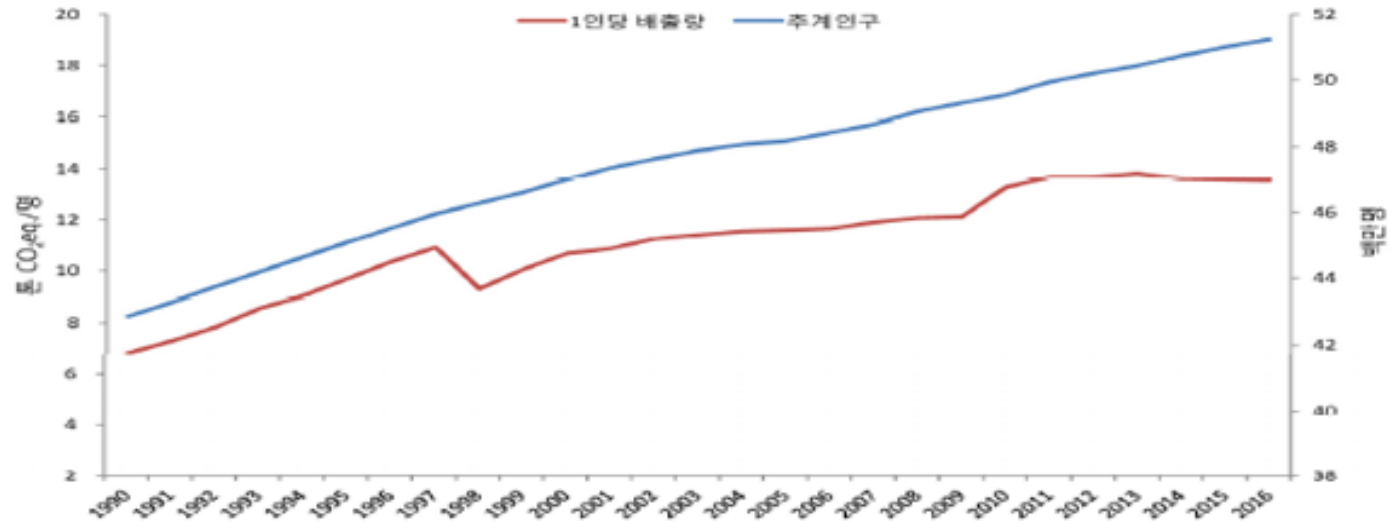
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	by Purpose	by Material
■	1. Heating	TOT
■	2. Transport	TOT



## 1. Major Trend \_ decoupling



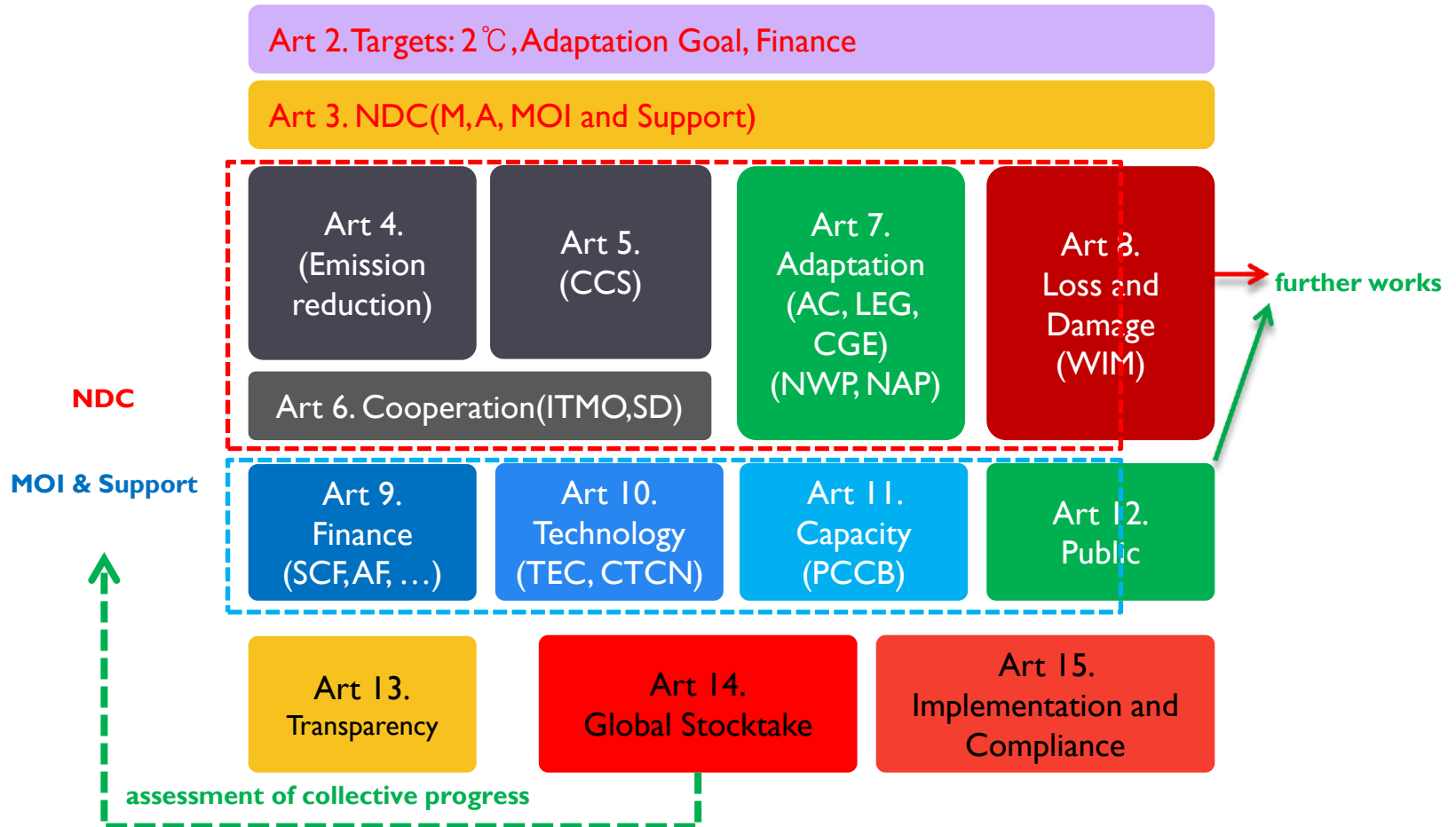
Per capita emission level  
(population in million, per capita emission in ton CO2eq/person, 1990~2016, GIR)

구분	1990	2000	2010	2014	2015	2016	*** 1990년 대비 증감률(%)	**** 2015년 대비 증감률(%)
* GDP당 총배출량 (톤 CO2eq./10억)	698.3	610.9	519.6	484.2	472.4	459.7	-34.2	-2.7
** GDP(천억원)	4,195	8,208	12,653	14,270	14,668	15,098	259.9	2.9

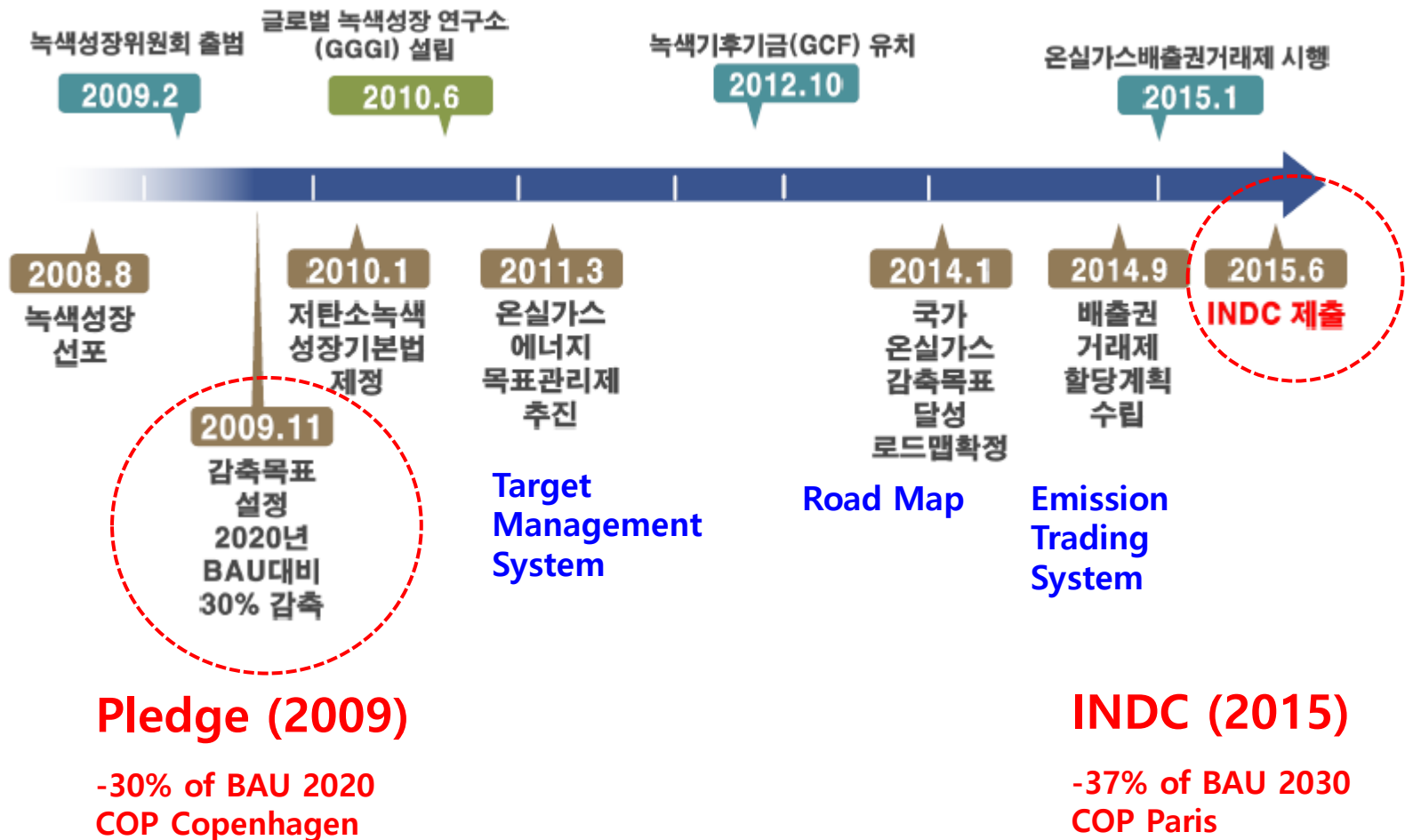
GHG intensity in terms of real GDP (\* ton CO2eq/billion Korean won, \*\* GDP in 100 billion Korean won, \*\*\* growth(1990~2016), \*\*\*\* growth(2015-2016), 1990~2016, GIR)

## 2. Low Carbon Actions \_ National

## Structure of PA and its bodies and programmes



## 2. Recent National Pledge and NDC in advocacy of LC Future



## 2. INDC \_ Mitigation (June 30, 2015)

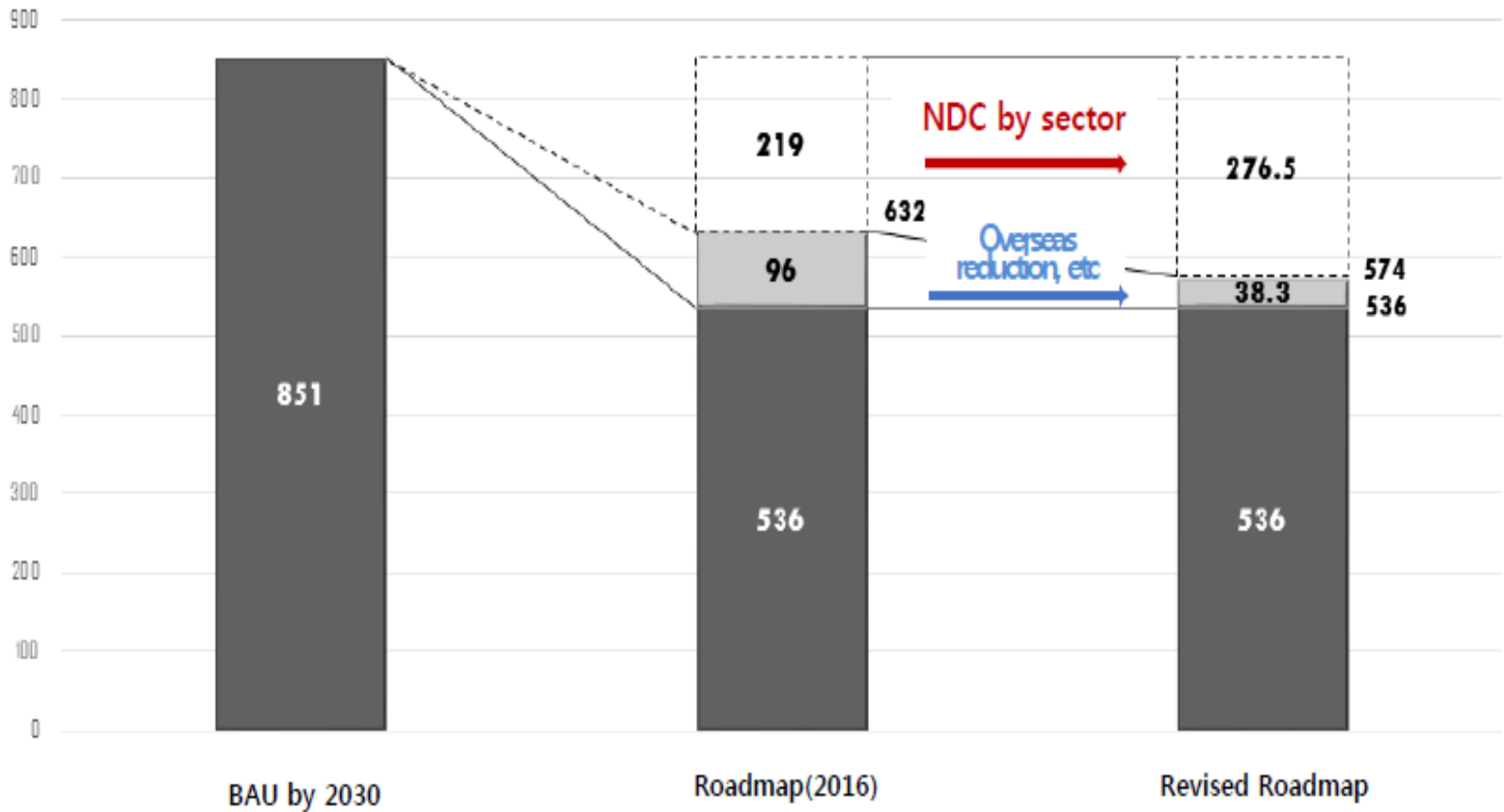
- ▶ Korea plans to reduce its greenhouse gas emissions by 37% from the business-as-usual (BAU, 850.6MtCO<sub>2</sub>eq) level by 2030 across all economic sectors.
- ▶ It will be implemented in accordance with the Framework Act on Low Carbon, Green Growth (2010)

Baseline	(MtCO <sub>2</sub> eq)			
	Year	2020	2025	2030
	BAU	782.5	809.7	850.6
	<p>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.</p>			
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.)			

## 2. INDC \_ Mitigation (June 30, 2015)

Gases	<ul style="list-style-type: none"> <li>• Carbon Dioxide (CO<sub>2</sub>)</li> <li>• Methane (CH<sub>4</sub>)</li> <li>• Nitrous Oxide (N<sub>2</sub>O)</li> <li>• Hydrofluorocarbons (HFCs)</li> <li>• Perfluorocarbons (PFCs)</li> <li>• Sulphur hexafluoride (SF<sub>6</sub>)</li> </ul>
Metric	Global Warming Potential (GWP) values from the IPCC Second Assessment Report (1995) used to calculate CO <sub>2</sub> equivalents
Inventory Methodology	<ul style="list-style-type: none"> <li>• Consistent with methodologies used in Korea's Biennial Update Report (BUR) submitted in December 2014</li> <li>• 1996 IPCC Guidelines used in general to calculate greenhouse gas emissions and sinks</li> <li>• 2006 IPCC Guidelines used to calculate greenhouse gas emissions from rice cultivation in agriculture (4C) and other waste (6D)</li> </ul>
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.

# Korean NDC \_ Mitigation (Million CO<sub>2</sub> ton eq., including §5 & 6 PA)



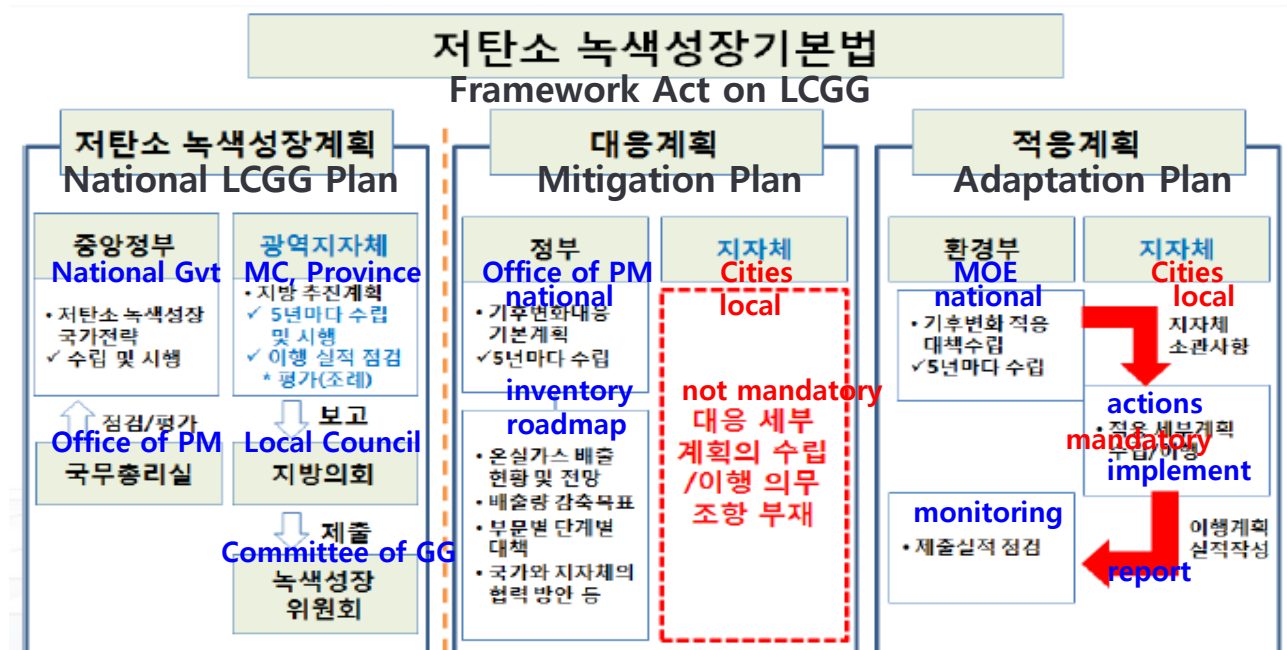


## 2. Low carbon governance structure

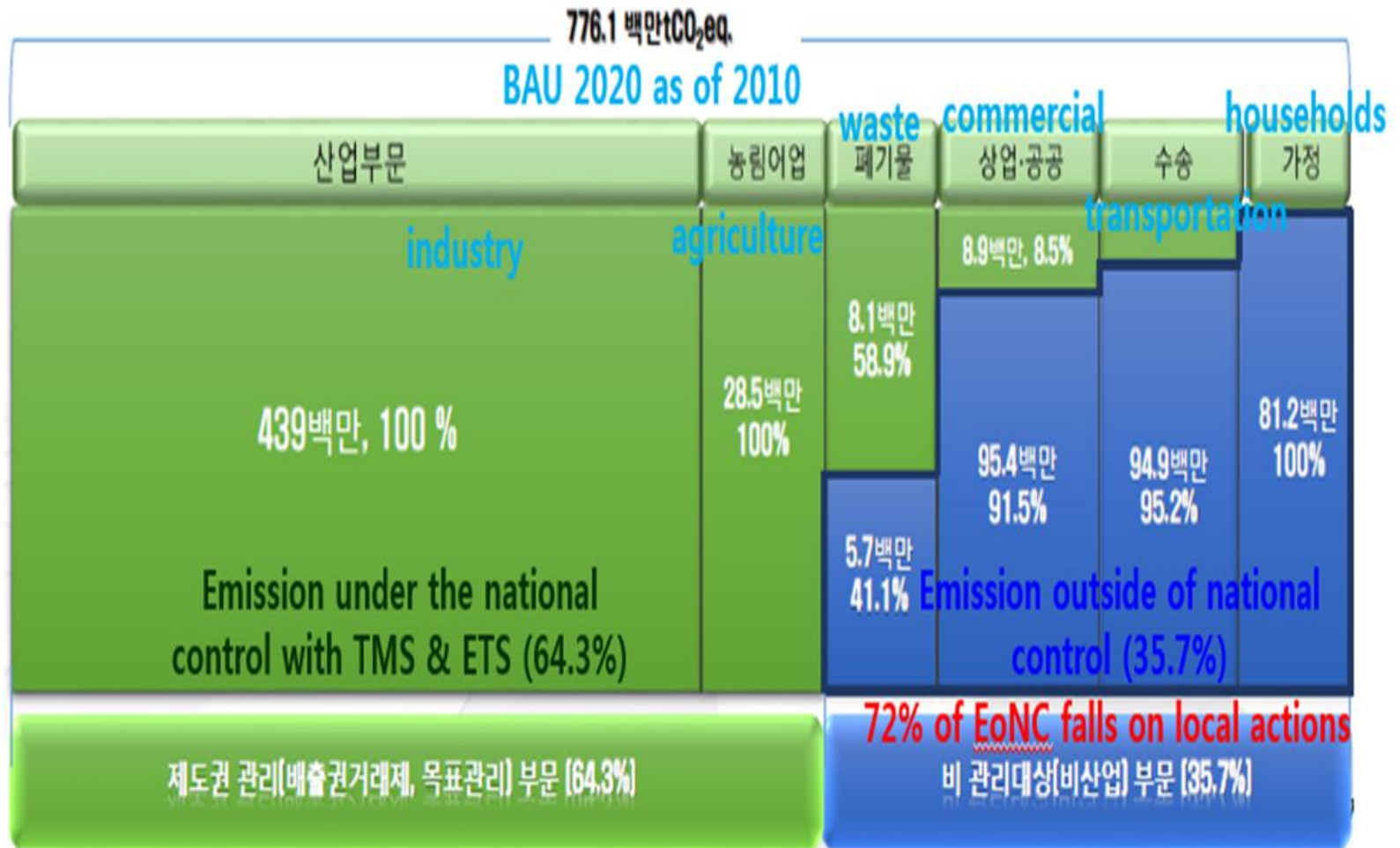
### GOVERNANCE OF CLIMATE ACTION IN KOREA UNDER FALCGG\*

\*Framework Act on Low Carbon Green Growth(2010)

National government (Article 4.3) supports local governments (1+1+6+9+226) implementing local actions in the LCGG action plans (Article 5, Article 11).

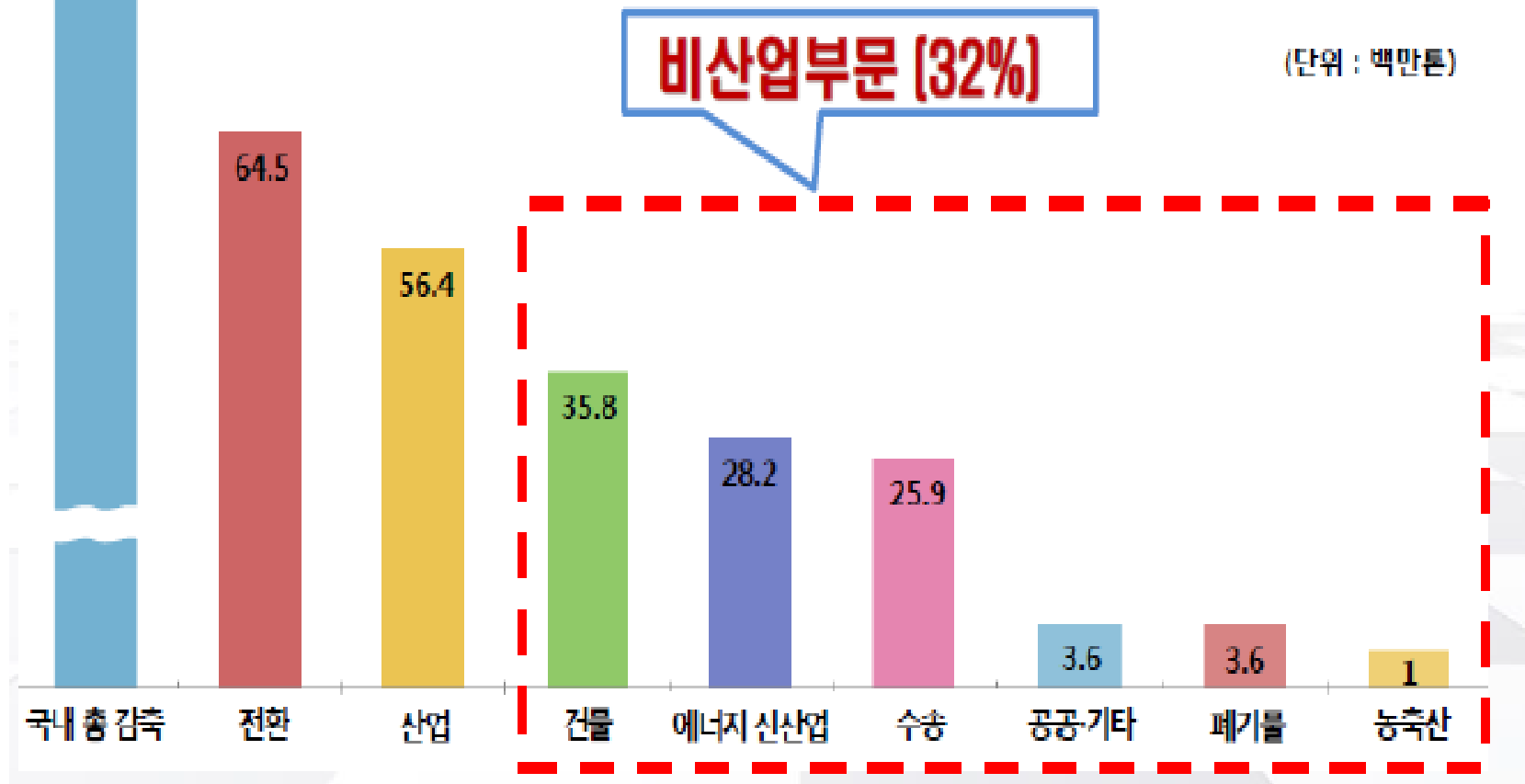


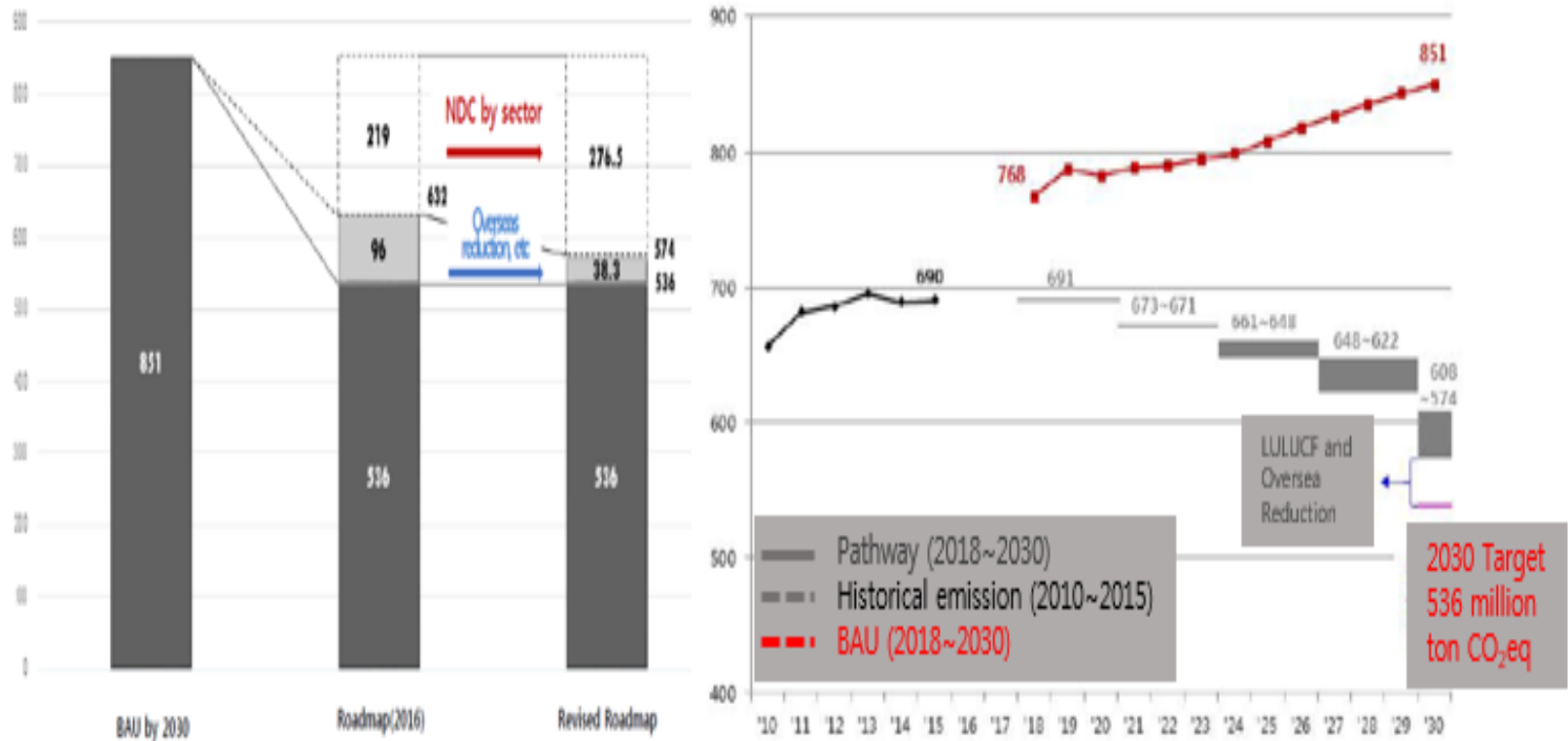
2.



## Korean NDC \_ Share of Local Actions (in 2015 analysis)

72% of non-industrial reduction (equivalent to 23% of national mitigation targets) is under the authority of local governments





Revised Low Carbon 2030 Roadmap of Korea (million ton TOE, 2018, MOE Korea)

## 2. Korean INDC & GHG Management System \_ ETS

KOR	1990	1995	2000	2005	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030		
Real	293.1	437.1	500.6	558.5	656.6	687.1	696.5	690.6										
MtonCO <sub>2</sub> e					Pledge_2010				INDC_2015					782.5				
					BAU			694.5	709.0	720.8	733.4	747.1	761.4	776.1	809.7	850.6		
					Target			659.1	637.8	621.2	614.3	604.4	585.4	543.3		536		
															(dom)	219	25.7%	
															(imm)	96	11.3%	
		TMS(2009)			2011	2012	2013	2014	2015	2016	2017							
		tCO <sub>2</sub> e			125000(25000)>	87500(20000)>		50000(15000)>										
		TJ			500(100)>	350(90)>		200(80)>										
					company(facility) bigger than >													
					302 companies + 810 Public Entities under TMS as of 2016													
								ETS (2015)	c1-1	c1-2	c1-3	c2-1	c2-2	c2-3				
								2014	2015	2016	2017	2018	2019	2020				
								Total	573.5	562.2	550.9							
								Pre_alloc	543.2	532.6	521.9							
								Gov. reserve (88.8 for add or cancel during 3 years of cycle1)										
								for 3 years c1	Rquest	2021.0								
									Allowed	1686.5								
								Companies	525	568	602							
								Result	alloc	539.8								
									real	542.7								

## The 2<sup>nd</sup> ETS cycle KAU allocation plan (2018.07.31)

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- ▶ 5개 부문(26개 업종)을 6개 부문(63개 ksic 업종)으로 세분화하고, 591개 대상업체의 2차계획기간 총 배출수량을 1,796,133,085 KAU로 설정
- ▶ 예비분 153,152,419KAU를 제한 나머지를 2018~2020간 매년 547,660,222KAU씩 할당 (1KAU = 1 이산화탄소환산톤 = 1KCU)
- ▶ 대상업체 별 할당량의 97%를 유상 할당하되, 일정기준 이상의 무역집약도 30% 이상, 생산비용발생도 30% 이상, 또는 무역집약도 10% 이상 업종의 생산비용 발생도 5% 이상인 업종에 대해서는 100% 무상할당(36개 업종)하며, 국가 목표는 6개 업종으로 통합관리
- ▶ 과거 배출량기반 할당방식과 과거 활동자료량기반 할당 방식(전기업 석탄 기력 발전시설)을 병용
- ▶ 2차 계획기간내 이행연도간 배출권이월 수량 제한없이 승인되나, 3차 계획기간으로의 이월에 대해서는 해당업체의 2차 계획기간 중 연평균 순매도량 혹은 25,000KAU 중 큰 값의 범위내로 승인

# The 2<sup>nd</sup> ETS cycle KAU allocation plan (2018.07.31)

## ◆ 제2차 계획기간 배출권 총수량 ◆

(단위 : KAU)

구분		이행연도별 할당량			합계	
		2018년도	2019년도	2020년도		
배출권 총수량		-			1,796,133,085	
예비분	시장안정화조치	-			14,000,000	
	시장조성	-			5,000,000	
	기타	전환	-			78,349,320
		전환 외	-			55,803,099
사전할당량		547,660,222	547,660,222	547,660,222	1,642,980,666	
전환 부문 일반		199,902,681	199,902,681	199,902,681	599,708,043	
전환 부문 내 증기, 냉온수 및 공기조절 공급업(KSIC 코드 : 353)		10,813,466	10,813,466	10,813,466	32,440,398	
전기업(KSIC 코드 : 351)의 부생가스 발전 사업장		17,070,858	17,070,858	17,070,858	51,212,574	
가스 제조 및 배관 공급업(KSIC 코드 : 332)의 탈루배출		273,533	273,533	273,533	820,599	

## The 2<sup>nd</sup> ETS cycle KAU allocation plan (2018.07.31)

산업 부문 일반	274,417,860	274,417,860	274,417,860	823,253,580
산업 부문 내 증기, 냉온수 및 공기조절 공급업(KSIC 코드 : 353)	13,322,899	13,322,899	13,322,899	39,968,697
석탄 광업(KSIC 코드 : 051)의 탈루배출	397,965	397,965	397,965	1,193,895
도자기 및 기타 요업제품 제조업(KSIC 코드 : 232), 시멘트, 석회 및 플라스터 제조업(KSIC 코드 : 2331)의 석회생산에 따른 공정배출	2,938,480	2,938,480	2,938,480	8,815,440
1차 철강 제조업(KSIC 코드 : 241)의 마그네슘 생산 관련 F가스 공정배출	112,732	112,732	112,732	338,196
반도체 제조업(KSIC 코드 : 261), 전자부품 제조업(KSIC 코드 : 262), 가정용 기기 제조업(KSIC 코드 : 285)의 반도체 및 광전지 생산 관련 F가스 공정배출	3,233,334	3,233,334	3,233,334	9,700,002
반도체 제조업(KSIC 코드 : 261), 전자부품 제조업(KSIC 코드 : 262)의 디스플레이 생산 관련 F가스 공정배출	2,467,498	2,467,498	2,467,498	7,402,494
건물 부문	4,032,637	4,032,637	4,032,637	12,097,911
수송 부문	2,009,406	2,009,406	2,009,406	6,028,218
폐기물 부문	15,989,328	15,989,328	15,989,328	47,967,984
공공·기타 부문	677,545	677,545	677,545	2,032,635





# Evaluation of the 1<sup>st</sup> ETS cycle (GIR, 2018)

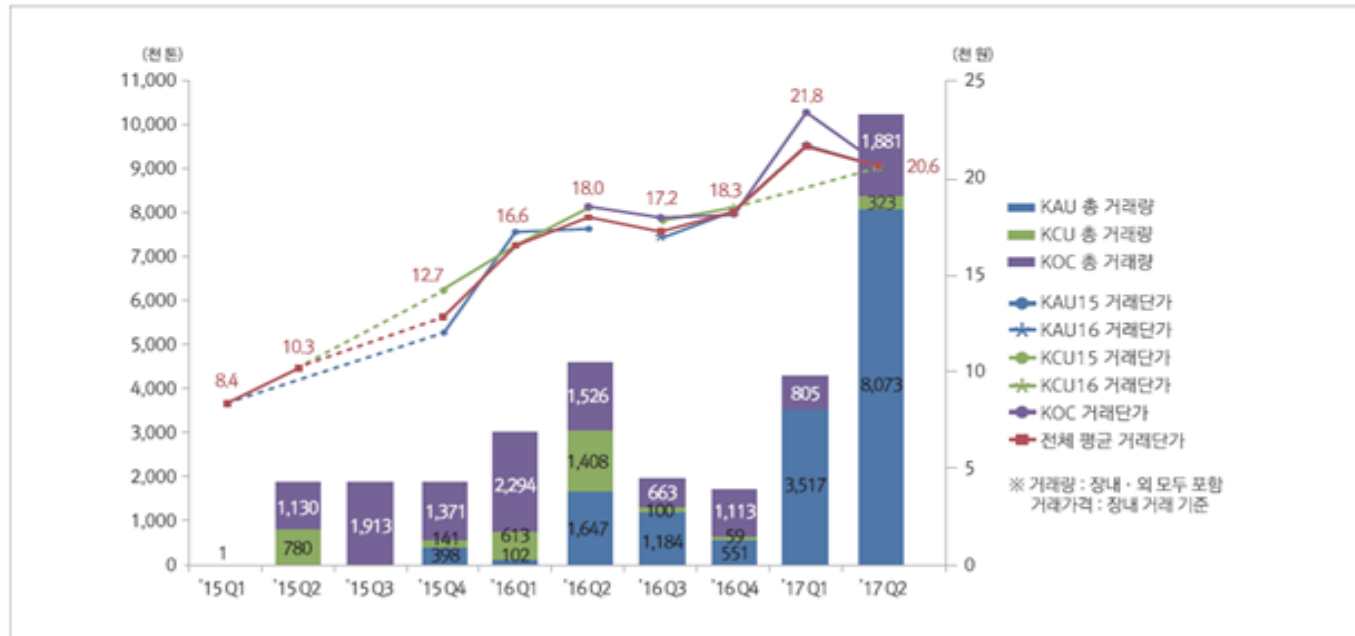
## (전체 시장 거래 규모)

- 전체 거래기간('15.1.1~'17.6.30) 장내외 총 거래 규모는 31.6백만 톤, 총 거래대금(장내)은 2,833억 원  
(※장외가격은 비공개로 산출 불가)

## (전체 배출권 평균 거래가격 추이)

- 장내 거래가격 기준, '15.1월 8,400원 대에서 첫 거래 체결 후 지속적 가격 상승을 거쳐 '17.6월 약 2.5배 상승한 20,600원 대로 마감

<KAU·KCU·KOC 총 거래 규모 및 가격 추이('15.1.1.~'17.6.30)>



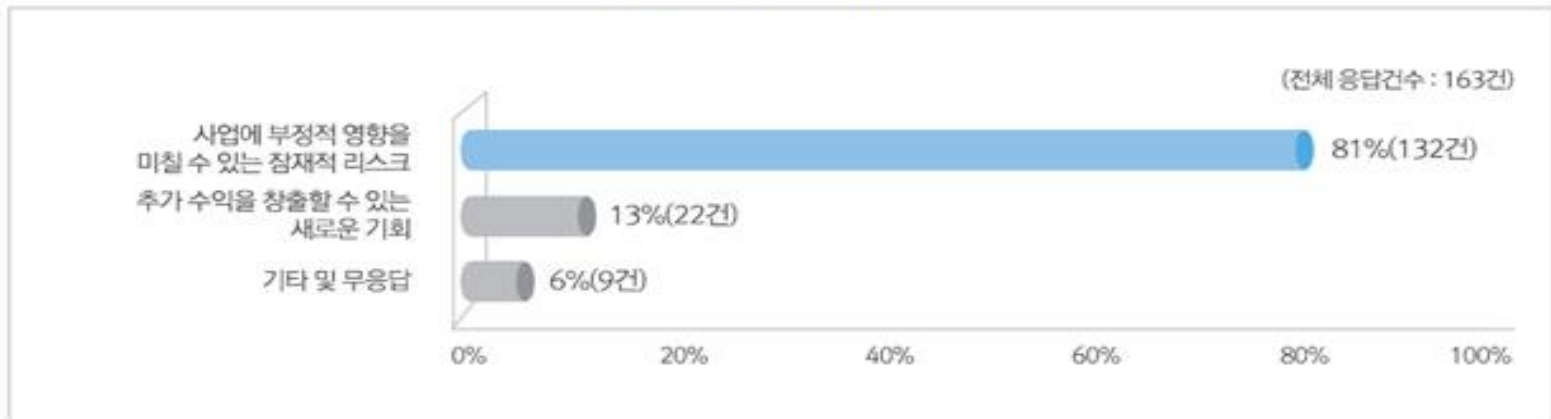
## V. 배출권 거래시장 분석

## Evaluation of the 1<sup>st</sup> ETS cycle (GIR, 2018)

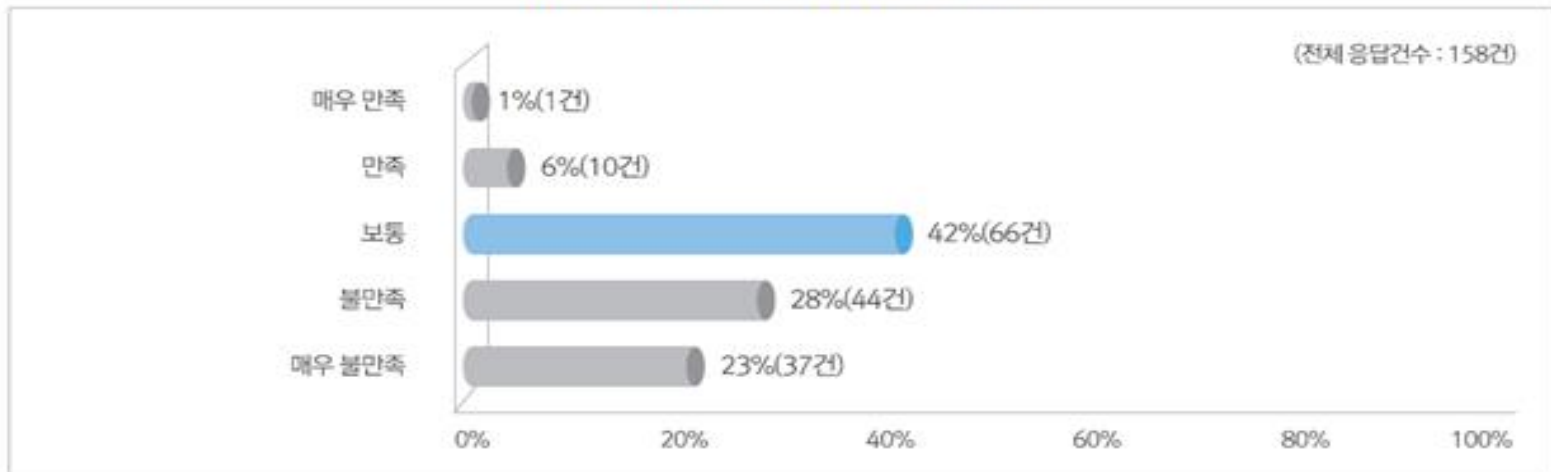
<p>VI. 할당대상 업체 설문조사 분석</p>	<p>(설문조사 개요)</p> <ul style="list-style-type: none"><li>- 전체 23개 업종 599개 업체 중 업종별 주요 업체 353개 표본 선정, 총 21개 업종 164개 업체 설문 참여(46.5% 응답률)(※설문기간 : '17.1.11~31)</li></ul> <p>(배출권거래제 인식 및 평가)</p> <ul style="list-style-type: none"><li>- 전체 응답건수(163건) 중 81%(132건)가 거래제를 사업에 부정적일 것으로 인식하고, 13%(22건)는 기회로 인식</li><li>- 거래제가 배출량 감축 및 경영 전반에 미친 영향에 대해 전체 응답건수(158건) 중 만족(11건/7%) 보다 만족하지 않는다(81건/51%)는 평가 우세</li></ul>
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# Evaluation of the 1<sup>st</sup> ETS cycle (GIR, 2018)

<배출권거래제에 대한 인식>



<배출권거래제 영향에 대한 만족도>



# Evaluation of the 1<sup>st</sup> ETS cycle (GIR, 2018)

## (배출권거래제 제도 개선)

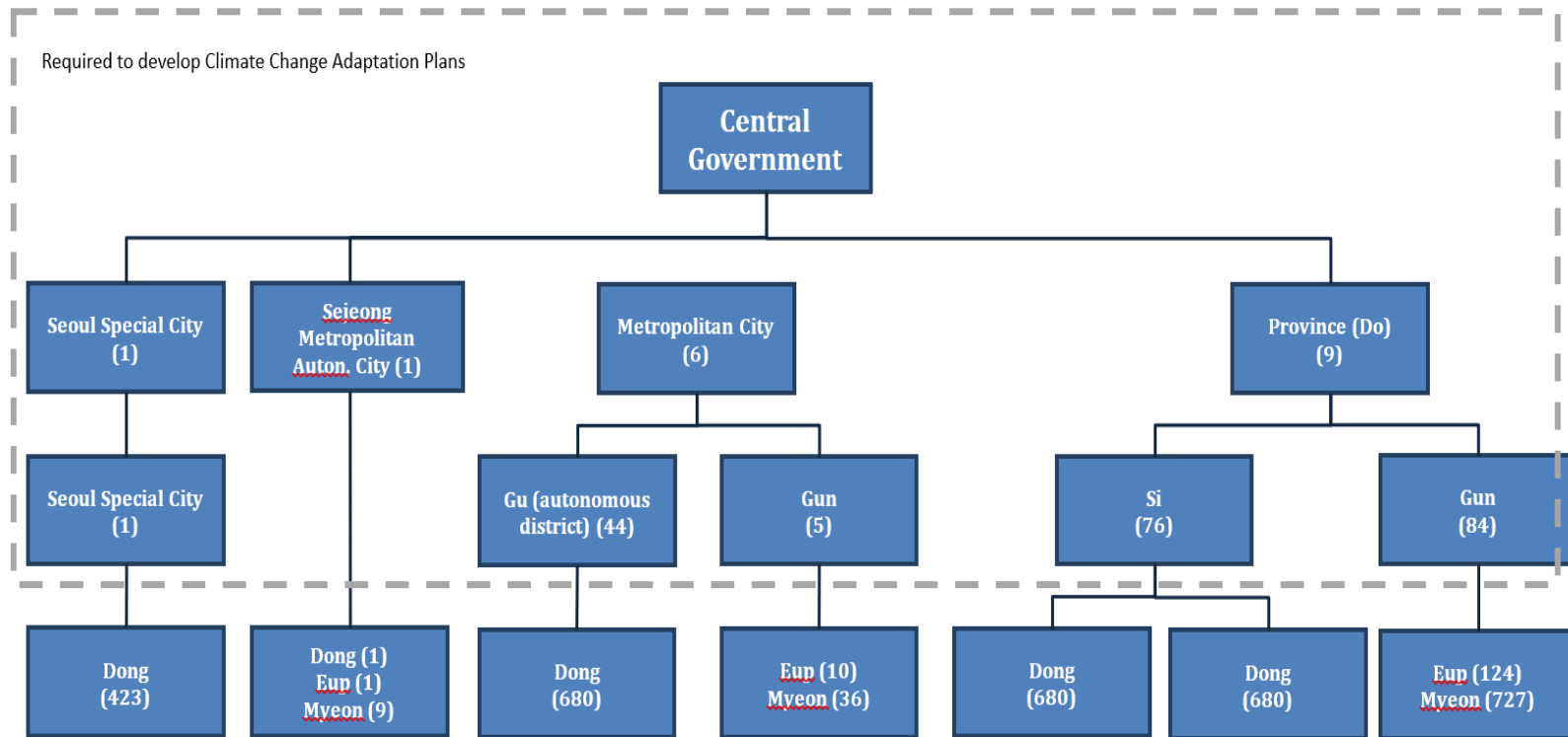
- 배출권시장 활성화를 위한 시장 유동성 확보 측면(전체 복수 응답 208건)에서 제3자의 거래시장 참여 조기 허용(63건/30%) 및 배출권 최대 보유량 제한(60건/29%), 배출권 파생상품 개발을 통한 거래상품 확대(53건/25%) 필요성 제안

### <배출권거래제 제도 개선사항>



## 2. Low Carbon Actions \_ Local

## 2. Administrative structure for local actions (243 under 3 tiers)



- **Local governments** often delegate planning and programming to **specialized policy development institutions at national and local level, which, usually owned by ministries and city government**, receive project grants from public budget: Mitigation\_ GIR, KECO; Adaptation \_ KACCC; ICEC, CCRC, TG04, TGDI, etc. under metropolitan cities and provinces

## 2. Current progress

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➤ **Mitigation:**

- one national(2010) and 243 local GHG inventories(2016) developed
- one national mitigation roadmap developed and revised(2018)
- elaborating 243 local mitigation roadmaps(2019)

➤ **Adaptation:**

- the first national adaptation plan(2010)
- 6 metropolitan and provincial adaptation plans(2012) finished
- 226 city, county, district level adaptation planning is on going(2019)

## 2 some best practices...

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# Korea in the Global Scene of Climate Change

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In Korea, many local governments set more ambitious emission goals for GHG than national goal in NDC, while some of them are challenged to assure sufficient financial resources from the central and local budget schedule during the implementation of their targets. This invites more innovative green financing mechanism including market incentives for PPP.

### 3 local governments

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**Gwangju  
Metropolitan  
City(39.9%)**

**Suwon City(59.6%)**

**Jeju Province(39.6%)**



# Science & IC Technology based Urban Carbon Management

## Gwangju Metropolitan City

Stats	Industry	Climate
- Size : 501.25 km <sup>2</sup> - Population : 1,489 mil.	- GRDP : appr 30 bil. US\$ (2016) - Export : 14.7 bil. US\$ (2016)	- Annual Temp. 14.5 (Cel.) - Annual Precipitation : 926.6 mm

### Democracy, Human Rights, and Peace

- Record of May 18(1900) listed as UNESCO Heritage (May, 2011)

### Asia Culture Hub

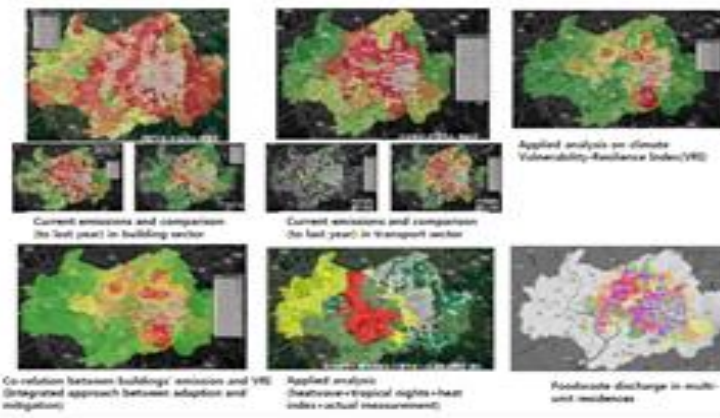
- Gwangju Biennale/Asia Culture Complex

### High Tech Industry

- R&D Complex, Basic Science Campus, Photonic Industry
- Samsung, KIA, LG Innotech, etc.

### Green City

- Designated by national govt, as a leading city for climate change



### Background

A Universal inventory tool for both developing and developed country cities to manage and monitor GHG emission reduction (e.g. CDM projects)



Citizens directly involves in solving environmental issues in town.

### [후가치GREEN] Project (Together Green)



# Ambitious Carbon Free Island Vision based on RE Sources & Tech.

## Jeju Special Self-Governing Province



# Mainstreaming Climate Policies into GE Capital Initiatives

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## Suwon City



## Gwangju

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**Gwangju city signed the 'Agreement on the Climate Change Model City' with the KMOE in 2008, the ever first agreement between central government and local municipality.**

**The climate change actions are supported by ICT based Urban Carbon Management System linked with GHG Projection and Diagnostics (GPD) Program for monitoring, reporting and verification of GHG and low carbon policy effects.**

**Gwangju has promoted low carbon life style of citizens and International Knowledge Sharings are actively promoted through the network cities of Urban Environment Accord, launched in 2010.**

# Jeju

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**Jeju province adopted a vision for global livable community with environment, economy and society in harmony(SEE Harmonized Jeju).**

**Jeju CFI plan progress in 3 directions: renewable energy, electric vehicles and smart grid reducing GHGs emission and increasing energy efficiency.**

**As a model island of carbon free, Jeju province promotes also active public participation and community based climate actions.**



## Suwon

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**Suwon announced itself as Environment Capital of Korea on September 26<sup>th</sup> 2011.**

**Suwon's low carbon experiences are characterized by two factors, community driven public participation in local climate actions and a panoply of integrated GHG management policies and measures.**

**Suwon has involved in the international platform for city level climate change cooperation, such as ICLEI, and contributes to energy welfare for the vulnerable.**



### 3. Challenges

# Challenges

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**Lack of Local Fiscal Resources and Financing**

**Stability of Policy Implementation Environment**

**Difference in Awareness of Multi-stakeholders**

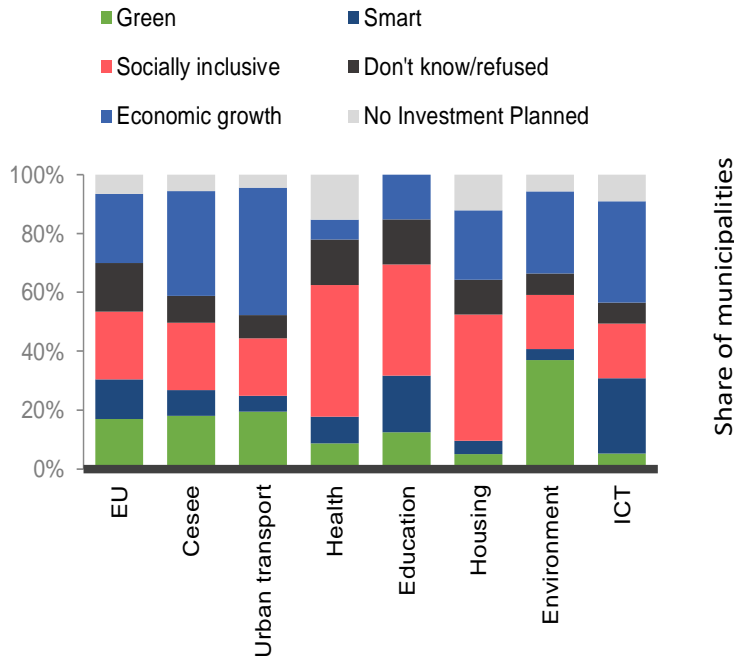


**3. we know what to do and how to do for low carbon development, but the problem is with what we can implement the strategy and plan**

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## 공공과 민간 재원을 결합한 저탄소 프로젝트 투자

- 유럽인구의 70%가 도시지역 거주
- 공공투자의 55%를 광역(regional) 혹은 기초(local) 지자체 재원으로 충당
- 대부분의 지방정부는 교통, 주거 부문에 투자 갭을 겪고 있으며, 이는 생산성 제고, 지역 혁신 및 시장투자 유인에 제약으로 작용
- 프로젝트별 공공재원 투자 목적 및 구성비



- **폭넓은 프로젝트 개발 준비금(URBIS, JASPERS, ELENA) 활용**
  - 지자체 투자전략 및 투자 프로그램 개발
  - 프로젝트 경쟁력 및 bankability 향상 전략 개발
  - 개발프로젝트의 재정 및 경제성 분석 지원
  - 투자자 네트워크 연계 지원
- **다양한 투자 플랫폼 제공**
  - 프로젝트 개발을 위한 무상지원 및 리볼빙 펀드 지원
  - 상업 투자은행 신용 연계 강화 지원
  - 투자 자원 연계 및 조달 계획 수립 지원
  - 목적성 대출 확대
  - 사회경제적 우선 순위를 고려한 투자 배분 지원
- **도시개발펀드 투자 사업례:**
  - 대기질 및 교통체증해소를 위한 지하철 확충
  - 주거용 건물의 리모델링을 통한 에너지 효율향상
  - 공공부문 대중 교통수단 조달전략(lease back) 실천
  - 스마트 검측 시스템 도입

## 지자체 기후행동 자원 조달 수단

### ➤ 파리 녹색도시채권(Green Municipal Bonds)

- 2015년 3.0억 유로 녹색장기채권
- 2017년 3.2억 유로 기후장기채권
- 17년 만기, 1.43% 수익율, 발행 3일만에 소진
- 국내외 투자기관으로부터 120유로 조달

Guidebook 'Climate mainstreaming municipal budgets', Energy Cities, 2018  
Free online courses on Green Bonds for Municipalities, Climate-KIC, the South Pole Group and Climate Bonds Initiative <https://bit.ly/2oUhLXc>

### ➤ 환경, 에너지 목적세 또는 부담금(Earmarking Taxes)

- 전기요금부가세, 교통혼잡세를 활용한 저탄소프로젝트 유무상 지원
- 스위스(로잔): 시 조례로 2018년 부터 전력회사에 0.3상푼/kW의 전력효율세와 지속가능발전세를 각각 부과하여 지자체 기후행동 재원으로 활용
- 이태리(밀라노): 도심 교통혼잡세를 부과하여 지자체 지속가능 교통프로젝트 부자재원으로 활용
- 노르웨이(오슬로), 세르비아(Nis), 영국(런던) 도입

### ➤ 에너지 효율계약(Energy Performance Contracting)

- ESCO(Energy Service Company) 사업방식의 투자이익 환수 조건부 에너지 효율프로젝트

RenoWatt: <http://www.renowatt.be/fr/renowatt/>

Toolkit for one-stop-shops based on the RenoWatt model: <https://bit.ly/2HfpSH6>

MARTE project: <http://www.marteproject.eu/en/>

EPC market in the healthcare sector (MARTE project report): <https://bit.ly/2Cw3IN>

- 벨기에(왈로니아): RenoWatt 법을 도입 학교, 정부청사, 병원 등을 대상으로 ESCO 사업 추진기반 (타당성조사, EPC 지원 등)
- 이태리(Marche 지역): 마르체지역 공공보건시설의 에너지 개선 프로젝트로 Marte Applied EPC 설립, Energy Service Plus 프로젝트 추진, 1,200만유로 투자재원 조달

### ➤ 지역에너지 조합(local Energy Cooperatives)

- 벨기에(Halle): 시민투자조합 결성을 통해 도심 가로등 LED화 프로젝트 투자재원을 100% 조달
- 벨기에(겐트), 크로아티아(Krizevici), 스페인(바르셀로나)

Public lighting project in Halle <https://bit.ly/2CnkCvn>

Luyts S. (2017). 'Collaboration between Local Authorities and Renewable Energy Cooperatives:

A bottom-up approach, partners in mitigating climate change'. KTH School of Industrial Engineering and Management, Stockholm.

REScoop - Municipality approach <https://bit.ly/2RJbxC4>

# 지자체 기후행동 자원 조달 방식

## 주택 에너지효율 개선 소프트론(Soft Loans)

Depending on the money and staff available for setting up the financing scheme, there are different Business model alternatives:

Money not available	Money already available	
<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
Partner banks provide soft loans	Partner banks provide soft loans, but the Region subsidises the interest rates, pays for the banks' operational costs and a guarantee fund	Local authorities set up a revolving fund which disburses soft loans and pay a fund manager

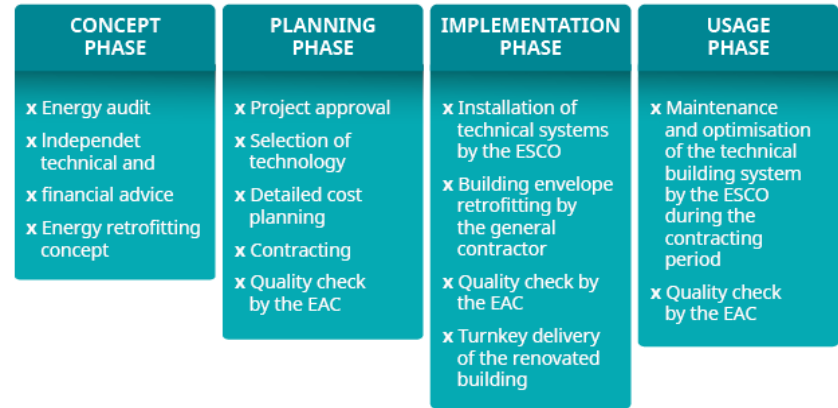
Guidebook 'Financing the energy renovation of residential buildings through soft loans and third-party investment schemes', Energy Cities, 2017: <https://bit.ly/1sRghcZ>

## On-Tax 파이낸싱(On-Tax Financing)

- 지방세 수입을 시민 혹은 기업의 에너지 효율 프로젝트에 대한 민간투자자의 비용 회수에 사용하고, 지자체는 해당 비용을 지방세 고지서에 추가하여 환수(20년 장기 프로젝트에 적용)
- 미국 (PACE scheme) 도입, 유럽연합 (Euro PACE) 도입 예정 (스페인 Olot 시를 대상으로 시범사업 진행 [www.europace2020.eu](http://www.europace2020.eu))
- 오스트리아, 벨기에, 이태리, 폴란드, 루마니아, 스페인

## 3자 투자 방식(Third Party Investment)

Home owners visit the Energy Advice Centre (EAC) and get tailor-made support for energy-efficient retrofitting carried out in four steps:



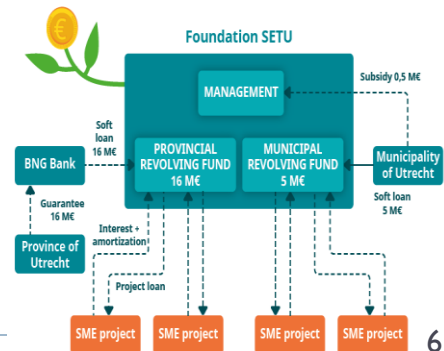
## 독일(Stuttgart) : Care Free Energy Renovation Package

Guidebook 'Financing the energy renovation of residential buildings through soft loans and third-party investment schemes', Energy Cities, 2017: <https://bit.ly/1sRghcZ>

## 리볼빙 펀드(Revolving Funds)

### 네델란드(Utrecht)

**The Energy Fund Utrecht (EFU)** with a total capital of €21 million is a joint initiative between the City of Utrecht and the Province of Utrecht, but it is managed by a SETU foundation. Part of the fund capital (1,25 M€) comes from the European Funds for Regional Development (ERDF). [www.setu.nl/nl/aboutsetu](http://www.setu.nl/nl/aboutsetu)







**KP ETS**