APPLICATION OF BUILDING ENVIRONMENTAL ASSESSMENT, CASBEE, BY PUBLIC SECTOR AND ITS INFLUENCE ON THE BUILDING MARKET

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Summary
CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) has been revised and updated in order to be utilized more effectively in the building market. This progress includes introduction of new assessment item “Measures for Global Warming,” the development of CASBEE for Home and the development of CASBEE for Urban Development. A number of local authorities now introduce CASBEE into their building administration as a part of sustainable building reporting system. Incentives based on the CASBEE rating are now provided. For instance, the maximum floor-area ratio of the building can be increased if the rating reaches the B+ class, the third of CASBEE’s five grades. The city of Osaka subsidizes residential buildings that are A-ranked by CASBEE. Financial sector, such as banks, utilizes such information to offer better interest rates to the consumers who buy environmentally high performance residential units. The assessment of building environmental performance is prevalent among the building industry, in other words, among professionals. On the other hand, the results published by a municipal suggested that social recognition may have more influence on sustainability in the building market.

1. Introduction
CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) is a method for assessing and rating the environmental performance of buildings. In recent years, several local authorities introduced CASBEE into their building administration. Consequently environmental performance assessment of buildings is now carried out in many buildings in Japan. The system appears to have become a very strong driving force towards market transformation of the building industry. This paper firstly explains the change in CASBEE as a system in order to be utilized more effectively in the building market. Then it describes administrative use of such assessment system, and discusses the effects on the building market.

2. Progress of CASBEE\Intending Utilization in the Building Market
2.1 The Outline of CASBEE
CASBEE is a comprehensive assessment ranked in five grades: Excellent (S), Very Good (A), Fairly Good (B+), Good (B-) and Poor (C). It has been developed under a committee established within the Institute for Building Environment and Energy Conservation, under the guidance of the Ministry of Land, Infrastructure and Transport. The first assessment tool, CASBEE for Office, was completed in 2002, followed by CASBEE for New Construction in July 2003, CASBEE for Existing Building in July 2004 and CASBEE for Renovation in July 2005. CASBEE assessment tools were developed on the basis of the following three principles: [1] Assessment can continue through the lifecycle of the building. [2] Assessment can consider both the “Environmental quality of the building (Q)” and the “Environmental load of the building (L).” [3] The idea of environmental efficiency can be employed to assess on the basis if Building Environmental Efficiency (BEE), a newly-developed indicator. CASBEE comprises the four basis tools, tailored to the building lifecycle, and expanded tools for specific purposes. These are collectively called as the “CASBEE Family,” as shown in Figure 1.
2.2 Incorporation of LCCO2 Assessment to CASBEE and New Assessment Item “Measures for Global Warming”

CASBEE (version 2006) is already capable of assessing efforts to reduce the energy needed to operate buildings, utilize existing building structural frames and recycled construction materials, and extend the service life of buildings. Such efforts can reduce CO2 emissions from the production of construction materials (embodied CO2), and reduce a building’s Life Cycle CO2 (LCCO2) emissions, respectively. But Lifecycle CO2 was not directly counted in BEE (Building Environmental Efficiency) and CASBEE Rating.

New CASBEE (version 2008) incorporated a new item, “Measures for Global Warming,” that can be rated by LCCO2 emissions. LCCO2 emissions are assessed in the simplified manner and reflected in the item “Measures for Global Warming” under “LR3: Off-site Environment.” These results also affect the radar chart, Building Environmental Efficiency (BEE), and CASBEE ranking directly. CASBEE has changed to explicitly assess measures for global warming. This new assessment item has been introduced to all the CASBEE tools since the publication of CASBEE for Home in 2007. Further efforts to prevent global warming are expected to be promoted by the building sector (Sato, 2008).

2.3 Development of CASBEE for Home

In Japan, about 500 thousand detached houses have been constructed per year. To improve the quality of those houses, CASBEE for Home was developed in 2007. There are various stakeholders surrounding housing construction industry such as clients, designers, contractors, and builders. Therefore “CASBEE for Home” especially focuses on making users easy to understand. Among CASBEE tools, CASBEE for Home first introduced five-star indicator as a new expression of the five BEE ranks in addition to the BEE chart.

Structure of “CASBEE for Home” is similar to other tools in the CASBEE family. Both quality and environmental loads are evaluated. They include 54 sub-criteria that are modified from the other standards in Japan. These assessment items for comprehensive assessment consider not only house itself but also outdoor space of the house, home appliances, provided information to the occupants from house suppliers and the environmental strategies at the material produce stage and the construction stage (Seike, 2008).

2.4 Development of CASBEE for Urban Development

2.4.1 The Purpose of Developing CASBEE for Urban Development

Previous CASBEE tools assessed individual buildings, but, as a general rule, CASBEE for Urban Development covers groups of buildings. The purpose is that “When a project is planned and implemented that comprises multiple buildings and other elements on a single, large-scale site under a unified design concept, assessment can go beyond the environmental design of each building, to identify
new or expanded environmental measures, and their effects, that are made possible by the building group, and thereby contribute to the comprehensive improvement of environmental performance in urban renewal."

For convenience, previous CASBEE versions is referred as “CASBEE (building scale),” to distinguish them from CASBEE for Urban Development, which considers building groups (urban scale). CASBEE-UD carries on the concepts of CASBEE (building scale), and it is one of the expanded CASBEE tools, developed with reference to the Q-3 (Outdoor Environment on Site) and LR-3 (Off-site Environment) assessment items of CASBEE for New Construction. However, CASBEE-UD is an environmental performance assessment tool for whole groups of buildings (urban scale), focusing on the phenomena that can accompany the conglomeration of buildings, and the outdoor spaces around the buildings. It is also a standalone system, independent of the previous building-scale CASBEE. CASBEE-UD excludes the interior of buildings from assessment (although there are exceptions in some assessment items), as shown in Figure 2. Therefore, this configuration makes it possible to use [1] CASBEE-UD to assess an area of development as a whole, while [2] CASBEE (building scale) assesses the environmental performance of individual buildings within the designated area (Japan Sustainable Building Consortium, 2008c).

Figure 2  Concept of Assessment subjects for CASBEE for Urban Development

The following are four examples of ways in which CASBEE-UD is used.
1) As a tool for environmental consideration in area development projects.
2) As an environmental labeling tool.
3) As a planning and assessment tool for energy-saving remodeling plans on the urban scale.
4) As a tool to support city planning with a view to sustainable urban development.

The first three applications, taken together, are expected to act as an incentive for environmental consideration in area development projects. Following the pattern of CASBEE for New Construction, a brief version has been developed to enable easy application from the preliminary stages of a plan.

2.4.2 The CASBEE for an Urban Area and Buildings

Now the overall indication format for assessment results [1] and [2] in 2.4.1 is defined separately as CASBEE for an Urban Area and Buildings (abbreviated below to “Urban + Building”), to meet demand for assessment of the urban area as a whole, including buildings. Also, as the assessment items for CASBEE-UD includes important elements of the city and regional planning fields, which may not extend down to the building scale, we recommend that Urban + Building be applied to projects which are individual buildings but have high levels of public interest (major social impact). That approach enables assessment using CASBEE-UD together with building-scale assessment. Figure 3 shows an example of the BEE of an Urban Area and Buildings.

Figure 3  An example of BEE of an Urban Area and Buildings
3. Measures to Spread Environmental Performance Assessment for Buildings by Public Sector

3.1 Administrative Use of CASBEE by Local Governments

Public sector has been playing a major role in spreading environmental performance assessment of buildings in Japan. In recent years, many major cities and prefectures in Japan have been adopting “Sustainable building reporting systems (SBRS)” as an environmental policy in their building administration. To operate this system, these local authorities utilize an environment performance evaluation method for buildings as policy instruments. Under required ordinances and guidelines, building owners are asked to carry out comprehensive assessment of their buildings’ environmental performance when a building above a certain size is newly constructed. These results must be reported to the authority and the authority must publish the submitted assessment results of environmental performance. Figure 4 shows the number of reports assessed by CASBEE published by the local authorities.

Over 2,000 CASBEE results have been submitted to the local authorities by Sept. 2007. Most authorities use the Internet to disclose the results and the summary of environmental measures taken by the building owner to improve environmental performance.

The reporting system is designed to promote voluntary actions by building owners for the environment through information disclosure to the local residents, by showing which building owners are active in environmental measures.

3.2 Localization of CASBEE

CASBEE is also intended to take regional conditions into consideration as background for the assessment. To promote environmental assessment for buildings, localization is one of the important processes to meet social demand of the region where the building market exists.

Local characteristics such as infrastructure, local economy, climate and history may be different. Local authorities that use this tool can tailor it to local conditions, such as climate and prioritized policies. Changes are generally made by modifying the weighting coefficients. Flexible response to regional character is a common feature of all elements of CASBEE. CASBEE-Nagoya has its own scoring guidelines that instruct some criteria in relation to local contexts, such as materials from local industry, and that define some excluding criteria (Noda, 2004). Another example is CASBEE-Osaka that altered weighting coefficient from the original to reflect the high priority they give to heat island policy. They changed the weights of Q-3 Outdoor environment on site from 0.3 to 0.4 (City of Osaka).

3.3 Advanced Application of CASBEE to Promote Sustainable Buildings in the Building Market

3.3.1 Incentives by the Municipals

Further, it is possible to provide incentives to buildings which gain high ratings with CASBEE, as shown Table 1. In city of Osaka, the rating should at least reach the B+ class, the third of CASBEE’s five grades, if the approval for an administrative scheme, called “Planned design system (sougou sekkei seido),” is given to the building being assessed. The maximum floor-area ratio of the building can be increased in this scheme. In Nagoya, 250% maximum floor-area ratio will be given if the buildings are S-ranked by CASBEE, whereas 200% will be given to the A-ranked buildings.

Financial support can be provided for high score buildings assessed by CASBEE. The city of Osaka subsidizes residential buildings that are A-ranked by CASBEE. The city of Nagoya also subsidizes the residential buildings selected in order of BEE value by CASBEE.

3.3.2 Utilization of the Assessment by Financial Sector

Financial sector, such as banks, may utilize such information to offer better interest rates to the consumers who buy environmentally high performance residential units. In Kawasaki, developers who are selling multi residential units must publish CASBEE results in their advertisements to inform consumers about the
environmental performance of the buildings (City of Kawasaki). This scheme is called “Environmental Performance Indication System for Apartment Buildings.” Up to 1.5% reduction in the interest rate is available for the consumers who bought units assessed as S-ranked by CASBEE-Kawasaki.

Table 1 Administrative use of CASBEE by local governments

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Started</th>
<th>Subject building scale (total floor area)</th>
<th>Adoption of Localized CASBEE</th>
<th>Incentives by government</th>
<th>Municipality Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Nagoya</td>
<td>2004.04</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-Nagoya</td>
<td>yes yes</td>
<td>yes</td>
</tr>
<tr>
<td>City of Osaka</td>
<td>2004.10</td>
<td>=&gt;5,000 m²</td>
<td>CASBEE-Osaka</td>
<td>yes yes yes</td>
<td>yes</td>
</tr>
<tr>
<td>City of Yokohama</td>
<td>2005.07</td>
<td>=&gt;5,000 m²</td>
<td>CASBEE-Yokohama</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>City of Kyoto</td>
<td>2005.10</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-NCb*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyoto Pref.</td>
<td>2006.04</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-NCb*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osaka Pref.</td>
<td>2006.04</td>
<td>=&gt;5,000 m²</td>
<td>Osaka’s own indicator</td>
<td></td>
<td>yes</td>
</tr>
<tr>
<td>City of Kobe</td>
<td>2006.08</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-Kobe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyogo Pref.</td>
<td>2006.10</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-NCb*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Kawasaki</td>
<td>2006.10</td>
<td>=&gt;5,000 m²</td>
<td>CASBEE-Kawasaki</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shizuoka Pref.</td>
<td>2007.07</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-Shizuoka</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Fukuoka</td>
<td>2007.10</td>
<td>=&gt;5,000 m²</td>
<td>CASBEE-Fukuoka</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Sapporo</td>
<td>2007.11</td>
<td>=&gt;5,000 m²</td>
<td>CASBEE-Sapporo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Kitakyushu</td>
<td>2007.11</td>
<td>=&gt;2,000 m²</td>
<td>CASBEE-Kitakyushu**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* CASBEE-NCb; Standard version of CASBEE-NCb
** Under development

4. Discussion

4.1 Increased Number of Professionals

The number of accredited professional CASBEE assessor is increasing year by year. Those who aiming to become assessor must attend an assessor training course, pass the assessor examination, and then complete registration. Applicants must be the first-class architects to be qualified. Even though the requirements of becoming CASBEE accredited assessor seem very demanding, the number of applicants increases rapidly because of the SBRSs introduced by many major municipalities. This suggests that assessment of building environmental performance is prevalent among the building industry, in other words, among professionals.

4.2 Environmental Performance of Buildings

It is crucial to investigate how the environmental performance of buildings improved because of the SBRSs using environmental performance assessment of buildings. The assessment results published by a municipal are shown in Figure 6. The SBRS of the municipal subjects buildings of total floor area above 5,000 m². This shows that apartment building accounts the largest part in new construction by building type. Many factories are low ranked in comparison to the other building types.

Figure 6 Assessment results of CASBEE in a municipal by building type.

Figure 7 describes variation of the environmental performance of reported buildings in the municipal from 2005 to 2007. Factories are excluded in this figure. This figure suggests that improvement in environmental performance of buildings can not be seen between 2005 and 2007 for both apartments and commercial buildings. It is also said that very few buildings are S-ranked since 2005. This also applies to other municipalities.

Tokyo metropolitan government (TMG) is the first municipal that adopted the SBRS and Environmental Performance Indication System for Apartment Buildings. TMG does not use CASBEE but operates its own assessment system. Since the indication system has started in 2005, TMG (2007) suggested that there was a slight improvement in environmental performance among apartment buildings. By comparing the assessment results between 2005 and 2006, the percentage of the top scored, so called “three stars,”
building, increased from 12% to 25% in insulation, from 32% to 42% in energy saving, from 8% to 9% in durability and from 48% to 51% in outdoor planting. However TMG also reported that commercial buildings were not improved in terms of CO2 emission.

To make a conclusion, further accumulation of data is required. However, one reason for the improvement of environmental performance in apartments in TMG may be because of Environmental Performance Indication System for Apartment Buildings. The indication system directly sends information on the environmental performance to the end consumers in the building market. And the results can be far more easily compared by the end customers to utilize for their decision making. This situation encourages developers to improve environmental performance of buildings they provide. Social recognition seems to have a very important role in improving sustainability of the building market.

![Figure 7 Percentage of BEE rank in a municipal from 2005 to 2007 (excluding factories)](image)

5. Conclusion

1. CASBEE has been revised and updated intending wide use of assessment in the building market. This progress includes introduction of new assessment item “Measures for Global Warming,” the development of CASBEE for Home and the development of CASBEE for Urban Development.

2. CASBEE has been seen as one of the most useful policy instruments by local governments. Together with incentives, administrative use of CASBEE is the most effective in spreading assessment of building environmental performance, so far.

3. The recognition of environmental performance of buildings has been widely spread among professionals in the building industry. However the social recognition, especially among the last consumers, of environmental performance of buildings may have more influence on sustainability in the building market.

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