

LEED Rating System Analysis

1 Assessment System

Green Building Certification plays a key role in green building development. Currently, many countries have been working on this area. China is just starting its journey. Although China has achieved certain success, the reliable rating system needs further improvements in technologies, materials, concepts and market promotion.

LEED rating system provides a series of data, which helps use quantitative criteria to evaluate the environment and building. The evaluation not only achieves qualitative analysis, but also quantitative analysis according to ASHRAE (American Society of Heating, Refrigeration and Air-conditioning). With its support, the building design and construction are more controllable and practical.

LEED is focused on the developers and owners, who want to be a leader in the market or already take advantage of green building technologies. LEED certification is judged and awarded by third authoritative party. LEED certificate is helpful for company to win marketing reputation and achieve high quality project.

LEED was launched 14 years ago (1995). LEED rating system is improved and updated continually. The recent version is LEED v2.2. However, starting at July of 2009, the LEED v3.0 (LEED 2009) is launched for new Projects.

LEED is a multilevel rating system and it subdivides sections into multi credit categories. In this way, the relationship between categories and credits is clear. At the same time, it is able to stresses the principal categories. In LEED-NC system, there are 7 prerequisites which are mandatory in applying LEED certification. The prerequisites constitute of 10% of total credits. So the limitation level of LEED application is relative low.

LEED contains 6 rating systems for different kinds of buildings.

- ◆ LEED for New Construction, LEED-NC
- ◆ LEED for Core & Shell, LEED-CS
- ◆ LEED for Commercial Interior, LEED-CI
- ◆ LEED for Existing Building, LEED-EB
- ◆ LEED for Neighborhood Development, LEED-ND

◆ LEED for Home, LEED-H

Among these green building rating systems, the LEED-CS certification is the only one providing pre-certification process.

Chinese green building assessment system is suitable for most Chinese buildings. However, it is only available for public buildings and residential buildings

2 LEED system value analysis

Green building means, during the entire life circle of a building, less usage of natural resources (energy, land, water and material), environmental friendly, less pollution and at the same time providing healthy, comfortable and high efficient spaces. Green building is beneficial to social sustainable development. However, the initial cost is relative high. If we consider the green building values from its entire life, the high initial cost would be paid back through reducing the operation cost, enhancing people's health and improving occupants' productivity and so on.

1、Energy Conservation

Apply automatic lighting control system, high efficient lamp etc. to reduce lighting electricity use. Use high efficient full heat exchanger, green shading and green roof etc. to save air-conditioning electricity use. Encourage employees to save electricity through sub-metering or relevant rules and regulations. According to the drawings, the lighting power in the office is 15KW, the power for air-conditioning is 48KW, and the total value is 63KW. After implementing energy conservation measures, the energy saving is about 35%. Based on the general operation data of office buildings, the total amount of energy saving is: $63\text{KW} \times 35\% \times 250\text{day} \times 8\text{hours per day} = 44100 \text{ KWh}$. Assume that the building stay alive for 50 years, the electricity saving through the entire 50 years life of the building is: $44100 \text{ KWh} \times 50\text{years} = 2205000 \text{ KWh}$.

2、Carbon emission reduction

It is widely known that carbon emission has great impacts on global warming. Carbon emission reduction directly shows the company's responsibility in environmental protection. According to statistic data in China, in average, 1KWh electricity results in 1kg carbon emission. In this project, the

carbon emission in one year will reduce 44100kg according to the quantity of electricity saving. According to 50 years' building life, the carbon emission reduction of this project is 2205000kg.

Furthermore, according to the research about the forest carbon absorption, 1000 m² artificial forest with a growth of 15 m³ in a year is able to absorb 14.3 tons of CO₂. The quantity of carbon emission reduction is equal to the absorption amount of 30839m² forest.

3、 Water Saving

Implement storm water harvesting program and using treated storm water for irrigation or road cleaning. The vegetated area and landscape is about 2500 square meter in this project. When the irrigation water usage is 1 ton/m² in a year, the water saving is 25000 tons per year. Assume that the project life is 50 years, and then the project saves 1250000 tons through the entire project life.

4、 Working Efficient improvement and absent rate reduction

Environmental improvement measures include applying the materials that meet LEED requirements, controlling the contaminant source (such as build independent copy room, print room etc.). Furthermore strategies, such as increased ventilation, CO₂ monitoring system connected to fresh air units, will improve indoor air quality and reduce the risk of sickness. Extended green field and improved exterior environment will increase employees' work efficiency. Based on the statistic, green buildings will improve occupants' efficiency by 5-15%.

Furthermore, as the LEED rating system is renowned for its advanced technologies and holistic design, the marketing potential will come along with LEED certificate.

3 LEED structure

Green building assessment should be a scientific and proper assessment system. Green building rating system includes quantitative criteria, weighting system, phase-by-phase evaluation and whole life cycle assessment, assessment structure development, operation maneuverability and etc.

The approach used in LEED is to compare with the baseline. When some characteristics of the project meet the criteria, it is awarded a certain score. The sum of the score is the total score gained by the project.

The following table is rating system analysis

Rating system	Quantitative criteria	Weighting system	Phase-by-Phase Assessment	Life cycle assessment	Assessment Structure Development	Operation maneuverability	Levels
LEED	Mediate grade of quantitative requirement	Using score to weight the principal	Two Phase	No life cycle assessment	Assessment and design guideline	easy	Four levels

4 Impacting Strength

LEED is the most reliable and most influential rating system around the world. It has been the basis for the green building development and guided sustainable assessment criteria design in many countries. LEED is used in 69 countries and 50 states in American. LEED was introduced in china in 2001. And up to now, there are already more than 200 projects registered, and these projects are located in 28 cities (including Hong Kong and Taiwan)

In 2008, the number of LEED project grows dramatically. There are 81 projects registered. This number is two times of that of 2007. In 2009, we see the continual growth trend.

The following figure shows the number of USGBC members. With the LEED brand well known in the market, the number of members grows significantly.

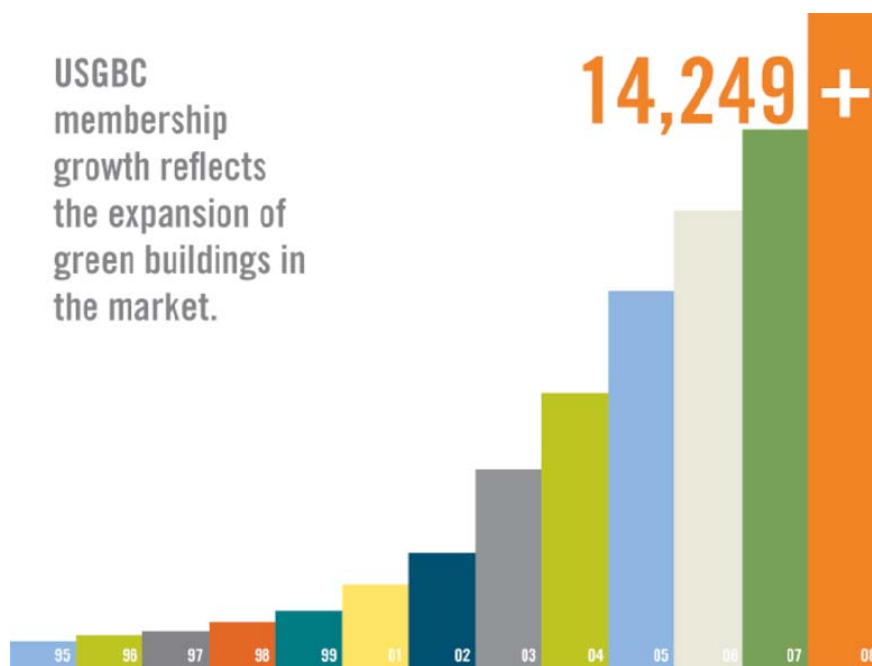
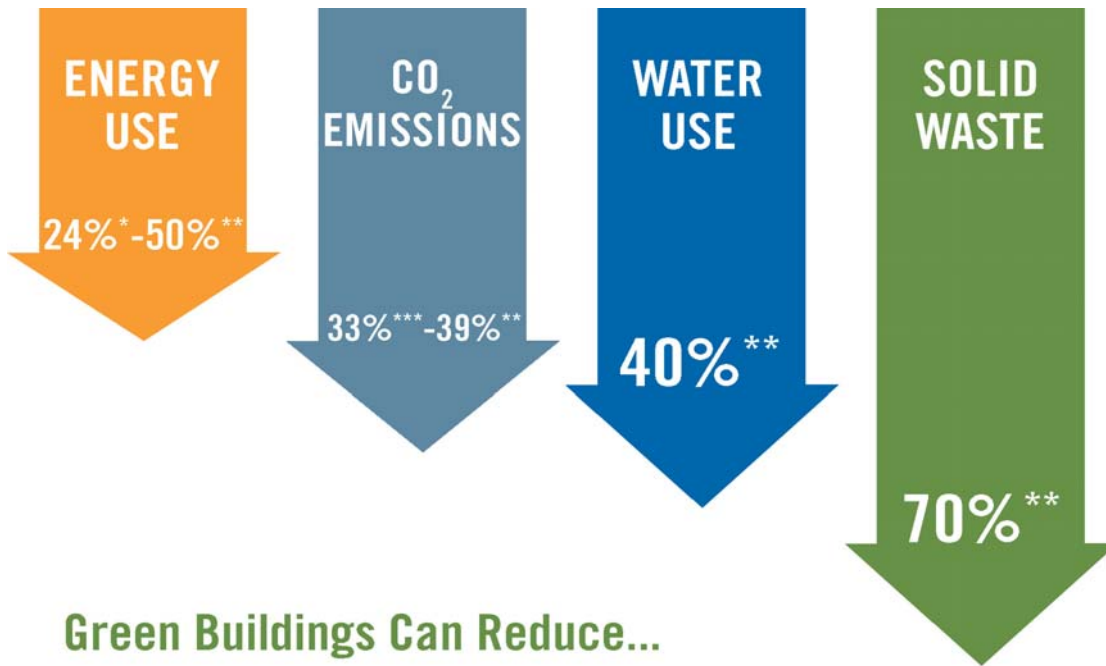


Figure 1 The number of USGBC member

5 Project Cost

Regarding the LEED credits, it does not put emphasis on new advanced technologies or expensive materials. But it pursues the integrated procedure through cooperation between different knowledge areas during the whole period of the project development. The following figure shows the benefits of the LEED projects with no or a little extra cost.



Green Buildings Can Reduce...

* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report.
 ** Kats, G. (2003). The Costs and Financial Benefits of Green Building: A Report to California's Sustainable Building Task Force.
 *** GSA Public Buildings Service (2008). Assessing green building performance: A post occupancy evaluation of 12 GSA buildings.



* Source: McGraw-Hill Construction, Key Trends in the European and U.S. Construction Marketplace SmartMarket Report, 2008
 ** Source: McGraw-Hill Construction, Greening of Corporate America SmartMarket Report, 2007

Figure 2 the potential benefits of Green Building