Overview of Successful Residential Development Planning Practices in Korea

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President, International Urban Training Center in Partnership with UN-HABITAT
President, Korea Smart Eco-city Network
I. Planning Hierarchy in Korea

### Legal System
- Constitution
  - Law on National Land Planning and Use
    - Area-wide City Planning
      - City Planning Law
        - City Development Law
          - EIA Law
        - Housing Site Development Promotion Law
          - Housing Construction Promotion Law

### Development Plans
- National Land Use Plan
  - Regional Plan
    - City Plan
      - District Unit Plan
        - Block Plan
          - Lot Plan

### A Case Example
- Korea
  - Seoul Capital Region
    - Seoul, Sungnam, Hanam city
      - Wirae New Town
        - Block S
          - “I Park” Housing Complex
II. Land use planning Theory

1. Land Use planning at the city level

1.1 Urban Land Use Planning Process
Figure 3. The Sequence of Action and the Influence of Values in Bringing About a Change in the Urban Land Use Pattern. Certain individual- or group-held values concerning the use of a particular parcel or area set in motion a four-phase cycle of behavior which culminates in the parcel or area being put to a particular use. This action sequence may bring into play new values or involve the values of other persons or groups, setting in motion new action sequences.
1.2 Land Use Perspectives

Figure 4. Abstract Representation of a Behavior Pattern Consisting of Several Independent Cycles of Human Behavior. This diagram shows that without conformance to a general land development plan, each of 1, 2, 3, 4 . . . n groups or individuals, motivated by mass values held in common and by distinct group or individual values, follows a sequence of distinct actions which in the aggregate tend to have rational and irrational consequences for urban land use. The rational consequences (shaded portions at the hub) are the intended changes in land use, and the irrational consequences (unshaded portion) are the unanticipated, often inconsistent relationships between two or more new or changed uses.
Figure 7. Interrelationships Among Land Use Determinants. Points $x_1, x_2 \ldots x_n$ represent points where all side effects of actions seeking changes in land use reach equilibrium, with a consequence of $1, 2 \ldots n$ changes occurring in the land use pattern.
- List of climate-friendly land use zoning system: Innovative approaches

<table>
<thead>
<tr>
<th>Smart Zoning for climate change mitigation</th>
<th>Smart Zoning for climate change adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating zones</td>
<td>Disaster risk zoning</td>
</tr>
<tr>
<td>Cluster zoning</td>
<td>Salinity affected areas</td>
</tr>
<tr>
<td>Planned unit development (PUDs)</td>
<td>Flood prone areas</td>
</tr>
<tr>
<td>Compact, transit-oriented residential and mixed use development</td>
<td>Integrated coastal zone management (ICZM)</td>
</tr>
<tr>
<td>Energy action areas</td>
<td>Seismic zonation (or microzonation)</td>
</tr>
<tr>
<td>Smart energy zones</td>
<td>Rezoning of low-lying coastal land at risk from tsunamis</td>
</tr>
<tr>
<td>Solar enterprise zones</td>
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<tr>
<td>District-based energy distribution</td>
<td></td>
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<tr>
<td>Modernization of grid infrastructure</td>
<td></td>
</tr>
<tr>
<td>Ecosystem-based zoning</td>
<td></td>
</tr>
</tbody>
</table>
Salinity affected areas: Vegetables can not grow in this village because of too much salinity content in the soil, Central Province, Sri Lanka
From my perspective

Ecosystem-based approaches maintain:

- Existing carbon stocks
- Maintain and increase resilience
- Reduce vulnerability of ecosystems and people
- Help to adapt to climate change impacts
- Improve biodiversity conservation and livelihood opportunities
- Provide health and recreational benefits

(Ecologic Institute and Environmental Change Institute, Oxford University Centre for the Environment 2011)
Land Adjustment Overview

- Free Simple Land Acquisition
- Conservation Easement
- Donation
- Land Exchange
- Development Right Transfer
- Land Purchase etc.
## 1.3 Tooling up for Land Use

### 1.3.1 Land Use Activities

**Recreation and relaxation**
- Attending spectator events (ball games, races, fights, etc.)
- Participating in recreation activities with others (golf, tennis, bowling, softball, swimming, fishing, etc.)
- Individual forms of physical and mental relaxation (taking naps, gardening, walking, reading, viewing TV, working on hobby, crafts, etc.)

**Club activities**
- Taking part in special-interest clubs (Garden Club, Stamp Club, etc.)
- Attending luncheon or dinner clubs (Rotary, Altrusa, etc.)
- Attending meetings of patriotic groups (Legion, DAR, etc.)
- Attending fraternal groups (Masons, Elks, Eastern Star, etc.)
- Attending and/or participating in civic improvement activities (LWV, Civic Assn., etc.)
- Serving on City Council, Planning Board, etc.
- Political action activities
- Fund-raising activities and similar volunteer efforts

**Community service and political activities**
- Meals at home, restaurants
- Shopping (convenience, specialty, and consumer goods)
- Visits to doctor, hospital
- Home and yard maintenance

**Activities associated with food, shopping, health, and similar needs**
1.3.2 Detailed Building and Land Use Mapping

Section of a Typical Base C Print for Field Survey.

Figure 27. Detailed Building and Land Use Mapping in Inspection-Type Surveys.

The Same Print After Entry of Field Notations.
Technique A—Field Notations with DU Count.

Figure 28. Generalized Land Use Mapping by Area in Inspection-Type Surveys.

Technique B—Field Notations by Area Only.
### 1.3.3 Standards for Land Use

#### Table 37. General Standards for Region-Serving Recreational Facilities

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>Population Standard</th>
<th>Minimum Site-Size Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major natural parks</td>
<td>1 park/40,000</td>
<td>100 acres/park</td>
</tr>
<tr>
<td>Public golf course</td>
<td>1 hole/3,000</td>
<td>150 acres/18 holes</td>
</tr>
<tr>
<td>County fairgrounds</td>
<td>1/county seat</td>
<td>special b</td>
</tr>
<tr>
<td>Colosseums</td>
<td>1/metro. area</td>
<td>special b</td>
</tr>
<tr>
<td>Public stadiums</td>
<td>1 stadium/100,000</td>
<td>special b</td>
</tr>
<tr>
<td>Botanical garden</td>
<td>1/metro. area</td>
<td>special b</td>
</tr>
<tr>
<td>Zoo</td>
<td>1/metro. area</td>
<td>special b</td>
</tr>
</tbody>
</table>

- Sometimes the standard of 18 holes/30–50,000 is used.
- Site size estimated according to size of facility appropriate to size of region served, facilities desired, and parking and service areas needed.
1.3.4 Examples of Land Use Plan
2. Land Use Planning at the Site Level

2-1. Primary drivers guiding urban development

- The important of Sustainable development
- The impart of the information age
- Changing social patterns
  * Social networks (e.g. spatial and circuit television (CCTV), etc.)
  * Public space for social interaction
- The 3\textsuperscript{rd} wave of tech company
- The 4\textsuperscript{th} Industrial revolution
- Global warming
2.2. Neighbourhood design principles

Main tenets of the Greenville Movement
- A development of adequate size, or critical mass;
- A walkable and pedestrian-friendly environment;
- A good mix of uses and good opportunities for employment;
- A varied architecture and a sustainable urban form;
- Mixed tenure for both housing and employment uses;
- Provision of basic shopping, health and education needs;
- A degree of self-sufficiency

* Source: T. Aldous(ed.), Urban Villages, Urban Villages Group, 1992
Perry’s neighbourhood unit, 1927, and traditional neighbourhood development, 1997 as featured in the Lexicon of the New urbanism / Duany Plater-Zyberk

**NEIGHBOURHOOD UNIT 1927**

- Regional institutions at the edge
- Pedestrian shed one-quarter mile radius
- Neighborhood institutions and schools within
- Civic space at center
- High capacity thoroughfares at the edge
- Many playgrounds
- Shopping at traffic junctions at the edge

**NEIGHBOURHOOD UNIT 1997**

- School to be shared by adjacent neighborhood
- Short face of residential blocks
- Club
- Playground in each quadrant
- Roads connect across edges wherever possible
- Neighborhood shops & institutions at center
- Bus stops at center
- Mixed use streets anchored by retail at 100% corners
- Regional institutions at the edge
- Parking lot designed as plaza
- Workshops and offices along edges

*Neighborhood Development: A diagram that updates the Neighborhood Unit and reconciles current models.*

- The school is not at the center but at an edge, as the playing fields would hinder pedestrian access to the center. The school at the edge can be shared by several neighborhoods, mitigating the problem created by the tendency of neighborhoods to age in cohorts generating large student age populations that then drop off sharply.
- There are few sites reserved for local institutions at the center and more for regional institutions at the edge. Ease of transportation has made membership in institutions a matter of proximity rather than proximity.
- The traffic at the busiest intersections have been modified to accommodate larger parking plazas for convenience retail and extended by an attached main street for destination and live-work retail.
- More service alleys and lanes have been added to accommodate the increased parking requirements.
The key components of a mixed-use and integrated neighbourhood proposed by the Urban Task Force

The Network of thoroughfares which is the principle structuring device of the urban pattern
The planning of main thoroughfares which should address issues of capacity and urban character
Streets unconnected and connected – new movement frameworks should be highly permeable (Calthorpe Associates)
### 3.1 Site Design Perspectives & Examples

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Post-2015 SDGs (2015-2030)</th>
<th>New Urbanism</th>
<th>Types</th>
<th>Approach</th>
<th>Cases</th>
<th>Outcome(s): Layout</th>
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<tbody>
<tr>
<td>Holistic View</td>
<td></td>
<td></td>
<td></td>
<td>• Waterfront Development Planning</td>
<td></td>
<td>• Wonju Innovation City</td>
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<tr>
<td>Environmental View</td>
<td></td>
<td>• Climate New Urbanism</td>
<td>• Eco-city</td>
<td>• Environmental and Ecological Planning</td>
<td>• Ecolonia</td>
<td>• Wirye New Town • Germany</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Eco New Urbanism</td>
<td>• Eco-village</td>
<td>• Carbon-centered Comprehensive Planning</td>
<td>• Kronsberg</td>
<td>• Vienna</td>
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<tr>
<td></td>
<td></td>
<td>• Landscape New Urbanism</td>
<td>• Green Building</td>
<td>• Green Development Planning</td>
<td>• Wirye New Town</td>
<td></td>
</tr>
<tr>
<td>Socially-Rooted View</td>
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<td>• Walk ability New Urbanism</td>
<td>• Affordable Housing (Bogeumjari Korea)</td>
<td>• Affordable Housing Planning</td>
<td>• Seoul</td>
<td>• New plus housing (Bogeumjari Korea)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Urban Village Movement (UK)</td>
<td>• Affordable Housing (Afghanistan)</td>
<td>• Affordable Housing Planning Resettlement</td>
<td>• Milton Keynes</td>
<td>• Fabricated Housing</td>
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<tr>
<td>Economic View</td>
<td></td>
<td>• Housing cooperative</td>
<td></td>
<td>• Tax based land adjustment Planning</td>
<td>• Banpo Development Project</td>
<td>• Wonju Enterprise City 원주 기업도시</td>
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</table>
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7.2.1 토지이용
<그림 7.2.1-1> 지목별 토지이용 현황도

7.2.1 토지이용
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<th>토지이용계획도</th>
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<tr>
<td>단독 주택</td>
<td>공원</td>
</tr>
<tr>
<td>아파트</td>
<td>경관 녹지</td>
</tr>
<tr>
<td>근린생활시설</td>
<td>종교 부지</td>
</tr>
<tr>
<td>준주거용지</td>
<td>주차 장</td>
</tr>
<tr>
<td>학교</td>
<td>환경 녹지</td>
</tr>
<tr>
<td>문화체육시설</td>
<td>보행자 도로</td>
</tr>
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<td>도로 및 기각</td>
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</tbody>
</table>

<그림 7.2.1-5> 토지이용계획도

7.2.1 토지이용
<그림 7.2.1-7> 공원-녹지계획도

7.2.1 토지이용
범례
수공간
조경녹지
벽면녹화
보전녹지

Fig. 4. 항공 및 보행 구역 환경적 시설자립 기반 제4호.
### IV. Eco-Smart Examples at the Technical Level

#### 4.1 Summary of Eco-Smart Tech

**Table. 1** Strategy and projects used in the low-carbon green city projects Korea

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Project Contents</th>
</tr>
</thead>
</table>
| **Land use** | • Low energy structure and function of city  
                • Compact city |
| **Application of plan for reducing heat islands** | • White network, blue network and planning schemes  
                                                               • Heat dispersion through traffic and site planning |
| **Better efficiency in energy supply: Use of renewable energy** | • Geothermal power, CHP  
                                                                  • Renewable energy plants |
| **Creation of energy consumption limits in each sector: Renovation of energy production sources** | • Energy use standards for each size and type of building  
                                                                 • Renovation of transportation energy fuel, Renewable energy in buildings |
| **Creation of sustainable mobility system** | Limiting automobile use in urban space  
                                              Public transportation linkage system, pedestrian/bicycle oriented roads |
| **Rainwater use: Creation of graywater reuse system: Reuse of sewage** | Use of porous pavement to reduce rainwater runoff  
                                                                             Gray water system  
                                                                             Methane gas energy plant, Compost of sludge |
| **Plan for urban green network, conservation and restoration of ecology** | Greening plan for entire city  
                                                                             Conservation of urban ecosystem  
                                                                             Restoration and linkage (creation of eco–green corridor) |
| **Reuse of solid wastes, management of business and construction waste** | Wastes management from construction stage  
                                                                               Separated recycling system  
                                                                               Waste reuse business  
                                                                               District heating system |
4.1.1 Summary of Eco-Smart Tech

Table 2 The Application of ICT and sustainable technologies in smart ecosystem grid for neighborhood planning

- Climate smart housing plots,
- Site for community builders,
- Site for local government offices,
- Site for children’s play house,
- Site for office building,
- Site for plantation,
- Studio for earth sculpture,
- Open space
- Transit center and parking space
- Shops
- Communal garden
- Associated roads and parking and improvements to site access,
- Healing facilities,
- Facilities for renewable energy,
- Physical infrastructure for water and waste and
- Digital café village, such as Wolcheong-ri, Jeju, Korea (Fig. 72)
4.2 Korean Examples

Fig. 1 Logo on the training course on eco-city & low-carbon smart city, IUTC, Korea

Fig. 2 IUTC smart water grid planner members
4.2 Korean Examples

**Fig. 3** Ministry of Science, ICT and Future Planning, National IT Industry Promotion Agency (nipa) and Korea IT Business Promotion Association (iPA), SW R&D: Creative-Idea-Challenge, COEX, 2016

**Fig. 4** Gwangju’s carbon banking system is a practical effort which many cities can implement, says Dr. Kim (photo credit: World Bank)
4.2 Korean Examples

Fig. 5 Zero carbon island demonstration facilities

Wind power generators, Jeju island, Korea

Energy Technology Center, Jeju island, Korea

Fig. 6 The Gasiri testbed of renewable energy including solar collector fields and wind power generators in the Jeju zero carbon island

4.2 Korean Examples

Fig. 7 Digitalized real time temperature measurement in the outdoor hot bath tub in the aqua-world, Sol Beach Samchok, Gangwon province, Korea

Fig. 8 Installment of CCTV cameras for safety and surveillance information in the aqua-world, Sol Beach Samchok, Gangwon province, Korea
4.2 Korean Examples

Sub-way station:
Arrival and departure information

Sub-way station:
Ticketing and traffic card charger

Bus stop with information terminal (BIT): Citizens have access to real time, information concerning temperature, air quality and arrival time of buses

Fig. 9 Digital signage, digital city of Seoul, Korea
4.2 Korean Examples

Fig. 10 Photovoltaic module, Seoul, Korea

Fig. 11 Agricultural drone used for pesticide, Incheon, Korea
Source: Chosun Daily News, No.29715, 22 July 2016
4.2 Korean Examples

Fig. 12 Digital café village, Wolcheong-ri, Jeju, Korea
Source: Chosun Daily News, No.29579, 15 February 2016

Fig. 13 Smart electric meters
4.2 Korean Examples

Fig. 14 Digital village: Drinking water, city gas, and energy consumption metering, solar village, Gwangju, Korea

Fig. 15 Dispersal of room arrangements through overlay of new transfer technologies and new types of heat, electricity and air-conditioning network, The Green, Korea Land and Housing Corporation
4.2 Korean Examples

Fig. 16 Water and energy nexus: Drinking water purification plant connected with the Jeju Renewable Energy Smart Grid System, Jeju island, Korea
4.2 Korean Examples

Fig. 17 Crack gauge to monitor horizontal and vertical movement across cracks on different rock surfaces, Seoraksan National Park, Korea
4.2 Korean Examples

Fig. 18 Measuring system of precipitation and snowfall with its protector, and a solar panel for power supply, Seoraksan National Park, Korea
4.2 Korean Examples

Fig. 19 Gabion walls to retain earth slopes on roadsides, Seoraksan National Park, Korea
4.2 Korean Examples

![Image of people on a subway train using their smartphones]

*Fig. 20* Use of smart mobile phone in sub-way train, digital city of Seoul, Korea
4.2 Korean Examples

- Urban Governance CPA: Carbon Banking System

Grant points by reduction of CO₂ emissions to the participants (Credits granted by Gwangju Bank)

Urban Technology CPA
Case 1: LED CDM business (already accredited in Gwangju)
Case 2: LFG CDM business of waste landfill (already accredited in Gwangju)

Program of Activity: Multiple Program of Activity Gwangju Multiple PoA as a planned program
4.2 Korean Examples

Fig. 21 Examples of GHG reduction activities in Gwangju
4.2 Korean Examples

**Fig. 22** The economics of low-carbon green city: The case of Gwangju

- **Baseline Emission**
  - Base year: 2010
  - 9,402 Kton CO₂

- **Today**

- **BAU Estimation of Total Emission in 2020**
  - 12,986 Kton CO₂

- **Gwangju Low-carbon Green City**

- **Investment and CERs from the Urban CDM to reduce GHG emission up to 30% compared to BAU by 2020**

- **GHG Total CO₂ reduction from 2011 to 2020:**
  - 8,426 Kton CO₂

- **Economic Effect:**
  - 84,263,290€

- **Employment:**
  - More jobs and skills in low carbon goods and services

- **Wider economic benefits:**
  - Energy security, increased competitiveness, extra GDP

- **Wider social benefits:**
  - Reduction in fuel poverty, improvements in health
4.2 Korean Examples

Fig. 23 Green card

a. Card used in 2008-2013

b. New card used from 2014

Fig. 24 Smart metering devices

Source: photo 1, Taken at Sinhyochon solar village, Gwangju, by the author, on 10 January, 2014
4.2 Korean Examples

Fig. 25 Combined electricity generation of solar energy and wind energy: Hybrid system generated by natural energy, Pasar, Japan
4.2 Korean Examples

Fig. 26 Combined electricity generation of solar energy and wind power: Hybrid system generated by natural energy, Seoraksan National Park, Korea

Fig. 27 T-Smart mini drone

Fig. 28 Bike ride, Munster, Germany
4.2 Korean Examples

**Fig. 29** Smart parking facility, Seoul, Korea

**Fig. 30** Digital parking space
4.2 Korean Examples

Fig. 31 Solar LED garden lighting, Jeju island, Korea

Fig. 32 Wind power generators, Seoraksan National Park, Korea
4.2 Korean Examples

Fig. 33 Application of Input-Output Model in Eco-friendly Energy Town
4.2 Korean Examples
4.2 Korean Examples
4.2 Korean Examples
4.2 Korean Examples
4.2 Korean Examples
4.2 Korean Examples
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5.1 Environmental and Ecological Planning
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2. What is Environmental and Ecological Planning? (32)

3. Development of Conceptual Model of Urban Environmental and Ecological Planning (34)
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   3.2. Types of Urban environmental and ecological Planning
   3.3. Procedures and Contents of Urban environmental and ecological Planning

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   4.2. Environmental and Ecological Planning Concept and General Planning
   4.3. Environmental and Ecological Detailed Planning
   4.4. Environmental and Ecological Conservation Planning

5. Practicality and Validity of Environmental and Ecological Planning (59) for Future Sustainable Ecological Cities: Implication for Urban Land Use Plans

6. Conclusions and Suggestions (63)
   6.1. Conclusions
   6.2. Suggestions
1. Preface
◆ The interest in sustainability and environmentalism of national land and city planning is increasing.

◆ The systematization of environmental and ecological planning within the constructions of recent new urban area and site development region is being sought, and the Ministry of Environment is preparing the national land, environment planning establishment guidelines.

◆ An environmental and ecological planning is being established in large scale nationally financed new urban area development projects (over 2,000,000 by (6,611,600m²)).
2. What is Environmental and Ecological Planning?
2. What is Environmental and Ecological Planning?

“Environmental and Ecological intends for sustainable city, is done prior to the establishment of land use planning, and aims to maximize the urban ecosystem service and ecological value through detailed investigation and assessment of environmental elements in natural and urban ecosystem”
3. Development of Conceptual Model of Urban Environmental and Ecological Planning
3. Development of Conceptual Model of Urban environmental and ecological Planning

3.1. Characteristics of environmental and ecological Planning Model

◆ Coordinated planning
◆ Advanced planning
◆ Equality planning
◆ Strategic planning
◆ Flexible planning
◆ Adaptive planning
3. Development of Conceptual Model of Urban environmental and ecological Planning

3.2. Types of Urban environmental and ecological Planning

<table>
<thead>
<tr>
<th>Spatial Phase</th>
<th>Types of environmental and ecological planning</th>
<th>Contents</th>
</tr>
</thead>
</table>
| City Unit     | Environmental and ecological planning concept | ●Environmental and ecological planning concept  
• Planning by sector  
  - Water circulation planning concept  
  - Biodiversity planning concept  
  - Wind channel and urban climate planning concept |
|               | ...                                            | ...      |
|               | Environmental and ecological basic planning    | ●Environmental and ecological basic planning  
• Planning by sector  
  - Water circulation planning  
  - Biodiversity planning concept  
  - Wind channel and urban climate planning |
|               | ...                                            | ...      |
| Block Unit    | Environmental and ecological detailed planning | ●Detailed planning by space/topic  
  - Planning of environment friendly residential areas  
  - Planning of parks and green areas  
  - Planning of environment friendly transportation |
|               | ...                                            | ...      |
| Site Unit     | Environmental and ecological construction planning | ●Construction planning related to construction  
  - Planning of rain water reservoir  
  - Planning of natural streams and creeks |
3.3. Procedures and Contents of Urban Environmental and Ecological Planning

◆ The distribution of land use should be accomplished through integrated planning of planning considering city as social and economic system and planning considering city as an ecology.

◆ Such distribution should be reassessed and verified through strategic impact assessment from the ecological perspective.

<Figure 1> Procedure and content of urban environmental and ecological planning for sustainable land use
4. The Application – The Case of Songpa-Geoyeo New Town
4. The Application – The Case of Songpa-Geoyeo New town

- Work Flow of Environmental and Ecological Planning Model for Songpa-Geoyeo New town and Linkage with City Basic Planning

*Figure 2* Work Flow of Environmental and Ecology Planning Model for Songpa-Geoyeo New town.

See text for explanation
4. The Application – The Case of Songpa-Geoyeo New town

4.1. Overview of Songpa-Geoyeo New town

<Figure 3> Regional Setting(above) and Whole View(below) of Songpa-Geoyeo New town
4.2. Environmental and Ecological Planning Concept and Basic Planning

4.2.1. Establishment of Basic Directions and Objectives

- Application of watershed approach
- Respect of function and value of ecological elements
- Comprehensive integration of qualitative and quantitative approaches
- Organic correlation of broad and site perspectives
- Seeking coexistence, commensalism, co-evolution of natural ecology and human society
- Inclination of following idealistic ecological city in which all ecological elements are respected.
4.2.2. Civic Survey and Analysis

- The current condition research and analysis analyzed ecological basis conditions based on watershed approach.

- Determination of ecological corridor and connectivity.

<Figure 4> Consolidated result of site profile survey based on watershed
4. The Application – The Case of Songpa-Geoyeo New town

4.2.3. Establishment of Conservation and Restoration Areas

1) Establishment of Conservation and Restoration areas by Ecological Elements

- Conservation and restoration areas for each process were established by ecological elements.

<Table 1> Selection of conservation and restoration area based on hydrology

<table>
<thead>
<tr>
<th>Normative Approach</th>
<th>Selection of evaluation element and standard</th>
<th>Suitability evaluation</th>
<th>Selection of conservation and restoration area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**Problem-Solving Approach**

- Current land use shape and pattern should be respected to the maximum.
- The whole shape of hydrology profile including streams should be conserved to the maximum.
- The disconnected area such as stream in hydrology perspective should be restored.
- Expert decisions should be taken when selecting restoration area regarding such areas as wetland and pond
- In entire perspective, linkage between green area should be connected and created a network
2) Overlay of Conservation and Restoration Areas on Each Ecological Element

- Process of absolute and relative assessments in comprehensive process of established results for each process conservation and restoration area selection were performed and through which the establishment of conservation and restoration areas was reached.

<Figure 5> Selection of conservation and restoration area through overlay of each ecological element: (a) Overlay of absolute value, (b) Overlay of relative value
4.2.4. Strategic Impact Assessment of the Proposed Land Use

1) Land Use Planning Proposal by Development

- The proposed land use planning by the Korea Land Corporation in the prior environmental review system.

<Figure 6> Land use planning for prior environmental review process proposed by land use planning (proposal)
2) Implementation of Strategic Environmental Assessment

The impacts of the proposed plan (<Figure 6>) on the value of natural ecosystem (<Figure 5>) were assessed through strategic impact assessment synthesized in conservation and restoration areas as a gain or a loss.

<Figure 7> Strategic impact assessment on land use planning proposal of Songpa-Geoyeo new town, proposed by the Korea Land Corporation: (a) Overlay of absolute value, (b) Overlay of relative value.
4.2.5. Environmental and Ecological Planning Concept

1) Selection of Conservation and Restoration Area through consideration of result from Strategic Environment Assessment

Conservation and restoration areas were selected with consideration of result from strategic environment assessment to improve the positive and to reduce the negative effects from development.

<Figure 8> Selection of conservation and restoration area on the basis of strategic impact assessment.
2) Selection of Conservation and Restoration Areas through consultation with Developer

- Conservation and restoration areas for the environmental and ecological land use through consultation with developer.
3) Ecological Network Concept

- On the basis of the conservation and restoration areas, ecological network in Songpa-Geoyeo new town with the consideration of regional connectivity and linkage was conceptualize.

![Figure 10] Ecological Network Concept
4) Refined Environmental and Ecological Planning Concept

- The overlay of conservation and restoration areas from conceptual approach through consultation with developer for the environmental and ecological land use, and ecological network concept.

*Figure 11*> Environmental and ecological basic concept for environmental and ecological land use in Songpa-Geoyeo new town
4.2.6. Environmental and Ecological Basic Planning

1) Draft Land Use Plan in consideration of Environmental and Ecological Basic Planning

- Land use planning for the Songpa-Geoyeo new town, proposed by the Korea Land Corporation, main developer.

<Figure 12> Draft land use plan from application of environmental and ecological basic planning
2) Final Environmental and Ecological Basic Planning

- Environmental and ecological basic planning with consideration of spatial scale was developed.
3) Sectoral Planning

From the perspective of green network, water circulation, biodiversity, energy and resource circulation, and wind channel, basic planning by sector for environmental and ecological land use was established.

Green Network

(Figure 14) Sectoral plan of Songpa-Geoyeo new town - Green network
4.3. Environmental and Ecological Detailed Planning

- Environmental and Ecological Detailed Planning should be based on environmental and ecological basic planning which is done in the prior process, and should provide detailed plan for the actualization of the basic planning.

<Figure 16> Environmental and ecological detailed plan(example) in Songpa-Geoyeo new town:
(a) Residential town near Changgok stream,
(b) Creation of school forest using the existing pond
4. The Application – The Case of Songpa-Geoyeo New town

4.4. Environmental and Ecological Construction Planning

- Based on sectoral Environmental and Ecological Detailed Planning, Environment and Ecological Construction Planning in site level was established.

*Figure 17* Environmental and ecological construction plan of a Water Garden in Songpa-Geoyeo new town:
(a) Plan of ecological pond, (b) Section drawing
(a) Floodplain swamp

(b) Riparian floodplain marsh
The wetland in Bukhan River of DMZ area reduces flood damage by allowing water to flow inside the wetland.
5. Implication for Urban Land Use Plans
5. Implication for Urban Land Use Plans

◆ The process of establishing the final land use planning

- Figure (a) is Proposal by the Korea Land Corporation in prior environmental review process, figure (b) is Proposal from environmental and ecological planning research, and figure (c) is final land use plan submitted for development permit by the Korea Land Corporation.

<Figure 18> Comparison of land use plan in Songpa-Geoyeo new town (proposal):

(a) Proposal by the Korea Land Corporation in prior environmental review process
(b) Proposal from environmental and ecological planning research,
(c) Final land use plan submitted for development permit by the Korea Land Corporation.
In establishing the final land use plans, the summary of reflected matters by ecological elements is shown in the following <Table 2>.

<Table 2> Result from applying proposed environmental and ecological plan in Songpa-Geoyeo new town

<table>
<thead>
<tr>
<th>Element</th>
<th>Hydrology</th>
<th>Landform</th>
<th>Vegetation</th>
<th>General habitat</th>
<th>Wildlife habitat</th>
<th>Natural circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation area</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
</tr>
<tr>
<td>Restoration area</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
<td>☉</td>
</tr>
</tbody>
</table>

☀: Mostly ☉: Partially, ☀: Little ×: Not at all
The following implications can be found in practicality and utility of the environmental and ecological plan case example.

- First, the environmental and ecological planning is one method of using and creating natural resources and environmental values within the city.
- Second, this environmental and ecological model can be applied to city level, block level, as well as regional level.
- Third, the environmental and ecological planning is a method to increase possibility and potential for the city to provide service to the urban ecology, and it provides for the increase of ecological value of the urban ecology.
- Fourth, the environmental and ecological planning can be applied repeatedly by using existing GIS tool from the use perspective, thereby provides for easy repeat application in other areas.
- Fifth, through strategic impact assessment, the environmental and ecological planning can assess on the effects and substitute measures of ecology as a result of urbanization which can be used as a tool for opinion adjustment and negotiations of various related parties.
6. Conclusions and Suggestions
6. Conclusions and Suggestions

6.1. Conclusions

◆ Opportunities:

- The environmental and ecological planning should be mandatory in environment friendly land use plan, and it provides a planning tool which makes selection of land use alternative measures which minimizes ecological risk.

◆ Limitations:

- In assessing ecological value and function of the subject area, when data is insufficient, the assessment of the structure and function of the urban ecosystem is difficult.
- During the concrete process of planning, the reflection of environmental and ecological planning on land use may be diluted.
6. Conclusions and Suggestions

6.2. Suggestions

◆ Introduction of Strategic Impact Assessment System for in the course of preparing city basic plan or Environmental and Ecological planning.

◆ Realization of comprehensive : “Inclusive City”

◆ Application of multidisciplinary approach

◆ Building up of Environmental and Ecological Profile(EP) and Environmental and Ecological Management Information System(EMIS).
5.2 Neighbourhood Design
위례송은집 Good House 공인중개사사무소
031) 758-5100

위례뉴타운 풀로리지

위례월드타운

위례에코랜드

위례에코제

위례삼성라미안

위례그린파크

위례שמ imgUrl
그린파크푸르지오
A3-9
입주일: 2016.01
총 972세대

에코앤캐슬
A3-8
입주일: 2016.02
총 1673세대

101A
495㎡

101B
124㎡

101C
238㎡

101D
106㎡

75A
92㎡

75B
292㎡

84A
159㎡

84B
154㎡
5.3 Photos During Construction

The Entire View of Namhan Mountain Watershed

View 1
Site Preparation (Earth Works) For Songpa-Guyeo New Town

Conservation of Existing Stream (1)
Conservation of Existing Stream (2)
Damaged Stream
Creation of New Stream
The Remaining Apartment
The Remaining Temple
The Remaining Public Building
New Road and Electricity Network
Cut an Fill
Apartments Under Construction

Apartment Construction with Crane(1)
5.4 Photos after Construction

Public facility

Public space
5.4.1 Types and Location of IoT and Smart-Tech in the Wiryae New Town, Korea

Legend

① Smart Growth Control: Green belt
② Land Use only for Pedestrians
③ Urban Connectivity
  ③-1 Green connectivity
  ③-2 Blue connectivity
  ③-3 Combined connectivity
④ Urban Ecosystem
  ④-1 Parks
  ④-2 Green spaces
  ④-3 Water bio-tope
  ④-4 Terrestrial bio-tope
  ④-5 Ecological restoration
5.4.1 Types and Location of IoT and Smart-Tech in the Wiryae New Town, Korea

⑤ Smart Eco-Mobility
  ⑤-1 Tram mall
  ⑤-2 Bike ride: Cycling for eco-mobility
  ⑤-3 Pedestrians
  ⑤-4 Park and ride
  ⑤-5 Transit system
  ⑤-6 Combined system ⑤-7 Subway station

⑥ Infrastructure
  ⑥-1 Drinking Water Supply
  ⑥-2 Separation and Recycling of waste materials
  ⑥-3 Underground mains
  ⑥-4 Roads
5.4.1 Types and Location of IoT and Smart-Tech in the Wiryae New Town, Korea

⑦ IoT
  ⑦-1 Broadband
  ⑦-2 Neighbourhood security scheme (CCTV camera watch)
  ⑦-3 Smart meters
  ⑦-4 Smart parking space information
  ⑦-5 Smart elevator
  ⑦-6 Digital bus information terminal (BIT)
  ⑦-7 Digital locker

⑧ Climate Change Mitigation Measures
  ⑧-1 Solar Panel
  ⑧-2 Carbon forests
5.4.1 Types and Location of IoT and Smart-Tech in the Wiryae New Town, Korea

⑨ Climate Change Adaptation Measures
  ⑨-1 Rainwater collection pipe
  ⑨-2 Flood control dam

⑩ Public Welfare and Educational Facilities
  ⑩-1 Community centre
  ⑩-2 Silver club
  ⑩-3 Playground
  ⑩-4 Kids club
  ⑩-5 Library
  ⑩-6 School
  ⑩-7 Public Spaces
5.4.2 Examples of IoT and Smart-Tech

① Smart Growth Control: Green belt

**Overview of the town with the backdrop of green belt**

**Details of the green belt**

**Green belt of Seoul Capital region:**
It surrounds the new town and is connected with the regional ecological network.
② Land Use only for Pedestrians

Pedestrian along the main road

Separation of pedestrian paths from bike rides and vehicle roads
② Land Use only for Pedestrians

Pedestrian Boulevard

Pedestrian mall between buildings

Pedestrian malls
Urban Connectivity

- Green connectivity

Green corridor along the road
Green corridor beside buildings

Green corridor along the road for pedestrians
Urban Connectivity

-2 Blue connectivity

Head water
3. Urban Connectivity
3-2 Blue connectivity

Up-stream (1)
Urban Connectivity

-2 Blue connectivity

Up-stream (2)
③ Urban Connectivity
③-2 Blue connectivity

Middle-stream (1)
Urban Connectivity
-2 Blue connectivity

Middle-stream (2)
Urban Connectivity

Blue connectivity

Down-stream

Blue corridor featured by ecological restoration
④ Urban Connectivity
④-1 Parks

River-side park

Restoration of riverine wetlands
④ Urban Connectivity
④-1 Parks

Neighbourhood Park
Pocket park
Connected urban park system
④ Urban Connectivity
④-2 Green spaces

Trees

Shrubs

Reeds

Connected green space system
④ Urban Connectivity
④-3 Water bio-tope

Sinage of Wirae I PARK

Water bio-tope with aquatic plants

Water bio-tope created in the I PARK apartment complex
4 Urban Connectivity
4-4 Water bio-tope

Terrestrial bio-tope with wood and rock piles

Terrestrial bio-tope in I PARK
Smart Eco-Mobility

-1 Tram mall

Tram rail under construction

Tram station under construction

Tram mall in the middle of the town
⑤ Smart Eco-Mobility
⑤-2 Bike ride: Cycling for eco-mobility

Sinage of bicycle racks

City bike rack
⑤ Smart Eco-Mobility
⑤-2 Bike ride: Cycling for eco-mobility

Apartment bike rack Types of bike rack user
Bokjung subway station which connects the town with Seoul

Public parking space
Park and ride system for subway train users
➎ Smart Eco-Mobility
➎-4 New subway station

Location of the new subway station

Commercial area near the new subway station
Smart Eco-Mobility

-1 Drinking water supply

Underground drinking water supply storage

High pressure electricity transmission line for water supply
Smart Eco-Mobility

-2 Drinking water supply

Recyclable waste storage

Separation of paper, cans, bottles, and batteries
Smart Eco-Mobility
-3 Underground mains

Broadband
TV Cable
Sewer meter
Electricity

Septic tank for parking lots

Drinking water
© Smart Eco-Mobility
©-3 Underground mains

Police

City gas valve box
IoT

Broadband

CCTV camera watch (1)

CCTV camera watch (2)
Smart meters for city gas, electricity and water

Smart meter for city gas
Smart Parking space information

Smart elevator
Digital bus information terminal (BIT)

Digital locker
Climate Change Mitigation Measures

Solar panel (1)  Solar panel (2)
Climate Change Mitigation Measures

Solar panel (3)  Carbon forest (1)
Climate Change Mitigation Measures

Carbon forest (2)
Climate Change Adaptation Measures

Rainwater collection pipe

Flood control dam
Public Welfare and Educational Facilities

Children’s playground

Silver club
Public Welfare and Educational Facilities

Preliminary School

Nursery school
Public Welfare and Educational Facilities

Community library

Kids club
Thank You