Low Carbon Society Development towards 2030 in Gyeonggi, Korea

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  - Food mileage(Carbon footprint)

Background

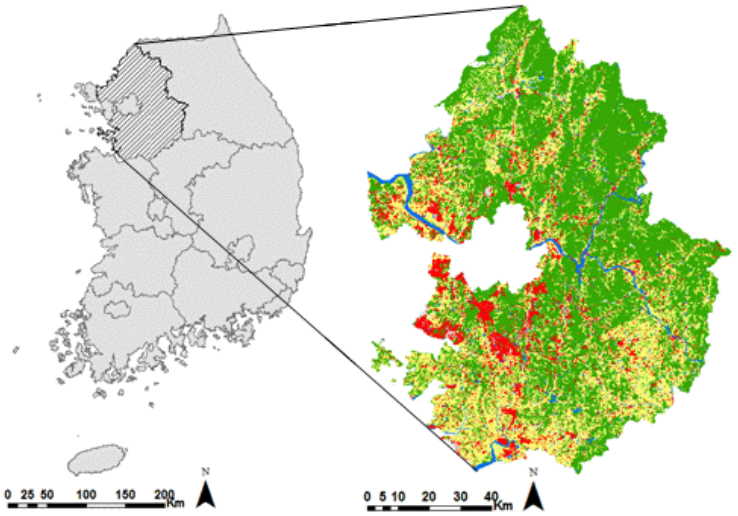
- **National GHG reduction goal**
  - 30% reduction below BAU projection by 2020
- **Role for Local Government**
  - Main carbon emitters and the key force to solve the problems
  - Carbon emission reduction targets
- **Me First : low carbon life style**
  - Research needs to quantify the impacts of low carbon life style

Forecasting the GHG emission and assessment of potential GHG reduction in Gyeonggi province

Background(Gyeonggi province)

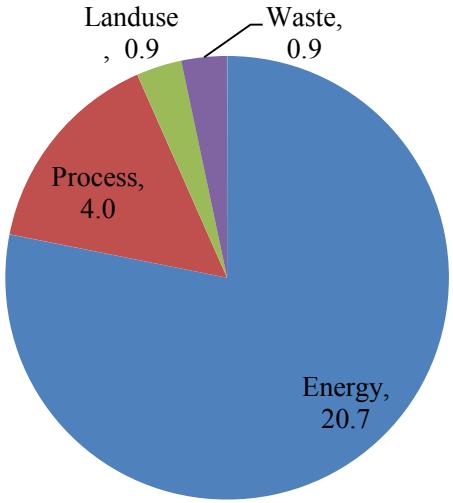
- Location : Western central region
- longitude : 126 ~ 127
- latitude : 36 ~ 38
- Area : 10,138 Km^2(10% of Korea's territory)
- Climate : continental climate

  (severe differentiation of temperature between summer and winter)
- Temperature : 11-13 °(annual average)
- Precipitation : 1,100mm (annual average)
- Population :12 million-people (rapid increase in population)
- Economy : 169 billion-KRW(2005) / 20.3% of total GDP



Background(Gyeonggi province)

- GHG emission : 26.5(2005) MtC
- Annual Growth rate : 6.5%
- Industrial process > Waste > Energy



	Energy	Process	Landuse	Waste	Total
1995	11.5	1.1	1.0	0.4	14.1
	81.7%	8.1%	7%	3.1%	100%
2005	20.6	4.0	0.9	0.9	26.5
	78.1%	15.2%	3.3%	3.3%	100%
Annual Growth rate	7.9%	25.1%	-1.1%	9.7%	8.8%

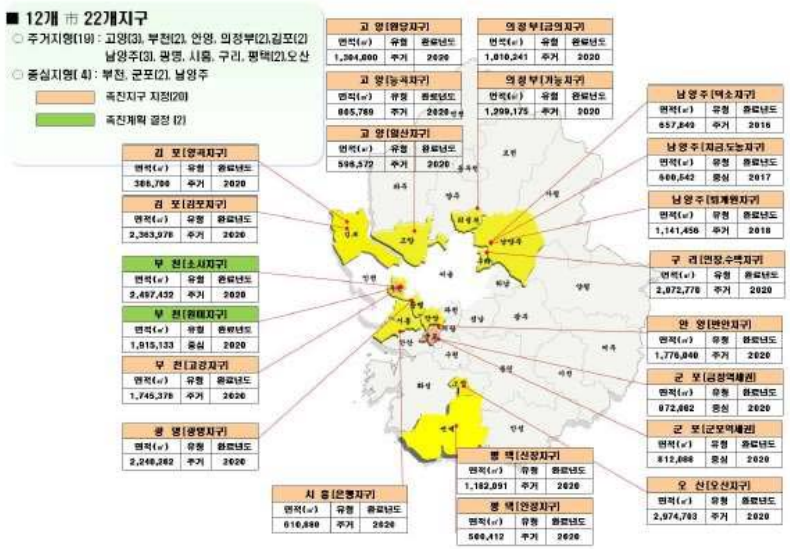
Background(Gyeonggi province)

High urban development pressures and Deforestation

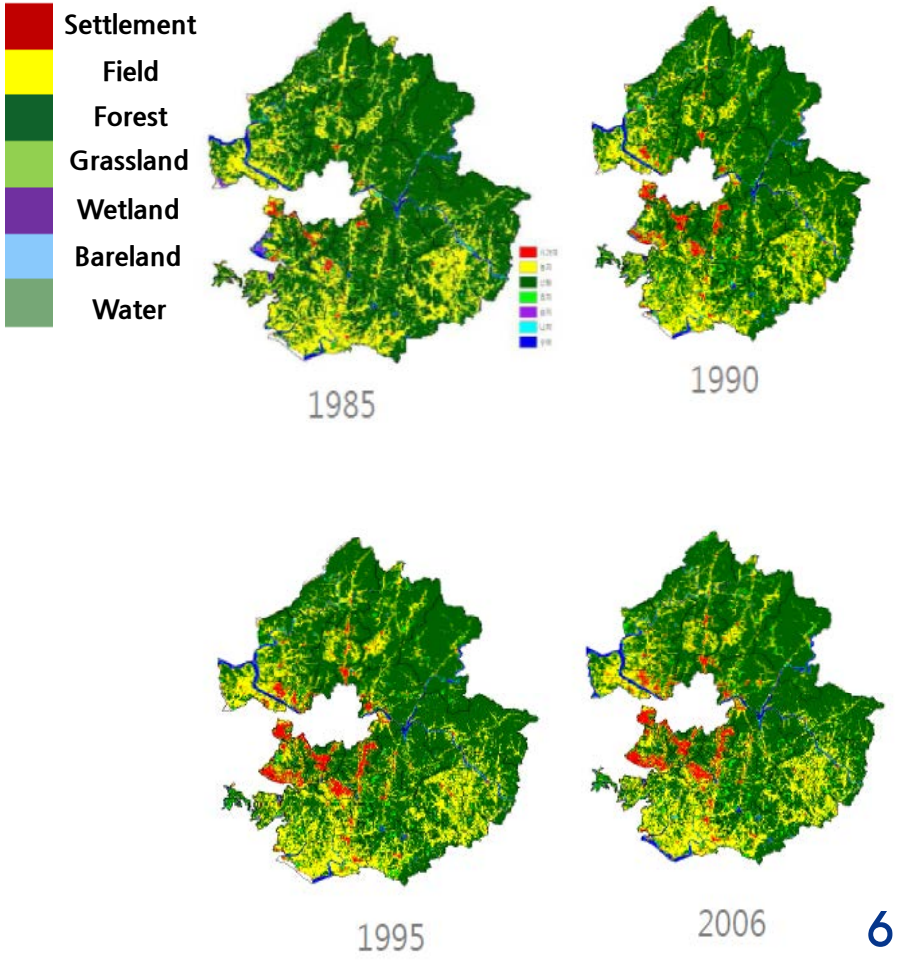
(2010 ~ 2020)

Building permission : 25 km² /1 year

Construction : 150,000(household) / 1 year



Urban Renewal Promoting Site
(Source : Gyeonggi province)



Scope

Emissions : CO_2

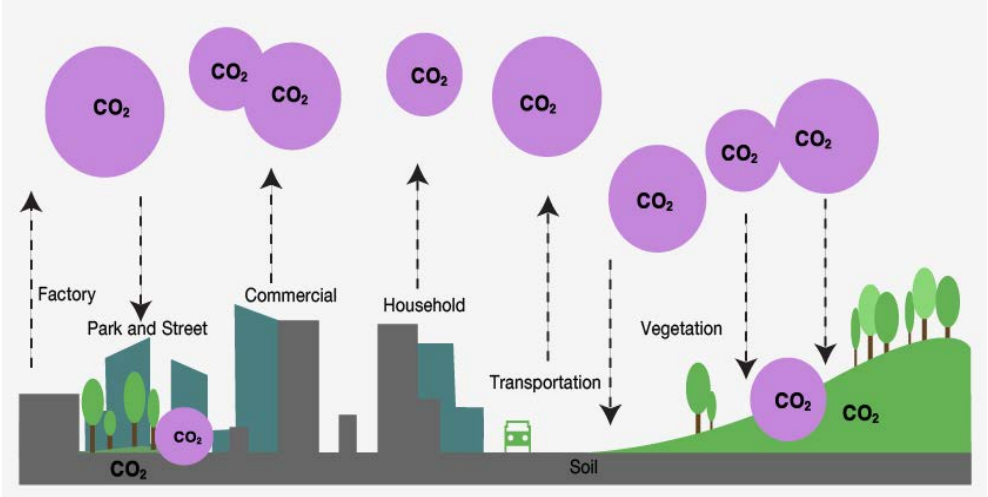
Regions : Gyeonggi province, South Korea

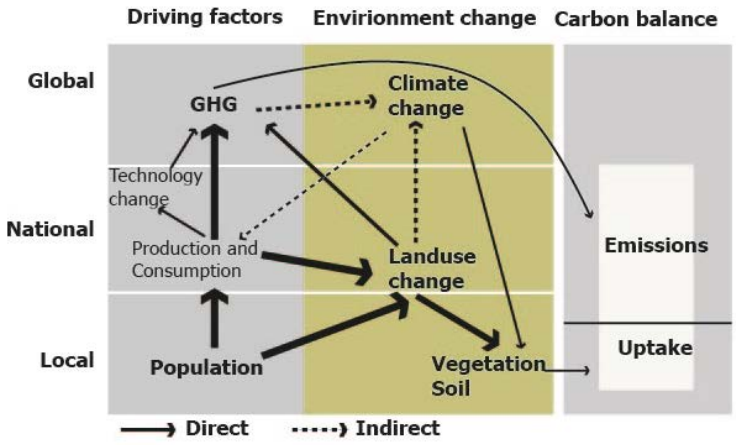
Base year : 2005

Target year : 2030

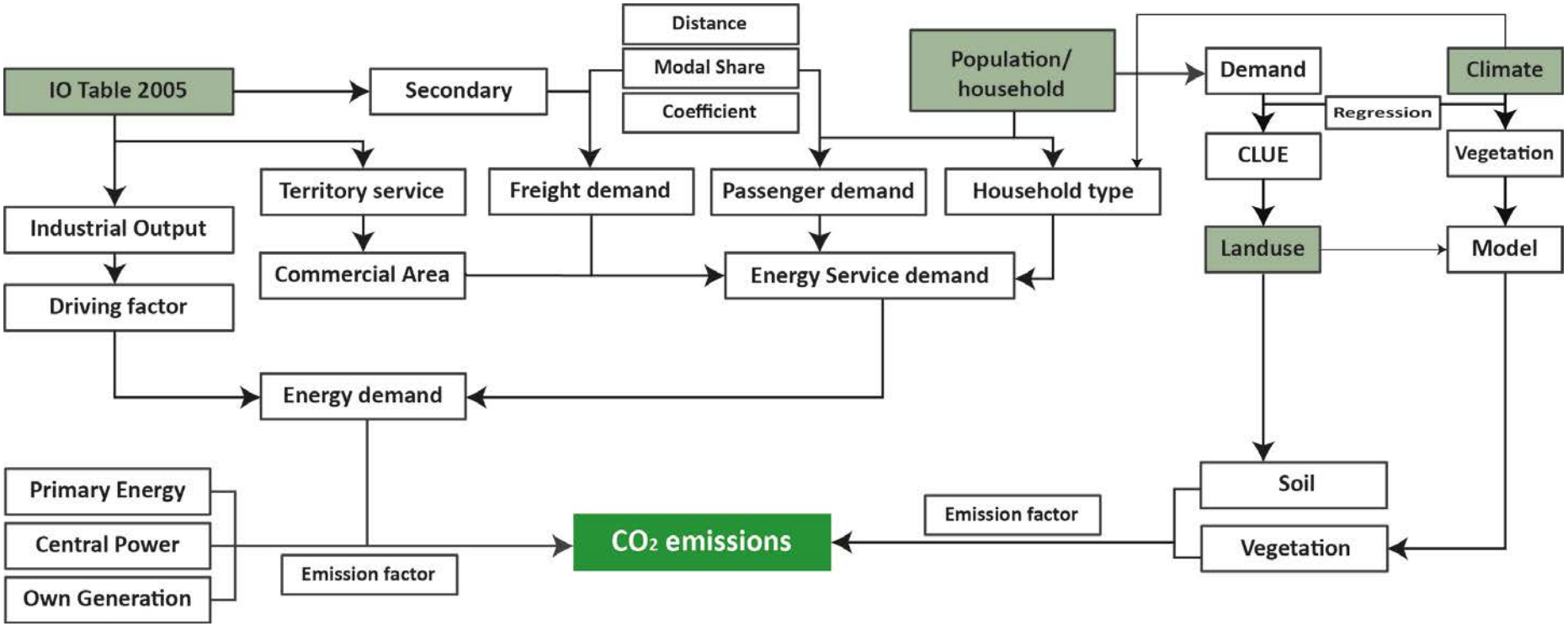
Sectors : Industrial, Residential, Commercial/public, Transport,
Land use (Soil, Vegetation)

Impact Factor: Human Activity, Climate Change, Land-use change





Methods


IO Table 2005
Secondary
Distance
Modal Share
Coefficient
Population/ household
Demand
Climate
Regression
CLUE
Vegetation
Industrial Output
Territory service
Freight demand
Passenger demand
Household type
Driving factor
Commercial Area
Energy Service demand
Landuse
Model
Energy demand
Primary Energy
Central Power
Own Generation
Emission factor
CO2 emissions
Emission factor
Soil
Vegetation

LCS vision

To be a sustainable low carbon city in line with national policies

- Ready for future and resilient to change
- Conservation and green orient for quality of life
- Economic and social competitive clean and green industries
- Efficient transport system
- Community participation in city development

Reduction Target (Gyeonggi Province)

- 30% of 2020 BAU Emissions

The Scenarios

Business As Usual (BAU) scenario

- The present trend in Gyeonggi has been considered with existing technology and prevailing economic and demographic trends.
- The BAU scenario for future energy consumption and emissions projection, and capture forecast for various economic, demographic, land use and energy use indicators.

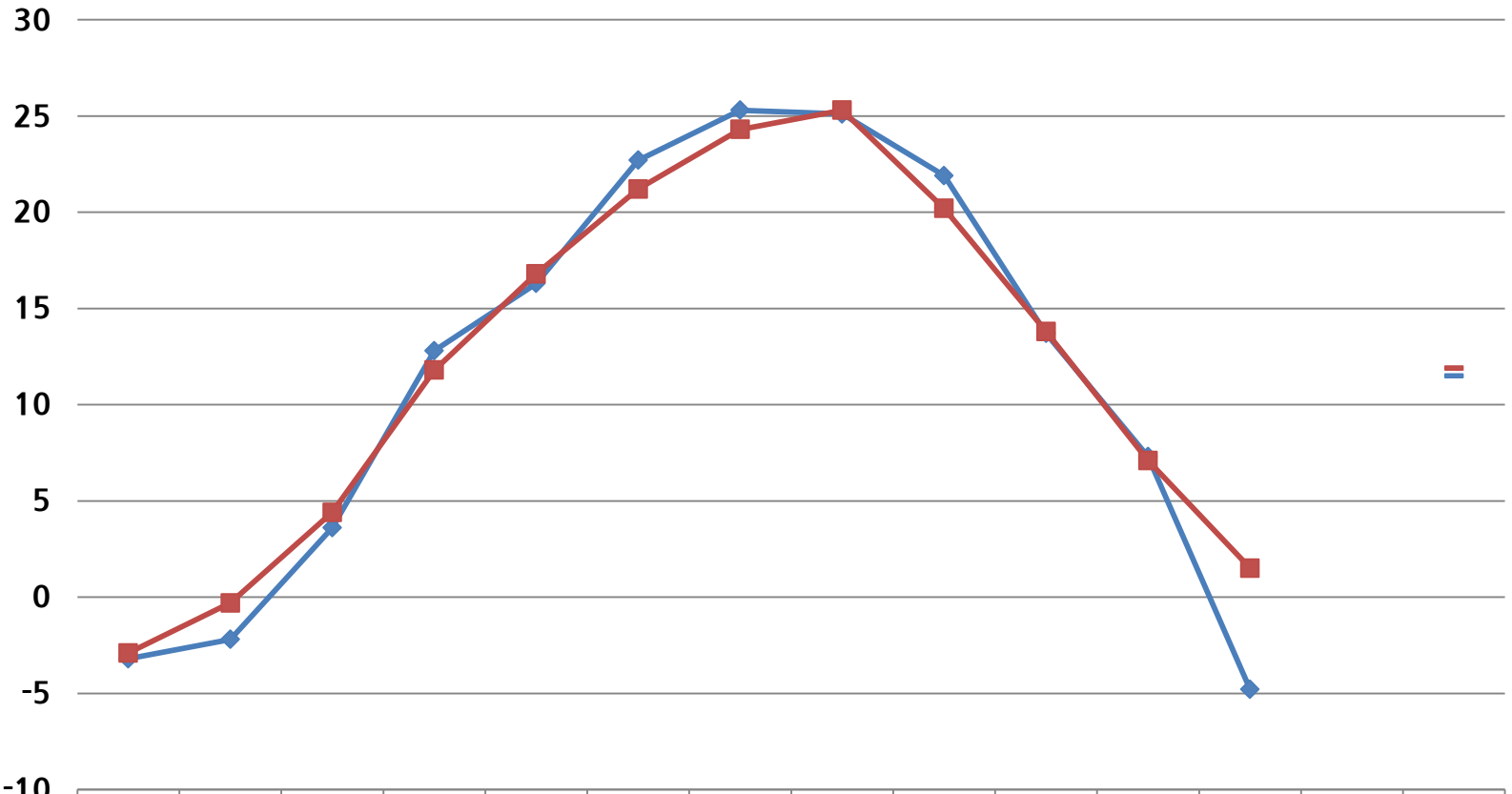
Low Carbon Society (LCS) scenario

- The energy consumption trajectory / emissions trajectory are drawn in all the sectors that would result from aggressive policies to promote demand side management, energy efficiency, development of renewable energy, and other policies to promote sustainable development .

Socio-economic Scenarios

		2005	2030 BAU	2030/2005
Population(million)		10,6	14,0	1.32
Number of households(million)		3.3	5.4	1.64
GRDP (billion KRW)		169	424	2.51
Industrial structure	Primary	2.4	2.1	
	Secondary	63.3	55.9	
	Tertiary	34.3	42.0	
Passenger transport demand(B.P.km)		119.3	147.2	1.2
Freight transport demand(B.T.km)		3.4	7.6	2.2
Land use (Km^2)	Settlement	122.4	155.9	1.22
	Rice field	167.1	144.3	0.86
	Crop field	101.5	97.3	0.96
	Forest	515.6	510.7	0.99
	Grassland	34.0	35.4	1.04
	Bare land	20.6	18.5	0.90
	Other	39.1	38.5	0.99

Climate Change Scenario



	1	2	3	4	5	6	7	8	9	10	11	12		Average
2005	-3.2	-2.2	3.6	12.8	16.3	22.7	25.3	25.1	21.9	13.7	7.3	-4.8		11.5
2030	-2.9	-0.3	4.4	11.8	16.8	21.2	24.3	25.3	20.2	13.8	7.1	1.5		11.9

2005 2030

LCS measures

Household/Commercial Sector

To promote low-carbon buildings and eco-friendly working places

- **Load Reduction**: Higher insulation standards, Shade and natural cooling design, Life style change
- **Equipment Efficiency Improvement**: Gas boilers Lighting fixtures, Electronics and appliances
- **Increase of Renewable Energy**

Transport Sector

To lower fuel costs using greener commuting options

- **Increased Use of Biofuels**: Increase blend ratio of biofuels in diesel and gasoline
- **Fuel Economy Improvement**: Fuel Economy Improvement Goal (CO_2 Emissions Standard in 2015: 140 g/km)
- **Green Car Deployment** : Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles(PHEVs), Fuel cell
- **Public Transportation Expansion**: High-speed regional rail, Bus Rapid Transit (BRT), Bicycle infrastructure
- **Eco-driving**

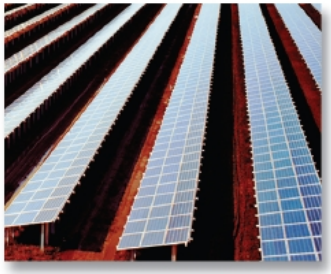
Industrial Sector

To strengthen international competitiveness through proactive investment in green technology

- **Energy Saving**: Replace existing facility equipment with high-efficiency equipment, Cogeneration, Waste heat utilization
- **Catalyst Efficiency Improvement**
- **Fuel Switch**: Replace heavy-oil and coal with natural gas, biomass, and waste

Power Transformation Sector

To supply cleaner energy with user-friendly access to improve quality of life

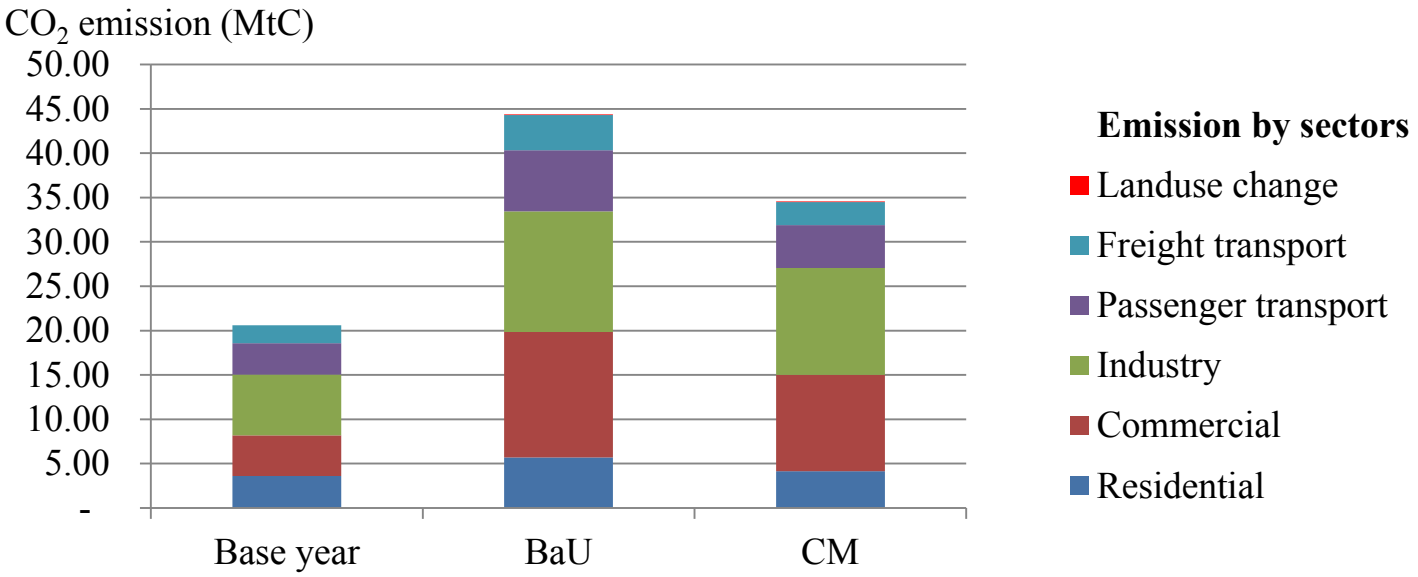


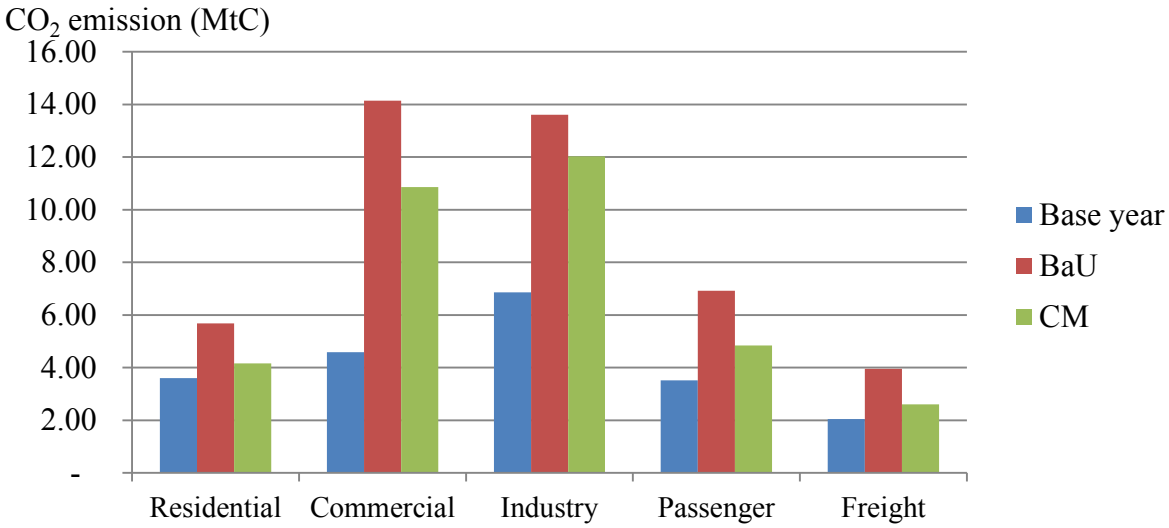
- **Demand-side Management**: Less dependence on fossil fuels
- **Renewable Energy**: Wind power, solar, geothermal energy expansion through renewable portfolio standard (RPS) and R&D investment

LCS measures

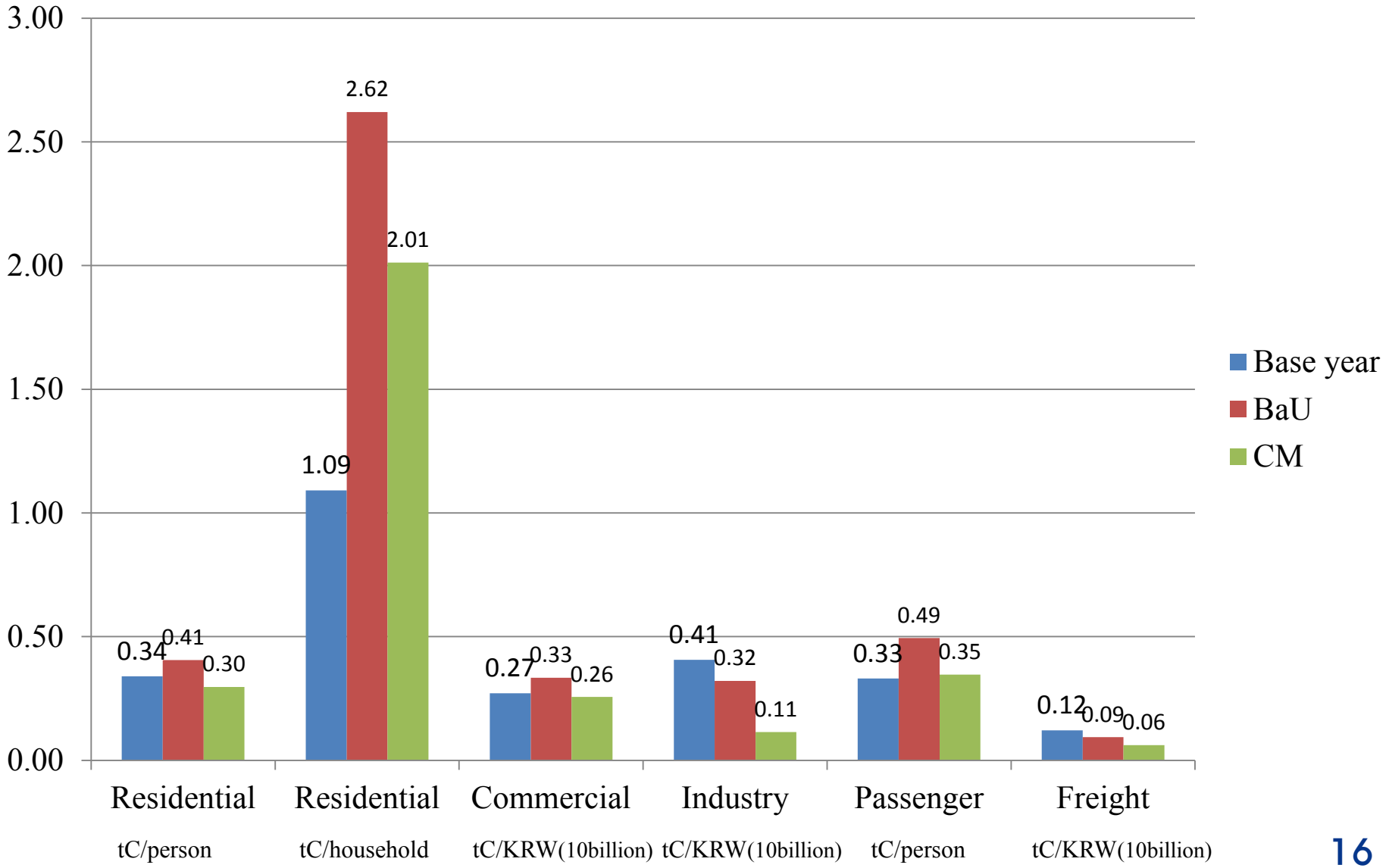
Measures		Factors	Quantification
Energy-efficient devices		Technological efficiency increased	
Building insulation		Heat energy demand decreased	5%
Electric power production		Energy Mix	
Renewable Energy	Geothermal houses	Heating fuel composition changed	1%
	Solar heat	Heating fuel composition changed	5%
Passenger transportation structure	Transportation demand decreased	Reduction in traffic per day	10%
	Expansion of public transportation methods	Transportation method changed	10%
	Technological efficiency improvement	High-efficiency, eco-friendly car increased	20%
	Compact city structure	Transportation distance reduced	5%
Freight transportation structure	Utilization of freight trains	Transportation methods changed	10%
	Technological efficiency improvement	High-efficiency, eco-friendly car increased	3~10%
Energy conservation action	Household	Decreased demand for energy service	10%
	Commercial	Decreased demand for energy service	5%

GHG emissions



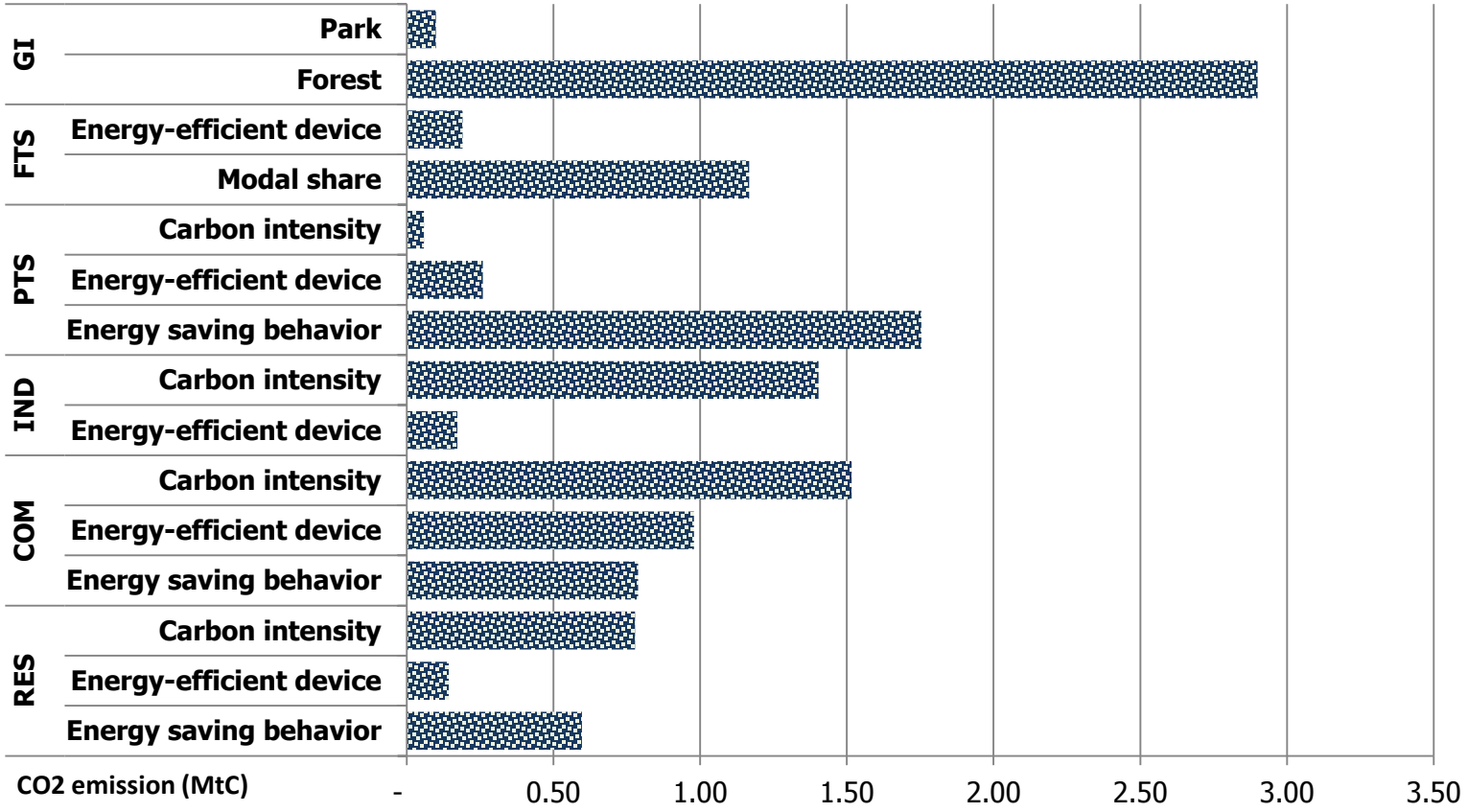


GHG Emissions by GRDP / per Capita



Mitigation Contribution

2030 BAU vs 2030 CM

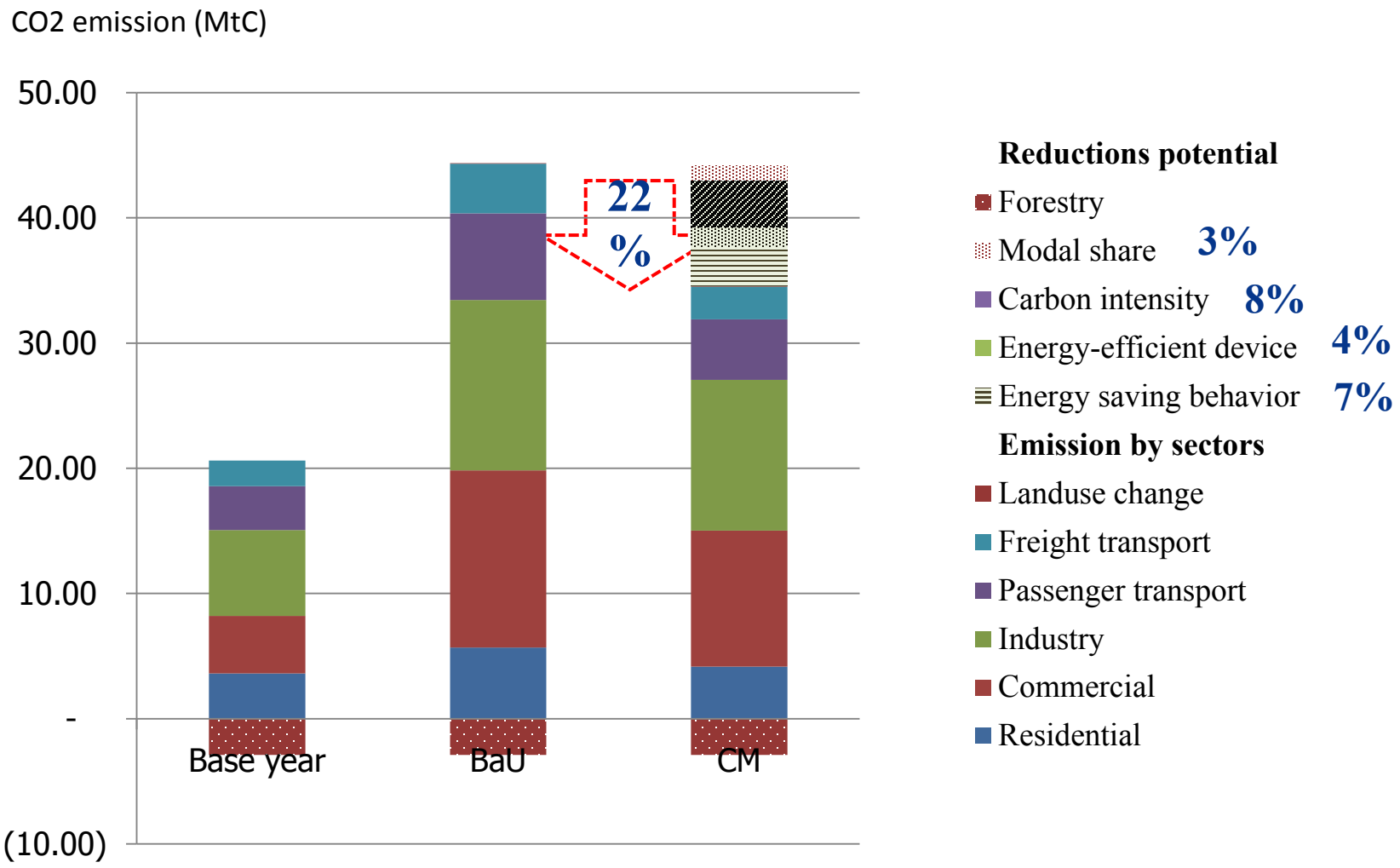


Residential & Commercial Sectors
- Efficiency Improvements in End Use Devices
- Fuel Switch
- Behavioral Changes
- New Technology Adoption & Retrofitting
- Improved Material Efficiency in Buildings
- Change in the Nature of Power Supply

Transport Sector
- Technology Efficiency Improvements
- Fuel Switch
- Improved Traffic Management
- Shift to Public Transport
- Implementing Integrated Transport

Industrial Sector
- Technology Efficiency Improvements
- Fuel Switch

Mitigation Contribution



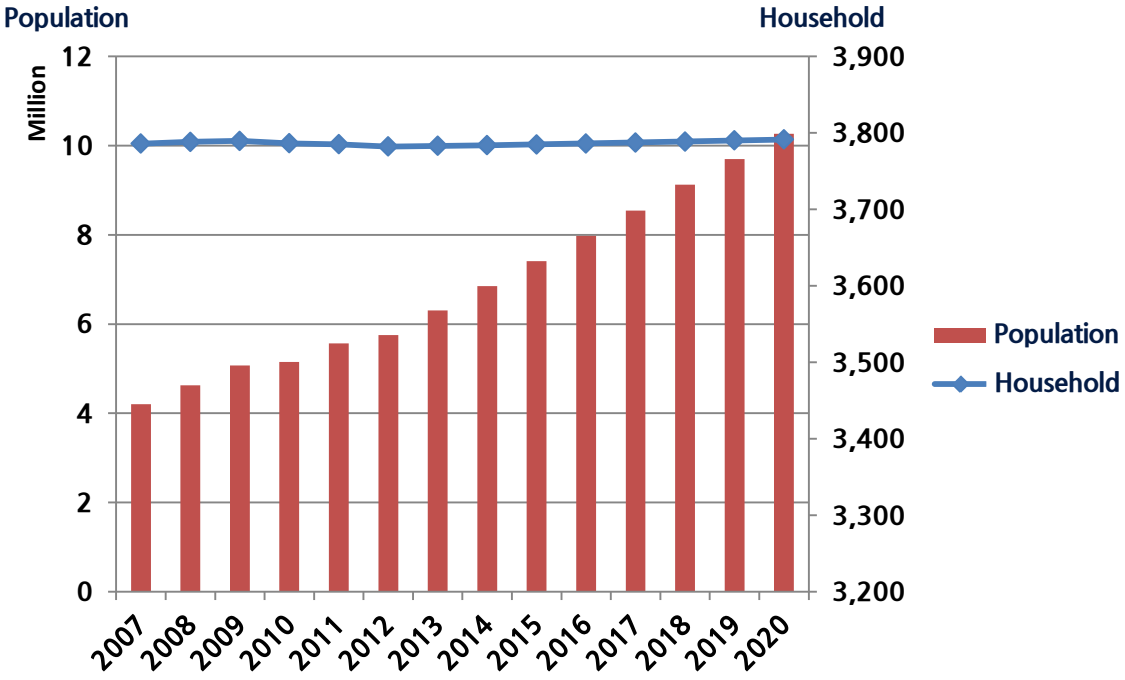
Future plan

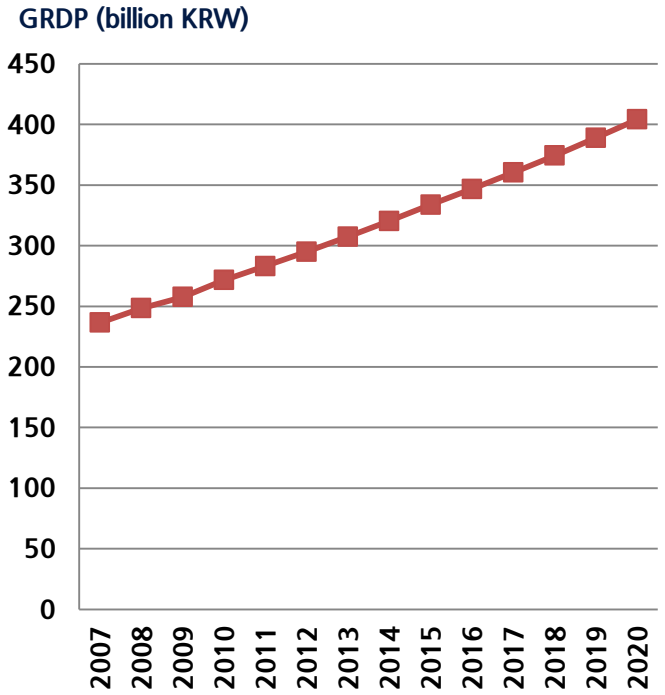
Developing Road Map for LCS Actions

- Establish reduction target by sector and implementation target action plans
- Propose the detailed countermeasures and action plan
- Perform follow-up actions to establish detailed reduction amount by sector
- Suggest the methodology to local Authorities for development of LCS vision

LCS for Seoul

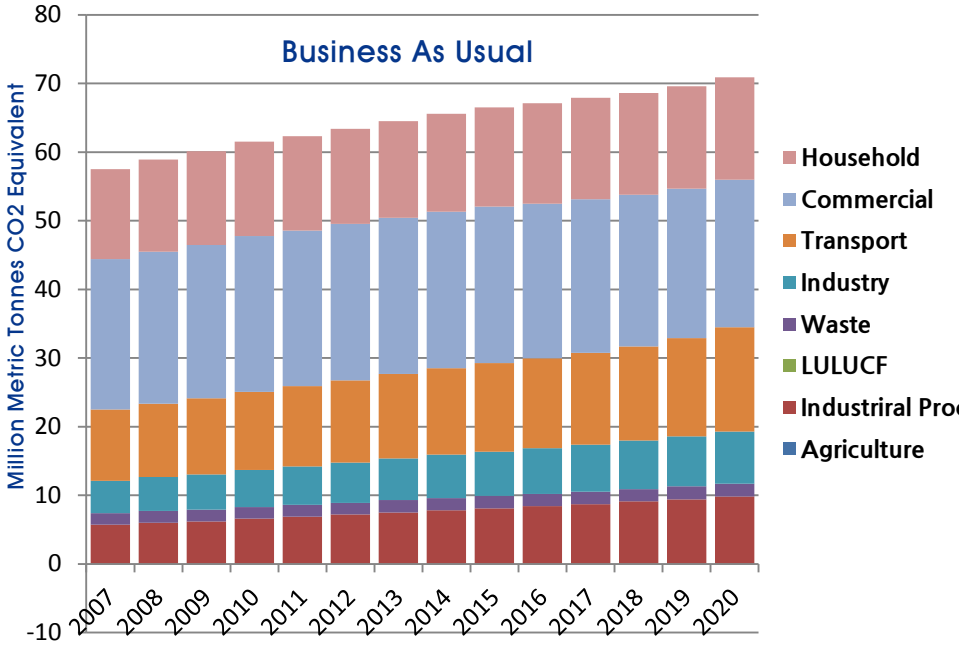
- **Socio-economic Scenarios**
  - Population : 2010 (10.0 million people), 2020 (10.1 million people)
  - Household : 2010 (3,445 thousand household), 2020 (3,798 thousand household)
  - GRDP : 2010 ~ 2016 (4.2%), 2017 ~ 2020 (3.9%)

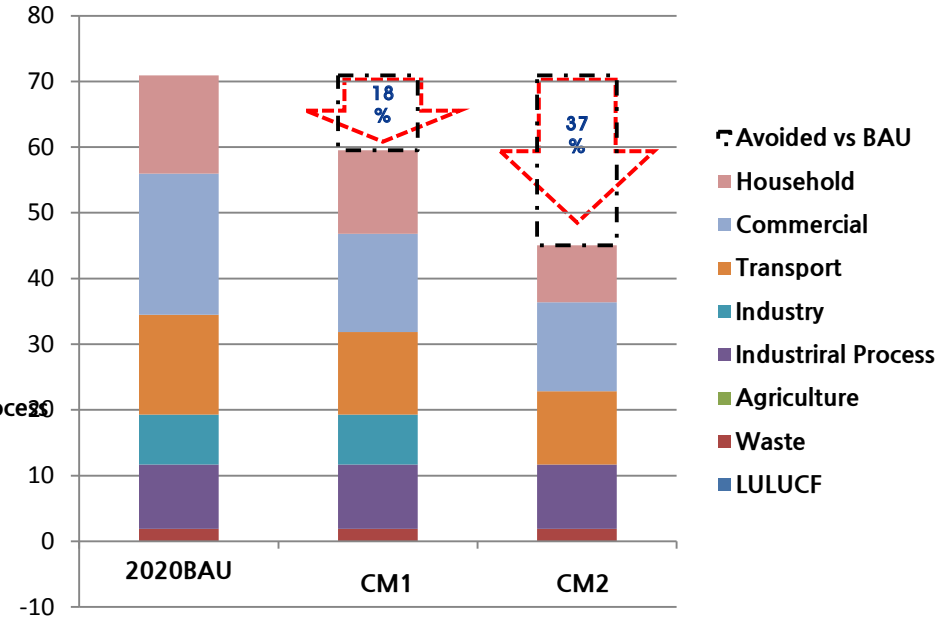




- Population : Statistics Korea
- GRDP growth : Korea Development Institute

LCS for Seoul





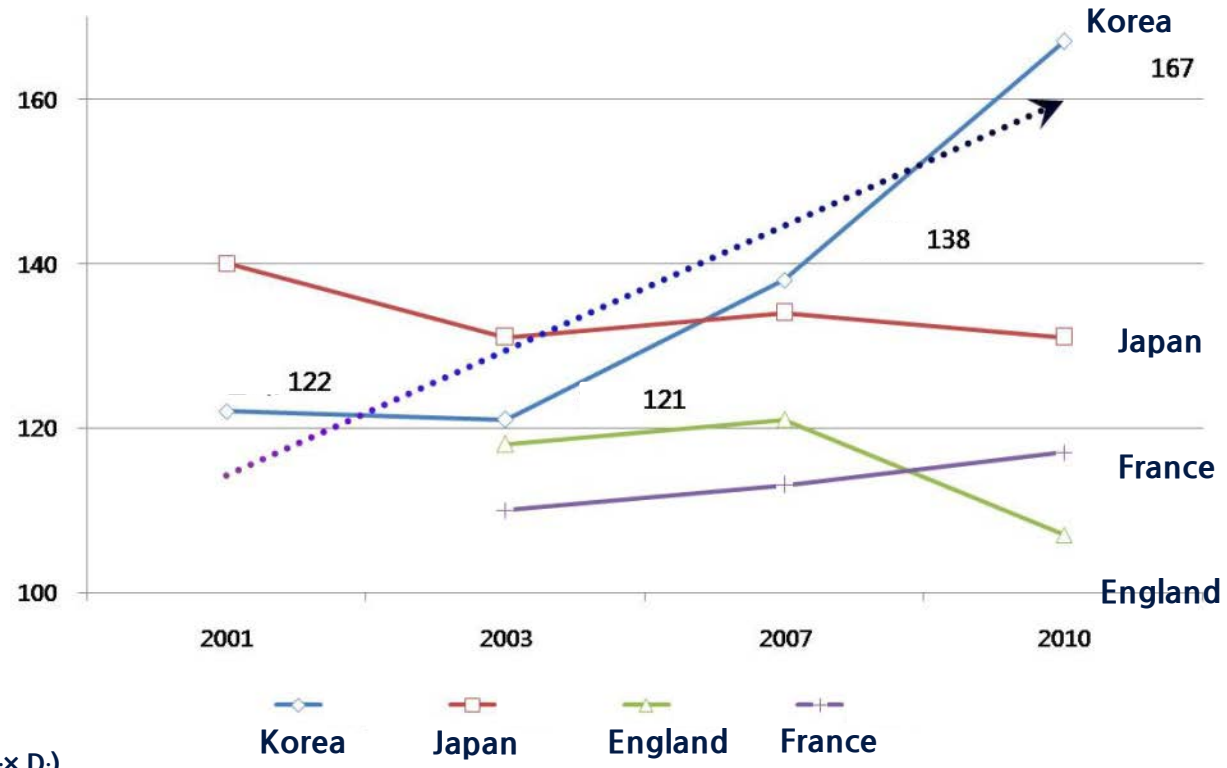
Emission : 1.2 times (Vs 2007)

Reduction potential (Gyeonggi Province)

- 18% of 2020 BAU Emissions(CM1)
- 37% of 2020 BAU Emissions(CM2)

Food mileage

- CO_2 emission per person
  - Korea : 2001 (122 kgCO_2/person) Vs 2010 (167 kgCO_2/person)



Food mileage(t·㎞) = $\Sigma(Q_{i,j} \times D_i)$
$Q_{i,j}$: cargo volume (ton)
D_i : distance (㎞)
CO_2 emission(㎏)=Food mileage (t·㎞)×CO_2 emission factor(㎏/t·㎞)

Preliminary feasibility study on Low Carbon Development Towards 2030 in Gyeonggi Province

Low carbon Society 20

Thank you