

Status of Sustainable Building in New Zealand

Prepared for SB08 Melbourne by
Building Research, the Ministry for the Environment and
the NZ Green Building Council



Contents

ACKNOWLEDGEMENT	4
STATUS OF SUSTAINABLE BUILDING IN NZ	5
1. Background	5
SB07	5
The Construction Industry and Sustainable Building	5
Drivers for Sustainable Building in NZ	6
2. Sources of NZ Information on Sustainable Building	7
carboNZero certification programme	7
Environmental Choice	8
Future Proof Building	8
GreenBuild:	8
Independent Eco-Advisers	9
Industry Associations	9
Level	9
NZ Standards	9
Productspec	9
Resource Efficiency in the Building and Related Industries (REBRI)	9
Smarter Homes	10
Community Organisations	10
3. Status of National or Regional Development Targets for Sustainable Development 10	
Home Energy Rating Scheme (HERS)	10
Sustainable Building Guidelines	11
4. Status of Adoption of Policies (Tax, Programmes, Regulations etc) that will Further Enhance Sustainable Development	11
Introduction	11
Climate Change Policy	12
Community Relations – SMF fund	12
Emissions Trading Scheme	12
Govt3	13
National Energy Efficiency and Conservation Strategy NEECS (Draft Dec 2006)	14
New Zealand Energy Strategy NZES (October 2007)	14
NZ Building Code	15
Urban Design Protocol	15
Waste Strategy	15
6. Status of Education and Training in Sustainable Building	17
Educational institutions	17
Industry training	19
7. Status of Adoption of New Sustainable Building Technologies and Techniques	21
Heat pump Uptake in NZ	21
Photovoltaic's	21
Solar Hot Water	22
Performance of Cladding Systems Using Solar Radiation to Pre-Heat Air	22

	<u>WEEP (Water End-Use and Efficiency of Use Programme)</u>	22
8.	<u>Status of Adoption of Sustainable Building Whole-Building Rating Systems</u>	22
	<u>BRANZ Green Homes Scheme (GHS)</u>	23
	<u>NZ Green Building Council</u>	23
	<u>Tool for Urban Sustainability – Code of Practice</u>	24
9.	<u>NZ Activities</u>	24
	<u>Beacon Pathway Ltd.</u>	24
	<u>Commercial Building Energy End-use Project</u>	25
	<u>Concrete³</u>	25
	<u>EnergyWise Home Grants</u>	25
	<u>Interest-free loans for residential energy efficiency and clean heating</u>	25
	<u>‘Green’ Mortgages</u>	25
	<u>Household Energy End-Use Project (HEEP)</u>	25
	<u>Lighting Product Stewardship Scheme Development</u>	26
	<u>Low Impact Urban Design and Development (LIUDD)</u>	26
	<u>SHaC09</u>	26
	<u>Structural Timber Innovation Consortium (STIC)</u>	27
	<u>Sustainable Buildings Project</u>	27
	<u>Warm Homes</u>	28
10.	<u>Industry Associations</u>	28
	<u>Institution of Professional Engineers</u>	28
	<u>NZ Institute of Architects</u>	28
	<u>Registered Master Builders Federation</u>	29

ABSTRACT

Building on the output from an MfE/Building Research sponsored workshop in February 2007 a compilation has been made of known sustainable building initiatives in New Zealand. This formed the input to a workshop at the SB07 conference on 16 November 2007 and this 'state of the art' report on sustainable building for SB08 in Melbourne.

ACKNOWLEDGEMENT

The production of this report has been a joint effort of Building Research, the Ministry for the Environment and the NZ Green Building Council. Gratefully acknowledged are a number of conversations with Beacon Pathway Ltd, and contributions from and conversations with industry sectors.

STATUS OF SUSTAINABLE BUILDING IN NZ

(Report Card for SB07 Auckland and SB08 Melbourne)

1. Background

SB07

The SB07 Conference “Transforming our Built Environment” was held in Auckland 14-16 November 2007. SB07 NZ was a platform for regional issues and is one of a number of independent conferences that are precursors to the International SB08 World Sustainable Building Conference sponsored by the International Council of Research and Innovation in Building Construction (CIB) and the International Initiative for a Sustainable Built Environment (iiSBE) to be held in Melbourne in 2008. SB07 NZ was organised by Building Research and Beacon, with a number of industry sponsors. Information on SB07 can be found at www.sb07.org.nz ; SB08 at www.sb08melbourne.org and iiSBE at www.iisbe.org

As part of SB07 NZ a workshop was held on 16 November with the following goals

1. To map and understand the current sustainable building initiatives in NZ, government and private sector (taking a much wider view than an initial workshop organised by Ministry for the Environment and Building Research in February '07)
2. To identify gaps in the current initiatives.
3. To develop goals for the development of sustainable building in NZ.
4. To develop the pathways to those goals.

The output from the workshop forms the basis of this report on the status of sustainable building in New Zealand to SB08 in Melbourne, along with other national ‘state of the art’ reports from SB07 conferences in other countries.

This report builds on the outputs from an MfE/Building Research sponsored workshop in February 2007 which provided an initial mapping of sustainable building initiatives in NZ. It is intended to provide a starting point for the workshop to be held at SB07 on the morning of 16 November 2007.

The Construction Industry and Sustainable Building

Building Research carries out an annual Industry Needs Survey which canvases construction industry opinion on topics for which research or information is needed. In the latest survey (published in BUILD October/November 2007 p92)

energy efficiency and sustainability and environmental issues were the top ranked topic areas for which respondents thought research was necessary. Specifically, research was suggested on:

- Double/triple glazing*
- Effects of moisture on insulation*
- Innovative water heating systems*
- Effectiveness of installed insulation*
- Passive heating and cooling*
- Renewable energy*
- Retrofit energy efficiency measures*
- Energy efficient heating and cooling*
- Life cycle impacts of materials and structures*
- Recycling and reuse*
- Water conservation*
- Rainwater collection and use*
- Making NZ houses more sustainable*

Energy efficiency and sustainability were amongst the top five topics on which information was sought. Anecdotally the industry has trouble finding ‘good’ information on sustainability, and is confused by conflicting claims in some different information sources available.

In compiling the information listed in this report, comments on aspects of sustainable building were received. These included:

- A lack of reliable and independent information on how sustainable building products actually are*
- The need for case studies of sustainable buildings to demonstrate the degree of sustainability actually achieved in the completed building and the economic and non-economic (e.g. health, staff quality and retention) gains.*
- The opinion that sustainability of residential buildings is much more advanced than non-residential in terms of knowing what will work*

Drivers for Sustainable Building in NZ

There has been interest in NZ in building sustainably for a very long time. This interest manifested itself in the form of energy efficiency in the 1970s and has evolved through the 1990s to include consideration of other aspects of buildings considered ‘sustainable’ - water efficiency, indoor environment quality, materials and wastes. Along with increasing interest in sustainability has come the realization that there are other benefits in building sustainably - economic, social, health and well-being.

There are two large drivers for sustainable building in NZ. In the government sector the government has been specifying increasing requirements for

sustainability in the office buildings it owns or leases, the Ministry for the Environment, Department of Conservation and Department of Statistics buildings (all in Wellington) for example. On the other hand in the private sector at the prime development end of the office market, there is an increasing move to build sustainable office buildings, and sustainable houses are being built at the high end of the housing market as well as for HNZC's housing stock.

Although the current version of the NZ Building Code has energy efficiency as the only really sustainable building requirement, there are some more radical suggestions for sustainable building contained in the most recent NZ Building Code review document. It is certain that Code requirements for sustainable building will be ramped up in the near future and become a requirement of new buildings and some renovations.

2. Sources of NZ Information on Sustainable Building

carboNZero certification programme

The carboNZero certification programme is run by Landcare and is a national brand that gives recognition to businesses caring for the environment. An organisation (or individual) with carboNZero certification has measured and managed (reduced) their greenhouse gas emissions, and invested in regenerating native forest to mitigate (offset) their climate change impacts. Through use of emission calculator tools, an organisation can find out how much carbon dioxide (CO₂) is released by the energy they use. The organisation then makes a decision about how much of their CO₂ to offset, then invests in special areas of land set aside in the project for native forest regeneration. These areas of land have special conditions covering their protection and use. The result is a reduction in greenhouse gases, and increased number of native plants and animals. carboNZero certification indicates that an organisation is actively dealing with its environmental impacts, particularly in the area of
c l i m a t e c h a n g e .

Organisations choose to participate in the scheme for various reasons,

- Environmental responsibility;*
- Marketing purposes;*
- Export credibility;*
- and "Walking the talk".*

See www.carbonzero.co.nz

Environmental Choice

Environmental Choice New Zealand is a voluntary ecolabelling programme. It is based on an independent third party assessment of a product[s] against a published specification which has been based on life cycle principles and best international best practice' adapted for New Zealand conditions. It is intended to provide a credible and independent guide for consumers wishing to purchase more sustainable products.

Environmental Choice New Zealand has mutual recognition agreements with 8 other mostly Pacific rim national ecolabelling programmes and is also a member of the Global Ecolabelling Network, www.gen.gp.jp the worldwide ecolabelling network.

Partial funding for Environmental Choice New Zealand comes from MfE, who own the Environmental Choice brand. Environmental Choice New Zealand is a key part of the government's Govt3 sustainable procurement scheme and important for GreenBuild. See www.enviro-choice.org.nz

Future Proof Building

The Future Proof Building programme has been developed by Construction Marketing Services which is a marketing and promotional service for manufacturers, importers and distributors of building products. FPB information is supplier sourced and aimed at educating the building industry and the public about the need for better buildings through better energy efficiency, building health and safety, resource responsibility, space management, life cycle costing, sound and quality control and security and automation. See www.fpb.co.nz

GreenBuild:

GreenBuild is a web-based building product database which will supply both technical and sustainability information about building products available in NZ. It is a partnership between Building Research, Construction Information Ltd and Green NZ and launched on 1 October 2007. The database is multi-tiered, with products listed in the higher tiers having greater 'proof' of their sustainability. GreenBuild works with Environmental Choice and the NZ Green Building Council, as well as linking closely with Construction Information Ltd. Although GreenBuild is aimed initially at designers it will be able to be used generally by the industry and the public. See www.greenbuild.co.nz (GreenBuild, Smarterhomes and Level were intended to be complementary web based sustainable building information sources. Level has information for industry on how to build sustainably; Smarterhomes has information for consumers/public on what to do to build sustainably, and Greenbuild has information on which products to use to build sustainably)

Independent Eco-Advisers.

This is a pilot programme (effectively a help desk) which provides practical advice from offices based in 3 local authorities for homeowners and designer/trades-people on building sustainability issues. See www.ecodesignadvisor.org.nz

Industry Associations

Some industry associations produce sustainable building information for the benefit of their members and for wider audiences such as MPs, industry influencers, and the public. See for example www.ipenz.org.nz www.cca.org.nz www.nzsses.org.nz

Level

Level is a web-based database which contains generic information (site analysis, site use, energy, materials use, passive design, health and safety, water and tools) on sustainable building. It is intended for building industry users. See www.level.org.nz

NZ Standards

A number of New Zealand and joint Australia/New Zealand Standards relate to sustainability; mostly they are concerned with energy or energy efficiency. See www.standards.co.nz

Productspec

Productspec is a database of sustainable building products and services. The sustainability information is supplied by manufacturers or product agents. See www.productspec.co.nz

Resource Efficiency in the Building and Related Industries (REBRI)

REBRI's purpose is to promote, advocate, and assist resource efficiency measures in the building and related industries.

REBRI grew from a collaborative effort (called Project Construction + Demolition) between The Auckland Regional Council, BRANZ, and the Auckland City Council (with some funding by the Ministry for the Environment), which began in 1995. As part of this partnership, research, demonstration projects, sorting trials, an industry advocacy group and a variety of other initiatives were carried out. All of these initiatives showed the value of resource efficiency when applied to the building industry. The REBRI web site contains

information on reuse and recycling of common construction materials as well as links to related sites.

Smarter Homes

Smarter Homes is a web-based information source for sustainable home design, building and lifestyle options. The site is aimed at home owners, tenants, builders and property professionals who want an overview of smart home and building issues. See www.smarterhomes.org.nz

Community Organisations

Sustainable Wanaka

Sustainable Wanaka is charitable trust set up to actively promote and manage the integration of ecological, social, cultural and economic goals for their community's sustainable development.

Aims

- To position Wanaka as New Zealand's most successful sustainable community.*
- To be catalytic and solution based in facilitating activities that bring our vision into reality.*
- To seek the highest possible levels of public participation and endorsement in all our initiatives.*
- To identify true costs and develop time frames in all our planning that recognise the life cycles of affected organisms.*
- To ensure access to the best information and the best science to thereby inform and motivate our community.*
- To ensure perennial funding of our organizational capacity that reflects our financial independence and wide community participation.*
- To develop a baseline of current economic, ecological and social performance in all relevant areas and to define indicators that measure improvement or deterioration from there.*

They provide links to sustainable design and construction information on their website and

3. Status of National or Regional Development Targets for Sustainable Development

Home Energy Rating Scheme (HERS)

The EECA (Energy Efficiency and Conservation Authority) is developing the Home Energy Rating Scheme (HERS) to make New Zealanders aware of the energy performance of their houses. The scheme is intended to make the right information available to enable people to make informed choices about what they want from their homes. HERS will be launched on a voluntary basis in

December 2007. HERS will be applied to homes in a similar way to the star rating that is currently seen on appliances. An accredited assessor will inspect the home to look at its energy performance over a range of criteria. Using an energy rating tool, the home will be given a home energy rating that reflects its performance. When homes are assessed and rated, homeowners will also be given information about how they can improve their home's energy efficiency - and therefore its rating. Overseas experience has shown that high rating homes are more attractive to buyers, which acts as a driver for homeowners to invest in improving the energy efficiency of their home. It is expected that a HERS will produce similar results in New Zealand.

The HERS is being introduced first as a voluntary scheme for homeowners to declare a rating at point of sale or lease. Depending on how this goes, the declaration may be made mandatory at some point in the future. International experience shows less than 1% uptake on voluntary schemes - for HERS to have an impact on consumer awareness and drive energy efficiency improvements it would need to become mandatory at some point. An initial voluntary phase is necessary to ensure the HERS is running smoothly and effectively.

See www.eeca.govt.nz/residential/home-energy-rating-scheme/indexnew.html

Sustainable Building Guidelines

These are being developed by a number of city councils for application at a local level. The approach and complexity varies from council to council. See, for example www.aucklandcity.govt.nz/council/documents/design
www.waitakere.govt.nz
www.wellington.govt.nz/services/environment/sustain/sustainable.html

4. Status of Adoption of Policies (Tax, Programmes, Regulations etc) that will Further Enhance Sustainable Development

Introduction

The NZ government mandated insulation of housing in 1978 and introduced the Resource Management Act in 1991. Other sustainability initiatives were introduced in the late 1990s and early 2000s including the National Energy Efficiency and Conservation Strategy and the Sustainable Development Programme of Action. Considerable additional impetus to the sustainable development of NZ Inc and government's sustainability initiatives followed the Prime Minister's presentation of her annual statement to the opening of parliament on 13 February 2007. That opening statement includes a statement that NZ should aim to be the first nation to be truly sustainable and to be carbon neutral in its economy and way of life. In support of government's sustainability initiatives a 'Sustainability 6-Pack' was announced in May 2007. The initiatives include:

From the Ministry for the Environment

- Household sustainability
 - Waste minimization and management
 - Towards a carbon neutral public service
- From the Ministry for Economic Development

- Enhanced eco-verification
- Enhanced sustainable procurement
- Business partnerships for sustainability

See www.sustainability.govt.nz

Climate Change Policy

Climate change is the underlying driver for MfE regarding the energy efficiency of new buildings as a crucial issue. It requires a quantum leap in building performance, and the affordability issues be addressed via compensatory policies, not by a compromised approach allowing inefficient construction. MfE is getting agreement to a common Evaluation Framework for climate change policy options. Currently the proposed common Evaluation Framework has “carbon footprint of new and renovated/refurbished long-lived assets” as part of the Strategic Analysis section (Buildings are long-lived assets).

Community Relations - SMF fund

There are several building-related projects currently being funded through the Sustainable Management Fund (SMF). These include:

- Eco Design Advisors (BRANZ)
- Sustainable building resource for new home builders (Sustainable Wanaka)
- Sustainable Urban Development Assessment Project (SUDAP) (Waitakere City Council)

Emissions Trading Scheme

In October 2007 the government announced a proposal for an emissions trading scheme.

It is intended that such a scheme will put a price on carbon dioxide and the five other greenhouse gases specified in the Kyoto Protocol. Putting a price on emissions should over time change investment and consumption patterns, so that NZ will develop an economy and lifestyle with lower emissions.

The economy does need time to adapt to the changes which the scheme brings. As well, different sectors of the economy are at different stages in their ability and readiness to reduce emissions.

The major features of the proposed emissions trading scheme are as follows:

- All sectors of the economy and all greenhouse gases will be included in the scheme.

- *Industry sectors will be brought into the scheme gradually, reflecting the different challenges and the differing capability of sectors to adapt. The proposed timetable is as follows:*
 - *Forestry from 1 January 2008*
 - *Liquid fossil fuels from 1 January 2009*
 - *Electricity generation, industrial heat and power and other industrial processes from 1 January 2010*
 - *Agriculture, waste, and all other emissions from 1 January 2013*

It is intended that the government continue to accept some Kyoto liability during the first commitment period, and that some free allocation of emission units be made. Both these decisions are stated to recognise the challenges faced by some sectors in adapting to the introduction of a cost on greenhouse emissions.

To reduce compliance and administration costs it is proposed to place the obligations for emissions upstream in the market. For example, fuel companies will be responsible for emissions, not motorists. To ensure that people on low or modest incomes are not unfairly disadvantaged by higher electricity costs, the government will put in place additional measures to reduce the financial impacts, while still ensuring that incentives for efficient energy use remain. An important point to note in this regard is that emissions pricing on fuel and electricity will not come into effect until 2009 and 2010 respectively, so no resultant price increases are imminent. See www.beehive.govt.nz/ViewDocument.aspx?DocumentID=30691

Govt3

Government spends about \$25 billion on goods and services per year, and has responsibility for about 30% of NZ buildings. Govt3 is a government wide (to date 47 agencies) sustainable procurement and energy efficiency programme that has as its current foci:

- *Recycling/waste minimization*
- *Buildings*
- *Transport*
- *Office consumables and equipment*

Over the past two years the buildings being built or refurbished for government use in Wellington have become progressively more sustainable. In May 2007 the government announced that it will require public service departments nationwide to adopt a minimum 5 star Green Star NZ rating for the construction of all new A grade office buildings, minimum 4 star Green Star NZ rating for the construction of new B grade office buildings. By 2012 all new government buildings are to meet a minimum five-star rating.

In May 2007, the Government also directed public service departments to adopt by 1st July 2007, Ministry for the Environment Commissioning Guidelines in buildings over 2000m².

See www.mfe.govt.nz/issues/sustainable-industry/govt3/

The Government recently signed the 'Australian and New Zealand Government Framework for Sustainable Procurement'

http://www.med.govt.nz/templates/MultipageDocumentTOC_29395.aspx

National Energy Efficiency and Conservation Strategy NEECS (Draft Dec 2006)

The draft NEECS issued by EECA for comment in December 2006 includes a number of measures aimed at improving the energy efficiency of buildings. For houses these were:

- Establish a Home Energy Rating Scheme (HERS) by 2007
- Improve insulation levels and water heating energy efficiency in the Building Code by 2008
- Install 15,000 to 20,000 new solar water heating units by 2010
- Increase the rate at which pre-1978 homes are insulated to adequate levels
- Develop a consumer information programme to encourage energy efficient behaviour in the home

And for commercial buildings:

- Change the Building Code to require more energy efficiency for new buildings and retrofits by 2009
- Introduce a Building Energy Rating Scheme (BERS) by 2009
- Expand electricity efficiency programmes by 2008, based on the findings of the Electricity Commission's potentials study

See www.eeca.govt.nz/eeca-library/eeca-reports/neeecs/report/draft-nzeeecs-06.pdf

New Zealand Energy Strategy NZES (October 2007)

The NZES was released in October 2007. The NZEECS is a subset of the NZEECS setting out the government's action plan for improving energy efficiency, conservation and use of renewable energy. The NZES establishes the principle that should occur in energy efficiency measures where this is cheaper than the long term costs of building extra generation capacity, including environmental costs.

See www.med.govt.nz/nzes

NZ Building Code

The NZ Building Code is currently undergoing a comprehensive review which started in 2004. One of the stated purposes of the Building Act 2004 is stated in s3(d) “buildings are designed, constructed, and able to be used in ways that promote sustainable development.” This is further defined in s4 as energy efficiency, energy conservation, use of renewable energy; efficient and sustainable use of materials and material conservation; efficient use of water and water conservation.

A document setting out the proposed performance requirements of a new NZ Building Code was released for public comment in July 2007, with comments closing at the end of September 2007. This review document included some proposed requirements for making NZ buildings sustainable. These include in Part 6 the concept of a whole of life approach to resource efficiency in buildings. The suggestion is to adopt a Life Cycle Assessment (LCA) approach in which CO₂ is used as a proxy for the use of energy. LCA could be used to assess the CO₂ emissions associated with a building for the whole of its life. The issues to be considered are stated as:

- Emissions produced on a day-to-day basis from the running of the building
- Emissions that arise from the production and use of materials to construct and maintain the building
- Emissions arising from the construction, maintenance and demolition of the building generally.

It is additionally suggested that measuring CO₂ emissions created in supplying drinking water and removing storm and wastewater from buildings would encourage water efficiency without prescribing water efficient solutions. There is a suggestion elsewhere (Part 5 page 51) that a minimum of 250 litres/person/day should be able to be supplied to buildings. See www.dbh.govt.nz/userfiles/file/consulting/pdf/2007/building/building-code-review.pdf

Urban Design Protocol

The UDP is a voluntary commitment to specific urban design initiatives by signatory organizations which include central and local government, the property sector, designers, and other groups. The protocol identifies seven essential design qualities: context, character, choice, connections, creativity, custodianship and collaboration. It is aimed at creating healthy, liveable urban environments that thrive economically and facilitate creativity and innovation. See www.mfe.govt.nz/issues/urban/design-protocol/index.html

Waste Strategy

The NZ Waste Strategy 2002 was intended to set in place a framework for addressing how NZ could minimise and manage waste. It recognised that there

was presently little or no information on the volume and category of waste arising in the area of building construction and demolition and that there were big gains to be achieved by diverting this sort of refuse from landfills and encouraging recycling. Targets were set that

- By December 2005 all territorial authorities will have instituted a measurement programme to identify existing construction and demolition waste quantities and set local targets for diversion from landfills
- By December 2008 construction and demolition waste going to landfill would be halved compared to December 2005.

A government review in 2006 noted that while there was evidence that diversion of construction and demolition waste from landfills was occurring, it was impossible to quantify. The latest government moves on waste include:

- A levy on solid waste disposal (which would include construction waste) with revenue used to support local authorities waste minimization activities and funding of waste minimization projects
- Product stewardship
- Public recycling facilities
- Reporting (in a consistent way) by operators of disposal facilities and resource recovery facilities (to enable national collection of waste data)
- Governance including the establishment of a national waste advisory board
- Integration with other government initiatives such as eco-verification

See www.mfe.govt.nz/issues/sustainability/cabinet-papers/pol-07-132.html

5. Status of Adoption of Sustainable Building by the Investor Community

In contrast to the widely publicised government initiatives in sustainable buildings the degree of adoption of sustainable building practices by private sector investors is harder to measure. Certainly the property industry generally is well involved with the NZ Green Building Council, in governance at board level and as members, as are many of the consulting firms who work in the construction sector (see www.nzgbc.org.nz).

There are initiatives being proposed and put in place in the property sector. MfE published a value case for sustainable building (See www.mfe.govt.nz/publications/sus-dev/value-case-sustainable-building-feb06/value-case-sustainable-building-feb06.pdf) and the benefits of sustainable building have also been highlighted by the property sector (see www.joneslanglasalle.co.nz/en-gb/research/researchabstract?artid=2469)

The degree of knowledge of sustainable building and interest in it varies widely across the property sector. Some developers have embraced sustainable building; some will build as sustainably only as much as necessary to attract government or private sector tenants, some view sustainable building as an expensive nuisance. Investors know that it has become necessary to get the sustainability of new buildings rated to attract tenants, but are concerned that the existing commercial building stock is becoming 'obsolete' as far as sustainability is concerned, with consequent implications for rents. Contractors see their role in sustainable building as being around the building process e.g. minimising waste, but knowledge is patchy and it has been suggested that they should take the opportunity to learn more from their involvement in construction constraints of sustainable buildings.

Generally building sustainably is seen as extra cost, with a 'tick the box' approach rather than industry having a good understanding of why certain sustainable features are asked for or desirable. Knowledge and approach varies often depending on size of company and physical location - large companies and main city companies are usually more knowledgeable.

Two critical factors were stated to be holding the development of sustainable building in NZ back. One, as stated earlier, is a lack of independent credible product information. The other is a lack of specialist consultants able to advise companies on how to become more sustainable and which sustainability practices to adopt. In many ways the situation seems similar to the rise of ISO 9000-based quality systems 15 or so years ago. While sustainability is seen as another 'wave' sweeping through the industry, in the same way that asbestos or accessibility have done in the past, sustainability is apparently more difficult to quantify and get to grips with.

6. Status of Education and Training in Sustainable Building

Educational institutions

Environmental science is taught in a wide range of different courses in tertiary institutions in NZ. However many of these courses are not specifically related to building.

In courses specifically related to construction, architecture and engineering degrees generally contain either optional or compulsory papers on environmental issues. Some specific cases are listed below. Other courses are available which produce graduates who work in professions that affect or interact with the building process such as planning, resource and environmental management. These are not specifically covered in this report. The following list of courses is not exhaustive.

University of Auckland

The Bachelor of Architectural Studies (BAS) and the Bachelor of Architecture (BArch) both include a core course on architecture and sustainability. Auckland also offers a Master of Architecture Sustainable Design degree. This degree offers advanced specialist study in aspects of sustainability and the relationship to architecture, the architect's role, urban design and building performance.

The Bachelor of Engineering (Civil) has an environmental engineering elective and post-graduate engineering degrees also have environmental engineering options.

Victoria University

The Bachelor of Architecture and Bachelor of Building Science course include an option for environmental science papers.

University of Canterbury

The Natural Resources Engineering Programme is a four-year Bachelor of Engineering (Honours)(NatRes) degree offered through the Department of Civil Engineering at the University of Canterbury. Degrees are also offered in environmental engineering which focus on applying sound engineering principles and experience to the solution of problems of environmental quality.

Auckland Institute of Technology

The Master of Construction Management includes a paper on sustainable construction issues.

Massey University

This university offers a Bachelor of Engineering with Honours (Environmental Technology and Sustainable Energy)

The Bachelor of Engineering Technology (Architectural Technology) and Bachelor of Engineering Technology (Building Surveying) include a paper on built environment covering sustainable building issues.

UNITEC

The Bachelor of Construction includes a paper on sustainable construction issues and the Bachelor of Engineering Technology (Civil) has optional papers

on sensitive environment, environmental chemistry, environmental law, waste minimization and environmental impact assessment.

The Bachelor of Applied Technology - Building has a sustainable technologies paper.

Polytechnic Institutes and accredited training organisations

Some polytechnic institutions offer undergraduate degrees in engineering and architectural design which include papers on sustainable issues. They also offer diploma and trades qualifications which are part of a national framework of trade qualifications administered under the National Qualifications Framework (NQF). The NQF is a three-pronged quality system:

- national standards are registered*
- these are used by accredited training providers (e.g. polytechnic institutes, industry training organizations etc.)*
- a moderation system ensures national consistency*

The National Diploma in Construction Management, National Diploma in Quantity Surveying and the National Diploma in Architectural Technology include a paper which has the following learning outcomes:

- Apply principles from published data to environmental impacts on and of the built environment.*
- Identify environmental aspects of building construction and services, and evaluate techniques that may apply to the built environment.*

Industry training

New Zealand Institute of Architects (NZIA) Continuing Professional Development Courses

NZIA requires members to undertake professional development. To comply, registered architects must undertake a minimum number of credits through recognised courses, seminars, workshops and conferences each year. The institute runs some of these units itself and the others are accredited events run by other reputable organizations. Sustainable building now forms a significant part of the content recognised by NZIA. For example in 2007, the SB07 Auckland Conference, LCA seminars run by BRANZ Ltd were recognised and the NZIA's own seminar series included sustainable building content.

Engineers New Zealand (IPENZ) Continuing Professional Development Courses

IPENZ recognises the vital importance of Continuing Professional Development (CPD) for its members and requires chartered and professional grade members

to undertake CPD annually. IPENZ has developed its own programme of short courses and IPENZ has also set up a CPD logging system for its members who can apply for recognition of attendance at non-IPENZ courses. While not compulsory, courses organized by IPENZ do include sustainability related topics.

New Zealand Institute of Quantity Surveyors (NZIQS) Continuing Professional Development Courses

NZIQS requires members who are registered to complete CPD training to maintain membership. The institute runs some of these units itself and the others are accredited events run by other reputable organizations. While not compulsory, activities accredited by NZQS do include sustainability related topics.

Architectural Designers New Zealand (ADNZ)

ADNZ members must undertake compulsory professional development and have their skills assessed to ensure they meet the requirements of the ADNZ Competency Standards. These are currently designed to respond to regulation changes affecting designers but will take into consideration licensing requirements for building designers once these have been established.

The Designers Institute of NZ (DINZ)

DINZ will be implementing a training option on sustainability for members in 2008.

Builders Organisations

At this stage there is little official training organised by the two bodies representing builders in NZ. There has been discussion about introducing such training which would link the NZ Green Building Council and the planned home energy rating system being developed by EECA. It is likely such a scheme would be voluntary.

Industry Seminars

A range of industry providers offer seminars to industry on an annual basis. BRANZ typically runs three seminar series a year aimed at builders, designers and building officials. These cover a wide range of topics and have included topics around sustainability such as LCA and insulation. The Department of Building and Housing often run seminar series to coincide with changes to the

Building Regulations and Means of compliance (standards and Acceptable Solutions for instance).

7. Status of Adoption of New Sustainable Building Technologies and Techniques

Heat pump Uptake in NZ

Every quarter BRANZ carries out a survey of new houses being constructed. Since September 2005, the survey has asked if there is a heat pump installed in the house. A summary of the results shown below, suggests over a third of new houses have heat pumps installed.

French LJ. (2008) 'Active Cooling and Heat Pump Use in New Zealand - Survey Results'. BRANZ Study Report SR 186. BRANZ Ltd, Judgeford, New Zealand

	Sep05	Dec05	Mar06	Jun06	Sep06	Dec06	Mar07	Jun07	Sep07	Dec07
<i>Percentage of houses with a heat pump</i>	27%	28%	26%	27%	33%	33%	36%	45%	37%	41%

Information from the NZ Energy Efficiency and conservation Authority (EECA) indicates that total sales of single phase reverse cycle heat pumps in 2006-2007 were approximately 79,000 units.

Photovoltaic's

A 2006 EECA report, 'Renewable Energy - Industry Status Report' for year ending March 2006., produced by East Harbour Management Services states a survey was carried out by the Photovoltaic Association" (now SEANZ) and estimated 1 MWp of installed PV capacity was in general use in New Zealand as at December 2004. In addition there is about 400 kWp of capacity on BP petrol

station canopies. Thus, a rough estimate of total installed PV in New Zealand at 31 December 2004 is 1.4 MWp. This is up from 0.75 MWp in 2001.

Solar Hot Water

Ian Page (BRANZ) has estimated from the BRANZ quarterly survey of new houses that just over 10% of new homes have solar water heaters. The 2006 EECA report indicates that passive (thermosiphon) systems are 40% of sales and active (pumped flow) are the remainder and as at 31 December 2005 there were an assessed 28,400 SWH systems installed throughout New Zealand.

Building Research commissioned a report from BRANZ Ltd in late 2005 which concluded that payback periods varied between eight and twenty years depending on circumstances, and that the available systems were appropriate. BRANZ Ltd identified that one of the biggest uncertainties in the cost/benefit analysis of solar water heating systems is the lack of reliable field data for system performances. EECA and Building Research have commissioned further work which will examine installations in Auckland, Wellington, Christchurch and Dunedin, and monitor their actual performance, to address this perceived information gap. The work is expected to be complete in late 2007. Provider: Team led by BRANZ Ltd

Performance of Cladding Systems Using Solar Radiation to Pre-Heat Air

Transpired metal membrane collectors have been claimed to be able to provide background ventilation and solar heating of building spaces through a simple low-tech approach which seems applicable to New Zealand. A preliminary study evaluating thermal performance and practical installation and operational issues for this technology in an actual house in suburban Wellington has been reported (see www.branz.co.nz/branzltd/publications/pdfs/SR167.pdf) and further work looking at its effectiveness on larger buildings such as schools, and houses in other climates is under way.

WEPP (Water End-Use and Efficiency of Use Programme)

Building Research commissioned BRANZ Ltd to develop a robust methodology for monitoring end uses of water in residential homes, which is available for use by a number of parties (e.g. regional councils, Ministry for the Environment, Territorial Authorities and water companies) for their specific interest projects. The methodology was applied in a pilot study of 12 houses in the Kapiti Coast area. The results are reported at www.branz.co.nz/branzltd/publications/pdfs/SR159.pdf

8. Status of Adoption of Sustainable Building Whole-Building Rating Systems

BRANZ Green Homes Scheme (GHS)

The BRANZ GHS is a method of assessing the environmental performance of new home designs. It offers a checklist system that operates as a rating tool, examining a wide range of environmental issues. A certificate is provided for those assessed designs that have a good environmental performance. The Green Home Scheme looks at mostly environmental issues, but also some health and safety issues, including

- space heating and cooling
- main appliances energy use
- water efficiency and conservation
- more sustainable materials
- indoor air pollutants
- waste disposal
- etc

See www.greenhomescheme.org.nz

To date the scheme has not become widely used.

NZ Green Building Council

The NZGBC was established in 2005. It follows overseas models which had their origins in the BREEAM tools of the British Building Research Establishment in the early 1990s which evolved into LEED in the USA and most recently the Australian GBC and its suite of Green Star tools. The NZGBC is similar to the overseas models, with a board comprised of a number of different industry sectors including property, government and education. The NZGBC is a member of the World GBC.

The NZGBC is developing tools to measure the sustainability of buildings. The first of these was the Green Star Office (Design) tool launched in April 2007 which will be revised during 2008. As at 1 December 2007 there were 22 buildings submitted for rating by the Green Star Office (Design) tool. More tools are planned and could include Office (As Built) and Office (In Use), Education and Houses. NZGBC is training assessors in the use of its tools, and educating and informing the industry about sustainable building. There were 61 Green star accredited professionals at December 2007 but 500 people have undertaken Level 2 training in the use of the tool.

The NZGBC works in close partnership with government and industry, and government has mandated that all new government office buildings must be of at least Green Star 4 Star quality. The NZGBC is developing economic value case studies for sustainable building. See www.nzgbc.org.nz . Membership of

the NZGBC is rising rapidly with 309 members at end of 2007 (an 83% increase in 2007).

Tool for Urban Sustainability - Code of Practice

TUSC is a web-based tool developed by Waitakere City and MfE. It is used to assess and plan new urban residential houses against sustainability indices. It has been expanded to include the ability to evaluate an multiple houses on asite.

The Tool for Urban Sustainability: Code-of-Practice (TUSC) is intended to provide Developers, Practitioners, Policy Makers and Compliance Officers a single user-friendly web-based Engineering and Planning tool that will deliver cost-effective urban sustainability outcomes in both new developments and urban retrofit or intensification projects. In working towards this goal, TUSC plans to:

- *simplify the development planning process;*
- *disseminate evidence and examples of sustainable urban development and techniques that heighten awareness and influence societal attitudes towards sustainability principles;*
- *offer a range of effective concept design choices for community planners, developers and home-owners to achieve sustainability goals;*
- *guide users through selection of appropriate technologies and design choices by use of a scorecard system;*
- *efficiently assess development proposals using integrated analysis tools against clearly stated benchmarks and indicators;*
- *produce a single flexible and expanding database for local environmental data, treatment technologies, monitoring and baseline information, policies goals and objectives, analysis models and tools, and presentation techniques and interfaces;*
- *develop a new national best practice approach that will be widely adopted and ultimately legislated.*

See www.tusc.org.nz

To date the uptake of TUSC has been limited. To encourage its use, Waitakere City Council offer up to a \$2000 rebate off developer contribution fees if they exceed a specified minimum rating using the tool.

9. NZ Activities

Beacon Pathway Ltd:

This research consortium has five shareholders (Building Research, Fletcher Building, NZ Steel, Scion, Waitakere City) and has a turnover of ~\$2 million a

year with shareholder research investment matched by the FRST. The consortium is addressing questions of how NZ's residential built environment can be brought to a high standard of sustainability by 2012. Beacon's vision is "Creating homes and neighbourhoods that work well into the future and don't cost the earth". See www.beaconpathway.co.nz

Commercial Building Energy End-use Project

This project is in its final planning stages by BRANZ and funding is likely from FRST and a number of industry bodies (Building Research, Dept of Building and Housing, EECA). It will explore the use of resources in the operation of commercial buildings.

Concrete³

Concrete³ is an initiative of the Cement and Concrete Association of NZ and the concrete industry. It is a campaign which is stated to educate and link concrete to the triple bottom line of sustainability. See www.sustainableconcrete.org.nz

EnergyWise Home Grants

EECA's EnergyWise home grants programme funds improvements to insulation and other energy efficiency measures in homes in partnership with community organisations. To be eligible for funding the house must have been built prior to 1978, and the home owner must have a community services card. See www.eeca.govt.nz/residential/energywise-home-grants/index.html

Interest-free loans for residential energy efficiency and clean heating

This programme, for implementation in early 2008, will provide interest free loans to households eligible for the KiwiSaver Home Deposit withdrawal programme. The programme will be delivered in partnership with third parties providing the necessary capital to cover the costs of retrofits, with government covering the interest.

'Green' Mortgages

These are becoming reasonably common overseas, where loans on a 'sustainable' house or apartment may attract a mortgage rate 0.5 to 1% below normal market rates. These loans are offered by cooperatives rather than major banks. Currently the only green mortgage on offer in NZ is from Westpac, and is consists of a normal mortgage plus an \$1800 package of vouchers for the installation of some sustainable features into a home. See www.westpac.co.nz/olcontent/olcontent.nsf/Content/Buying+a+house

Household Energy End-Use Project (HEEP)

This project (which has had heavy FRST funding alongside the Building Research investment and other smaller funders) commenced in 1995 with a pilot study and has progressed to a representative sample of four hundred houses from throughout New Zealand. HEEP monitoring activities included a

detailed occupant survey as well as a detailed house energy examination. The monitoring covers all fuel types (electricity, natural gas, LPG, solid fuel, solar water heaters) as well as temperatures in at least three locations. A model has been produced of the way energy is used in New Zealand households, using physical building and appliance characteristics as well as socio-demographic factors to describe the energy consumption patterns and some of the energy services, in particular the achieved indoor temperatures. The model will be used to understand current and future national household energy requirements, and as a tool to evaluate the implications of building and appliance performance changes. See www.heep.co.nz

Lighting Product Stewardship Scheme Development

MfE is working with the Efficient Lighting Strategy group (EECA and Electricity Commission and Lighting Council) on feeding in lighting waste issues into the strategy and looking at how to develop a collection and recycling system for used mercury-containing lamps from business and household in the future.

Low Impact Urban Design and Development (LIUDD)

Low impact and water-sensitive approaches to urban development have been evolving in New Zealand since the late 1990's. A partnership between Landcare Research, Auckland and Lincoln Universities are working on LIUDD initiatives in NZ with the intent of achieving:

- approaches that maximise natural values and minimise sediment and pollutant run-off and impervious areas.
- reduce the environmental footprint of urban areas on natural and reticulated waters, terrestrial and aquatic biodiversity, energy and material use and waste.
- more sustainable subdivision and development and improved urban catchment management.

LIUDD comprises design and development practices that utilise natural systems and low impact technologies. Key elements include working with nature, avoiding or minimising impervious surfaces, minimising earthworks in construction, utilising vegetation to assist in trapping sediment and pollutants. See www.landcareresearch.co.nz/research/built/liudd/

SHaC09

The Sustainable Habitat is a national project for collaborative, tertiary led teams to design, develop, and build sustainable housing in their local community. The key outcome for the Challenge is to bring ideas and methods for low energy, low resource housing to our communities and through building them, show this life to be practical and desirable. By involving student and staff designers, architects, planners, builders, engineers, and others and pursuing a housing development from concept, to project development, to consenting and building, the challenge will prove practical a number of low-

e n e r g y , l o w - r e s o u r c e d e s i g n s .

The challenge is a great opportunity to link theory with practice. It will demonstrate that we are able to live our lives using fewer resources than our c u r r e n t s i t u a t i o n .

The collaborative teams from each region will develop a vision of a way of life that requires significantly less resources. Then they will design and build a home for their region that supports and encourages that low-energy, low-resource lifestyle. Teams will have to prioritise their goals in order to provide what they think is the best way to develop New Zealand sustainable housing for the future. They will have to show (by simulation) how their projects result in significantly lower resource use, the result of efficiency gains and adaptive behaviours. Good design will make the new or retrofitted home a desirable and delightful improvement on how we live today. After the challenge simulations will be compared with real performance, and be the s u b j e c t o f a p u b l i s h e d r e p o r t .

The challenge is completed when teams have communicated with their wider community about the choices they have made in their design, the benefits, and how the design ideas can successfully be used again.

More Information is on our web page, at: www.shac.org.nz and wiki at: http://www.greymatter.co.nz/otagowiki/index.php/SHaC_09.

Structural Timber Innovation Consortium (STIC).

A research consortium funded extensively from the timber industry has been proposed which seeks to answer the question “Why aren’t we building large span and multi-storey timber buildings to capitalise on the growing world-wide demand for sustainable buildings?” STIC would investigate and develop novel engineered structural timber solutions for large span multi-storey buildings with adaptable open-plan interiors and for very large span roof systems for single storey timber buildings, and investigate and develop a modular system concept for large prefabricated timber buildings.

Sustainable Buildings Project

The New Zealand Business Council for Sustainable Development aims to provide Government with an informed business view on what will work to achieve more sustainable construction and buildings. NZBCSD considers that there are opportunities to develop a viable, robust business model for the sustainably focused retrofit sector of the residential and commercial market (increasing the adaptability, resource efficiency and the health and comfort of existing buildings). Similarly, the business model and the preconditions for the middle income sustainable new residential construction market (between the architect designed and influenced high income end and the HCNZ and private landlord supplied rental housing) could be developed. The Business Council

project team has already identified some enablers for sustainably focused new home and retrofit providers to emerge, together with a number of issues/barriers and potential solutions that have been identified. The Business Council's approach is to create a more practically focused, progressive working business model and, in particular, address how the transition from where we are now to this working model could be most successfully achieved. The Business Council will advocate and campaign for the introduction of the targeted interventions during 07/08.

See www.nzbcsc.org.nz

Warm Homes

MfE is working with a range of central and local government agencies on the Warm Homes project. The aim is to ensure that all New Zealanders heat their home cleanly, efficiently and sufficiently. The main driver of the Warm Homes project is the national environmental standard for air quality. This was introduced in 2004 and requires regional councils and communities to deal with poor air quality in their areas. This year MfE is running a Warm Homes trial in Taumarunui with an aim of retrofitting heating appliances in at least 15 homes.

10. Industry Associations

Many of the construction industry associations are active in sustainable building for their members. Initiatives include (but are not limited to) the following:

Institution of Professional Engineers

IPENZ publishes a series of Informatory Notes in the media & public policy part of its website. Information notes and papers on sustainable building are on the IPENZ website. See www.ipenz.org.nz

The New Zealand Society for Sustainable Engineering and Science is a Technical Interest Group of IPENZ. See www.nzsses.org.nz

NZ Institute of Architects

Worldwide the architectural profession is committed to environmental and social sustainability and the New Zealand Institute of Architects encourages its members to take a lead role in the design of sustainable buildings. The NZIA has adopted the definition of sustainable development that has been adopted by the Construction Industry Council being: 'Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs'. Each year the NZIA arranges a national seminar series on sustainability and there are a number of other seminars held as part of the Institute's Continuing Professional Development Programme. See www.nzia.co.nz

Registered Master Builders Federation

The RMBF is making sure it's connected as best as it can to the various initiatives underway at present [including Green Building Council; rating schemes; Building Code review; Electricity Commission initiatives; EECA initiatives; Sustainable Business Council work; etc]. RMBF are strategizing on 'what can we best do for our members'; it's likely the key value add will be 'green training' for members, and in that regard it's likely they will follow and draw on similar programmes developed and delivered by our MB counterparts in Australia [for both residential and commercial builders].