STUDY REPORT

SR 276 (2013)

APPLICATION OF ENVIRONMENTAL PROFILING TO WHOLE BUILDING WHOLE OF LIFE ASSESSMENT – KEY FEATURES

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Preface

Based on the importance of whole building whole of life assessment recognised by the New Zealand building sector, BRANZ has been conducting research into environmental profiles, and their application to evaluate building environmental performance, in the interests of the industry. This report is an Executive Summary of a Plan to establish a whole building whole of life assessment framework in New Zealand, based on research carried out by BRANZ from November 2011 to September 2012 and comments and input received from interested stakeholders during consultation with the New Zealand construction industry in October/November 2012. The full text of the Plan is also available in a separate report. All reports arising from the research are available on the BRANZ website (www.branz.co.nz/environmental_profiling). Other reports in the series include:

Dowdell D. (2012). Evaluation of Environmental Choice New Zealand as a Best Practice Ecolabel and Comparison with the GBCA Framework; BRANZ Study Report (SR 271), Judgeford.

Dowdell D. (2012). Review of how Life Cycle Assessment is used in International Building Environmental Rating Tools – Issues for Consideration in New Zealand; BRANZ Study Report (SR 272), Judgeford.

Dowdell D. (2013). Application of Environmental Profiling to Whole Building Whole of Life Assessment – A Plan for New Zealand; BRANZ Study Report (SR 275), Judgeford.

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Dan McCallum, Consultant.

Note

This report is intended for stakeholders across the New Zealand construction industry.

Acronyms and Terms

AGO: Australian Greenhouse Office.

ALCAS: Australian Life Cycle Assessment Society.

AusLCI: An initiative to develop an Australian Life Cycle Inventory database.

BIM: Building Information Modelling.

BRANZ: Building Research Association of New Zealand.

Building Code: New Zealand Building Code.

CEN: European Committee for Standardisation.

CPA: (UK) Construction Products Association.

CSR: Corporate Social Responsibility.

EC: European Commission.

ECNZ: Environmental Choice New Zealand.

EeBGuide: Energy Efficient Buildings Guide – a European research project under the 7th Framework Programme to develop methods and operational guidance for the preparation of LCA studies for energy efficient buildings and building products**.** It has been published as a draft for consultation at the time of this Plan.

Environmental Choice New Zealand: A New Zealand Government owned Type I ecolabel scheme.

Environmental Product Declaration: Voluntary declaration providing quantified environmental data using predetermined parameters and, where relevant, additional quantitative or qualitative environmental information. Also known as a Type III ecolabel and underpinned by ISO 14025 (ISO; 2010). There is no current scheme in New Zealand that awards EPD although ALCAS and LCANZ are in the process of establishing a scheme for Australia and New Zealand.

Environmental Profile: A quantitative method of assessing the environmental performance of building materials. See Environmental Product Declaration.

EPD: Environmental Product Declaration.

GBCA: Green Building Council of Australia.

GBCA Framework: Green Building Council of Australia Framework for Product Certification Schemes – a framework recognised by NZGBC onto which ecolabel schemes can be mapped to gain recognition in Green Star.

Green Star: Suite of green building rating tools managed by the GBCA and NZGBC covering various building typologies. Reference to Green Star in this report specifically concerns Green Star Office in New Zealand unless otherwise stated.

Greenwash: False or misleading environmental claim.

HVAC: Heating, ventilation and air conditioning.

ILCD: International Life Cycle reference Data system.

International reference Life Cycle Data system: a developing global initiative with the aim of providing a consistent platform for production and reporting of life cycle data.

ISO: International Organisation for Standardisation.

LCA: Life Cycle Assessment.

LCANZ: Life Cycle Association of New Zealand.

LCI: Life Cycle Inventory.

LCIA: Life Cycle Impact Assessment.

LEED: Leadership in Energy and Environmental Design, the building environmental rating tool of USGBC.

Life Cycle Assessment: Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

Life Cycle Impact Assessment: Phase of LCA aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts of a product system.

MfE: New Zealand Ministry for Environment.

NZ LCI: New Zealand Life Cycle Inventory.

NZGBC: New Zealand Green Building Council.

NZLCM Centre: New Zealand Life Cycle Management Centre (at Massey University).

PCR: Product Category Rules.

Product Category Rules: Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories.

SME: Small or medium sized enterprise.

USGBC: United States Green Building Council.

APPLICATION OF ENVIRONMENTAL PROFILING TO WHOLE BUILDING WHOLE OF LIFE ASSESSMENT – KEY FEATURES

BRANZ Study Report SR 276 David C Dowdell

FOREWORD by Pieter Burghout, Chief Executive, BRANZ

The New Zealand building and construction sector is New Zealand's fifth largest, contributing 4% of GDP and employing 178,000 people. The industry is not only tasked with delivering a sustainable built environment for New Zealand but also provides NZ$3 billion in exports annually.

To ensure we can deliver, the New Zealand construction industry is now faced with a decision. Other parts of the world have developed or are developing product environmental reporting schemes to provide a basis for openness and transparency and facilitate more informed decisions about the environmental impacts of materials in the context of the buildings in which they are used. This is increasingly being required by architects, designers, builders and their clients.

Environmental profiles and underlying databases have developed or are developing in important markets for New Zealand – Australia, China, Japan, North America, South East Asia and other regions such as Europe and South America. This will increasingly create an expectation for provision of New Zealand-specific data on environmental performance of products and materials. To do this requires an investment now – but will provide many businesses with benefits such as cost savings, access to new markets (or consolidating existing ones), improved awareness of product environmental issues amongst staff and more informed decision making and R&D.

The industry has asked for a more consistent approach to the assessment of environmental performance of products and materials. International experience shows that evaluation of designed buildings across the life cycle provides the level playing field sought by the industry. Such an approach lends itself to emerging technologies such as BIM, providing further opportunities to integrate consideration of environmental impacts early in the design process.

The benefits are there, demonstrated by Case Studies in this Plan. We need to ask the question - where do we want the New Zealand construction sector to be in five years time? There has been and will continue to be a necessary focus on energy reduction and energy efficiency in buildings, due to the overall impacts this has. But as we see improvements here, focus will increasingly shift to materials and products used in buildings. It would be prudent to begin preparing now by raising our understanding, knowledge and skills and developing our LCA data, EPD and whole building whole of life assessment method.

This Plan is about opportunity. It carefully sets out a view on how we can use LCA to help deliver more sustainable and better buildings. We would like to thank everyone who has contributed to the development of this Plan.

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1. ABOUT THIS PLAN

1.1 Introduction

BRANZ began researching environmental profiling in 2010 to help answer questions raised by the construction industry. The first stage of research sought to better understand the opportunities that exist for environmental profiling of materials in New Zealand. It piloted the development of draft New Zealand Environmental Product Declarations (EPD), recognising that EPD are increasingly being used and valued internationally to communicate environmental product information that is robust, credible and transparent, and set out a Roadmap for further research and development (Jaques *et al*.; 2011).

The second stage of research commenced in December 2011 and was informed by the Roadmap. It has focussed on how EPD underpinned by Life Cycle Assessment (LCA) can provide an optimal approach to a more robust and consistent evaluation of the environmental performance of New Zealand buildings across the life cycle – *an LCA-based whole building whole of life assessment*. Development of such a framework, based on the findings and recommendations of this research, is presented in this Plan because:

- The sector wants an internationally aligned basis for declaring the environmental performance of products that facilitates a robust evaluation mechanism for the delivery of a sustainable built environment in New Zealand.
- Exporters of New Zealand construction materials and products need to be able to compete with product manufacturers in other countries that already have programmes in place for declaring environmental performance of products and evaluating buildings. Similarly, manufacturers who supply domestically should have the tools and capability to demonstrate how their products, instead of imported products, can contribute to achievement of higher performing buildings.
- EPD are increasingly being used (within and outside the construction sector) internationally as the basis for declaring the environmental performance of materials and products.
- Designers and their clients want robust data and information on environmental performance of products which can be used to inform design decisions.
- Manufacturers want a fair basis for comparison of the environmental performance of their products with competitor products.
- There is recognition in the sector that product performance needs to be considered across the building life cycle, in order to provide a level playing field for assessment and comparison.
- Increasing use of tools such as BIM in the future provide further opportunities for rapid, iterative, quantitative assessment of building environmental performance during the design process.

This document provides a short summary of a proposed whole building whole of life assessment plan ('Plan') that sets out why whole building whole of life assessment can provide the "level playing field" sought by the industry and how we can get there. The full Plan can be downloaded from the Environmental Profiling page of the BRANZ website - www.branz.co.nz/environmental_profiling.

1.2 Why the Need for this Plan?

The construction sector is important to New Zealand with domestic expenditure on building materials and products of nearly NZ$6 billion and a further NZ$3 billion in exports annually.

Taking into account all the activities involved in planning, constructing and maintaining buildings, the value of the industry has been calculated at over NZ$ 15 billion (Page, 2012).

However, the environmental performance of construction materials and products is coming under increasing focus both here in New Zealand and overseas because:

- They are **responsible for 50% of total material resources taken from nature and 50% of total waste generated** according to estimates (Edwards and Bennett, 2003).
- **Environmental impacts from use of buildings are likely to reduce over time so the contribution that materials and products make to the overall environmental impact of buildings will rise**. This is already resulting in greater demand for information and data from clients, designers and the media in other parts of the world.
- Local and overseas **studies are increasingly communicating the benefits that accrue from building green, including financial savings** during construction and use, and improved productivity experienced by occupants. Governments, as significant procurers of buildings in many countries, want to provide a strong signal to their construction markets whilst companies increasingly want to occupy buildings that help them meet their sustainability targets and reflect their status as responsible "corporate citizens".
- Putting in place 11% of the total outputs of the New Zealand economy, the construction sector has the capacity to deliver a more sustainable built environment. **Manufacturers with products that are innovative and environmentally preferable will be well positioned** to benefit from an increasing demand for green buildings domestically and internationally.
- **Designers and their clients want robust, locally relevant information and data from manufacturers about the environmental performance of products**. EPD meeting international standards provide the transparency, rigour and consistency sought by the market and are increasingly being used internationally as a basis for communication between manufacturers and their customers.

This Plan is a response to a call from the New Zealand construction industry for a better basis for evaluating environmental performance. Recommendations made by the industry during workshops held in 2010, to which this Plan responds, are set out in Table 1.

Table 1. Summary of Industry Recommendations

Issue	Designers Workshop	Manufacturers Workshop
Governance	A credible authoritative body or process needs to oversee implementation.	Establish a credible body or mechanism.
Methodology	The methodological approach needs to be robust enough to ensure unbiased fair comparison, yet flexible to encompass different applications.	Examine the different options for establishing an LCA approach for New Zealand recognising lessons learnt from international experience.
Suggested Actions to address Barriers	Green Star should be developed to incorporate LCA data, to encourage a consistent and robust approach to materials sustainability assessment in New Zealand using LCA.	Consult with industry groups and improve knowledge using training, coaching and workshops. Encourage the development of a working group to champion the LCA agenda.
	Further design tools will be needed to maximise data uptake by practitioners. A 'one tool suits all' approach is unlikely to be appropriate.	Develop a business case for the New Zealand building sector and promote case studies illustrating industry lessons from use of LCA.

2. WHOLE BUILDING WHOLE OF LIFE ASSESSMENT

2.1 Overview

Figure 1 provides an overview of inputs to whole building whole of life assessment including potential users and their applications.

Under such a framework, trade associations or sector bodies can assist their members by overseeing development of independently verified sector average product EPD to establish sector benchmarks and facilitate member understanding and engagement. Individual manufacturers may develop their own independently verified product specific EPD as a basis for communication with their customers and to demonstrate the environmental credentials of their products in comparison with competitor products.

Consistency between EPD is achieved through definition of detailed, locally relevant rules (called Product Category Rules or PCRs) established through a consultative process administered by an LCANZ/ALCAS Australasian EPD scheme. The Australasian EPD scheme would operate in accordance with published governance arrangements and relevant international standards, ensuring scientific credibility and close alignment with other schemes internationally. Verified EPD would be published by the EPD scheme, providing information about the environmental performance of products and data on quantified impacts for all or parts of the life cycle.

Manufacturers and/or trade associations may also choose to submit life cycle inventory (LCI) data (on which their EPD are based) to a developing New Zealand Life Cycle Inventory database (NZ LCI) that aligns with international LCI databases to help ensure that products are more accurately represented in LCAs being conducted by practitioners who reference these sources.

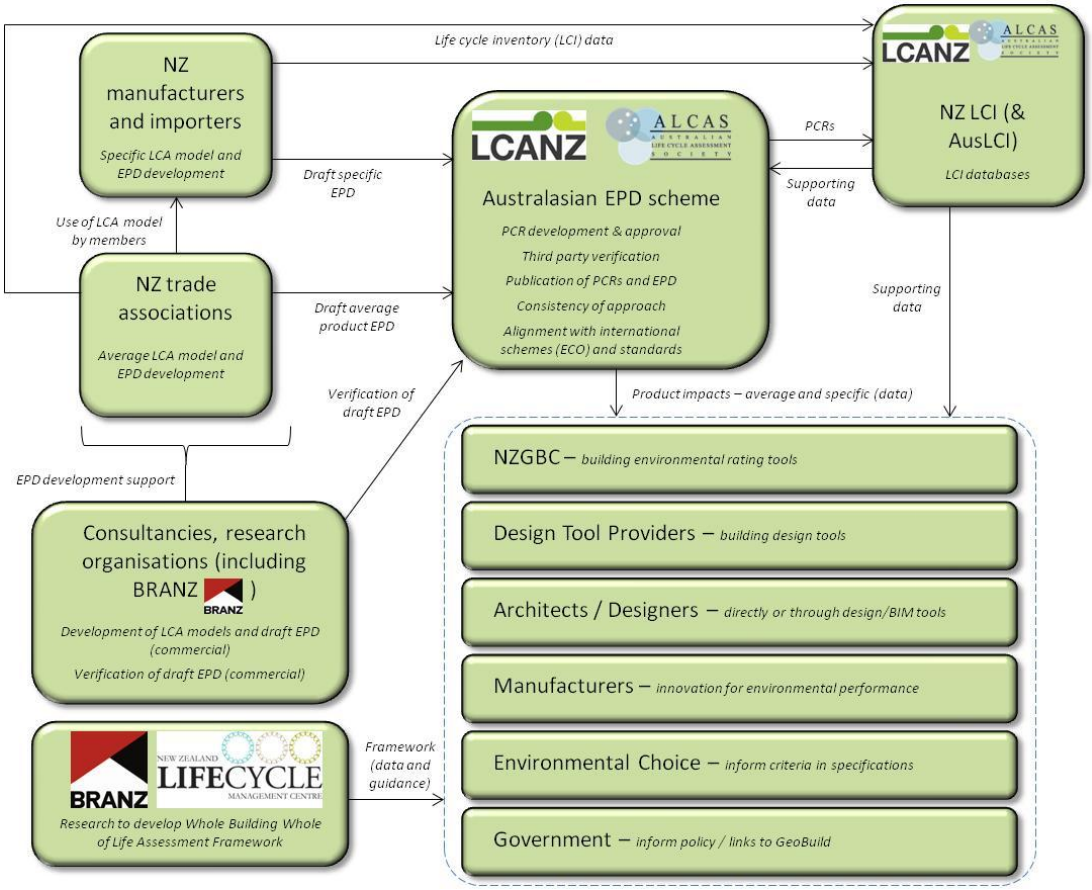


Figure 1 Overview of a New Zealand Whole Building Whole of Life Assessment Framework

2.2 Example Application for Rating the Environmental Performance of Offices

Figure 2 provides an example application, illustrating how whole building whole of life assessment can be used to inform the rating of the environmental performance of buildings (in this case, offices) in Green Star.

Whole building whole of life assessment as a basis for evaluating building environmental performance typically uses:

- Product information and data reported in EPD and from LCI.
- Data and information specific to a building design potentially held by architects, engineers, designers, quantity surveyors, project managers, contractors and other building professionals .
- Data in design, BIM, thermal simulation and other tools that may be applied to a project.

These data are used to quantify impacts of a designed building across its life cycle compared to a reference building. The assessment calculates environmental performance as potential environmental impacts (reflected as a quantified impact/m^2/year). It ensures that the contribution that products make to the overall performance characteristics of a designed building across its life cycle are fairly considered taking into account its location and design, by not drawing artificial and subjective boundaries around parts of the building's life cycle that can lead to unfair comparisons.

Environmental impacts reported in sector average EPD (representing the same or similar technologies and fulfilling the same function within a sector) provide useful industry benchmarks which could be incorporated into specification criteria of Type I ecolabels (Environmental Choice New Zealand (ECNZ) in New Zealand). Individual manufacturers who wish to demonstrate the environmental performance of their products may then choose to:

- Publish product specific EPD (which may be compared to sector average EPD), or;
- Obtain a Type I ecolabel (featuring environmental impacts incorporated from sector average EPD).

Manufacturers that do not want to publicly disclose environmental impacts in a product specific EPD could choose the second option above, where impacts reported in sector average EPD have been incorporated into relevant Type I ecolabel product specifications.

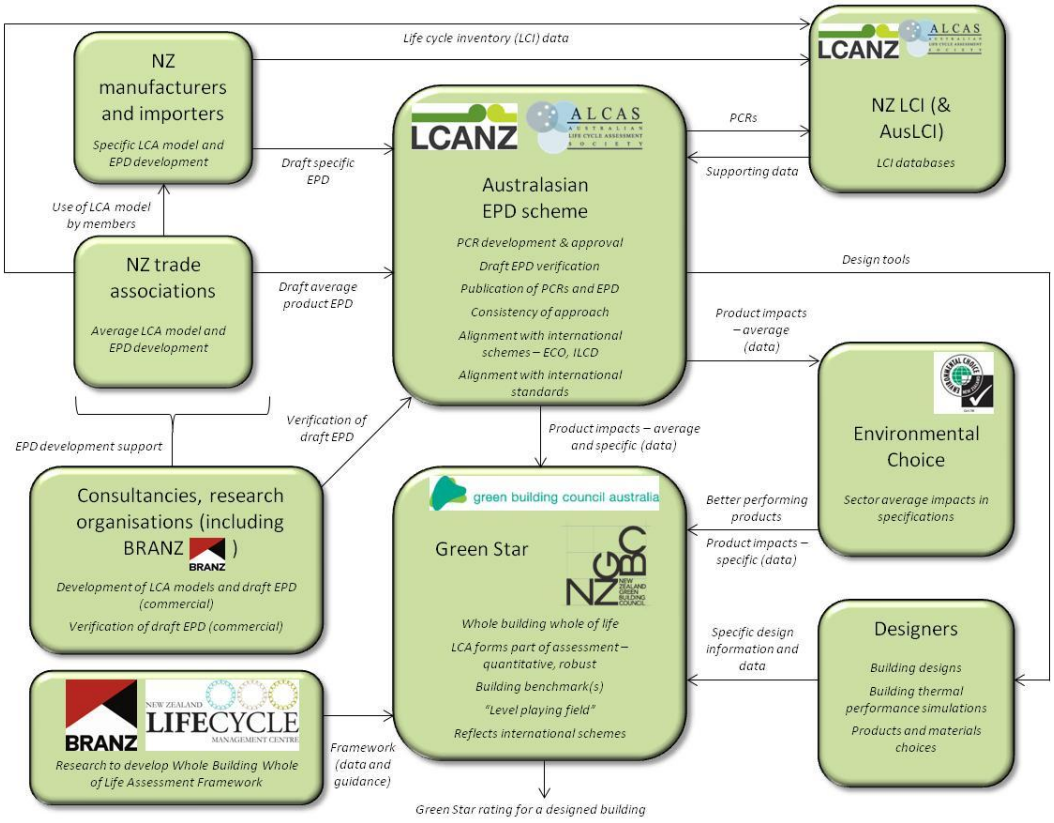


Figure 2 Example Application of the Framework for evaluating Building Environmental Performance

Both routes would require independent verification:

- Product specific EPD would be independently reviewed as part of the LCANZ/ALCAS EPD scheme.
- Manufacturers choosing the Type I ecolabel route could submit their LCA and other information for assessment against product specification requirements (including against sector average impacts derived from sector average EPD). In this second case, the Type I ecolabel could be awarded based on an assessment which includes verification of demonstrated lower than sector average environmental impacts, in addition to attaining other criteria defined by the Type I ecolabel in its specification.

Verification of the underlying LCA model and data in order to obtain a product specific EPD or Type I ecolabel is likely to have similar components and may be undertaken by the same verifiers. Following the Type I ecolabel route and having met the criteria to be awarded an ecolabel, product specific data would be submitted for inclusion in the whole building whole of life assessment but need not necessarily be published.

To calculate building environmental impacts, product data from EPD (or data from the Type I ecolabel route) would be used in combination with data about the performance of a designed building (for example, its thermal performance and use of water) as well as maintenance, replacement of products over the building life and eventual deconstruction. Calculated impacts for a designed building could then be compared to impacts for a reference building.

In Green Star, points for the LCA-based assessment would comprise a proportion of the points currently available in categories such as Materials and Energy. Points from other non-LCA issues such as Management, Indoor Environment Quality, Land Use & Ecology, for example, would then be added to obtain a final star rating for the designed building (Figure 3).

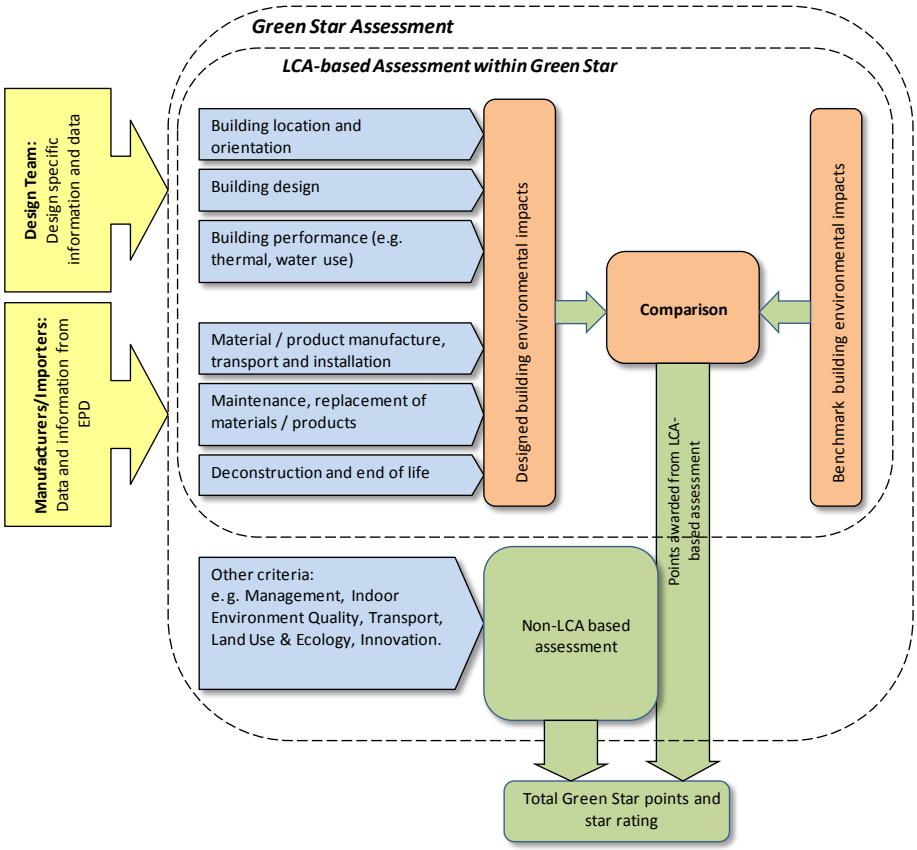


Figure 3. Example of how the Assessment Framework could be used in Green Star

Underlying data to support this type of assessment are from measured, reported and independently reviewed values derived from EPD and information from the design process such as outputs of building performance models. The calculated potential environmental impacts of the building will reflect the design brief issued by the client and the decisions taken about the design to meet this brief, including the building's performance and choice of materials.

The assessment of environmental performance is therefore based on how materials and design contribute to calculated potential impacts across the life of the building rather than assessing materials based on proxy measures such as recycled content, distance materials are transported or whether a manufacturer has ISO 14001. These issues lead to environmental impacts but are not impacts themselves and therefore not necessarily a sound basis for comparison of alternatives.

2.3 The Benefits

Using EPD to report product environmental performance provides manufacturers with the following benefits:

- **Credibility**: EPD development would be overseen by an authoritative LCA body (LCANZ and ALCAS) setting consistent requirements across the Tasman and with other schemes internationally. The scope of the scheme would cover all products and services (not just building products) and should align with relevant international standards including ISO 14025 (ISO, 2006a), ISO 21930 (ISO, 2007)) and ideally EN 15804 (CEN, 2012). EPD should therefore be recognisable in other countries.
- **Consistency:** PCRs in the Australasian EPD scheme would draw on and align with international PCRs where they have been developed, with adaptation to reflect local conditions. This would provide manufacturers with the assurance that competing product manufacturers must use the same rules for their EPD.
- **Transparency:** EPD require manufacturers to declare across a range of environmental impacts to allow a full understanding of issues. This would provide manufacturers with a stimulus for continuous improvement and would ensure that impacts are less able to be hidden through non-reporting.
- **Market driven:** EPD provide manufacturers with a market driven basis for demonstrating better environmental performance of products through comparison with competitor products.
- **Informative:** EPD allow manufacturers to better understand their supply chains and develop stronger links and co-ordination with their suppliers, as a basis for working towards improvement. They provide a means of communication of information about the environmental performance of products to customers, including provision of data on associated environmental impacts.
- **Independent verification:** EPD are independently reviewed for accuracy, ensuring rules have been applied correctly and the reported environmental impacts are based on sound data and assumptions.
- **Integrity:** Provides a format for disclosure of data and information to challenge perception or consensus driven thinking and avoid “greenwash”.
- **Non-judgemental**: EPD do not reflect values and priorities of others.

The benefits of whole building whole of life assessment to the industry are:

- **Less risk of incorrect or inappropriate decisions:** Assessment based on quantified, independently verified impacts across the life cycle of a building allows better understanding of the implications of design and materials decisions. Concentrating on specific impacts, such as global warming, or parts of the life cycle, such as embodied impacts, runs the risk of unintended consequences that arise due to the more limited scope of these assessments.

- **Location and design specific:** Evaluates building design in specific locations against a suitable benchmark, rather than considering average buildings in generic locations. Building design needs to be in the context of its location. This is important because two buildings with apparently identical materials can have dramatically different operational energy performance depending on design, detailing and construction (AGO; 2006).

- **Can inform the design process:** by demonstrating significant contributors to environmental impacts across the life cycle and by aspect. This allows identification of key issues to which further focus can be given.

- **Flexibility:** Provides the framework and data for a more rigorous, quantitative assessment of the environmental performance of designed buildings without prescribing how this is achieved. Environmental improvement may be defined in comparison with a benchmark based on the New Zealand Building Code for reference. Calculation of life cycle environmental impacts of buildings using this process can additionally facilitate adoption and use of other benchmarks or aspirational targets for comparison with designed buildings, where desired.

- **Better information for valuers:** Calculated building impacts across the life cycle provides a common basis for valuers to identify where there is a differentiation in the market value of buildings with higher levels of sustainability. The current approach provides different pathways for demonstrating sustainability making comparison of buildings inherently difficult (Warren *et al*.; 2009).

3. SEVEN REASONS FOR MANUFACTURERS TO USE LCA AND PUBLISH EPD

1. ***Identification of cost savings:*** With forecasts for rising and more volatile energy and resource costs, manufacturers using tools such as LCA that quantify resource and energy use across the value chain of their products will be better positioned to investigate alternative strategies and options that can lead to cost savings and reduced exposure to these trends.

2. ***Meeting customer needs:*** As corporate clients increasingly develop their CSR and sustainability objectives and targets, manufacturers who use LCA and publish EPD demonstrate their own commitment to reporting and continuous improvement, providing a basis for communication with specifiers, architects and clients.

3. ***Ensuring products are assessed on a "level playing field":*** Materials and products can only really be assessed on a "level playing field" if their functionality and use is considered at the building level (CPA, 2012). It is this recognition that has led to the development of whole building whole of life assessment, underpinned by LCA, in other rating schemes globally. Manufacturers using LCA and publishing EPD can ensure their products are properly represented in schemes recognising environmental performance in building level assessment.

4. ***Avoiding greenwash:*** EPD, and the LCAs behind them, are developed using consistent rules and are independently verified providing a robust basis for declaration of environmental performance.

5. ***Preparing for changing market needs:*** There is an increasingly strong case for building more sustainable offices and other buildings. This does not just equate to a premium on value and lower operating costs, but also in increased occupant productivity and reduced days when staff are ill. Corporate tenants and owners are becoming more discerning and want to realise these benefits. Similarly, better transparency of information about the environmental performance of products is increasingly required or

desired in design and/or procurement. Manufacturers who understand the environmental impacts of their products, and have EPD to demonstrate this, can more easily meet these changing needs and take advantage of the opportunities they present.

6. ***Benefitting from standards and guidance:*** There are now international standards for assessing the environmental performance of construction products and buildings, as well as guidance and examples of schemes that have been operating internationally. The development of an internationally aligned Australasian EPD scheme together with a whole building whole of life assessment approach based on international standards provides the security sought by the sector that materials and products will be fairly assessed for environmental performance.

7. ***Building Information Modelling (BIM):*** Greater use of BIM in the future, driven by clients, and the integrated design approach that use of BIM can facilitate, provides further opportunities for whole building whole of life assessment. Manufacturers who develop LCAs and EPD for their products will have the quantitative data to make available in BIM in the future leading to opportunities for more rapid, cheaper assessment.

4. A PLAN FOR WHOLE BUILDING WHOLE OF LIFE ASSESSMENT FOR NEW ZEALAND

The Plan sets out activities needed in order to develop a whole building whole of life assessment framework for offices in New Zealand. The underlying work to achieve this will facilitate adoption for other building types, such as homes, schools and industrial premises.

Most organisations who responded to the consultation on the draft of this Plan supported the principle of a whole building whole of life assessment framework noting the importance of the details of such a framework. This Plan sets out stages of development and the underlying research that will be important in order to provide the required detail. Research will be undertaken by BRANZ and the New Zealand Life Cycle Management Centre (NZLCM Centre) with oversight and input from construction industry stakeholders.

There are currently parallel discussions about use of LCA in Australia, as recently demonstrated by a GBCA consultation on use of LCA in Green Star. This provides opportunities for information sharing and development of a unified approach to whole building whole of life assessment between New Zealand and Australia (which could leverage off of an Australasian EPD scheme in development).

The Plan has two phases called *Preparation* and *Development,* both of which commence in 2013. Manufacturers and/or sector bodies with little or no experience of LCA are recommended to begin with *Preparation* whilst manufacturers and/or sector bodies already knowledgeable about LCA (or who have completed the *Preparation* phase) can opt to begin with *Development* where they feel that this would benefit their business.

The two phases of the Plan are summarised in the first column of Figure 4 entitled Manufacturers/Importers. This shows two possible routes through a five stage process – Route A for trade associations/sector bodies and Route B for individual manufacturers. These routes are not exclusive meaning there are opportunities through activities and outputs at the sector body level (Route A) to be used by member companies at the individual business level (Route B).

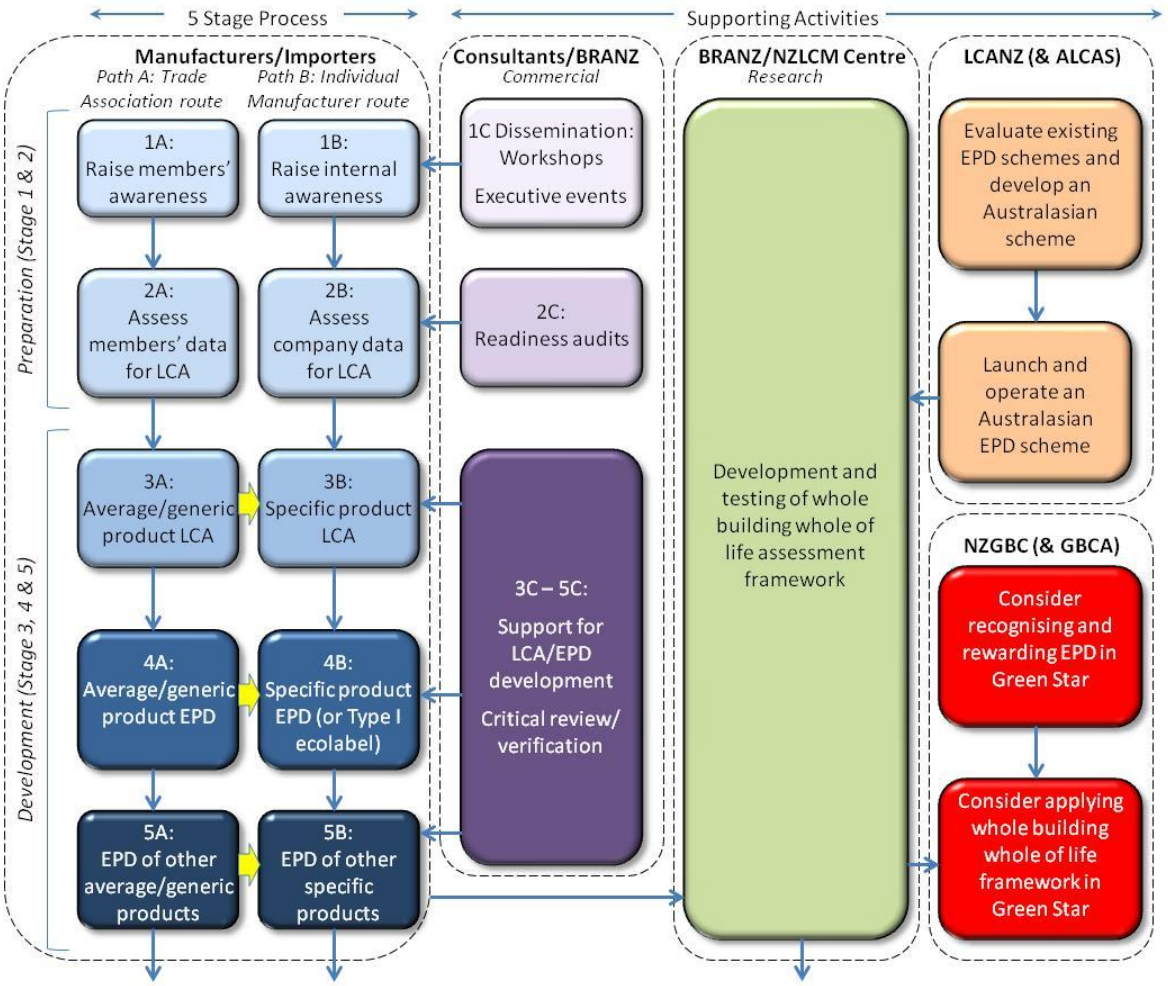


Figure 4. Proposed Approach for development of Whole Building Whole of Life Assessment Framework for New Zealand

Preparation is broken down into two stages and *Development* into three stages. Manufacturers can therefore assess and decide at which point in this five stage process they can engage with the Plan. Not all manufacturers would need to start at Stage 1 depending on existing level of knowledge and use of LCA.

Preparation (Stages 1 and 2) is about gaining knowledge and information about LCA, EPD and whole building whole of life assessment, and obtaining a better understanding of data requirements and implications. The *Preparation* phase provides underlying information necessary for manufacturers to decide about proceeding to the *Development* phase (Stage 3 onwards).

A December 2015 completion date has been set for *Development.* At this point, it is envisaged that publicly available data in EPD published by manufacturers and/or in NZ LCI would be incorporated into the first version of the whole building whole of life assessment framework scheduled for finalisation around March 2016. Thus, sector bodies wanting product average data or individual manufacturers wanting product specific data incorporated into the framework would need to have EPD third party verified and published by the end of December 2015, in order to ensure incorporation in the first version of the framework.

It is envisaged that the whole building whole of life assessment framework will then be updated every two to three years, the frequency of updates to be decided and agreed during the forthcoming research process that will underpin this framework.

Aspects of this Plan are already in the process of development, such as the LCANZ/ALCAS Australasian EPD scheme (last column in Figure 4), so this suggested process is designed to build on existing activity rather than "reinvent the wheel". It is also designed to build on international experience and to align with this.

Information about the proposed five stage process is provided in Sections 4.2 to 4.5 and information on supporting activities is in Section 4.6.

4.1 Costs and Funding

There are two main costs to manufacturers associated with this Plan - the cost of developing an LCA model for a product or products and the cost of obtaining EPD. Small to medium sized enterprises (SMEs) represent a large and important proportion of the sector, and are likely to encounter additional barriers that need to be overcome in order to engage in development of LCA and EPD. It is important that this section of the industry is not excluded. Therefore, a research area in this Plan will focus specifically on the needs of this group.

4.1.1 Developing an LCA Model

The cost to manufacturers of developing an LCA model will vary depending on a range of factors, for example:

- Industry bodies and trade associations may choose to fund the development of a sector LCA model using data from participating member companies. This model, once developed, may then be used by individual members. The cost of developing such a model is likely to be significantly less than if individual manufacturers each funded the development of their own LCA models.
- Manufacturers with similar products (in terms of contributing materials and processes) will be able to use one LCA model to evaluate a range of their products. Therefore the cost per product will be less than for a manufacturer with very different products, groups of which may require different LCA models.
- Manufacturers who have good data, shorter supply chains and/or good supply chain relations are likely to find the process of obtaining data and developing an LCA model cheaper as much of the data that is needed will already exist or be more easily obtainable.
- Manufacturers may choose to develop their own LCAs (generally requiring licensing of an LCA software tool from a provider and training) or obtain support from external organisations with expertise in LCA. There are various environmental and sustainability consultancies and other organisations in New Zealand that can provide this support. BRANZ also intends to provide support to manufacturers as illustrated in Figure 4. The choice of whether to develop internal capability or engage external support will depend on the cost and time for training and development of an LCA model versus the costs of consultancy support. Investing in internal capability is likely to be more cost effective where manufacturers want to actively use LCA as a decision support tool to help inform company strategy on sustainability, investment decisions and research & development.
- Development of an LCA model is generally a one-off cost. Once an LCA model has been developed for a product, it can be quickly and easily updated in future years, meaning the costs of updates are likely to be minimal in comparison with the initial development cost.
- The process of looking at products through an "LCA lens", using the right data and engaging staff in the process, can lead to identification of opportunities for financial

savings and improved resource efficiency and environmental management. Demonstrating an understanding of environmental impacts of products through use of LCA can help with communication to clients, demonstrate commitment and integrity and enhance reputation, all of which are more difficult to value but can nevertheless be significant.

This cost to develop an LCA model is normally more significant than the cost of publishing an EPD, and is highly dependent on the factors outlined above.

4.1.2 Publishing an EPD

The details of an Australasian EPD scheme are not currently available but it is useful to look at an example of an international EPD scheme to better understand the potential costs involved with publishing EPD.

Fees charged by an EPD scheme usually include registration (which typically reduces if more EPD are registered), the cost of third party verification of the EPD and may include an annual membership cost to be part of the scheme. Manufacturers may also want to provision for support to assist with drafting an EPD and development of evidence for the third party verification process.

Based on fees in euros cited by the International EPD System (www.environdec.com), some example costs converted into New Zealand dollars are provided below[1]. **These should not be taken as indicative of a future Australasian scheme**. The costs below exclude verification which is incurred before a draft EPD becomes final and is estimated at typically 2-3 days of work for a verifier:

- A manufacturer with less than 250 employees registering one EPD costs about NZ$3000 in the first year, and NZ$1500 each following year whilst a member of the scheme. Registration of four EPD by the same manufacturer costs around NZ$1175 per EPD in the first year and less than an equivalent of NZ$400 per EPD per following year whilst participating in the scheme.
- A manufacturer with more than 250 employees registering one EPD costs about NZ$5500 in the first year, and around NZ$3900 each following year whilst a member of the scheme. Registration of four EPD by the same manufacturer costs less than NZ$1770 per EPD in the first year and less than an equivalent of NZ$1000 per EPD in each following year of participation thereafter.

As with LCA models, the cost of developing EPD may also vary. For example if an LCA model developed at an industry organisation or trade association level is used for the publication of a sector average EPD, use of the underlying and verified LCA model and EPD template by individual members should save cost and time, in comparison with development of individual LCAs as the basis for product specific EPD.

EPD need to be updated periodically, usually every three to five years depending on the rules of the specific scheme. The cost of update should be significantly lower than the initial set up cost as the LCA model and EPD template would already exist. During an update of an EPD, it is envisaged that the following would be required:

- Updating the existing LCA model with more recent data.
- Updating the product environmental impacts in the EPD template, and any new information that needs to be added about the product.

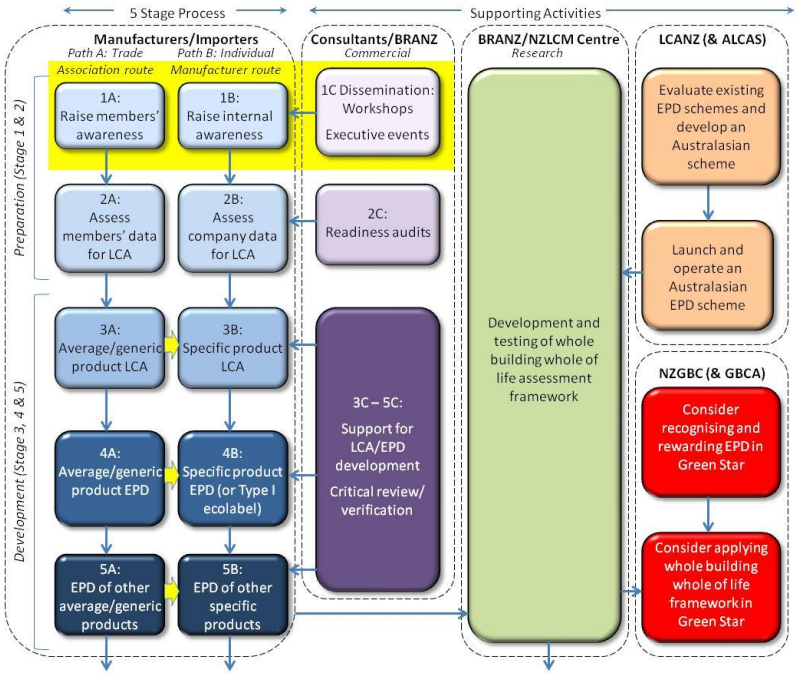
[1] Based on a euro being equivalent to NZ$1.573, the exchange rate quoted on www.ft.com on 20th September 2012.

- Verification of the new data and information (which is likely to take less time as only the new data and information should need review).

4.1.3 Funding for Research

BRANZ has applied to the Building Research Levy to fund a three year research programme that will deliver a New Zealand whole building whole of life assessment framework. Funding includes establishment of two doctorate positions with the NZLCM Centre, whose outputs will assist achievement of the research programme aims. Information about the proposed research is set out in Section 4.6.

4.2 Stage 1: Awareness Raising

Stage 1 - Key Features	
	
Who	NZ trade associations (1A), manufacturers (1B), BRANZ/consultants (1C)
When	Preparation (2013)
Why	• To respond to NZ industry feedback that there is a lack of understanding and therefore buy-in from executive management, and training and workshops will help improve knowledge. • To help inform the NZ construction sector about the benefits of LCA, EPD as a communication tool and the "level playing field" to assessment created by a whole building whole of life approach.
Measure of success	• Executives and other key decision makers in manufacturing companies better understand the costs/benefits of a "level playing field" approach, use of LCA and publication of EPD. • Company champions better understand what is involved at a practical level.
Cost to industry	Nominal for workshops and events to cover preparation, travel and venue (if applicable).

Stage 1 is about raising awareness of the benefits of environmental profiling and whole building whole of life assessment amongst New Zealand member organisations, trade associations and manufacturers.

There are two pathways proposed for engaging in this process:

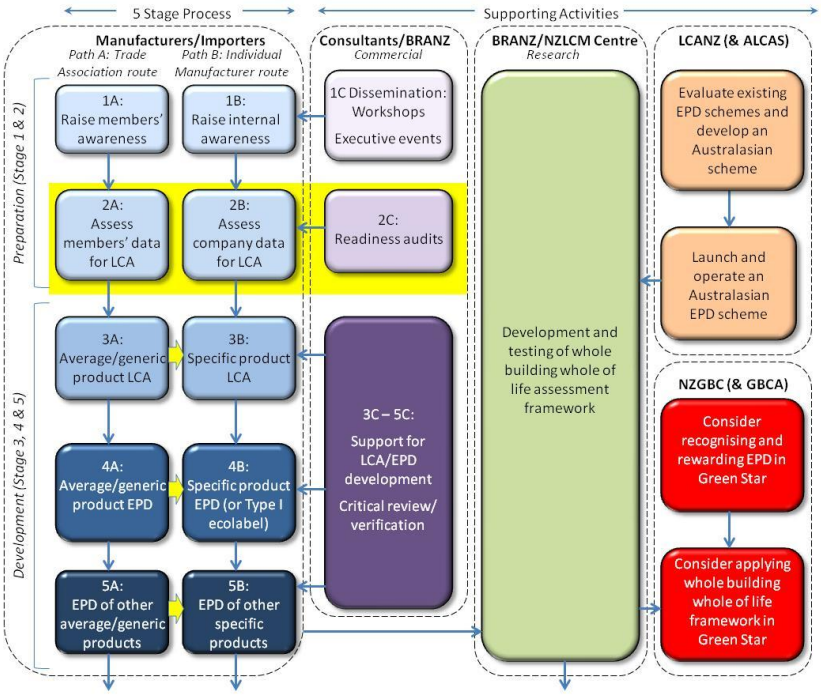
- Pathway A represents awareness raising at the trade association or industry body level.
- Pathway B represents awareness raising at the manufacturer level.

BRANZ proposes to develop and offer two types of awareness raising activities:

- *Executive Events*: These would be aimed at decision makers and would cover the business benefits of LCA, EPD and whole building whole of life environmental assessment.
- *Dissemination Workshops:* These would be aimed at company representatives who have a responsibility for environmental management, products and/or development. They may be conducted through trade associations (Pathway A) or for individual manufacturers (Pathway B). It is envisaged these would have an interactive element so would benefit from smaller group sizes and a workshop format. They will provide a practical understanding of what is involved in undertaking an LCA, publishing an EPD and how this facilitates whole building whole of life assessment, to help participants determine next steps.

4.3 Stage 2: Assess Readiness

Stage 2 - Key Features

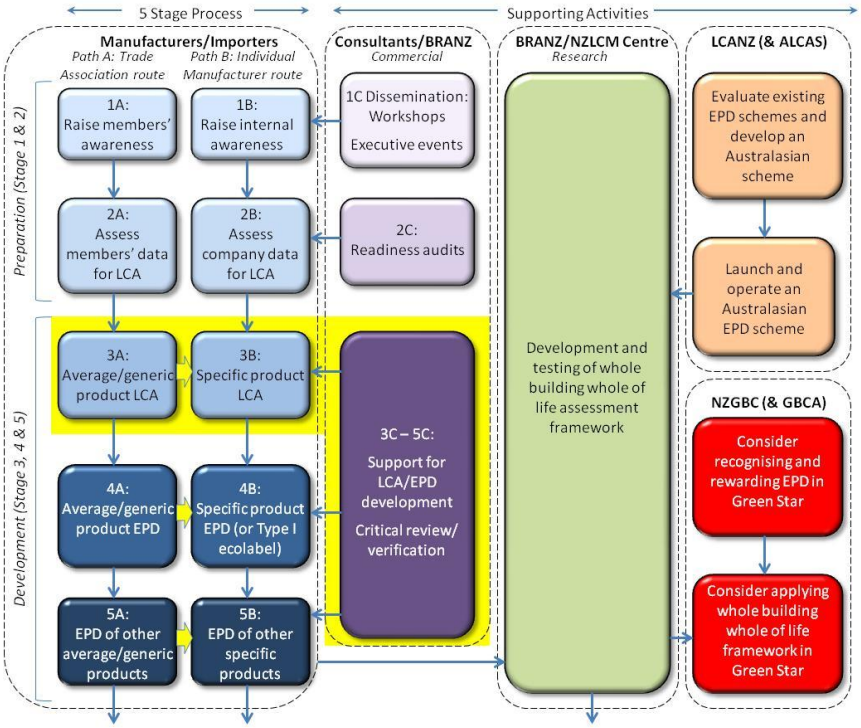


Who	NZ trade associations (2A), manufacturers (2B), BRANZ/consultants (2C)
When	Preparation (2013)
Why	To help manufacturers to better understand readiness for LCA and EPD by undertaking a "readiness" audit which focuses on data and information held (scope, extent, quality, format) and suitability for LCA and EPD development.
Measure of success	Manufacturers understand how ready they are for LCA and EPD and the cost of development based on their specific situation (products, data, data quality).
Cost to industry	Nominal cost for an audit to cover time on site, review of information/data and production of a report.

BRANZ proposes to support trade associations assisting their members (Pathway A) and individual manufacturers (Pathway B) who want to better understand their level of preparedness for developing an LCA model and EPD. This support is envisaged as providing an audit and advice service that will look at what data and information is held, its format, depth and data quality and assess this against the data needs of an LCA. Where gaps or issues are identified, they will be highlighted together with suggestions to address any issues found. BRANZ envisages a site visit will comprise part of the work. A short report will set out level of readiness and recommendations for next steps.

Environmental and sustainability consultancies, and other organisations with expertise in LCA, may additionally provide this service. LCANZ should be able to provide details (http://www.lcanz.org.nz/).

4.4 Stage 3: LCA Development

<table>
<tr><th colspan="2">Stage 3 - Key Features</th></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Who</td><td>NZ trade associations (3A), manufacturers (3B), BRANZ/consultants (3C).</td></tr>
<tr><td>When</td><td>Development (2013 – 2015)</td></tr>
<tr><td>Why</td><td>• To better understand the environmental impacts of a product or products using LCA-based model.
• To provide a basis for publication of an EPD.
• To explore and assess potential benefits.</td></tr>
<tr><td>Measure of success</td><td>• LCA modelling carried out to ISO 14040, ISO 14044, ISO 21930 (and EN 15804 standards) and PCRs from an Australasian EPD scheme.
• LCA model used as a tool for business planning, assessing alternatives and performance (continuous improvement).</td></tr>
<tr><td>Cost to industry</td><td>Dependent on factors set out in Section 4.1. Process can lead to identification of cost savings.</td></tr>
</table>

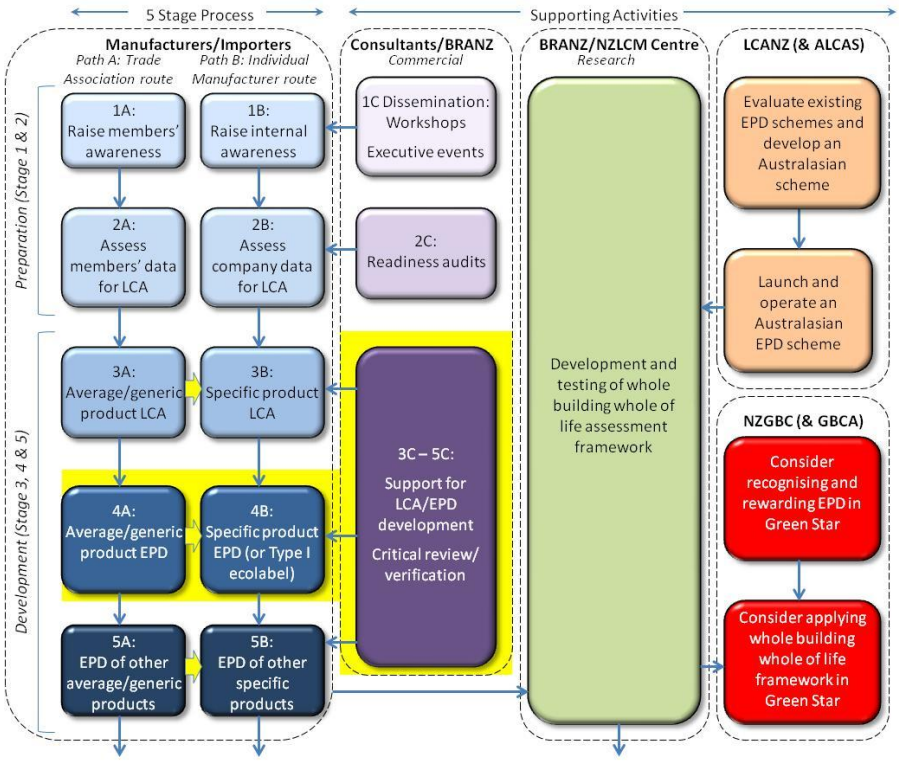
Stage 3 involves developing an LCA-based model of a product or products. This may be undertaken at a trade association level (Pathway A) with support and data from individual members in order to generate an average product LCA for similar products or at the manufacturer level (Pathway B) in order to generate a product specific LCA.

A generic LCA model developed at the trade association level may, in turn, be utilised as the basis for individual members to develop their own product specific LCAs.

There are providers available that can help and support manufacturers with LCA development. BRANZ also intends to provide support on a commercial basis to help manufacturers to develop LCA (and EPD), drawing on in-house expertise in LCA, construction, materials and buildings.

Completion of this stage additionally provides trade associations and/or individual manufacturers with the option of submitting LCIs arising from developed LCA models to LCANZ for inclusion in a developing database of New Zealand materials, products and processes called NZ LCI (illustrated in Figure 1 but not in this section). By making LCIs available, trade associations and/or manufacturers can help ensure that good quality data that are representative of their product(s) are available for use in studies carried out by LCA practitioners.

4.5 Stage 4: Publish an EPD

Stage 4 - Key Features	
	
Who	Trade associations (4A), manufacturers (4B), BRANZ/consultants (4C).
When	Development (2013 – 2015)
Why	• To demonstrate product integrity through public declaration of environmental performance for domestic and export markets. • To develop benchmarks for a sector (sector average EPD). • To provide a basis for continuous improvement. • To input to whole building whole of life assessment providing the level playing field sought by the industry. • Impacts from sector average EPD can be considered for incorporation into specifications of Type I ecolabel schemes (ECNZ in New Zealand).
Measure of success	• Published sector average and product specific EPD on the Australasian EPD scheme website. • Manufacturers have the option of demonstrating a product's impacts are better than sector average impacts by opting for a Type I ecolabel (featuring sector average impacts) as an alternative route. • Manufacturers have a sound, internationally recognised platform for reporting environmental performance of products, demonstrating benefits over competitor products and yielding opportunities for improved sales. • Basis for more robust, transparent information/data available to designers.
Cost to industry	Cost varies and will be dependent on fee structure of Australasian EPD scheme. See Section 4.1.

LCA-based models developed in Stage 3 provide an important basis for EPD development. EPD may be developed to convey sector or product average information and data at the trade association level (Pathway A) or product specific information and data at the manufacturer level (Pathway B).

There may also be opportunities for sector average EPD templates (and the underlying LCA models behind them) to provide the basis for adaptation for development of product specific EPD by individual member companies.

Where a sector average EPD has already been developed, and impacts reported in it have been incorporated into a specification of a Type I ecolabel scheme, manufacturers on Pathway B could have the choice of submitting their product specific data, LCA model and information for review by a Type I ecolabel provider to confirm better environmental performance than the sector average (in addition to other non-LCA criteria set in the specification). This provides a route for recognition of better environmental performance without requiring publication of a product specific EPD where a manufacturer would prefer not to do this.

If a manufacturer chooses this route, it is envisaged that data on the impacts of the product would be submitted by the Type I ecolabel scheme for inclusion in the whole building whole of life assessment, so they are included in the calculation of building impacts but would not be individually reported or published.

Consultancies that provide LCA services will also be able to support manufacturers and trade associations with EPD development. BRANZ proposes to assist manufacturers with EPD development at both an individual company and trade association level. This new commercial service would deliver a BRANZ EPD in accordance with the Australasian EPD scheme rules. It is envisaged that this would be an additional service to BRANZ Product Appraisals.

With BRANZ's expertise in LCA, materials, construction and buildings, BRANZ also envisages providing an EPD verification service, subject to EPD scheme rules. This would include review of draft EPD and supporting LCA models to ensure alignment with Australasian EPD scheme requirements and PCRs.

Companies can review the process for LCA and EPD development, and the benefits, before deciding to develop LCA and EPD of other products (Stage 5 in Figure 4).

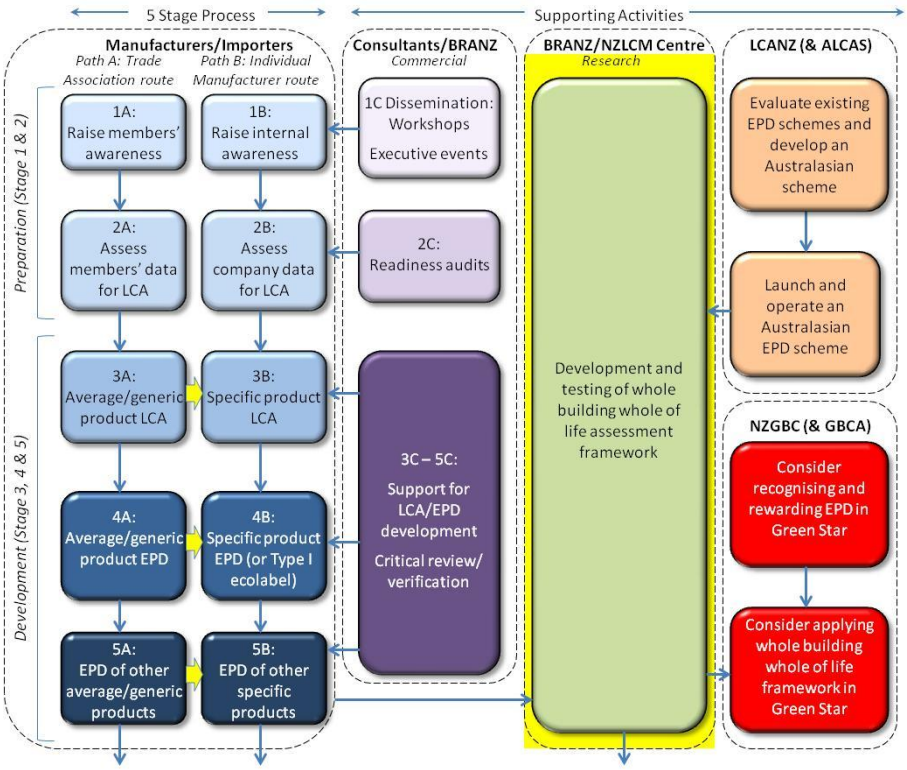
4.6 Supporting Activities

Three supporting activities will assist the establishment of whole building whole of life assessment in New Zealand:

- Research required to develop the supporting framework.
- Establishment of an Australasian EPD scheme that is consistent with international schemes and standards.
- Adoption in tools and schemes that evaluate building environmental performance (such as Green Star).

Further information on these is provided in the following sections.

4.6.1 Research to support Whole Building Whole of Life Assessment

<table>
<tr><th colspan="2">Supporting Activity: Research</th></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Who</td><td>BRANZ, NZLCM Centre, industry stakeholders</td></tr>
<tr><td>When</td><td>2013 - 2016</td></tr>
<tr><td>Why</td><td>• To provide a consistent basis for evaluation of buildings in terms of their life cycle environmental impacts.
• To ensure that materials and products, and the contribution they make to the performance of buildings across the life cycle, are fairly represented.
• To provide a basis for collection of data to help inform the design process.</td></tr>
<tr><td>Measure of success</td><td>• Publication of a whole building whole of life assessment framework for use by the NZ construction industry and suppliers to the industry, such as design tool and rating tool providers.
• Delivery of research to address research questions set out below.
• Participation by the industry through a Programme Committee to oversee the project, and working groups established where necessary.</td></tr>
<tr><td>Cost to industry</td><td>Participation by individuals on the Programme Committee and, where necessary, working groups.
Input of information, experience and data.</td></tr>
</table>

BRANZ proposes that a Programme Committee is established to oversee the research. Progress would be reported regularly to this Committee, whose membership would consist of nominated representatives of interested stakeholder groups.

A review of international building environmental rating tools (Dowdell, 2012) and other work has highlighted the following areas for research.

Research Question 1 - *What environmental impacts, impact assessment methodologies and other outputs should form the basis of whole building whole of life assessment in New Zealand?*	
Output	A report setting out environmental impacts, impact assessment methodologies and other outputs that will underpin a New Zealand whole building whole of life assessment approach.
Envisaged Process	1. Set out impacts, impact methodologies and other outputs. 2. Discuss their relevance and appropriateness for use in a whole building whole of life assessment, using an interested stakeholder group (featuring representation from manufacturers, design, other industry stakeholders, academia and LCANZ (for EPD scheme)). 3. Develop a draft list of potential impacts, impact methodologies and other outputs. 4. Publish on BRANZ website for comment from wider group of stakeholders. 5. Consider comments received and publish final list.

An output of LCA is the calculation of potential environmental impacts of materials and products across all or part of the life cycle. This is called Life Cycle Impact Assessment (LCIA). Other reported outputs may arise from the LCI such as waste production or water use.

International building environmental rating tools differ with respect to the number of impacts and other outputs used in their whole building whole of life assessment. This research will gather relevant standards, guidance, and information and develop a list of proposed potential impacts, methodologies and other outputs for consideration for a New Zealand scheme, followed by consultation with the industry.

Research Question 2 - *What would be an appropriate office building benchmark to provide the reference case for whole building whole of life assessment?*	
Output	A whole life office building benchmark or benchmarks, expressed as outputs from Research Question 1, on an "impact/area/year" basis.
Envisaged Process	1. Assemble research team with architecture, design, construction management, quantity surveying, materials and LCA experience. 2. Define office building characteristics and building typologies that meet these characteristics. 3. Develop an LCA model of the office life cycle from cradle to grave. 4. Undertake sensitivity analysis and scenario testing to understand impact of alternatives on outputs. 5. Define benchmark values and key variables that impact on these values, for use in a whole building whole of life assessment.

The following building elements are recommended for consideration:

- *Structure & Enclosure*: sub-structure / foundations, frame, external walls (structural/non-structural), internal walls (structural), roof, windows and doors.
- *Non-structural*: upper floors, internal walls (non-structural), ceilings, wall and floor finishes, HVAC systems, electrical provision (cables, lighting), water and wastewater provision (on-site collection, distribution and use).

An office lifetime will need to be established for New Zealand. Reviewed international building environmental rating tools typically use 50 or 60 years.

The work will seek to understand whether there is a need to define benchmarks for different types of office e.g. low rise and high rise or when expressed on an impact/area/year basis, whether they are sufficiently similar that fewer benchmarks will be needed. Furthermore, the work will determine what variables affect benchmark values e.g. climate zone, orientation, number of storeys, underground parking, HVAC, through use of scenario testing and sensitivity analysis. This is to ensure that the reference building is relevant and provides a suitable benchmark for comparison.

Research Question 3 - *What default scenarios need to be defined for New Zealand to fill data gaps?*	
Output	Default scenarios to support whole building whole of life assessment.
Envisaged Process	1. Identify what default scenarios need definition in the life cycle e.g. transport in New Zealand, replacement of products during building life cycle, maintenance. 2. Review standards and guidance to inform scenario setting. 3. Investigate basis for default scenarios, with supporting assumptions and information. 4. Test with sensitivity analysis. 5. Report on findings and provide default values.

Default scenarios are based on informed assumptions about standard New Zealand practices and technologies in order to provide values or information for use where project specific data are not available at the time of an assessment. For example, if undertaking an assessment during early design, it is unlikely that the source of materials will be known. In this case, default scenarios for transport, which apply a distance and mode of transport, may be used where project specific information is unavailable.

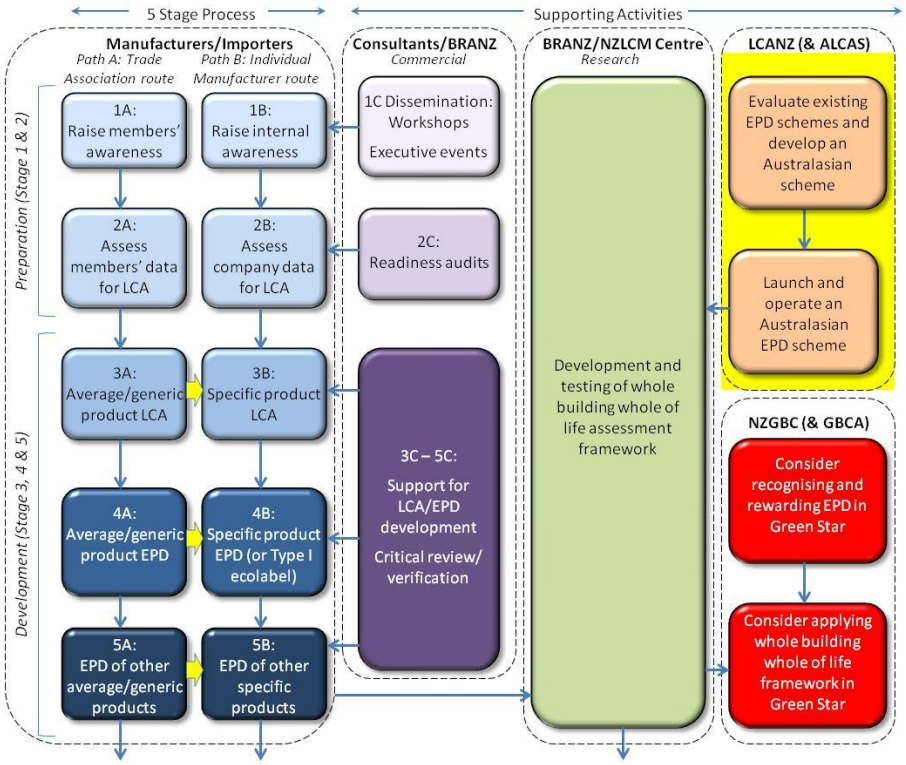
It is envisaged that default scenarios will be used to fill gaps in data or information and will be informed by reference data, research, guidance, standards, codes of practice and legal limits, in addition to input, knowledge and experience of industry professionals.

Research Question 4 – *How can SMEs be better included in the process?*	
Output	Processes and guidance to help SMEs to develop LCAs of their products.
Envisaged Process	1. Identify SMEs in the NZ construction sector, their activities, level of readiness and needs. 2. Review templates, tools and guidance available internationally to help SMEs engage in LCA. 3. Identify options to assist NZ SMEs and review with SME stakeholders. 4. Develop process and guidance to help SMEs, and test with case studies.

Around 42% of manufacturing firms (including those that manufacture construction products) in New Zealand have 49 employees or less and about three in every four construction sector companies have 49 employees or less. SMEs therefore make an important contribution to the sector in New Zealand.

This research would focus on SMEs and seek to understand who they are, their roles within the sector and their attitudes and readiness for LCA and EPD. The work will capture what templates, tools and guidance have been produced either internationally for SMEs or for other sectors within New Zealand and assess applicability and usefulness. Based on these findings, processes and/or guidance will be developed with the aim of obtaining better engagement from SMEs and it is envisaged that case studies will be generated.

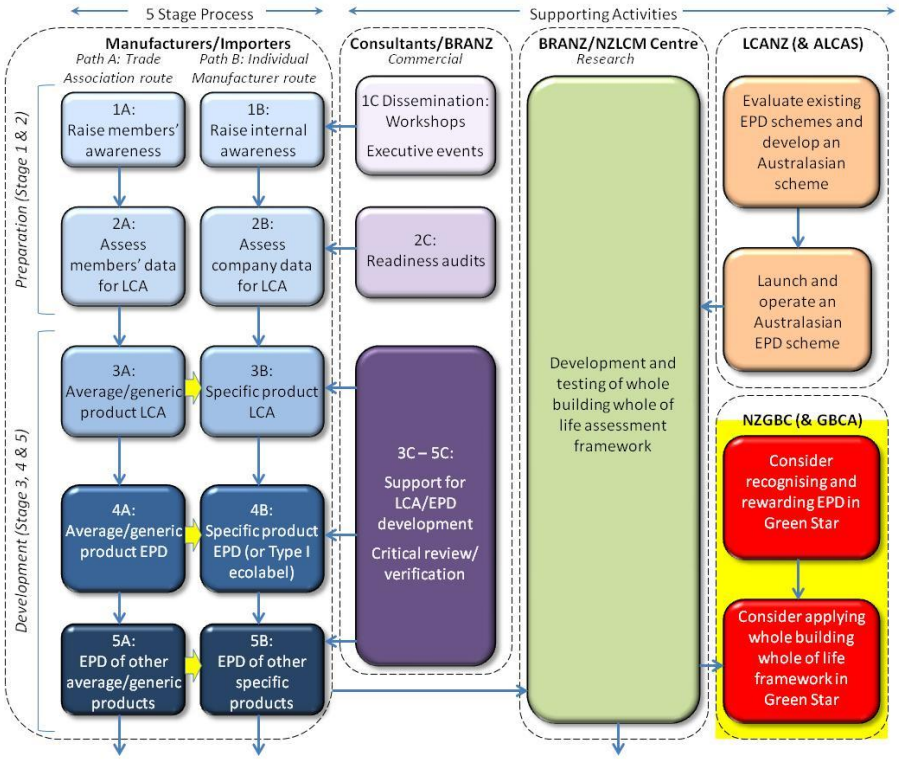
4.6.2 Establishment of an Australasian EPD Scheme

Supporting Activity: Australasian EPD Scheme	
	
Who	LCANZ / ALCAS
When	Anticipated 2013 launch.
Why	• To provide a local resource and hub for New Zealand and Australian manufacturers that want to develop EPD. • To have a scheme aligned with international schemes and standards. • To ensure that it is locally relevant. • To provide a mechanism and format for recognition of the environmental performance of New Zealand and Australian made products domestically and overseas.
Measure of success	• EPD scheme in operation during 2013. • Mutual recognition and alignment with other EPD schemes. • EPD published on the scheme by New Zealand and Australian manufacturers.
Cost to industry	There will be a cost to register and for verification of draft EPD. These are yet to be established. Section 4.1 provides some indicative figures.

LCANZ and ALCAS are in the process of considering potential options for an Australasian EPD scheme by assessing examples of schemes that currently operate internationally. Basing an Australasian scheme on an existing scheme has the advantage that it should not "reinvent the wheel", should be aligned and consistent with international developments, should have access to existing PCRs (for adaptation to Australasian conditions, where necessary) and can use existing governance structures and processes.

It is envisaged that LCANZ and ALCAS would have joint responsibility for the scheme, and would jointly operate it either directly or potentially through assigned representatives. The aim is to have a scheme in place during 2013.

4.6.3 Adoption in Tools/Schemes that evaluate Building Environmental Performance

<table>
<tr><th colspan="2">Supporting Activity: Framework in Rating Tools and Schemes eg. Green Star</th></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Who</td><td>NZGBC / GBCA</td></tr>
<tr><td>When</td><td>For consideration throughout research process</td></tr>
<tr><td>Why</td><td>• Recognition and incorporation into Green Star provides an important driver.
• Assessment process incorporates more materials and evaluates how they contribute to building environmental performance.
• Assessment based on calculated environmental impacts rather than proxy, consensus based measures of performance.
• Opportunities to link to design process and with BIM in the future.</td></tr>
<tr><td>Measure of success</td><td>• NZGBC and GBCA participate as members of Programme Committee overseeing research.
• Consider findings of research throughout project and possible implications in Green Star.
• Consider a recognition process for EPD in Green Star, providing a further incentive to manufacturers to develop EPD (2013 - 14).
• Consider recognising whole building whole of life assessment based on research outcomes in this Plan, due around March 2016.</td></tr>
<tr><td>Cost to industry</td><td>No direct cost.</td></tr>
</table>

Recognition and use of whole building whole of life assessment in schemes and tools that evaluate building environmental performance is an important driver to facilitate take up and use, providing an incentive for manufacturers to be more transparent with respect to the environmental performance of their products and providing a sound platform to help inform design decisions. In New Zealand and Australia, Green Star is the main rating tool used to assess the environmental performance of offices (and other building types).

By engaging in the three year research process for the whole building whole of life assessment framework, NZGBC and GBCA would have an opportunity to assess and consider how the framework could be incorporated into the process for rating the environmental performance of buildings.

In the short term (2013-14), development of a basis in which Green Star recognises and rewards EPD published by trade associations and/or individual manufacturers would be favourable, followed by consideration of how the whole building whole of life assessment framework can be considered in Green Star in the mid-term (2015 – 2017).

4.6.3.1 Short Term: EPD Recognition in Green Star

Current methods for evaluating materials in Green Star make it difficult to establish equivalency as the criteria used to determine environmental performance do not reflect impacts. As a result, there is no way of comparing the environmental benefits of using recycled aggregate in concrete or using steel with a high recycled content, for example.

EPD provide a robust, transparent, consistent input to calculation of whole building whole of life impacts. It is therefore important that an investment by manufacturers in EPD development and publication is incentivised and rewarded.

EPD and use of LCA are increasingly being recognised in international building environmental rating tools including LEED (USA), BREEAM (UK), HQE (France) and DGNB (Germany) (Dowdell; 2012).

As a first stage, consideration of recognition of EPD in Green Star would provide a further incentive to manufacturers to develop EPD. LEED uses an interesting approach for recognising EPD by providing a (pilot) credit for innovation, details of which can be found in the full Plan.

Earlier notice of additional recognition of EPD in Green Star would be preferable. This would also mean that manufacturers who are early adopters of EPD could obtain more immediate benefits through recognition in Green Star.

4.6.3.2 Mid Term: Consideration of how to apply the Framework in Green Star

As the research underpinning the development of a whole building whole of life assessment framework produces outputs, NZGBC and GBCA would have the opportunity to consider how these outputs may be utilised in Green Star, with the following potential benefits:

- A common understanding between manufacturers, architects/designers and rating tool providers concerning which environmental impacts are of importance and how they are calculated.
- Evaluation of buildings based on their calculated impacts, taking into account all relevant and significant processes in the life cycle, rather than using consensus driven proxy measures of performance.
- Greater objectivity.

- A data rich process drawing together questions currently covered in parts of the material, energy, water and emissions sections of Green Star.
- A thorough assessment of products, in which use of higher quality data eg. product specific EPD, is rewarded.
- Future opportunities to directly draw underlying data from BIM, reducing the time and cost of assessment.

5. SUMMARY OF HOW THIS PLAN RESPONDS TO NEW ZEALAND CONSTRUCTION INDUSTRY RECOMMENDATIONS

Table 2 reproduces Table 1 but with an additional column that summarises how this Plan addresses the recommendations made by the industry in 2010.

Table 2. Summary of how this Plan addresses Industry Recommendations

Issue	Designers Workshop	Manufacturers Workshop	How issues raised are addressed in this Plan
Governance	A credible authoritative body or process needs to oversee implementation.	Establish a credible body or mechanism.	A Programme Committee of key stakeholders is proposed to oversee research set out in this Plan, which would be delivered by BRANZ, NZLCM Centre and other partners. LCANZ and ALCAS are currently evaluating examples of international EPD schemes with a view to basing an Australasian scheme on one of these. Governance arrangements would be in accordance with the chosen EPD scheme model and overseen by LCANZ and ALCAS or their representatives.
Methodology	The methodological approach needs to be robust enough to ensure unbiased fair comparison, yet flexible to encompass different applications.	Examine the different options for establishing an LCA approach for New Zealand recognising lessons learnt from international experience.	Different options examined (Dowdell, 2012) and used to inform the development of this proposal. PCRs in the Australasian EPD scheme would align with relevant international schemes and standards. PCRs provide detailed rules for material and product groups and provide better consistency. EPD may cover all of the life cycle or part of the life cycle where the product can be used in different ways or contributes to the performance of a designed building (such as thermal performance). Where EPD cover part of the life cycle, the rest of the life cycle is modelled in the whole building whole of life assessment.
Suggested Actions to address Barriers	Green Star should be developed to incorporate LCA data, to encourage a consistent and robust approach to materials sustainability assessment in New Zealand using LCA.	Consult with industry groups and improve knowledge using training, coaching and workshops. Encourage the development of a working group to champion the LCA agenda.	Industry events aimed at two levels – CEOs and environmental/product/sales managers. Environmental impacts reported in EPD are a public declaration and provide a sound basis for inclusion in whole building whole of life assessment. Impacts reported in EPD are consistent, transparent and freely available, providing a useful resource for design tools. NZGBC (and GBCA) invited to the Programme Committee to consider development of the framework and its application in evaluating environmental performance of buildings.
	Further design tools will be needed to maximise data uptake by practitioners. A 'one tool suits all' approach is unlikely to be appropriate.	Develop a business case for the New Zealand building sector and promote case studies illustrating industry lessons from use of LCA.	Benefits of developing EPD and using these as the basis of whole building whole of life assessment provided in this Plan. Case studies of companies that have undertaken LCA and EPD, setting out their needs and the benefits they obtained are provided. EPD provide more consistent data which can provide the basis for design tools.

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