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# Korean Green Building Certification Criteria

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### Introduction

Given Korea's current status of limited energy and resources in a small country with dense population, green building is a viable solution for sustainable growth. To promote the sustainable construction industry in Korea, the Korean government has been trying to develop and encourage green building certification. This system will assess the entire building construction process and is also expected to promote technological development and quality competition in green building materials.

### Benefits of Green Building

Green building—also known as “sustainable environmentally-friendly building,” “environmentally responsible building,” “ecological building” and “high performance building”—is a whole systems approach to the design, construction and operation of buildings. The key green building priorities address:

- Nontoxic materials
- Recycled or reused materials
- Indoor environmental quality
- Water conservation and eco roofs
- Energy efficiency and renewable energy
- Sustainable construction site management
- Reduced building size and wise use of space

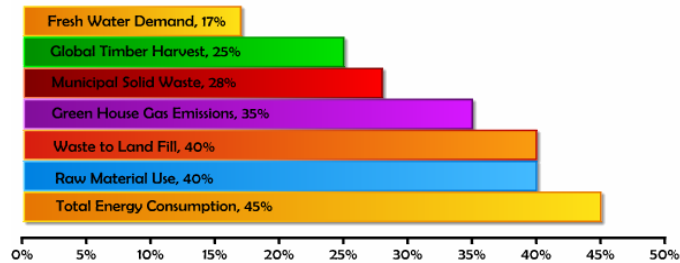
Green building also can provide several economic benefits to building owners and users. The key economic benefits include:

- Public relations value for corporations
- Productive increase in office buildings
- Long-term energy and operating cost reduction
- Higher rental value and faster sales for residential buildings

### Why Do We Need Green Building?

Traditional buildings consume large amounts of energy and other natural resources and generate harmful byproducts for the environment around them. In Korea, buildings account for 26% of total energy consumption. Globally, buildings consume 40-50% of total energy consumption, 40% of raw materials and 25% of harvested timber. Buildings generate 35% of green house gas emissions that harm air quality and contribute to global warming.

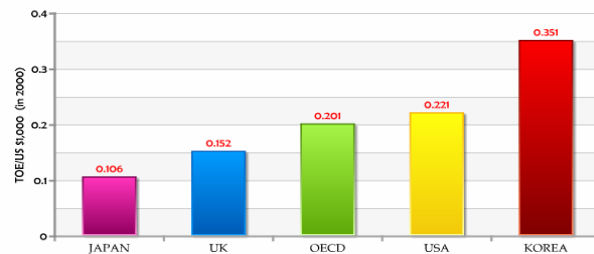
Figure 1: Resource Use and Environmental Impact of Buildings



Sources: DOE, Center of Excellence for Sustainable Development

The energy intensity index measures how much energy a country consumes in order to earn one dollar. Korea has high energy intensity ratings compared to other OECD countries. In other words, the energy efficiency of the Korean economy is low compared other countries.

Figure 2: Comparison of Energy Intensity



Sources: IEA, Energy Balances of OECD Countries (2005)

### Korean Green Building System

#### History of Korean Green Building Certification Criteria (GBCC)

**1997-2000:** early green building systems for office building and residential building were developed.

**2001:** systems were integrated into Green Building Certification Criteria (GBCC) by Korea Institute of Energy Research (KIER). This system is based on GB Tool.

**2003:** in Korea the Green Building Certificate System extended to include the semi-residential buildings, office buildings (public and private), commercial buildings and remodeled buildings.

#### Trends in GBCC Construction in Korea

Korean GBCC construction market is still small but is growing dramatically. In 2006, it is expected that green building projects will more than quadruple from 2005. Initially, most GBCC projects were office buildings. However, after 20 mixed-use green residential building projects, residential projects now account for 77% of total green building projects.

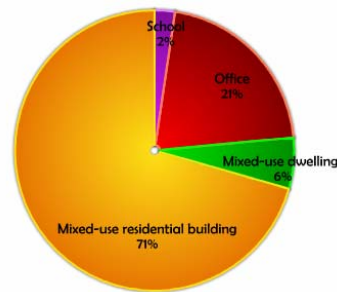


Figure 3: GBCC Projects by Building Type

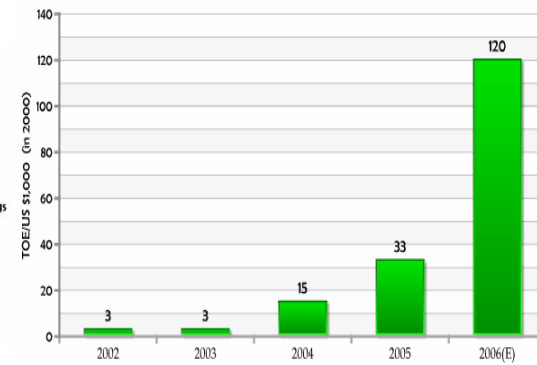


Figure 4: Green Building Growth in Korea, 2000-2006

#### Green Building Certification Criteria and Grades of Certification

Korean GBCC currently has 4 issues and 44 categories. Criteria has been developed for various types of buildings such as mixed use residential buildings, office buildings, and mixed use dwellings (residential and non residential, school, retail, accommodation). Indoor environmental quality and material and resources are the most important factors. The grades of certification are divided into two grades, 'best' and 'excellent'.

**Best: 85 points or more**      **Excellent: 65 points or more**

Issue	Category	Residential Building*	Office Building
Land use and commuter transportation	Land use	22	7
	Transportation	8	5
	Energy	15	23
Energy resources consumption and environmental loads	Material and resources	23	21
	Water resources	13	14
	Environmental pollution loads	3	6
	Management	7	10
Ecological environment	Ecological environment	18	19
Indoor environmental quality	Indoor environmental quality	27	31
Total		136	136

#### Not included in Korean GBCC (compared to other countries' systems)

- Transportation: Parking capacity
- Material and Resources: Using certified wood products
- Environmental pollution loads: Heat island effect and light pollution reduction
- Management: system performance monitoring
- Indoor environmental quality: Monitor carbon dioxide concentrations, Manage temperature and humidity

#### Only included in Korean GBCC (compared to other countries' systems)

- Land use: Access to rivers, mountains and/or forests around apartment complex, Creation of pedestrian walkways in the apartment complex
- Material and Resources: **Easiness in churning interior layout during life cycle**, Minimal use of furniture for living use
- Management: Planning environmental management in construction process
- Ecological environment: Green space area ratio

### Case Study: Two Best Green Buildings in Korea

Category	I-Park (Multi-unit residential building)	Kolon E&C Institute of Technology (Office Building)
Building area	2,960.50m <sup>2</sup> (Gross Floor: 146,482.92m <sup>2</sup> )	1,867.00m <sup>2</sup> (Gross Floor: 2,061.28m <sup>2</sup> )
Green space ratio	50.63%	33.14%
Number of floors	46 stories above ground and 39 stories above ground	3 stories above ground, 1 story underground
Structure type	Reinforced concrete structure	Reinforced concrete structure

#### Environmental design strategies

Total Points	KGBBC: 85.6 Points & BEST, GB Tool 2005 : 2.6 points	KGBBC: 91.2 Points & BEST, GB Tool 2005: 2.4 points
Land use and commuter transportation	<ul style="list-style-type: none"> <li>Using information and communication equipment</li> <li>Proximity of site to public transportation</li> <li>Creation of pedestrian walkways connected with community space</li> </ul>	<ul style="list-style-type: none"> <li>Providing bicycle rack and shower rooms</li> <li>Proximity of site to public transportation</li> </ul>
Energy resources and management	<ul style="list-style-type: none"> <li>Mechanical steel reinforcement splicing system</li> <li>Complex waterproof system of improved asphalt sheet and polyurethane coating materials</li> <li>Reduction of city-water use</li> <li>Ratio of porous pavement area: 36.3%</li> <li>Supplying 10% or more of total drainage generated with grey water</li> <li>Reducing emission of CO<sup>2</sup> by district heating system</li> </ul>	<ul style="list-style-type: none"> <li>Total heating and cooling design loads supplied by geothermal system</li> <li>Day lighting control system- light shelf and solar sun lighting system</li> <li>Use of environmentally certified products</li> <li>Installing garbage cans for sorting and storage on each typical floor</li> <li>Ratio of porous pavement area : 95.4%</li> <li>Reduction of city water use</li> </ul>
Ecological environment	<ul style="list-style-type: none"> <li>Afforestation of rooftop, wall surface and street</li> <li>Creation of aquatic biotope and terrestrial biotope</li> </ul>	<ul style="list-style-type: none"> <li>Afforestation of rooftop, wall surface and street</li> <li>Creation of aquatic biotope and terrestrial biotope</li> </ul>
Indoor environmental quality	<ul style="list-style-type: none"> <li>Using low VOC-emission materials and non-formaldehyde insulation</li> <li>Good noise attenuation performance through the walls and floor</li> <li>Installation of thermostatic control system in all units</li> <li>Accessibility for the disabled and elderly</li> </ul>	<ul style="list-style-type: none"> <li>Use of paint and gypsum board with environmental friendly certification</li> <li>Preparation of rest place for occupants within the building</li> <li>Individual control for temperature, ventilation and lighting</li> <li>Installation of thermostatic control system</li> </ul>



Exterior view

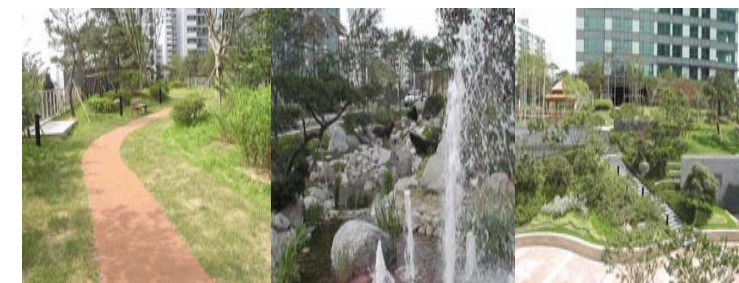
Sunken garden

Connection of green space

Exterior view

Eco-roof

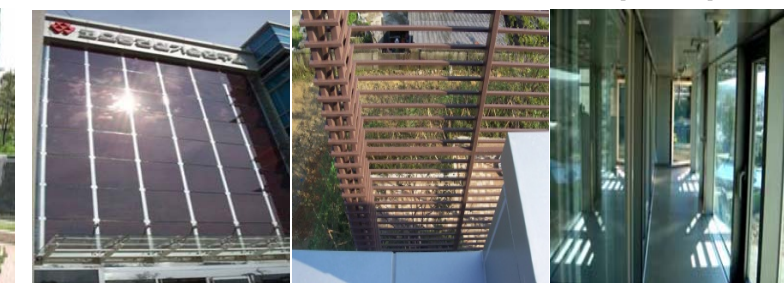
Aquatic biotope



Pedestrian walkways

Aquatic biotope

Terrestrial biotope

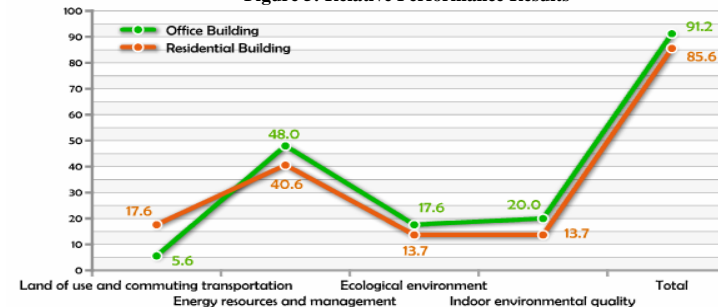


BIPV system

Geo-thermal System

Double skin

Figure 5: Relative Performance Results



Sources: The World Sustainable Building Conference in Tokyo

### Conclusions

Interest in green building is growing as consumers and builders look for ways to reduce environmental footprints. In the US, LEED certification has created new markets in the institutional and government sectors, with green buildings now accounting 10% or more market share. In Korea, it is also expected that GBCC can help to reshape the construction industry over the next three to five years, with more green, energy-efficient and sustainable buildings.

#### Future needs to encourage green buildings

- Developing evaluation software tools
- Encouraging public green building construction
- Developing integrated standard for various types of building
- Improving incentive grant program for certified green buildings
- Modifying green products or technology to suit the Korean market or environment.