

If you think about the public buying cars, they are pretty well informed not just on price but on performance, reliability and depreciation of a vehicle, but you never see them thinking about those things when they buy a house.

(Professor Lindsay Johnston, Chair, Royal Australian Institute of Architects Environment Committee)¹

Building design and management

- 7.1 The committee's vision is one of a built environment in which the usually competing issues of profitability, environmental sustainability and safety complement one another and become segments of the whole sustainable building process.

Residential buildings

Energy ratings

- 7.2 By moving towards more sustainable residential buildings, Australia can improve the sustainability indicators of its cities as a whole.
- 7.3 The current Building Code of Australia (BCA) mandates a minimum level of energy performance for new and refurbished houses in Australia. Using House Energy Rating Software (HERS), houses must have a minimum of 4 stars in order to comply. The committee was advised that the Building Codes Board is looking at introducing mandatory energy ratings for both commercial and multistorey residential buildings by mid-2005.²

1 Professor Lindsay Johnston, Royal Australian Institute of Architects, *Transcript of Evidence*, 11 March 2004, p. 8.

2 Mr Neil Savery, Australian Capital Territory Planning and Land Authority, *Transcript of Evidence*, 4 March 2004, p. 24.

- 7.4 In Victoria, all new homes are required by legislation to meet 5 star energy ratings. It is also a requirement for homes in the ACT to be rated for energy efficiency at the time of sale.³ Evidence to the committee supported these concepts, pointing out that mandatory disclosure of energy efficiency at point of sale would empower consumers and enable them to take energy efficiency into their living choices.⁴
- 7.5 Origin Energy drew to the attention of the committee the savings that can be made with energy efficient homes:
- What is currently missing is a comprehensive appreciation of the value of ecoefficiency. For example, a home that uses 50% less energy than an average house will save its occupants around \$800p.a. Assuming a mortgage rate of 7% and inflation of 2.5%, this would mean that the buyer could afford to spend \$12,000 on the house and be no worse off.⁵
- 7.6 The committee believes that it is sensible that there be mandatory disclosure of the energy efficiency and greenhouse performance of residences at point of sale and point of lease. This would require State and Territory governments legislating appropriately.

Recommendation 17

- 7.7 **The committee recommends that the Australian Government encourage the States and Territories to mandate disclosure of the energy efficiency and greenhouse performance of residences at point of sale and point of lease.**

3 Australian Conservation Foundation Sydney Branch, *Submission 44*, p. 5.

4 Australian Conservation Foundation and Environment Victoria, *Submission 162*, p. 10; see also Mr Ric Brazzale, Australian Business Council for Sustainable Energy, *Transcript of Evidence*, 16 March 2004, p. 55.

5 Origin Energy, *Submission 143*, p. 9.

Going further

7.8 The committee was advised that, while Australia is a world leader in the energy star rating system with regard to cars and appliances, our building standards are 'lower than some other developed countries'; however:

Once the financial and comfort benefits of mandated 5 star rated homes are widely recognised, the momentum and consumer support will exist to lift to 6 star and beyond.⁶

7.9 The Royal Australian Institute of Architects also believes we should go much further than a star rating system, arguing that current energy performance measures 'appear to be largely ineffective' and:

... address only a small part of a much bigger problem – unnecessarily large houses are rewarded, total energy consumption in dwellings is ignored and initiatives apply only to new dwellings which are, in any one year, a tiny proportion of the total housing stock. In a radical vision of a sustainable city, domestic rates might be calculated on annual energy consumption or emissions per resident.⁷

7.10 Further, while the star rating system is an excellent tool, it only has value if consumers are aware of, and concerned about, residential energy ratings. There is a need to do more to educate the public. Professor Lindsay Johnston thought that houses could be, much like cars, 'road-tested' in magazines, because issues such as airconditioning and heating costs are currently 'not actually penetrating in the housing market'.⁸

7.11 Mr Michael Robb from the Hickinbotham Group prefers an incentive approach (such as tax incentives) to a coercive approach to have more energy efficient buildings.⁹

7.12 Two factors are currently inhibiting the growth of sustainable housing; the comparative upfront costs, and lack of easily accessible information. Origin Energy noted, for example, that 'most home and building buyers are concerned about the up-front amount rather than the whole-of-life cost'.¹⁰

6 Origin Energy, *Submission 143*, p. 10.

7 Royal Australian Institute of Architects, *Submission 159*, p. 7.

8 Professor Lindsay Johnston, Royal Australian Institute of Architects, *Transcript of Evidence*, 11 March 2004, p. 8.

9 Mr Michael Robb, Hickinbotham Group, *Transcript of Evidence*, 29 April 2004, p. 47.

10 Origin Energy, *Submission 143*, p. 9.

- 7.13 Ms Monica Richter believes it cannot be left to the consumer alone to choose the benefits of sustainable housing. Builders must have the knowledge and incentive to build sustainable housing at the same cost as other housing; smart design options should not be more costly – they ‘should be moving towards having a zero net cost’.¹¹

Your Home Guide

- 7.14 The Australian Government, in partnership with the design and construction industries, has developed the *Your Home Guide* to sustainable housing.
- 7.15 The guide is part of a suite of consumer and technical guide materials and tools developed to encourage the design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable.
- 7.16 This manual and supporting documentation has been widely distributed and forms the basis for training programmes with the Housing Industry of Australia and tertiary institutions.
- 7.17 In addition, the Housing Institute of Australia introduced its *HIA GreenSmart* programme to promote sustainable building practices within the industry. Members of the Housing Institute of Australia, such as builders, manufacturers and suppliers, have to undertake GreenSmart training to obtain GreenSmart professional status.
- 7.18 The committee is pleased that this important tool is being used to increase the awareness of professionals in the building industry of sustainable building concepts and encourages any further initiatives in this area.
- 7.19 The committee heard from the Department of Environment and Heritage that the *Your Home Guide* concept is being extended to the commercial sector.¹²

11 Ms Monica Richter, Australian Conservation Foundation, *Transcript of Evidence*, 16 March 2004, p. 6.

12 Department of Environment and Heritage, *Submission 157*, p. 27.

Commercial buildings

7.20 Integrating Sustainability makes the point that it is the very way in which commercial buildings are developed that make them unsustainable:

The delivery of commercial buildings and developments is complex, and depends on a dysfunctional supply chain, in which each component operates within its own silo. This discourages joint problem solving, which is necessary to build "green" buildings and developments.¹³

7.21 The committee notes that achieving green buildings in the commercial sector is extremely challenging. Perhaps change in this area can only be effected as tenants place a greater value on green buildings and so increase market pressures. However, the committee notes that the extension of energy efficient measures to commercial buildings is under way and 'this should assist in reducing the infrastructure demands placed on cities by new dwellings'.¹⁴

Features of green buildings

7.22 The following discussion and recommendation apply equally to residential and commercial buildings. Further consideration of building issues such as energy efficiency, heating, cooling, insulation and lighting and water management is provided in chapters 6 (water) and 8 (energy).

Solar orientation

7.23 It is well known that good solar orientation assists in home cooling in summer and heating in winter. Delfin Lend Lease designs its communities with solar orientation at the dwelling level being considered as 'one of the urban design constraints'.¹⁵

13 Integrating Sustainability, *Submission 27*, p. 18.

14 Western Australian Government, Sustainable Energy Development Office, *Submission 89*, p.4.

15 Delfin Lend Lease, *Submission 66*, p. 14.

- 7.24 The committee was advised that in cities such as Perth, the orientation of a building could play a large role in sustainable building, but the opportunity is not being taken up:

There is a sustainable home in the city of Subiaco that has been built to demonstrate that with careful design you can keep a home at a temperature of between 20 degrees and 30 degrees all year around in the Perth climate. So it is shame that we have just one or two houses in the city that actually meet those standards. I think we are building about 17,000 to 20,000 new homes in the Perth area every year. The vast majority of those homes require incredible amounts of energy just to maintain a comfortable climate inside.¹⁶

Construction materials

- 7.25 Sustainable construction materials, by the sheer volume of their use, would be 'imperative to the development of sustainable cities':

The extraordinary mass and volume of these materials that are used in the construction of our cities simply dwarfs that of any other industry.¹⁷

- 7.26 However, the committee was advised that a major obstacle to changing current unsustainable uses of materials is a lack of data on construction material life cycles; there are only a 'handful' of countries that work to 'understand eco-efficiency and eco-effectiveness of their raw materials and construction resources'.¹⁸

- 7.27 Examples of such countries include the United Kingdom, which has instigated a 'mass balance' study on construction material flows in its economy.

- 7.28 The mass balance concept is based on the principle that, for all practical purposes, matter can neither be created nor destroyed. Therefore, the mass of inputs to a process, industry or region balances the mass of outputs as products, emissions and wastes, plus any change in stocks. When applied, this concept of balancing resource use with outputs can provide a methodology for analysing resource flows.¹⁹

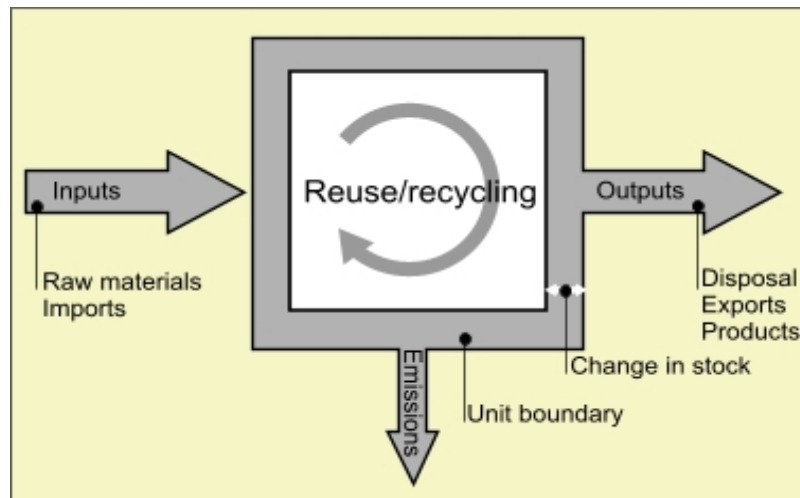
16 Mr Christopher Tallentire, Conservation Council of Western Australia, *Transcript of Evidence*, 31 March 2005, pp. 30-31.

17 Association for the Advancement of Sustainable Materials in Construction, *Submission 190*, p. 5.

18 Association for the Advancement of Sustainable Materials in Construction, *Submission 190*, p. 21.

19 See www.massbalance.org

Figure 7.1



7.29 The committee considers that this concept has value and recommends that the CSIRO investigate a mass balance analysis for Australia.

Recommendation 18

7.30 **The committee recommends that the Australian Government, possibly through the CSIRO, investigate the value of a mass balance analysis for Australia.**

7.31 The committee received evidence from TecEco about the amount of CO₂ generated by the production of cement and concrete. The company has had trouble getting building approval for new materials.²⁰ The committee believes important product advances, such as concrete that sequesters rather than emits greenhouse gases, would make a global difference. The committee believes that regulatory systems must be open to assist and not block such advances.

7.32 An alternative approach to rating a building's sustainability is the 'carbon signature' measurement. The City of Townsville explained that a carbon signature refers to the:

- embedded energy (carbon) of the materials;
- the greenhouse emissions associated with transport of the materials, the carbon signature of powering the building;

²⁰ TecEco, *Submission 75*, p. 21.

- the carbon signature of decommissioning/recycling or removing the structure at the end of its life.

Buildings with a low construction carbon signature would typically have a high quantity of construction materials made of natural materials (wood, earth, and stone) and low energy demand in operation.

Alternatively, buildings with a high construction carbon signature would have energy intensive materials such as stainless steel and aluminium, and would be energy intensive to operate (eg. to heat/cool and light).

Carbon intensity alone is not a total sustainability indicator but is a good proxy indicator for many aspects of sustainability.²¹

- 7.33 The Plantation Pine Framing Alliance points to the different environmental impact between timber and steel construction and reiterates how important sustainable construction material use is:

. . . building all of these houses with steel frames results in 426.6 kilo-tonnes of CO₂, compared to the 63.2 kilo-tonnes generated if they are built using timber frames. (This example is indicative only; the PPFA understands that not all of the 158,000 forecast new dwellings are necessarily four-bedroom on 180 square metres.)

Extrapolate this scenario over the 22 years to 2025 and the scope for dramatically improving the ecological footprint of new housing stock built in this time, through choice of materials, becomes apparent.²²

Life cycle assessment of materials

- 7.34 The Royal Australian Institute of Architects points out that all aspects ‘from extraction, processing and transport through to possible fire, demolition and disposal or reuse’ need to be considered when selecting construction materials.²³ Further:

Balancing design decisions and materials choices for sustainable buildings requires integrated life cycle assessment that will evaluate the relationship between, first, investment in embodied energy, second, commitment to long term operational energy consumption energy use and, third, concomitant environmental performance, such as thermal comfort and natural light. Studies have indicated that annual operational energy of most buildings,

21 City of Townsville, *Submission 161*, p. 34.

22 Plantation Pine Framing Alliance, *Submission 5*, p. 4.

23 Royal Australian Institute of Architects, *Submission 159*, p. 25.

and associated greenhouse emissions, currently far outweigh the total embodied energy amortized into an annual component over a life cycle of, say, forty years.²⁴

- 7.35 The committee notes that PVC for example, traditionally thought of as a non-green building material, has benefited from life cycle assessment. The Vinyl Council Australia cites a CSIRO study that reports that there is little conclusive evidence that PVC has significantly more effect on the environment than alternative materials and notes that:

Indeed, in respect of thermal efficiency, uPVC window profiles consistently rate five stars under the Australian Window Energy Rating Scheme, and this is in addition to low maintenance and long-term durability.²⁵

- 7.36 By encouraging life cycle assessment of materials, the Conservation Council of Western Australia believes the 'full impacts of products, including environmental and social, are factored into the cost'.²⁶ Similarly, Bayside City Council believes that:

The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. . .²⁷

Eco-labelling

- 7.37 Eco-labelling is becoming well known as greater emphasis is placed on the need for environmentally friendly products and services. There is considerable scope within the construction materials industry to further develop this concept.
- 7.38 Eco-labelling is an attempt to encourage the manufacturing of products with a reduced impact on the environment and to address public concerns about raw material scarcity and the impact of pollutants on the air and water. Eco-labelling also enables consumers to make an informed purchase choice.
- 7.39 Eco-labelling represents another combined measure of sustainability, initially used to endorse products. This has since evolved into methods for assessing entire buildings, such as the Building Council of Australia's Green Star building rating scheme.

24 Royal Australian Institute of Architects, *Submission 159*, p. 14.

25 Vinyl Council Australia, *Submission 24*, p. 1.

26 Conservation Council of Western Australia, *Submission 139*, p. 2.

27 Bayside City Council, *Submission 101*, p. 14.

- 7.40 The development and promotion of sustainable materials and their labelling against a credible rating system would benefit the built environment and represents a non-regulatory method of fostering consumer demand for cradle-to-cradle materials.²⁸
- 7.41 Accordingly, the committee endorses the following recommendation made by the House of Representatives Standing Committee on Environment and Heritage report *Employment in the Environment Sector: Methods, Measurements and Messages*:
- The Committee recommends that the Australian Government:
- Develop a national policy for the environmental labelling of consumer goods;
 - Ensure the establishment of a national environmental labelling program that is widely recognised, consistent and meaningful to both producers and consumers; and
 - Undertake a national campaign to raise awareness of environmental labelling.²⁹
- 7.42 The committee recommends that the Australian Government look to creating a 'sustainable building material' label that encompasses environmental sustainability in its construction and/or harvesting processes.

Recommendation 19

- 7.43 **The committee recommends that the Australian Government, in consultation with the Housing Industry of Australia, CSIRO and other industry and scientific bodies, investigate the establishment of a 'sustainable building material' labelling system.**

Green spaces

- 7.44 Appropriately designed housing with energy efficient landscaping would also result in reduced energy use for cooling and heating.³⁰

28 Association for the Advancement of Sustainable Materials in Construction, *Submission 190*, pp. 11-12.

29 House of Representatives Standing Committee on Environment and Heritage, *Employment in the Environment Sector: Methods, Measurements and Messages*, Parliament of the Commonwealth of Australia, Canberra, November 2003, p. 115.

30 Mordialloc Beaumaris Conservation League Inc, *Submission 77*, p. 5.

- 7.45 There is, however, a tension between the maintenance and size of green spaces. As Lend Lease explains in its submission, Australian natives would therefore be the preferred option, representing lower maintenance, improving 'biological conservation corridors' and being 'in keeping with the bushland setting that represents traditional Australian living'.³¹
- 7.46 The Shoalhaven City Council points out that green spaces, in addition to flora and fauna benefits, can provide recreation and social benefits as well, as long as the areas are well planned and incorporate an analysis of needs.³²
- 7.47 The inclusion of green spaces in developments is a matter for the developer, local and State governments and, ultimately, the Australian community. The committee urges these stakeholders to work towards creating more green spaces in newer development areas.
- 7.48 Christie Walk, a housing complex in Adelaide, and the 60L commercial building in Melbourne, are examples of different approaches to sustainable building that utilise 'green' building materials and incorporate green spaces in their design.

Case Study: 60L Green Building - a sustainable commercial refurbishment

The 60L office building in Carlton, Melbourne, was completed in September 2002. It was developed by the Green Building Partnership and is a prototype for Australia's sustainable commercial building sector.

In contrast with conventional buildings, the 60L Green Building has minimal environmental impact, and was built for a cost similar to that of a less-sustainable commercial building. Its design also guarantees significantly lower running and tenancy costs.

The project aimed to provide an environmentally healthy building for its occupants and also to raise awareness within the construction industry.

Accordingly, the project deliberately used mainstream architect and construction companies to demonstrate how achievable it is to design and refurbish a sustainable inner-city commercial building.

Economic returns

Construction and refurbishment costs of the sustainable 60L Green Building are comparable to standard construction and refurbishment costs. However, the 60L building delivers significant environmental benefits, comfort and health benefits to the building occupants and significantly reduced running costs. In comparison to a conventional office building, the 60L Green Building has:

31 Lend Lease, *Submission 71*, p. 15.

32 Shoalhaven City Council, *Submission 20*, p. 2.

- Expected energy savings of over 65 per cent;
- Reduction in lighting costs of over 80 per cent;
- Over 60 per cent reduction in equipment, ventilation, heating and cooling costs;
- Approximately 100 per cent reduction in annual carbon dioxide emissions; and
- 90 per cent savings in average annual mains water consumption.

While some commercial buildings incorporate particular energy efficiency features, 60L is unique in achieving high environmental standards and efficiency in all areas of construction and operation. It is also unique in providing a workplace largely free of toxic emissions from furniture and fittings.

Construction materials

- Approximately 80 per cent of the timber used in 60L is recycled. The remaining 20 per cent is from plantation timber;
- All bricks used have been recycled and cleaned without acid;
- Reinforcing steel is from recycled sources;
- Galvanised steel has been used in preference to stainless steel which requires higher levels of energy in its production process;
- PVC use has been reduced by 50 per cent and, wherever possible, low toxic materials have been used;
- The concrete used has a 60 per cent recycled component; and
- Carpets are made from recycled and low-toxic materials.

Energy consumption and generation

60L maximises the use of thermal mass for heating and cooling. The building's computerised environmental management system automatically adjusts internal and external louvres to retain even temperatures.

The building incorporates double-glazing, low energy glass, and north and west windows for winter sun. It utilises light shelves, light wells and an atrium to provide natural lighting, supplemented by high efficiency fluorescent lights when required.

60L has rooftop photovoltaic arrays for electricity generation. Any additional energy requirements are purchased through a green-power scheme. The use of embodied energy in construction materials has been off-set by purpose-specific tree planting in western Victoria.

Water management

60L uses 90 per cent less mains water than a similar conventional building. Rainwater is collected, micro-filtered and UV sterilised for use within the building.

Water-efficient showers are fitted in the building.

All waste water passes into an in-house biological sewage treatment plant after which it is used for toilet flushing, the rooftop and internal gardens. Excess water is discharged, as treated water, to the municipal sewage. The residual solid sewage waste is utilised on farms in western Victoria.

Alternative transport and green spaces

The workplace facilitates walking and cycling by incorporating a bicycle storage area, on-site showers and change rooms.

A rooftop garden has been designed to enhance the aesthetics of the inner city and provide an outdoor space for employees. The garden uses native plants and is watered using on-site treated waste water.

Case Study: Christie Walk – a sustainable housing development

Christie Walk is a community housing development on a 2000 square metre block of land in inner-city Adelaide. It is being developed as a pilot project, demonstrating how communities can provide sustainable inner city living through:

- Water and energy conservation;
- Material reuse and recycling; and
- Shared landscaped areas and community spaces.

Stages 1 and 2 of the project have been completed and stage 3 is under way. The project consists of 14 dwellings which include four linked, three-storey townhouses, a three storey block of six apartments, four stand-alone cottages and a 'community house'. The land is owned by the Wirranendi development co-operative during construction and individual properties are sold on a community title. A range of dwelling types are represented in the project, with differing configurations, orientations and construction systems to demonstrate the variations of environmental design to meet lifestyles choices and climatic conditions.

Purchasers own their own dwelling and also share ownership and responsibility for the landscaped community areas. These areas include a community garden, and a 'cohouse' (community house) with a kitchen, small general purpose hall and a laundry. To date, properties in the development have sold well.

Construction materials

Timbers are plantation or recycled. Floor decking is generally made from a

compressed straw product, which is equivalent to particle board, but contains no woodchips or formaldehyde. Paving, carports and feature elements incorporate bricks, stone, steel and timber retrieved from the demolition of pre-existing structures on the site.

All concrete in slabs and mass walls contains the maximum percentage of flyash permitted. Flyash is a waste product from power stations and its addition reduces the amount of new cement used in the construction (cement production is one of the largest single global contributors to greenhouse gas emissions).

All finishes, including paint and varnishes, are chosen on the basis of environmental and non-toxic criteria.

Energy generation and efficiency

Mains electricity is drawn from the grid, but photovoltaic panels generate electricity for sale to the local energy utility. On completion, it is expected that the site will be a net energy exporter for much of the year, as the design and efficiency of the dwellings means that energy requirements are minimal.

All dwellings have solar hot water and a shared system of banked solar panels. All new appliances have high energy efficiency ratings; companies with a recycling programme were favoured when specifying appliances.

Heating, cooling, lighting and insulation

Each house works as a 'thermal flue', allowing controlled release of warm air while drawing in filtered, cooled air from the vegetated, landscaped surroundings. Window placement and planned vegetation planting ensures that natural lighting is maximised. Most windows are double-glazed. Rooftop gardens provide a thermal buffer to the upper floor apartments.

The concrete slabs provide substantial internal mass, particularly to the cottages and apartments. External and internal walls are made from either an aerated concrete product or other materials which have high thermal and acoustic insulation properties. This places an additional thermal mass between the townhouses and also assists in noise reduction between dwellings.

The apartments use cross-ventilation and high thermal mass for cooling. Some ceiling fans are included to assist in maintaining air flow on still days. However, there are no heaters or air conditioners and the expectation is that none will be needed to supplement the passive heating and cooling of the houses.

Water management

All water shed by the roofs, balconies and other impervious surfaces is collected for use on site. After filtering, the water is used for irrigation and toilet flushing, reducing the total water importation to the site. An onsite chlorine-free sewage treatment system is being purchased. Composted solids will be taken to rural sites

as fertiliser and the filtered effluent returned to the second-class water supply through the on-site stormwater system.

Access and green spaces

The development is designed to take advantage of its inner-urban location and maximise access to a range of public transport services. There is no internal traffic within the development and there is limited provision for car parking.

Outdoor spaces encourage walking. Low water use plantings favour native species. Some exotics have been chosen where appropriate to suit passive design considerations.

Renovations and retrofitting

7.49 A number of organisations expressed support for retrofitting and renovation of residential and commercial buildings as one way to achieve more sustainable cities. The Royal Australian Institute of Architects refers to the 'adaptive reuse of existing building stock' as a 'primary strategy towards sustainable cities' for two main reasons:

First, to 'throw away' the existing buildings is to throw away much of the energy consumed in their making (embodied energy) and to generate more demand for more energy consumption and associated greenhouse gas emissions. Second, notwithstanding the possibility of increasing intensity of land use through demolition and redevelopment, existing buildings are often located where there is good local infrastructure, particularly transportation, and the re-use of this valuable serviced land through recycling of the existing building stock for new uses makes good energy sense in comparison to constructing new buildings on the city fringes. Because of the longevity of the building stock, opportunities to affect energy consumption occur more frequently in renovations and retrofits than in new construction.³³

33 Royal Australian Institute of Architects, *Submission 159*, p. 8.

- 7.50 The Centre for Sustainable Energy Systems explains that retrofitting is particularly important in Australia due to the low turn-over of buildings which limits ‘the rate at which greenhouse gas emissions from buildings can be reduced by building better buildings’:
- Mass retrofitting of energy saving devices and renewable energy equipment to houses, commercial buildings and industrial sites will be required to meet greenhouse targets.³⁴
- 7.51 The Western Australian Government, however, drew to the committee’s attention the fact that materials used for building a house in the first place will impact on the ability for retrofitting:
- . . . ‘standard practice’ does not lend itself to adaptable or modified retrofitting. Further, the materials are manufactured from non-renewable resources that require energy intensive production processes. Promoting (and where necessary developing) building materials and components that incorporate the principles of cleaner production and include recycled and/or recyclable materials and can be easily modified for redesign will address many aspects of resource depletion, energy use, and building adaptability.³⁵
- 7.52 The Australian Conservation Foundation and Environment Victoria also advocate that energy efficiency requirements extend to major renovations and that there should be rebates and incentives for retrofitting for improved energy efficiency.³⁶
- 7.53 The committee considers that there should be mandatory energy efficiency and greenhouse performance requirements before approval is given for major renovations. This would need to be implemented through State and Territory legislation.

Recommendation 20

- 7.54 **The committee recommends that the Australian Government encourage the States and Territories to put in place a regime whereby approval for major residential and commercial renovations is conditional upon meeting energy efficiency and greenhouse performance requirements.**

34 Centre for Sustainable Energy Systems, Australian National University, *Submission 5*, p. 2.

35 Western Australian Government, *Submission 173*, attachment 1, p. 19, and attachment 3, p. 4.

36 Australian Conservation Foundation and Environment Victoria, *Submission 162*, p. 11.

Regulation and awareness

- 7.55 The committee notes that:
- . . . the building industry has worked constructively with regulators to introduce energy efficiency requirements into the Building Code of Australia . . .³⁷
- 7.56 The Electricity Supply Association of Australia also identifies standards and regulation as an area of great opportunity to create sustainable building practices, including 'aspects such as thermal mass, orientation and fenestration, as well as setting standards for lighting, heating, cooling and ventilation'.³⁸
- 7.57 Introducing energy standards and making developers, architects and builders more aware of the benchmarks would help the drive toward sustainability. It would also improve profitability: the Centre for Photovoltaic Engineering advocates fast-tracking of the introduction of uniform and mandatory energy standards for both new buildings and major retrofits, advising that:
- Renewable energy options from passive solar design through to solar water heaters and photovoltaic (PV) systems can readily be included. Such an approach will immediately alert developers to the cost effectiveness of correct building orientation and preservation of solar access. This in itself is the crucial first step in facilitating the use, either at construction or later on, of solar technologies.³⁹
- 7.58 Lend Lease argues that education is the best way to increase building sustainability, but commented that financial and statutory influences offer the best opportunity for progressing building sustainability.⁴⁰
- 7.59 In some instances, the regulatory relationship between developers and building owners and building occupants and energy providers can be a barrier to sustainable building. Further, legislation is often inconsistent between States.⁴¹

37 Planning Institute of Australia, *Submission 168*, p. 33.

38 Electricity Supply Association of Australia, *Submission 13*, p. 3.

39 Centre for Voltaic Engineering, *Submission 84*, p. 2.

40 Lend Lease, *Submission 71*, p. 11.

41 Lend Lease, *Submission 71*, p. 19.

7.60 The National Trust of Australia (New South Wales) explained how making developers aware of the advantages of reusing and recycling material can benefit both Australian heritage and the developer's bottom line:

Despite the developer preference for starting afresh rather than adaptation there have been notable examples where the sensitive conservation, reuse and adaptation of existing building fabric has resulted in cost savings and higher property resale values. There are demonstrable financial benefits in adopting this approach.⁴²

7.61 The committee believes that a campaign to make builders more aware of the economic and environmental benefits of sustainable building practices, including reusing and recycling building materials, is a better alternative to any regulatory intervention in this area.

Recommendation 21

7.62 **The committee recommends that the Department of the Environment and Heritage and the Australian Building Codes Board work with industry groups to raise awareness among builders, architects and developers of the economic and environmental benefits of sustainable building practices, including reusing and recycling building materials.**

Ratings tools, planning and materials technologies

7.63 There are currently a range of planning and building sustainability rating tools in operation in different States and Territories. What is lacking is a nationally accepted and implemented building rating tool.

7.64 Integrating Sustainability argues that Australian Standards, Building Standards and council regulations are conservative. They:

... don't encourage innovation and often result in buildings and development infrastructure that are often over-designed, resulting in poor sustainable outcomes. While there has been a move towards performance based standards, this process needs to be accelerated.⁴³

42 National Trust of Australia (New South Wales), *Submission 50*, p. 1.

43 Integrating Sustainability, *Submission 27*, p. 18.

BASIX

- 7.65 The NSW Government has developed a comprehensive planning tool, the Building Sustainability Index (BASIX), to standardise good development practices across NSW and help streamline the planning process.
- 7.66 It is a web-based planning tool, designed to assess the potential performance of new homes against a range of sustainability indices: landscape, stormwater, water, thermal comfort and energy. BASIX aims to reduce the environmental impact of developments and to produce homes that are more comfortable and cheaper to run than most existing homes.
- 7.67 BASIX sets energy and water reduction targets for new homes and apartments. The energy target is 25 per cent across the State, and will increase to 40 per cent in July 2006. A typical single dwelling design will meet the minimum 25 per cent target if it includes:
- an efficient hot water system; and
 - design features that make the most of natural heating, cooling, and lighting.
- 7.68 The water target ranges from 40 per cent to 0 per cent across NSW, taking into account the significant variances in the climate:
- 90 per cent of new residential development will be covered by the 40 per cent water target.
 - No new home built in NSW will use more water than the current State average.
 - The area covered by the 40 per cent target represents 98 per cent of the State's population growth.
- 7.69 The first stage of BASIX focuses on reducing water and energy use. BASIX has set targets for these indices which all new developments must meet. Landscape, stormwater and thermal comfort indices are also activated because information relating to these indices impacts on water consumption and greenhouse gas emissions.
- 7.70 The BASIX online assessment requires information about the proposed development, such as site location, dwelling size, floor area, landscaped area and services. BASIX compares the proposal to average existing homes. The proposal is scored according to its potential to consume less mains supply water and energy than an average existing home.⁴⁴

44 For further information on BASIX, see www.basix.nsw.gov.au/information/about.jsp

National Australian Built Environment Rating System

- 7.71 The National Australian Built Environment Rating System (NABERS) is a unique rating system that will focus on the environmental impacts of existing commercial office buildings and residential homes, rather than the intentions of the building design. It evaluates key environmental criteria including energy use and greenhouse emissions, water use, storm water runoff and pollution, sewage and waste, landscape diversity, indoor air quality, transport and occupant satisfaction.
- 7.72 The rating system is a flexible, user-friendly system that can be adapted to suit the needs of different building types, including homes, apartments and commercial offices.
- 7.73 NABERS is a voluntary system that will enable building owners, users and tenants to rate the environmental performance of existing buildings and increase their awareness of the importance of sustainability in the built environment.
- 7.74 Implementation of NABERS will encourage better informed choices and greater investments in buildings that have a low environmental impact, while providing accompanying financial savings, improved comfort and health benefits. NABERS has been developed by the Australian Government and is currently the subject of public consultation.⁴⁵

Nationwide House Energy Rating Scheme

- 7.75 The Nationwide House Energy Rating Scheme (NatHERS) is a CSIRO developed programme. It is based on the allocation of star ratings to houses according to how well they are designed to minimise the need for energy use to maintain comfort (such as whitegoods are currently star rated and labelled).
- 7.76 The proposed building's size, orientation and construction materials used are entered into the programme. This building description with the postcode of the building site, to determine climate, is used to work out a zero to five star rating, where four or five star signifies a thermally comfortable house that minimizes heating and cooling needs.

45 Department of Environment and Heritage, see www.deh.gov.au/industry/construction/nabers/index.html

7.77 Mr Steve King, however, advised the committee that one of the unintended consequences of the way NatHERS rates houses was that it encouraged large houses:

It has been known since the day after it was introduced that one of its effects was: the bigger the house, the less critical it was for it to perform well. That is because big houses have small surface-to-volume ratios and therefore they achieve the ratings easily, because the ratings were originally designed to deal with an equity issue, which is: do not penalise people who need big houses. So the indicator became rate of energy use per square metre, instead of rate of energy use all up.⁴⁶

Green Star rating tools

7.78 The Green Building Council of Australia aims to define and develop a sustainable property industry in Australia and to drive the adoption of green building practices through market-based solutions.

7.79 The Council has developed the Green Star set of rating tools and also promotes economic incentives, government initiatives and programmes, new technologies and industry knowledge.

7.80 Each Green Star rating tool is based on a standard framework. Green Star establishes a number of categories under which specific key criteria are grouped and assessed. These categories include management, indoor environment quality, energy, transport, water, materials, emissions, and land use, site selection and ecology.

7.81 The focus for the Green Star rating tool development has been commercial office buildings. To date, rating tools have been developed for the design and the construction of commercial office buildings. A pilot rating tool for interiors is being finalised.

7.82 Green Star will also have rating tools for different phases of the building life cycle (e.g. design, construction and operation) and for different building classes (office, retail, industrial, residential etc). These rating tools will use the best regulatory standards to encourage the property industry to improve the environmental performance of development.

46 Mr Steve King, Centre for a Sustainable Built Environment, *Transcript of Evidence*, 8 June 2004, p. 33.

- 7.83 The City of Melbourne recommends that the Green Star rating system be expanded to residential and other building types.⁴⁷ There is some anecdotal evidence to suggest that developers would find it useful if there were a single standard of building rating system such as Green Star.⁴⁸
- 7.84 In evidence to the committee, Mr Ric Brazzale was encouraged by the States' individual initiatives, but emphasised that:
- ... we must make sure that the rating tools that we use to measure and assess performance are all consistent and can be applied across states.⁴⁹
- 7.85 The committee is of the view that the Australian Building Codes Board should evaluate the various ratings tools and develop a nationally consistent tool that takes into account the range of the environmental and sustainability factors dealt with by existing codes.

Recommendation 22

- 7.86 **The committee recommends that the Australian Building Codes Board develop a nationally consistent building ratings tool that takes into account the range of environmental and sustainability factors dealt with by existing codes.**

Incentives for sustainable building

Taxation

- 7.87 The committee was advised that the Australian Government could provide a range of taxation incentives to encourage sustainable building practices. The South East Queensland Regional Organisation of Councils believes that 'Australia has dumb taxes that encourage unsustainable patterns of consumption' and advocates the introduction of 'smart' taxes to encourage more efficient urban development, such as increased densities around transport nodes and disincentives for sprawl.⁵⁰

47 City of Melbourne, *Submission 109*, p. 16.

48 City of Melbourne, *Submission 109*, p. 8.

49 Mr Ric Brazzale, Australian Business Council for Sustainable Energy, *Transcript of Evidence*, 16 March 2004, p. 49.

50 South East Queensland Regional Organisation of Councils, *Submission 60*, p. 5.

- 7.88 Delfin Lend Lease suggests that research and development incentives be provided via the taxation system to promote sustainable residential building.⁵¹
- 7.89 The committee notes this proposal. However, it considers that at this time there may be more cost effective and less administratively complex means to provide incentives.

Green and location efficient mortgages

- 7.90 Origin Energy explained to the committee that the public largely ignores the savings available due to eco-efficiency; consumers consider the up-front cost of a home rather than its whole of life cost. There are, however, banks that are willing to factor in this variable in their mortgage lending, and offer lower mortgage rates for eco-homes, recognising that 'lower energy bills mean that homeowners are more able to pay off their mortgage and therefore represent a lower risk'.⁵²
- 7.91 The Southern Sydney Regional Organisation of Councils also supports such financial products, and points out that some institutions also encourage environmentally friendly retrofitting, which may lower the lender's financial risk due to reduced operating costs.⁵³
- 7.92 The committee also heard evidence of 'location efficient' mortgages that operate in the United States, where people may borrow more and can locate somewhere where a car may not be necessary, thus lowering their transport costs and thereby increasing their disposable income available for loan service.⁵⁴ A location efficient mortgage:

... gives lower income people the opportunity to get a mortgage which might not otherwise be available to them on the basis that they live in an area with good public transport and make a commitment to only having one car in that household. Their rationale is that the high cost of buying and maintaining a car offsets their lack of income under a normal mortgage process, so it is actually rewarding people for choosing public transport and recognising that they are more able to pay their mortgage.⁵⁵

51 Delfin Lend Lease, *Submission 66*, p. 11; see also Lend Lease, *Submission 71*, p. 11.

52 Origin Energy, *Submission 143*, p. 9.

53 Southern Sydney Regional Organisation of Councils, *Submission 150*, pp. 12-13

54 Mr David Wake, Conservation Council of Western Australia, *Transcript of Evidence*, 31 March 2005, p. 33.

55 Ms Nicole Hodgson, WA Collaboration, *Transcript of Evidence*, 31 March 2005, p. 58.

- 7.93 The committee strongly urges all financial institutions to offer their customers 'green' and 'location efficient' mortgages and to consider residential and commercial building sustainability ratings and building operating costs in their assessments.

First Home Owner grant

- 7.94 Mention was made earlier in this report of the possibly unintended negative effects of the First Home Owner grant on urban sustainability.
- 7.95 The Australian Government introduced the First Home Owner grant in 2001 to offset the impact of the introduction of the goods and services tax (GST).
- 7.96 The broad principles of the grant include a one-off payment to eligible applicants; that it must be the principal place of residence; and that the grant is not means tested. Some changes have been made to the grant since 2001.
- 7.97 According to the City of Port Phillip, such schemes contribute to housing price inflation, which in fact reduces home ownership affordability, and the grant should actually target lower income households.⁵⁶
- 7.98 The City of Newcastle argued that the First Home Owner grant scheme encourages urban fringe development and affects the environmental sustainability of the homes built and that:
- The concentration of populations at the urban fringe creates community isolation, increased car dependency and the growth of residential populations without basic support services, facilities or transport.
- This form of fringe development also results in significant impacts on the environment, as the ability of new development to meet the principles of Environmental Sustainable Development (ESD) is limited.⁵⁷
- 7.99 It was suggested to the committee that the First Home Owner grant should be scrapped altogether.⁵⁸ The committee does not agree. It sees potential for the scheme to be modified to provide incentives for sustainable building construction.

56 City of Port Phillip, *Submission 40*, p. 21.

57 City of Newcastle, *Submission 147*, pp. 3-4.

58 Mr Marcus Spiller, Planning Institute of Australia, *Transcript of Evidence*, 29 April 2005, p. 50.

- 7.100 The committee believes that, as an incentive for sustainable building practices, the Australian Government should increase the grant to \$10,000 for those homes that meet specified sustainability criteria. The committee also adds that, in order to make a significant impact, the criteria used be stringent, though within the abilities of an HIA accredited builder.
- 7.101 The committee considers that those States and Territories that do not have a 5 star rating system should implement one as a priority.

Recommendation 23

- 7.102 **The committee recommends that the Australian Government increase the First Home Owner grant to \$10,000 for those homes that meet a high standard of specified sustainability criteria and that these criteria be:**
- **stringent; and**
 - **within the abilities of an HIA accredited builder.**

Recommendation 24

- 7.103 **The committee recommends that those States and Territories that do not have a 5 star rating system implement one as a priority.**

Virtual building technology: life cycle analysis of design

- 7.104 Life cycle analysis (LCA) of design enables building design professionals to make informed decisions on the environmental impact of commercial buildings, by providing detailed environmental and cost measures for different materials, products and designs, automatically from their 3D computer-aided design drawings. It aims to meet a growing need from designers and regulators for real-time appraisal of design performance of built assets against an emerging set of sustainability criteria.
- 7.105 Benefits of LCA Design include:
- Automated environmental assessment direct from 3D computer-aided design drawings;
 - Choice of environmental impact and performance measures;
 - Detailed design evaluation;

- Comparative ratings of environmental impacts of alternatives at all levels of design analysis; and
 - Comprehensive graphical and tabular outputs.
- 7.106 LCA Design has been specifically designed to:
- Drive innovative and eco-efficient building design through an automated environmental impact assessment design tool for building design professionals;
 - Audit and assess current and future building codes and standards;
 - Harmonise with simpler checklist and other environmental rating tools; and
 - Provide a method for environmentally conscious design which aligns with the International Standards Organisation framework for assessment of building environmental performance.⁵⁹
- 7.107 According to the CSIRO:
- Life-Cycle Analysis (LCA) Design and Energy Express software can automate the process of green design direct from 3D computer aided design (CAD) models. This can be augmented by checklist systems such as Green Star and NABERS for auditing performance of *existing stock* (approximately 98% of total buildings).⁶⁰
- 7.108 Dr David Ness points out that life cycle thinking will enable designers of new buildings to:
- ... design for adaptability and re-use so that, after one life, a building component or entire building may be adapted or converted easily to a new use. Adopting the industrial ecology concepts being implemented in the product field, buildings and their components can be designed for disassembly or deconstruction.⁶¹
- 7.109 The committee sees this as a useful tool to further sustainable building design in the future. The committee encourages builders, designers and architects to make full use of this technology.

59 See www.cmit.csiro.au/brochures/tech/lcadesign

60 CSIRO, *Submission 91*, p. 8.

61 Dr David Ness, *Submission 25*, p. 2.

Australian Government leadership

- 7.110 Australian Government agencies are required to refer proposals for new capitals works or major refurbishments valued in excess of \$6 million to the Joint Standing Committee on Public Works.
- 7.111 The Joint Standing Committee on Public Works refers proposals to the Australian Greenhouse Office for advice on the proposal's compliance with Government policy on improving energy efficiency in its own operations.
- 7.112 Dr David Ness suggested arrangements for improving the sustainability of Government leasing arrangements; for instance, the Government leasing solar panels that would be maintained and replaced as appropriate by a solar panel manufacturing company.⁶²
- 7.113 The committee considers that all Australian Government departments and agencies that own property should take appropriate measures to improve the sustainability of these buildings. There is also scope for agencies to improve the efficiency and sustainability of tenanted buildings. Agencies that rent property should consider building efficiency, including grey water re-use, when seeking tenancy agreements.

Recommendation 25

- 7.114 **The committee recommends that Australian Government departments and agencies that own property take steps to improve the sustainability of those buildings, at least to the 5 star rating, and that departments and agencies that rent property consider measures to improve building efficiency when seeking tenancy agreements.**

62 Dr David Ness, *Transcript of Evidence*, 29 April 2004, p. 60.