

BENEFITS OF GREENING EXISTING BUILDINGS

Introduction

The concept of green building can be applied to existing buildings to reduce energy consumption and CO₂ emissions. They consume relatively more energy compared to new green buildings, as about 95% of the existing buildings are high-energy consumption buildings, and more than 80% of building life-cycle energy consumption occurs during the occupancy stage, so saving potential is very high. Such greening is done through renovations, retrofits, installations, or system upgrades, and as and when they are needed. There are many other benefits too, but the greening 'movement' is not getting momentum in Brunei, despite its increased popularity globally. It was therefore decided to gauge the general awareness of the local construction industry towards greening existing buildings, through the perceptions of a cross-section of industry participants on benefits of greening existing buildings.

Material and Methods

A questionnaire survey was launched, using 15 benefits of greening existing buildings (GEB) that were extracted from literature. This paper is based on 68 responses from the ongoing survey with average experience of 9.9 years : 33 from clients, 27 from consultants, and 8 from others, i.e. contractors and quantity surveyors. On the other hand, 37 respondents had some degree of experience in green building or the green building concept, 29 respondents had no experience, and 2 respondents did not mention if they had any experience. Data was collected on the 15 benefits in terms of their 'degree of benefit' on a scale from 1 to 5: 1 being the 'least benefit' and 5 being the 'most/highest benefit'. The average scores of individual benefits by different groups of respondents were computed and ranked. They were then compared between the groups of (a) 'experienced' in green building, and 'no experience' in green building; and (b) clients and consultants. One-sample t-test was used to examine the consistency of the responses, and one way ANOVA was used to compare the means between different groups of responses.

Results

- The one-sample t-test at 95% confidence interval shows that the mean values are significantly important, and that the respondents consistently assessed the importance of the 15 benefits in the similar way, within all the groups of respondents.
- The lowest score is higher than the average of the measuring scale, indicating general importance of all the benefits, thus a general awareness.
- The most and the least important benefit is "Reduced energy/electricity consumption" and "Increase in building occupancy/usage rate, respectively.
- ANOVA results: (1) 'experienced and inexperienced groups agree on the importance of 14 benefits in the same way, and disagree for "reduced operation and maintenance cost"; (2) client and consultants also agree on the importance of 14 benefits in the same way but disagree for 'increase in building value'.
- Despite some disagreements on the ranks of individual benefits, and the range of the scores of the identified 15 benefits by different groups of respondents, the overall results indicate a general agreement of the respondents that all the benefits are significant, and that there exists a general awareness of GEB.

Table 1. Perceptions of greening existing building: Total Sample

Description of the benefits	Av	Rank
Reduced energy / electricity consumption	4.07	1
Resultant reduced impact on the climate change	3.8	2
Resultant reduced impact on enviro. for GHG	3.79	3
Improvement in indoor air / environment quality	3.79	3
Resultant reduction in environmental pollution	3.78	5
Improvement in health & safety & hygienic situation	3.76	6
Improvement in working environment & productivity	3.67	7
Conservation of non-renewable energy	3.66	8
Improvement in dwelling quality of life	3.51	9
Reduction in cost due to reduced energy consumption	3.51	9
Increase in building value	3.42	11
Conservation of construction materials	3.3	12
Savings of money / capital expenditure	3.03	13
Reduced operation & maintenance cost	2.97	14
Increase in building occupancy/usage rates	2.96	15

Table 2. Comparing perceptions of 'Experienced' and 'No experience' groups.

Description of the benefits	Exp.		No Exp.		ANOVA
	Av	Rank	Av	Rank	
Reduced energy / electricity consumption	4.21	1	3.90	1	.817
Resultant reduced impact on enviro. from GHG	4.05	2	3.45	7	.102
Resultant reduced impact on the climate change	4.00	3	3.55	5	.287
Improvement in indoor air / environment quality	3.95	4	3.59	4	.235
Resultant reduction in environmental pollution	3.90	5	3.62	3	.061
Conservation of non-renewable energy	3.85	6	3.41	8	.239
Improvement in health & safety & hygienic situation	3.79	7	3.72	2	.217
Improvement in working environment & productivity	3.79	7	3.52	6	.428
Improvement in dwelling quality of life	3.68	9	3.28	10	.639
Reduction in cost due to reduced energy consumption	3.59	10	3.41	8	.602
Increase in building value	3.53	11	3.28	10	.084
Conservation of construction materials	3.34	12	3.24	12	.292
Savings of money / capital expenditure,	3.10	13	2.93	15	.588
Reduced operation & maintenance cost	3.00	14	2.93	15	.011
Increase in building occupancy/usage rates	2.95	15	2.97	13	.402

Table 3. Comparing the perceptions of 'Client' and 'Consultant' groups.

Description of the benefits	Client		Consultant		ANOVA
	Av.	Rank	Av.	Rank	
Reduced energy / electricity consumption	3.91	1	4.30	1	.156
Resultant reduced impact on the climate change	3.78	2	3.77	7	.963
Improvement in working environment & productivity	3.75	3	3.56	9	.424
Improvement in health & safety & hygienic situation	3.72	4	3.81	4	.686
Conservation of non-renewable energy	3.7	5	3.70	8	.980
Improvement in indoor air/environment quality	3.67	6	4.00	2	.169
Resultant reduction in environmental pollution	3.67	6	3.78	6	.297
Resultant reduced impact on enviro. from GHG	3.66	8	3.89	3	.364
Improvement in dwelling quality of life	3.63	9	3.37	11	.302
Reduction in cost due to reduced energy consumption	3.45	10	3.56	9	.730
Conservation of construction materials,	3.31	11	3.26	12	.861
Increase in building value	3.22	12	3.81	4	.035
Savings of money / capital expenditure	3.12	13	2.96	15	.631
Increase in building occupancy/usage rates	3.00	14	3.04	13	.891
Reduced operation & maintenance cost	2.85	15	2.96	15	.692

Discussions & Conclusions

The ongoing study, as reported here, shows a general awareness of the 68 respondents, since the groups of people with, and without, experience of green building expressed their opinion in the same way. This, in turn, shows the motivation of the respondents to practice greening existing buildings, contrary to the actual state of adopting the practice in industry. It is being suggested here to undertake some demonstration projects by government, and disseminating the outcomes to the public. Such attempt is expected to help wider adoption of greening existing buildings in Brunei. The similar approach may be undertaken elsewhere, to attract relevant segment of clients, and thereby wider adoption of sustainable development through greening existing buildings, to benefit both environment and society.