

Improving the environmental performance of building facilities through a green building product labelling scheme

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Abstract

The environmental impacts caused by the prodigious demand for building facilities around the world should not be underestimated as construction projects consume a great deal of natural resources, water and energy. To help save the ecosystems and achieve the global vision of sustainable development, the construction industry has an indispensable role to play. Of various approaches to reduce the environmental burdens of construction facilities, the use of green building materials is considered a crucial aspect. Yet, it is not easy for construction stakeholders to select the most suitable green building materials for a construction project. What is needed is a transparent and credible scheme to evaluate and compare the greenness of building products. In Hong Kong, a green building product labelling scheme has just been launched by the Hong Kong Green Building Council. A major characteristic of this green building labelling scheme is that it enables construction stakeholders to differentiate the level of greenness of building materials and products based on various environmental impact categories. By integrating the green building product labelling scheme with the building environmental assessment schemes such as LEED, the overall environmental performance of a building can be easily delineated. In this paper, the salient features of the green building product labelling scheme in Hong Kong are presented and the way to capitalise on the scheme to enhance the environmental performance of building facilities in the city is discussed.

Keywords: sustainable construction development, green building material, green label, environmental impact.



1 Introduction

Building facilities are essential to a city as they do not only provide dwelling space for inhabitants but can also support its economic development. With continuous growth in population and exacerbated urbanisation, the demand for building facilities is expected to increase for the years to come.

Despite that, the construction of building facilities can be detrimental to the environment [1] as it consumes large quantity of different building materials. UNEP [2] estimated that the construction industry is responsible for about 40 per cent of the overall environmental burden. The most common environmental impacts caused by the consumption of building materials include resource depletion and effect to the eco system and human health [3].

Nowadays, more and more clients, designers and end-users are aware of the adverse environmental impacts brought by construction materials [4]. Apart from reducing the amount of materials in a building materials through design optimisation and/or greater use of recycled materials, greater adoption of green building products is gaining popularity.

While many manufacturers have great expectations on the niche market of green building materials and invested heavily in improving the environmental friendliness of their products, the greenness of some building products remains ambiguous to construction stakeholders [5].

In some countries, green or eco labelling schemes have been developed to promote green products. These schemes fall short in providing a comprehensive coverage of building products considering the diversity of materials used in a construction project. Besides, the existing green or eco labelling schemes do not allow decision-makers to differentiate how green the products are. This would impede the construction industry's opportunity to significantly uplift the environmental performance of building facilities.

In Hong Kong, the Hong Kong Green Building Council has launched a Green Building Product Labelling (GBPL) Scheme in January 2015. The GBPL scheme aims to provide a transparent and credible platform for evaluating and comparing the life cycle environmental friendliness of building products.

In this paper, the essential features of the GBPL scheme *viz.* the product coverage and assessment mechanism are first highlighted and the potential application of the scheme to improve the environmental performance of building facilities is exemplified.

2 Product coverage

In the initial phase of the GBPL scheme, fifteen building products which are commonly used in building facilities in Hong Kong as well as representing the highest environmental burden are included. These fifteen building products are categorised into four distinctive categories, i.e. structure and façade, interior system, finishes, and mechanical and electrical (fig. 1).

In determining which building products should be incorporated in the first stage of the GBPL scheme, a thorough analysis of the building project was carried out.



This involved a systematic examination of the amount of materials used in a series of capital projects in the city. The frequency of replacement of the building products based on a fifty year building life as well as the material wastage at the construction stage were taken into account when assessing the amount of materials needed in the selected projects.

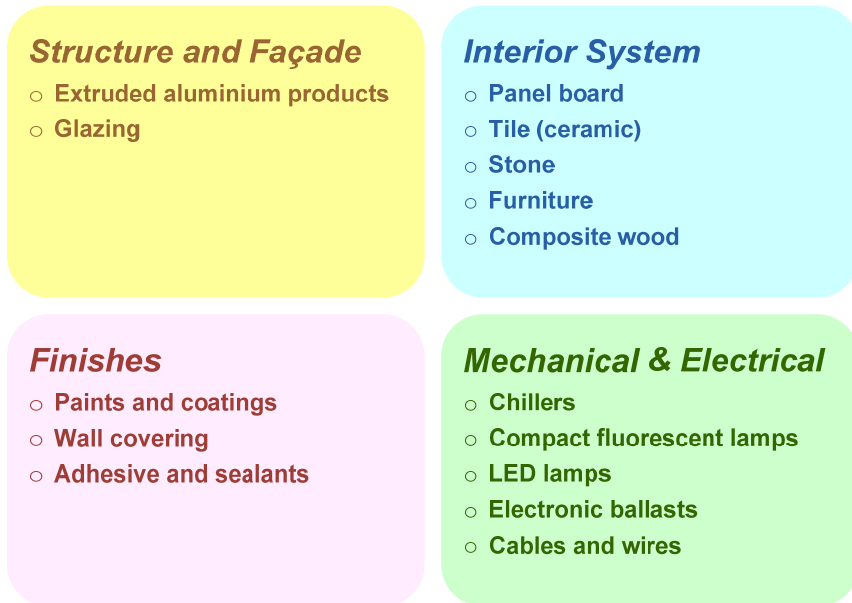


Figure 1: Building products covered in the GNPL scheme.

To better understand the environmental impacts of various building products, commonly environmental inventories were used. Through which, the quantity adjusted environmental impacts could be computed to establish which are the most predominant building products from the environmental performance's perspective. Given the potential environmental impacts brought by building services components, analyses were conducted by referring to their energy consumption throughout the building life cycle.

Analogous to other similar studies, the findings of the current study shows that reinforcement bars, copper, aluminium, tiles and concrete are the greatest contributors of environmental burden in building projects. As for the building services components, chiller, compact fluorescent lamp and electronic ballast deserve much attention due to their energy consumption and extensive usage.

3 Assessment mechanism

A life cycle assessment approach is adopted to determine the environmental impacts brought by a building product. However, as the characteristics of each building product vary, the impact categories of individual product could exhibit

some variances. For instance, paint and coating products shall be assessed by referring to their serviceability, hazardous substances, toxicity, biocides, heavy metals, environmentally hazardous substances, carcinogenic substances, ozone depleting substances, and volatile organic compounds.

While some assessment criteria are similar to other green or eco labelling schemes around the world, the standards can be different especially when the building facilities and their usage in Hong Kong is not the same as other cities. Therefore, a series of focus group meetings were conducted to establish the most suitable standards for each of building product. Besides, relevant international and local standards or regulations were reviewed to ensure that the requirements are in line with the trend.

Another major distinction between the GBPL scheme and other existing green or eco labelling schemes is that the criteria are divided into core and non-core ones. Since the core criteria represent absolute minimum environmental standard of a building product, only those materials which can satisfy all the core criteria will be awarded a label under the GBPL scheme. For instance, recycle content is one of the core criteria for extruded aluminium products.

The non-core criteria, however, demonstrate whether additional efforts have been directed to improve the environmental friendliness of the product. This should help differentiate how green the product is. As a result, additional scores will be awarded if the product can meet any of the non-core criteria. Table 1 shows the scoring regime under the GBPL scheme.

Table 1: An example of core and non-core criteria and scoring regime.

	<i>Criteria</i>	<i>Basic Score</i>	<i>Bonus Score</i>
Core	Volatile organic compounds	10	
	Lower than the limit specified (Table 2)		5/10
	Carcinogenic substances	10	
	Heavy metals	15	
	Serviceability	10	
	Product information	5	
	<i>Maximum sub-total for core criteria:</i>	<i>50</i>	
Non-core	Environmental management system		5
	Packaging requirement		5
	⋮		⋮
	Ozone depleting substances		5
	<i>Maximum sub-total for non-core criteria:</i>		<i>50</i>
MAXIMUM TOTAL SCORE:		100	

To facilitate manufacturers and verification bodies report and validate the environmental impacts of a building product in a transparent and unequivocal manner, the detailed requirements pertinent to each criterion are provided in the assessment guideline (Table 2). More importantly, the score corresponding to each criterion is shown so that manufacturers can estimate how green their product is.

Table 2: Limit of volatile organic compound and associated scores.

	Score		
	10 (basic)	+5 (bonus)	+10 (bonus)
Paint/coating type	Interior		
	VOC limits (g/L) (include water and tints/colourants)		
	Minimum requirement	Higher standard	Highest standard
Matt (≤ 10 gloss units)	50	25	10
Semi-gloss/gloss (≥ 15 gloss units)	80	40	10

There are altogether five different grades under the GBPL scheme ranging from 'platform', 'gold', 'silver' and 'bronze' to 'green' (fig. 2). The level of label to be awarded depends on the satisfaction to the scoring regime (see Table 1 for example). A product which satisfies all the core criteria would result in 50 marks and it is eligible for a 'green' label under the scheme. If the product satisfies all the requirements of the core and non-core criteria, extra marks of up to a total score of 100, which would lead to the award of a 'platinum' label.



Figure 2: Different levels of green labels.

4 Improving Buildings' Environmental Performance

As explained earlier, the environmental performance of building facilities depends not only on the energy consumption at the operational stage, but also a careful selection of building products as the opportunity to reduce the environmental burden would diminish once the facility is built. The problem is aggravated when the use of inferior materials may pose health hazards to the occupants.

Through the GBPL scheme, clients and designers can select green building products of different environmental friendliness to commensurate their goal in contributing to environmental conservation and protection. While some countries or cities like Hong Kong offer incentives to promote green construction, e.g.

granting gross floor area concession, it is necessary to see how to integrate the GBPL scheme with the existing mechanisms in appraising green buildings.

The ability to differentiate building products into various degrees of greenness makes the GBPL scheme extremely useful and handy as it can be linked to the existing building environmental assessment schemes like the Leadership in Energy and Environmental Design (LEED) in the United States, Building Environmental Assessment Model (BEAM-Plus) in Hong Kong, etc.

Of various possible approaches, one can improve the material aspects of the existing building environmental assessment schemes by assessing the labelled green building products used in the project. The more the labelled green building products are used and the higher are the green labelling grade of the selected materials, the higher score on the material aspects can be achieved. This together with the incentivising programme should promote a greater uptake of green building products.

Clients and design team members can also specify the use of labelled green building products. For instance, for those building products which are hazardous to the environment and/or human health, at least those having awarded a 'silver' green building product label can be used. This should help change the behaviour of the construction industry and ensure the manufacturers are moving towards the production of greener building products.

From the perspective of the buyers and end-users of the building facilities, they may be more prepared to move in to a property with better environmental quality. With the aid of the GBPL scheme, buyers and end-users can delineate the environmental friendliness of the building. Through which, the demand for green buildings would increase.

5 Conclusions

A GBPL scheme which can differentiate the level of environmental impacts of building products has been introduced in this paper. The scheme adopts a life cycle assessment approach whereby the environmental impacts instigated by various stages of production including raw material extraction, transportation, processing, fabrication, installation, operation, reuse, recycling and disposal are taken into account.

Fifteen commonly used building products have been carefully selected after reviewing the amount of different building materials used in construction projects and the environmental impacts of those materials. Assessment standards have been developed to help manufacturers and validation bodies compile and verify the information for the award of a green building product label. By referring to the core and non-core criteria and the level of green label awarded, one can easily differentiate which building product of the same category is greener than the other so as to facilitate decision making.

Improving the environmental performance of building facilities is the duty of all stakeholders. From the clients and designers' point of view, specifying the use of green building products can ensure that the building is safe for occupancy and causing minimal disruption to the environment. With a greater demand for green



building products, manufacturers should invest more in research and development for new materials and new production process to minimise the environmental burden. The government should play a proactive role to encourage the construction of green buildings in particular the use of green building products, and incentivising and educating the industry to go green should be built into a country or city's policy.

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