G-SEED : The Revised Korean Green Building Certification System

ABSTRACT

The study introduces G-SEED (Green Standard for Energy and Environmental Design), with particular reference to the importance of the government's role in the dissemination and diffusion of Green Architecture through the certification system, incentive schemes and certification records. In addition, the need for improvement of the current environmental performance has been discussed through green building diffusion in Korea, by introducing the revised G-SEED and further directions for improvement.

1. INTRODUCTION

Scope and Method of the Research

The research for green building certification in Korea began in 1996, promoted by the Ministry of Construction and Transportation. First the certification was applied to apartment buildings but eventually it was expanded to education facilities, offices, and currently all buildings are included in its certification scope and from 2013 all buildings 3,000㎡ or over were obliged to be certified. In particular, the ministries established the Green Architecture Support Act to legally implement the policies such as economic-institutional support for green architecture, establishment of information system and education of relevant professionals, etc.

Operating Body and Certification Procedure

The operating bodies of the green building certification system are classified into management organization and certification organization. The research aims to examine the changes in factors such as building energy reduction and environmental improvement charges, additional charges for design services and obligation of public buildings. Therefore, both the public and private sectors have contributed to the environmental performance improvement and energy saving. Particularly given the poor political and industrial infrastructure and the scant support from the private sector. Therefore, the public and private sectors have contributed to the environmental performance improvement and energy saving. The research aims to examine the changes in factors such as building energy reduction and environmental performance improvement within the green building certification-assessment standards. Finally, we will analyze the development of Korea’s green building certification system to analyze what made the certification system successful.

2. INCENTIVE FOR CERTIFICATION

Local Government Ordinances related to Green Architecture. The City of Seoul established the Seoul City Green Architecture Support Ordinance in January 2014 according to the enforcement of Green Architecture Support Act in February 2013, to expand green architecture and reduce the greenhouse gas generated by buildings.

3. INCENTIVE FOR CERTIFICATION

The economic-institutional support consisted of exemption of acquisition-registration tax, property tax, relaxation of architectural regulation, environmental improvement charges, additional charges for design services and obligation of public buildings.

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Operating Body and Certification Procedure

The operating bodies of the green building certification system are classified into management organization and certification organization. The management decides and establishes the diverse economic and institutional incentives as certification assessment standard, certification procedure, designation of entity for certification, inspection of certification records, etc. and the initial management organization was the Ministry of Land, Infrastructure and Transportation and the Ministry of Environment, which alternately managed with terms of 2 years.

Green Building Certification Records

In the green building certification records, the standard for apartment building was established in 2002 and in 2006 the certification records were increased to 142 cases. In addition, the office buildings standard was prepared in 2003 and in 2010 the certification records were increased to 110 cases. Meanwhile, the education facilities standard was prepared in 2005, and in 2007 the records increased to 120 cases. For other buildings, the standard generally was established in 2010 and in 2013 the records increased to 100 cases.

Related Regulations

Green Architecture Support Act. The Korean Government established and enforced the Green Architecture Support Act in February 2013, aiming to reduce greenhouse production by 26.9% until 2020 through a general and systematic green architecture promotion and progress plan considering that the building industry in Korea is producing 1/4 of all greenhouse gas production.

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Figure 1 Current status of certification cases (March, 2014)
The number of certified buildings in 2010 increased to 570, which is 156 more than the 414 certified buildings in 2008. Also, the property tax the exemption period is December 2011, it was found that compared to 500 cases in 2011, certification number is increased by 567 in 2012.

**Additional Price Incentive.** The incentive system for apartment buildings was revised in March 2005 to add 3% of the basic construction cost when the green building certification was acquired according to the regulations of the Calculation of Parcel Price (Article 13-2) for Housing price ceiling system. Therefore the certification records of apartment buildings rapidly increased, from 33 cases in 2005 to 165 cases in 2006.

**Obligation of public buildings and Green Building certification records.** The regulation on the obligation of green building on public buildings was revised in March 2010 according to the energy usage rationalization guideline. There were 64 public buildings with certification, 19 more than in 2009. Furthermore, in December 2011 the standard was revised to apply at least Excellent level for public office buildings.

**Figure 2** Current status of certification of apartment buildings (March, 2014)

**Figure 3** Current status of certification of public office building/facilities (March, 2014)

4. CHANGE OF BUILDING ENERGY-REDUCTION AND ENVIRONMENTAL IMPROVEMENT FACTORS IN G-SEED

**ENERGY-SAVING EFFECT OF THE BUILDING**

**Building Energy-saving.** The building energy-saving sector was assessed as an EPI item from 2002 to assess the energy consumption. There were only 12 energy consumption points among all other items of energy sector, but in 2010 the system was modified by applying the weighting, and therefore it was increased to 15 points. Thus, the importance of the energy-saving sector (energy consumption) is increasing daily.

**Obligation of use of Renewable Energy:** In 2002, renewable energy such as sunlight, bio-energy, wind power to reduce the use of fossil fuel and increase renewable energy facilities was only applied to the apartment buildings and the hot water supply, but from 2003 it was modified to produce 1~5% of the total electric design load, air-conditioning and heating by renewable energy facilities.

1 Parcel Price Ceiling System: System which designates the parcel price of the house calculated based on the site price; construction costs and the proper rate of constructor's income, which limits the price according to this calculation (Ref: Doosan Encyclopedia)

<table>
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<tr>
<th>Classification</th>
<th>Assessment standard</th>
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<tr>
<td>Energy consumption (2002)</td>
<td>Energy consumption assessment according to Energy Performance Index (EPI) points. Y = (12 \times (EPI_{pts-60}) \div 25)</td>
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<tr>
<td>Energy consumption (2003)</td>
<td>Energy consumption assessment according to Energy Performance Index (EPI) points. Y = (15 \times (EPI_{pts-60}) \div 25)</td>
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<td>Energy efficiency improvement (2010)</td>
<td>Applied as energy performance index review</td>
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**Table 1. Assessment standards of Energy-saving sector**

**Table 2. Natural ventilation performance assessment standard**

5. CASE STUDY BUILDINGS

**S Chemical BLDG.** The S Chemical BLDG is located in Gyeonggi-do. The total architectural area of the building is 47,541.88㎡, with 5 basement floors and 9 floors above ground. The building acquired the Best G-SEED certification level and LEED (Platinum) certifications. The main application parts are: energy saving sector (energy performance index (EPI) 96 points), renewable energy (installed sunlight and geothermal heat pump system), BIVP installation, ecological material, rainwater and graywater, permeable paving rainwater load reduction plan, etc. In addition, using the temperature difference between the upper and lower atrium, an air control system, the S Chemical BLDG was planning to reduce the air-conditioning load and natural ventilation.
The FKI Building. The FKI building is located in Seoul. The total architectural area of the building is 168,629㎡, with 6 basement floors and 50 floors above ground. The building acquired the Best G-SEED certification level. The main application parts are: energy saving sector (energy performance index (EPI), application of carbon emission material, renewable energy (installed sunlight (BIPV) and geothermal heat), and ecological sector of rooftop greening, roadside plantation and bio-top, etc. In addition, The FKI building was planned, which will include solar panels on the roof and elevation to maximize the use of solar power. (The production of 4% electricity to 728,971 kw solar power generation amount)

6. DISCUSSION

The building certification system in Korea, which was adopted in 2002, had been applied to over 4000 cases of certification records in a short period of about 10 years, contributing to the spread of green architecture in Korea. By increasing the energy efficiency it also played an important role in the reduction of greenhouse gases. This was thanks to strong government support to respond to the private sector's demand. The successful case studies shall be an exemplary reference for further green architecture introduction, diffusion and dissemination for other countries.

The Green architecture support act, which was established in 2013, consolidated all the scattered green construction related regulations and standards and encapsulates the generalized and comprehensive green building policy and promotion plan. By enforcing diverse and effective ecological and energy-saving green architecture dissemination policies such as the establishment of a certification system, establishment and disclosure of an information system, designation of a professional organization, education and training of professional operators, etc., it became a strong legal basis for the dissemination and expansion of green architecture by the government and local governments.

Green architecture suffered various difficulties in its initial phase of voluntary diffusion due to increased investment costs, though it assured the improvement of environmental performance of buildings. These were surmounted through diverse economic and institutional incentives provided by the government, and certifications increased explosively after the enforcement of the certification incentives. The public sector led the private sector by requiring certification and established a paradigm in which long-term innovative design took precedence over short-term economic profit.

The building industry in Korea also developed rapidly. As skyscrapers and diverse complex buildings increased, issues such as global warming showed the problematic nature of the curtain wall method, leading to a general change and improvement in the construction industry. Korea’s green building assessment and certification system, initiated in 2000 and implemented in 2002, have improved and developed assessment standards for the most optimal assessment, and led the construction industry by responding to the demands of the private sector through measures such as departmentalization of certification levels, diversification of buildings for certification, etc.

The development of professional bodies to support the government policy is critical to the success of the certification system. The green building certification is based on fairness, objectivity, consistency, and the subsidiary roles such as education and consulting for the constructor, designer and operators also guarantee the greater effectiveness of this certification system. In addition, its role as a medium that delivers the industry's demands to the government and reflects them in policies is also a critical function of the certification institutes. Also, its role as a professional certification institute that performs education of professionals and accumulation of relevant technologies is a critical factor affecting the general sector of certification system. If the certification body is not reliable, the entire certification system loses credit and fails.

7. CONCLUSION

As mentioned previously, for the dissemination and diffusion of green buildings, a certification system based on relevant regulations is essential, and therefore a fair and professional certification institute must be developed. By reflecting these features of a certification body the institute needs a strategy to survive within a system of autonomic competition. Furthermore, though the obligation of public areas it must take an initiating role and grant diverse and effective incentives to the private sector to promote the rapid proliferation of the certification system. To continue and maintain this, the certification system must be steadily improved and developed to provide actual benefits to prevent dismissals. The greening of architecture that results will have great results, including the reduction of greenhouse gases, saving of resources and efficiency of energy consumption, which are critical problems in architecture from an economic-environmental point of view, as well as improving the residential environment, and thus promote global sustainability.

Meanwhile, from 726 cases certified as green architecture in 2013 by G-SEED, only 118 cases were certified by the Korea Research Institute of Eco-Environmental Architecture (KRIEA), which corresponds to 16.3% of the total records and 2nd place in the entire certification records scope.

REFERENCES
4. Verify the Ministry of Land, Infrastructure and Transport web page (www.milit.go.kr)