

DEVELOPMENT OF ENVIRONMENTAL ASSESSMENT CRITERIA AND PROTOCOLS FOR RESIDENTIAL AND COMMERCIAL DEVELOPMENTS

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SUMMARY

Singapore's next leap of development — a world class business hub with high standards of quality-of-life, increased population density and enhanced environmental standards, must be achieved with the existing land constraint and without any local material resources. The way forward for the construction industry is thus the development and implementation of relevant environmental and resource sustainability know-how. To fulfill the demands of an increasing population, sustainable development has to be considered in Singapore to better utilize the scarce natural resources without compromising the development in the future.

Building environmental assessment methods (BEAM) are proven approach in bringing about efficient use of construction resources, environment conscious design and management. Through the design and implementation of suitable BEAM, professionals, contractors and building owners may be motivated to pursue set targets for achievements and recognitions, and by doing so it fulfils national and global objectives towards sustainable development. In the UK, BREEAM (Building Research Establishment's Environmental Assessment Method) was first launched in 1993. In the USA, the LEED (Leadership in Environmental and Energy Design System) has also been established in the mid 90s. In 1996, Hong Kong launched its HK BEAM using the same structure as BREEAM which was developed in consultation with the BRE of UK.

However, none of these assessment methods is fully appropriate for widespread applications that suit all countries. Preliminary studies by CTBP of NUS have shown that more than 30% of the criteria included in the BREEAM and other systems are not relevant to Singapore's tropical and high density living city context. Hence there is a real need to look into the development of an environmental assessment criteria that is applicable to Singapore's tropical and high-density living conditions.

KEY RESEARCH FINDINGS

This research project aims to:

- Identify and define a set of design, construction and management criteria which are relevant to Singapore and the tropical context with respect to residential developments.
- From the established criteria sets, and using modeling studies establish weighting scales for residential developments.
- Develop Environmental Assessment Methods, including methods of measurement and evaluation protocols, for residential buildings.

The study for the appropriate environmental assessment criteria and protocols was studied through:

(A) Identification of a set of sustainable criteria, which are relevant to Singapore and the tropical context with respect to residential developments.

Reviewed currently used environmental assessment methods for sustainable development including BREEAM, HK-BEAM, LEED, and NUS-BEAM(2001), comparison of these assessment methods, and identification of a set of environmental criteria including design, construction and management relevant to Singapore and the tropical context with respect to residential development. Relevant environmental issues in the environmental assessment criteria and protocols have been identified according to local environmental consideration and literature review of currently used environmental assessment methods. Those sustainable issues are categorized into five groups:

- Sustainable site
- Water efficiency
- Energy use
- Material & resources
- Indoor environmental quality

(B) Survey and case studies of relevant parameters and building users' opinions

Conducted survey and interview of HDB apartment residents. The survey results were used to identify relevant parameters and to adjust the identified criteria.

(C) Development of a new model of environmental sustainable assessment criteria and protocols

Based on the identified sustainable development criteria, a new model of environmental assessment criteria and protocols for local residential buildings was proposed. The new environmental assessment criteria and protocols for residential buildings covers three levels:

- Unit level
- Block level
- Precinct level

This is to facilitate the assessment of different parts of residential development.

(D) Indoor survey/measurement and assessment of two HDB residential buildings using LEED-NC and NUS-BEAM.

Indoor surveys / measurements and assessment using LEED-NC and NUS-BEAM were conducted on two HDB public housing buildings. The exercise allowed the team to appreciate the applicability of existing environmental assessment criteria when used for public housing development in the tropical setup.

(E) Survey on local building experts regarding environmental sustainable issues of local residential development and generation of weights of environmental issues in relation to local priority.

A local building expert survey was conducted to investigate local building experts' opinions towards the importance of identified environmental sustainable issues relevant to Singapore and the tropical context with respect to residential developments. The data gathered from the survey was used to prioritize different environmental issues according to the ratings provided by respondents. Weights were generated for each environmental criterion based on the

experts' opinion. The new environmental sustainable assessment criteria and protocols were developed using these weights as a foundation in assigning scores for each criterion.

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