Korea Research Institute for Human Settlements

Korean Strategy for Low-Carbon Green City

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I Background

"Low carbon Green City = Low carbon + Green City"

Green Independent	Use of **renewable energy** Expansion of carbon sinks Carbon disposing technology
Green Environment	Environment friendly low carbon land use, **Green transportation** **Virtuous cycle** of water and resources
Green Society	Environmental education Activation of eco community
Green Economy	Use of **local green resource**

making together a happy green base

Low carbon Green City

Land Use & Urban Structure

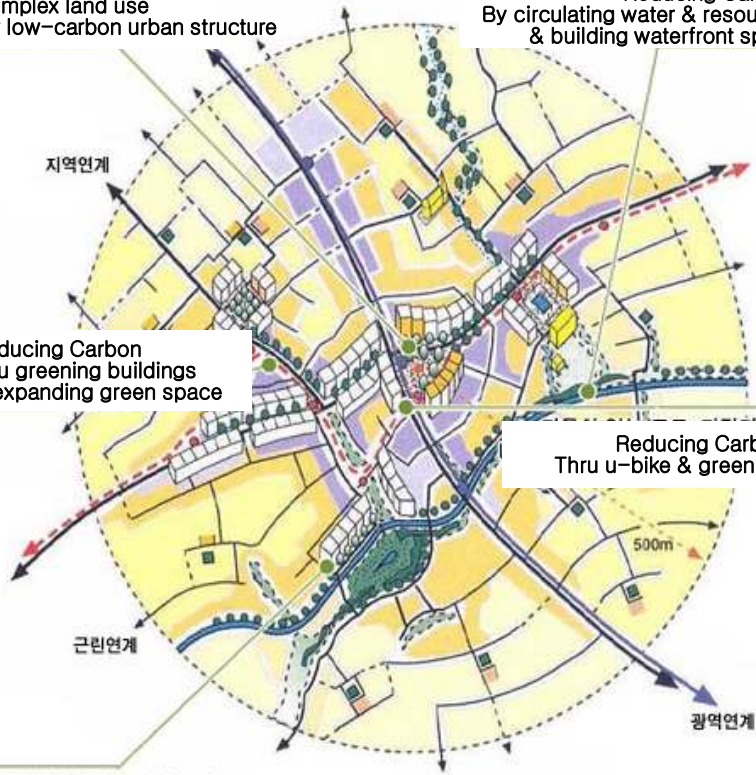
Complex land use
for low-carbon urban structure

Reducing Carbon
By circulating water & resources
& building waterfront space

Water Circulation

Ecosystem & Green Space

Reducing Carbon
thru greening buildings
& expanding green space



Reducing Carbon
Thru u-bike & green car

Green Transportation

Low-Carbon Energy System

Reducing Carbon
based on renewable energies
& green home

Reducing Carbon system
Based on movements on
green consumption & green start

Railway
Bus
Bicycle
Acess
Complex Use
Residential (High density)
Residential (Low density)
Neighborhood Square
District Square
Waterfront

Green Lifestyle

Source : Modified from Toward Urban Renaissance

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II

National Level Projects

II-1. Central Governments Pilot Projects
II-2. Low Carbon City Planning Simulation S/W
II-3. Smart City Energy Management System

II-1. Central Governments Pilot Projects

Pilot projects commissioned by central government and conducted by municipal governments are 9 projects in total

- Government-led initiatives including Eco Rich City, Pilot City Development for Climate Change, Low-Carbon Green Community and Sustainable Newtown Planning
- Carried out to achieve goals similar to that of low-carbon green city project
- Categorized into three types by their nature; urban planning, guideline and others

  ** The urban planning projects are subdivided by the target area; city-level and community-level.*

Projects can also be categorized by the commissioner

- Ministry of Environment (3 projects; Pilot City for Climate Change, Green City, Eco City),
- Ministry of Land, Transportation and Maritime Affairs (4 projects; Eco Rich City, Low-Carbon Green City Guideline, Sustainable New Town Planning Guideline, Innovative City),
- Joint Project by 7 Ministries (1 project; Low-Carbon Green Community)
- LH Corporation (1 project; Environment-Ecology Planning)

II-1. Central Governments Pilot Projects

Category		Project Title	Goal	Key Directions	Authority
URBAN PLANNING	CITY LEVEL	EcoRich City	Establish and Promote a Low-Carbon Green Growth Model City Where Environment and Economy Coexist and Cooperate.	7 key consideration factors; Energy, Commuting, Oasis, Recycle, Industry, Corridor, Humanism.	Presidential Committee on Green Growth
		Pilot City Development for Climate Change	Encourage Awareness of and Participation in Measures to Cope with Climate Change and Reduce GHG Emission.	GHG BAU, main themes and joint projects with central government by each municipality are selected.	Dept. of Climate Change in Ministry of Environment
		Green City	Reinforce Environment Management Capability of Municipalities and Decentralized Administration.	Provides incentives for municipalities selected as green city (prize money, environmental budget).	Dept. of Participatory Cooperation in Ministry of Environment
		Eco City	Promoting regional development focusing on backward areas while maintaining environmental preservation policies.	Target backward areas (in mountainous, hillside, coastal region) with high interest in eco city projects or participatory intention among residents.	Dept. of Natural Policy in the Ministry of Environment

II-1. Central Governments Pilot Projects

Category	Project Title	Goal	Key Directions	Authority
Community	Low-Carbon Green Community	Achieve the new/recyclable energy supply target using wasted resources and biomass, while fostering Green New Deal projects and new growth dynamic projects	Select target communities for pilot projects taking the municipalities' demand, locality, waste resources and available biomass energy into account, and prepare plans for effective operation and nation-wide expansion.	MPAS/ MEST/MKE/MARA/ME/Korea Forest Service/MLTM
Guideline	Low-Carbon Green City Guideline	Overcome risks of resources and environment challenged by climate change and create low-carbon green growth urban spaces	Utilize as basic information for status quo investigation and forecast on GHG emission, and reduction target	Dept. of Urban Policy, MLTM
	Sustainable New Town Planning Guideline	Create healthy environment and beautiful landscape in harmony with economic and social developments to achieve sustainable green growth	Create healthy environment and beautiful landscape with harmonized economic and social development to achieve sustainable green growth	Dept. of Urban Development, MLTM
	Environment-Ecology Planning	Secure best-of-breed low-carbon green growth research capabilities and measures and capabilities to cope with global warming	Categorized into regional environment-ecosystem planning and urban environment-ecosystem planning, which are prepared before land use planning.	Green Landscape Service in LH Corporation
Other	Innovative City	Realize low-carbon green city through eco-friendly construction and green infra	Prepare growth plans to develop the 10 innovative cities as green growth hubs through localized specialization strategies including new/recyclable energy	Dept. of Urban Development, MLTM

II-2. Low Carbon City Planning Simulation S/W by R&D

Structure of LCCP Simulation S/W

1 Create Basic Urban Plan Scenarios

- Create scenario for each basic urban plan sector
- Create plans for land use, transportation, spatial structure

BAU

Index 1 : Population
Index 2 : Economy
…

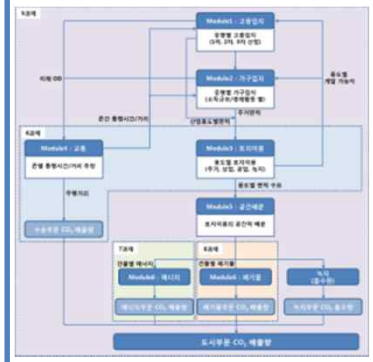
Land 1 : Total area
Land 2 : Usage
…

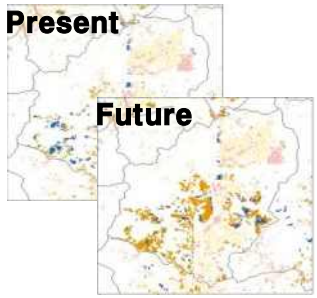
Space 1 : Compression
Space 2 : Distribution
…

S1
S2
S3

2 Simulation for Index and Distribution of Spaces

- Distribution of spaces according to the scenario





3 Estimation of CO2 Emission Rate

- Estimate CO2 emission rate for each sector

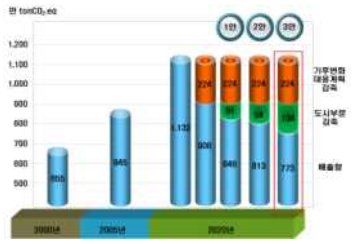
Energy (Usage of buildings)
Transportation (Type of vehicle)
Waste
Green space absorption rate

City's Total Emission Rate

4 Evaluate Scenarios

- Evaluate the reduction effects for each scenario

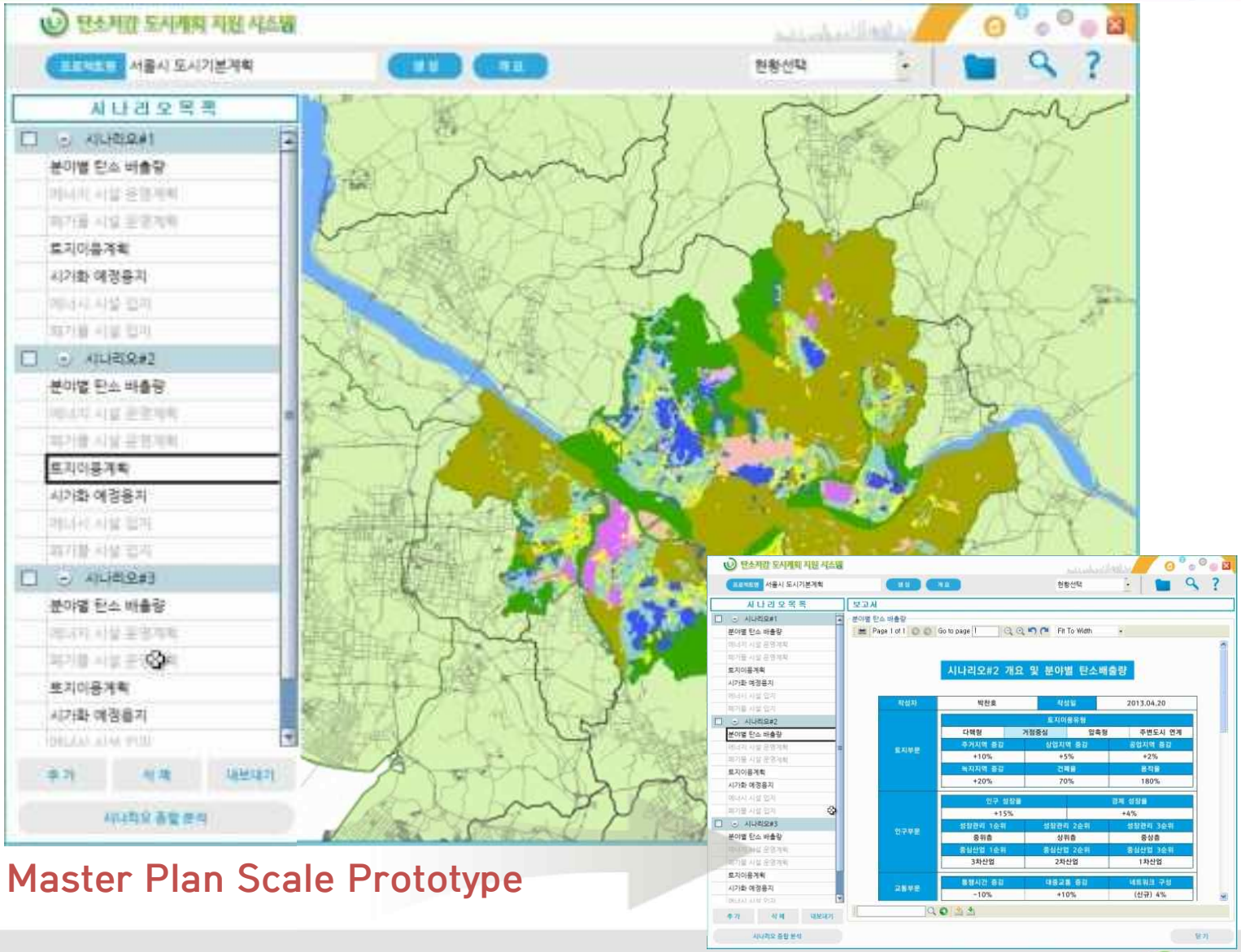
BAU (City's total emission rate)
S1 Potential Emission Rate(BAU-S1)
S2Potential Emission Rate(BAU-S2)
S3 Potential Emission Rate(BAU-S3)



Select Final Scenario

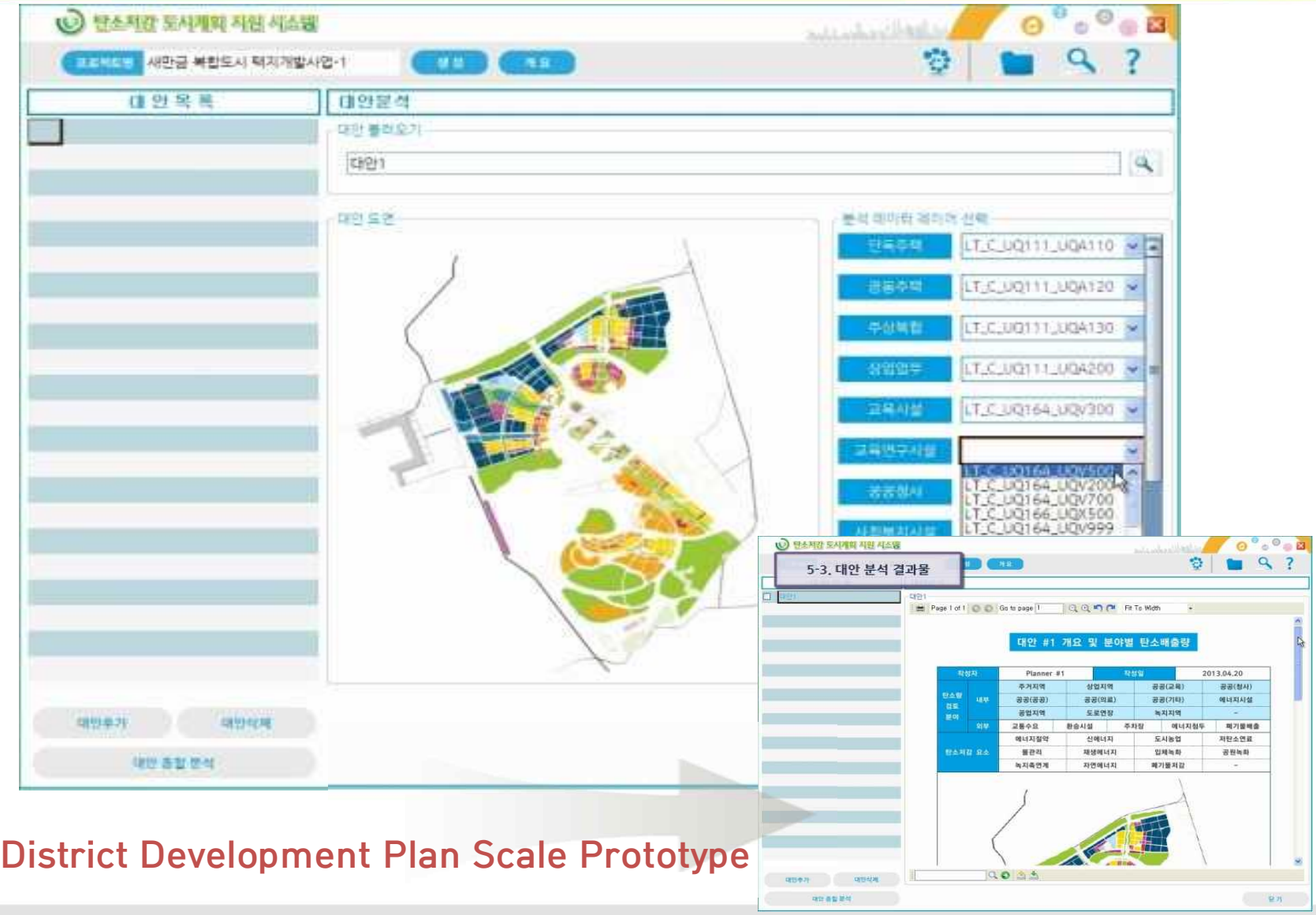
Feedback (Adjust Scenario)

II-2. Low Carbon City Planning Simulation S/W by R&D



City Master Plan Scale Prototype

II-2. Low Carbon City Planning Simulation S/W by R&D

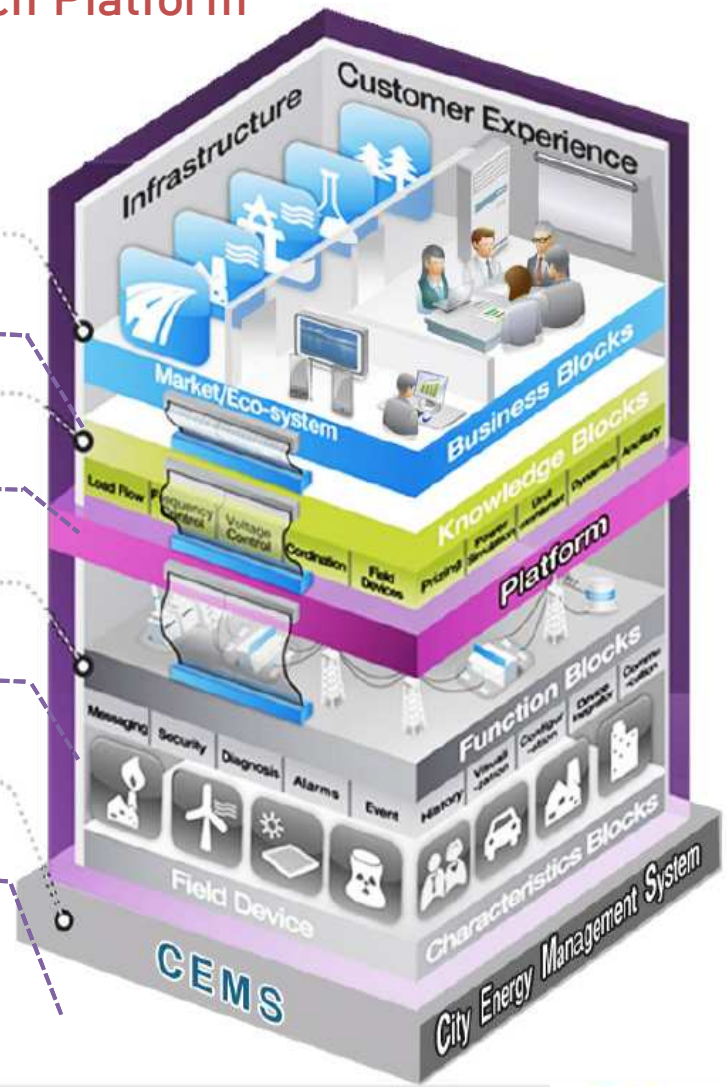


District Development Plan Scale Prototype

II-3. Smart CEMS(City Energy Management System) by R&D

Based on the Real Time Capacity Approach Platform

- **Energy Portal Service**
  실시간 양방향 서비스 및 정보 공유 기반
- **Modular Energy Solutions**
  에너지 감시, 진단, 분석
  양방향 에너지 거래, 입찰 최적화
  및 CO_2 감시, 진단, 분석
- **Integrated Service Architecture**
  에너지 최적화 알고리즘 및 지능형 제어
  다단계 심층방어 보안 아키텍쳐
- **Open Communication Service**
  표준화된 통신 규약 제공
  대용량 Data 처리 및 Integration



II-3. Smart CEMS(City Energy Management System) by R&D

City Scale Test Bed Model : Integrating the technological scope of the Energy Mix, Grid Collaborations and existing efficiency energy solutions including HEMS, BEMS and FEMS

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III

Best Practice Cases

III-1. 2030 Wonju City Masterplan
III-2. Gangneung Green City Development
III-3. Geomdan New Town Development

III-1. 2030 Wonju City Masterplan

Consistency with Upper and Related Plans

The 4th Revision for National Comprehensive Planning (2012~2020)
5 Year Regional Development Plan
Ganwon Province Comprehensive Plan(2012~2020)
The 5th Tourism Development Plan for Ganwon Province

Demands on New Green City Development

Established legal framework such as Framework Act on Low Carbon, Green Growth, Low-Carbon Green City Planning Guideline

Accepting Changes in Demography, Economy and social Growth

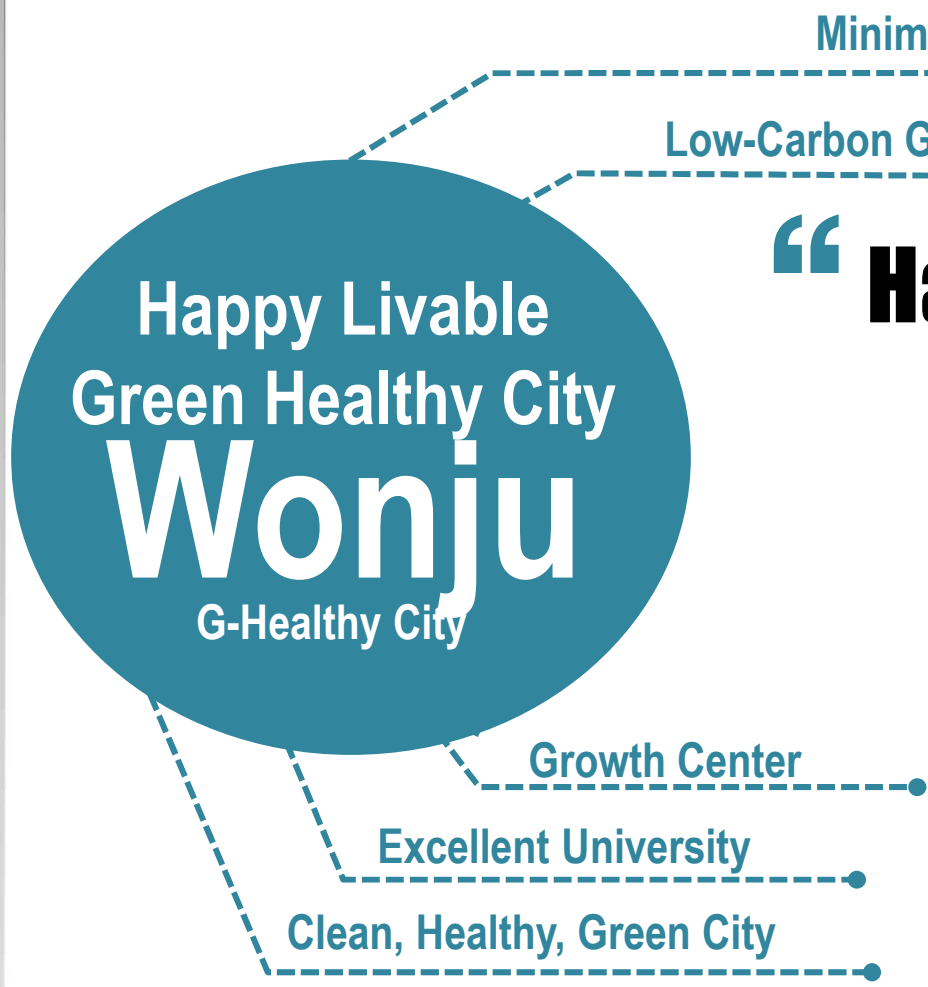
Long-term plan representing future of Wonju city over the next 20 years

Adapting Climate Change & Overcoming Resource/Environmental Risks

Deliberate/reasonable comprehensive plan suggesting environmentally sustainable urban structure

2030 Wonju Master Plan

Low carbon Green City Plan



“Happy & Livable & Green Healthy City”

- Respecting diversity of individuals
- Ensuring best quality of living
- Participatory urban development
- An urban-rural complex city with improved physical, social environment
- Caring about physical, mental health of citizens
- Fostering advanced medical and healthcare industries

Urban Master Plan (Wonju City)

Suggesting urban planning strategies to establish low-carbon green city plan

Urban Planning Aspects

- Encourage concentrated public facility and services
- Normalize the energy demands by mixed-use
- Adopt use of unused/recyclable/new energy thru urban development
- Preserve and create green spaces

Category	Strategies
Spatial Structure	• Mononuclear concentrated spatial structure interlinked to living zones • Low-carbon development axis connecting exsting nuclears and trasportation axes • Prioritize and reinforce preservation and green axis
Land Use	• Compact, mixed land use for reduced GHG emission and reasonable distribution of land • Develop unused/underused lands within existing established lands than developing new lands • TOD-oriented transportation plan • Reduce GHG emission and minimize impact of developments on environment
Transportation	• Energy-saving transportation system • Expanding the green transportation - promoting bicycle use • Transportation system with less GHG emission - activating public transportation
Urban Center/ Residential Environment	• Reinforce energy standards on new buildings • Improve energy efficiency of existing buildings • Improve energy efficiency of public buildings • Develop green construction technology and infra
Parks and Green Spaces	• Expanding rest areas within the city (parks, green paths, forests) • Build green networks for efficient urban greening • Carbon-absorbing facilities

Other Aspects

- Maximize use of water resources and waste recycling
- Establish plans for interoperability with industrial development plans
- Expand the use of unused/new/recyclable energy
- Restore intercity streams to mitigate heat island effects

Category	Strategies
Water Resource	• Energy saving and GHG reduction through managing water environment and wastes • Waterfront spaces and eco-streams to mitigate island heat effects • Water circulation system (storm sewers, detention ponds, sewage treatment facilities) and recycling of water resources
Waste Treatment	• Waste recycling and fuelization to create waste recycling circumstances and industries • Create new energy using incineration heats and promote the utilization
Agricultural Development	• Agricultural science to deal with the effects of climate change • Efficient use of energy in agricultural facilities
Industrial Development	• Promote conversion from traditional to low-carbon industry • Establish green industrial complex • Eco-friendly industrial complex through improving structure of existing industrial complexes

III-2. Gangneung Green City Development

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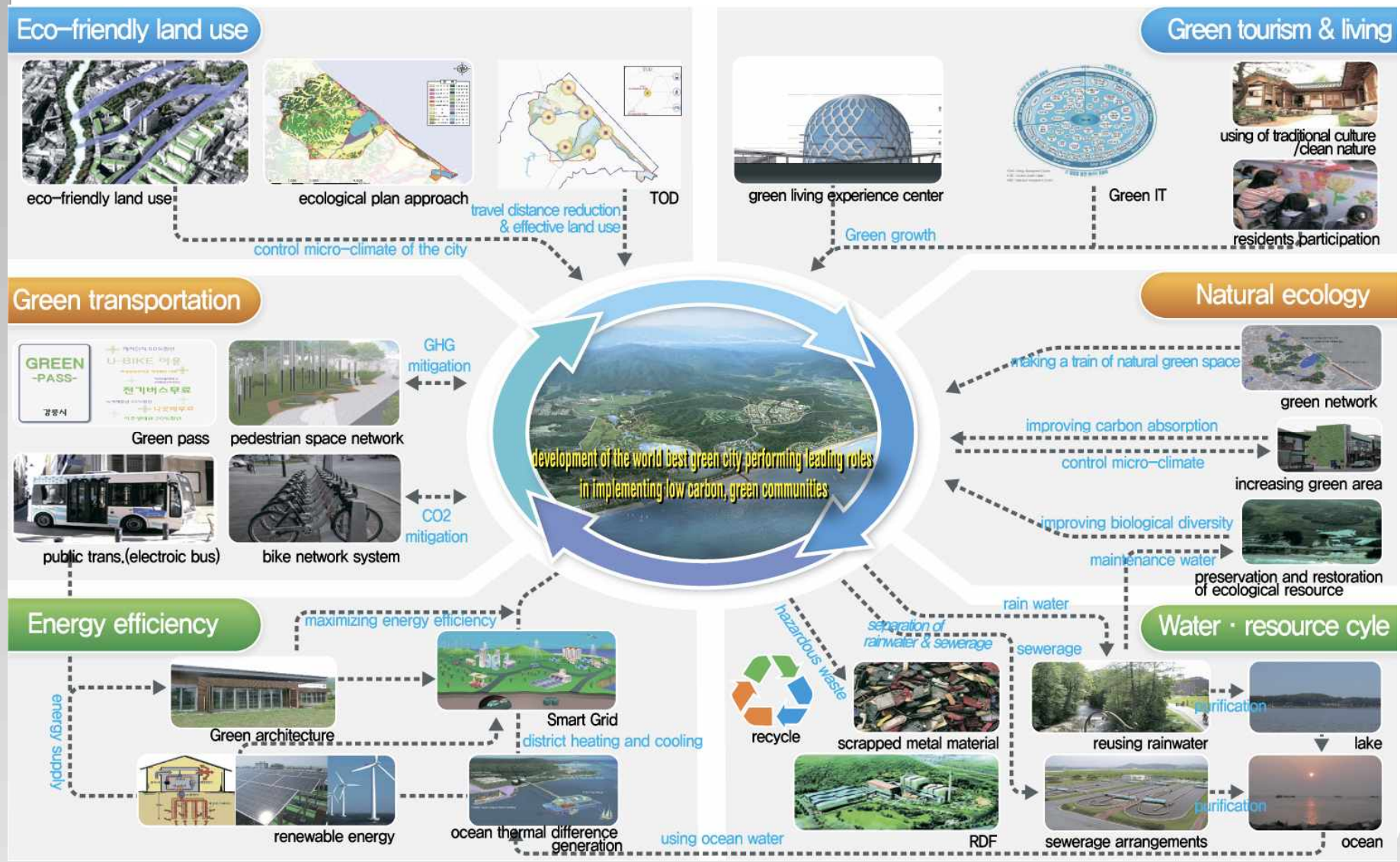


III-2. Gangneung Green City Development

- **The first pilot project for Low-Carbon Green City in Gangneung city** (18,326k㎡) started from July, 2009.
  - The project aims to create a globalized city to lead low-carbon green growth
  - Until 2020, 29 sub-projects will be carried out

Phase 1 (~2013)	Green Renaissance Landmark Project, Gyeongpo Lake Wetland Restoration Project, Green Path Project, Project for 10 Bicycle Cities
Phase 2 (~2016)	Home Stream Project for Gyeongpo Stream, Healing Forest Project, Green Forest Path, LED Security Lighting Project, Green City New/Recyclable Energy Project, ZED Village Project
Phase 3 (~2020)	Green Technology Theme Park Development, U-City, Energy Generation Facility using Waste Resources

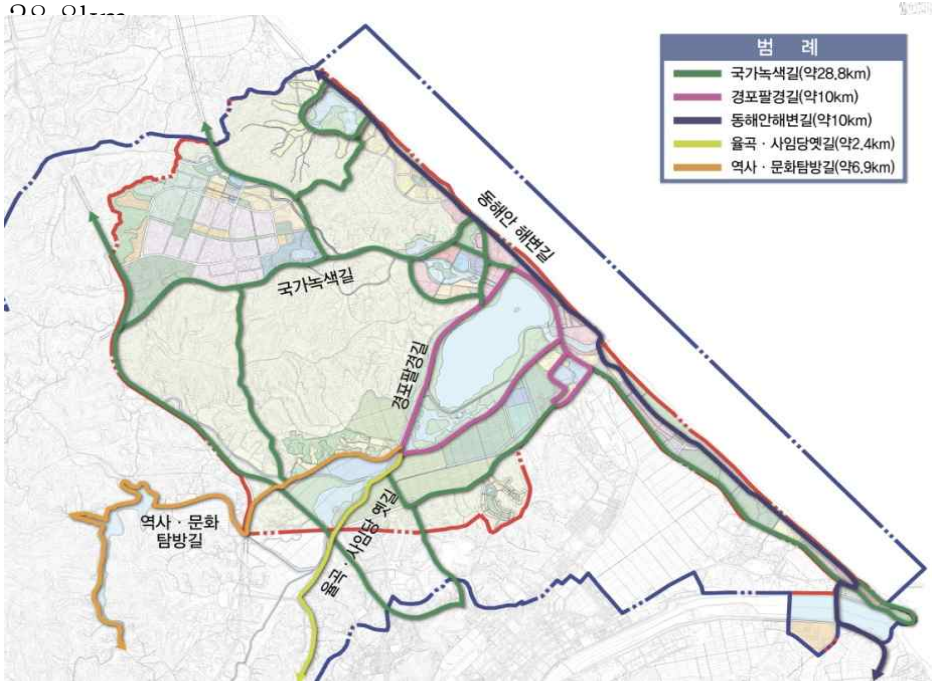
III-2. Gangneung Green City Development

Phase 1 (2009 ~ 2013) : 9 Projects ($ 90 million)

Green Road

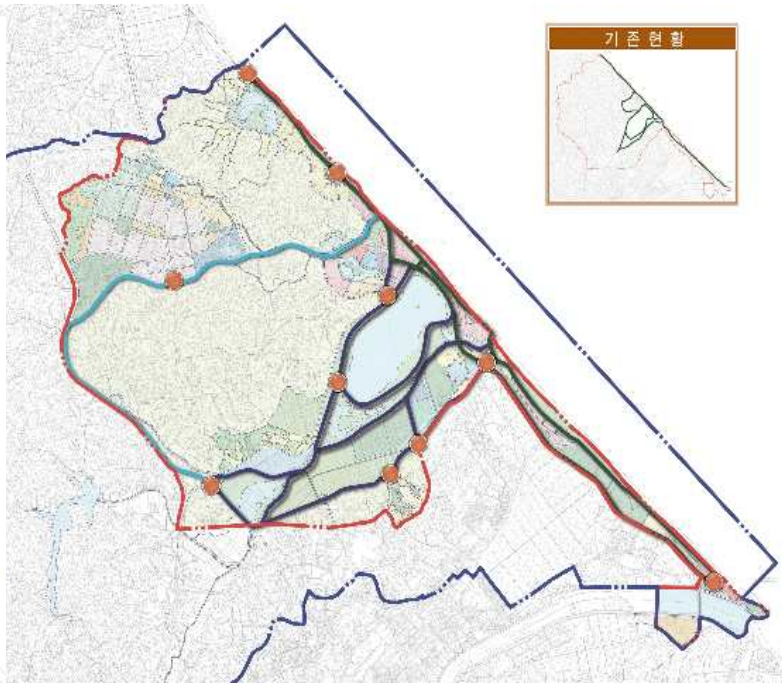
- Walkable Historical Pedestrian Pathway :

28.81km



Bicycle City

- Transportation Mode Shift : 31.2km



III-2. Gangneung Green City Development

Ecological Wetland Restoration

- Farmland → Ecological Wetland : 290,000m^2

Ecological detention pond

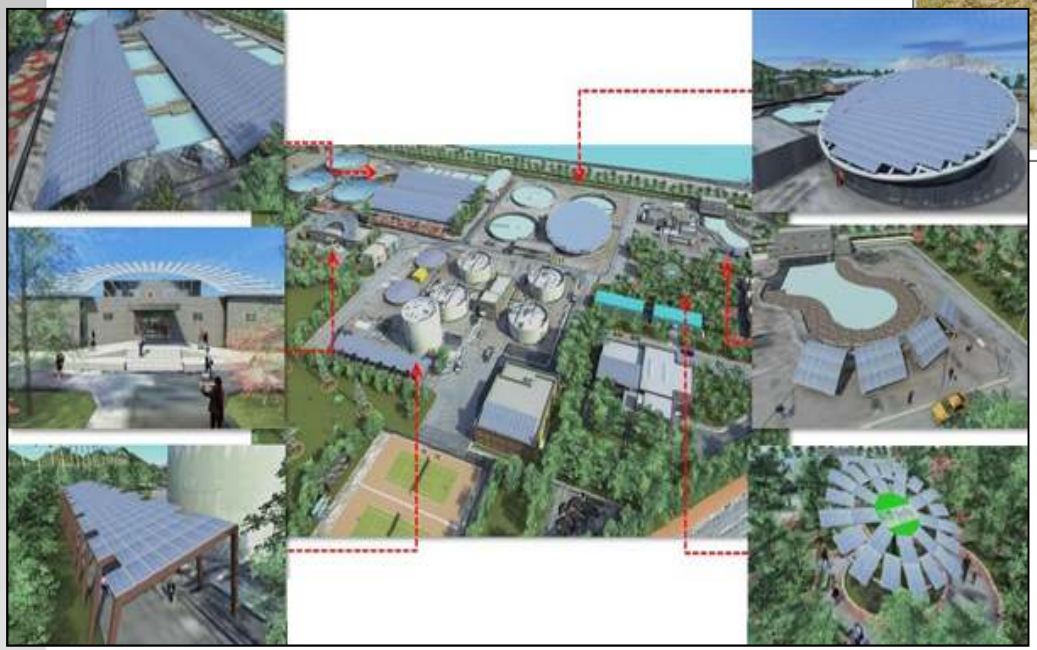
- Prevent Flooding River : 267,000m^2

국토연구원

III-2. Gangneung Green City Development

Solar and Wind Power for terminal disposal plant of sewage

Solar Power	Wind Power
500㎾ / 8000㎡	100㎾ / 500㎡



Water Recycle System

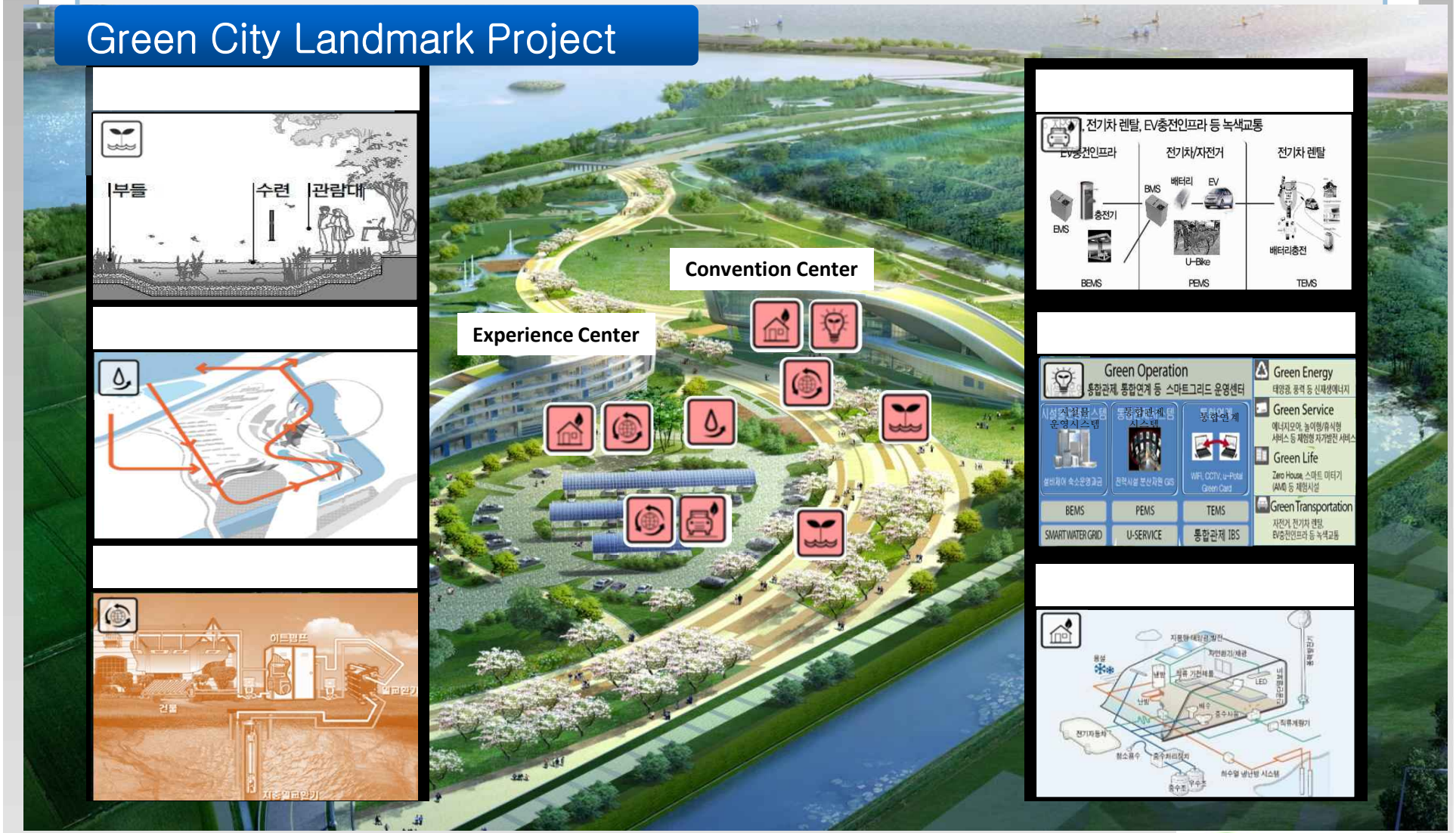
Sewage	20㎥/day	Fire Water
Rain	80㎥/day	Restroom, Washing

Low Carbon Elementary School

III-2. Gangneung Green City Development

Plans to Apply Green Technology (6 green technologies & 68 factors)

Green City Landmark Project

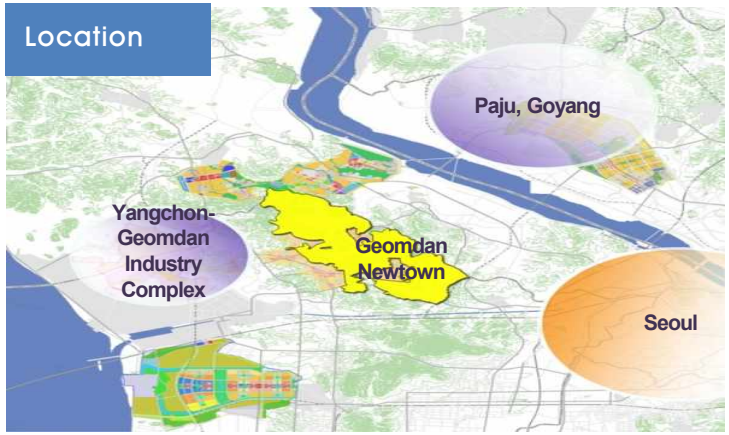


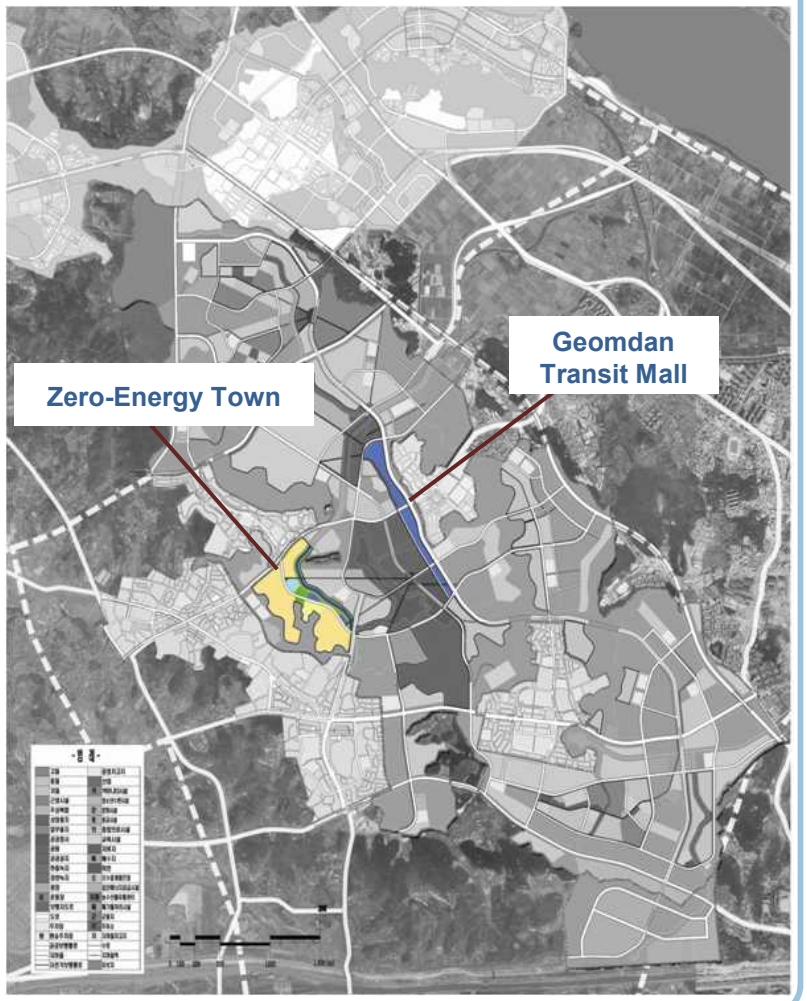
Geomdan Newtown

Geomdan Newtown

- **Ranges over Dangha, Majeon, Bullo and Wondang dong, Incheon Metropolitan City**
- **Area:** Approx. 18.1 km^2 (5.5M Pyeong)
- **Population:** 230,000 (92,000 households / 127 persons per ha)
- **Project Duration:** Feb. 2009 ~ Dec. 2014
- **Promoter:** Incheon City Government, Incheon Urban Development Corporation, Korea Land & Housing Corporation
- **Projected Cost:** Approx. 16 trillion Won (14 billion USD)

Location





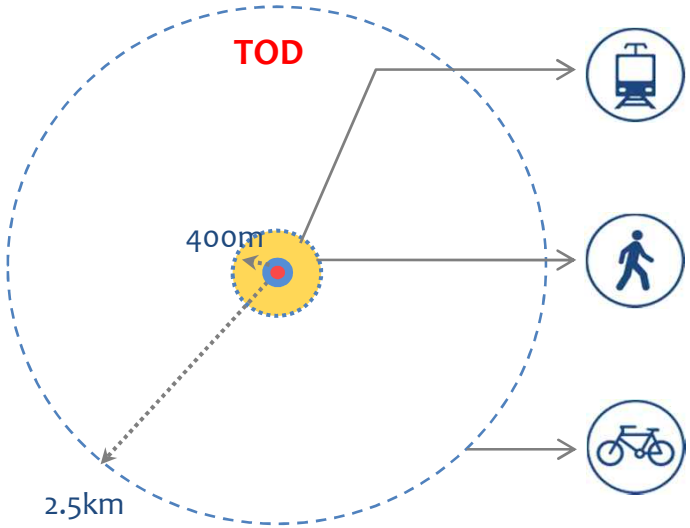
III-3 Geomdan New Town (Incheon Metropolitan City)

Categories	Methods	Techniques	Adopted Techniques
Urban Structure	**Formation**	Compact City Public Transportation	Station-centric allocation (TOD, BOD, POD)
Site Planning	**Pedestrian-centric Environment**	Pedestrian Network Spatially Separated Road Traffic Calming	In-site pedestrian/bike road network Parking lots on site fringes Traffic Calming
	Building Allocation	Planning facing directions & wind paths	Construction considering buildings' facing directions
	Microclimate	Green spaces & water places	Green space & water place
Buildings & Facilities	**Renewable Energy Use**	Buildings with renewable energy system	Zero-energy town Transit malls
	Water & Ventilation	Gray water & ventilation	Building system recycling gray water &ventilation

Geomdan Newtown

Urban Structure #1

- Public transportation (subway) centric system (TOD)
- All transits in the town are accessible in 10 minutes by foot (POD) or by bike (BOD)
- First urban planning based on eco-friendly transportation system



TOD Center
Transit Oriented Development

POD Area
Pedestrian Oriented Development

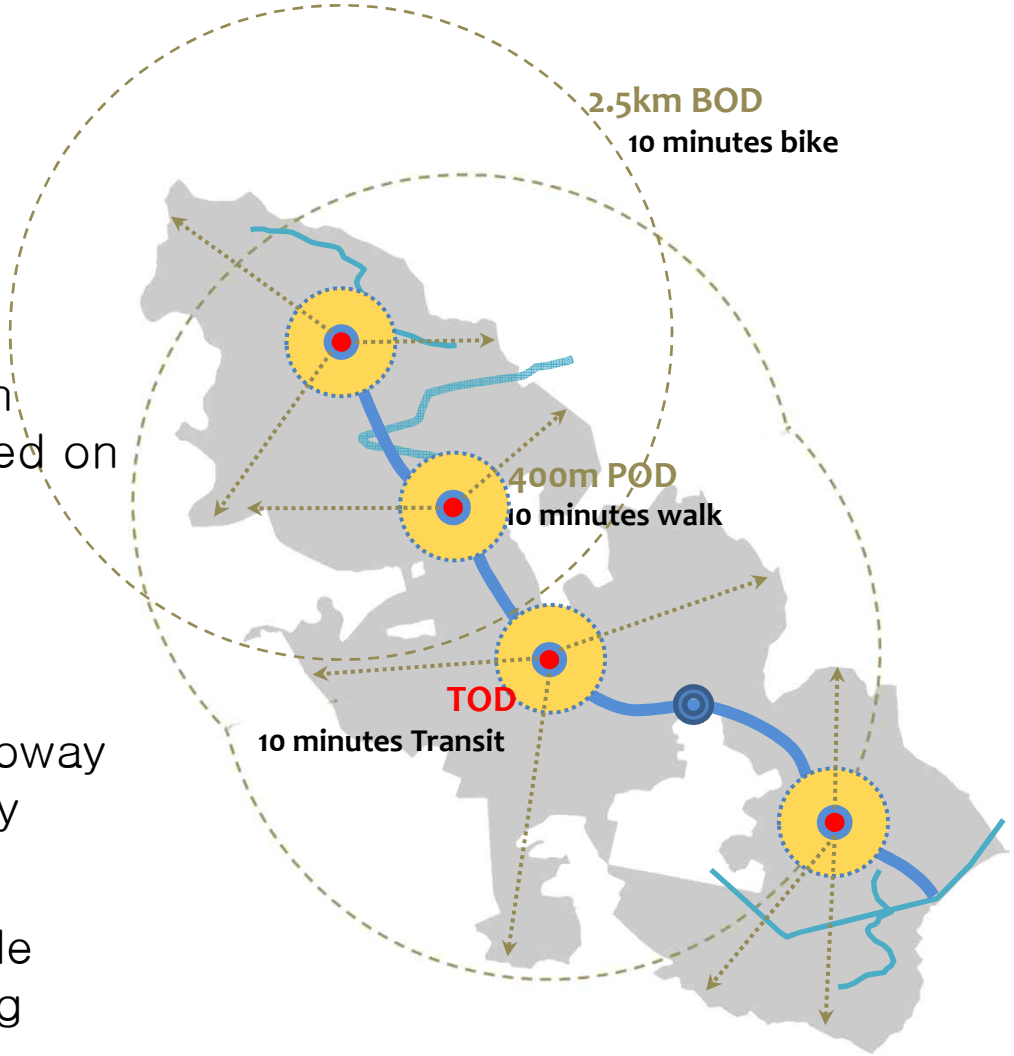
BOD Area
Bicycle Oriented Development

III-3 Geomdan New Town (Incheon Metropolitan City)

Compact Urban Form

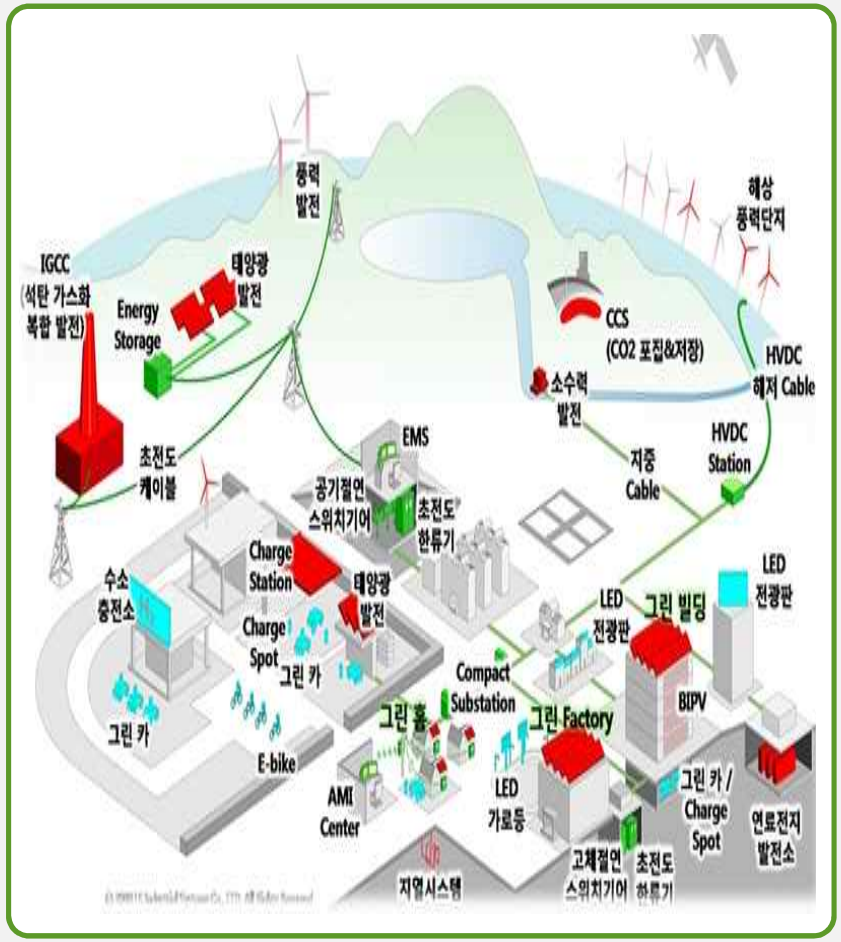
- Station-Centric Allocation
  - 3 areas centered around subway station
  - Compact development on pedestrian network centered on subway station

- Transportation Networks
  - 10 minute distance to subway station on foot (POD) or by bicycle (BOD)
  - Circular pedestrian/bicycle network for interconnecting areas



IV For the future Low Carbon City

1) Low-Carbon Green City Model



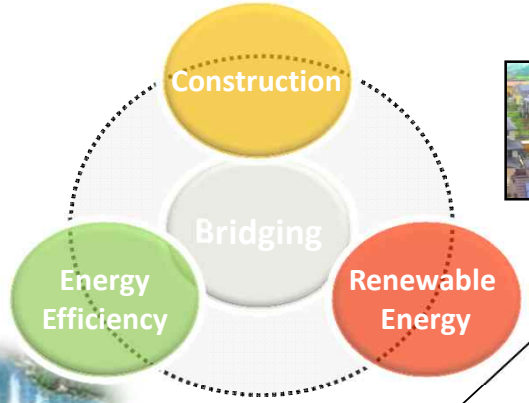
Green Smart Town

Environmental Agriculature

Strategies for Green City Development

1) Low-Carbon Green City Model

Eco-Friendly City with Site-Level Energy System and Less CO_2 Emission through Convergence of Technologies of Renewable Energy, Energy Efficiency and Building Energy System

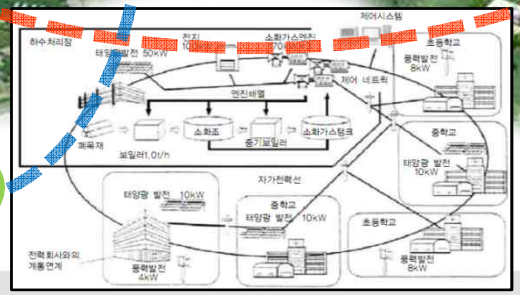


1. 100% Zero Energy House
Houses running on natural energy not fossil fuel (Renewable system + building energy saving techs, waste heat recovery, solar power, backup system)

5. Comprehensive Design
Technology for comprehensive renewable energy generation/consumption for buildings (BIPV, BiWP, BiST, etc.)

7. Building Energy Saving Technologies
(adiabatic vacuum panel, vacuum window, LED lighting, waste heat recovery, etc.)

2. Zero Energy Community (Town)
A housing site consisting of a series of zero energy houses (Renewable energy supply for electricity/heating, group energy supply system)



3. Micro CHP
Small cogeneration system connected to renewable energy systems for building/site

6. Integration of Green Buildings
Encourage to use solar heat collector, sunlight modules as claddings on buildings for efficient energy generation

4. Centralized Group Energy Supply System for Renewable Thermal Sources
(Solar heat, bio, cogeneration, local heating, geothermal…)

Future Challenges

- **Classify cities in consideration of urban characteristics and status**
  - Encourage local governments to draw up a distinctive green city plan by applying green factors including the size and functions of cities to urban planning
- **Develop applicable policies to realize regional green cities**
  - Propose a pool of policies supporting the realization of green cities and discover a package of green policies reflecting each unique region
- **Come up with a supporting structure to develop specialized planning in creating regional low-carbon green cities**
  - Present an incentive to establish specialized green city planning reflecting each urban type

THANK YOU!