



CASBEE[®] for Property Appraisal

Japan Sustainable Building Consortium (JSBC), Corp.

What is CASBEE?

CASBEE, the Comprehensive Assessment System for Built Environment Efficiency, is a system for assessing and rating the comprehensive environmental performance of the designated building(s) from two major aspects: 1) the environmental quality to be enhanced through its service performance, amenity, etc. and 2) the environmental loads to be reduced through energy and resource saving, etc.

The assessment result is determined by the value of the Built Environment Efficiency (BEE), a quotient index of Q (building environmental quality) as dividend and L (building environmental loads) as divisor (cf. Fig. 1). It briefly and explicitly indicates the diverse environmental performances of a building. Since 2004, CASBEE has been quickly adopted by major local governments nation-wide (cf. Fig. 2).

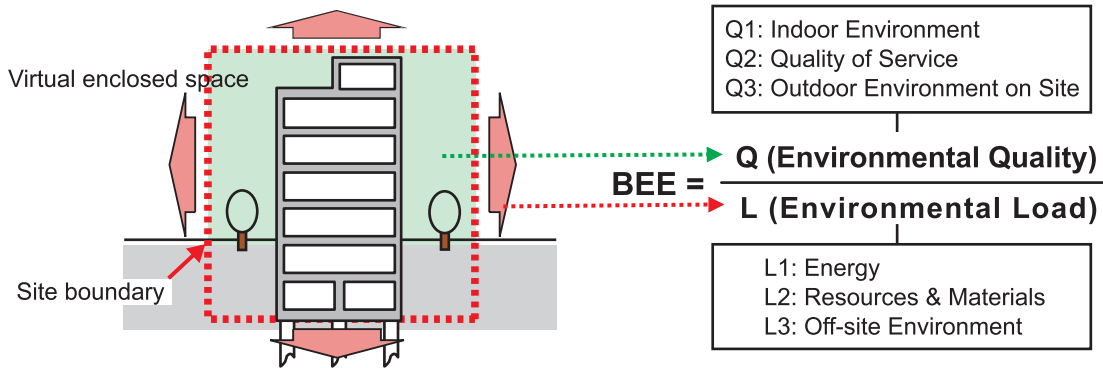


Figure 1 Basic concept of Built Environment Efficiency (BEE)

A building with a higher BEE value (e.g. higher Q value and lower L value) is assessed to be more green. Specifically, it is ranked according to five-grade system in terms of the BEE value from "S (Excellent)" over 3.0 points to "C (Poor)" under 0.5 points. This assessment result is indicated on BEE graph of L (0-100 points) as the horizontal axis and Q (0-100 points) as the vertical axis, which graphically visualizes the environmental performance for clear comparison between different buildings (cf. Fig. 3).

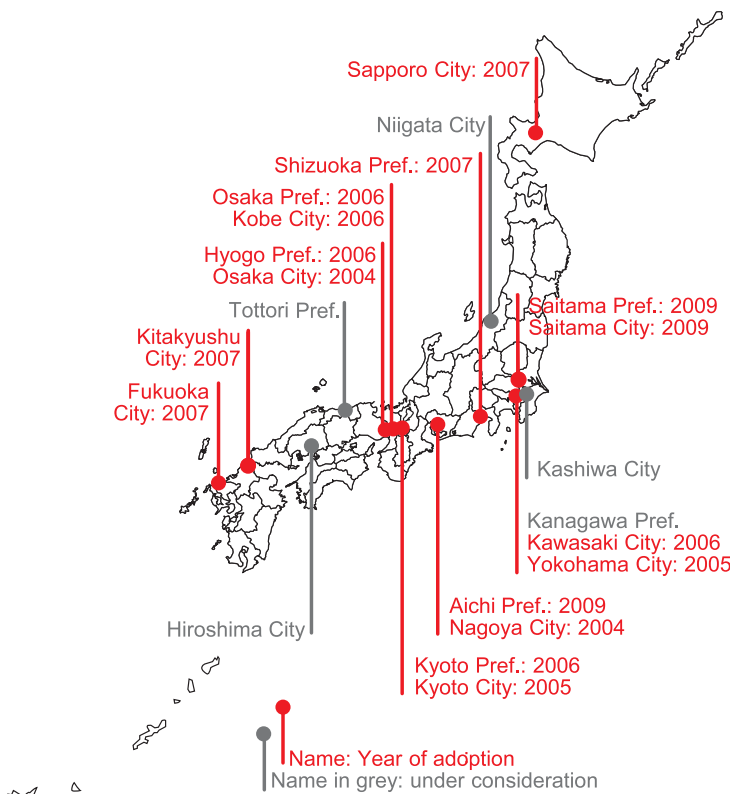


Figure 2 Local governments having adopted CASBEE in Japan (as of Dec. 2009)

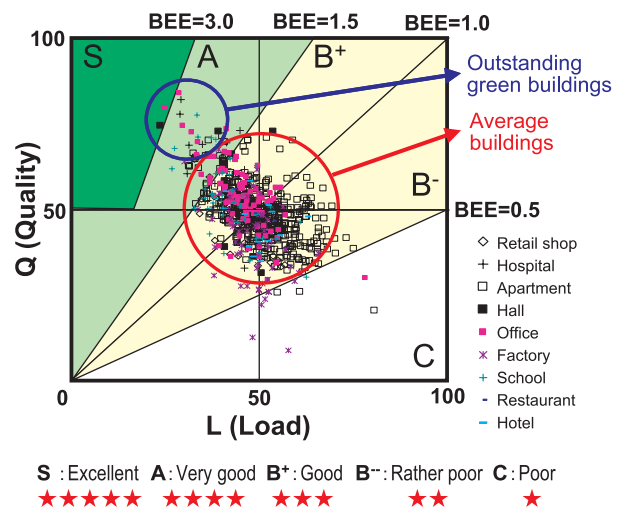


Figure 3 Rating result of the projects submitted to Nagoya City during 2004-2008

Why should CASBEE be linked to Property Appraisal now?

Building environmental performance assessment tools such as CASBEE of Japan and LEED of the USA have become widely used in the building-related market worldwide in recent years, specifically as effective tools supporting design for the environment (DfE), promoting closer communication between clients and designers, disseminating green buildings through building/construction authorities, as well as visualizing the building performances, etc.

In the current property transaction market, however, green buildings highly assessed by CASBEE are not necessarily achieving higher trading prices. This means that the assessment itself does not work as an incentive to promote constructing green buildings in relevant markets. One reason for this is that there has been no tool available for bridging CASBEE originating

from the construction industry, and the property appraisal system used in the property transaction market. This issue has started recently to be discussed seriously by international organizations including the “United Nations Environment Programme Finance Initiative Property Working Group (UNEP-FI PWG).”

The “CASBEE for Property Appraisal” tool has been developed to cope with this issue. To sum up, it is an “appraisal support tool that measures the impact degree of DfE on the property value.” When more stakeholders in the property transaction market begin to use this tool and acknowledge the close relationship between the CASBEE indicators and the pricing factors of the designated property, more and more green buildings will be expectedly traded in the market .

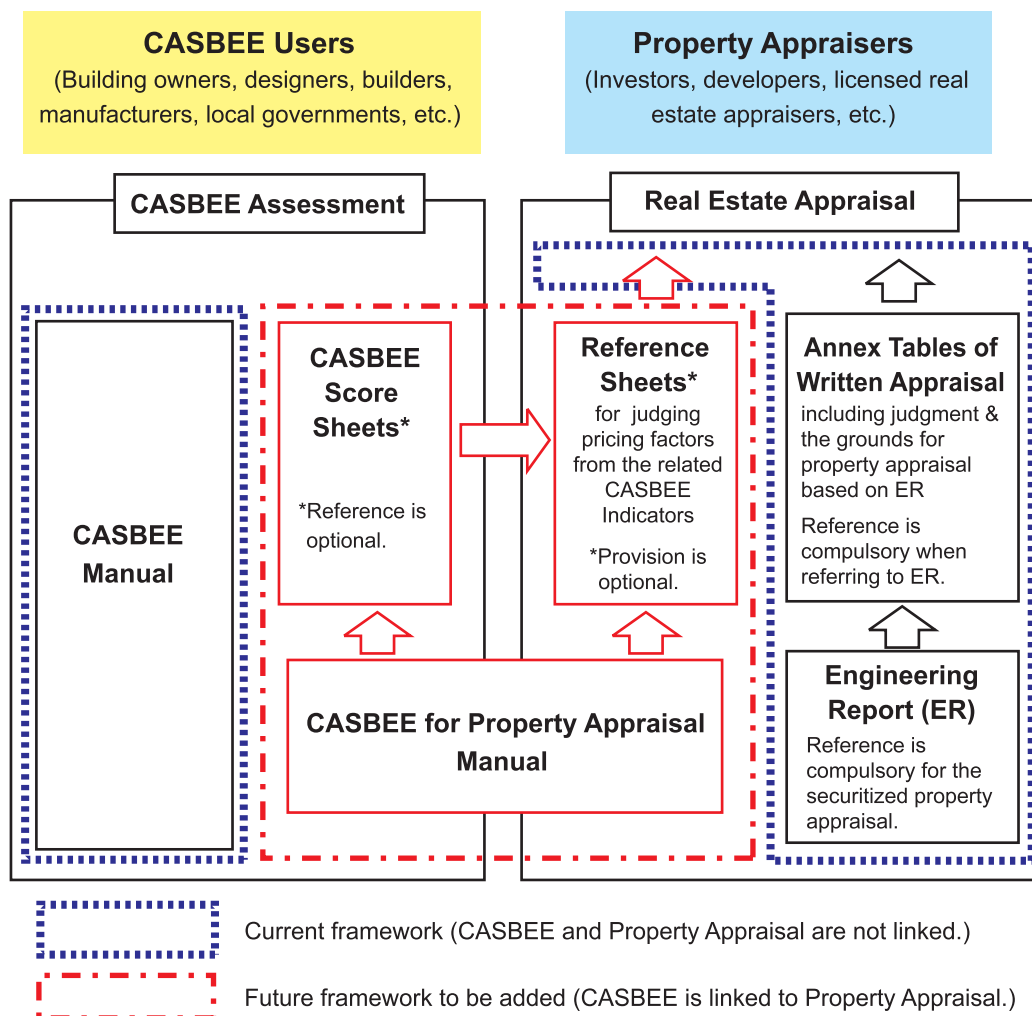


Figure 4 Linkage of CASBEE to Property Appraisal (for real estate appraisal)

■ How to assess the effects of design for the environment (DfE) on property pricing

Property value is generally according to the following 3 aspects: 1) "**Expense characteristics**" (how much cost invested therein), 2) "**Marketability**" (at what price traded in the market) and 3) "**Profitability**" (how much profit is available from utilizing it). However, green buildings are traded at a value similar to conventional

buildings in the current market, even though the value can be assessed according to the additional cost from the "Expense characteristics" aspect.

"**Profitability**" among the three aspects is hereby highlighted, therefore, in assessing the effects of design for the environment (DfE) on property values.

■ How to determine the price reflecting the "profitability"

The price reflecting the "profitability" of the designated property, namely the "value indicated by the income approach," can be determined by dividing the "net income produced by the property" by the "capitalization

rate of the property" (i.e. the ratio of the net income to the amount invested in the property)."

(cf. The formula below: in case of using the direct capitalization method)

● Property price in terms of profitability

$$\text{Value indicated by the income approach} = \frac{\text{Net income produced by the property}}{\text{Capitalization rate of the property}}$$

This formula shows that the higher net income the property produces, the higher value the property gains. It also suggests that the more stable net income is (= lower volatility in the net income), the lower capitalization rate is available for the property investment, which leads to higher value indicated by the income approach.

Why is the property price evaluated higher when the capitalization rate is lower?

This is because investors determine risk volatility such as return fluctuation in terms of "capitalization rates." Taking the long-term government bond as an asset generating 100 million yen in net income per year for example, investors invest in it at the capitalization rate (risk free rate) of circa 1.3% (as of September 24, 2009), because there is little inherent risk of potential damage and a volatile return profile, which is usually common to real estate investment. In this case, the asset value is evaluated circa 7.7 billion yen (=100 million yen ÷ 1.3%). As for real estate properties, in contrast, investors invest in them at the higher capitalization rate of circa 4% (as of September 24, 2009) because they need an additional yield to offset the potential risk mentioned above even if those buildings are located in central districts such as the Marunouchi Area in Tokyo, where is likely to ensure relatively stable returns (high return stability). In this case, the property value is evaluated circa 2.5 billion yen (= 100 million yen ÷ 4%). Therefore, buildings of lower return stability need a higher capitalization rate to attract investor's interests.

Effects of DfE on net income and capitalization rate

1) Effects on the net incomes (Fig. 5): Green property increase the net income through the cost reduction of utilities and repairs by energy saving and longer durability, as well as the income increase by productivity improvement, etc.

2) Effects on the capitalization rates (Fig. 6): Risk premiums and depreciation rates, specific to real estates, are added to the capitalization rate of risk free assets (i.e. long-term government bonds, etc.). Regarding a green building, its risk reduction related to

future environmental taxation and regulation as well as its depreciation rate reduction through the longer building lifespan lead to capitalization rate reduction (before depreciation). In addition, green real estate may improve the image and reduce the marketability risk in the market.

Thus, DfE affects the net income and the capitalization rate, which increases the property value indicated by the income approach.

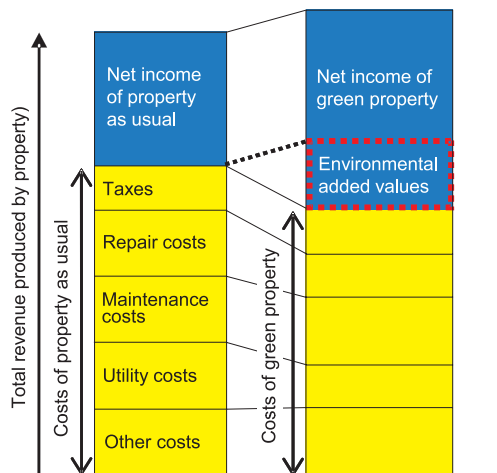


Figure 5: Environmental added values related to increased net income

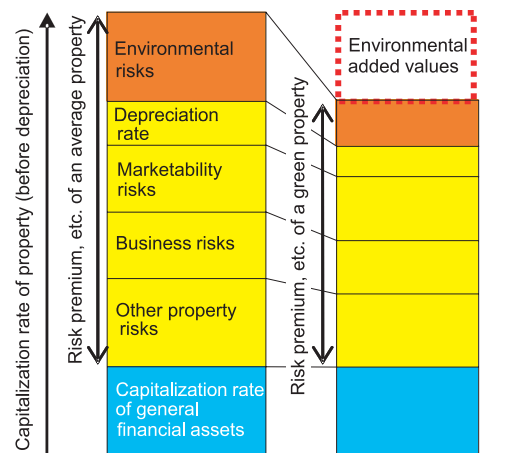


Figure 6: Environmental added values related to reduced risk premium

(Source: Memorial paper for the 10th anniversary of Tokyo Association of Real Estate Appraisers "A Note on the Environmental Added Value for Real Estates," partially revised by the author)

Relevance of CASBEE assessment items to Property Appraisal items

Now, let us examine what kinds of DfE factors specifically affect the net income and the capitalization rate.

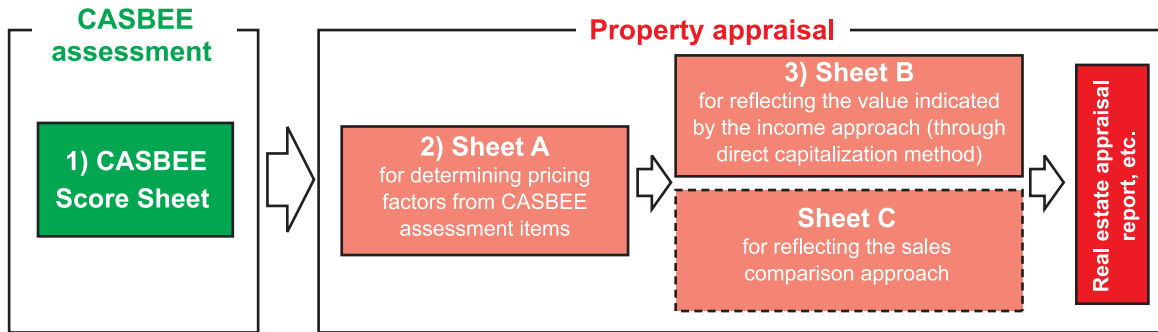
The Indoor Environment (Q1) is mainly related to increase of total income, while the Quality of Service (Q2) and the Energy (L1) is related to reduction of cost and future environmental risk. And the Outdoor Environment On-site (Q3) and CASBEE Ranking may contribute to improving the image but not necessarily to affecting the pricing process at the moment. They have potential, however, to be reflected thereon in the future.

CASBEE assessment items	Property appraisal items			
	Increased total revenue	Reduced costs	Reduced risks	Improved image
Q1-1 Noise & Acoustics	○			
Q1-2 Thermal Comfort	○			
Q1-3 Lighting & Illumination	○			
Q1-4 Air Quality	○			
Q2-1 Service Ability		○	○	
Q2-2 Durability & Reliability		○	○	
Q2-3 Flexibility & Adaptability		○	○	
Q-3 Outdoor Environment on Site				○
L1 Energy		○	○	
L2 Resource & Material			○	
L3 Off-site Environment			○	
CASBEE Ranking				○

Case Study

Now let us make a trial calculation of the value indicated by the income approach of a model green building by using the “CASBEE for Property Appraisal Manual” as a case study. The property price of the

model case will be assessed according to the work-flow shown below by using the CASBEE assessment results.



Outline of the model case

[Site outline]

Address: XX-XXX, XXX Ward, Tokyo, JAPAN
Land use: Land for building, Total area: 3,400m²
Ratio of the co-ownership share: 69/100

[Building outline]

Structure: Steel framed reinforced concrete and steel frame with 21 stories above ground and 2 below
Building use: Offices, shops and garage
Total floor area: 35,000.00m²

[DfE outline]

DfE Category	DfE Items	Expected effects of the applied DfE measures
Improvement of surrounding environment	Greening of pedestrian decks	Mitigation of heat island phenomena, recharge of underground water, linkage with surrounding greenery
	Greening of public open spaces	
	Rainwater harvesting	Mitigation of loads on local infrastructure
Energy and resource saving	External walls with high heat-insulation and air-tightness	Enhancement of heat insulation through using low-ε double glazing, simple air flow system, and slated PCa Panels with a single window
	Design for day-lighting	Maximum day lighting through combination with glazed curtain walls at the corners.
	Hybrid type natural ventilation system	Natural ventilation for internal air discharge through dampers, installed in three facades of each floor of offices, which lead external air naturally into office space and cavity ceiling
	Individual air-conditioning system	Provision of 28 VAV zones per floor to be controlled individually by sensors.
	Lighting	Provision of 20 dimmer zones per floor for initial lighting adjustment and day-lighting, as well as human detection sensors for automatic turning on/off (dimming) of lights in toilets and emergency evacuation stairs
	Co-generation system	Power generation by gas engines, the exhaust heat of which is supplied to the hot and chilled water generator or of recovered heat absorption type
Water saving	High efficient turbo refrigerator with ice thermal storage	Reduction of environmental loads through peak-cut by using discount nocturne electric power based on the contract of heat storage type-based load shift for business use. Use of high-efficient turbo refrigerators for office sections
	Use of the regional gray water	Use of grey water provided by the Tokyo Metropolitan Government for flushing toilets
Longer lifespan	Seismic resistance grade: S (skyscraper + seismic proof)	Prolongation of the building lifespan
	Ceiling height 3,000mm, Electric outlet 60VA	Enhancement of functionality Provision of flexibility in equipment upgrading
Eco-materials	Use of cyclical materials and low environmental load materials	Possibility of resource recycling, etc.

Sheet A: Analysis of pricing factors of the model case

(Sheet A) Analyzing pricing factors by CASBEE score sheet

Category	Item	Score	Weighting	Weighted Score	Impact on Price	Appraisal Use
01 Indoor Environment	1 Noise & Acoustics	1.1	1.00	1.00	Blue	Blue
		1.2	1.00	1.00	Blue	Blue
	2 Thermal Comfort	2.1	1.00	1.00	Blue	Blue
		2.2	1.00	1.00	Blue	Blue
		2.3	1.00	1.00	Blue	Blue
		2.4	1.00	1.00	Blue	Blue
	3 Air Quality	3.1	1.00	1.00	Blue	Blue
		3.2	1.00	1.00	Blue	Blue
		3.3	1.00	1.00	Blue	Blue
		3.4	1.00	1.00	Blue	Blue

The results of CASBEE assessment are indicated in Sheet A on the above left. The factors should be analyzed by reviewing these results to be entered into

the blue cells on the right). These results are automatically filled in Sheet B (see next page)

◆ **Sheet B: The value indicated by the income approach of the model case**
(by the direct capitalization method)

Items		Designated Property (DP)	Property as usual (PaU)	Calculation basis (in comparison between DP and PaU)
1	Rent	1,737,481	1,641,600	8,000 yen/month/m ² for PaU, to which the percentage of increased CASBEE income and a half of the reduced amount of utility costs within the occupied area are added for DP (Rate of operation is 95% for both)
2	Common service costs			Included in the rent
3	Utility costs	98,496	123,120	600 yen/month/UF for PaU, while 20% less for DP through its energy-saving design (Rate of operation is 95% for both, and the budget table is referred to for calculation.)
4	Parking lot			Not added up due to the operation by the property management union
5	Others	1,000	1,000	Income from renting places for vending machines and antennas, etc.
6	Operating earnings	1,836,977	1,765,720	
..
15	Profit from operating deposits (+)	0	0	Not included herein but added up in the liquid deposits
16	Capital expenses (-)	30,000	30,000	Assessed by referring to the engineering report, etc.
17	Net income	1,360,461	1,258,100	
18	Capitalization rate	5.00%	5.50%	Consideration of the rate increase and decrease through the analysis of relevant CASBEE assessment items
19	The value indicated by the income approach using the direct capitalization method	27,209,000	22,875,000	(17÷18)
	(Comparison with PaU)	119	100	

Thus, the value indicated by the income approach of the model case has been worked out at **27,209,000,000 yen** using the direct capitalization method.

■ **Afterword**

The vicious spiral (cf. Fig. 7) of shifting responsibilities among stakeholders in the construction market is referred to as a major reason for the delay in green building dissemination. One of the causes of this state has been the lack of a system for sharing information among the stakeholders on green property and its potential for enhancing the added values. In order to transform such a vicious spiral to an onward spiral (cf. Fig. 8), it is of utmost importance to assess the environmental performances of buildings, visualize the

mechanism of enhancing the added values of buildings through DfE and share the significance and values among all the relevant stakeholders.

We do sincerely hope hereby that the development of the “CASBEE for Property Appraisal Manual” will provide good occasions to increase awareness of the importance of promoting green buildings in the real estate industry, and contribute further to creating a low-carbon society in Japan.

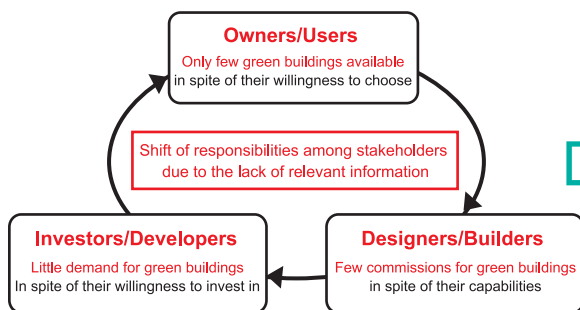


Figure 7: Vicious spiral in the construction market: State of shifting the responsibility¹⁾

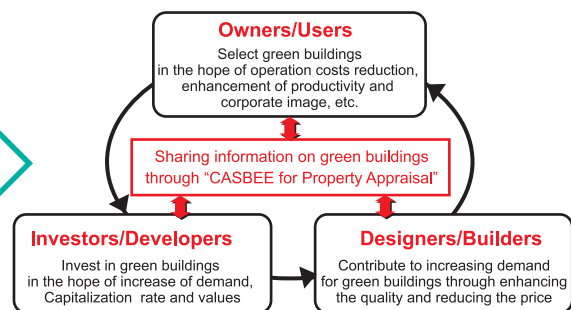
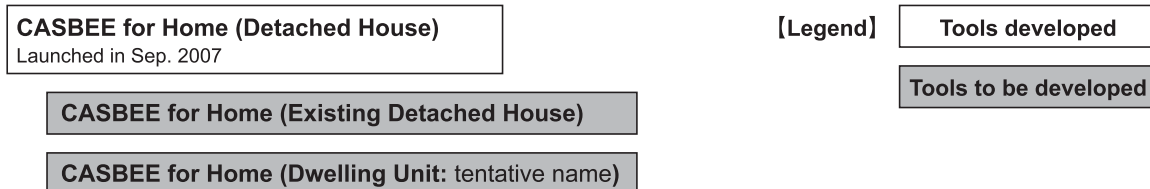


Figure 8: Onward spiral towards market transformation

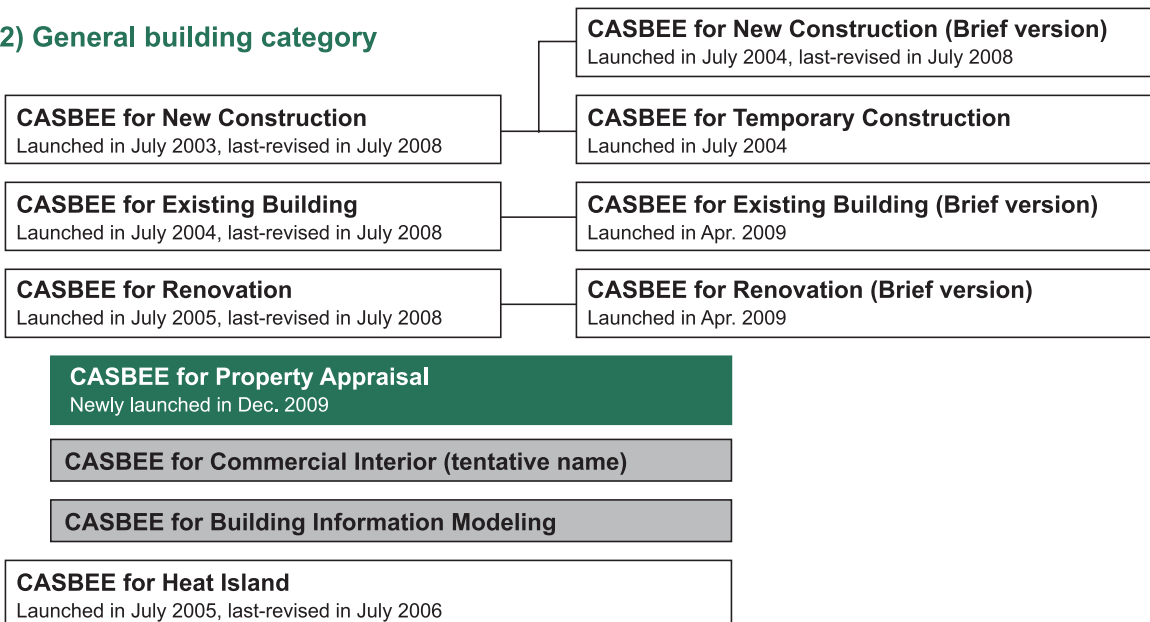
CASBEE[®] Family (as of December 2009)

CASBEE is provided with a series of tools specifically designed for various usages and purposes. One such tool is the newly-developed "CASBEE for Property Appraisal Manual," which is designed so that CASBEE for New Construction, Existing Building and Renovation can be utilized for property appraisal. Therefore, it should be noted that this manual cannot be used independently. Some manuals and relevant brochures are available or downloadable in English on the CASBEE Website shown below.

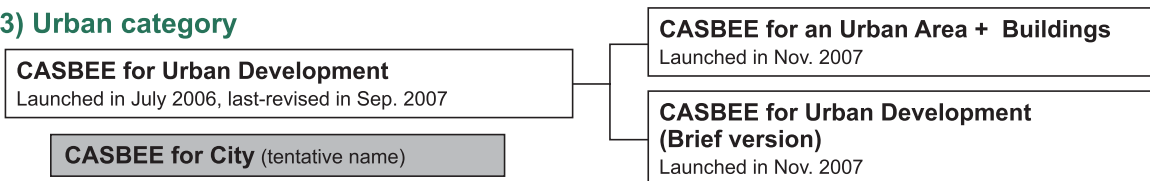
1) Housing category



2) General building category



3) Urban category



Visit the following Website for further information about CASBEE:

<http://www.ibec.or.jp/CASBEE/english/index.htm>

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