Design for dementia: Sustainability and human wellbeing

Roger Fay¹, Richard Fleming² and Andrew Robinson³

¹University of Tasmania, Launceston, Australia
²University of Wollongong, Australia
³University of Tasmania, Hobart, Australia

ABSTRACT: The key internationally utilised building environmental rating tools, such as Green Star (Australia), BREEAM (UK), LEED (US) and CASBEE (Japan), are scientific in their epistemological underpinnings. Buildings are rated on the basis of their anticipated energy consumption and consequent carbon emissions, water consumption, indoor environmental quality and so on. Generally, these are based on theoretical, modelled estimates, compliance with standards or use of best practice in the case of tools used at the design stage or in some cases, actual performance data for buildings having at least a year of operational use.

Given that these building rating tools have been developed to address the scientific evidence that human activity, including the construction but especially the operation of buildings, contributes significantly to global warming, resource depletion and pollution, it is understandable, therefore, that the tools have focused primarily on energy, pollution and water reduction. Applied research has been the focus of industry and academic research that supported the development of these rating tools.

There are certain building types, those for which human wellbeing is central, for which the scientifically based rating tools appear inadequate. Perhaps the assumption is that designers take human wellbeing as a given though in many cases the evidence for this is not clear. This paper, argues through an examination of buildings designed for the care of people with dementia, that the lessons learned from the design of these buildings and the rating tools developed to assist in their design are transferable to all buildings occupied by sentient beings. Current research indicates that quantitative and qualitative indicators that go beyond the current building rating tools are relevant to the design of buildings for wellbeing.

Keywords: housing, sustainability, dementia, wellbeing

INTRODUCTION

Dementia is a terminal illness, generally affecting the elderly. Currently there is no cure though there is a great deal of research being undertaken by neuroscientists and other medical researchers. The affects of dementia include loss of short-term memory, other cognitive impairments, depression and impacts on the quality of life. According to the AIHW (2004), “Dementia describes a syndrome associated with a range of diseases which are characterised by the progressive impairment of brain functions, including language, memory, perception, personality and cognitive skills”. Of the people in residential aged care homes, approximately 50% possibly or 31% probably had dementia (AIHW 2004).

People with dementia, depending on the stage and severity of the illness, do not perceive their surroundings in the same way as people without cognitive and physical impairments. Evidence is growing of the potential for the built and natural environment to improve their quality of life and general wellbeing. Well-designed environments will also provide a better work setting for nursing and caring staff as well as for families and friends visiting the care homes.

With the recognition of the need for well-designed physical settings comes the internationally accepted need to make buildings more sustainable. That is, buildings should consume less energy and contribute less carbon to the biosphere, less water, fewer resources, and emit few pollutants to air, water and land. Currently, there are a number of tools used by architects to design increasingly ‘green’ buildings and for buildings that cater for people with dementia, tools that outline evidence-based principles known, to varying degrees of reliability, to improve outcomes for residents.

This paper compares building environmental rating tools that aim to lead to more sustainable buildings with an environmental audit tool designed specifically for dementia-specific care homes. Through a discussion centred on a number of existing care homes, the paper argues for a critical area neglected by these two approaches to be given greater attention. This is such a key role of architecture that there may be an assumption that architects will address as a matter of course. The evidence that this occurs is patchy to say the least. Given the rapidly growing number of
people with dementia, many of whom will live in care homes towards the end of their life, the need to spend wisely and well will become increasingly more pressing for government, agencies, families and especially the residents of the care homes.

1. DEMENTIA: A GROWING ISSUE

1.1. The Asia Pacific Region
The fifteen members of the Asia Pacific Region include Australia, China, Japan, India, Indonesia and Malaysia. In 2005 the population of the region was estimated to be 3.58 billion people. The statistic of concern is that the number of people in the region with dementia is expected to grow from 13.7 million in 2005 to 64.6 million in 2050 (Access Economics 2006). The Access Economics report notes that the ‘dementia epidemic’ is a certainty and that it will have a devastating impact on public health systems, particularly as dementia is “among the most disabling of all chronic diseases”. The cost (2003 US$), according to the report, has been estimated to be $60.4 billion with 70% of those costs spent by the advanced economies having 18% of the dementia population.

1.2. England
Of England’s 50 million population, 16% are older than 65. The English National Health Scheme costs £100b/year. Currently, 700,000 people have dementia and within 30 years this is expected to reach 1.4 million. The current expenditure of £17 billion is expected to be £51 billion in 30 years. The National Audit Office report noted that doing nothing should not be an option (Banjeree 2010).

1.3. Australia
It is estimated that in 2009 245,000 people in Australia have dementia and that this will increase to 1.13 million by 2050 (Access Economics 2009). Many more may have cognitive impairment according to the report. The incidence of new dementia cases in 2009 was 69,600 but the report expects it to grow to 385,000 by 2050. For people over 65, dementia is the leading single cause of disability in Australia and by the 2060s it is anticipated that it will consume approximately 11% of the entire health and residential aged care sector spending (Access Economics 2009).

1.4. Implications
The care of people with dementia over the coming decades will represent a considerable challenge for governments around the world. Private and government investment in buildings, technology and health care provisions will have to grow to match demand. Discussions currently taking place suggest that new models of healthcare will develop over the coming decades in response to budgetary issues and the pressure for higher quality accommodation and services that will be applied by the “baby boomer” generation coming into retirement now (Gale 2010). Gale argues that the ‘patient’ of 2040 will be empowered and will want to be a respected and equal partner in their own care and will seek a welcoming engaging environment and expect more convenience and personal comfort. However, given the large costs of providing for the ageing “boomers”, cost reducing strategies that allow people with dementia to stay at home for longer may lead to care homes providing end of life care in that sense may need to be more hospice-like than the home-like model. It is in this context and the increasingly stringent regulatory environment regarding the effective environmental design of buildings that the design of new care homes should be placed.

The next section addresses the tools used to design environmentally effective buildings – that is, those that do less harm to people and the biosphere than the previous generation of buildings.

2. BUILDING ENVIRONMENTAL RATING TOOLS

2.1. Environmental rating tools overview
The most well-known and widely accepted tools are BREEAM (UK and LEED (US). Given the similarity of these tools to those developed in Australia, the Australian tool Green Star is the only tool discussed in any detail. Systems such as CASBEE (Japan) and others are not discussed, as they are not relevant to Australian conditions. Similarly, Triple Bottom Line (TBL) evaluations, in which environmental, social and economic criteria are assessed, are not discussed here in detail. However, in brief, Kimmet (undated), describes the social aspects of TBL in relation to, inter alia, OH&S, training, provision of facilities, transport, green space, insurance, disclosure and accountability, human rights, recognition of past history and cultural values.

2.2. Green Star (Australia)
Green Star was developed by the Green Building Council Australia (GBCA 2010a) and tools have been developed for a number of building types including office, industrial, multi-unit residential, education, industrial and healthcare. The Healthcare Tool was released in June 2009. It aims to “minimise the environmental impact of their buildings; improve patient health outcomes and staff productivity; receive recognition for green leadership and achieve real cost savings” (Green Building Council Australia 2010b). Green Star is “a comprehensive, national, voluntary environmental rating system that evaluates the environmental design and construction of buildings…” (GBCA 2010c). The development of the suite of tools was based on two existing tools: BREEAM (Building Research Establishment Environmental Assessment Method in the UK and LEED (Leadership in Energy and Environmental Design) in the US.

The recently developed Green Star Healthcare Tool was designed for hospitals, medical centres, ambulatory clinics and aged care facilities. Gaining a 4 Star Certified Rating indicates the building indicates “Best Practice”, 5 Star indicates “Australian Excellence” and 6 Star indicates “World Leadership”. The key assessment categories within the Healthcare Tool are: Management, Indoor Environmental Quality, Energy and greenhouse gas emissions, Transport...

44th Annual Conference of the Architectural Science Association, ANZAScA 2010, Unitec Institute of Technology

---

**References**


A review of each of the credits available within each of the categories listed above indicates that points are awarded for measures that can be measured, simulated or compiled with (standards and codes), thereby satisfying or not Green Star requirements. Since the tool has too many credits to address comprehensively, a representative sample is provided to illustrate the approach taken by Green Star (and other similar tools).

Management: this category addresses mostly process issues such as the use of an accredited Green Star professional, commissioning the building to ensure building services work as designed, preparation of building guides so users understand how to get the best out of the building, the incorporation of a building management system, building maintenance, planning for construction indoor air quality and having a sustainable equipment procurement guide to ensure low energy and water use.

Indoor Environmental Quality (IEQ): this category addresses ventilation rates, air change effectiveness, air quality (measured by CO2, VOC, formaldehyde levels and mould), daylight and glare control, thermal comfort and user control, hazardous materials, internal noise levels, electric lighting, external views, outdoor pollutant control and places of respite (allowing connection to external environment). Of all the categories, IEQ pays the most attention to human wellbeing by requiring good standards of air quality, natural and artificial lighting, thermal comfort and connection to the external environment (by means of views from interior spaces or the provision of places of respite).

Energy and greenhouse gas emissions: all credits in this category relate to energy and greenhouse gas emission reductions.

Transport and greenhouse gas emissions: this category seeks to reduce transport related greenhouse gas emissions by limiting the availability of car parking and encouraging fuel-efficient transport, the use of mass public transport and cycling.

Water including potable water: this category encourages the efficient use of water through benchmarking, metering, landscape irrigation and fire and heat rejection systems design.

Materials: this category encourages designs that use less material than conventional designs, that allow for re-use through disassembly and that use environmentally acceptable materials for flooring, joinery, loose furniture, ceilings, walls and partition.

Land Use and Ecology: this category encourages the use of land of limited ecological value and discourages the use of ecologically valuable land. This includes the reuse of land formerly developed, the reclamation of contaminated land and causing minimum damage to the ecology of the site when developing it by protecting topsoil.

Emissions and sewage: this encourages the use of refrigerants and insulation materials that have minimum ozone depletion potential and minimum global warming potential, discourages refrigerant leaks, stormwater polluting watercourses, discharges to the municipal sewerage systems, light pollution (to night sky) and eliminates the risk of Legionella.

Innovation: this final category encourages the use of innovative technologies or processes, projects that exceed Green Star benchmarks or that have environmental design initiatives that are not within current Green Star requirements.

The examples discussed highlight the numeric, scientific or quasi-scientific approach taken by the GBCA Healthcare Tool and others in the suite of tools available. As the GBCA says of the tools: they aim to evaluate the environmental design and construction of buildings, so the emphasis is on environment is paramount and legitimate. Nevertheless, claims are made by the GBCA, as noted above, that the Healthcare Tool aims to improve patient health outcomes and staff productivity. From the brief review above, patient health and staff productivity are addressed within Green Star through the provision of an internal environment that has good air quality, lighting, acoustic environment and thermal comfort together with the provision of access to natural light, views to the external environment and places of respite. Less directly related is the credit rewarding the uptake of cycling as a means of reducing greenhouse gas emissions while also improving commuter health (more likely for staff than patients).

Other tools have been developed specifically to improve the design of buildings catering to the needs of people with dementia. These tools, developed from evidence-based research are not intended to provide an assessment of a building’s environmental impact – the word ‘environment’ here has a different meaning.

3. DEMENTIA ENVIRONMENTAL AUDIT TOOLS

3.1. Environmental Audit Tools

Several audit tools designed for dementia specific facilities have been developed. The three well-known tools are: the Scottish ‘Design for People with Dementia Audit Tool’ (DPDAT), the US ‘Therapeutic Environmental Screening Survey’ (TESS-NH) and the Australian ‘Environmental Audit Tool’ (EAT). In a rigorous analysis, Fleming and Forbes (2010) compare EAT and Tess and conclude that TESS-NH was developed in the early 1990s and therefore has an institutional orientation while the more recently developed EAT reflects changes that have occurred, particularly the
focus now on smaller scale and a domestic philosophy of care that has developed in Australia, informed by recent literature. The Scottish DPDAT and the Australian EAT bear many similarities because of the cooperation between the key researchers in both countries. The discussion below therefore focuses attention on the Australian Environmental Audit Tool.

### 3.2. The Environmental Audit Tool (Australia)

The Environmental Audit Tool (EAT) was developed by Fleming and Forbes (c. 2008) for the purpose of auditing existing care homes against a set of principles known to improve the wellbeing of people with dementia. The tool can also be used as a design aid when developing new care homes. These principles are based on a literature survey conducted by Fleming et al in 2008.

These principles, according to Fleming (2008), providing an environment that is to be used to provide care aimed at maintaining the abilities of people with dementia, should:

1. Be safe and secure
2. Be small
3. Be simple and have good ‘visual access’
4. Reduce unwanted stimulation
5. Highlight important stimuli
6. Provide for planned wandering
7. Be familiar
8. Provide opportunities for privacy and community
9. Provide links to the community
10. Be domestic.

Following these principles is an 8-page survey that is conducted by an assessor. There are a series of questions with boxes that are ticked ‘yes’ or ‘no’ or values that are to be circled and on that basis the building scores points that are finally totalled. These questions are now discussed.

#### Table 1: Issues addressed by the Environmental Audit Tool (EAT) survey

<table>
<thead>
<tr>
<th>Issues</th>
<th>Method of assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Safety</td>
<td>Questions address resident safety in relation to the garden, the front and back door to the unit, windows, the kitchen (lockable knife drawer, type of cooker, appliances, switches, risk of scalding from hot water, slipping on wet floors, weight of pots and pans), supervision by staff of living areas and adequacy of lighting.</td>
</tr>
<tr>
<td>2 Size</td>
<td>Units with less than 10 people score the most while those with 30 or more score zero.</td>
</tr>
<tr>
<td>3 Visual access features</td>
<td>Details what can or cannot be seen and from where. Examples: Can the resident see the lounge and dining room from their bedroom? Can they see their own bedroom from the lounge room? Can the exit to the garden be seen from the lounge room? Can the kitchen and toilet be seen into from the lounge and dining rooms? The greater the visibility, the better.</td>
</tr>
<tr>
<td>4 Stimulus reduction features</td>
<td>Aims to reduce stress. These stimuli include doorbells, public address systems, noise, doors to potentially dangerous areas, deliveries through areas occupied by residents, service entries and wardrobes with too many clothing choices.</td>
</tr>
<tr>
<td>5 Highlighting useful stimuli</td>
<td>Addresses signage that assists residents locate the dining and lounge rooms, their own bedroom, toilets, bathrooms and kitchen (where residents are allowed access), and the quality (glare-free) and quantity of natural and artificial light.</td>
</tr>
<tr>
<td>6 Provision for wandering and access to outside area</td>
<td>Encourages safe but interesting opportunities for residents to walk and have opportunities to participate in activities, go the toilet if required and be seen by staff.</td>
</tr>
<tr>
<td>7 Familiarity</td>
<td>Familiarity in particular when residents were 30 years old. This includes colours familiar to the residents, taps, light switches, doorknobs, furniture in lounge, dining and...</td>
</tr>
</tbody>
</table>
8 Privacy & community
Points are given for providing small areas or nooks where residents can meet in small groups, where these areas have interesting views, where they can participate in small group activities of 4-6 without rearranging furniture in lounge areas, and where they can eat in groups of 2-4 or alone.

9 Community links
Points are given if families of residents can share a meal with them in an area separate from the dining room and that this area encourages families to feel comfortable visiting and participating in the care of the resident.

10 Domestic activity
Points are given for providing opportunities for residents to participate, if they choose, to assist with the preparation of meals and snacks, doing their own laundry, cleaning their own bedroom, having easy and ready access to lounge and dining rooms and the opportunity to work in the garden.

While the Environmental Audit Tool addresses issues different to that of the Green Star Healthcare building rating tool, the two tools aim to support the design of high quality buildings leading to improved quality of life for inhabitants and in the case of Green Star, improved environmental outcomes. Both do this by using measures that can be agreed by different assessors. Relationships in the case of EAT are evident or not. Measures in the case of Green Star are complied with or not. There is scope for interpretation in each but the aim is to reduce uncertainty to a minimum or risk having the tools declared unreliable and the results inconsistent and non-repeatable. That is the strength of these tools but it may also be their Achilles heel. This will be explored later in this paper. First it is necessary to have a sense of what the research literature has to say about the relationship between the built environment and the wellbeing of people with dementia.

4. DESIGN FOR DEMENTIA

4.1. Research evidence from scientific and medical literature
The most extensive and recent literature review from the scientific and medical literature (Fleming, Crooke, Sum 2008) supported and extended the findings of a previous review in 2001 by Professor Mary Marshall from Stirling University. The 2008 review identified 148 relevant articles and on the strength of their methodology narrowed them down to 57. The researchers conclude that there is strong empirical evidence to support the principles on which EAT is based.

4.2. Architecture and landscape architecture literature
A number of architecture reference books have been written (inter alia, Brawley 1997, 2006, Regnier 2002, Anderzohn et al 2007, Fedderson et al 2009) about designing buildings and gardens for people with dementia. They draw on research evidence including anecdotal or experiential evidence, and perhaps through observation and evaluation of existing care homes. Most include case studies that are used to exemplify, to varying degrees, the principles or ideas developed in the preceding essays or sections. Under the title ‘Best Practice in Design for People with Dementia’ the Dementia Services Development Centre at the University of Stirling has a series of books on interior design, lighting and gardens, developed on the basis of their research. There is also a landscape literature in relation to design for dementia (inter alia, Chalfont 2008, Berentsen et al 2008, Rodiek et al 2007, Marcus and Barnes 1999). The authors of the references on architecture and landscape architecture come from both academic and practice disciplines.

Taken together, the architectural and landscape architecture literature provides a rich source of built examples, principles and processes and a diversity of perspectives based on evidence from both research and experience. Many provide an architect’s perspective on, for example, safety and security (Fedderson and Lüdtke 2009) – one of the principles derived from Fleming and others from the scientific/medical literature. In this way, the literatures from the various disciplines are mutually reinforcing in many instances. However, the design literature adds a depth of understanding associated with design opportunities that cannot appear in the scientific literature.

Much of this design literature does not address design for dementia and design for sustainability. Brawley (2006) devotes less than four pages to this subject and her approach is similar to that of building environmental rating tools – that is, scientific or quasi-scientific. An exception, written by Guenther and Vittoria (2008) specifically addresses sustainable healthcare architecture, though not dementia aged care homes specifically. Of particular interest is the span of sustainability issues addressed, ranging from the environmental with a science orientation (biosphere health and human health) to environmental with a spiritual orientation. However, disciplines other than science, medicine and design, are addressing issues of relevance to the design of care homes for people with dementia that may be more profound.

4.3. Research from other areas
The literature discussed earlier supports the idea of small scale, domestic environments. The terms ‘home’ and ‘homelike’ are used frequently. The literature from other disciplines (philosophy, environmental psychology, sociology, geography, for example) puts a critical lens to the idea of ‘home’ and equally important ‘place’. This is a
subject for further investigation in relation to designing for dementia. However, some observations may serve to highlight the potential deficiencies of the ‘home’ and ‘homelike’ principles.

Through observation of existing care homes in Australia and Europe, there are several aspects of the physical design that are rarely seen in homes and these include, inter alia, large lobbies, nurses stations, wide corridors, hospital-like bathrooms, very large dining and living spaces, large numbers of bedrooms, suspended ceilings, institutional floor finishes and lighting and limited space for personal items and furniture. In an institution, residents live side-by-side with people they are unlikely to know.

Dovey (2005) in a chapter titled ‘Home as a Paradox’ notes how little we know about the experience and concept of ‘home’. He reinforces the importance of home as a place of safety and security – just as does the literature on which EAT and other tools are founded. Dovey observes that ‘home’ is “a place where social and cultural identities become expressed and stabilized” (2005: 361). He argues that the experience of home is largely unselfconscious, and that this area of research on ‘home’ has opened up a “philosophical abyss”. More recently, Dovey (2009) adopts a Deleuzian approach and addresses place, identity and power – all key issues for people with dementia living in care homes. The earlier phenomenological position of Norberg-Schulz (1979) and more recently Pallasmaa (2005) highlighted the importance of the senses and for people with dementia this remains valid. However, Dovey argues for a richer understanding of place, one that is based on ideas of assemblage and flows of desire through which cities, houses and institutions are designed. Assemblage allows heterogeneous objects to hang together. Importantly, this understanding replaces older notions of places that have ‘become’ with that of ‘becoming’ since time does not stand still. These more fluid understandings of place and place formation over time may offer a productive and creative means of re-evaluating the notion of ‘home’ as a meaningful place for people with dementia. The next section examines, very briefly, two care homes to draw from experience a sense of the deficits in the current notions of ‘domestic’, ‘home’ and ‘homelike’.

5. CASE STUDIES: CARE HOMES

5.1. Care home study tour
A study tour was undertaken in early 2010 of care homes in the Netherlands, Denmark, Sweden and Norway and several care homes in Tasmania were visited in mid 2010. The northern European examples demonstrated the benefits of a research-based approach to design and of more social welfare oriented societies that invest in the provision of care homes. Notwithstanding this apparently rosy picture, the demographic pressures on those societies will and are causing problems just as they are elsewhere in the world, as presaged in section 1 of this paper.

Figure 1 shows a corridor in an elderly care home with wide corridors, handrails and double doors to bedrooms that are required in such a facility but which do not render the space as ‘homelike’. Similarly, Figure 2 illustrates a lounge room in another facility which is well maintained, provides comfortable recliner chairs and river views but which does not create a domestic ambience due to the institutional scale of the space and furniture layout.

Figures 3 and 4 show a care home in Norway. While corridors are wide (Figure 3), architectural strategies are employed to create a less institutional feel, with highlight windows bringing light into the corridor, bedroom doors inset into alcoves, domestic finishes and lighting. Similarly, the kitchen, dining and living space are continuous, airy, light and accessible. Residents may assist with meal or snack preparation if they wish but in any case the senses are aroused with varying levels of lighting and the smell of food being cooked. Nevertheless, there are institutional clues: the number of bedrooms (8 for each unit), ceiling tiles and the size of corridors and living spaces, for example.
DISCUSSION AND CONCLUSION

The projected growth in the numbers of people having dementia in Australia, and worldwide, over the next few decades will put increased pressure on already stretched government health budgets. There is an imperative to seek strategies that will provide high quality care and accommodation for the elderly and particularly those with dementia as they are among the most vulnerable. Among healthcare experts including architects, there is a strong view, supported by research evidence that good design can contribute to improved quality of life for people with dementia.

Tools developed to improve the sustainability of buildings, such as the Green Star Healthcare Tool and the design of buildings that better serve people with dementia such as the Environmental Audit Tool, use checklists that can be assessed reliably and objectively. TBL evaluations aim to reconcile diverse sustainability objectives using a similar process. A review of the scientific, medical, and built environment literature supports the principles that underpin the Environmental Audit Tool used to assess buildings housing people with dementia. However, the literature from other disciplines opens up opportunities to re-think a number of principles that make intuitive good sense, such as providing homelike environments but which seem problematic when examined more closely. Identity, place and power are intermixed and consequently to develop a meaningful (to residents) homelike environment requires something more than current tools offer.

A richer understanding of sustainability and dementia that has human wellbeing as the focus of design should be the goal of all stakeholders involved in procurement of new or refurbishment of existing care homes. Human wellbeing, as we see it, does include thermal comfort, lighting, scale, security and safety and so on. However, of equal importance are the issues that are not on design checklists: that is, the creation of an architecture of spirit, one that makes one feel good to be alive. While these qualitative and contested aspects of design stubbornly resist categorization, their visceral absence in the design of many care homes highlights a problem not of funding but of design. It ought to be addressed in the interests of an ageing and vulnerable population.

ACKNOWLEDGEMENT

Thanks are expressed to the managers of the care homes who allowed us to walk freely through the facilities, to talk with staff and with residents and to photograph their buildings and gardens. The people we meet who care for the elderly and in particular for those with dementia are unsung heroes.

REFERENCES


Fleming, R., Crooke, P., Sum, S. (2008) A review of the empirical literature on the design of physical environments for people with dementia, Collaboration of Dementia Collaborative Research Centres, the University of New South Wales and HammondCare for the Australian Government.


Kimmet, P (undated) *An Institutional Understanding of Triple Bottom Line Evaluations and the use of Social and Environmental Metrics*, This research is part of a CRC for Construction Innovation project. Retrieved: http://www.prres.net/Papers/Kimmet_Institutional_Understanding_Triple_Bottom_Line_Evaluations.pdf


