GWANGJU CITY

Gwangju

Toward the Low-Carbon Green City

Kwi-Gon Kim, Ph. D. (UCL, England)

Secretary General, UEA
Emeritus Professor, Seoul National University

CONTENTS

Contents

01 Statistics and Characteristics of Gwangju Metropolitan City

1. General Statistics
2. Greenhouse Gas Emission Status

Chapter 01

General Statistics

General

- Area : 501.24km²
- Population : 1.48 million

Industry · Economy

- GRDP : 23 billion US$
- Export : 13.34 bil. US$(2011)

Climate

- Annual avg. temp : 14.2℃
- Annual rainfall : 1,573mm

Chapter 02

Greenhouse Gas Emission Status

[ktonCO2 eq]

Category	Emission Status				Emission Projections			
	2005yr.		2010yr.		2020yr.		2030yr.	
Household	2,045	25.5%	2,210	25.5%	3,379	26.0%	3,167	23.0%
Commercial/ Public	2,060	25.7%	2,218	25.6%	3,146	24.2%	2,906	21.0%
Transportation	2,333	29.0%	2,461	28.4%	2,384	18.4%	2,755	20.0%
Industry	1,587	19.8%	1,776	20.5%	4,077	31.4%	4,934	36.0%
Total	8,025	100%	8,665	100%	12,986	100%	13,762	100%

- Compared to 2005, it is estimated that emissions will grow by 61% and 71% respectively in 2020 and 2030
- In order of greenhouse gas emission status, transportation, household, commercial/public, and industry sectors are listed.
- For greenhouse gas emission Projections,industry area expected to make up the largest share depending on economic development

Contents

02

Gwangju Metropolitan City Low-Carbon Green City Development Strategy

1. Greenhouse Gas Reduction Target
2. Trends and Projections, and Best Practices

Chapter 01

Greenhouse Gas Reduction Target

Base year : 2005

reduction by **40%** compared to BAU by 2020

reduction by **50%** compared to BAU by 2030

Achieve **carbon neutrality** by 2050

※ Korea's reduction target : 30% reduction compared to greenhouse gas emission forecast (BAU) by 2020

Chapter 02

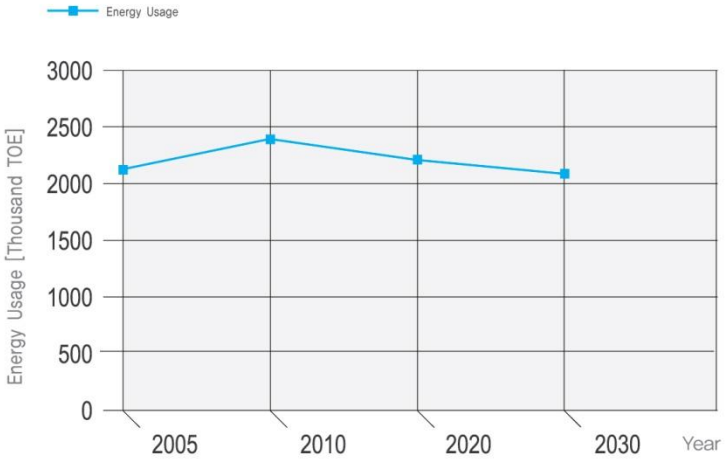
Trends and Projections by Sector

1) Energy

Category	2005yr.	2010yr.	2020yr.	2030yr.
Energy Usage	2,089	2,386	2,215	2,071

➠ Compared to 2010, 7.2% reduction in 2020, 13.2% reduction in 2030

- 85% of greenhouse gas emission occurs from energy area
- To achieve greenhouse gas reduction goal, energy usage has to be reduced at same levels
  - ➠ Expansion of renewable energy use will reduce use of fossil fuel to reduce greenhouse gas
  - ➠ City tree-planting will be expanded for increased carbon absorption
  - ※ World energy usage is trending downwards since 2009 (BP-World Energy Statistics Review 2010)



Chapter 02

• Best Practices

(1) Expand use of LED

- Phase 1 : LED traffic signal implementation (97% complete, 14,500 units)
- Phase 2 : LED for street lamp (World's first registration to Program CDM, Apr. 161,800 US$ emission right earned annually)
- Phase 3 : Household · industrial LED (2011.11~2029.11)
  - ※ Achieve 100% for public by 2020, 60% for private
  - ※ Create a virtuous cycle structure for development of regional LED industry (147) by LED product production increase

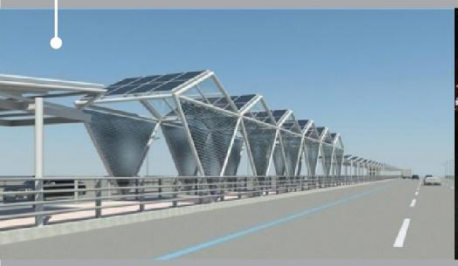
(2) Renewable Energy Mecca City

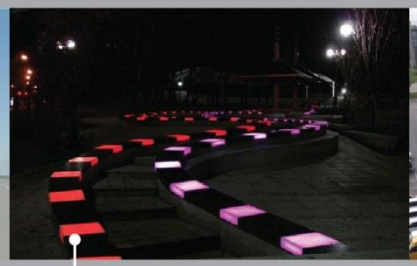
- World's leading performance organic plastic solar cell technology
- Research/development of fuel cell (256kW), wind power, and other renewable energy
- Renewable energy supply : 1,200 solar energy facilities (power 12MW)
  - ※ Supply rate : 2.33% (2010) -> 5.00% (2020) -> 11.00% (2030)
- Green village 111 units, solar energy housing 1,198 units

(3) Utilize Smart Grid system for optimal energy efficiency

[Smart Grid concept]

1) IT conversion of electricity network
2) Intelligent consumer
3) Electric car recharging
4) Renewable energy


Install roadside solar energy panels

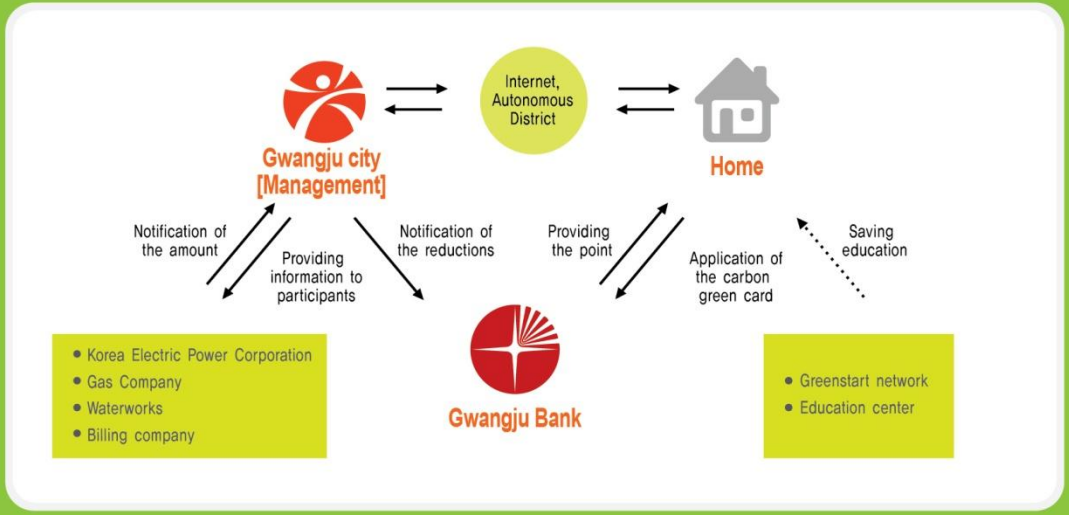

Install road LED lighting


Solar energy parking


Solar energy housing complex


LED traffic signal

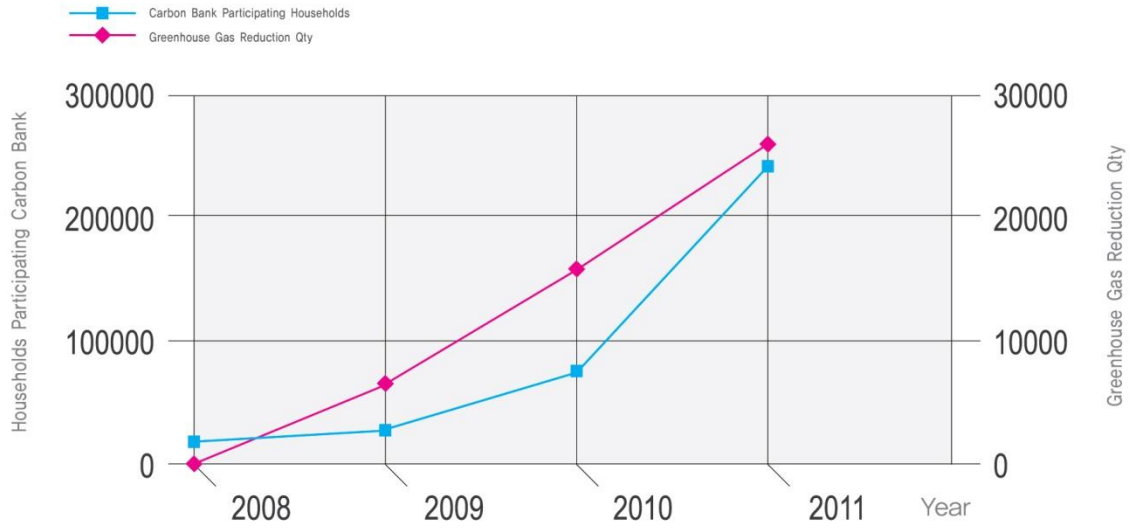
EXAMPLE 1



- Carbon point payment according to reduction quantity compared to recent 2 year usage by household
- Participating households : 240,000 households (2011)
  ※ 44% of all Gwangju households (target : 100% by 2015)
- Reduction and Incentive : Electricity(6 Cent/kW), Gas(1.7 cent/m^3), Water(5 Cent/m^3)

● Carbon Bank Management Result

Category	2008yr.	2009yr.	2010yr.	2011yr.
Participating Households	20,327	36,803	60,248	240,350
Reduction Households	11,708 (57.6%)	24,393 (66.3%)	44,746 (74.0%)	145,831 (60.6%)
Carbon Point Incurred (Apr.)	98,000 US$	295,000 US$	688,000 US$	2,300,000 US$
Greenhouse Gas Reduction	57 tonCO_2	4,752 tonCO_2	15,305 tonCO_2	25,550 tonCO_2
Effect (Pine Tree Planting)	20,00 trees	1.71 mil. trees	5.50 mil. trees	9.18 mil. trees



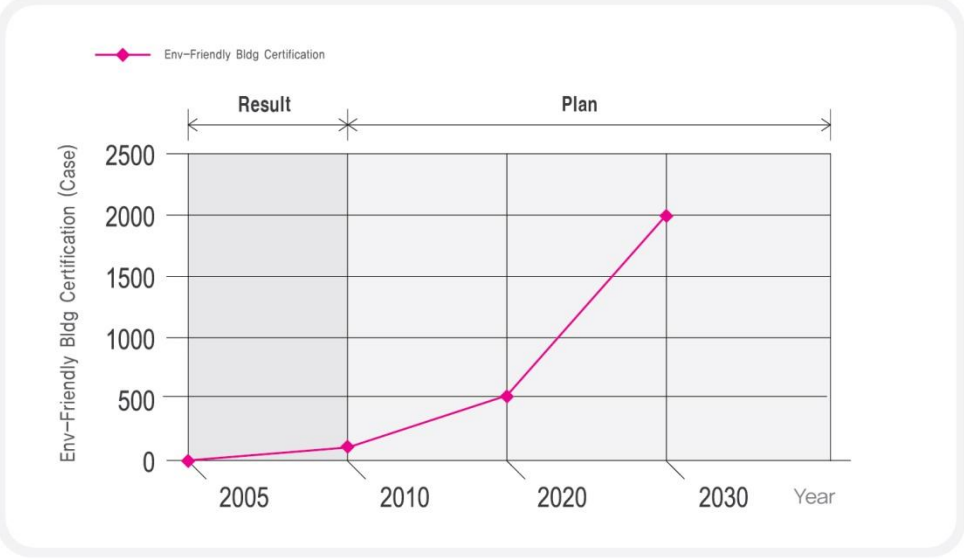
※ From Gwangju Total Households 549,105, About 44% subscribed to Carbon Bank (2011.12)

※ 100% subscription by 2015

2) Eco-Environment Building Planning

Category	2005yr.	2010yr.	2020yr.	2030yr.
Environment-Friendly Bldg Certification (Case)	0	46	500	2,000

- Application of building ordinance regarding environment-friendly building certification in 2009



Chapter 02

• Best Practices

Eco-Environment Building Planning

- Eco-Environment building certification (46) and expansion
- Provide incentive for Eco-Environment buildings (Floor space ratio relief, reduce acquisition · registration tax, reduce environment improvement burden charge)
- Expand supply of green home - town house etc.

2015 U competition athlete's village

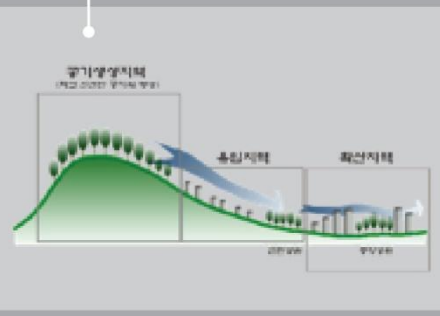
Residential environment improvement project

Environment-friendly house

Urban restoration and water corridor

Urban Polly

Consider urban wind path

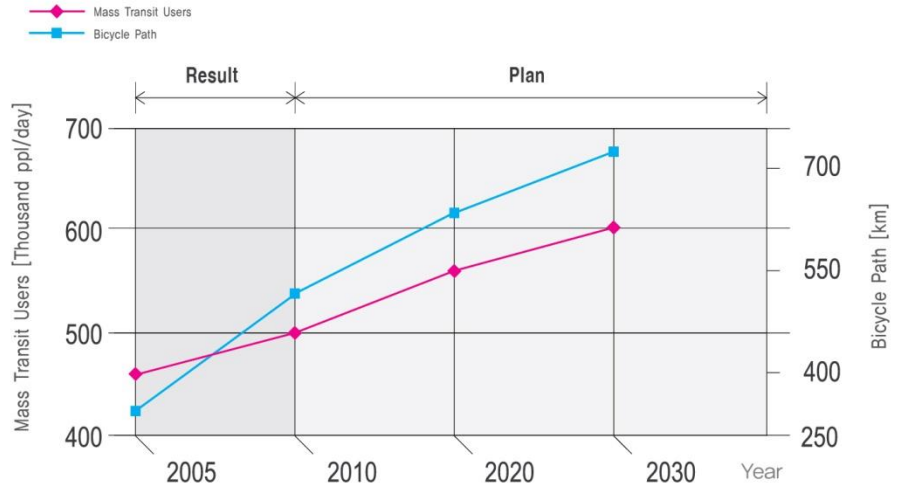


Chapter 02

3) Transportation

Category	2005yr.	2010yr.	2020yr.	2030yr.
Mass Transit Users [Thousand ppl/day]	456	502	552	602
Bike Path (km)	294	511	613	715

- Mass transit users increasing due to supply/demand management by establishing free transfer system by transport mode, passenger car number limit driving system, etc. (2010)
- Transportation usage system improved considering number of mass transit users
  - ➠ Compared to 2010, increase of 10% in 2020 and 20% in 2030 (additional construction of subway)



Chapter 02

• Best Practices

(1) Transportation system reformed centered on mass transit use

- Enforced free transfer system by transport mode (2006. 12)
  ※ Before 456,000 per day, After (2010) 502,000 per day (10% increase)
- Expand long-distance bus IT system
- Build subway line no. 2 (2012 ~ 2023)

(2) Promote bicycle demo city : Green Bike City

- improve transportation share ratio of bicycles by increasing bicycle paths
  ※ 1.75%(2010) ➠ 3.0%(2012) ➠ 4.0%(2015)
- Expand bicycle culture : Provide incentive to user
- Improve usage convenience of bicycle : Can be stored, repaired, and transferred at destination

(3) Environment-friendly transport mode

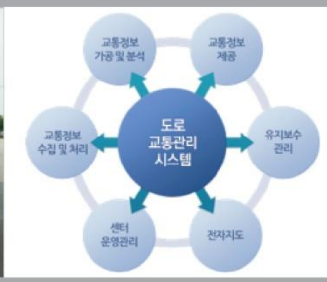
- Continued expansion of hybrid · electric cars

(4) Establish intelligent road management system (2009 ~ 2018) and construction of energy-independent road

※ Supply electricity to street lamp, tunnel, traffic signal by roadside solar power

Bicycle path

Solar power panel + bicycle path



Electric car and recharge station

Contents

03

UEA's proposal for worldwide environment cooperation

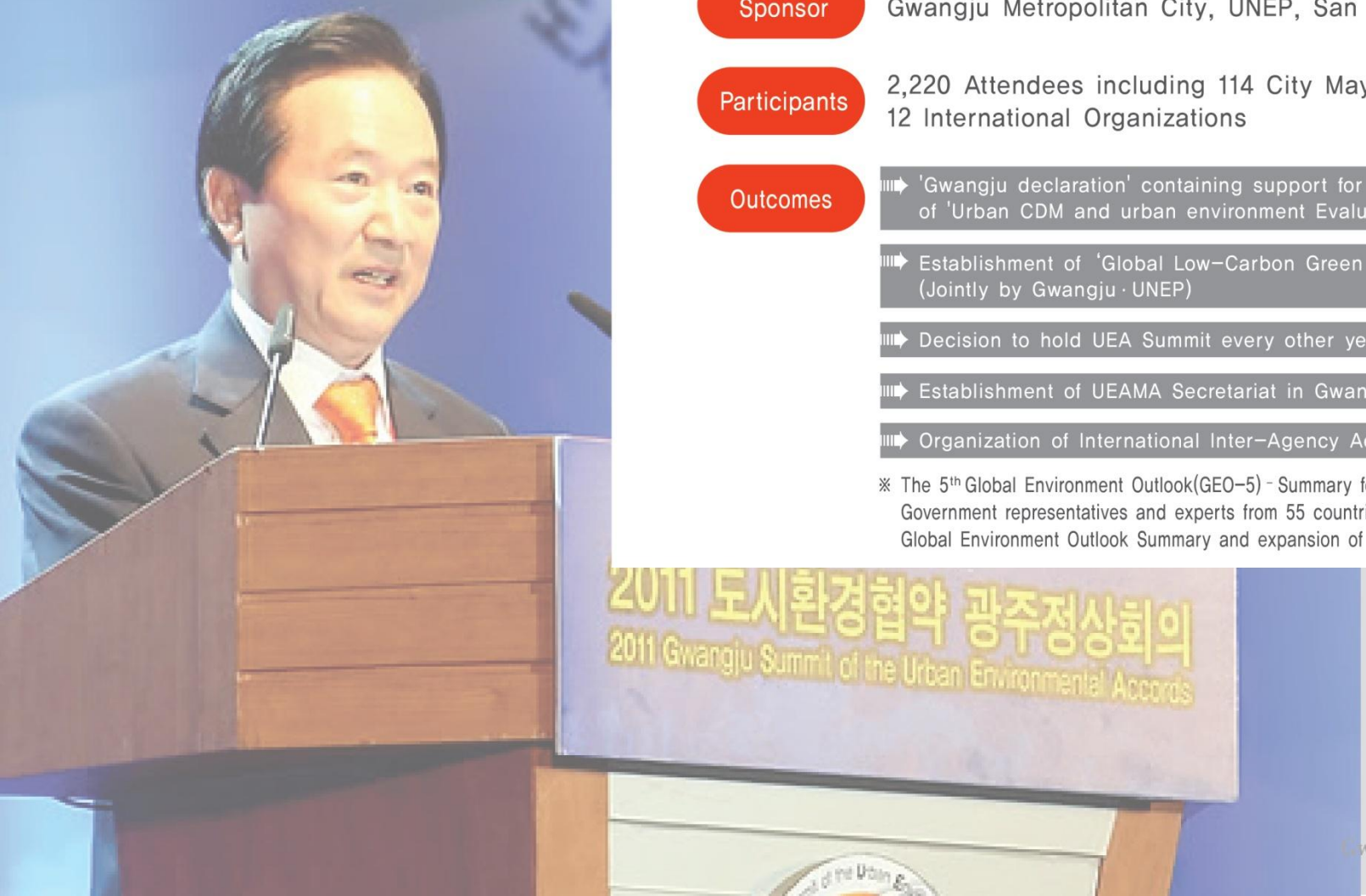
Chapter 01

2011 Gwangju Summit of UEA (Urban Environment Accords)

• Ceremony Overview

Date/Location	Oct 11th(Tue) ~ 14th(Fri) 2011 / KDJ Convention Center
Sponsor	Gwangju Metropolitan City, UNEP, San Francisco
Participants	2,220 Attendees including 114 City Mayors and Representatives, 12 International Organizations
Outcomes	➡ 'Gwangju declaration' containing support for international application of 'Urban CDM and urban environment Evaluation Index' was selected
	➡ Establishment of 'Global Low-Carbon Green City Award' (Jointly by Gwangju · UNEP)
	➡ Decision to hold UEA Summit every other year (UNEP)
	➡ Establishment of UEAMA Secretariat in Gwangju metropolitan city
	➡ Organization of International Inter-Agency Advisory Group

※ The 5th Global Environment Outlook(GEO-5) - Summary for Policy Makers(29~31 Jan, 2012, Gwangju) : Government representatives and experts from 55 countries participated to discuss about Global Environment Outlook Summary and expansion of Urban CDM



Chapter 02

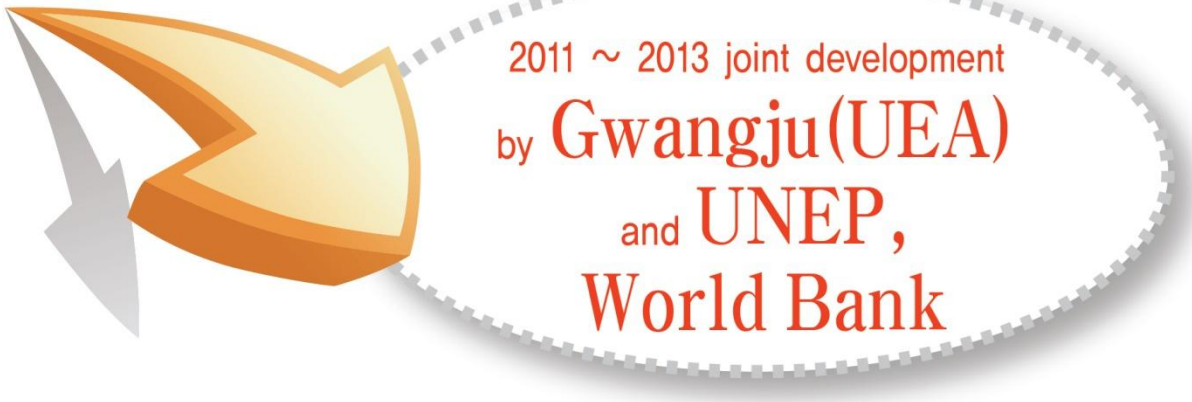
Urban CDM

Execution background

- Agreement regarding post-Kyoto system is unclear
  ➠ New Reduction Paradigm required
- Reduction rate of existing CDM is only at 4.9% compared to worldwide greenhouse gas emission rate
  ➠ Large-scale greenhouse gas reduction effort by city's policy, land use, and governance and recognition of record have to be required
- Possibility of allocation of UN Green Climate Fund raising $100 billion annually until 2020 according to developing country greenhouse gas reduction record

Meaning of Urban CDM

- Carbon Bank system where rights can be purchased by UN Green Climate Fund which bestows carbon emission right to city up to greenhouse gas reduction rate compared to BAU

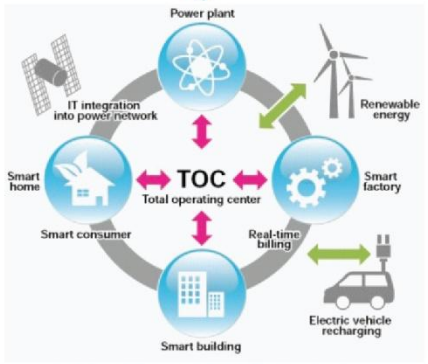


Urban CDM Frame work

- Here is my framework for the proposed Urban CDM.
  How I have arrived this framework is a reflection process of analyzing and validating documents, which have been conducted.

- This model is very useful to understand inter-relationships between energy suppliers and consumers, and between built form, urban infrastructure and CDM mechanism for them, in a total holistic manner.

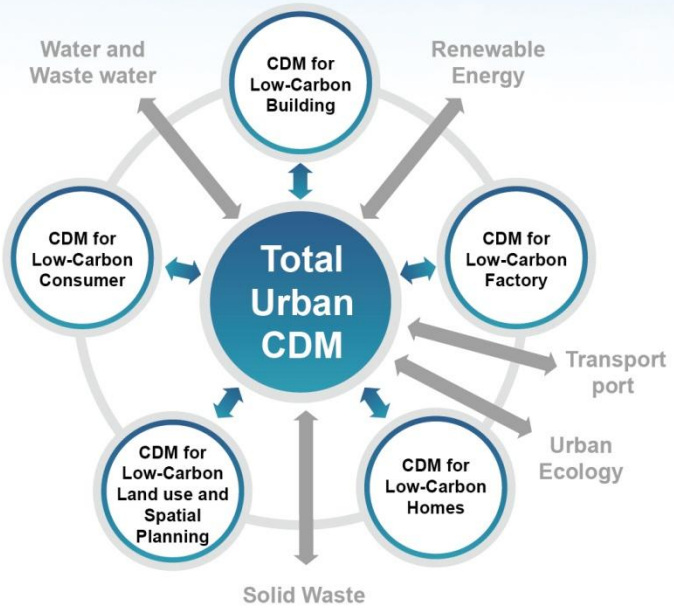
Single CDM Project



<Urban Smart Grid System>

<Integrated Urban Planning and Management>

Feedback



<Total Urban CDM Model>

Feedback

Super-Smart Grid System

Urban CDM application method

- Utilize UN Green Climate Fund as effective allocation method under agreement between international community including UN Green Climate Fund administrative agency, UNFCCC, and world cities

Expected Effect

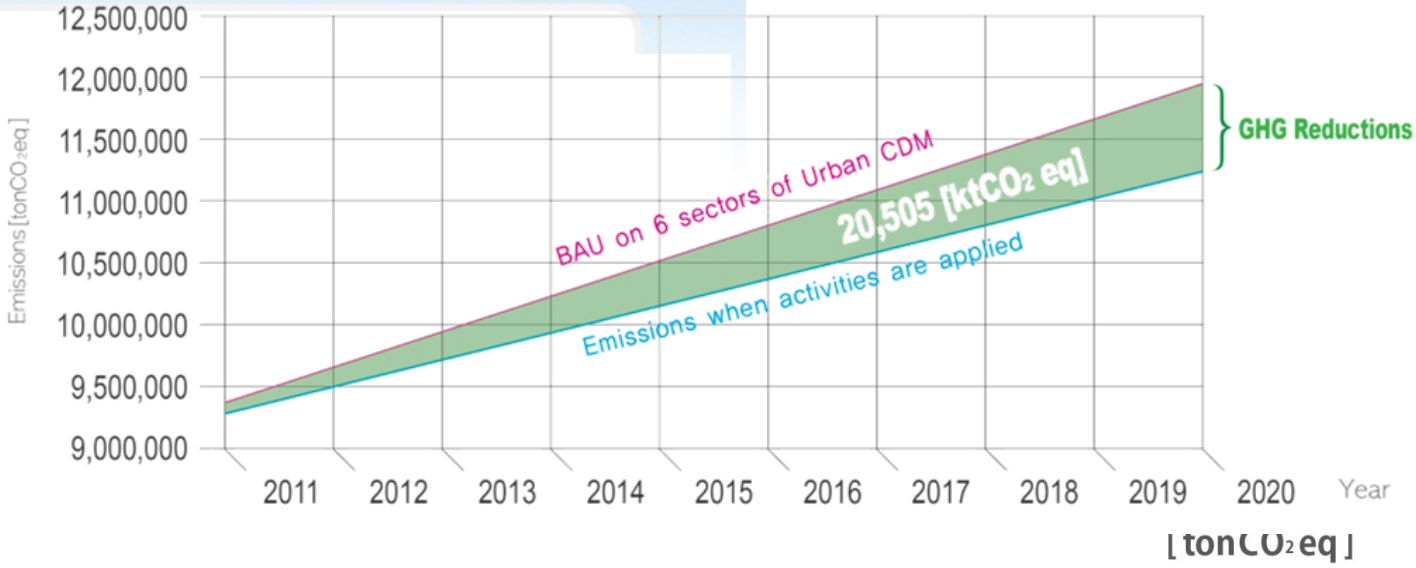
- Worldwide greenhouse gas reduction due to participation by cities of developing countries
- Application of UN Green Climate Fund as reasonable allocation method
- Application as replacement methodology of uncertain Kyoto system

Chapter 02

Interim results of Application of Urban CDM

- When Urban CDM is applied which is leading project that can comprehensively monitor by area, 92.2% of greenhouse gas emitted by cities can be gauged
- According to 10 year reduction activity compared to BAU for 6 areas, greenhouse gas reduction is 20,505ktCO₂ with economic benefit of 72,382,000€ (3.53€/ton)

Application of measurable planned reduction activities

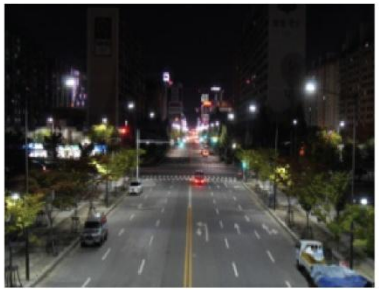


[tonCO₂eq]

6 Areas	Monitoring Method	2020 Emission (Forecast)	2020 Reduction Plan	Reduction Quantity (2011~2020)
Household/Commercial Electricity	Electricity provider gauge	3,435,400	46.0%	7,809,880
Industrial Electricity	Electricity provider gauge	3,473,200	19.9%	3,661,543
Urban Water Usage	Water provider gauge	307,201	40.0%	671,781
Urban Gas Usage	Gas provider gauge	2,355,300	40.0%	4,534,924
Car Emission Greenhouse Gas	Car inspection agency (CC, distance, driving pattern considered)	2,320,500	22.2%	3,310,650
Carbon Absorption Green Area	Actual tree planting compared to plan	– 68,215	100%	516,092
Total	–	11,822,909	40.0%	20,504,870

• Suggested Roadmap

2011. 5 ~ 2012. 10	1st Development of methodology – R&D of Base-line/monitoring method by reduction program
2012. 10 ~ 2013. 8	2nd Pilot Test – Actual application of developed model on member cities
2014. 3	3rd Methodology registered at UNFCCC – Urban CDM methodology registered at UNFCCC – Share data with member cities
2014. 7 ~	4th Urban CDM program registered at UNFCCC – After Urban CDM program by member city, secure CERs



Thank you for your attention