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CASBEE Certification emblem

Comprehensive Assessment System
for Built Environment Efficiency

CASBEE®

Published by Institute for Built Environment and Carbon Neutral for SDGs (IBECs)

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Introduction

Building construction is an extremely resource-intensive process and takes a heavy toll on the environment. As such, it is the responsibility of those in the building industry to promote environmentally-friendly, sustainable practices. Today, a variety of environmental assessment tools developed around the world have become crucial components in the advancement of sustainable buildings.

The development of the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) began in 2001. CASBEE has been developed by a research committee as part of a joint industry-government-academia project with the support of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). This partnership has been instrumental in developing CASBEE's clear and solid concept to the benefit of a broad spectrum of users in Japan. Now, two decades after the introduction CASBEE, the assessment system known as the "CASBEE Family" now includes over 20 tools including 9 checklists specific to fields ranging from buildings to cities.

Recognized for its clear conceptual underpinnings, CASBEE generated considerable interest among government agencies, industries and academics. Ranging from administrative support to design support, property appraisal and building branding, the systemized CASBEE tools enable broad applications. The most significant characteristic of CASBEE is that all the tools are developed and organized consistently with a unified concept. Without such a concept, the creation of a systemized group of tools would be difficult to achieve.

What is CASBEE

CASBEE is a method for evaluating and rating the environmental performance of buildings and the built environment. It is a comprehensive assessment of the quality of a building, evaluating features such as interior comfort and scenic harmony, in consideration of environment practices that include using materials and equipment that save energy or achieve smaller environmental loads. The CASBEE assessment is ranked in five grades: Superior (S), Very Good (A), Good (B+), Slightly Poor (B-) and Poor (C).

Compared to other tools available worldwide, CASBEE exhibits a unique and simple structure. The key characteristics of CASBEE are as follows:

1. Clear definition of spatial boundaries to be assessed

In many tools in use worldwide, the subject of assessment is often vaguely defined as a building or a location. However, the clear definition of spatial zones to be assessed should never be omitted before conducting an assessment. In this regard, of the assessment tools available throughout the world, only CASBEE is explicit on this issue. In CASBEE, the virtual boundary is introduced as an area surrounding the building concerned and is treated as a site boundary. The inside and the outside of the virtual space boundary are specifically framed to be evaluated separately. The key here is that the surrounding area of the building is explicitly included for the on-site assessment.

2. Clear definition of environments to be assessed

As already mentioned, a pair of different aspects represented by an incompatible vector, that is, improvement of Q (environmental quality) and reduction of L (environmental load) are included for building environmental assessment in this global environment era. Only the CASBEE tool system was designed with this point of view. In CASBEE, each item to be evaluated is first associated with either Group Q or Group L and is further assigned to the respective sub-group for more detailed categorization.

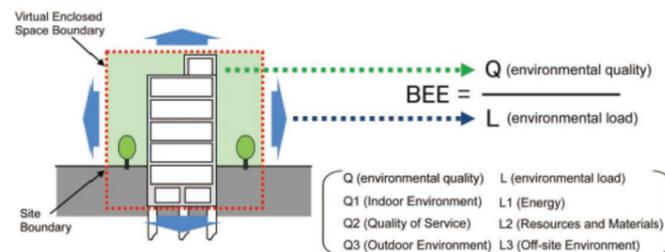


Figure 1: Setting of the spatial boundary for CASBEE assessment and the definition of Built Environment Efficiency (BEE)

3. Scoring method

CASBEE ranks buildings from C to S according to the BEE value. Many assessment tools have adopted the simple addition of scores attained from the respective assessment items. However, the originality of the CASBEE assessment method stems from use of the aforementioned Q and L to obtain a scalar indicator determined by Q/L (referred to as the Built Environment Efficiency; BEE). The BEE is a concept akin to Factor Four proposed as the efficiency of resources use by Weizsäcker in Germany. Automatic calculation software for each assessment tool is provided that presents CASBEE result on the result sheet. It indicates more precisely by awarding 1 to 5 red stars based on BEE rank. The scoring criteria for each assessment items are five-level scale, 1 to 5 points with 3 as the standard grade. To make the scoring easy, L is first evaluated as LR (Load Reduction) as higher score is given to improved load reduction.

CASBEE® for Building (New Construction) | Assessment result |

SDGs compliant 2021 edition

Manual: CASBEE for Building (New Construction) SDGs compliant 2021 edition

Software: CASBEE-BD_NC_2021SDGs (v1.2)

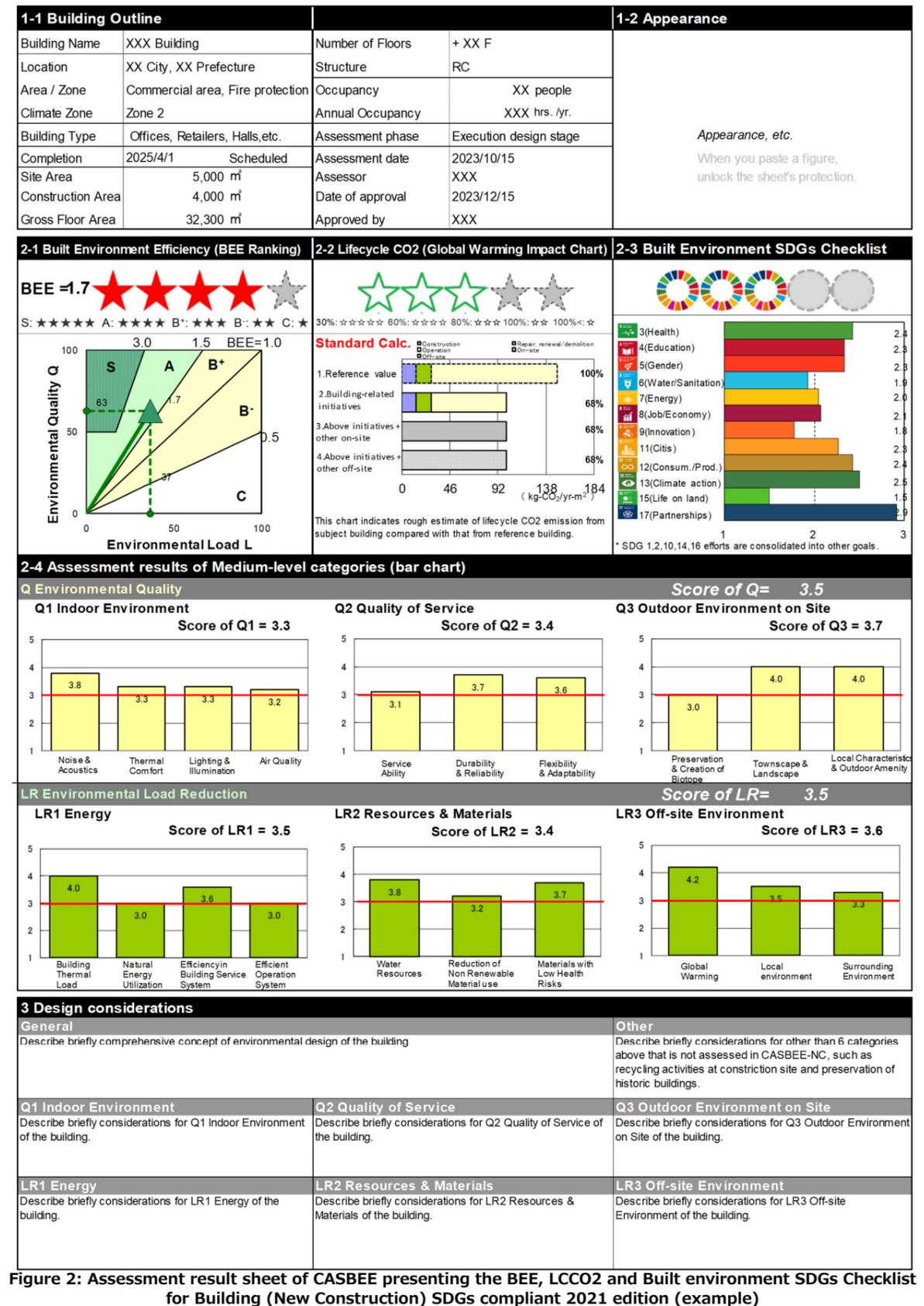


Figure 2: Assessment result sheet of CASBEE presenting the BEE, LCCO2 and Built environment SDGs Checklist for Building (New Construction) SDGs compliant 2021 edition (example)

4. LCCO2 emission assessment (for housing and building scale)

Since 2008, CASBEE has included Lifecycle CO2 (LCCO2) assessment, which evaluates CO2 emissions during the entire building life cycle from construction and operation to demolition and disposal. A new "Standard Calculation" method automatically provides a simplified estimation of LCCO2 based on data already entered in a CASBEE spreadsheet. The feature is especially beneficial to assessors who are not familiar with the LCCO2 evaluation. LCCO2 performance is indicated more precisely by awarding 1 to 5 green stars based on LCCO2 emissions together with the existing BEE assessment (e.g., S: 5 red stars). Specifically, the emissions rate (%) for the assessment target is evaluated relative to the LCCO2 emission level of a reference building (one that satisfies energy standards for building owners according to the Japanese Energy Conservation Law).

5. Built Environment SDGs Checklist

In 2021, the SDGs-compliant versions of CASBEE for Detached House, CASBEE for Building Design, and CASBEE for Real Estate were issued. The versions were added by a "Built Environment SDGs Checklist" to reflect the principles of the SDGs, which aim to improve the sustainability of the Earth and humankind, in CASBEE. The checklists have been developed for the voluntary, simplified evaluation of various efforts embodied in buildings to achieve the SDGs, and to communicate the results clearly with stakeholders.

6. Stratified structure of a scale of defined areas for assessment

CASBEE gradually expanded so as to perform the assessment on a scale of a district (or local area or neighborhood). CASBEE for Cities, which was released recently, is the only tool enabling city-scale assessment.

7. Inclusion of time scale for assessment

Initially, almost all the assessment tools dealt with the new construction of buildings. The subsequent development of tools to assess the existing buildings occurred in many cases. The promotion of environmental assessment of existing buildings is a policy that is challenging but meaningful.

In CASBEE for Cities, urban environment can be assessed in the context of past, present and future. Urban development is usually planned and executed over a longtime span. The outcomes of urban environment policy can be better presented by comparing how the city was in the past, how it is in the present, and how it would be in the future.

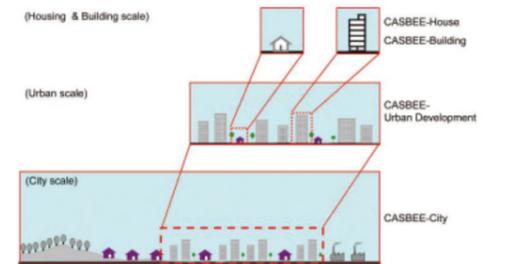


Figure 3: Stratified structure of a scale of defined areas for CASBEE assessment

CASBEE FAMILY

CASBEE is comprised of a suite of assessment tools tailored to different scales: construction (housing and buildings), urban (town development) and city management. These tools are collectively known as the "CASBEE Family."

1. Housing scale

1) CASBEE for Detached House

[CASBEE-DH/NC \(NC: New Construction\) with SDGs Checklist](#)

*English version is available as "CASBEE for Home (Detached House) 2007 edition."

This tool is used to assess the environmental performance of detached houses wherein the scoring criteria are simplified in anticipation of use by residents or small- and medium-sized building contractors.

There are various stakeholders in the housing construction industry such as clients, designers, contractors, and builders. Therefore, "CASBEE-DH/NC," was introduced in 2007 which especially focuses on making its structure easy for users to understand. CASBEE-DH/NC includes 54 sub-criteria that have been modified from the other standards in Japan. These items for comprehensive assessment cover not only the house itself but also the outdoor space of the house, home appliances, information provided to the occupants from house suppliers, and the environmental strategies at the material production and construction stages. Among CASBEE tools, CASBEE-DH/NC was the first to introduce the five BEE ranks using the corresponding number of stars.

[CASBEE-DH/EB \(EB: Existing Building\)](#)

This is a tool for the assessment of existing detached houses and was developed to enable a resident, an architect, etc., to check the environmental performance of the house in which the resident is living, and to perform effective renovations.

2) CASBEE for Housing Unit

This assessment tool was developed as a tool to evaluate the environmental performance individual units within an apartment building, the results of which can be utilized when trading or renting a unit.



CASBEE-DH/NC



for Housing Unit

3) CASBEE Checklists for Housing

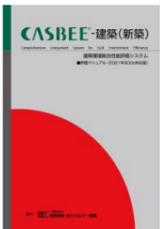
CASBEE Checklists for Housing are a type of software wherein answering several questions allows residents to identify the aspects of their home that affect their health, resilience and other issues. Available checklists are: "Housing Health Checklist," "Housing Resilience Checklist," "Housing for Senior Checklist," "Housing Infection Control Checklist," and "House Renovation Checklist".



Housing Health Checklist



Housing Resilience Checklist



CASBEE-BD/NC



CASBEE-BD/EB



CASBEE-TC



CASBEE-HI

2. Building Scale

1) CASBEE for Building Design

[CASBEE-BD/NC \(NC: New Construction\) with SDGs Checklist](#)

*English version is available as "CASBEE for New Construction 2014 edition."

CASBEE-BD/NC (formerly called the DfE (Design for Environment) tool) is mainly used by architects and engineers to assist them in increasing the BEE value of a building during the design process. It can be used as a design support tool as well as a self-checklist and makes assessments based on the design specifications and the anticipated performance.

The environmental quality and performance of the building and its load reduction performance can be evaluated at any phase of the Preliminary Design, Execution Design or Construction Completion. Reconstruction projects are also assessed by CASBEE-BD/NC. As the environmental performance and the evaluation may change during operation stage, the results of assessments remain valid only for three years after the completion of construction.

[CASBEE-BD/EB \(EB: Existing Building\)](#)

CASBEE-BD/EB targets existing buildings with an operational record for at least one year after completion and developed to also be applicable to the asset value assessment. CASBEE-BD/EB can be used:

- As a labeling tool to declare the environmental performance of buildings
- To support building maintenance.
- By building owners, such as real estate agencies and large enterprises, as a self-evaluation tool for mid- to long-term management plans.

The results of the performance assessment are valid for 5 years and, since the building condition may change over time, it should be reassessed using the latest version of the assessment tool.

[CASBEE-BD/RN \(RN: Renovation\)](#)

CASBEE-BD/RN was designed to evaluate the performance of existing buildings based on specifications for renovation and the predicted performance. It can be used:

- In renovating existing buildings or making proposals for building-operation monitoring, commissioning and upgrade designs with a view to Energy Service Company (ESCO) projects.
- To evaluate the degree of improvement of environmental performance relative to the level preceding renovation.
- To assess the improvement of specific performance in relation to the purpose of renovation. For instance, the BEE for energy saving can also be evaluated; this is determined by scores for the assessment categories especially related to energy saving renovation, such as Energy (LR1) and Indoor environment (Q1).

The assessment is valid for three years after the completion of renovation work, and assessment should be repeated with the latest version of CASBEE-BD/RN available.

[CASBEE for Temporary Construction \(CASBEE-TC\)](#)

CASBEE for Temporary Construction was developed as an extension to CASBEE-BD/NC for evaluating temporary buildings constructed specifically for short-term use, such as Exposition Pavilions. Buildings of this type have short-term lifecycles and therefore consideration should concentrate largely on material use and recycling in the construction and demolition phases.

[CASBEE for Heat Island Relaxation \(CASBEE-HI\)](#)

Assessment of the heat island effect is essential in major urban areas such as Tokyo and Osaka. CASBEE-HI is a tool aimed for more detailed quantitative assessment of heat island reduction measures in building design. In CASBEE-HI, the criteria deal with more detailed conditions in the outdoor thermal environment and heat island load on the surroundings. Such issues are also addressed in CASBEE-BD/NC.

[CASBEE for Schools](#)

In Japan, there are an enormous number of old school facilities built in the 1960s or earlier awaiting for renovation. CASBEE for Schools was developed to assess primary schools and junior high or high schools and for

use especially at the planning and operation stages of buildings. The primary target users are administrative officers in charge of the planning of educational facilities, for easy assessment of the schools.

Locally Customized Edition for Municipalities

A flexible response to regional characteristics is a common feature of all the tools of the CASBEE family. CASBEE-BD/NC can be used by local authorities for construction administration. Local authorities using this tool can tailor it to local conditions, such as climate and relevant policies wherein changes are generally made by modifying the weighting coefficients. This system is introduced to the local authorities as a way to improve the environmental efficiency of buildings in the respective regions.

2) CASBEE for Real Estate with SDGs Checklist

*English version is available as "CASBEE for Market Promotion 2014 edition."

CASBEE-Real Estate (CASBEE-RE) is a tool developed to promote the use of CASBEE in the real estate market. The evaluation targets "office, retail, logistics facilities and multiple dwelling buildings (and their multiple uses)" that have been completed for at least one year, and also supports evaluation after renovation for office and retail buildings.

3) CASBEE-Wellness Office

CASBEE-Wellness Office (CASBEE-WO) is a tool for evaluating building specifications, performance, and initiatives that support the maintenance and promotion of the health and comfort of building users. It evaluates not only factors that directly affect the health and comfort of workers in the building, but also factors that contribute to improved workplace productivity, as well as safety and security-related performance. The tool can be used in both the planning and operational phases, and can also be used to evaluate tenant buildings that have not had their interiors completed.

4) CASBEE Checklists for Office

CASBEE Checklists for Office are a type of software wherein answering several questions allows building owners and workers to identify the aspects of their office that affect their health and other issues. Available checklists are:

"Office Health Checklist," "Office Infection Control Checklist," and "Office Renovation Checklist".

3. District scale

1) CASBEE for Urban Development (CASBEE-UD) *English version is available as "CASBEE-UD 2014 edition."

CASBEE-UD is to evaluate urban development projects on the ground where there are several architectural constructions and other areas for various purposes such as roads, public squares and green spaces. In CASBEE-UD, the environmental performance of such constructions and areas is examined collectively. CASBEE-UD has served as a useful tool to developers and city/district planners. The assessment framework of the Q is based on the triple-bottom-line approach, while the L evaluates broad sustainable development considerations similar to CASBEE-BD. In addition, application of smart technology and management performance of area are comprehensively evaluated.

2) CASBEE Community Health Checklist

The CASBEE Community Health Checklist is a type of software used to assess the health of community residence. The checklist conforms to the assessment system based on the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization (WHO). Communities are evaluated from the viewpoints of removal of function-disabling factors and sufficiency of encouraging factors for activities and participation.

4. City scale

1) CASBEE for Cities *English version is available.

CASBEE for Cities is a system for comprehensively evaluating the environmental performance of cities, using a triple bottom-line approach of "environment," "society" and "economy." This tool was developed with the cooperation of the Japanese Promotion Council of Low Carbon Cities (PCLCC) that resides within The Regional Revitalization Bureau of Cabinet Secretariat. The PCLCC consists of Eco-Model Cities and other local governments, government-related organizations, relevant ministries and agencies, private companies and other bodies in Japan.



CASBEE-RE



CASBEE-WO



Office Health Checklist



CASBEE-UD



Community Health Checklist



CASBEE-City

CASBEE for Cities measures the current BEE of a city and estimates the future BEE after the implementation of sustainable planning policies. By comparing the two values, CASBEE for Cities quantitatively evaluates the effectiveness of such policies and presents the results in an easy-to-understand format. It is hoped that this new tool will help administrative officers and other stakeholders to share a common understanding of the current state of cities and cooperate in setting and pursuing goals in order to create a low-carbon society.

2) CASBEE for Cities -Pilot version for worldwide use *English version is available.

CASBEE for Cities (Pilot version for worldwide use) is a tool specifically developed for city-scale assessment applicable to various types of cities in both developing and developed countries around the world. The assessment items and indicators were carefully selected by referring to previous studies and documents such as the UN's Sustainable Development Goals (SDGs) indicators, ISO 37120, IPCC and COP-FCCC, etc. The tool users can understand the actual conditions of their cities and progress toward achieving global SDGs. This tool is under development, and its pilot version has been released now.



CASBEE-City -Pilot version for worldwide use

CASBEE applications

1. Sustainable building reporting system

In Japan, many local governments have made it mandatory to include the CASBEE assessment result along with the application for building permits. Assessment results (ranking) of all the CASBEE-assessed buildings registered by 24 local governments in Japan are available on the Internet. CASBEE is an assessment system applied to a great number of private buildings (other than detached houses), which makes CASBEE very special and unique and which is one of its main features. CASBEE results of 32,385 buildings are reported and published on websites by march 2022.

2. Certification system and Accredited Professional registration system

CASBEE Certification is a system in which a third party examines and certifies assessment results provided by CASBEE-BD/NC, BD/EB, BD/RN, DH/NC, UD, RE and WO. An application for certification must be accompanied by assessment results provided by a CASBEE Accredited Professionals. CASBEE Accredited Professional Registration System was established as CASBEE assessment requires a specialized engineer with expertise and knowledge in the comprehensive environmental performance evaluation of buildings. There are 4 qualifications of CASBEE-APs depending on the CASBEE tools the assessor is capable of using. CASBEE-AP for Housing is a license for assessment with CASBEE-DH series, CASBEE-AP for Buildings is for CASBEE-BD series, CASBEE-AP for Real Estate is for CASBEE-RE and CASBEE-AP for Wellness Office is for CASBEE-WO. To become a CASBEE-AP, passing the examination after taking the training lecture must be needed.

3. CASBEE Voluntary Assessment and Registration System

The results of voluntary assessments of CASBEE are not disclosed to the public, despite the fact that there are many such assessments conducted by private companies. Disclosures of voluntary CASBEE results may support the further use of CASBEE and the spread of green buildings. Therefore, the registration system has been established to publicize the results of CASBEE self-assessment in 2019.

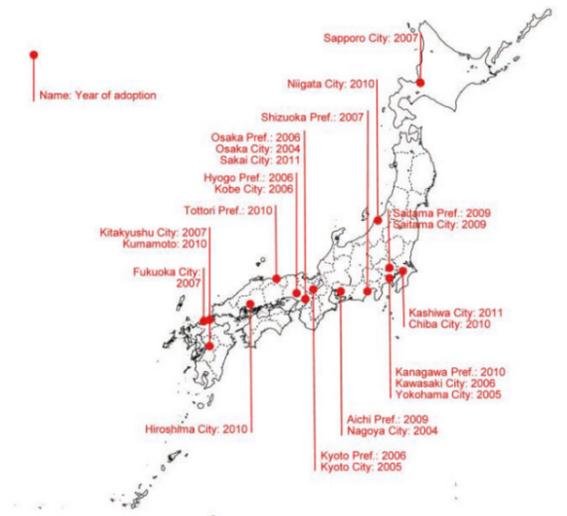


Figure 4: Local governments in Japan utilizing CASBEE

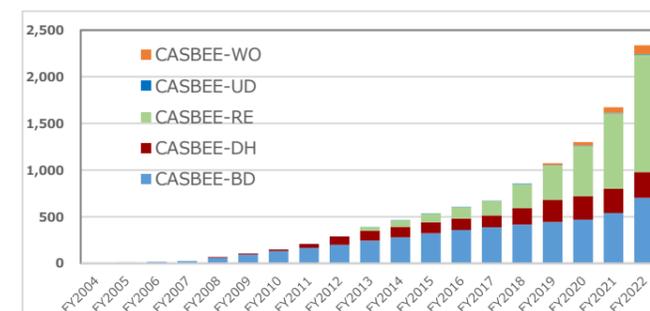


Figure 5: Cumulative numbers of CASBEE certified buildings

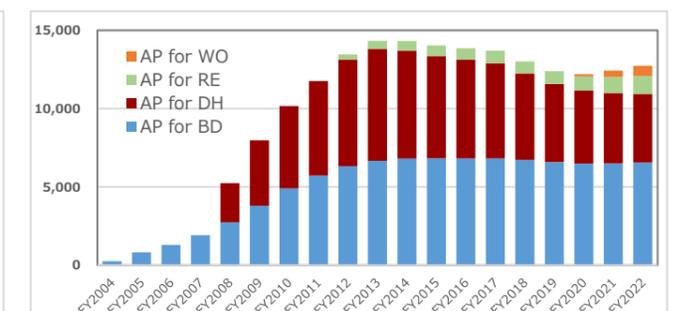


Figure 6: Number of CASBEE Accredited Professionals