

Lessons for South Africa from global trends in environmental labelling of buildings and construction products

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1 Introduction

The consumption choices of individuals shape consumer markets and drive production patterns. Environmental labelling serves as a means of communication, from the producer¹, to the consumer², of the consequences of consumption choices and behaviour so as to encourage the demand for, and the use of environmentally sound products³.

Encouraging the participation of all of mankind in environmental protection through appropriate access to product environmental information was endorsed by all three previous Earth Summits as indispensable to sustainable development. The *Declaration of the United Nations Conference on the Human Environment* (1972) points out that mankind's efforts to defend and improve the human environment for the benefit of present and future generations will need to be founded on fuller knowledge of the environmental consequences of human actions⁴. To assist consumers to make environmentally sound purchasing decisions, *Agenda 21* (1992) urges government, business and industry to develop consumer legislation and environmental labelling in consideration of the full life cycle environmental consequences of products and processes⁵. To accelerate the global shift towards sustainable consumption and production (SCP), the *Johannesburg Plan of Implementation* (2002) of the World Summit on Sustainable Development (WSSD) calls for a number of critical actions. These include the development of tools and policies founded on Life-Cycle Analysis; the development of public awareness-raising programmes on the importance of sustainable consumption and production (SCP); and the adoption, where appropriate, of voluntary, transparent, verifiable, non-misleading and non-discriminatory consumer information tools to provide information on SCP, in particular, the human health and safety aspects⁶.

This chapter examines the international state-of-the-art of environmental labelling of buildings and construction products⁷; and discusses ways in which the emerging South African framework for environmental labelling could benefit from the lessons learnt.

2 The role of Life Cycle Assessment in environmental labelling

The Life Cycle Assessment (LCA) concept, previously known as Life-Cycle Analysis, is a science-based tool which is used to measure the environmental performance of a product over its entire life cycle, from the acquisition of raw materials, through manufacture of the product, transportation and distribution, use and maintenance, and finally, to disposal of the product at the end-of-life (Figure 1). Where the extent of the inquiry ends with transportation of the product to the point of disposal, it is a cradle-to-grave analysis. If it

¹ Industry and business

² Used broadly to denote government, organisations or the individual

³ Used broadly, includes processes and services

⁴ Paragraphs 6 and 7

⁵ Section I, Chapter 4: *Changing consumption patterns*, paragraphs 4.2-4.22

⁶ Chapter III: Changing unsustainable patterns of consumption and production, paragraphs 15(a), 15(c), 15(d) and 15(e)

⁷ Construction products means all elements, materials and components which go into the construction of a building

includes the recycling potential, it is deemed a cradle-to-cradle analysis. Environmental performance is measured in terms of a wide range of effect categories (Table 1).

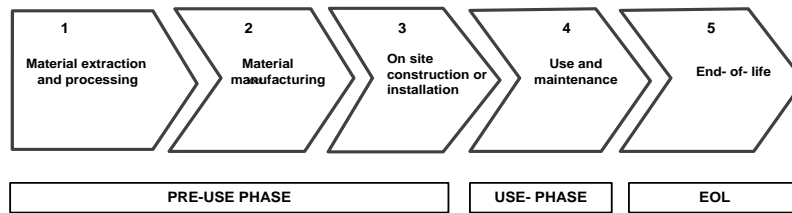


Figure 1: Generic life cycle stages of a construction product

Environmental labels and claims such as “recyclable” and “low energy” emerged in the 1980s in response to the growing global concern for environmental protection and conservation. To reduce confusion in the “green” market place, the International Organisation for Standardisation (ISO) developed its 14020 series of standards, *Environmental Labels and Declarations* for which LCA is the main analysis method. Of the three environmental labelling choices provided by the ISO 14020 series of standards, the Type III Environmental Product Declaration (EPD), which represents the closest link between LCA and environmental labelling, forms the basis for the building sector-specific EPD standard ISO 21930: 2007, *Sustainability in building construction – environmental declaration of building products*.

However, LCA is suitable for measuring the *potential environmental effects* of a product on the outdoor environment, but not the *environmental risks* associated with the use of that product in the indoor environment. Therefore, appropriate indoor air quality (IAQ) performance assessment standards are used in conjunction with the LCA-based standards when assessing the environmental performance of products destined for indoor use.

3 Building rating systems

3.1 First generation building rating systems

The environmental labelling of buildings contributes to society’s quest for sustainable development. Starting with the United Kingdom’s (UK) Building Research Establishment Environmental Assessment Method (BREEAM), established in 1990, a large number of building environmental assessment and rating systems have been launched around the world to put the concept of Sustainable Construction which is “the creation and operation of a healthy built environment based on ecological principles and resource efficiency” (Kibert, 1994) into effective practice. They include but are not limited to HK BEAM (Hong Kong, 1995), Eco-Profile (Norway, 1996), LEED (USA, 1997), CASBEE (Japan, 2001), Green Star (Australia, 2002) and Green Star (South Africa, 2007).

Building environmental assessment and rating systems develop voluntary standards, linked to credits, against which the environmental performance of candidate buildings can be assessed. Typically, both indoor/outdoor environmental aspects are assessed. Summing the credits gives an overall score for the assessed building. The standards provide practical guidelines for improving the environmental quality of buildings relative to current typical building practices. The notion of rating⁸ is used together with the assessment as a logical outcome. For example BREEAM (UK) applies a rating scale ranging from “Excellent” to “Fair”.

Given the historical lack of an environmental-management structure in the construction industry sector, building rating systems have come to serve an important secondary function by providing a framework that defines and guides the green building process (Blom, 2006; Cole, 1998; Zimmerman & Kibert, 2007). Building rating systems also foster a more integrated approach to design by the building team and provide a broad

⁸ Rating is used interchangeably with labelling

coverage of building-related environmental issues, enabling building performance to be comprehensively described.

However, “first generation” building environmental assessment and rating systems are subject to a number of shortcomings and limitations that constrain their future effectiveness as drivers for Sustainable Construction. To truly contribute to sustainable development, performance assessments would need to be expanded beyond environmental considerations to include the economic and social dimensions of sustainability. Even if the assessment is kept within the existing confines of environmental sustainability, performance would need to be assessed against the *absolute* impact or burden that a building system exerts on the environment (Cole, 1998). This would require quantification of *all* the complex links between decision-making in the building life cycle; and the resultant contribution to outdoor environmental problems such as climate change, or indoor environmental quality issues such as sick building syndrome (SBS). Environmental performance is however assessed indirectly, on the basis of proxies – “atmosphere”, “ecology” or “responsible sourcing of materials”. LCA studies have shown that the service life of the building and its components; and the end-of-life management are environmentally significant but these are generally overlooked in an assessment. Furthermore, given the shelter needs of the world’s ever growing population, the voluntary nature of building rating systems may not be sufficient to create the necessary critical mass of high performing buildings to meet the increasingly urgent national, regional and global sustainability targets.

3.2 Second generation building rating systems

Ultimately, building rating systems need a scientific basis that links sustainability principles with solutions appropriate for the building sector. Trends in the environmental labelling of buildings, which are highlighted in the following sections, suggest that the sector is has embarked on this new route to Sustainable Construction. The environmental assessment of buildings is becoming less prescriptive and more performance-oriented, where performance is defined in terms of assessment criteria derived from the actual, as opposed to the perceived, environmental effects of buildings.

3.2.1 International trends - Sustainable Building Alliance

The Sustainable Building Alliance (SB Alliance) is an international coalition of standard setting organizations and construction industry sector stakeholders who aim to accelerate the international adoption of Sustainable Building (SB) practices through the promotion of shared methods of building performance assessment and rating (SBA, 2011). SB Alliance members include nine building assessment and rating tool developers, of which the most well-known are the US Green Building Council (LEED), the British Research Establishment (BREEAM).

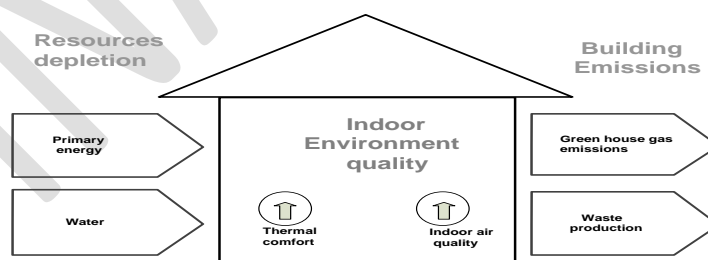


Figure 2: Six Indicators of sustainability, adapted from SBA 2009

In 2009, the SB Alliance identified a core set of six quantitative indicators for building performance assessments. Outdoor environmental effects will be assessed on the basis of four criteria, namely, primary energy, water, greenhouse gas emissions and waste. The assessment criteria for indoor environmental quality (IEQ), which reflect concerns for human health and well-being, are thermal comfort and indoor air quality (IAQ). The key source of information will be Environmental Product Declarations (EPDs) of building products. The additional indicators under discussion are economic performance, and visual and acoustic comfort. Unlike the first generation building rating systems which limit assessments to building design,

construction and operation, the harmonised environmental assessment and rating methodology takes the entire building life cycle into consideration (SBA, 2009). An assessment will factor in the service lives of building materials, components and elements; and will address deconstruction in lieu of demolition in the End-of-life (EOL) Phase. SB Alliance members started to implement the harmonised features by gradually phasing these into new versions of their building assessment and rating tools from 2009.

3.2.2 Regional trends – Harmonised European standard

To prevent the plethora of national building rating systems from becoming a technical barrier to trade within the European Union (EU), the European Commission (EC) in 2004 mandated the European Committee for Standardisation (CEN) to develop harmonised, horizontal⁹ European Standards for the measurement of the embodied and operational environmental effects of whole buildings and construction products across the entire life cycle. The key concepts which inform the harmonised standards include but are not limited to (CEN, undated):

- A holistic sustainability assessment which considers the economic, environmental and social performance of a building over the entire life cycle without value judgement;
- Application of the principles of ISO 21930: 2007, *Sustainability in building construction – environmental declaration of building products*; and
- A whole building assessment approach provided that a new building is assessed across all life cycle phases while the assessment of existing buildings is limited to the Use Phase and the EOL Phase.

The standards are intended to be voluntary. However, when regulating, EU Member States are required to use European Standards and mandatory standards are becoming the norm rather than the exception in the European community.

3.2.3 National – International Green Construction Code (IgCC)

By contrast to “green” building rating, which is voluntary and has spawned a niche market, the new International Green Construction Code (IgCC) is set to mainstream “green” building in the US as it stipulates enforceable minimum “green” requirements to be met by all buildings. The historic model code sets mandatory minimum requirements in respect of site development, materials use, energy and water efficiency, indoor air quality (IAQ) and commissioning (SB.com, 2011). A set of additional “project electives” gives users the option to customise content beyond the minimum sustainability requirements. As a model regulation, the IgCC requires adoption by a US state or jurisdiction to become law. Several local councils and state governments have already adopted the IgCC in the lead up to the release of the Final Version in March 2012. The IgCC was developed by the US International Code Council (ICC) in cooperation with a number of building sector stakeholders including the American Institute of Architects (AIA) and the US Green Building Council.

3.3 Building energy labelling

While all stages of the building life cycle demand energy and produce carbon emissions, the Use Phase (Figure 1) plays a dominant role, accounting for 40% of the world’s energy consumption, at least 20% of a country’s energy demand and 80-90% of a building’s life cycle energy demand. Building energy labelling provides a means to document, understand and reduce this dominant operating energy component and thereby contribute to security of energy supply and climate change mitigation efforts.

3.3.1 International – Common Carbon Metric for buildings

The Common Carbon Metric (CCM) for buildings measures energy consumption and reports GHG emissions from the Use Phase of existing buildings. It is intended to support international, regional, national and local energy policy development and industry initiatives. While the developers do not present it as a building rating

⁹ Harmonised means applicable to all building types and construction products

tool, the CCM for buildings gives the sector which represents 40% of the world's energy consumption and associated 33% GHG emissions a tool and a protocol to measure, report and verify reductions in a consistent and comparable way (UNEP-SBCI, 2009). The actual reporting is done in carbon dioxide equivalents (kgCO₂e) emitted per square metre per year in consideration of the building type and climatic region, but excluding the value-based interpretations inherent in weighting and benchmarking. The CCM methodology is consistent with that of a number of LCA-based standards, for example, the Greenhouse Gas (GHG) Protocol; ISO 15392: 2008 *Sustainability in building construction* and the ISO 14040 Series: *Environmental Management – Life Cycle Assessment*. The CCM for buildings was developed by the United Nations Environment Programme Sustainable Building and Climate Initiative (UNEP-SBCI) and unveiled at COP-15, Copenhagen 2010. It is currently undergoing two parallel processes, namely, pilot testing before it is released for use by the international community; and reconfiguration into an international standard so that it can form part of the ISO's offering of standards for sustainability in buildings.

3.3.2 Regional – Energy Performance of Buildings Directive (EPBD)

The Energy Performance of Buildings Directive (EPBD) is a key component of the energy efficiency policy of the EU, adopted to contribute to Europe's Kyoto commitment, security of energy supply and competitiveness. The EPBD requires EU Member States to implement mandatory energy certification of all building types at the time of construction, sale or rent (EC, 2009). To support the implementation of the EPBD after it became law in 2003, the European Commission (EC) mandated CEN to develop standards covering the key energy demand aspects of the building Use Phase that is, heating, lighting, ventilation and thermal performance (CEN, 2011). The implementation of the Directive started in 2005 and as at 2009 the majority of EU Member States had certification schemes in place.

3.3.3 National – Building Energy Quotient

Building Energy Quotient (bEQ) is an energy labelling programme which conveys information to consumers in a format similar to a nutritional label on food or the miles per gallon rating on a car (Reuters, 2009). The potential use of information provided by a bEQ label includes mandatory disclosure of building energy performance, an emerging policy already implemented in nine America States; and identification of the potential energy saving options for existing buildings. The bEQ rating system is applicable to both new and existing buildings including residential buildings higher than three storeys. It has two components, an Operational Rating (In Operation) and an Asset Rating (As Designed). Newly completed buildings receive an "As Designed" rating, based on simulation modelling results. An "In Operation" rating is awarded when a building has accumulated at least twelve consecutive months of actual energy use data. The "In Operation" rating is renewable annually therefore to maintain or achieve a preferred rating; building owners need to make use of the valuable insights provided by previous assessment data (Jarnagin, 2009). The bEQ labelling programme applies a 7-level technical scale¹⁰ to rate a building from A⁺ (Net Zero Energy) to F (Unsatisfactory). The results of an assessment are communicated in two ways – a prominently displayed label which confirms the building's rating; and an energy certificate issued to the building owner. The bEQ labelling programme is an initiative of the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). The bEQ label aims to drive both existing and new buildings towards net zero energy building¹¹ (NZEB). Development of the two bEQ labels started in June 2009 and both were subsequently tested and refined through pilot projects.

¹⁰ Technical scale means a rating scale which uses a potential as opposed to an existing building as its reference point. (The rating scale of the prominent building rating systems discussed in previous sections is a statistical scale, that is, the benchmark is the existing building stock).

¹¹ Net Zero Energy Building (NZEB) means a building which produces as much energy as it draws from the grid, effectively reducing its operating energy to zero.

4 Construction product certification programmes

4.1 Context for construction product certification

The outdoor and indoor environmental effect of a building is the sum total of the environmental effects of the hundreds of construction products – structural, envelope and finishing materials; and building services components – that go into the assembly and maintenance of the building. Product certification aims to avoid or reduce these potential effects at the level of individual construction products and is therefore an essential component of sustainable construction.

The outdoor environmental effects arise from resource use and pollutant release which may occur at any stage from raw material extraction to disposal or reuse of the construction product (Figure 1). The environmental areas of protection (AoPs) of interest to society are ecological and human health, natural resources and the built environment. The effects may occur at a global, regional or local scale. For example, GHG emissions contribute to climate change which is a global environmental problem. By contrast, product labels such as “No VOC” or “low VOC” is to communicate compliance with Volatile Organic Compounds (VOCs) *content* regulations which seek to reduce the contribution of this class of chemicals to ground level ozone formation which is a local environmental problem. Since not all VOCs contribute to ambient air quality problems, “No VOC” or “low VOC” labelled products can still off-gas potentially toxic chemicals into the indoor environment (AQS, 2010).

Table 1: Environmental areas of protection and labelling criteria

Examples of outdoor environmental effects of concern	Examples of common indoor air contaminants of concern
<ul style="list-style-type: none">▪ Climate change▪ Eutrophication▪ Solid waste generation▪ Fossil fuel (energy) depletion▪ Fresh water intake	<ul style="list-style-type: none">▪ Formaldehyde▪ Acetaldehyde▪ Toluene▪ Xylene

A growing body of scientific evidence suggests that the air within buildings can be more seriously polluted than the outdoor air (USEPA 2008); and that the construction products which occupy large surface areas – floors, walls and ceilings, are the single most important source of indoor air contaminants (Levin, 2010). Other research findings suggest that people spend up to 90% of their time indoors (GreenGuard, 2011). Such relatively long term exposure to low doses of chemical pollutants can result in moderate to serious systemic harm that does not reverse itself when an occupant leaves a building - this constitutes the most important potential exposure in respect of human health (Hodgson & Alevantis 2004). From an indoor air quality (IAQ) perspective, the key chemicals of concern are Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) used in the manufacture of furniture, upholstery, cleaning supplies and a broad range of construction products found in the indoor environment

Trends in the development and use of standards for certifying the indoor/outdoor environmental performance of building products are discussed in the sections which follow.

4.2 ISO 14020 certification programmes

The ISO 14020 Series of standards *Environmental Labels and Declarations* comprises ISO 14021(1999): *Type II Self-declared Environmental Claims*; ISO 14024 (1999): *Type I Environmental Labelling*; and ISO 14025 (2006): *Type III Environmental Declarations*. These documents are supported by a fourth document:

ISO 14020 (2000): *General principles*. The overall objective of this series of standards, internationally accepted as best practice on environmental labelling is to (ISO, 2000):

- Communication verifiable and accurate information - which is not misleading in anyway - on the environmental aspects of products and services;
- Encourage the demand and supply of those products and services that cause less stress on the environment: and
- Stimulate the potential for market-driven continuous environmental improvement.

4.2.1 ISO 14021(1999): Type II Self-declared Environmental Claims

As its title suggests, ISO 14021 is a standard for first-party claims therefore the criteria setting, product assessment and verification and certification protocols are all under the control of the product manufacturer. The standard is intended for business-to-consumer communication by means of statements or symbols. To foster the verification of a Type II claim, the methodology underpinning a claim needs to be scientifically sound. There is however no requirement to use Life Cycle Assessment (LCA) in any of its forms. To prevent unwarranted claims, ISO 14021 prohibits the use of vague or non-specific language such as “environmentally friendly” or “non-polluting” or “green” in a claim. Arguing that there are no definitive methods for measuring sustainability, the international standard specifically excludes usage of the terms “sustainability” or “sustainable” in the contents of a first-party claim.

Table 2: ISO Type II certification programmes

Programme name	Country/region	Environmental area of protection	Description
SCS ¹² recycled and material content certification	USA	Outdoor	Private (3 rd party). Limited to building products only
Energy Star ¹³	USA	Outdoor	National (voluntary, 3 rd party) programme. Covers building products including whole buildings

Type II labels are typically marketed on the basis of only one environmental attribute, for example, energy efficiency, with a risk that possibly adverse environmental impacts are not made known to the consumer. This label type is the most frequently dogged by concerns of “green washing”¹⁴. Many manufacturers are now resorting to second¹⁵ or third¹⁶ party certification to boost the public image of Type II labelled products - both of the examples given in Table 2 above conform to this trend which is a positive deviation from the intents of ISO 14021.

By contrast to the requirements for Type II labelling, the standards for Types I and III labelling have the following built-in features, designed to foster transparency, impartiality and credibility in the market place, namely:

- Independent, third-party verification and certification of product claims.
- A whole life cycle assessment based on multiple criteria so that all environmental consequences of a product are identified and addressed in a holistic manner.

¹² <http://www.SCScertified.com>

¹³ <http://www.energystar.gov>

¹⁴ To “green-wash” means to mislead consumers regarding the environmental practices of a company or the environmental benefits of a product or service (available at <http://sinsofgreenwashing.org/>)

¹⁵ Second-party certification implies that an interest group that stands to gain in some way from the increased market share of the product, has critical involvement in the certification process, either through administration of the programme, verification of claims or creation of standards and methods

¹⁶ Third-party certification refers to certification programmes in which all aspects of the programme are administered by an independent body whose only ties to product manufacturers are fees for assessment services.

- Thorough consultation; and participation of stakeholders (producers, consumers, authorities, etcetera) in the standard development process

4.2.2 ISO 14024 (1999): Type I Environmental Labelling

A Type I label is commonly known as an “ecolabel”. It conveys business-to-consumer information in the form of a symbol or seal of approval which confirms the environmental preferability of a labelled product within a specific product category. For example, an ecolabel serves to distinguish between an environmentally preferable or “green” carpet and a conventional carpet but not other floor coverings. An ecolabel is awarded by an impartial third-party who operates an ecolabelling programme¹⁷ which sanctions the use of the label. The relationship between LCA and ecolabelling lies in the criteria setting. ISO 14020 requires that the criteria be based on life cycle considerations – that is, the criteria selection process shall consider in a qualitative manner the function of the product (or service); and all life cycle stages¹⁸ and embodied effects¹⁹ associated with the product in question. The first Type I ecolabelling programme set up was the German Blue Angel, in 1978. Type I programmes now exist all over the world, though most are found in the developed countries. The Global Ecolabelling Network (GEN), a non-profit body representing Type I ecolabel programmes, has twenty-seven members made up of regional, national and privately run programmes.

Table 3: ISO Type I certification programmes

Programme name	Country/region	Environmental area of protection	Description
Nordic Swan ²⁰	Nordic countries	Outdoor /indoor	National (voluntary, 3 rd party) cross-sectoral programme of the Nordic countries. Covers all building products including whole buildings, e.g. homes
Blue Angel ²¹	Germany	Outdoor / indoor	National (voluntary, 3 rd party) cross-sectoral programme. Covers building products and construction equipment
SCS Indoor Advantage Gold ²²	USA	Indoor	Private (3 rd party) programme. Limited to products used indoors, e.g. decorative paints, hard surface flooring and insulation.
RFCI FloorScore ²³	USA	Indoor	Industry (2 nd party) programme. Limited to resilient flooring and hard flooring systems and their adhesives

Though ecolabelling programmes cover a wide range of different products only a few include building product labels – they are Nordic Swan (Nordic countries), Blue Angel (Germany), Environmental Label (China), Ecolabel (Czech Republic), Green Seal (USA), Ecolabel (European Union) and Ecomark (India). A few ecolabel programmes have also emerged in the USA in recent years which apply only to products used within an enclosed indoor environment. Table 3 provides examples of ecolabelling programmes.

¹⁷ Programme and scheme are used interchangeably in the literature

¹⁸ Extraction of raw materials, manufacture, distribution, use and disposal

¹⁹ Input of key resource (energy, materials, water), release of pollutants (to air, water and soil) and contribution to environmental problems (human and ecological health and natural resource depletion)

²⁰ <http://www.svanen.se/en/Nordic-Ecolabel/>

²¹ <http://www.blauer-engel>

²² <http://www.scs-certified.com/gbc/indooradvgold.php>

²³ <http://www.carpet-rug.org/>

4.2.3 ISO 14025 (2006): Type III Environmental Declarations

This label type, commonly known as an Environmental Product Declaration (EPD), represents the closest link between LCA and the environmental labelling of products. EPDs foster the environmental comparison of products fulfilling the same function, based on objective, quantitative information. As a declaration, an EPD simply discloses the environmental performance of products and expects the consumer to judge which product is best in an environmental sense. An EPD is intended for business-to-business communication but its use in business-to-consumer communication is not precluded.

An EPD needs to be developed in conformance with Product Category Rules (PCRs), that is, highly standardised procedures for conducting quantitative LCA²⁴ on a product in order to achieve results which are transparent, consistent and scientifically robust. As ISO 14025 is a generic standard, a further ISO standard, ISO 21930: 2007, *Sustainability in building construction – Environmental declaration of construction products* has been developed to provide a framework for construction product-specific PCRs. The certification of an EPD results in the issuing of a report card which provides detailed product environmental information, akin to the nutritional label on food products. Internationally, EPD programmes are represented by the Global Environmental Declarations Network (GEDnet). The first EPD programme was launched in Sweden in 1998.

Table 4: ISO Type III construction product certification programmes

Programme name	Country/region	Environmental area of protection	Description
BRE Global ²⁵ Environmental Profiles	UK	Outdoor	National (voluntary, 3 rd party) building sector-specific programme. Covers all building products - materials, components and whole buildings
AUB ²⁶	Germany	Outdoor	National (voluntary, 3 rd party) building sector-specific programme. Limited to building materials and components
The Green Standard ²⁷	USA	Outdoor	Private (3 rd party) building sector-specific programme. Limited to building materials and components
RT ²⁸ Environmental Declaration	Finland	Outdoor	Private (3 rd party) programme supported by government. Limited to building materials and components

Ongoing developments which point to an increasing role for EPDs as a fundamental tool for Sustainable Construction include:

- A more rapid development of building sector-specific EPD (Type III) programmes as compared to the limited number of cross-sectoral Type I programmes which carry a few building product labels. At least ten of such programmes have been launched in Europe and North America since the late 1990s (Chevalier et al, 2004). Examples are given in Table 4.
- An EPD standard for building products, which is currently under development, and is likely to become a US national standard, subordinating existing Types I and II labels (Leonardo Academy, 2008).
- Development of a harmonised, European EPD standard for construction products to be published in 2012 (BRE Group, 2011).
- Obligatory EPDs for construction products as required under France's *Le Grenelle de L'Environnement* which came into effect in early 2011 (Schenck, 2009).

²⁴ The LCA behind an EPD must comply with the ISO 14040 Series of standards: *Environmental Management – Life Cycle Assessment*

²⁵ <http://www.bre.co.uk>

²⁶ <http://www.bau-umwelt.com>

²⁷ <http://www.thegreenstandard.org>

²⁸ <http://www.rts.fi>

4.3 Indoor air quality performance certification programmes

The purpose of indoor air quality (IAQ) performance labelling is to foster the development and use of low-emitting construction products which have been shown to improve IAQ without a need to increase ventilation rates. Labelling is preceded by the development of emissions standards which meet or exceed nationally regulated exposure limits to the chemicals of concern. Certification results in the disclosure of environmental performance without claims of environmental superiority. IAQ labels are characterised by statements such as “very low emissions PLUS” (EMICODE, 2011) and “Formaldehyde free” (GREENGUARD, 2011b).

IAQ certification programmes, which rely on voluntary participation by product manufacturers, take the form of environmental testing and labelling or comprehensive environmental evaluation and certification. To foster credibility, certification programmes are subject to second or third-party certification; and make provision for stakeholders to participate in the selection of evaluation criteria and the development of test standards.

Table 5: IAQ performance certification programmes

Programme name	Country / Region	Environmental area of protection	Description
M1 Classification ²⁹ Scheme	Finland	Indoor	Private (3 rd party) programme promoted by government for building products, e.g., wall and floor coverings
GreenGuard Indoor Air ³⁰ Quality (Type I)	USA	Indoor	Private (3 rd party) programme for building products, promoted by government, e.g., countertops, cabinetry and doors
Indoor Climate Label ³¹	Denmark	Indoor	Industry (3 rd party) programme promoted by government for building products and other products used in the indoor environment
EMICODE ³²	Germany	Indoor	Industry (3 rd party) programme limited to building products for installation of floor coverings, e.g. screed.

A common feature of IAQ certification is that the labelling of a product is generic. Product emissions testing takes place under standardised test conditions which foster comparison between products but cannot take into account the actual application context, for example, ventilation rates. Testing includes short (3-day) and long-term (28-day) assessment. The results of emission testing can be expressed as pass / fail in relation to a single Volatile Organic Compound (VOC) or Total Volatile Organic Compound (TVOC) limit value.

A major challenge for more widespread use of IAQ performance labelling to enhance indoor environmental quality is that the development of standards will require emissions, exposure and human health effects data. However, such data are currently insufficient or lacking because most nations do not have the regulations to limit or prevent exposure to indoor air contaminants. Emerging regulatory activity which holds promise for the future of IAQ performance labelling of construction products include:

- The European Union’s Construction Product Directive (CPD) of 1989 and Construction Product Regulation (CPR) of 2011 both require that no construction product should cause harm to occupants of buildings. To satisfy this requirement, the European Commission mandated CEN to develop harmonised test standards for the emissions of regulated dangerous substances into indoor air from building products and furniture (CEN, 2011).

²⁹ <http://www.rakennustieto.fi>

³⁰ <http://www.greenguard.org>

³¹ <http://www.dsic.org>

³² <http://www.emicode.com>

- The EU Member States are also taking individual action to meet the requirements of the CPD and CPR. Germany has a restriction on VOC emissions from construction products which has formed the basis for mandatory testing of floor coverings and their adhesives since 2004 (Levin, 2010). In March 2011, France published mandatory labelling requirements for construction products installed indoors. The regulation is effective from January 2012. The construction product groups covered by the French regulation include but are not limited to floor and wall coverings, ceiling systems and all products used in their installation (Eurofins, 2011).
- The European REACH³³ policy which in February 2011 imposed a ban on five chemicals used in construction products. The targeted substances include three phthalates³⁴, HBCDD³⁵ and MDA³⁶. The ban impacts on the supply chains of a number of common construction products including PVC, foam insulation, carpet backing, adhesives and composite wood products (HBN, 2011).
- The Building Standards Law of Japan stipulates mandatory testing of all construction materials against a standard for emissions rates of VOCs into the indoor environment (Levin, 2010). The Japanese standard currently covers building boards, wall paper, floor coverings, adhesives, decorative paints and coatings and heat insulating materials.

5 South African state-of-the-art

5.1 Policy context

The use of environmental labelling as an instrument for sustainable development is not new in South Africa. The Constitution, Act 108 of 1996 makes provision for an Environmental Right³⁷; and also guarantees access to environmental information³⁸ required to protect that right. *The White Paper on environmental management policy for South Africa (1998)* makes specific reference to eco labelling³⁹ as a means for industry to take greater responsibility for environmental protection⁴⁰; and for the consumer public to gain access to environmental information⁴¹, signalling that the minimum preferred national standard for environmental labelling ought to be the ISO Type I Ecolabel which is based on multiple life cycle criteria; and requires public consultation and third-party certification. This policy position has been transcribed in key items of consumer and environmental legislation. For example, the *Air Quality Act* of 2004 requires the use of environmental labelling to achieve emissions reductions targets; and the minimum requirements set out by the *Consumer Protection Act* of 2008 include labelling of products which may result in hazardous waste.

However, in practice, the degree of environmental awareness of the consumers in a particular country or region will determine whether a market for “green” products is initiated and can be sustained. In the context of South Africa, there has been extensive media coverage linking the building life cycle to the most prominent environmental issues of the current era, that is, energy security and climate change. This has served to stir up an interest in environmental protection by both producers and consumers, creating the necessary momentum for the demand and supply of green buildings and construction products.

³³ Registration, Evaluation and Authorisation of Chemicals (REACH) is the regulation that governs the management of chemicals in the European Union

³⁴ The banned substances are known hormone disrupting reproductive toxicants used in flexible PVC products such as vinyl flooring

³⁵ A persistent, bio-accumulative toxicant (PBT) widely used as a flame retardant in polystyrene foam insulation

³⁶ A know, potent carcinogen used as a basic building block in the manufacture of polyurethane foams and some composite wood binders.

³⁷ Section 24 of the Constitutional Bill of Rights

³⁸ Section 32 of the Constitutional Bill of Rights

³⁹ Government Gazette dated 15 May 1998 - Chapter 5: Governance – indirect measures, page 54.

⁴⁰ Government Gazette dated 15 May 1998 – Chapter 4: Strategic goals and objectives, page 31.

⁴¹ Government Gazette dated 15 May 1998 – Chapter 3: Principles, page 24.

5.2 Status of environmental labelling in the SA construction industry sector

Green Star SA

The notion of rating and certifying South African buildings as “green” first came into prominence when the Green Building Council of South Africa (GBCSA) launched its first Green Star SA tool in November 2008. To date, four rating tools for office, retail, multi unit residential and public and education buildings have been published. The overall aim of GBCSA is to develop building rating tools, based on the Australian Green Building Council tools, to provide the South African property industry with an objective measurement for green buildings and to recognise and reward environmental leadership in the property industry. As a whole building assessment and rating tool, Green Star SA awards credits for the choice of environmentally sound construction products but cannot in any way test, verify or certify the environmental performance of such products. Emerging environmental standards and initiatives which respond to, and also complement the “green” marketing opportunity created by Green Star SA are discussed in the sections below.

EcoStandard South Africa

EcoStandard South Africa is a non-profit body aiming to provide impartial, third-party environmental certification services for construction products. The basis for environmental performance assessment and labelling will be EcoProduct, a tool founded on the principles and procedures of the Type I environmental labelling standard, ISO 14024: 1999. EcoStandard completed a pilot project in 2011 and intends to launch its construction product certification programme, which will rely on voluntary participation by construction product manufacturers, in January 2012.

Energy labelling standard for buildings

SANS 204 *Energy Efficiency in Buildings*, released for final comment in March 2011, is a national standard for energy labelling of buildings. It is set to mainstream energy efficient building in South Africa as it specifies minimum energy usage requirements to be met by all building types, whether ventilated naturally or artificially. In terms comparable to that of ASHRAE's bEQ, SANS 204 requires an energy audit to be conducted twelve months after completion of a new building as proof of compliance with the benchmark set for the building type. SANS 204 is currently subject to voluntary application in new buildings but can be used for the retrofitting of existing buildings. A process is currently underway to translate the *General Requirements* of this historic national standard into enforceable provisions under the National Building Regulations (NBR). SANS 204 has been developed to support the implementation of building sector-specific targets set under the *National energy efficiency strategy of the Republic of South Africa (2005)* which sets a national long term target for energy demand reduction of 12% by 2015.

South African National Ecolabelling Scheme

The goal of the South African National Ecolabelling Scheme (SANES), a government funded initiative established in 2007, is to create an enabling environment for South Africa to achieve an important environmental policy milestone – that of using industry self-regulation to complement environmental regulation. SANES provides third-party certification of environmental claims in accordance with principles and procedures of the Type I environmental labelling standard, ISO 14024: 1999. Participation in SANES is voluntary. The stated objectives of SANES are to:

- Unite the growing number of environmental claims “under one umbrella”;
- Provide environmental assessment, certification and labelling services for all South African industry sector products;
- Enhance the market share of “green” products; and
- Encourage new actions which will enhance biodiversity, minimise waste and pollution and conserve resources (water and energy)

To date, SANES has developed and piloted ecolabels for domestic cleaning products and the tourism sector. There is currently a process underway to develop SANES ecolabels for construction products. SANES is administered by Indalo Yethu, a legacy project of the Third Earth Summit which was held in Johannesburg in 2002. Indalo Yethu was created by the Department of Environmental Affairs (DEA) in 2003.

Materials manufacturing industry initiatives

The results of a desk top survey on the “green” initiatives of leading South African manufacturers of construction products suggests that “green” marketing is established and growing. Nine out of twenty-one major construction material groups already feature an environmentally sound or “green” brand. There is however a strong trend in ISO Type II Self-declared claims and therefore a high risk of loss of consumer confidence due to fears of green washing. Furthermore, five out of the nine major material groups identified in the survey (Table 6) - floor covering; decorative paint; doors, windows and frames; particleboard and medium density fibreboard (MDF); and insulation are known to have a negative influence on indoor environmental quality and should therefore be labelled with IAQ performance in mind. However, with the exception of one floor covering brand, the “green” claims identified in the survey are concerned with energy use and GHG emissions / the protection of the outdoor environment.

Table 6: South African construction product certification and labelling trends

Construction product group	Certification trend	Environmental area of protection / labelling criteria
Cement	First-party	Outdoor – energy and air quality (GHG emissions)
Masonry	First-party	Outdoor – materials, energy and air quality (GHG emissions)
Floor covering	Third-party	Outdoor/indoor, materials, energy , air quality (GHG emissions and IAQ)
Decorative paint	First-party	Outdoor – air quality (VOC emissions)
Doors, windows and frames	Third-party	Outdoor, Forest Stewardship Council (FSC) certified
Particleboard and MDF	First-party	Outdoor – materials, energy and air quality (GHG emissions)
Glass and mirrors	First-party	Outdoor – materials, energy and air quality (GHG emissions)
Insulation	First-party	Outdoor, air quality (CFC and HCFC emissions)

6 Lessons learnt

Environmental labelling emerged in the 1980s in response to growing global concerns for environmental protection and conservation. In the construction industry sector, environmental labelling serves to incentivise sustainable construction which is an important component of society’s quest for sustainable development. It has evolved at two distinctive levels namely, whole building rating; and construction product certification.

Building environmental assessment and rating systems develop voluntary standards against which the environmental performance of candidate buildings is assessed, certified and rated. However, there is a mismatch between the performance assessment principles and practices of the first generation building rating systems; and what is needed to foster sustainable construction. Furthermore, the voluntary nature of building certification and rating has to date failed to create the critical mass of “green” buildings needed to accelerate the building sector’s shift towards patterns of sustainable consumption and production, a precondition for sustainable development.

Second generation building assessment and rating systems, which are still evolving, are beginning to address these concerns. Their key features include:

- Promotion of shared methods of performance certification and rating to avoid confusion in the globalised marketplace and increase the credibility and demand for “green” building
- Adoption of LCA principles and quantitative criteria which enable performance to be assessed against the absolute impact that a building system exerts on the environment
- Development and adoption of economic and social indicators to foster a shift from sustainable construction, which addresses only environmental concerns, towards sustainable building which seeks to address all three dimensions of sustainability
- Increasingly serving as a source of minimum, enforceable environmental standards that local and national authorities can apply to all buildings to mainstream “green” building

In parallel with the second generation building rating tools, standards for the energy labelling of buildings are being developed at national, regional and global levels. The overarching objective is to give the sector which represents 40% of the world’s energy consumption quantitative, transparent tools to drive both existing and new buildings towards net zero energy building (NZEB). The energy labelling of buildings supports mandatory disclosure of building energy performance, an approach which has already been mainstreamed in the EU since 2005, and is now emerging across the USA.

The purpose of construction product certification is to minimise the outdoor environmental effects of buildings; and create a healthier indoor environment for building occupants. The basis for construction product certification is the ISO 14020 series of standards, *Environmental Labels and Declarations*. LCA, which is the main analysis method for this standard, is suitable for measuring the *potential environmental effects* of a construction product on the outdoor environment, but not the *environmental risks* associated with the use of that product in the indoor environment. Two principal types of construction product certification programmes have therefore emerged, ISO 14020 certification programmes; and IAQ certification programmes.

Of the three environmental labelling standards provided by ISO 14020, Type I Ecolabel and Type III EPD rely on multiple, LCA-based assessment criteria and make provision for public consultation and third-party certification which fosters credibility and impartiality. Furthermore, Type III EPD forms the basis for the building sector-specific standard ISO 21930: 2007, *Sustainability in building construction – environmental declaration of building products* which is playing an increasingly prominent role in the development of second generation building rating systems and the implementation of national and regional environmental policy. By contrast, the Type II Self-declared claim is prone to concerns of “green washing” therefore users of this standard are resorting to second or third-party certification to boost the public image of their “green” claims.

The purpose of IAQ performance labelling is to foster the development and use of low-emitting construction products which have been shown to improve IAQ without a need to increase ventilation rates. Mandatory IAQ labelling of construction products installed indoors to protect public health and safety is an established practice in many EU member states and Japan. A major challenge for international adoption of this approach is that most nations lack the human health effects data; and do not have the regulations to limit or prevent exposure to indoor air contaminants.

In the context of the South African construction industry, the launch of Green Star SA in 2007 and the ongoing efforts to develop and adopt other voluntary environmental standards for whole buildings and construction products respond to the environmental policy expectation that business and industry will take greater responsibility for environmental conservation and protection through self-regulation. The policy provision presupposes that the development of voluntary environmental standards, such as Green Star SA will be sufficient to stimulate the environmental improvement of individual buildings and major construction products, result in collective reduction in the environmental burdens attributable to the sector, and thereby serve as an input to national sustainable development targets.

However, the international literature suggests that a voluntary basis for building rating and construction product certification encourages a niche market whereas a more mandatory approach, driven by enforceable minimum environmental standards for all buildings, is necessary to garner the critical mass which meets such national policy expectations. Bearing in mind the key components of the emerging framework for environmental labelling in the South African building sector, comprising:

- Environmental policy provision/reference to ISO Type I Ecolabel which is based on multiple life cycle criteria; and requires public consultation and third-party certification as the minimum requirement for environmental labelling
- First generation whole building rating system / Green Star SA
- Whole building energy labelling standard / SANS 204
- Established or emerging ISO Type I Ecolabels and ISO Type II Self-declared claims

The following complementary measures would at a minimum be needed in the short term to consolidate the gains made, and drive the South African framework towards current best practice in building rating and construction product certification:

- Environmental standard or family of standards, applicable to all buildings, which complements SANS 204 by seeking to mainstream enforceable, minimum requirements in respect of site development, materials, water, indoor air quality (IAQ) and commissioning
- A national regulation which stipulates public consultation and third-party certification as minimum requirements for environmental labels, claims and declarations
- A construction product regulation which makes provision for the restriction, substitution or elimination of harmful substances used in the formulation of construction products installed indoors, and will therefore create an enabling environment for the development of IAQ labels for construction products

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