FEEDBACK ON 'LIFE CYCLE ASSESSMENT IN GREEN STAR' DISCUSSION PAPER

PAGE 6

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?

While it is appropriate that the GBCA investigates the best methods for rating materials, perhaps the Australian Life Cycle Inventory Database Project is better positioned to investigate and propose the best metrics to assess materials. It is appropriate that the GBCA recognises LCA, but how that recognition transfers to points awarded is another matter.

- 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?

Select areas of the primary materials industry may be prepared for LCA but our opinion is that the majority of small to medium sized manufacturers are not. Considering that much of Australian manufacturing is now confined to assembly and distribution of components sourced from outside of Australia, many companies are ill-equipped to tackle full LCA(s). We suggest the industry is only now coming to terms with environmental attribute-based product assessment or only just recouping costs from being a front runner in this area. To impose a new rating system before 3-5 years seems an unrealistic impost.

- What do you see as the main barriers to implementing LCA as an assessment methodology for materials in Green Star?

This is largely dependent on whether LCA becomes the new benchmark, forsaking all other sustainable product rating systems or becomes an additional assessment category with bonus points awarded. Barriers might include, lack of accredited third party agencies to adequately assess LCA claims or further excluding small to medium companies who do not have the time or finance to pursue full LCA for their product.

- If the GBCA decided to introduce the methodology described in this paper, how much notice would you recommend the GBCA give to the market?

At least 3 years.

PAGE 8

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

The advent of LCA arrived with the need to provide consistent and comparable metrics for measuring the carbon footprint or GHG impact of products that factored in externalities to the products' assembly, sale and use. Hence, depending on the model used, it is very powerful for providing a standard regime to accurately assess the true and full environmental impacts of a manufactured product. While it has potential to bring to light the most energy/resource intensive aspects of a production chain, LCA by itself has no ability to promote or encourage continuous improvement, which is a stated objective of the GBCA. Nor does it guarantee improved environmental outcomes in a cost effective manner. Whilst current attribute-based, sustainable product ratings cannot provide

comparable data for environmental impacts along the production chain, many have specific requirements that reward improved environmental outcomes that a raw 'product as is' LCA score cannot promote. For example, that an item can be recycled might impact/improve on its LCA rating, does not guarantee that the item will be recycled, whereas product attribute requirements for policies on Product Stewardship, ability to disassemble, and to demonstrate recycled content or full recycle after take back, requires these practices to be set up and actioned. In other words, LCA rates the product and its current production process, whereas sustainability assessment rewards and encourages initiatives towards best practice. As another example, can LCA promote FSC sourcing of timber? A rare timber harvested locally, being renewable, not transported far, with minimal machining and finishing may score well for its LCA, but does that mean it is a sustainable product? Furthermore, and very significantly, we would also question whether an LCA can rate the sturdiness and long life of a product (fitness for purpose) or specify that it must meet some basic strength and durability requirements?

PAGE 10

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?

It would seem appropriate to begin consideration of LCA with simpler 'primary' materials (timber, concrete, steel, glass) as these industries being less removed from the raw material extraction process, may be better equipped to submit to LCA assessment. Focus on the building core would also seem appropriate. Perhaps a separate LCA Core Rating could be appended to the Green Star Rating, recognising that although fitout may be only sustainability rated – but not fully LC assessed – the core of the building has been LC assessed.

- Please provide feedback on the list of inclusions and exclusions.

Once primary materials have been assessed for production LCI, theoretically only energy expenditure for storage (if any, i.e. concrete mixed onsite), transport and installation would need to be factored in. Hence, other simple primary products (ceramics, paints, sealants) installed during construction could be considered for inclusion. However with complex, multi-component fixtures (furniture, plumbing, fitouts, carpets etc.), with their accompanying complex calculations along the supply chain, exclusion would seem to be expedient.

- 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?

Yes in theory, although strong(er) justification should be documented/given to stakeholders for deviating from the typical "cradle to grave" approach to LCA.

- 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 of the specific materials are unknown?

No, it is not practical to make generalised assumptions in the context of a Green Star "design" submission, due to the following potentially conflicting scenarios that may arise:

- It seems unlikely that metrics for primary materials or the distance from providers to site would change dramatically enough between As Designed and As Built metrics so as to negate qualified assumptions for 'As Designed' scores;
- Alternatively, it is possible that a supplier of a material may change between the As Designed and As Built stages. This could be due to for example, closure of a supplier, change to a cheaper supplier, change to a more sustainable supplier etc. There should be room for common sense adaptations in the sourcing of materials between the two stages. It will be important to make sure that such allowances are not abused. The points awarded to a project at the As Designed stage can be based on in part quantified assumptions on the source of materials. The points awarded to a project at the As Built stage will be based on where the materials were actually sourced from.

PAGE 12

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- Is $1m^2$ of GFA an appropriate unit?

This unit is only appropriate where standard depths or thickness of materials are used and a common energy/carbon/resource expenditure can be assumed for these standards, and therefore assumed for a square meter of standard building floor space.

- Are there constraints to using this unit?

While this unit only accounts for surface area in a two dimensional plane (and not the potential empty space inherent in a 3 dimensional unit), a per cubic metre unit could factor in volumes of materials in a three dimensional plane (thick concrete walls, concrete pillars etc.), especially at non-standard depths or thicknesses of materials, without having to convert a resource expenditure metric (LCI) per volume of material into a per square meter 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?

No. It is appropriate to include all impact categories that are relevant to the production process.

- 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?

Unless these considerations can be factored into the 6 proposed impact headings (such as land use or mineral depletion) additional impacts to be considered could be:

- efficiency or waste output (how much unusable or re-usable waste the production/construction process creates);
- the relative re-newability of the materials (i.e. timber vs concrete or glass);
- the time spent until project completion, considering that the length of a building project has noise, dust and service disruption impacts; or

- other emissions aside from carbon or GHG's, arising from production/construction processes (particulates, chemicals to waste/groundwater).

- 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?

The six suggested categories are appropriate, and if no others are to be included, these would seem to be the most pertinent.

- Is it appropriate to refer to the AusLCI impact categories? Is there an alternative which should be used? Why?

If it is the intention of the GBCA to investigate in the future, the possibility of recognising rating systems across all countries and GBC's then it is perhaps most appropriate to use international LCI metrics. Where LCI's differ dramatically between international and Australian standard building and energy generation practices, then Australian LCIs should be used for the purposes of our local industry. If the building was to declare its International LCA compliance score, it would have to be re-calculated using internationally accepted LCIs.

PAGE 14

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?

Separate credits for each of the environmental categories would assist the designers (with regards to As Designed LCA ratings) or other construction companies (regarding As Built LCA ratings) in recognising which areas of construction (materials or building practices) are more or less successful in improving LCA scores, and therefore target which materials or practices to change or adopt.

PAGE 17

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?

It is practical to attempt a baseline reference case on which to gauge best practice improvement against. However, deciding which building practices are deemed to be 'standard' or 'pre-sustainability' practices is the critical issue. Considering building practices towards sustainability have no doubt been incremental rather than changing drastically from a given time point, pin-pointing a time that represents 'standard' building practices or materials (as opposed to sustainable or LCA rated practices or materials) may present difficulties. Another option is to base the reference case of each building type on the design and construction methods of an actual example of each building type completed no less than 10 years ago.

- Should the reference case distinguish between new building on a green field site, refurbishment of existing buildings and fit outs? How can an equitable system be developed which acknowledges the advantages of the options from an environmental impact perspective?

The base reference case should operate on the assumption of a green field site, and provide resource use calculations for provision of services (water, sewer, gas, power) to the site based on standard service supply metrics across a given distance (distance to nearest service outlet). It is assumed the Land Use impact category would account for conversion and landscaping of the site. Retrofit/refurbishment of existing buildings should be afforded its own Green Star category (Green Star Upgrade perhaps?) and corresponding LCA improvement score. Providing a standardised reference case for retrofit or refurbish fit outs would seem too onerous. In cases of brown field sites with services installed and a cleared level site, an environmental impact category that factors in waste output could factor in removal of old foundations and services infrastructure that is not needed, however this eventuality would also seem too variable to make a standard reference case feasible.

- 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?

To encourage the benefits of retrofitting and refurbishing, there would need to be a way to assess the impacts of providing the residual services and infrastructure in today's' market, and subtracting (or adding, depending on how the score is geared) these from the LCA score. Even though existing infrastructure did once have to be built (with resources extracted and energy spent), attempting to calculate the LCI of old materials and building practices would seem too onerous. Alternatively a calculation that includes an LCA of resource use to provide the same remaining infrastructure today (using standard modern materials and construction processes), then subtracting a figure that calculates energy/resource expenditure involved in site clearance (unnecessary in this case), could factor in the reduced resource use benefits inherent in retrofit and refurbishment.

- Can LCA methodology in the Green Star Materials category operate without a reference case? If so, how do you see this working?

Without a reference case, the LCA score could not represent an improvement from a standardised design, but could only provide a score based on an agreed benchmark such as overall Carbon Footprint, Sustainability or resource/energy use intensity. The difficulty with this approach is how to convert all environmental impact considerations (Eco toxicity, Human toxicity, Water depletion) into a metric that is compatible with these benchmarks.

- Is it practical to conduct two iterations of the LCA with different inputs for the project?

This would be highly dependent on the availability of modelling software that could facilitate easy substitution of different products or practices with differing LCI scores. This could provide an improvement score based on initial design and practices before moving to substituted products and practices with better LCA ratings. We suggest two iterations of a full LCA without such software would be too time consuming to be practical.

- 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?

Again this would be highly dependent on the availability of standardised LCI metrics for a variety of building material and building practice combinations. The availability of such pre-calculated data and modelling software should theoretically only require 25%-50% more time for a second iteration.

- 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?

PAGE 17

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?

Yes, it would seem most appropriate to use an international standard for the reporting mechanism as within a globalised market place ISO standards are where any country will look to ensure their products are marketable overseas. It also creates valid international competition as those looking to improve LCA scores can look to innovations in other countries and see how other building projects scored. They could then be assured that better scores were the result of innovations in materials or practices and not incompatibilities between reporting mechanisms between different countries.

- Is there an alternative that is preferred or should be considered?

No, based on the previous response, no other reporting mechanism/declaration set should supersede those prescribed in the ISO level Standard.

PAGE 18

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?

Yes, this seems appropriate.

- 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?

Whilst it is noted any re-weighting of points would result in "no less than what is currently available", any changes proposed to the existing points-based system would require (more) detailing by the GBCA before acceptance, due to the potential ramifications within industry, i.e. for current licensees/certificate holders if interior fitout elements are eventually included in the LCA methodology.

PAGE 19

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?

If the AusLCI Building Product Inventory has been peer reviewed and endorsed as having sound and thorough metrics then yes, such data should be used locally.

- Should a European LCI be used?

Perhaps only when and where a building practice or material is utilised locally that does not have a listing on the AusLCI. To convert to European/international LCA rating equivalencies, perhaps any software utilised could have functionality for importing or entering different LCI values (say for carbon released from energy generation or different manufacture techniques for materials for example), that will then calculate a European/international equivalent score.

- Are penalties needed?

Penalties may be the only way to discourage poorly performing products or building practices and encourage looking for best practice, especially where a better alternative is available for no extra cost. Considering a building is built once and typically lasts a long time, and the cost to retro-fit is more often higher than to build in from the start, it is especially important to encourage the use of the best materials and building practices from the beginning of construction.

- What data sources would be acceptable for a credible LCA to be conducted?

PAGE 20

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?

As fitouts and furniture items are highly personal and aesthetic-based choices for a business, highlighting the benefits of certain fitout materials or products over others based purely on their LCA rated status seems less relevant than core building materials, and could be aesthetically restrictive considering the current shortfall of LCA rated fitout products in the marketplace. If fitouts were to be included sometime in the future, requiring a re-assessment every time a building's internal fitout is changed to maintain the buildings entire true LCA rating also seems an unreasonable impost for tenants. While fitout 'churn' is an industry issue that needs to be discouraged, perhaps the increased use of recycled/recyclable materials and furniture, dismountable/disassemblable panels and workstations will make churn less of an issue (fitouts may become more transferable to new office spaces). Again LCA rating by itself cannot necessarily discourage fitout 'churn' unless points are available for transferring/re-using office fitout materials (perhaps percentage of new to old/re-used items).

Due to the inherent difficulty in defining a singular functional unit for each of the entire diverse range of interior fitout elements, it is suggested said items, e.g. furniture and fittings, remain excluded from the LCA methodology being considered.

PAGE 21

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?

There should be provision to recognise existing LCA systems if it is the intention of the GBCA to produce their own proprietary system and not obtain the license to use a pre-existing system. Businesses are very sceptical towards new certification schemes if they feel they are too often made redundant or obsolete.

- What constitutes an LCA practitioner, what qualifications should be required, and should the system ALCAS are developing be referenced?

If the ALCAS system were to become the Australian benchmark for LCI data, then training in how their Index is calculated should be a mandatory requirement. It is assumed training in GBCA Green Star assessment would also be a mandatory requirement.

- 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?

If adequate software currently exists in the marketplace to accommodate agreed metrics and environmental impact categories then it should be considered, rather than re-writing a proprietary package. An approach that requires manufacturers or construction companies to purchase expensive software to create their own LCIs or complete their own LCA for a building project would seem prohibitive. An approach where the GBCA maintains the license to use a certain software that uses Australian or internationally recognised LCI metrics to complete a third party assessment of a building project using pre- Life Cycle Indexed materials and building practices would be more appropriate at this time.

- 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?

Peer review of the validity of the LCI metrics and how the LCA rating tool completes its assessment is appropriate before any scheme is endorsed and adopted by the GBCA. Requiring peer review of each LCA rated Green Building project assessment by the GBCA after the scheme is endorsed and adopted would seem excessive.

- What other requirements are necessary to ensure best practice LCA modelling?

Understanding that primary building materials become a part of the building regardless of tenants or building owners, it is difficult to establish Product Stewardship for a building core, to ensure that all relevant components are taken back by their original manufacturers or disposed of as sustainably as possible. This presents difficulties for a true LCA that factors in end of life disposal impacts of building materials. There have been major improvements in planning for recycling of construction waste, but negotiating waste handling resulting from if and when the building is dismantled (20-30+ years in the future) is a difficult ideal. This is no doubt the reason for the proposed LCA timeline to extend only as far as 'constructed, sealed and serviced' in scope. Perhaps a credit for incorporating modularity or non-destructive disassembly capability into a building could also be recognised.