Considering SB environmental assessment tool for the performance of buildings in Taiwan

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ABSTRACT

The International Organization for Standardization officially issued ISO 21930 and ISO 15686 standards in 2006, for quantitatively measuring the influence of buildings on environmental performance. SBTOOL is an international assessment tool promoted by the iiSBE, which can be employed to reflect the influence of the different phases of the life cycle of a building on climate, society and economy.

Taiwan has been actively implementing the Sustainable Development Policy, and the Architecture and Building Research Institute of Ministry of The Interior has established the "Green Building Evaluation and Labelling System" in 1999 to promote the so-called Green Building. This research takes SBTOOL which is a prevailing sustainable building assessment tool adopted all over the world as the subject of research and carries out a comprehensive analysis on the development trend of international sustainable building.

KEYWORDS

SBTOOL; EEWH; Performance of Building

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1. INTRODUCTION

The promotion and development of sustainable building have been carried out for several years, and extensively discussed and communicated at as Sustainable Building Conference 2008(SB08) by research teams from all over the world. For building environment assessment tool's conversion in recent years, a trend is forming and intensifying from the use of green building assessment tools towards the development of sustainable building assessment tools. It is SBTOOL that first developed from GBTOOL into a sustainable building assessment system. At the Sustainable Building Conference 2008(SB08) in Melbourne, SBTOOL was chosen by research teams from many countries as their research subject, whether in terms of regional assessment system development or in empirical comparison between

cases.According the relevant studies and literature, and taking the speciality of environmental and climate conditions of Taiwan District, this paper chooses Sustainable Building assessment tool SBTOOL developed by International Initiative for Sustainable Built Environment(iiSBE) and Green Building Evaluation and Label System (TAIWAN EEWH) as objects of comparison Further, cases are used to demonstrate the analysis of differences between these two systems, in the hope of exploring the emphasis or aspects to which attention shall be paid by Sustainable Building assessment in Taiwan District.

2. BACKGROUND

2.1 .International assessment of SBTOOL

SBTOOL into 3-level assessment system comprising assessment groups, which, besides integrating environmental, social and economic aspects, considers Cultural and Perceptual Aspects as well as life cycle of buildings.



Figure 1: BASIC ASSESSMENT GROUPS IN SBTOOL.

2.2 TAIWAN EEWH

To get a full knowledge of the environmental performance and quality of buildings in Taiwan, the Taiwan Architecture and Building Research Institute (ABRI), Ministry of the Interior developed a Green Building Evaluation (EEWH) in 1999 and added two more indicators in 2003. Now there are nine indicators in EEWH for green building assessment: biodiversity, greenery, soil water content, daily energy saving, CO2 emission reduction, waste reduction, indoor environment, water resource, and sewage and garbage improvement. Each assessment item is scored using its respective assessing formula as well as its weight coefficient, and scores are rated into the following ranks: qualified rank(12<=RS<26) bronze rank(42<=RS<53)and rank(26<=RS<34). silver rank(34<=RS<42), gold diamond rank(53<=RS). According to statistics released by the Chinese Architecture & Building Centre (CABC), among new buildings built up during the period from 2004 to 2008, 223 cases have acquired Green Building Labels, and 1072 cases have gained Candidate Green Building certificates. The distribution of green buildings among building types is shown in the chart below.

Indicator	Indicator	Connection with global environment						
Category	mercator	Climate	Water	Soil	Organisms	Energy	Materials	
Ecology	Biodiversity	*	*	*	*			
	Greenery	*	*	*	*			
	Soil Water Content	*	*	*	*			
Energy saving	Daily Energy Saving	*				*		
Waste	CO2 Emission Reduction			*		*	*	
reduction	Waste Reduction			*			*	
Health	Indoor Environment			*			*	
	Water Resource	*	*					
	Sewage & Garbage		*		*		*	
	Improvement		,					

 Table 1. The connection in Taiwan EEWH system and global environment.[ABRI,2007]

Located in a subtropical zone, Taiwan as a whole has a high-temperature and high-humidity climate. Taiwan is a long and narrow island along north-south direction with the Tropic of Cancer at 23.5 degrees north latitude passing through it. See map below. The climate in the area north to the Tropic of Cancer is subtropical, and that in south is more tropical and warm. Therefore, Taiwan plays an indicative role in terms of environment. In Taiwan's present residential building environment, existing buildings account for 97% and new buildings only 3%. Urban areas are narrow and densely populated, without large hinterlands for use, so the buildings there develop towards high-rise/high density forms whereas, buildings in countryside towns or mountain areas are of low density, without limitations of space. The goal of sustainable development is more easily reached in countryside towns and mountain areas.

All newly built 3 residential buildings cases chosen in this paper are located in Kaohsiung, Taiwan, which, due to being south to the Tropic of Cancer geographically, has an annual mean atmospheric temperature of about 25.1° C slightly higher than the annual mean atmospheric temperature of the whole Taiwan 24.5°C and a lowest temperature seldom lower than 10° C This area experiences the highest temperature in Augusts with the average temperature of 29.6°C has an annual precipitation of 1720.2mm and an annual mean total sunlight of 2075.4 hours.

3. ANAYSIS AND CASE STUDIES 3.1 ASSESSMENT RESULTS IN TAIWAN EEWH

The results cases assessed by using Taiwan Green Building assessment indicators are all certified, and the scores of individual indicators are outlined in Table 2. The choosing of Taiwan Green Building assessment items is voluntary, so the scores of some items are not blank. However, the biodiversity indicator must be assessed for buildings with site areas larger than 1 hectare. The cases chosen in this study are all residential buildings, so it is unnecessary to assess this indicator. In the cases chosen in this study, the assessment items chosen most among Taiwan Green Building assessment indicators are Greenery, Soil Water Content, Daily Energy Saving, and Water Resource.

Table 2.	The assessment	results of	of three	residential	building-cases i	n Taiwan	EEWH
system.							

Indicator category	Indicator Name	Case 1	Case 2	Case 3	
	Biodiversity	Free from assessment			
Ecology	Greenery	5.8	2.9	2.6	
	Soil Water Content	2.3	2.2	2	
Energy Saving	Energy Saving Daily Energy Saving		5.3	11.9	
Weste Deduction	CO2 Emission Reduction				
waste Reduction	Waste Reduction			3.3	
	Indoor Environment		2.1		
Health	Water Resource	1.7	7.5	2.5	
	Sewage & Garbage Improvement	2		2.6	
	21.6	20.2	24.9		

3.2 ASSESSMENT RESULTS IN SBTOOL

Assessment results gained by applying default weighting values in SBTOOL are indicated in Table 3. In SBTOOL, the first three assessment items having largest default weighting values are Environmental Loadings, Indoor Environment Quality, and Energy and Resource Consumption. In three chosen cases, the first three assessment items having highest scores are Social and Economic Aspects, Energy and Resource Consumption, and Indoor Environment Quality in sequence. If the order of items is considered by using values internally decided by SBTOOL international experts, the item whose Taiwan Green Building score varies from case to case is Social and Economic Aspects.

Table 3. The assessment results of three residential building-cases in SBTOOL system which are adapted the SBTOOL default weighting.

SBTOOL assessment items	weighting value	Case 1	Case 2	Case 3
Site Selection, Project Planning and Development	7.8%	1.8	1.8	1.7
Energy and Resource Consumption	21.6%	2.2	1.7	2.2
Environmental Loadings	25.9%	1.9	1.4	1.9
Indoor Environment Quality	21.6%	1.2	1.9	2.1
Service Quality	15.5%	0.3	0.8	0.4
Social and Economic Aspects	5.2%	2	2.3	2.4
Cultural and Perceptual Aspects	2.6%	1	1	1
self-assessment score	1.3	1.6	1.7	

4. COMPARISION

4.1 Comparison of Case scores on SBTOOL and EEWH

In three cases located at Taiwan, viewing from the total score of various items and Taiwan EEWH assessment rating result obtained by entering different weighting values into Taiwan EEWH, the total score computed by using SBTOOL system is closer to assessment rating result obtained by means of Taiwan EEWH after regional experts' opinions have been introduced. Further, if different weighting values are brought into the system, it can be concluded from comparing scores of assessment items that the item whose score varies largely from case to case is "Indoor Environment Quality": the score of this items after the opinions of experts from Taiwan South regarding the weighting values differs largely from case to case.



Figure 2: CLASSIFICATION ON SBTOOL DEFAULT WEIGHTING AND EEWH.

4.2 Comparison of Case differences

Assessed by means of SBTOOL, 3 cases are examined regarding such design as follows:

Case1 has three composite functions: the floor immediately under the ground is underground parking space, the floor immediately above the ground is occupied by stores, and the floors above the first floor are used as residence. For the assessment item "Indoor Environment Quality" of the second floor, consuming that the waste of the underground parking space has been removed and the ventilation of stores in the first floor is considered being separated from the main usable space, its score obtained by inputting relevant information into the system is low; in "ventilation" item, the score of each use just reaches the benchmark (equal to 0); In the terms of "noise and sound control" item, the score of such item of the underground packing space doesn't meet the benchmark.

5. CONCLUSIONS

The comparison between the performance results of the cases in the research and those in the previous research reveals that although the scores obtained using SBTOOL and Taiwan EEWH are different, the calculated results were subjected to the correction using regional expert weights.

The establishment of regional Sustainable Building experience doesn't only depend on the existing Green Building techical indicators. To accommodate the causes of variation of each regional condition caused by global climate change, higher benchmark value must be pursued, while the overall performance of buildings is kept unchanged within their life cycles.

The maintenance of indoor environmental quality of a building has a huge impact upon the life of persons living in it. It is found in the exploration of Green Building cases in Taiwan South by means of SBTOOL that the comfort and health of the user in different spaces can be catered for only after different usable areas and environmental conditions have been considered in benchmark for buildings of composite functions.

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