

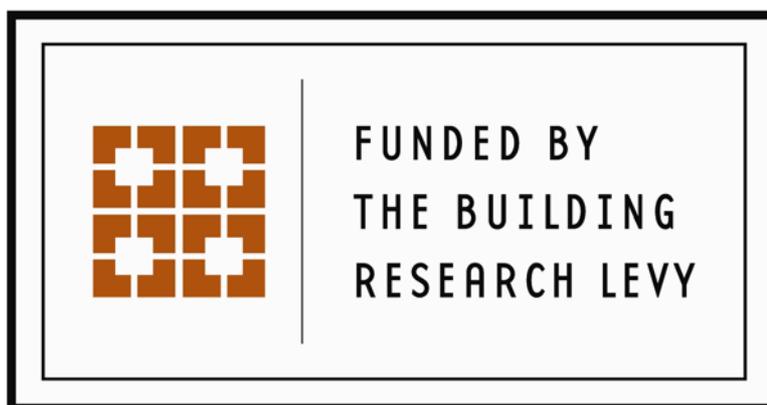


STUDY REPORT

No. 135 (2005)

Compendium and Evaluation of Building Environmental Impact Schemes being used in Australasia

Rachel Hargreaves
May 2005



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Building Research Levy

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Preface

This report provides an assessment of the current building environmental impact schemes being used in Australasia with a view to recommending a scheme for use as the primary scheme in New Zealand.

Acknowledgements

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Note

The opinions expressed in this report are those of the author and are not necessarily those of Building Research. For all enquiries, please contact Dr Wayne Sharman (04) 237 2054.

COMPENDIUM AND EVALUATION OF BUILDING ENVIRONMENTAL IMPACT SCHEMES BEING USED IN AUSTRALASIA

BRANZ Study Report SR 135

Rachel Hargreaves

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ABSTRACT

A building environmental impact scheme is a tool for evaluating the environmental design or operational performance of a building. There are many schemes currently available with many more under development. While there are commonalities between the schemes, the various methods all differ slightly, depending on which markets they cater for, what type of buildings they apply to, what environmental issues are included, whether the evaluation is undertaken at the design stage or is retrospective, etc. Some schemes measure just one environmental issue, i.e. energy, some the life-cycle impact of materials, whereas others measure a range of environmental issues, e.g. water, materials, waste, etc. No two schemes are exactly the same. For the building and construction industry and other urban practitioners, knowing which scheme to use can be a challenge, especially if the intent of the scheme is unclear.

This report identifies the major schemes currently in use in Australasia (including those in their pilot stages or under development), and describes each scheme with respect to:

- its overall 'sponsor'
- the overall purpose for which the sponsor operates the scheme
- the types of buildings to which it applies
- the types of customers for whom assessments are done
- the types of persons carrying out the assessments
- the general methodology used in the assessment
- the current market penetration of the scheme in Australia and New Zealand.

The aim of this assessment is to provide an expert opinion as to which scheme may be the most appropriate for use as the primary scheme in New Zealand. Nine schemes were reviewed:

- Green Star (Aus)
- BASIX (Aus)
- The Green Home Scheme (NZ)
- Green Globe 21: Design & Construct (Aus and NZ)
- NABERS (Aus)
- The Green Office Scheme (NZ)
- LCADesign (Aus)
- TUSC (NZ)
- NZ Settlement Liveability Index (NZ).

Note: energy-specific schemes were not included (e.g. ABGR, NatHERS, etc) because they do not leverage broader environmental outcomes, given their singular focus on energy. Schemes with no definitive measurement or rating component (i.e. a final score) were also not included because of their limited ability to influence design or operational performance.

The analysis showed that there are a variety of schemes on the market (or soon to be), each unique to the purpose for which they are intended. There is a mix of building types evaluated, environmental categories considered, scoring methodologies (and the expression of this score), and at what stage the assessment is undertaken (predictive or operational).

As a result, it is not possible to recommend one scheme for use as the primary scheme for New Zealand. It is possible to recommend a scheme for the varying purposes and market segments to which the various tools apply. After reviewing each scheme in detail, the following recommendations are proposed:

- For a residential building (design) scheme, the Green Home Scheme is the most appropriate tool. It will require a more concentrated marketing and commercialisation commitment for effective market penetration.
- For a (mandatory) residential planning tool, a similar tool to BASIX would be appropriate. The New Zealand scheme, TUSC, is modelled on the BASIX scheme and is therefore the most appropriate application in the New Zealand context. It is recommended to follow the developments of the TUSC programme to see how this scheme evolves.
- For a commercial building (design) scheme, Green Star's suite of commercial tools are currently the most appropriate IF they are to be introduced in New Zealand in the near future. They will need to be adapted to the New Zealand context before use, and a process for commercialisation established (either through the Green Building Council of Australia, a New Zealand chapter of the Green Building Council, or another mechanism).
- If the Green Star commercial tools are NOT introduced to New Zealand in the near future, the most appropriate scheme to use is the Green Office Scheme. While decisions as to its future have not been finalised at the time of writing, there is no reason why this scheme would not be

an effective commercial rating tool for New Zealand. (As for the Green Home Scheme, it will require marketing and commercialisation commitment for effective market penetration.)

- In terms of a retrospective or operational scheme for commercial and residential buildings, NABERS has potential for use in New Zealand. Depending on the fate of the Green Office Scheme (which has retrospective capability for commercial buildings), NABERS may be of use in the New Zealand market. It is recommended to wait and see the results of the commercialisation process of NABERS (in Australia) before further investigating its potential for use in New Zealand. If the Green Office Scheme is implemented, it will supersede the need for NABERS (although it would still have a role in residential buildings).
- For a hotel (travel and tourism sector) scheme, Green Globe 21: Design & Construct is the most appropriate.
- For a neighbourhood rating scheme, it is recommended to follow the developments of the BASIX communities tool (METRIX), TUSC and NZ Settlement Liveability Index (NZSLI) programmes.
- For a specialised materials-choice type scheme, it is recommended to follow the LCADesign scheme's continuing development and roll-out (especially in line with TUSC development). It is also recommended to follow the use of the Green Star – Office Interiors tool (with its 'materials calculator'), as the potential for conflict between these two tools in Australia has yet to be determined.

Note: any of the industry-led schemes – Green Star, Green Home Scheme, Green Office Scheme, LCADesign – could be integrated into (and are potentially complementary with) government-led planning-based schemes, e.g. BASIX, TUSC.

The decision-making process about which building environmental impact scheme to use will continually evolve. Because of the rapidly evolving nature of scheme development, what may appear the most appropriate scheme to use today, may not be the case in a few years time. Whatever scheme is chosen, for it to remain successful it must be continuously supported (with dedicated training, marketing and validation processes) and updated to remain current with the rapidly evolving nature of the environmental field. A great deal depends on the purpose of the scheme and its usefulness in the market.

New Zealand is an ideal position in that there are a select number of relevant schemes currently available for use in the New Zealand market place, with a broad range to choose from (if required) from Australia. Careful selection of schemes that minimise competition between tools (to avoid market confusion) and maximise sustainability outcomes, is clearly the preferred option and something that the New Zealand building industry should aim for.

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1. INTRODUCTION

1.1 Background

Environmentally responsible building is an emerging trend for the building and construction industry in both New Zealand and Australia. There are many drivers behind this trend – changing political agendas, greater tenant demand, attention towards improved corporate responsibility, branding opportunities, moral preferences and the emphasis on the financial savings to be made through ‘greening’ practices – all are causing an increased focus on sustainable buildings. Building environmental impact schemes are important mechanisms for evaluating a building against specified sustainability criteria. As there are many different schemes (with varying criteria) in operation, with many more beginning to emerge, it is important for the industry to understand which schemes are available and which is the most appropriate in differing circumstances.

1.2 Purpose of report

The purpose of this report is to compile and evaluate the building environmental impact schemes currently being used in Australasia, with a view to recommending a scheme for use as the primary one in New Zealand. The work has been undertaken in response to the following terms of reference.

1.3 Terms of reference

In accordance with the technical brief (Project 85121), the work will:

- list all building environmental impact schemes in Australasia
- describe each scheme with respect to:
 - its overall ‘sponsor’
 - the overall purpose for which the sponsor operates the scheme
 - the types of buildings to which it applies
 - the types of customers for whom assessments are done
 - the types of persons carrying out the assessments
 - the general methodology used in the assessment

in sufficient detail that a non-expert in this field can understand the relative characteristics of the schemes

- provide an expert assessment of the worth of each scheme, based on the potential appropriateness of the scheme for use as the primary scheme in New Zealand
- provide an assessment of the current market penetration of the scheme in Australia and New Zealand (it is accepted that subjective judgement will be necessary for this element of the task).

1.4 Definition of terms

For the purpose of this project:

- ‘Australasia’ is defined as Australia and New Zealand.
- ‘Building environmental impact scheme’ is taken to mean building-related environmental assessment methods (i.e. rating tools) for all building types. The analysis excludesⁱ energy-specific rating tools and schemes that do not lead to a composite value, rating or score.
- ‘Current market penetration’ is taken to mean how widely the scheme is used (degree of uptake by customers).

ⁱ Note: energy-specific schemes were not included because they do not leverage broader environmental outcomes, given their singular focus on energy. Schemes with no measurement or rating component were also not included because of their limited ability to effectively influence design or operational performance in the market.

2. SCHEMES CURRENTLY IN USE IN AUSTRALASIA

An environmental impact scheme is a tool for evaluating and rating the environmental **design and/or operational performance** of a building. They have emerged as a means of evaluating buildings across a broad range of environmental considerations. In addition, they have a secondary role in that they are perceived as tools for promoting and contributing to sustainable development.

There are many such schemes available, especially internationally.ⁱⁱ Examples include LEED (US), BREEAM (UK), GBTool (Canada), CASBEE (Japan), BASIX (Aus), Green Star (Aus), NABERS (Aus), Green Home Scheme (NZ), etc. These building rating tools generally deal in one way or another with a number of environmental concerns, such as site selection criteria, the efficient use of energy and water resources during building operations, waste management during construction and operations, indoor environmental quality, demands for transportation services, the selection of environmentally preferable materials, etc. While there are some commonalities between the schemes, the various methods all differ slightly, depending on which markets they cater for, what type of buildings they apply to, the breadth and depth of environmental issues included, whether the rating is undertaken at the design stage or is retrospective, etc.

New Zealand and Australia are relative newcomers in the development of environmental assessment schemes specific for our buildings, cultural practices and environmental conditions. However, as the building industry is attuning itself more and more towards the sustainable development agenda, schemes are beginning to emerge in both countries. Because the development of these schemes is occurring at a relatively fast pace, this report assesses the currently operational schemes as well as those currently being piloted or undergoing development.

All building types for which schemes have been developed have been included. The focus for most scheme development has been either the residential or commercial sector. In the residential sector, schemes are emerging that deal with multiple dwellings (i.e. multi-unit residencies and communities or neighbourhoods). There is one scheme operating for tourism infrastructure (e.g. hotels), and a soon-to-be released scheme for 'Public Assembly' (Building Code of Australia Class 9b) buildings.

All of these schemes are included in this report and are detailed as follows.

ⁱⁱ For more information about the range of schemes in operation worldwide, the Australian Performance Based Building Network has produced a 'Guide to Environmental Design and Assessment Tools'. This information can be downloaded from the following link: <http://www.auspebbu.org/page.cfm?cid=32>

2.1 Compendium of schemes

The major building environmental impact schemes currently operating in Australia and New Zealand are:

- Green Star
- BASIX
- The Green Home Scheme
- Green Globe 21: Design & Construct.

Schemes in pilot stage(s) are:

- NABERS
- The Green Office Scheme .

Schemes under development are:

- LCADesign
- TUSC
- NZ Settlement Liveability Index (NZSLI).

While detailed descriptions of each scheme are to follow, they are summarised here according to which building type they apply to, and their predictive (design) or retrospective (operational performance) capability. Australian-based schemes are coloured red, New Zealand-based schemes are coloured blue. Green Globe 21 operates in Australia and New Zealand.

Table 1: Major building environmental impact schemes operating in Australasia

Environmental Impact Scheme	Building Type				
	Residential		Commercial	Hotel	Public Assembly
	Houses	Neighbourhoods			
Design tool (predictive)	BASIX Green Home Scheme TUSC	TUSC	Green Star LCADesign Green Office Scheme	Green Globe 21	Green Star
Operational performance tool (retrospective)	NABERS	NZSLI	NABERS	Green Globe 21	

2.2 Characteristics of each scheme

2.2.1 Green Star

Overall sponsor

The Green Star scheme is sponsored and managed by the Green Building Council of Australia. The principal contact for the scheme is:

Maria Atkinson
Green Building Council of Australia
PO Box N413
SYDNEY, NSW 1220
Tel: +61 2 9251 1344
Email: maria.atkinson@gbcaus.org

Overall purpose

Green Star was created to:

- establish a common language
- set a standard of measurement for green buildings
- promote integrated, whole-building design
- recognise environmental leadership
- identify building life-cycle impacts
- raise awareness of green building benefits
- reduce the environmental impact of development.

The scheme is voluntary and recognises and rewards Best Practice, Australian Excellence and World Leadership.

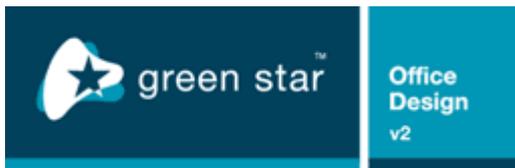
Types of buildings to which it applies

Green Star is considered an umbrella term for a suite of schemes. Currently released schemes rate commercial office buildings, of which four have been developed to date: Green Star – Office Design (v2.0), Green Star – Office As Built (v2.0) and Green Star – Office Interiorsⁱⁱⁱ are operational. Green Star – Office Asset is currently being piloted.

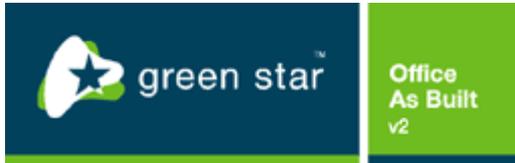
- **Green Star – Office Design v2.0:** evaluates the environmental potential of the design of commercial office buildings (base building construction or refurbishment).
- **Green Star – Office As Built v2.0:** assesses the same design initiatives as Green Star – Office Design. However, the validation documentation differs in that it is retrospective and therefore evaluates those initiatives that are relevant to the construction of the building and are the responsibility of the contractor.
- **Green Star – Office Interiors:** enables organisations to rate their fit-out designs.
- **Green Star – Office Asset:** enables organisations to rate their existing buildings.

ⁱⁱⁱ Green Star – Office Interiors was released on 4 May 2005.

All tools are freely available for downloading from the internet:



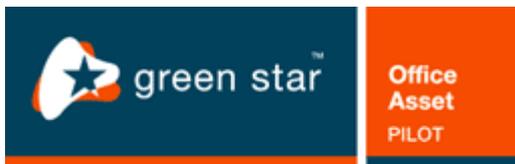
[Click here to download the rating tool](#)



[Click here to download the rating tool](#)



[Click here to download the rating tool](#)



[Click here to download the rating tool](#)

The pilot version of Office Asset is also available online for review (link above). Once finalised, it will join the suite of Green Star tools already operational. The three currently operational tools are design (predictive) schemes. The Office Asset tool is for existing buildings and therefore is performance based (retrospective), but differs from other operational schemes (e.g. NABERS) in that 80% of the credits are accrued independent of occupant behaviour.

Note: Green Star – Convention Design (official name to be finalised) was developed for the Victorian Government’s new convention centre tender. This tool will be released in the coming months with a more generic name to suit its sector (Class 9b Public Assembly buildings). Further tools scheduled for development in 2005–2006 are for Retail, Education, Health and Residential building types. Potential development beyond 2006 include tools for the Hotel and Industrial sectors. GBC have started discussions with Green Globe 21 about this.

Types of customers for whom assessments are done

For the Office Design, Office As Built and Office Interiors tools, the types of customers for whom assessments are done include building owners, developers, architects and designers, interior designers, builders, contractors, facilities managers, and state and local government agencies.

The following chart (Figure 2) reflects the range of interested parties and potential users of each Green Star tool. While Office Interiors is not shown in this chart, it is the same as Office As Built but would be used by the developer/builder to demonstrate to the tenant (rather than owner) that the initiatives have been realised before occupancy.

Approval Milestone	Responsible Party	Contracted Parties	Phase of Life Cycle	Green Star rating tool	
	Local or State Government	Planners	Planning		
* Development Approval	Developer	Design Team	Briefing + Feasibility		
			Concept Design	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office Design V1.0
			Design Development	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office Design V1.0
			Documentation	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office As Built V1.0
* Construction Approval		Builder	Tender	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office As Built V1.0
			Construction	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office As Built V1.0
			Handover	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office Asset PILOT
* Occupancy Approval	Owner	Facilities Manager	Operation	 green star™ <small>INTERNATIONAL BUILDING SYSTEMS FOR SUSTAINABLE DESIGN</small>	Office Asset PILOT
	Owner or Developer	Design Team / Builder	Refurbish/Demolish /Redevelop	Design / As Built rating tools	

Figure 1: Potential users of Green Star

(Note: Version 2.0 of Office Design and Office As Built have been released.)

Types of persons carrying out the assessment

To become a Green Star Accredited Professional it is necessary to attend the Green Star Accredited Professional course and pass the competency exam. The course is open to anyone, and to date over 250 people are listed as Green Star Accredited Professionals. Having an Accredited Professional on the design team of a project qualifies for 2 credit points towards the project score.

The GBC also currently manage the certifying process via a panel of certified assessors. As the number of applications grow, GBC are seeking to outsource this function to keep both costs down and to ensure the accreditation and certification process is transparent.

General methodology

Each Green Star rating tool is based on a standard framework. There are a number of categories under which specific key criteria are grouped and assessed:

- Management
- Indoor Environment Quality
- Transport
- Energy
- Water
- Materials

- Land Use, Site Selection and Ecology
- Emissions.

Within each category the credits awarded have an effective weighting by virtue of the number of credits awarded versus the total credits available. The credits available correlate with, but are not always linearly proportional to, the environmental impact. The weightings can vary by 5% depending on state variations. Credits are also available for innovation. From the final score, a rating is given (see Figure 2 below).

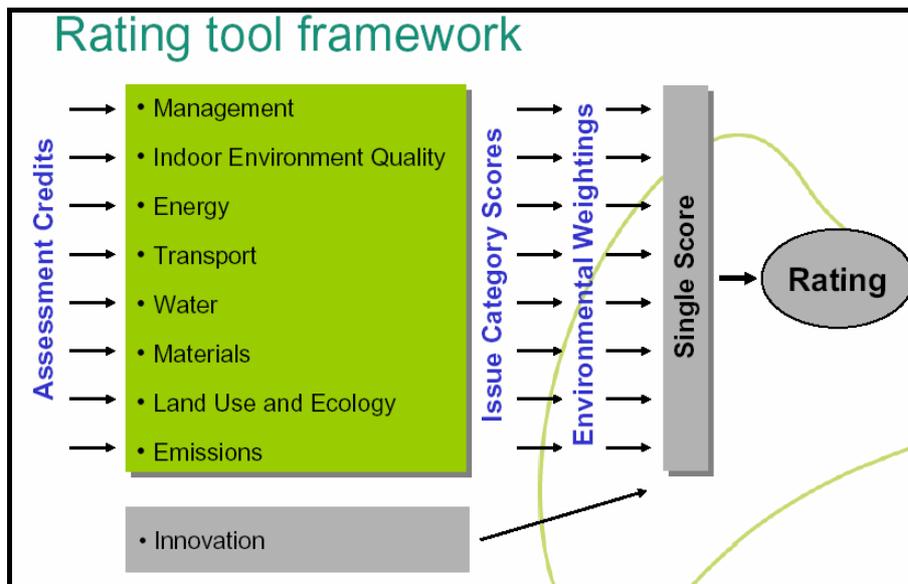


Figure 2: Green Star Rating Tool Framework (GBC: <http://www.gbcaus.org/>)

If the final verified score is 45 or above, the building is awarded a Green Star rating (from four to six stars) (see Figure 3 below).

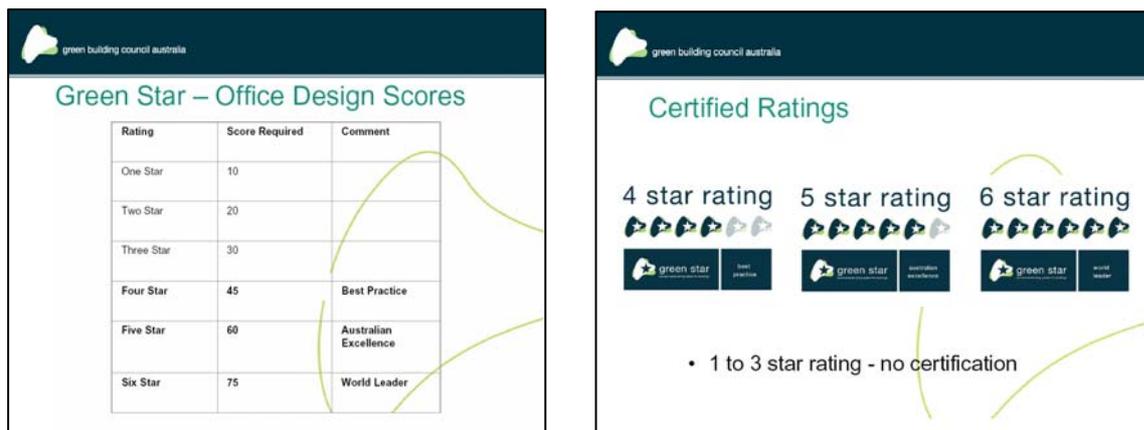


Figure 3: Green Star Scores and Ratings (GBC: <http://www.gbcaus.org/>)

To gain Green Star certification, projects must demonstrate that they meet all requirements detailed in the relevant Technical Manual for each of the rating tools. Public promotion of a Green Star rating is not approved until a project has undertaken the formal certification process run by the Green Building Council. The use of a Green Star rating tool without formal certification by the Green Building Council does not entitle the user or any other party to

promote the Green Star rating achieved. As yet, only two buildings in Australia have been given a Green Star rating (Office Design), although many more projects are in the process of obtaining certification.

Once the applicant submission has been received by the Council it is estimated that the assessment process will take a minimum of six weeks. The applicant then has one opportunity to resubmit information relating to credits which may not have been achieved during the first assessment. The project representative and the Council's Technical Manager can then agree a date for resubmission. This can take another six weeks for the second round (final assessment).

Certification costs for Green Star – Office Design and Green Star – Office As Built are as follows:

GBCA members:	
less than 5,000m ²	NLA \$5,500 + GST
5,000 – 10,000m ²	NLA \$6,500 + GST
10,000 – 20,000m ²	NLA \$8,500 + GST
20,000 – 40,000m ²	NLA \$11,500 + GST
greater than 40,000m ²	NLA \$15,500 + GST

Prices are around \$1,000–2,000 more expensive for non-GBCA members. Prices for the Interiors tool will be slightly cheaper, around \$4,000 for buildings less than 5,000m².

Market penetration

To date, 24 projects have registered for Green Star certification (22 for Green Star – Office Design, two for Green Star – Office As Built). More than 800 practitioners have attended the Green Star Accredited Professional courses (with over 250 completing the competency exam), and demand is high with all 2005 courses sold out before the start date.

The first building to receive a certified design rating of five stars was the Brindabella Circuit project in Canberra (October 2004). Since then, the City of Melbourne has been awarded six Green Stars for the design of its 10-storey office building Council House 2 (CH2), which is due for completion by end-2005. CH2 is the first building design to be awarded six stars under the Green Star – Office Design rating tool.

The South Australian and ACT Government's have announced that all newly constructed office buildings to be used by the Government will be built to at least a five-star standard, using the Green Building Council's rating system. Sydney Olympic Park Authority have specified that all new commercial buildings are to have a four-star Green Star – Office Design certified rating. Melbourne City Council have proposed to the Victorian Cabinet to implement planning approval for all new commercial buildings to be at least four-star Green Star – Office Design. All new commercial buildings for the Department of Defence are also to be four-star Green Star – Office Design^{iv}.

^{iv} The information on Green Star was sourced from <http://www.gbcaus.org/> and from personal communication with Maria Atkinson (19/4/05).

2.2.2 BASIX

Overall sponsor

The Building Sustainability Index (BASIX) was developed by the New South Wales Government Department of Infrastructure, Planning and Natural Resources (DIPNR) under the portfolio of the Minister for Infrastructure and Planning. The principal contact for the BASIX scheme is:

Bruce Taper
Director, Sustainability Unit
Office of the Director-General
Department of Infrastructure, Planning and Natural Resources
23-33 Bridge Street, Sydney, NSW, 2000
(GPO Box 39, Sydney, NSW, 2001)
Tel: +61 2 9228 6469
Email: bruce.taper@dipnr.nsw.gov.au

Overall purpose

BASIX is a web-based planning tool that requires new residential developments to reduce water consumption by 40% and greenhouse gas emissions by 25% (increasing to 40% on 1 July 2006) compared with the average home. It is mandatory for all new single dwellings and dual occupancies in Sydney from 1 July 2004 and will apply to all new residential developments in New South Wales from 1 July 2005, including multi-units. BASIX is applied consistently across NSW. In its next phase, BASIX will apply to all renovations and additions across NSW from 1 October 2005.

Development applicants must lodge a 'BASIX Certificate' (issued under legislation by DIPNR's Director-General) with their application which demonstrates compliance with the Government's greenhouse and water reduction targets. The certificate includes a schedule of 'commitments' made by the applicant to meet the targets (e.g. rainwater tank, solar hot water system) and these must be shown on all relevant plans and specifications.

BASIX demonstrates the planning system 'online' which is consistent with the NSW Government's planning reforms. Its online delivery means it is freely available, updated information can be added automatically (e.g. briefing sessions, help notes), users can save projects in a 'portfolio' and new technologies can be incorporated into the tool more effectively.

Types of buildings to which it applies

New residential dwellings.

Types of customers for whom assessments are done

Development applicants require a BASIX Certificate to form part of their application for development consent. BASIX customers can thus include parties such as architects, building designers, building surveyors, builders, project home companies and householders. Development assessment officers and building certifiers/inspectors are required to assess applications against the commitments made under BASIX as part of the development approval process, including the issuing of certification for final occupation.

Types of persons carrying out the assessment

Same as for customers above, namely architects, building designers, building surveyors, builders, project home companies and householders. Anyone can use BASIX – there are no ‘BASIX Assessors’. Quality control is built within the assessment tool and through the development approval process as mentioned above.

General methodology

Users must access the BASIX website and assessment tool (www.basix.nsw.gov.au), enter relevant details and make certain ‘commitments’ to generate a BASIX Certificate. A BASIX Certificate is issued and must form part of an application for the following development types:

- single dwellings/dual occupancies (from 1 July 2004, Sydney area)
- all new dwellings, including multi-units (from 1 July 2005, whole of NSW).

The development applicant must ensure all relevant ‘commitments’ are clearly marked on plans and specifications as this will be checked by development assessment officers and building certifiers/inspectors.

The sustainability indices under BASIX include:

- Thermal Comfort (forms part of the Greenhouse score)
- Energy (forms part of the Greenhouse score)
- Water.

Users first enter project data such as the dwelling type, size, number of bedrooms and location. This establishes an energy and water ‘footprint’ for the development based on aspects such as the size of the dwelling compared to the average, and the number of people in the dwelling based on statistical data for that location and climate and rainfall data.

Users enter the relevant information into the BASIX tool under each index. Once all the required fields have been entered, the tool calculates and displays the results. The targets for water (40%) and greenhouse (25%) must be achieved, and users have the opportunity to return the plans to make adjustments (if required) to ensure that the targets are met.

Market penetration

As a mandatory planning requirement, BASIX has 100% market penetration for new residential developments in NSW. Over 20,000 BASIX Certificates have been generated since its launch on 1 July 2004. Monitoring by DIPNR of a range of development applications with BASIX Certificates suggests that significant sustainable design improvements are being made such as:

- all homes have rainwater tanks with an average size 4,000 litres, with the majority plumbed to toilet and laundry
- all homes opting for efficient shower heads and tap fixtures
- one in four new home builders opting for solar hot water systems
- over 40% of homes optimising thermal design by including performance glass and double glazing
- eaves are back in fashion, which reduces cooling costs and energy use.

The BASIX assessment tool is complemented with ‘links’ to help notes and a free call helpline is available where DIPNR staff can access a project to assist users through the process. DIPNR also conducts briefing and training sessions across NSW and has maintained effective partnerships with industry and local government. BASIX is effectively integrated with the planning system through a regulation and a state planning policy. This means that conflicts with other policies are reduced and the requirements through the development approval process are clear and provide certainty^v.

BASIX for commercial developments

There have been numerous calls for a commercial BASIX scheme. The Department of Infrastructure, Planning and Natural Resources (DIPNR) is currently investigating such a scheme with full consideration of existing and proposed approaches to reduce greenhouse gas emissions, such as the proposed amendments to the Building Code of Australia. DIPNR recognises that there are policy gaps relating to the reduction of potable water for commercial buildings. This provides increased impetus to ensure any proposed scheme is both comprehensive and compatible with existing mechanisms which are already working well.

DIPNR will work with stakeholders (e.g. the Property Council of Australia, Green Building Council, the Australian Building Codes Board and other government departments) to achieve the best combination of regulation and market-based drivers for sustainability in commercial buildings.

Other indices

BASIX for residential dwellings currently addresses energy and water consumption, but has the potential to be expanded and applied on a broader planning scale across neighbourhoods and cities (unofficially known as METRIX – or ‘Metropolitan Sustainability Index’). This would assist DIPNR to rate the sustainability of transport accessibility, housing mix and design scenarios with urban developments.

DIPNR does not currently have an active timeline for the implementation of other BASIX indices. They are in the early stages of developing a stormwater index in partnership with the Department of Environment and Conservation, local government and industry experts.

(Ref: http://www.basix.nsw.gov.au/information/future_plans.jsp).

Note: BASIX is not the only government-led building environmental assessment method currently operating in Australia. Many jurisdictions have various mandatory and voluntary planning requirements with any number of sustainability criteria. Examples include:

- **Canberra Residential Sustainability Index**
- **South East Queensland’s Sustainable Housing Code**
- **Melbourne Docklands ESD Guide** (now VicUrban’s ESD Guide)
- **‘STEPS’** (City of Moreland’s on-line planning tool, equivalent to BASIX although not mandatory as yet)
- **‘IDEAS’** (Victorian State Government equivalent of BASIX; under early stages of development)

^v The information on BASIX was sourced from

<http://www.basix.nsw.gov.au/information/about.jsp> and from personal communication with Angus Nardi, on behalf of Bruce Taper, Director, Sustainability Unit, DIPNR (27/4/05).

While of interest to this project, as these schemes are planning tools relevant to local, regional and state variations, they are of less relevance in the New Zealand context. BASIX is evaluated here because of its relatively high profile (it is the first mandatory planning ESD tool) and the interest it has created in New Zealand. The New Zealand TUSC scheme (see section 2.2.8) is modelled on it.

2.2.3 The Green Home Scheme

Overall sponsor

The BRANZ Green Home Scheme is a domestic environmental rating tool developed, run and managed by BRANZ Ltd. It is based on the UK's Eco Home Tool, originally called BREEAM (Homes). It has had some funding from the Ministry for the Environment under their Sustainable Management Fund and was developed after consultation with industry and environmental organisations. The principal contact for the Green Home Scheme is:

Roman Jaques
BRANZ Ltd
PO Box 347
HAMILTON
Tel: (07) 839 5360
Email: RomanJaques@branz.co.nz

Overall purpose

The Green Home Scheme (GHS) aims to promote sustainable, healthy and safe homes by recognising the environmental impact buildings have on their occupants and surroundings. Specifically, the scheme was developed to:

- assist the building of comfortable, practical and environmentally sensitive houses
- encourage and recognise safe and healthy homes
- influence the availability of environmentally preferable materials.

The GHS is a voluntary environmental rating method which supports several national strategies, including the National Energy Efficiency and Conservation Strategy, the New Zealand Urban Design Protocol, the National Waste Strategy and higher performance guidelines, such as Standards New Zealand / Publicly Available Specification 4244:2003 *Insulation of lightweight-framed and solid timber houses* and the Cement and Concrete Association of New Zealand's *Designing Comfortable Homes*.

The focus was to have a paper-based practical assessment tool, which went well beyond the requirements of the NZ Building Code and 'greenwash', providing the user/client with clear direction on what the key domestic environmental issues are and how to achieve them.

Types of buildings to which it applies

The scheme applies to residential buildings at a developed design stage or which have been recently completed. The tool is able to cope with a range of domestic building styles, types, sizes and locations, in a fair and equitable manner. It is inclusive of both radical one-off alternative life-style designs, as well as more conservative 'run-of-the-mill' designs.

The scheme has been developed so that it can be used to inform design decisions, making the assessment procedure an iterative one. Although the scheme was designed for detached housing, few modifications are needed for multi-residential dwellings.

Types of customers for whom assessments are done

As the scheme rates residential buildings, the types of customers for whom assessments are done are homeowners. However, the scheme is also used by designers and architects as part of the design process.

Types of persons carrying out the assessment

Architects, designers and building technologists (such as building consent officers) who have attended a half-day accreditation workshop.

General methodology

To ensure the best chance of making a significant improvement on the environment, the GHS assessment tool was designed so that it is flexible, easy to use and holistic. The scheme is flexible, being able to cope with a range of domestic building styles. It incorporates discretionary credits, allowing for building systems, products or approaches which were not available at the time of writing to be recognised. The scheme is easy to use, with only one issue requiring anything more than a one-step calculation (the design's thermal insulation level requires application of a static heat loss equation). The scheme is holistic, covering a wide range of (mainly) environmental, but also health and safety issues.

The GHS tool uses a standard framework for the assessment process. There are seven categories under which specific key criteria are grouped. The categories addressed by the GHS can be grouped into the following thematic areas:

- Household energy efficiency (assessing both thermal envelope performance as well as major appliance efficiencies).
- More Sustainable Materials (recognising the use of independent, third party certification systems, such as Enviro-Choice NZ™).
- Water Economy (examining independent water supplies and water efficient appliances).
- Site Selection (recognising the benefits of being in close proximity to public transport or key amenities).
- Indoor Air Quality (addressing the removal of pollutants and moisture-laden air).
- Fire Safety (where above Code requirements have been applied).
- Design Excellence (where especially innovative and integrated approaches have been used in the design/construction process).

Credits are awarded for designs fulfilling set criteria within each issue addressed. All credits are weighted, depending on the environmental importance of the issue and the amount of effort required in achieving it. The weightings of the categories are shown in the following figure:

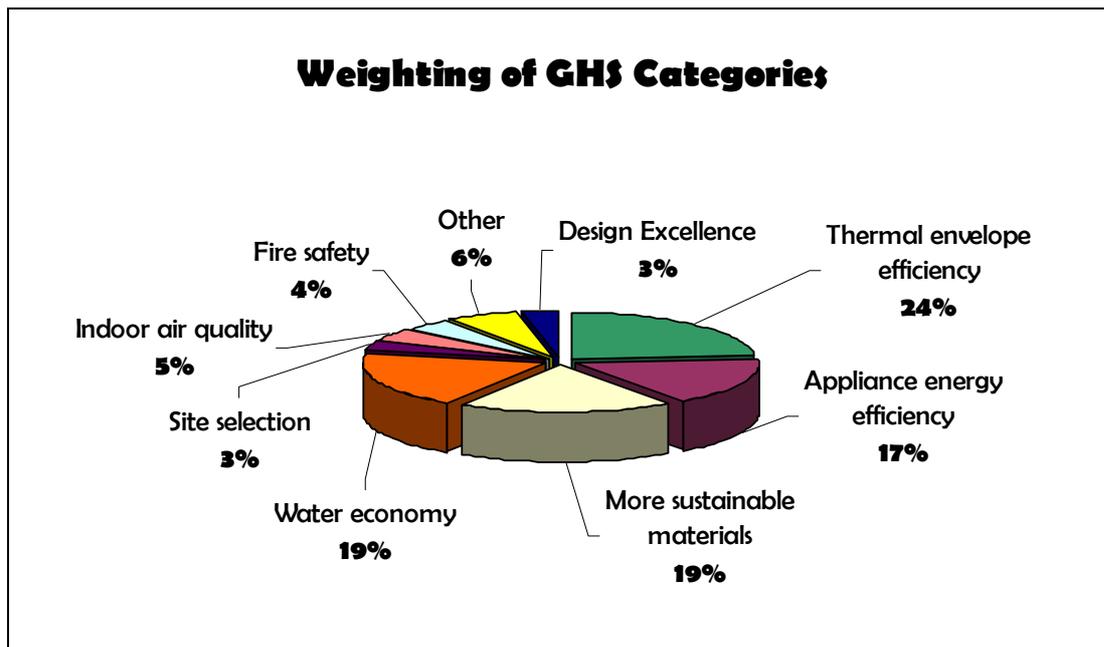


Figure 4: Weightings of GHS Categories

The credits are summed into a total score which determines the design's overall environmental performance. To gain a GHS certificate, the design (or recently finished building) must achieve at least 40 credits^{vi} out of a possible 120. The only mandatory category is the 'whole-building thermal performance' issue (worth 6 credits), as this is recognised as the cornerstone of good environmental design. All the other issues can be traded off to make up the balance of credits required. The four environmental performance categories (along with their threshold credit numbers) are Fair (40), Good (56), Very Good (70) and Excellent (86). These categories reflect the overall environmental competency of the developed design, with the remaining credits becoming progressively more difficult to achieve.

From a recently conducted survey (Jaques, 2004^{vii}), it seems that GHS accredited assessors are still having to sell the idea of resource efficiency/eco-design to clients. The survey also shows that the perceived extra (initial capital) investment of incorporating eco-design related attributes was seen as the most common barrier for the new homeowner. This barrier to adopting eco-design is closely followed by the lack of awareness of the principles of eco-design. However, this situation is changing with the rapidly growing amount of



^{vi} An average house scores between 5-8 credits.

^{vii} Jaques, R. (2004) *Review of the BRANZ Green Home Scheme*. SR 134. Judgeford, Porirua.

central and local government and industry research and other initiatives in this area.

Currently, there are 30 GHS accredited assessors nationally. They are a mixture of architects, designers and building technologists/building consent officers. An example of an awarded GHS Certificate is shown above. Although this certificate is for an Excellent design, they are also awarded in each of the other three categories. For the designer/client to be awarded the certificate, pro-forma documentation is sent to BRANZ detailing the design, the resulting environmental performance category and assessment worksheets, as well as an administration payment of \$100. BRANZ then sends out the certificates, as appropriate. All designs for which an Excellent rating has been achieved must undergo a more comprehensive BRANZ audit, to verify that all requirements have been fully met.

Market penetration

The scheme has been operational since late 1997. The market penetration of awarded certificates has been low. There are still fewer than 100 designs formally awarded a certificate – that is, designs gaining more than the minimum 40 credits necessary. This low figure is, however, not a fair indication of the level of actual application of the tool. The survey shows that the accredited assessors are not using the scheme for its original intent – rather, they are using it as a design prompt and more commonly for information provision on eco-design issues. Thus, its influence is likely to be far wider than initially thought. Some architectural firms, such as Warren and Mahoney (Christchurch), are applying the scheme to all of their new domestic designs and have integrated it into their Environmental Protocol.

The BRANZ GHS has been extensively modified and updated in 2004, reflecting new codes, guidelines and feedback from users. A new marketing and communications strategy has been developed in response to the findings that the scheme is not highly visible in the marketplace. The marketing will include: the running of a series of accreditation workshops in the main city centres; advertising at Home Shows, environmental days and other public forums; closer involvement with accredited assessors and local authorities (especially the more proactive councils who have displayed a keen interest in the scheme); a targeted presence at professional body talks, such as the NZIA, Master Builders etc; integration into upcoming tools where possible (such as TUSC and the developing Beacon^{viii} home comparative tool); and support through a revamped web site which will contain best example case studies/feature designers and be more informative for the public^{ix}.

^{viii} Beacon Pathway Ltd (Beacon) is a residential building industry research consortium aiming to drive sustainability outcomes consistent with New Zealand sustainable development requirements. Beacon is funded by industry, with matched monies from Government research funds from the Foundation for Research, Science and Technology. There are currently four shareholding partners – Building Research, Forest Research, Waitakere City Council and Fletcher Building. The consortium has been established to bring about significant improvement in the sustainability of the residential built environment in New Zealand, by carrying out research, managing resultant intellectual property, and facilitating development and increased availability of products and systems via emergent markets, through working together with like-minded organisations and by lobbying regulatory organisations. See www.beaconpathway.co.nz for more information.

^{ix} The information on the Green Home Scheme was provided by Roman Jaques (18/4/05).

2.2.4 Green Globe 21: Design & Construct

Overall sponsor

Green Globe 21 is the worldwide benchmarking and certification program which facilitates sustainable travel and tourism for consumers, companies and communities. There are four Green Globe tools: Company, Community, Ecotourism and Design & Construct. The Design & Construct tool was developed by the University of New South Wales and University of Queensland, in conjunction with the Sustainable Tourism Cooperative Research Centre (STCRC) of Australia. The STCRC comprises 17 Australian universities, government tourism bodies and tourism business partners. Green Globe Asia Pacific (GGAP) is over 70% owned by the STCRC.

The principal contact for the Green Globe Asia Pacific programme is:

Ray Sloan
Executive Director
Green Globe Asia Pacific
GPO Box 371
CANBERRA, ACT 2601
Tel: +61 2 6257 9105
Email: ray.sloan@greenglobe21.com

Overall purpose

The principal objective of the scheme is to facilitate environmentally sustainable design and construction of travel and tourism infrastructure. Its key supporting aims are to:

- Provide developers with the fundamental guidelines for facilitating responsible and environmentally and socially sustainable design and construction from the initial design stage.
- Provide developers with an assessment of their performance, and encourage continual improvement.
- Provide consumers and travellers with the means to recognise and choose sustainable travel and tourism operations.
- Protect local ecosystems and the global environment, through realising best practice design and construction procedures that minimise environmental impacts.
- Design for healthy and natural living in a range of contexts and for a variety of future customers.
- Provide facilities that have educational, health and technological benefits for guests and employees.
- Improve profitability through reduction in waste and energy savings.

Types of buildings to which it applies

All buildings used for travel and/or tourism purposes (e.g. hotels, motels, guest houses, youth hostels, backpackers, resort, villas, information/interpretive centres and park accommodation).

Types of customers for whom assessments are done

Developers, building owners, project managers, building design professionals, consultants and contractors, consumers and travellers.

Types of persons carrying out the assessment

Participation in the scheme can occur at three levels:

A: Green Globe has an Awareness (Affiliate) program, which helps tourism companies to understand the Green Globe methodology, its benefits and requirements. It also provides information to the developers to understand the principles of sustainable design and construction and ways and strategies to achieve it.

B: Developers may undertake benchmarking independently of full certification. Projects that have been successfully benchmarked above baseline performance against the Sector Benchmarking Indicators for design, and have addressed all of the points in Section 1 of the Design & Construct Standard, will be given the GREEN GLOBE 21 logo (without a tick). This logo can be used by the developers for promoting their environmental and social achievements for the design.

C: Design and construction, that satisfy all the requirements of the Design & Construct Standard, and have the indicators for both design and construction benchmarked, can be certified following an external referee review of the design process and visit to the building post-construction by an accredited third party auditor. After this certification developers are entitled to use the GREEN GLOBE 21 logo with its distinctive tick.

Under the GGAP Design & Construct Standard, businesses are assessed by independent assessors who are suitably qualified, experienced and accredited by GGAP.

General methodology

The scheme assesses the following issues to define sustainable design and construction:

- design approach and sustainability policies
- siting
- conservation of energy
- selection of materials and process
- protection of earth, air and water
- construction processes
- response to social and contextual issues.

Some specific examples include: environmental briefing; passive design strategies; involving users and builders at an early stage to communicate the sustainability vision; predicted energy use and CO₂ emissions; rating of materials for their recycled content, reusability; waste minimisation during construction including daily waste monitoring; management of impacts and loadings on land; management of non-biodegradable chemicals, post-construction EMS etc.

Additional elements of the methodology include:

- The developer should have a written Sustainable Design and Construction Policy in place reflecting clear commitment to its implementation.

- Compliance with the regulatory framework for design and construction.
- Measurement of Sector Benchmarking Indicators (‘performance indicators’) for the design phase including: sustainable design approach; energy efficiency; potable water consumption; solid waste production; social commitment; resources conservation; siting of the development; wastewater management.
- Measurement of Sector Benchmarking Indicators for the construction phase including: sustainable construction approach; energy reduction measures; water reduction measures; building waste management; social commitment; resource conservation; site management; wastewater management; air quality protection; noise control.
- Having in place a system for managing both the design process and the construction process – emphasis on an integrated approach involving key persons from all sides, i.e. developer, planner, architect, building designer, engineer, builders and other stakeholders/community.
- Adherence to requirements for Community Stakeholder Consultation and Performance Reporting^x.

Market penetration

Over 500 participants are listed on the Green Globe website, with six documented case studies in the Design & Construct category. Uptake is particularly high in the Asia-Pacific region. An assessor is not involved at the Affiliate stage (A level participation). This is the ‘awareness’ level. For level B (Benchmarking), the fee for the smallest accommodation category, Micro (e.g. B&B, eco-cabins and accommodation with less than 10 rooms) is AUD1,250. For the Small accommodation category (10 to 69 rooms), the fee is AUD2,400; for a resort hotel with more than 70 rooms, it is AUD5,000 and for a large complex development with multiple buildings/functions, a fee of AUD10,000 is applied. A similar fee is applied for these categories for level C (Certification) stage^{xi}.

2.2.5 NABERS

Overall sponsor

The overall sponsor of the National Australian Built Environment Rating System (NABERS) is the Australian Federal Government’s Department of Environment and Heritage. The principal contacts for the NABERS project are:

Xavier Menagé or Anne Close
 Industry Partnerships Section
 Environment Protection Branch
 Department of the Environment and Heritage

^x The Green Globe Design & Construct Standard can be downloaded from the following website:
<http://www.greenglobe21.com/Documents/General/GG21%20Design%20&%20Construct%20Standard%20Dec04.pdf>

^{xi} The information on Green Globe 21 was sourced from www.greenglobe21.com and from personal communication with Ray Sloan, GGAP (26/4/05).

GPO Box 787
CANBERRA ACT 2601
Tel: +61 2 6274 1668
Email: xavier.menage@deh.gov.au or anne.close@deh.gov.au

Overall purpose

NABERS overall purpose is to provide a performance-based rating system that measures an existing building's overall environmental performance during operation. Its specific objectives are to:

- Rate the environmental performance of operational commercial office buildings and residential homes.
- Provide separate ratings for commercial office base buildings and commercial office tenancies.
- Provide an explicit and consistent rating system methodology, with a clear performance-based structure and methodologies and defaults where necessary.
- Provide a realistic rating scale that recognises and rewards current performance levels, and encourages and promotes best practice.
- Take into account both building and user considerations, so that the impact of occupant behaviour on the environmental performance of the built environment is recognised.
- Allow for voluntary self-assessment, with the option of seeking a certified rating from an accredited provider if desired.
- Use measured quantities as the primary means of assessment. Where measurement is not feasible, then practice-based or default scores are acceptable in some categories.
- Contain appropriate normalisations for factors, such as climate and occupancy pattern.

Types of buildings to which it applies

NABERS provides separate ratings for:

- **Commercial office building:** this covers the environmental impacts of the activities and services traditionally supplied by, or within the control of, the landlords/operators of commercial office buildings.
- **Commercial office tenancy:** this covers the environmental impacts of the activities that are under the control of commercial office tenancies.
- **Residential:** this is designed for occupants of homes, covering all situations where the home carries all of its own services and land as a single identifiable package. NABERS has not been designed for multi-unit residential homes at this stage. Occupants of such buildings may, however, choose certain aspects of the system against which to rate their dwelling – taking into account that the benchmarks and rating issues have been designed for individual houses rather than apartments. This can affect the relevance and/or appropriateness of benchmarks and rating issues.

Types of customers for whom assessments are done

Based on the types of buildings to which NABERS applies, the types of customers for whom assessment are done are commercial office owners and tenants, and residential occupants.

However as a voluntary tool, NABERS will also provide investors, designers and builders with a reliable and easy-to-use method of assessing the environmental impacts of buildings in use. NABERS can be used to define and set operational performance targets and measure and

rate actual performance. It can also be used to disclose and report on performance to interested parties, establish commercial relationships for the monitoring and maintenance of performance targets, enlist professional services to improve a rating, and make decisions about priority actions or investment options.

Government agencies and councils, planning and housing authorities, and utilities may also be interested in the information that NABERS generates as a means of encouraging environmental improvement and providing incentives.

Note: NABERS is not intended to be a replacement to other rating systems that focus on the design stage, and the intention is that NABERS can be used in a mutually supportive way with other design stage rating systems currently in the market.

Types of persons carrying out the assessment

NABERS has free, publicly available spreadsheets for Commercial Office Building, Commercial Office Tenancy or Residential Homes which allows individuals to input the required data to complete an assessment and generate a rating score for a particular building. The spreadsheets explain and define the data inputs required and provide clear instructions for answering all questions.

- Download [NABERS Commercial Office Tenancy Spreadsheet – Version 2](#) (nabers-tenancy-v2.xls – 704 KB)
- Download [NABERS Commercial Office Building Spreadsheet – Version 2](#) (nabers-office-building-v2.xls – 980 KB)
- Download NABERS [Residential Homes Spreadsheet – Version 2](#) (nabers-residential-v2.xls – 1120 KB)

While the spreadsheets have been informally used for some time, there is currently no system in place for verification of ratings or Accredited Assessors available to undertake independent assessments. This process has recently become the responsibility of the Department of Energy, Utilities and Sustainability (DEUS), NSW.

General methodology

NABERS measures environmental performance against the set of key impact categories listed below. The relevance of these impact categories in a NABERS assessment will depend on whether the rating is for a Commercial Office Building, Commercial Office Tenancy or Residential Home.

- Energy use and greenhouse *emissions* (Note: NABERS uses the Australian Building Greenhouse Rating tool (ABGR) to rate energy use and greenhouse emissions)
- Refrigerant use (Global Warming Potential and Ozone Depletion Potential)
- Water use
- Stormwater runoff
- Stormwater pollution
- Sewage outfall volume
- Transport
- Landscape diversity
- Toxic materials
- Waste

- Indoor air quality
- Occupant satisfaction.

The final rating is expressed as a percentage mark. Scores of 35% can be achieved by normal sound architectural design. Scores of 50% require serious consideration of environmental factors, and scores of 60% or more require a concerted holistic approach to all sustainability criteria. Note: the rating requires 12 months of data, and as it measures performance over that time period, the rating can change from year to year.

Market penetration

One building, the Landcare Research Tamaki Campus (in New Zealand), has been assessed using the NABERS system. No buildings in Australia have been formally assessed. In August 2004, the NSW Government's Department of Energy, Utilities and Sustainability (DEUS) was awarded the tender to make NABERS a commercial reality. They are responsible for the full roll-out of the scheme, training of assessors, and ensuring market uptake. NABERS is currently being piloted in 11 commercial buildings across Sydney and Melbourne.

Further details about the next steps for commercialisation of NABERS are available from Ione McLean (+61 2 8281 7382)^{xii}.

2.2.6 The Green Office Scheme

Overall sponsor

The BRANZ Green Office Scheme is a commercial environmental rating tool developed by BRANZ Ltd. It is based largely on the UK BREEAM '98 for Offices environmental assessment tool, with some aspects and issues also adapted from the US LEED tool. The work carried out to develop the scheme was funded by the Building Research Levy and the Foundation for Research Science and Technology under their Public Good Science Fund. The principal contact for the scheme is:

Roman Jaques
 BRANZ Ltd
 PO Box 347
 HAMILTON
 Tel: (07) 839 5360
 Email: RomanJaques@branz.co.nz

Overall purpose

The Green Office Scheme aims to promote more resource efficient, low environmentally impacting and healthy offices by recognising the significant environmental impacts buildings have both on their occupants and their surroundings by:

- **Promoting** comfortable, practical designs which are environmentally sensitive.
- **Encouraging** and recognising healthier offices.
- **Influencing** the availability of environmentally sound products.

^{xii} The information on NABERS was sourced from <http://www.deh.gov.au/industry/construction/nabers/overview.html> and personal communication with Anne Close (19/4/05).

- **Rewarding** those buildings and building designs that are well above NZ Building Code requirements for environmental performance.

Types of buildings to which it applies

Commercial (office) buildings – either at the advanced design stage, newly built or after a major retrofit. As such, the scheme has some predictive as well as some retrospective aspects it.

Types of customers for whom assessments are done

Commercial building owners, developers, designers, commercial tenants.

Types of persons carrying out the assessment

Trained assessors are used for the assessment, with the designer having the opportunity to improve the environmental and health aspects of the design before final assessment.

General methodology

A credit system rewards meeting set criteria within each itemised issue. Each issue has a number of credits allocated to it. The number of credits allocated is dependent on the environmental significance of the issue concerned. The more important the environmental issue (according to expert opinion), the more credits allocated to it. These individual credits are then summed into a total score. This score corresponds to the overall environmental performance rating – Good, Very Good and Excellent – depending on the number of credits gained. A minimum number of credits must be achieved for a design to gain a Green Office Scheme certificate, as shown in the table below:

Table 2: Rating scores for the Green Office Scheme

RATING CATEGORY	NUMBER OF CREDITS REQUIRED		
	Design*	Existing	Refurbish
Good	170	140	120
Very Good	200	160	130
Excellent	220	180	140

*A provisional Green Office Scheme is given for this category, with the opportunity to obtain full certification when the building has been built and in commission for two years. This safeguards against ‘green’ design features that are not subsequently built.

Note: There is a real risk in that building designs that reach an high environmental rating (using whatever design scheme) are not built in accordance with those specifications and therefore do not meet the predicted environmental goals (or operational efficiencies). This is a common lament for design based schemes. Green Star make an attempt to alleviate this risk with the Office As Built tool, but there is no requirement for users to use this tool after design certification has been achieved. The NABERS scheme captures actual performance, and is therefore useful for ongoing monitoring of the building in relation to initial environmental claims. The NABERS tool could be effectively used in corporate sustainability reporting, i.e. each year the building’s performance rating is disclosed. The Green Office Scheme, by deferring full certification until two years after the building has been in operation, effectively works as both a design and operational rating scheme.

The categories for which credits are awarded are:

- Management
- Health and Well-Being
- Energy
- Transport
- Water Consumption
- Materials
- Land Use
- Ecology
- Pollution
- Design Excellence.

The assessment procedure is carried using paper-based assessment worksheets. Three types of assessment worksheets are provided, targeted to the different stages of the building process:

- **DESIGN STAGE** (for design stage and recently constructed buildings)
- **EXISTING BUILDINGS** (for existing buildings that have been fully operational for more than a two years)
- **MAJOR REFURBISHMENTS** (for buildings that have recently undergone extensive refurbishments)

Only those issues which are applicable to that particular stage of construction are examined in each worksheet. However, not every issue within the chosen assessment worksheet will be applicable to all types of office buildings, but this is balanced out by the availability of complementary and discretionary credits.

Market penetration

The Green Office Scheme has been piloted on four commercial buildings: two retrofits and two new buildings. The finalised assessment worksheets have been prepared. The Green Office Scheme is currently ‘parked’ until decisions are made about its marketing and commercialisation process have been finalised^{xiii}.

2.2.7 LCADesign

Overall sponsor

LCADesign was developed in the Cooperative Research Centre for Construction Innovation (overall sponsor), with CSIRO as the principal researchers. The principal contact for this scheme is:

Dr Keith Hampson
CRC Construction Innovation
QUT Gardens Point, 2 George Street
BRISBANE, QLD 4000
Tel: +61 7 3864 9295
Email: k.hampson@construction-innovation.info

^{xiii} The information on the Green Office Scheme was provided by Roman Jaques (5/5/2005).

Overall purpose

LCADesign's overall purpose is eco-efficient design and detailing of embodied environmental impacts. It combines life-cycle assessment, whole-of-life costing and whole-of-life performance assessment to develop a suite of CAD-integrated cost and environmental assessment ('eco-efficiency') tools for commercial buildings. These tools can enhance the decision-making process among architectural, engineering and construction professionals and deliver superior built environment outcomes.

The stated intent is for this eco-efficiency assessment tool and associated databases to become the nominated system for providing a rating assessment of commercial buildings in all Australian jurisdictions.

Types of buildings to which it applies

LCADesign covers commercial and medium to high-density residential building types.

Types of customers for whom assessments are done

The types of customers include designers, purchasers, owners, developers, manufacturers and researchers.

Types of persons carrying out the assessment

Use of the scheme is self-initiated so no additional assessment is essential, but it can be used in conjunction with assessors for specific environmental schemes.

General methodology

Working from the 3D CAD design for a building, the calculator provides an instant display of the volume and cost of all the materials involved in its construction. At the same time, it can calculate the environmental impact of all those materials – how many tonnes of clay were used to make them, how much water, how much energy, and how much greenhouse gas and other polluting emissions they made to air, land or water. This allows users the opportunity to instantly redesign or respecify materials for a building based on both the economic and environmental cost of the materials involved in its construction. It will also show how well the building complies with government, industry, company or project standards.

The calculator is linked in real-time to a constantly updated index of the prices of more than 800 key building materials – concrete, brick, steel, aluminium, glass, timber and tiles – to obtain an instant read-out of the cost of alternatives.

Behind the LCADesign tool is an extremely powerful Australian-designed software engine, which searches a constantly updated register of materials prices and a database of their environmental impact. (Note: prices and impacts are based on Australian data and therefore would require adapting before use in New Zealand).

The calculator will be trialled by leading construction industry and building design firms, including Bovis Lend Lease, engineers Arup PL and Rider Hunt, and architects Woods Bagot. From the government side, Building Commission Victoria, the Australian Building Codes Board, and Queensland Department of Public Works are key partners in the project.

Market penetration

Construction Innovation envisages commercially releasing LCADesign within the year and the degree of market penetration will align directly with 3D object-oriented CAD uptake. As mentioned above, the scheme has been commissioned with the express intent of being the preferred eco-profiling tool for all Australian Government jurisdictions with LCADesign Government project partners (which include the Australian Building Codes Board, the Queensland Government and the Victorian Building Commission plus research and industry partners)^{xiv}.

Note: The LCADesign scheme is not the only specialised building environmental assessment scheme operating in Australia. Others include:

- **Sustainable Project Appraisal Routine (SPeAR™)** developed by Arup (this gives a performance summary rather than a rating as such)
- **Heilbronn Group's Eco Index (THG EcoIndex)** which gives a 'rating number'
- **LCAid, LISA, EcoSpecifier, VicUrban's Eco-Selector.** These are not evaluated here because they are specific to material selection and also do not result in a single value, rating or score (see Definition of terms in section 1.4).
- **Green Star – Office Interiors** (refer to section 2.2.1). This tool has a 'materials calculator' which equates to varying credits depending on particular materials choices.

While the details of how the results of an LCADesign assessment will be expressed are not clear at the time of writing, it has been evaluated in this report due to: its claims of becoming the nominated system for providing a rating assessment of commercial buildings in all Australian jurisdictions; and because of its claim of offering a 'real-time' financial assessment ability.

2.2.8 TUSC

Overall sponsor

'Tools for Urban Sustainability Code of Practice' (TUSC) is a Ministry for the Environment Sustainable Management Fund project being developed by Waitakere City Council. The principal contact for the TUSC scheme is:

Garry Peters
Sustainable Engineering Manager
Waitakere City Council
Private Bag 93109
WAITAKERE CITY
Tel: 021 244 3635
Email: garry.peters@tusc.org.nz

Overall purpose

The purpose of this scheme is to develop an interactive Code of Practice for sustainable urban engineering, with the objective of having the Code accepted as best practice throughout the

^{xiv} The information on LCADesign was sourced from the following website and from personal communication with Delwyn Jones, Queensland Department of Public Works (3/5/05).

<http://www.construction-innovation.info/fdl.php?fid=904&project=&/LCADesign+Brochure+%5BJul+03%5D.pdf>

country. The Code of Practice will be provided as a user-friendly web-based toolbox system that includes linkages to models.

It will improve sustainable management by raising awareness and understanding of sustainability issues by providing practitioners and decision-makers with appropriate tools, and by ensuring cost-effective sustainable urban development.

Types of buildings to which it applies

TUSC has already been developed to assess residential dwellings (both for retrofitting and new build), and the tool will eventually measure the sustainability of a wider range of urban development projects. It thus includes all building types, from single buildings through to neighbourhoods and cities. As both an assessment and a planning-based tool it provides a framework for decision-making at four levels as follows:

- The performance standards (environmental, social, cultural and economic) required.
- At macro and micro levels, neighbourhood or community land use, amenity and infrastructure planning. Typically this would be used for resource consents.
- Site specific planning, such as land use and subdivision consents.
- Building planning, at the building consent stage to enable designs to consider the building life-cycle, energy, waste and infrastructure.

Types of customers for whom assessments are done

Developers, designers, homeowners, building owners, utilities and infrastructure providers, council staff, planners, building consent officers.

Types of persons carrying out the assessment

As a web-based assessment tool, the assessments are carried out by the person or party wishing to obtain a resource or building consent.

General methodology

The primary medium for distribution and use of TUSC is the internet via a single multi-functional website. A concept website has been established to demonstrate what the interface and application of this integrated planning tool might look like: see www.tusc.org.nz.

Users access a specific location of interest via a GIS interactive mapping medium, which will allow different scales (catchment to individual lot) to be identified. Layers in this GIS will hold site-specific data including environmental data, planning constraints (or target TUSC score for area) goal, local networks and existing development information, existing lot boundaries, existing building floor plans and site coverages, etc.

Via a series of ‘wizards’ and graphical tools, users will then be able to ‘design’ or specify their development plans, which will then be scored in an iterative fashion. The user will be prompted with options to improve the development proposal score by using various sustainability techniques and technologies appropriate to the scale of development proposed.

It is planned that the toolbox models and objects (infrastructure, buildings, treatment devices, environmental data, etc) will link and operate seamlessly within the user interface to analyse

and score the development proposal within location-specific criteria. At lot-level, building targets are set for energy and water (like the BASIX scheme).

Advanced users may be able to view, moderate and add objects within limits, so TUSC can serve as a research and powerful design tool. New models and resources for the toolbox will also be able to be progressively added or improved. A key advantage of a web interface is centralised data management that ensures currency of data to users while avoiding pitfalls associated with the use of outdated versions.

TUSC is also designed to integrate with existing industry standard software tools such as computer-aided draughting (CAD) packages, and geographic information systems (GIS), as well as a variety of water and energy models, databases and spreadsheets (including 'real-time' financial data). A central principle of TUSC technical development is flexibility to adapt and integrate with existing Council datasets, websites and industry tools to avoid duplication of effort.

Market penetration

The TUSC scheme is currently under development. Several potential applications for TUSC have already been identified and earmarked for inclusion in the pilot phases, sponsored primarily by Waitakere City Council. However, it is also hoped to include other Auckland councils such as North Shore City Council, as well as projects at various scales and localities around New Zealand. Further opportunities for demonstration projects are likely to be identified as prototype TUSC versions are released to Management and Liaison team parties.

Results from these demonstration projects will be built into the TUSC work programme, and ultimately a repository of projects and results will be continually added to on the TUSC website. This will serve to provide design ideas, raise awareness, educate and engender the confidence of stakeholders.

The Prototype and Draft versions of TUSC will make use of the demonstration projects for verification and calibration of the outputs of the TUSC models, to refine and improve interfaces and to fully test the framework across a number of scenarios and applications^{xv}.

2.2.9 NZ Settlement Liveability Index

Overall sponsor

The NZ Settlement Liveability Index (NZSLI) is a part of programme of research called 'Learning Sustainability' funded by the Foundation for Research, Science and Technology (FRST). The principal contact for the scheme is:

Darren Walton
Research Manager
Opus International Consultants
PO Box 30845
WELLINGTON
Tel: 04 587 0663
Email: darren.walton@opus.co.nz

^{xv} The information on TUSC was provided by Darren Utting, Synergine Group Ltd (28/4/05).

Overall purpose

To develop the means to reconcile social, economic, cultural and environmental consequences of settlement management and form by integrating New Zealanders' settlement impact into demands for a uniquely New Zealand lifestyle. This task will determine the limitations on settlements design and preference for a style of living that meets with current and future demographics for lifestyle under population growth, with its associated economic growth as well as social and cultural demands.

This is a five-year development of a psychometric scale development within a survey-based methodology. The research aims to produce a measure of the adequacy of adaptation of the environment by the form of the built environment to meet the aspirations of New Zealanders for a uniquely New Zealand lifestyle. This research will establish the cultural and social parameters of settlement design that will meet the lifestyle requirements of a changing New Zealand population.

Types of buildings to which it will apply

Residential dwellings, including houses, apartments and other buildings.

Types of customers for whom assessments will be done

The New Zealand public, for uptake by local, regional and central government.

Types of persons who will carry out the assessment

The Behavioural Sciences group at Opus Central Laboratories in collaboration with the research team at Landcare and the University of Auckland.

General methodology and market penetration

Scale construction is in its preliminary phase, and it examines the application of overseas scales of 'residential satisfaction' in an attempt to isolate differences between overseas and domestic concerns. Further preliminary studies supporting the construction of the main measures are being undertaken including qualitative enquiry, domestic migration studies and studies of expatriate perceptions of the New Zealand lifestyle. These studies will culminate in the construction of the NZSLI in 2006–2007 with its application across New Zealand settlements to establish and validate the liveability of existing settlement forms^{xvi}.

^{xvi} The information on the NZSLI was provided by Darren Walton, Opus Central Laboratories (28/4/05).

1.3 Summary

The following table summarises the results of the schemes reviewed:

- Green Star
- BASIX
- The Green Home Scheme (GHS)
- Green Globe 21: Design & Construct (GG21)
- NABERS
- The Green Office Scheme (GOS)
- LCADesign
- TUSC
- NZ Settlement Liveability Index (NZSLI)

Table 3: Summary of building environmental impact schemes being used in Australasia

Characteristic	Green Star	BASIX	GHS	GG21	NABERS	LCADesign	GOS	TUSC	NZSLI
Sponsor	GBC Australia	NSW Govt	BRANZ	Green Globe 21 Asia-Pacific	Federal Govt (DEH)	CRC CI	BRANZ	WCC / MfE	FRST
Purpose	To drive innovation and best practice	To achieve savings in energy and water through the planning process	To drive uptake of best building practice	To provide a path to sustainable travel and tourism	To provide a performance-based rating system to measure performance during operation	To provide a comprehensive eco-efficiency design tool including embodied environmental impacts	To drive uptake of best building practice	To achieve sustainable urban engineering through the planning process	To measure the acceptability of alterations to the environment to accommodate lifestyle choice
Building type	New and existing commercial (other building)	Residential (including multi-unit and renovations/	New residential (can be applied to	New travel and tourism infrastructure	Existing commercial buildings, commercial	New commercial buildings and medium to	New and existing commercial buildings	All, including residential (at lot-level to neighbourhood,	New and existing neighbourhoods (residential

Characteristic	Green Star	BASIX	GHS	GG21	NABERS	LCADesign	GOS	TUSC	NZSLI
	types under consideration)	additions)	multi-unit residencies)		tenancies and residential buildings	high-density residential buildings		regional and city applications)	focus)
Main customer type	Commercial building owners/ developers designers, builders	Homeowners, designers, builders	Homeowners, designers	Owners, developers, consumers, designers, builders	Commercial building owners and tenants, homeowners, designers	Building owners, designers, quantity surveyors	Commercial building owners, designers	Developers, homeowners, designers	Public
Assessors	Accredited Assessors and certification verification	Self-initiated with approval by planning staff	Self-initiated with certification verification from BRANZ staff	Accredited Assessors and certification verification	Self-initiated, assessment and verification process under development	Self-initiated	Self-initiated with certification verification from BRANZ staff	Self-initiated with approval by planning staff	Team at Opus, Landcare and University of Auckland
Methodology	- Voluntary - 10 core categories - Web-based - Star rating	- Mandatory - 3 core categories - Web-based - % of target achieved	- Voluntary - 7 core categories - Paper-based - Four grades (Fair to Excellent)	- Voluntary - 7 core categories - Web-based - Three levels (A, B, C)	- Voluntary - 12 core categories - Web-based - % rating (0-100%)	- Voluntary - Materials focussed (impact plus cost) - Web-based - (unclear how rating will be expressed)	- Voluntary - 10 core categories - Paper-based - Three grades (Good to Excellent)	- Voluntary (likely to become mandatory) - 2 core categories - Web-based - % of target achieved	- Index scale under development
Market penetration	Medium	High	Low	Medium	Low	(under development)	(currently 'parked')	(under development)	(under development)
Country	AUS	AUS	NZ	AUS / NZ	AUS	AUS	NZ	NZ	NZ

3. CONCLUSIONS: COMPARATIVE ASSESSMENT OF WORTH

The project brief asks for an ‘expert assessment’ of a building environmental impact scheme (out of the tools currently being used in Australasia) that could be used as the primary scheme in New Zealand. As the preceding review shows, there are a variety of schemes on the market (or soon will be), each unique to the purpose for which they are intended. There is a mix of building types, environmental categories considered, scoring methodologies (and the expression of this score), and at what stage the assessment is undertaken (predictive or operational).

The government-led planning type tools (e.g. BASIX, TUSC) are relatively similar in that they are used to meet jurisdictional targets for (mainly) energy and water use through the planning and building consent processes (and it has been recognised that there has been a ‘grey’ area created by these tools between planning and building in that a planning consent is required before the building consent, but that building regulations impact on what can be planned). There is a concern that while these schemes are effective in mainstreaming elements of sustainable design and better practice, they are less effective in encouraging innovation or efforts beyond meeting the required targets. This is exacerbated if/when used by Building Code Authorities to implement Code requirements – the planning targets will in effect become minimal practice (this can be offset by local councils being able to raise the targets independently of base regulation, i.e. if the Building Code stipulates a water reduction target of say 10%, a local authority can mandate a higher target of say 20%).

It is difficult to comment further about the worth of the TUSC scheme at this stage as significantly more work needs to be done to make the scheme operational (especially the data requirements for energy usage and determination of benchmarks and targets). Once the scheme is completed, it does have the potential to be a nationwide tool (highly recommended) and to be used for developments beyond the house-level. There has also been an indication that the scheme will incorporate ‘real-time’ financial data, and link to education resources to encourage better practice (over and above the proposed targets). New Zealand should be mindful of the plethora of planning-based schemes operating in Australia: while BASIX is the first to become mandatory, most councils across Australia have their own version or upcoming version. It would be unfortunate for each council in New Zealand to follow this trend and develop their own version of TUSC.

There is no direct competition between the Green Star suite of commercial tools, NABERS or the Green Home Scheme. Green Star is currently for commercial buildings (design phase), NABERS is for commercial and residential buildings (operational phase) and the Green Home Scheme is for residential buildings (design phase). Note: although the Green Star – Office Asset tool is for existing building and is therefore retrospective, the data required for the rating uses operational parameters that are independent of occupant behaviour. For example, Green Star – Office Asset measures how many water efficient fixtures and fittings are present in a building, whereas NABERS measures water used from those fixtures and fittings. It is dependent on the occupant (and is affected by changing occupancy), whereas Green Star is not. NABERS is therefore ideally suited for owner-occupiers and larger organisations who are looking to change operational behaviour or for eco-footprinting. NABERS could also be used in corporate sustainability reporting. Green Star and NABERS are therefore (at this stage) complementary to one another.

There is the potential for competition between Green Star and LCADesign. They are different tools in that Green Star is based on LEED (US) and BREEAM (UK) rating methodologies, whereas LCADesign is based on Life-cycle Assessment methodology, CAD technology and is focussed on the choice of materials. LCADesign offers real-time assessment of the cost of design choices as well as the environmental implications of choices. While both target commercial buildings, LCADesign is totally design focussed – whereas Green Star covers multiple stages of the construction process (design, construction, interiors and existing buildings). Therefore they may co-exist in the marketplace with minimal confusion. As LCADesign gains more traction in the marketplace, the realisation of any conflict will become more apparent. The same is true for the Green Office Scheme and LCADesign.

LCADesign may have some synergies with the TUSC scheme in that real-time financial data is also being proposed in the TUSC tool. Clearly, the LCADesign data and the cost information would require to be contextualised for New Zealand, but this scheme could be used in New Zealand via the TUSC development and implementation process.

Green Star's current suite of commercial tools would be suited for New Zealand (once adjusted for this country's parameters). However, Green Star and the Green Office Scheme are in competition with one another (although the Green Office Scheme does not cover fit-outs and therefore the Green Star – Office Interiors tool is unique). Based on current ongoing discussions about the introduction of the Green Star commercial tools into New Zealand, it would be extremely unwise to encourage competition between the two. Due to the advanced marketing and commercialisation processes of the Green Building Council (and because the tools are currently operational – whereas the Green Office Scheme is in its pilot phase), it is more appropriate for the Green Star tools to take the lead in New Zealand IF the tools are to be introduced in the near future. However, if the Green Star tools are NOT to be introduced, the Green Office Scheme is the obvious choice.

Indeed there is an argument for the Green Office Scheme to be implemented over the Green Star tools, despite Green Star's current operational success in Australia: the financial resources that would need to be spent to bring Green Star into New Zealand (costs associated with changing the data for New Zealand conditions and setting up of a 'group' to run the scheme) could equally be spent on publishing and commercialising the Green Office Scheme which is already contextualised in New Zealand and has an operational base via BRANZ). As a suggestion, training could be provided through the Construction Industry Training Enterprise (CITE) and commercialisation could occur through a body similar to that of the Australian Green Building Council.

NABERS is suitable for application in New Zealand, but would face some competition with the Green Office Scheme (if implemented). However, as the NABERS tool is still in the process of being commercialised, it is too soon to be able to definitively say whether it should be recommended for use in New Zealand or how it would compete with the Green Office Scheme (Note: the Landcare Tamaki building has a NABERS rating).

The Green Home Scheme has been operating since 1997 and has recently been revamped as a response to environmental and cultural developments as well as to increase its formal uptake. The Green Home Scheme should therefore be the scheme of choice for the residential sector in NZ (design phase). It is strongly recommended that a more committed approach is taken to increase its formalised uptake (in advance of any other residential tool development).

For hotels and the like, the Green Globe 21 scheme has significant uptake and a well established programme for encouraging sustainability in this sector. More use of this scheme in New Zealand should be encouraged.

For measuring and rating a neighbourhood's contribution to building sustainability, it is very much a case of 'watch this space' at present and see what emerges from the METRIX, NZSLI and TUSC work in this area.

In summary, there is no ONE tool that can be recommended as the primary tool for New Zealand. Based on the preceding discussion the following determinations are made:

- For a residential building (design) scheme, the Green Home Scheme is the most appropriate tool. It will require a more concentrated marketing and commercialisation commitment for effective market penetration.
- For a mandatory residential planning tool, a similar tool to BASIX would be appropriate. The New Zealand scheme, TUSC, is modelled on the BASIX scheme and is therefore the most appropriate application in the New Zealand context. It is recommended to follow the developments of the TUSC programme to see how this scheme evolves.
- For a commercial building (design) scheme, Green Star's suite of commercial tools are currently the most appropriate IF they are to be introduced in New Zealand (in the next six months). It will need to be adapted to the New Zealand context before use, and a process for commercialisation established (either through the Green Building Council of Australia, a New Zealand Green Building Council, or another mechanism).
- If the Green Star commercial tools are NOT introduced to New Zealand in the near future, the most appropriate scheme to use is the Green Office Scheme. While decisions as to its future have not been finalised at the time of writing, there is no reason why this scheme would not be an effective commercial rating tool for New Zealand. (As for the Green Home Scheme, it will require marketing and commercialisation commitment for effective market penetration.)
- In terms of a retrospective or operational scheme for commercial and residential buildings, NABERS has potential for use in New Zealand. Depending on the fate of the Green Office Scheme (which has retrospective capability for commercial buildings), NABERS may be of use in the New Zealand market. It is recommended to wait and see the results of the commercialisation process of NABERS (in Australia) before further investigating its potential for use in New Zealand. If the Green Office Scheme is implemented, it will supersede the need for NABERS (although it would still have a role in residential buildings).
- For a hotel (travel and tourism sector) scheme, Green Globe 21: Design & Construct is the most appropriate.
- For a neighbourhood rating scheme, watch the developments of the BASIX communities tool (METRIX), TUSC and NZ Settlement Liveability Index (NZSLI) programmes.

- For a specialised materials-choice type scheme, it is recommended to follow the LCADesign scheme's continuing development and roll-out (especially in line with TUSC development). It is also recommended to follow the use of the Green Star – Office Interiors tool (with its 'materials calculator'), as the potential for conflict between these two tools in Australia has yet to be determined.

Note: any of the industry-led schemes – Green Star, Green Home Scheme, Green Office Scheme, LCADesign – could be integrated into (and are potentially complementary with) government-led planning-based schemes, e.g. BASIX, TUSC.

The decision-making process about which building environmental impact scheme to use will continually evolve. Because of the rapidly evolving nature of scheme development, what may appear the most appropriate scheme to use today, may not be the case in a few years time. Whatever scheme is chosen, for it to remain successful it must be continuously supported (with dedicated training, marketing and validation processes) and updated to remain current with the rapidly evolving nature of the environmental field. A great deal depends on the purpose of the scheme and its usefulness in the market.

New Zealand is an ideal position in that there are a select number of relevant schemes currently available for use in the New Zealand market place, with a broad range to chose from (if required) from Australia. Careful selection of schemes that minimise competition between tools (to avoid market confusion) and maximise sustainability outcomes, is clearly the preferred option and something that the New Zealand building industry should aim for.