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The role of product eco-labels in realising the greening agenda of the construction industry

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Abstract

The proliferation of green products/materials in the construction industry (CI) have been traced to the global attention on sustainability. However, greenwashing and continuous specification and use of unsustainable construction products/materials keep restraining the transition of the industry towards the sustainable path. Hence, the need for efficient and effective assessment and labelling tools to provide reliable information about the environmental attributes of construction products/materials. This study sets out to examine the impact of green product eco-labels in achieving the sustainability goals of the CI. An extant review of the literature was conducted on the various available green product eco-labels in use in the industry. Findings revealed two significant types of eco-labels namely: single attribute and multiple-attribute. Specification and use of construction products/materials with household-named and reliable eco-labels by construction professionals and stakeholders is recommended, as this step has the potential of mitigating the negative environmental impacts of the CI.

Keywords: assessment tools; built environment; construction materials; green building; sustainability.;

1. Introduction

Products, materials and technologies specified for use in any infrastructural or building project play a cogent role in achieving the sustainability objectives of such project. To achieve sustainable design and construction goals, the United States Green Building Council (USGBC) considers the choice of construction materials as a fundamental factor [1]. The study of [2] also identified the specification/selection and use of products and materials with unfavourable impacts on the environment as a significant constraint to the transition of the construction industry (CI) towards the global sustainability movement. Products and materials used to construct, operate and maintain infrastructures over their life-cycle contribute to their degrading impacts on the natural environment [3], thus impeding their sustainability goals. Based on past predictions of sustainability proponents and various researchers, pollution, greenhouse gas emissions, and loss of biodiversity are few of the effects of the continued utilisation of unsustainable products and materials over the years. For example, Sick Building Syndrome has been attributed to the off-gassing of volatile organic compounds (VOCs) from modern finish materials such as carpets, paints, adhesives and vinyl among many others [4]. Also, the traditional Portland cement contributes significantly to the atmospheric concentration of GHGs through limestone decomposition, fossil fuel combustion, the breakdown of raw materials and energy consumption during its production

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[5]. The extraction, processing, production and transportation processes involved in the manufacturing of construction products and materials have also contributed to the gradual depletion of worlds natural resources. As a strategy for curbing the spread and continuous adverse impacts of the CI, the concept of sustainable construction (SC) is introduced.

The terms sustainable construction (SC), high performance, green building (GB), and environmentally-friendly building amongst others are often used interchangeably to describe the transition of the CI towards achieving sustainability [3,6,7]. The focal point of SC is to proliferate the efficient use of water, energy and materials while minimising its footprint on the environment, human health and safety [8]. SC is premised on the provision of socially, technically, and economically pleasing and blooming human environment with minimal or no harm to the natural environment [9]. However, despite the global recognition of the importance of GB, the demand, adoption and implementation are still at its infancy due to lack of knowledge, awareness, sustainability measurement tools and eco-friendly construction materials [10,11,12]. To achieve the sustainability of building projects and construction products/materials, energy and water efficiency are some of the standards to be met, leading to the development of sustainability assessments. This paper, therefore, evaluates the roles played by product eco-labels in realising the sustainability goal of the construction industry. Related studies on construction products/materials eco-labels are done and presented. The final section presents an overview of the existing eco-labels, concludes the study and after that proffer recommendations.

2. Overview of sustainability evaluation tools

The development of several sustainability evaluation tools is aimed at achieving GB projects. Sustainability evaluation tools offer standards and guidelines in measuring how green or environmentally friendly a building is while also supplying recognition and validation of such claims [4]. These tools help in addressing environmental issues during construction processes and assessing the environmental performance of buildings. They are voluntary tools developed in each country/region to support the development of sustainable buildings, apart from Sustainable Building Challenge and Living Building Challenges which are regarded as international rating standards. While some of these tools are country specific (applied within their country of origin), others are applied both in their country of origin and adopted by other countries, an example of which is Building Research Establishment Environmental Assessment Method (BREEAM).

According to [13], prominent among the sustainability assessment tools include BREEAM, Leadership in Energy and Environmental Design (LEED), Comprehensive Assessment System for Built Environment Efficiency (CASBEE, Japan), Green Mark Scheme (Singapore), Hong Kong Building Environmental Assessment Method (HK BEAM), Green Building Index (Malaysia), Green Building Council of Australia Green Star (GBCA, Australia), Green Globes, and Pearl Rating System for Estidama (Abu Dhabi Urban Planning Council). However, most commonly used and widely accepted among these assessment tools are LEED and BREEAM [7]. The development of these assessment tools is for different types of buildings (i.e. residential, industrial, commercial) and urban developments which are assessed differently and with a different criterion. They are deployed to evaluate and provide verifiable sustainability ratings [14]. [15] also listed EcoQuantum (Netherlands), KCL Eco (Finland), Bees (USA), and Beat (Denmark) as other available assessment tools. These assessment tools, however, play a prominent role in advancing the growth of sustainable buildings/projects in their respective countries of use as well as globally.

2.1. BREEAM

Building Research Establishment Environmental Assessment Method (BREEAM), developed in the United Kingdom (UK), is one of the first and most utilised ratings systems in the world for evaluating the compliance level of projects to sustainability guidelines and criteria [3,16,17]. BREEAM assesses the environmental performance of building projects under ten major categories namely: health and well-being; pollution; ecology; water; materials; waste; management; transport; energy; and land use. The rating scale used are certifications of pass, good, very good, excellent, and outstanding [17]. Trained and licensed assessors provide the assessment of BREEAM ratings by producing a report containing an outline of the project's performance and overall rating. It has influenced the development of other rating tools such as LEED, Green Globes, and Green Star. There has been a consistent update of BREEAM version to address the different categories of project types such as educational, residential, industrial and infrastructural projects. Till date, BREEAM has developed versions for infrastructure projects (BREEAM Infrastructure), mixed-use projects (BREEAM Bespoke), communities or regeneration projects (BREEAM Communities), commercial building projects excluding residentials (BREEAM In-use), new building projects and new-build extensions to existing building projects (BREEAM New Construction), and refurbishment or fit-out projects (BREEAM Refurbishment and Fit-out).

2.2. LEED

Leadership in Energy and Environmental Design (LEED) is developed by the United States Green Building Council (USGBC) as a green building certification program, and it is best known and prominent in the U.S [17]. LEED seeks to measure and assess environmental performance in seven categories as follows: sustainable sites; water efficiency; energy and atmosphere; materials and resources; indoor environmental quality; innovation in design; regional priority (added in 2009); and locations and linkages [3,4,17,18]. Just like BREEAM, LEED is updated from time to time and newer versions established to address the different types of building projects ranging from infrastructural, residential and commercial projects among others.

2.3. Green Globes

Presently deployed both in Canada and the United States, the framework of Green Globes is based on the BREEAM rating system. The non-profit Green Building Initiative (GBI) is the licensor of Green Globes in the U.S [18]. This tool can be used to assess the impact of project decisions on point scores with the ratings expressed as one, two, three or four globes representing increasing levels of environmental performance [3]. Green Globes assesses environmental performance under seven key categories namely: site; energy; water; indoor environment; emissions, effluents and other impacts; resources; and project/environmental management [4,18].

3. Sustainability evaluation tools: classification and categories

From literature, there are two main classifications of sustainability assessment tools namely: criteria-based system and life cycle assessment methodology (LCA). The criteria-based tools are those that assign point values to selected criterion (i.e. BREEAM, LEED) while the life cycle assessment methodology (i.e. EcoQuantum, KCL Eco) uses different weighing techniques based on different rationale for evaluation to be deployed for selection of building design, material, and local utility options [15]. Due to the complexities in the greening of infrastructural projects, these rating tools address different aspects and categories. For example, GBCA Green Star rating tools tackle nine aspects which are material; emissions; transport; energy; indoor environmental quality; management; water; land use and ecology; and innovation [13]. On the other hand, the Malaysian Green Building Index, derived from the Australian Green Star System and Green Mark Singapore, addresses six vital benchmarks namely: material and resources; indoor environmental quality; water efficiency; energy efficiency; innovation; and sustainable site planning and management [8]. A careful analysis of the constituting categories of these assessment tools reveals material as a significant and indispensable part that is common to all. This discovery, however, substantiates the fact that the kind and attributes of materials and products selected for use in a project go a long way in determining whether it will achieve its sustainability objectives.

4. Products/materials evaluation, rating and labelling systems

There are quite a few assessments, rating, and labelling systems/tools for evaluating material and product sustainability (also referred to as eco-labels). As listed by [3], the following are the most common, popular and widely used, with their corresponding country of origin: Blue Angel Certification (Germany); CarbonFree Certification (USA/UK);

China Environmental Logo (China); Building Research Establishment Certified Environmental Profile (UK); EcoLogo (Canada); EcoMark (Japan); Eco-Leaf (Japan); Energy Star (USA); EU Ecolabel (European Union); Environmental Choice (New Zealand); Good Environmental Choice (Australia); Forest Stewardship Council (FSC) Certification (USA); GREENGUARD (USA); GreenSeal (USA); Hong Kong Green Label (Hong Kong); GreenLabel Plus (USA); National Sanitation Foundation (NSF) International (USA); Korean Ecolabel (Republic of Korea); Nordic Ecolabel/Swan (Denmark); Thai Green Label (Thailand); Singapore Green Label Scheme (Singapore); WaterSense (USA); Water Marque (UK); Scientific Certification Systems Recycled Content (USA); and Water Efficiency Labelling and Standards (WELS) Scheme (Australia).

These tools offer significant ways of verifying and understanding the numerous characteristics affecting material and product sustainability [16]. They also help to provide users with core information on the source, content, performance, and impact of such material and product on the human and natural environment. According to [4] and [19], material and product evaluation, rating and labelling systems fall into two categories namely: multiple-attribute rating system (which consider and verify several attributes) and single-attribute rating system (which verify and focus on only one attribute). An example of the multiple-attribute rating system is GreenSeal (USA) and Environmental Choice (New Zealand) while that of the single-attribute rating system is Energy Star (USA). Certification, assessment, rating and labelling tools have, therefore, become the most effective way of authenticating the sustainability attributes of construction products/materials. These tools also serve as an avenue for regulating the green market, specification and use of materials with adverse impacts on the environment.

5. Benefits and goals of products/materials eco-labels in achieving sustainability

Several benefits are accrued to embracing the use of products/materials with eco-labels in achieving the sustainability objective of the construction industry. The definite transition from the traditional and unsustainable construction materials is believed will result in a continuous rise in demands for those that are sustainable and specifically eco-friendly. Eco-labels have become mechanisms by which the environmental performance of construction materials and products are measured and ascertained. To aid the transition of the CI from the traditional state to the sustainable one, materials/products eco-labels aims to protect the green market, expand the green market, curb greenwashing, and reduce environmental impacts.

5.1. Green market protection

Several construction products/materials have laid claim to a certain level of been green without the application of any standard, hence the reason for the development of products/materials rating systems, standards and guidelines (eco-labels). However, the development of materials and products eco-labels are out of the need to protect the green market from construction materials that are unsustainable for use. According to [20], these product eco-labels ensure the protection of the green market in the following way:

- Ensures the confidence of consumers (construction professionals and stakeholders) in materials/products quality;
- Provides consumers with detailed information about the materials/products quality;
- Prevents the influx/import and circulation of inappropriate or low-quality construction materials/products;
- Facilitates and simplifies the specification of materials/products for consumers;
- Stimulates the acceleration of scientific and technological development;
- Contributes to the improvement of the organisational and technical level of production; and
- Contributes to lasting success and protect competition with manufacturers and suppliers of non-certified materials/products.

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5.2. Green market expansion

GB has become answers to the several negative environmental impacts of the CI. With the global focus on rapid economic development of which infrastructural provision plays a key role, the adverse effects of the CI will continue to rise except the concept of GB is not embraced. The shift to GB development has now seen a significant increase in the demand for GB materials [19], owing to the understanding of their impacts on the natural and human environment. Manufacturers of green materials/products are ensuring their products are certified in other to penetrate and dominate the market and since certification is a criterion to guarantee patronage from consumers.

5.3. Curbing greenwashing

Due to the global call for the adoption and implementation of sustainable construction practices, there has been an increase in the utilisation of green products/materials. Hence, the reason for the significant proliferation of construction materials and products with false claims on their sustainability attributes which is termed "greenwashing". According to [21], greenwashing is the convergence of shoddy environmental capacity and affirmative disclosure about the environmental performance of a product. However, [22] presented the definition of greenwashing simply as a false claim and label of products as environmentally-responsive while they are not. The intention of which is to take advantage of the booming market and demand for materials with little or no environmental footprint by flooding the green market with false eco-friendly materials/products. Adopting the use of construction materials/products certified and rated by credible eco-labels with global integrity is, therefore, a significant way of tackling greenwashing marketing tactics.

5.4. Reducing environmental footprint

The selection and use of construction products and materials that are not environmentally responsible is a significant hindrance to the successful greening of the construction industry. With the advent of eco-labels, an inventory of product/materials LCA is provided including global warming potential, emissions, resource use (weighed and absolute), embodied energy and energy consumption among many others. Construction professionals and stakeholders are therefore able to specify and use materials/products based on their environmental impact and performance as detailed by the eco-labels they possess. Embracing the use of certified/rated green building materials with the 3R (reduce, reuse and recycle) characteristics; focusing on health impact and toxicity in materials/products; and understanding and applying life cycle analysis (LCA) of construction materials/products are factors suggested by [18] to be considered by construction professionals and stakeholders in the quest to meet the greening target of the CI.

6. Conclusion and recommendations

As the adverse impact of the CI continues to be evident and bite, the role played by construction materials and products cannot be overemphasised. These materials/products are known to emit VOCs, contains non-recyclable content and hazardous substances, consumes a significant amount of energy, and generate waste. All of these impacts among many others are contributors to the environmental degradation experienced globally. In the bid to mitigate these environmental impacts of the CI, the demand for eco-friendly construction materials and building components has seen a rapid increase. The objective of this paper was to assess the role of product eco-labels in the sustainability drive of the CI while adopting a descriptive-exploratory approach.

To profitably maximise the boom in the green market, manufacturers are giving false information on the environmental performance about their materials/products referred to as greenwashing. The adoption of reliable sustainability assessment, certification and labelling tools for construction materials/products helps serve as a guide to the right specification, selection and use. While some eco-labels (multiple attribute eco-labels), such as Green Seal and Environmental Choice New Zealand (ECNZ) evaluates materials/products against several environmental standards, others (single attribute eco-labels) such as Energy Star, Basta and GRI Green Label Plus assesses only one standard (energy efficiency). Materials/products eco-labels provides consumers (construction professionals and stakeholders) with a clear understanding of the available materials/products in the green market, provides sound information on their composition, environmental performance and effect. This study is intended to benefit the CI and encourage the specification and use of certified construction materials/products. The study recommends that government and construction professional bodies should support the proliferation and uptake of certification as a yardstick for materials specification and use.

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