

Discussion Paper

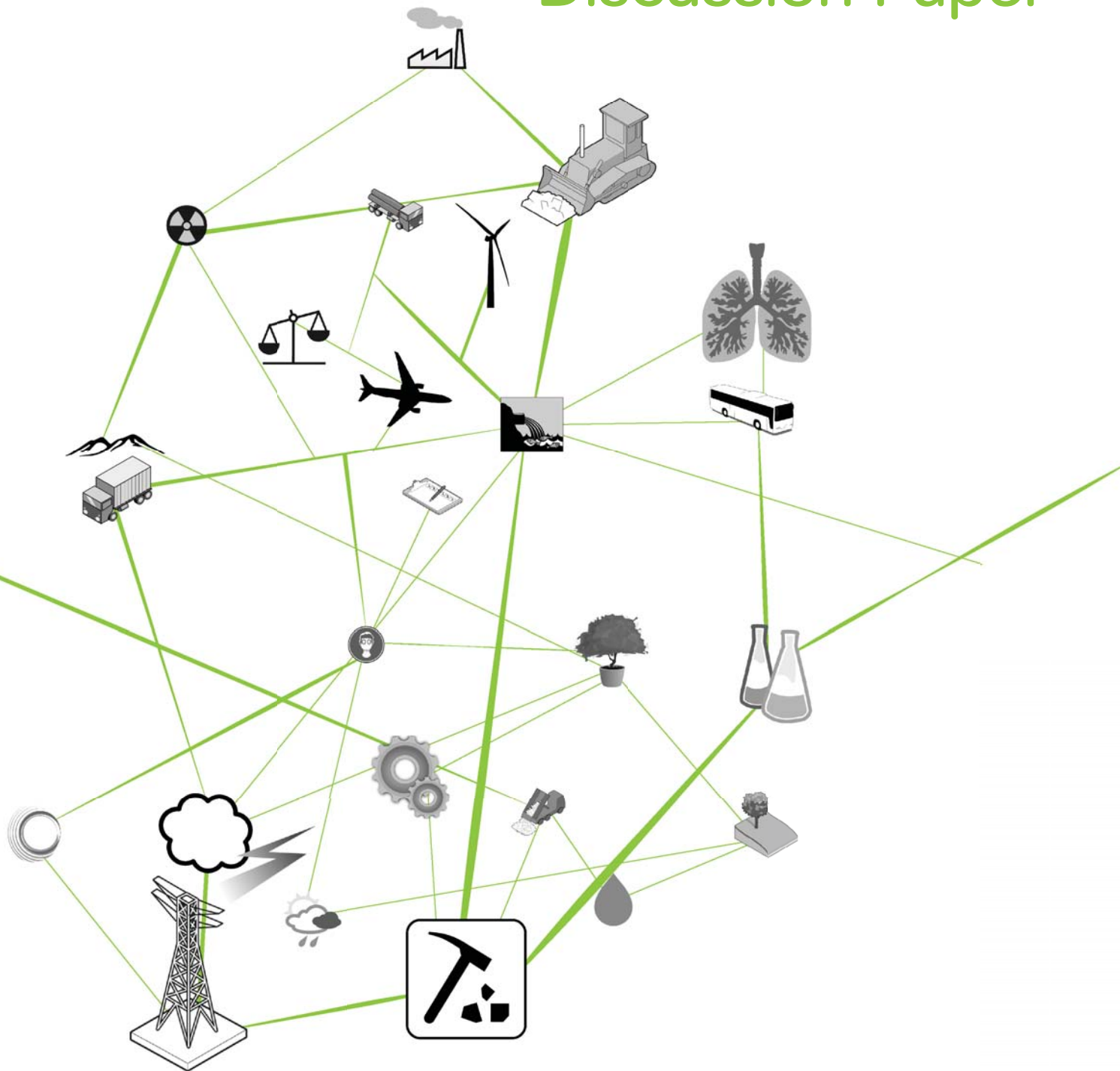




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1. Executive summary

Life cycle assessment (LCA) is a methodology used to estimate the overall environmental impact of materials or products during their lifetime. LCA is currently used by some in the Australian property and construction industry to identify and prioritise the use of products and materials with lower environmental impacts.

Currently, the Green Star materials category does not require projects to evaluate the impact of materials using LCA; but instead contains specific criteria that address opportunities for reduced environmental impact. These criteria address the majority of materials used in building construction, including concrete, steel, timber and PVC, and also reward the use of recycled and re-used materials.

The incorporation of LCA based methodology into the Green Star Materials category may facilitate and encourage:

- assessment of the environmental impact of selecting one material over others within a building
- selection of materials with lower environmental impact
- reductions in the quantity of materials used
- increased re-use of materials, and use of materials containing recycled content; and
- expansion of the Materials credits to address the impact of materials that are outside the bounds of the current credits.

The perceived benefits of an LCA-based methodology have prompted the release of this discussion paper, in order to explore how LCA may be effectively incorporated into the Green Star Materials category. It is anticipated that introducing LCA to the Green Star Materials category may:

- deliver better environmental outcomes
- continue to assist in the transformation of the Australian materials industry; and
- enable greater transparency, consistency and cost effectiveness.

This document initiates the discussion by outlining how LCA methodology may be incorporated into Green Star.









2. Introduction

This discussion paper is the first step in the development of the Green Star Materials category to assess the environmental impact of materials based on Life Cycle Assessment (LCA) principles and methodology.

The issues and possibilities outlined are based on stakeholder feedback provided to the Green Building Council of Australia (GBCA) through several Green Star Materials credit reviews, undertaken over the past few years. The paper includes an outline of what an LCA based methodology in the Green Star Material category may include, and how it may be incorporated into the various Green Star rating tools.

Tabled within this paper are a number of topics and issues which will require discussion and resolution prior to the incorporation of LCA into the Green Star Materials category. These include:

-  the environmental impacts considered
-  the need to set system boundaries
-  the assessment model to be used
-  the determination of benchmarks for awarding points
-  the approach for determining appropriate data inventories; and

-  the determination of appropriate mandated qualifications for practitioners undertaking LCAs on behalf of project applicants, manufacturers, and suppliers of building materials.

The basic objective of the incorporation of a life cycle-based approach into the Green Star Materials category is to facilitate and encourage the quantification of the environmental impacts of the majority of materials used in a Green Star project, and comparison of such data against a standard practice benchmark. In this way, the selection of materials or products that are determined to have a low impact in comparison to the reference case will be recognised and rewarded, while those recognised as having a high impact will be discouraged.

This paper is not intended to introduce the reader to LCA and the intricacies of how an LCA is conducted. Several LCA-specific concepts and terms are referenced, and it should be considered beyond the scope of this paper to define them. Further reading may be necessary for a better understanding of the specifics of LCA.

3. Provide your Feedback

This paper is intended to initiate discussion around the topic and create a basis for the practical incorporation of LCA into the Green Star Materials category.

This paper includes feedback prompts in blue breakout boxes. The GBCA is particularly interested in receiving feedback in response to these specific issues. However, feedback is welcome on any and all aspect of this discussion paper. You can submit your feedback either as a written report, addressed to: tool.development@gbca.org.au or via an online form at: www.gbca.org.au. All feedback should be provided by 15 July 2012.



- Is it appropriate for the GBCA to undertake this project or would any other organisation be better placed to do it. If yes, which organisation?
- Is the Australian market ready for LCA as a tool for assessing the environmental impact of materials? If no, in how many years time do you think the market would be ready?
- What do you see as the main barriers to implementing LCA as an assessment methodology for materials in Green Star?
- If the GBCA decided to introduce the methodology described in this paper, how much notice would you recommend the GBCA give to the market?

4. Materials category and LCA

The Materials category of Green Star rating tools aims to reduce the environmental impact of resources used in the construction or refurbishment of buildings. To achieve this, the credits in the Materials category encourage the re-use, recycling and responsible use of materials. In most cases, the credits within the Materials category cover the vast majority of materials used in building projects.

Leading up to the development of this discussion paper, the GBCA revised several Material category credits, including the credits for timber, PVC, steel, and concrete. Feedback received from industry stakeholders during the review of the Materials credits indicated that an LCA-based assessment methodology could be the next step in advancing the Materials category. However, at the time of these credit reviews (2008 to 2011), there were questions and concerns raised around the resources required to conduct LCAs in Australia, and how an LCA based methodology could be effectively incorporated into the Green Star Materials category.

Since this time, progress has been made by organisations such as the Building Product Innovation Council (BPIC) and several green building councils in other countries, to incorporate LCA methodology into comparable sustainability rating systems. Such progress motivates the discussion on the application of LCA methodology to the Materials category of Green Star rating tools. In the following sections of this document, one example of how LCA

could be incorporated to the requirements in the Green Star Materials category is detailed.

This example is based on feedback received during Materials category credit reviews conducted between 2008 and 2011, in addition to feedback provided by LCA practitioners in Australia.



5. Objectives

The objectives of incorporating LCA methodology into the Green Star Materials category across the various Green Star rating tools are aligned with the GBCA's mission and key objectives, which are to drive the transition of the Australian property industry towards sustainability by promoting green building programs, technologies, design practices, operation and the integration of green building initiatives into mainstream design, construction and building operation.

The specific objectives of this project are to:

- develop a transparent and consistent methodology for assessing the environmental impact of construction materials using life cycle assessment
- continue to assist and facilitate the uptake of best environmental practice product and materials selection in the Australian construction market
- facilitate the use of ISO 14025, Environmental Product Declaration (EPD) for materials assessment in Australia.
- deliver better environmental outcomes; and
- deliver these outcomes in a cost-effective manner.



The Green Building Council of Australia invites feedback from stakeholders on the objectives of the project.

6. Methodology

This section introduces an outline of how an LCA based methodology could operate within the Green Star rating system, including the modelling requirements, scope of assessment, boundary definition, environmental impact categories and more. In LCA terminology, this is the 'product category rule'. The product category in this case is materials used in new buildings and building refurbishments. The next section of the document discusses data inventory and how results should be interpreted within a Green Star context.

It is proposed that the following construction elements be included in the assessment:

- columns
- beams
- slabs
- exterior walls, including curtain walls
- windows, including framing and glazing
- core structure
- interior load bearing walls
- roofs
- foundations; and
- cabling, pipes, conduit and related fittings used in the provision of water and waste water services, electric and data services, ventilation and air conditioning.

Scope of Assessment

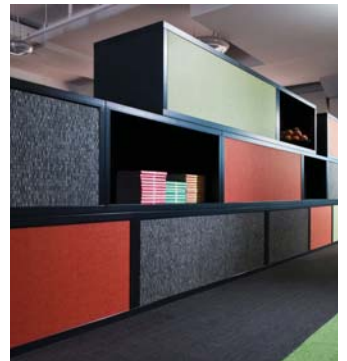
The scope of assessment of the proposed LCA includes the building structure, core services and façade materials. Such a scope is intended to address the majority of materials used in building construction while providing a balance between the robustness of an LCA approach, and the complexity of implementation.

Limiting the initial scope of assessment will simplify the task of conducting LCAs. GBCA recognises that simplification may be necessary to mitigate against the risk of assessments becoming overly complex and expensive as a result of the inclusion of additional building elements. The scope of assessment may be expanded in the future.



It is proposed that following be excluded from the scope:

- elements associated with the construction process (including those related to components included within the scope as listed above). For example mortar, formwork, etc.
- construction equipment such as pumps, chillers, energy generation systems, computers, servers, tanks, photocopiers, refrigerators etc
- paints, adhesives, grouts and sealants
- HVAC systems (including duct work)
- lift systems
- light fittings
- bathroom and kitchen fittings and fixtures, such as hand basins, tap ware, toilets, urinals and other hardware
- ceiling systems
- non-load bearing internal walls and partitions
- shading structures and other elements that form part of the exterior skin of the building
- flooring, furniture, joinery, raised floors and other elements of the interior fitout
- landscaping
- hand rails, balustrades, stairs, and other interior hardware; and
- outdoor furniture and other outdoor materials.



The Green Building Council of Australia seeks your feedback on the following questions.

- The list of inclusions may be expanded in the future, is it appropriate to start with a limited scope of assessment in order to simplify the LCA?
- Please provide feedback on the list of inclusions and exclusions.
- Are there additional materials should be addressed by the inclusions and exclusions?



Boundary definition

There are currently two main approaches to defining LCA system boundaries - 'cradle to grave' and 'cradle to gate'. 'Cradle to grave' assesses the impact of a product from raw material extraction to manufacture, through to use and disposal, including all inputs and outputs throughout the cycle. 'Cradle to gate' is a partial life cycle assessment, analysing the impact from raw material extraction to manufacture, stopping at the 'factory gate'.

The main advantage of limiting the system boundary through the adoption of a 'cradle to gate' approach is simplicity. However, such simplicity comes at the expense of the completeness of the assessment. For example, transport from the factory to the building site is excluded in a 'cradle to gate' approach, as are construction, ongoing maintenance and disposal. As such, 'cradle to grave' is the more complete approach.

It is proposed that a third approach be developed, which assesses the product from raw material extraction through to the constructed, sealed and serviced building. The term 'constructed, serviced and sealed' is taken to mean a finished building structure, including all services such as water, electric, ventilation, air conditioning, etc, installed in common areas. 'Sealed' means protected from the elements, and encompasses all exterior wall, roof cladding, and glazing.

The GBCA believes there is merit in adoption of a limited approach in the first instance. This provides an entry level LCA in Green Star rating tools and paves the way for more robust LCA approaches to be developed in the future. A more limited approach corresponds well with the aim of the Green Star Materials category in promoting the environmentally sound use of materials, and will address the same materials currently assessed within the Green Star Materials category. Such an approach also provides a balance between the cost of completing the LCA, and the credibility of the result.

The consequences of limiting the system boundary to the delivery of a constructed, serviced and sealed building means that many impacts which occur post construction will not be assessed, most notably maintenance and disposal. However, this is consistent with the current scope the Materials category, which does not directly address post-construction impacts.

The proposal will be implemented across both Green Star - Design and Green Star - As Built rating tools. In a Design assessment, the applicant will have to make justified assumptions regarding the source and transport of materials to use the LCA methodology.

The Green Building Council of Australia invites feedback from industry stakeholders on the proposed system boundary:

- Is the use of a 'cradle to constructed, sealed and serviced' building approach appropriate?
- Is it practical to make qualified assumptions about the origin and the distances that material must be transported in a Green Star design submission, i.e. at a tender stage when some the specific materials are unknown?

Functional Unit

On the basis of the proposed boundary definition and scope discussed above, the proposed functional unit used for reporting the results of the LCA is one Gross Floor Area (GFA) unit (m²) of the constructed, sealed and serviced building.

If in the short term there are constraints in applying the scope proposed, another may be developed. This, as well as any other changes to the product category rules, will influence the functional unit adopted.

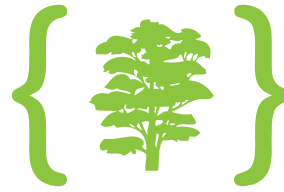
M²

GFA

(Gross Floor Area)

The Green Building Council of Australia invites feedback from industry stakeholders on the functional unit:

- Is 1m² of GFA an appropriate unit?
- Are there constraints to using this unit?
- If there are constraints or reservations about the proposed functional unit, what are the alternatives?



Environmental Impact Categories

Life cycle assessments generally take a range of environmental impacts into consideration. As an example, the Australian Building Products Life Cycle Inventory¹ addresses 14 environmental impact categories:

1. Climate change
2. Mineral and fossil fuel depletion (i.e. abiotic depletion)
3. Land transformation/occupation and biodiversity
4. Water footprint
5. Eutrophication
6. Acidification
7. Eco-toxicity
8. Photo-chemical smog
9. Ozone depletion
10. Ionising radiation
11. Human toxicity
12. Respiratory effects
13. Nuisance
14. Indoor environment quality

1. Developed by the Building Products Innovation Council (BPIC) and the Australian Life Cycle Assessment Society (ALCAS).

Some stakeholders have indicated that it may be preferable to include five or six environmental impact categories in the first version of an LCA - based methodology as it applies to Green Star. Other stakeholders claim that the application of many impacts will not require significant additional resourcing when compared to a smaller number of impacts. Depending on feedback received, and in the event that a limited number of impacts are included, it is proposed that initially the following impacts will be included. Please note that these definitions are taken from the Australian Building Products Life Cycle Inventory:

1. Climate change.

This measures the greenhouse gas emissions which have been generated by a product or material. Climate change is also called global warming potential (GWP) or carbon footprint. Factors are expressed as global warming potential for time horizon 100 years (GWP100), in kg carbon dioxide/kg emission.

2. Land transformation and use.

This measures the environmental damage caused during production. It is measured in hectares of land transformed.

3. Ecotoxicity to land and water.

Ecotoxicity to land provides an indication of the damage to land based ecosystems. Ecotoxicity to water provides an indication of the damage to water-based ecosystems. The indicator is reported in kg 1,4 diclorobenzene (1,4-db) equivalent.

4. Mineral and fossil fuel depletion (i.e. Abiotic depletion).

Fossil fuel depletion measures the use of fossil fuels in production, and is measured in kg of oil-equivalents. Mineral resource depletion measures the extraction of minerals as a result of production inputs. This indicator generally excludes fossil fuel use and soil erosion. It is measured in kg of mineral extracted.

5. Water depletion.

This measures the use of water from all water sources. This includes water use in manufacturing and construction, and water used for electricity generation. Water depletion is reported in litres.

6. Human toxicity.

Human toxicity provides an indication of the risk to human health. These are based on concentrations tolerable to humans. This toxicity indicator generally excludes the impact on human health from indoor air quality. The indicator is reported in kg 1,4 diclorobenzene (1,4-db) equivalent.

The Green Building Council of Australia invites stakeholders to provide feedback:

- Is it appropriate to limit the number of environmental impact categories to six?
- If more categories are to be included, which categories do you recommend be included? What method should be applied to determining the impact categories the LCA will take into account?
- If fewer categories are to be included which categories do you recommend be removed?
- If six impact categories are appropriate, are the six categories above the most appropriate?
- Is it appropriate to refer to the AusLCI impact categories? Is there an alternative which should be used? Why?

Weightings of Environmental Impacts

Weightings are essential for LCA results to be calculated. Ideally, it is proposed that established weightings be referenced. In Australia, there is a lack of agreed weightings, although there is one example of established Australian weightings for LCA - the Building Products Weighting for Environmental Impact Categories, which has been developed as part of the 'Aus LCI' project.

There are other examples of established weightings that may also be applied. As part the incorporation of LCA methodology into the Green Star Materials category, the proposed weightings of the environmental impacts chosen will determine how improvements against specific impacts are awarded with Green Star points.

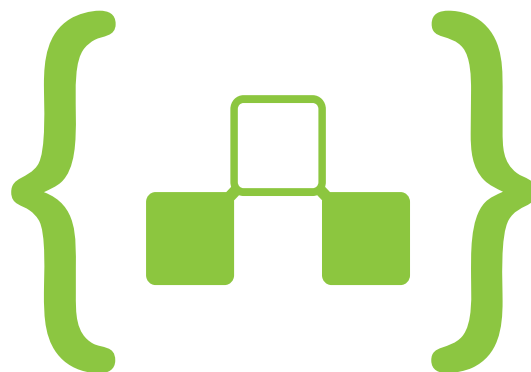
The Green Building Council of Australia seeks stakeholder feedback on the proposed Weightings and points:

- Is it appropriate to reference the BC LCI weightings? If not, what should be used instead?
- Is it appropriate to have separate credits for each of the environmental categories or should the total score be weighed together and assessed in one credit?



7. The Assessment Model

It is proposed that the environmental impact of materials used in a Green Star project will be estimated using LCA. The results of this LCA will then be compared with the environmental impact of materials used in a standard practice, reference case building.



The same calculation methodology and assumptions should be used when calculating the environmental impact from the materials used in the proposed building and the standard practice building. The input parameters should be the only difference between the two calculations.

The Standard Practice Reference Case

A reference case will be used as a benchmark for comparison with the proposed building. It is proposed that this reference case may operate as follows.

Recognising that conventional design is different for low-rise, mid-rise and high-rise, three standard practice cases reflecting this will be developed. In this case, the terms 'low-rise', 'mid-rise' and 'high-rise' are defined as follows:

- Low-rise - 1 to 4 storeys
- Mid-rise - 5 to 15 storeys
- High-rise - 16 storeys and above.

Each project will be required to create a reference case. This will involve quantifying the standard practice use of materials for the specific type of construction. The quantities, types and other qualities of each material would be estimated by adding the quantity across all building components. Instructions and definitions for how these quantities should be estimated and how the environmental impact from these materials should be calculated will need to be developed.

Table 1 below includes examples of how to determine what the input parameters should be for the standard practice reference case. Please note that this table is provided as an example and will be further developed.

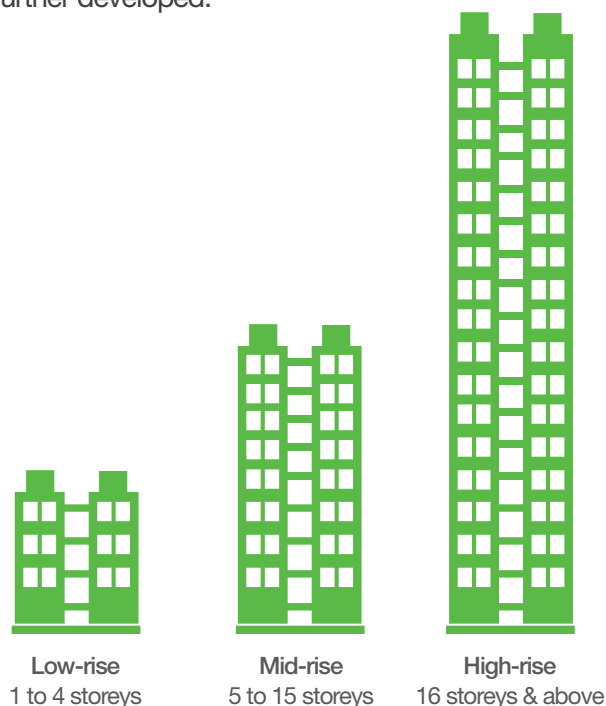


Table 1: Standard practice for low-rise buildings

Building component	Functional Unit	Proposed Building	Standard Practice Low-rise			
		Material and Quantity	Material	Quantity	Environmental impact data	Distance Transported
Columns	m ³	As per the building design	Reinforced Concrete	Define conventional spacing	to be selected following stakeholder engagement	The distance from the closest concrete batching plant, and steel supplier
Beams	m ³	As per the building design	Reinforced Concrete	Define conventional spacing	To be agreed (TBA)	The distance from the closest concrete batching plant, and steel supplier
Slabs	m ³	As per the building design	Reinforced Concrete	One slab per storey covering the entire floor plate	(TBA)	The distance from the closest concrete batching plant, and steel supplier
Exterior walls	m ²	As per the building design	Brick	Four walls, covering the entire building exterior except the area covered by windows and doors.	(TBA)	To be defined
Core Structure	To be defined (TBD)	As per the building design	Reinforced Concrete	One core that goes through the entire building.	(TBA)	The distance from the closest concrete batching plant, and steel supplier
Windows	(TBD)	As per the building design	Single Glazed Aluminum Framing	Define conventional number of windows in a conventional design	(TBA)	Sourced in Australia
Roof	(TBD)	As per the building design	Reinforced Concrete	Covering the same area as the building footprint	(TBA)	The distance from the closest concrete batching plant, and steel supplier
Foundation	(TBD)	As per the building design	Reinforced Concrete	To be defined	(TBA)	The distance from the closest concrete batching plant, and steel supplier
Cabling	(TBD)	As per the building design	PVC and copper	To be defined	(TBA)	To be defined
Pipes	(TBD)	As per the building design	PVC	To be defined	(TBA)	To be defined

The Green Building Council of Australia invites feedback from stakeholders:

- Is it practical to establish a standard practice reference case for low-rise, mid-rise and high-rise buildings of different classes? If not, what other methods could be used to establish a reference case?
- Should the reference case distinguish between new building on a green field site, refurbishment of existing buildings and fitouts? How can an equitable system be developed which acknowledges the advantages of the options from an environmental impact perspective?
- If the reference case is constructed in a similar manner to that described above, would you be able to provide your interpretation of how this may operate in practice?
- Can LCA methodology in the Green Star Materials category operate without a reference case? If so, how do you see this working?
- Is it practical to conduct two iterations of the LCA with different inputs for the project?
- How much additional time would it take to do the second iteration of the LCA having completed the first one? Is it 25% more, 50% more, 100% more etc?
- Does the intended content of Table 1 include enough data to determine the input parameters for the standard practice case LCA? If not, what is missing?
- What would be the best way to determine the rules for the input parameters in Table 1?

Reporting Mechanism

In order for the proposed LCA methodology to operate effectively, manufacturers and suppliers of building product will need to provide LCA data concerning their products using the product category rules prescribed. Green Star project teams will require an agreed format by which the LCA outcomes for the project can be presented.

The most commonly referenced standard for reporting LCA results is ISO 14025 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures, which prescribes the procedure for issuing a product with an Environmental Product Declaration (EPD). As an acknowledgement of the wide use of this standard, it is proposed that ISO 14025 be selected as the reporting mechanism, both for building materials, and for the actual building.



The Green Building Council of Australia invites feedback from industry stakeholders on the use of ISO 14025 EPDs:

- Is it appropriate to nominate ISO 14025 as the reporting mechanism?
- Is there an alternative that is preferred or should be considered?

Allocation of Green Star points

The Green Star points available for improvements in environmental impact from materials, calculated via the assessment of LCA data, will be awarded based on a percentage improvement of the building's environmental impact, in comparison to that of the reference case building. It is proposed that points be awarded at each 5% improvement. This constitutes a similar calculation methodology to that already employed for the Ene-1 'Greenhouse Gas Emissions' credit, within the Energy category of Green Star rating tools. Table 2 details how points are currently awarded for that credit.

It is proposed that each of the environmental impacts identified in the section 'Environmental Impact Categories' would form a Green Star credit in the Materials category. For example:

- Mat-1 'Climate Change'
- Mat-2 'Land Transformation and Use'
- Mat-3 'Ecotoxicity to Land and Water'
- Mat-4 'Mineral and Fossil Fuel Depletion'
- Mat-5 'Water Footprint'
- Mat-6 'Human Toxicity'

An alternative approach would be to include all impacts in a single credit, with points attributed to each impact within that credit.

The actual number of points available will be determined at a later date. At a minimum, the points available will be no less than the sum of relevant points currently available in the Materials category of Green Star rating tools.

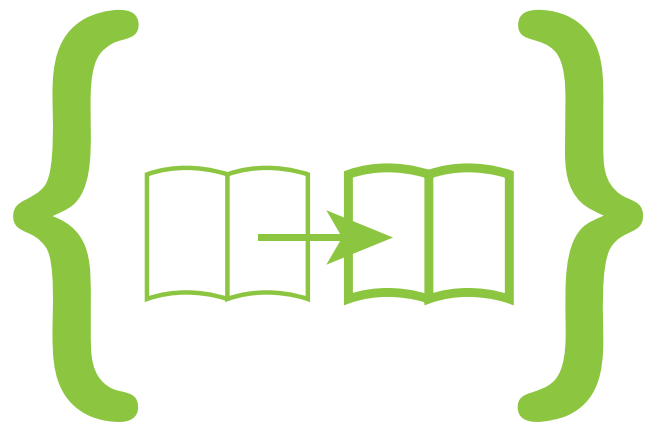
Table 2: Ene-1 Points achieved for greenhouse gas emission reductions

Predicted percentage reduction in green house gas emissions	Points awarded
0	0
5	1
10	2
15	3
20	4
25	5
30	6
Etc.	Etc.

The Green Building Council of Australia seeks stakeholder feedback on the proposed Allocation of points:

- Is percentage reduction in impact an appropriate way to award points for improvement?
- Is it appropriate to have separate credits for each of the environmental categories or should the total score be weighed together and assessed in one credit?

8. Data Inventory



For LCA methodology to operate in practice, it must be underpinned by inventory data. The data selected must be:

- nationally or internationally recognised
- in line with ISO14044:2006
- freely available; and
- internally consistent- meaning data sets cannot be mixed within the same LCA.

LCA data is released in life cycle inventories (LCI). The Australian Life Cycle Inventory project, which operates to produce LCI datasets including building products, energy, manufacturing, plastics, transport, agriculture and water, has yet to release complete LCI datasets at the time of writing. However, the building products inventory dataset, has been published and is available for use.

The building product LCI may or may not suffice for the implementation of LCA within the Green Star Materials category in the first instance, with other data to be included as it becomes available. If the building product LCI is found to be insufficient, the scope of assessment may be modified so that less data is required, or another LCI may be used until an appropriate Australian alternative is available - such as those currently available in Europe.

In some examples of the application of LCA, the use of non-approved data results in penalties, which are applied to the final result of the LCA. It is proposed that non-approved data would incur penalty within a Green Star context.

The Green Building Council of Australia seeks stakeholder feedback on the proposed Data inventory:

- Should the Aus LCI Building Product inventory dataset be used in a LCA methodology within Green Star rating tools?
- Should a European LCI be used?
- Are penalties needed?
- What data sources would be acceptable for a credible LCA to be conducted.

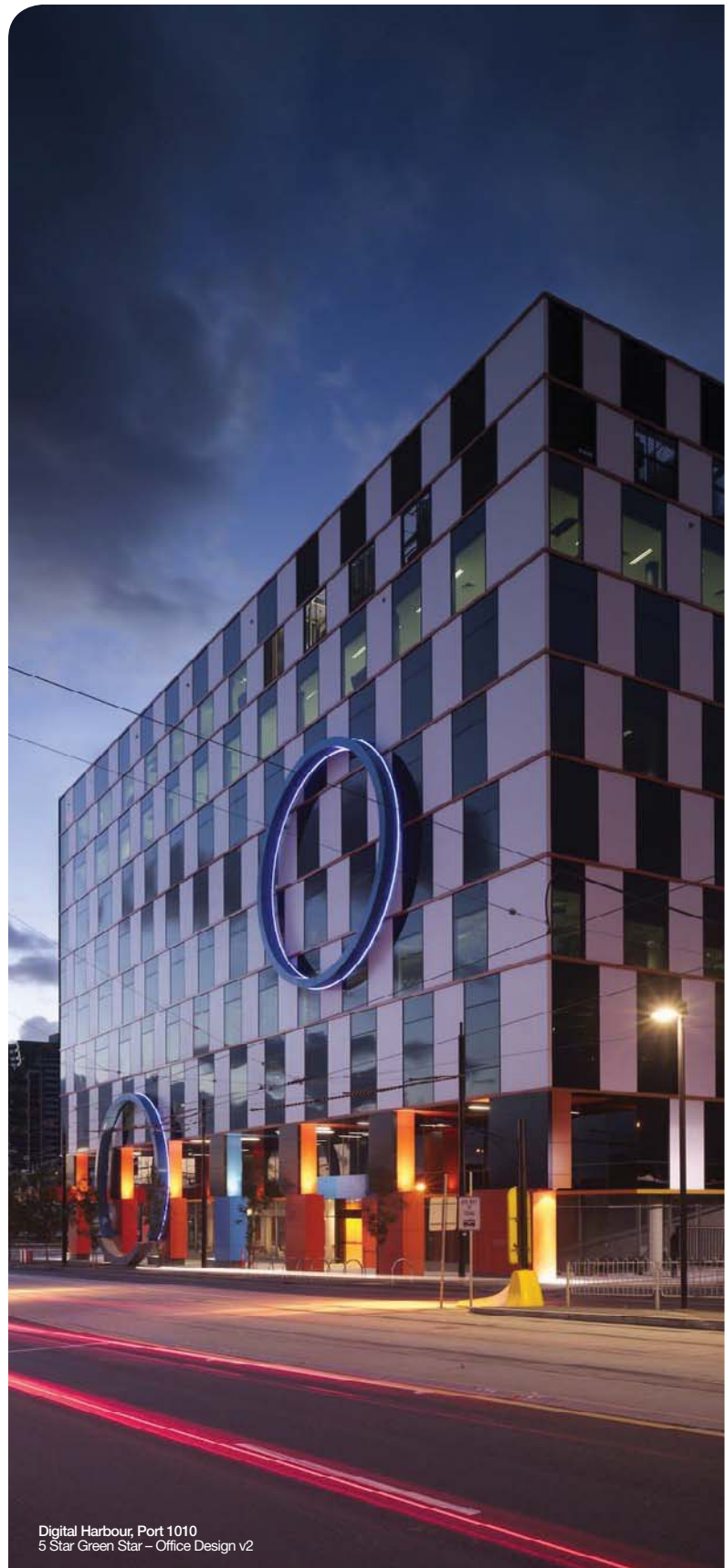
9. Applicable Green Star rating tools

It is proposed that the incorporation of LCA methodology into the Green Star Materials category would encompass the assessment of base building construction or refurbishment, but exclude building fitouts. The main barrier to the incorporation of fitout items such as walls, partitions, furniture and flooring, are understood by the GBCA to primarily relate to the functional unit of these items. Stakeholder engagement as part of the development process of an LCA methodology may result in changes to this understanding.

It is proposed that when future agreement on consistent or comparable functional units for fitout items is reached, the Green Star LCA methodology may be expanded to include interior fitout material components.

The Green Building Council of Australia invites feedback from industry stakeholders:

- Is it appropriate to exclude fitouts based on the lack of an agreed functional unit for fitout items?



10. Other matters for discussion

The GBCA recognises there are other matters which may need to be addressed by the LCA methodology within Green Star. Comments are invited on any such matter. The following list includes a brief discussion on some of these issues.

Existing LCA tools – The LCA methodology described in this paper should be able to accommodate the use of existing LCA tools and software. Eg. Sima Pro and GaBi.

LCA Practitioner – A qualified LCA practitioner will be required to undertake LCAs on behalf of project applicants, product manufacturers and suppliers. The Australian Life Cycle Assessment Society (ALCAS) is currently in the process of establishing an independent accreditation system for LCA practitioners. This may be referenced.

Cost – The implementation of LCA methodology within Green Star will need to take into account the cost of documenting compliance for the Materials category in a typical Green Star rated building or fitout, both in Design and As-Built phases. The provision of this information will rely on input from stakeholders.

International Standards – LCA is underpinned by international standards in the ISO 14040 series of standards. Any LCA applied within the Green Star Materials Category will be required to follow these standards.

Peer Review – Peer review of LCA results is often used to ensure credibility, LCA submitted as part of a Green Star assessment will be required to be peer reviewed.

The Green Building Council of Australia invites feedback from stakeholders on the issues listed in section, as well as any other matter you believe should be addressed:

- Will the proposed LCA methodology accommodate existing LCA systems and tools?
- What constitutes an LCA practitioner, what qualifications should be required, and should the system ALCAS are developing be referenced?
- How much would you estimate it would cost to complete the assessment outlined in this paper? And how does that cost compare to the cost of demonstrating compliance with the current Materials Category in Green Star?
- Is the requirement to adhere to international standards necessary?
 - Which are the relevant standards that Green Star related LCAs should adhere to?
 - Is the requirement to use recognised software necessary?
 - Should the GBCA recognise particular softwares?
 - Which software should be recognised, and why?
 - The requirements of the Energy category within Green Star rating tools, stipulate that any energy simulation software used are BESTEST compliant. Does equivalent software exist for LCA?
- Is the requirement for peer review necessary?
- What other requirements are necessary to ensure best practice LCA modelling?

11. Summary of Questions

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The Green Building Council of Australia invites feedback from stakeholders on undertaking a project aimed at introducing LCA based assessment in the Green Star Materials category. You may need to read the entire paper before you can answer these questions.

- Is it appropriate for the GBCA to undertake this project or would any other organisation be better placed to do it. If yes, which organisation?
- Is the Australian market ready for LCA as a tool for assessing the environmental impact of materials? If no, in how many years time do you think the market would be ready?
- What do you see as the main barriers to implementing LCA as an assessment methodology for materials in Green Star?
- If the GBCA decided to introduce the methodology described in this paper, how much notice would you recommend the GBCA give to the market?

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Objectives -The Green Building Council of Australia invites feedback from stakeholders on the objectives of the project.

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The Green Building Council of Australia seeks your feedback on the following questions.

- The list of inclusions may be expanded in the future, is it appropriate to start with a limited scope of assessment in order to simplify the LCA?
- Please provide feedback on the list of inclusions and exclusions.
- Are there additional materials should be addressed by the inclusions and exclusions?

Page 11

The Green Building Council of Australia invites feedback from industry stakeholders on the proposed system boundary:

- Is the use of a 'cradle to constructed, sealed and serviced' building approach appropriate?
- Is it practical to make qualified assumptions about the origin and the distances that material must be transported in a Green Star design submission, i.e. at a tender stage when some the specific materials are unknown?

Page 12

The Green Building Council of Australia invites feedback from stakeholders on undertaking a project aimed at introducing LCA based assessment in the Green Star Materials category. You may need to read the entire paper before you can answer these questions.

- Is 1m² of GFA an appropriate unit?
- Are there constraints to using this unit?
- If there are constraints or reservations about the proposed functional unit, what are the alternatives?

Page 13

The Green Building Council of Australia invites feedback from stakeholders on undertaking a project aimed at introducing LCA based assessment in the Green Star Materials category. You may need to read the entire paper before you can answer these questions.

- Is it appropriate to limit the number of environmental impact categories to six?
- If more categories are to be included, which categories do you recommend be included? What method should be applied to determining the impact categories the LCA will take into account?

- If fewer categories are to be included which categories do you recommend be removed? -
- If six impact categories are appropriate, are the six categories above the most appropriate?
- Is it appropriate to refer to the AusLCI impact categories? Is there an alternative which should be used? Why?

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The Green Building Council of Australia seeks stakeholder feedback on the proposed Weightings and points:

- Is it appropriate to reference the BC LCI weightings? If not, what should be used instead?
- Is it appropriate to have separate credits for each of the environmental categories or should the total score be weighed together and assessed in one credit?

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The Green Building Council of Australia invites feedback from stakeholders:

- Is it practical to establish a standard practice reference case for low-rise, mid-rise and high-rise buildings of different classes? If not, what other methods could be used to establish a reference case?
- Should the reference case distinguish between new building on a green field site, refurbishment of existing buildings and fitouts? How can an equitable system be developed which acknowledges the advantages of the options from an environmental impact perspective?
- If the reference case is constructed in a similar manner to that described above, would you be able to provide your interpretation of how this may operate in practice?
- Can LCA methodology in the Green Star Materials category operate without a reference case? If so, how do you see this working?
- Is it practical to conduct two iterations of the LCA with different inputs for the project?
- How much additional time would it take to do the second iteration of the LCA having completed the first one? Is it 25% more, 50% more, 100% more etc?

- Does the intended content of Table 1 include enough data to determine the input parameters for the standard practice case LCA? If not, what is missing?
- What would be the best way to determine the rules for the input parameters in Table 1?

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The Green Building Council of Australia invites feedback from industry stakeholders on the use of ISO 14025 EPDs:

- Is it appropriate to nominate ISO 14025 as the reporting mechanism?
- Is there an alternative that is preferred or should be considered?

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The Green Building Council of Australia seeks stakeholder feedback on the proposed Allocation of points:

- Is percentage reduction in impact an appropriate way to award points for improvement?
- Is it appropriate to have separate credits for each of the environmental categories or should the total score be weighed together and assessed in one credit?

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The Green Building Council of Australia seeks stakeholder feedback on the proposed Data inventory:

- Should the Aus LCI Building Product inventory dataset be used in a LCA methodology within Green Star rating tools?
- Should a European LCI be used?
- Are penalties needed?
- What data sources would be acceptable for a credible LCA to be conducted.

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The Green Building Council of Australia invites feedback from industry stakeholders:

- Is it appropriate to exclude fitouts based on the lack of an agreed functional unit for fitout items?

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The Green Building Council of Australia invites feedback from stakeholders on the issues listed in section, as well as any other matter you believe should be addressed:

- Will the proposed LCA methodology accommodate existing LCA systems and tools?
- What constitutes an LCA practitioner, what qualifications should be required, and should the system ALCAS are developing be referenced?
- How much would you estimate it would cost to complete the assessment outlined in this paper? And how does that cost compare to the cost of demonstrating compliance with the current Materials Category in Green Star?
- Is the requirement to adhere to international standards necessary?
- Which are the relevant standards that Green Star related LCAs should adhere to?
- Is the requirement to use recognised software necessary?
- Should the GBCA recognise particular softwares?
- Which software should be recognised, and why?
- The requirements of the Energy category within Green Star rating tools, stipulate that any energy simulation software used are BESTEST compliant. Does equivalent software exist for LCA?
- Is the requirement for peer review necessary?
- What other requirements are necessary to ensure best practice LCA modelling?