

Market Response to a Demonstration Home: the Subiaco Sustainable Demonstration Home

Dr Elizabeth Karol

Curtin University of Technology, GPO Box U1987, Perth WA 6845

Ph: 08 9266 7260

Email: e.karol@curtin.edu.au

Dr Monica Leggett

School of Natural Sciences

Edith Cowan University, 100 Joondalup Drive, Joondalup, WA 6027

Cindy Siano

City of Subiaco, PO Box 270, Subiaco WA 6008

Abstract

In 2001 the City of Subiaco embarked on a project that had the potential to make a significant impact on the housing market in suburban Perth, Western Australia. That project, the Subiaco Sustainable Demonstration Home (SSDH), co-designed by the presenter of this paper (EK), has been visited by approximately 16,800 people between March 2004 and September 2005.

This paper examines the paths taken to achieve the primary intent of the City of Subiaco (CoS) in commissioning this house; that is to demonstrate to visitors that environmentally sensitive design is attainable, attractive and affordable whilst at the same time being accessible to potential home-builders and renovators. The paper considers the educational aspects of the project and the visitors' responses to the project. The written and anecdotal responses from visitors indicate that the most obvious issue raised by SSDH was how readily thermal comfort could be achieved in Perth, without space heating or cooling, and without compromising high quality design. The written responses and general interest of visitors in the project contribute to the development of housing policy as this provides an insight into public opinion in relation to sustainable design. This insight could inform the further development of sustainable building regulations for housing. The various categories of awards bestowed on the SSDH by the housing construction industry also indicate a recognition of the high quality and high impact of the project.

Keywords

Sustainable housing, Perth, energy efficient

1. Background

Building a house primarily to educate the public about energy and water efficiency is unusual although in West Australia after the 1972 oil crisis, a number of houses were constructed to demonstrate energy efficient design. These included the Unibuild Solar House completed in 1978 and the Solar Q1 project completed in 1979 (see, Parnell & Cole, 1983). These initiatives were part of a global trend to demonstrate the effectiveness of passive solar design to provide comfortable thermal conditions without using expensive oil for mechanical heating or cooling. The underlying assumption was that if the houses performed well then the concept would automatically be adopted. The subsequent fall in the oil price mitigated against this.

Over the past decade Federal, State and Local Governments have shown a growing interest in promoting reduced energy consumption in the residential sector. For example, national building regulations (see, ABCB, 2005) were amended to include requirements for energy efficiency in all residential buildings. That interest was, and continues to be, driven by a concern that greenhouse gas emissions are leading to climate change (see, Australian Greenhouse Office, 1999). At local government level the interest has shown itself as an association with two initiatives in particular; the Cities for Climate Protection¹ (CCP) and Local Agenda 21² (LA21).

The CoS committed itself to both these initiatives in the late 1990s. The CoS joined the CCP Campaign in 1999 and the final milestone of achievement (milestone five) was attained in 2004. During the process of achieving the five milestone, greenhouse gas emissions resulting from energy consumption in municipal buildings decreased by more than 30%.

In 1997 CoS agreed to establish an LA 21 Steering Committee consisting of Councillors, community representatives and administrative officers. This Committee was created “to help plan for a sustainable future through the Local Agenda 21 process” (see, CoS, 1997, p.6). This Steering Committee oversaw the development of *The Environmental Plan for Subiaco* that was published by the Council in 2000. That plan included a number of objectives related to encouraging the adoption of sustainable development principles for the built environment, promoting efficient energy use and educating the Council and community to facilitate sustainable development.

During the same period that the CoS was developing initiatives within CCP and LA21, a large industrial area of Subiaco was being transformed into a housing subdivision. The CoS had a financial as well as an administrative interest in the redevelopment. It was opportune that a Councillor on the LA 21 Committee was also representing the Council in the negotiations regarding the redevelopment. He suggested that there was an opportunity for a block of land in the display homes area of the subdivision to be allocated

¹ The Cities for Climate Protection (CCP) campaign requires a local authority to show leadership in addressing a range of economic and liveability issues including reducing waste, choosing green power, energy efficiency, improving air quality and reducing traffic congestion. There are 5 milestones of achievement described in the campaign (Local Government Focus, 2001).

² LA 21 is an international sustainability planning process that provides an opportunity for local governments to work with their communities to meet the environmental, social and economic needs of the present generations without compromising the ability of future generations to also meet their needs (see, State Government of South Australia, 2005).

to the Council so that a house for educational purposes could be built. It was anticipated that there would be a flow on effect of visitors between such an 'educational' home and the neighbouring typical project display homes. This suggestion was in line with one of the 18 principles of sustainability included in the Rio Declaration on Environment and Development. This principle states that "Environmental issues are best handled with the participation of all concerned citizens. Nations shall facilitate and encourage public awareness and participation by making environmental information widely available" (see, McKeown, 2002, p.3).

After considerable debate, over an extended period, the Councillors approved the proposal to construct a demonstration home in the proposed new subdivision by the narrowest of margins (see, CoS, 2001). The house was completed in 2004 and formally opened to the public in March 2004 by the Premier of Western Australia. Over the following 12 month period approximately 13000 people visited the SSDH including school groups, professional organisation groups and the general public. A well known quality project home builder³ in Perth confirmed that this number is approximately 20% higher than the average number of annual visitors to one of their typical display homes of similar size in suburban Perth.

2. Design principles

The design philosophy for the house was based on a broad concept of 'accessibility'. Accessibility has four layers of meaning. It refers to looking and feeling familiar to the typical home owner, being able to accommodate a variety of family arrangements, being in the same price range as similar projects and being physically accessible to people in their various life phases. This concept was fundamental in both the short term, when the building was an educational display home, and also in the long term when the house was sold as a private residence to unknown client groups.

Display home

As a display home the building was required to raise awareness of visitors to the range of environmentally friendly, energy efficient, 'liveable'⁴ and innovative housing design and building solutions readily available for addressing growing sustainability issues such as excessive water and energy use in West Australian homes. Rather than showcasing the latest innovative and experimental sustainable techniques that may be inaccessible to the general public, the specific objective was to provide attractive, modest in the context of the area, reproducible and affordable solutions for both renovations and new housing. The SSDH needed to demonstrate that environmentally sensitive housing was for everyone, not just the "green fringe". However as an educational display home the SSDH was also designed to include 'approachable' learning material. It was essential that visitors could readily understand the climate sensitive design principles and technologies used.

³ S. Greenway 2005, Personal communication, 5th July. A typical Peter Stannard Homes two storey display home in Karrinyup attracted approximately 200 people per weekend.

⁴ 'Liveable' refers to environmental features that a typical householder would apply or use as they were not considered unduly demanding of time or effort.

Private residence

As a private residence the SSDH was designed to create a stimulating home with broad-spectrum market appeal that remained 'liveable'. This was achieved as can be seen in Figure 1. It was to be physically and financially 'accessible' to a variety of occupant groups including families with children, working couples, empty nesters and older people. It was to require minimal space heating and cooling to provide thermal comfort, incorporate simple to operate energy and water saving systems, be physically accessible and be low allergen.

Figure 1: The SSDH in the streetscape and inside one of the living spaces



3. Using the SSDH as an educational tool

As the primary driver for the CoS to construct a house was to educate, the principles incorporated within the design were to be easily understood by the target audience. This target audience included home builders, industry professionals, students and other local authorities as well as the general public. The educational aspects of the project were managed jointly by the City of Subiaco and Project Managers (Clifton Coney Group), with advice from a specially formed Public Education Group (PEG). The Public Education Group included representatives from the City of Subiaco, Sustainable Energy Development Office, Curtin University (architect), Solar Dwellings (designer), Glenway Homes (builder), Disability Services Commission, Independent Living Centre, Murdoch University Environmental Technology Centre and Edith Cowan University. The PEG provided advice on the development and integration of a variety of matters including a media campaign, website development, thermal monitoring of the completed house, landscape design, displays within the house including ‘fact sheets’, ‘static displays’ and a self guided tour, and training volunteer guides for the house. This paper will elaborate on two of these matters that were critical to the educative value of the home - the displays within the house and the role and training of volunteer guides.

Displays

Two important problems were identified by the PEG in developing the displays. One problem for the PEG was the diversity of the expected audience in respect to knowledge, education, experience, aspirations, financial situation and environmental awareness. The second problem stemmed from the success of the design in looking “normal” with the passive solar features being largely invisible as can be observed in Figure 1. Education through the intellect requires information, but for people to feel that they want to live in such a house without taking on extra tasks, the house must feel like a home and compete with the other display homes in the area.

The PEG decided that the house experience was the key. All the furnishings and finishes were chosen with both sustainability and ambience in mind. Information was supplied using a set of attractive flip charts designed round key concepts with each key concept being coded with an image. The “Mums” and “Dads” were the target audience for the flip charts. An example of the key concept coding for solar radiation is shown in Figure 2. These images of key concepts were then repeated in displays around the house at the appropriate places. Further information was provided through a series of linked fact sheets, business cards of the suppliers and the knowledge of the volunteer guides. In this way the educational experience was designed to operate at different levels and to link text, image, experience and conversation (see, Roth and Lee, 2002; Macdonald, 1998).



Figure 2: Coding of a key concept - solar radiation

Volunteer Guides

Any home that is regularly open to the public (Wednesday, Saturday and Sunday afternoons), must be staffed by people who are able to answer the inevitable queries. It was considered that trained volunteers would be particularly valuable in this role. Not only could they explain the house design but they could also discuss the 'liveability' aspects. The volunteers were also seen as a way of involving the community in the project thus creating a 'ripple' effect in terms of education. Most importantly, the volunteers would be known to have no vested interest in selling any product or service.

To this end the City of Subiaco advertised for volunteers in the local community newspaper. The applicants, once police cleared, underwent a 10-hour training program with the two designers of the SSDH. Two recruitment drives yielded 40 volunteers, 30 of whom are still active. After 18 months there has been a low drop out rate by volunteers because, they say, they enjoy the time they spend at the house. The volunteers are on two-hour rosters once a fortnight and are supervised by a CoS staff member who is available to assist with difficult queries. Visitors to the home often comment on how appreciative they are of the knowledgeable and helpful volunteers.

4. Collecting feedback

There were three primary sources of data used in this paper to examine the market response to the SSDH. These sources were survey forms completed by visitors, entries in a Visitors' Book and anecdotal evidence from volunteer guides at the house.

A single page survey developed by the PEG included ten questions⁵ and a space for general comments. The primary intent of the survey was to provide CoS with information as to the real usefulness and breadth of reach of this public education project. The results of the survey could also be used to contribute to the accountability provisions prescribed for local authorities.

The survey forms were prominently positioned on a table in the house and visitors were reminded by the volunteer guides about the survey form. A Visitors Book, also prominently displayed, enabled people to record the date of their visit, where they lived and a comment about the visit. These comments from the Visitors Book were used in the analysis in conjunction with the answer to survey question number 3.

One of the authors (CS) of this paper was the supervisor of the volunteer guides. Thus she was able to contribute anecdotal evidence based on debriefing sessions with the volunteer guides.

⁵ The 10 questions are summarised here.

1. What was the most interesting aspect of the house?
2. What would you most like to have in your home?
3. Describe your reaction to the house in 3 words.
4. How did you find out about the house?
5. What reasons did you have for visiting the house?
6. How far have you travelled to visit the house?
7. Will you be building, buying, renovating, landscaping your home within the next one to five years?
8. Do you think you will apply some of the ideas you have seen?
9. If so, what ideas do you think you will put into action?
10. What else would you like CoS to do in the area of sustainable development?

5. Method of analysis

The raw data collected from the survey forms and visitors' book was tabulated and examined. It became clear that the information gleaned from these sources could be grouped into five categories of interest.

The first category encapsulated the broad reasons why respondents had come to the SSDH. Data in this category was obtained from survey questions numbers 5 and 7. The broad reasons were sorted into five groups. These groups were:

- Planning to renovate, build or landscape your home within the next 5 years
- Wanting to save money
- Having an interest in sustainability or good design
- Wanting to learn about sustainability in housing
- Being sceptical about passive solar design

The second category looked at how the respondents had found out about the SSDH. This information was obtained from survey question number 4. The guides' discussions with visitors at the house were also used to contribute to an understanding of how visitors had found out about the SSDH.

The third category captured respondents' general impressions of the SSDH. Data in this category was obtained from comments in the visitors' book and from the survey question number 3. The general impressions were sorted into three groups, namely did the house feel homely and desirable, did the visitor consider the features were achievable and was there a sense of exhilaration or pleasure in the house.

The fourth category encapsulated the particular interests of respondents. Data in this category was obtained from survey questions numbers 1 and 2. Seven particular areas of interest were evident. These were nominated as:

- Energy or water efficient appliances, fittings and fixtures
- Access for disabled and low allergen materials
- Central mass wall constructed of recycled materials
- Active systems such as photovoltaic cells, solar water heating
- Grey water system with discharge used to water a vegetable garden
- Design in general including choice of materials
- Design for thermal comfort

The fifth category looked at the ideas used in the SSDH that visitors thought they would apply. Answers in this category came from survey questions 8 and 9. The features nominated were in four general areas. These areas were passive control of thermal conditions, water efficiency, energy efficiency and universal design.

SPSS Text Analysis for Surveys (Version 1.5) was used to group the raw data under the five categories of interest and SPSS –PC (Version 13) statistical software package was used to produce a series of multiple response categorisations and a set of collated responses. The collated responses provided information about the number of times an

issue was mentioned divided by the number of respondents. As respondents frequently mentioned more than one issue, the number of collated responses could exceed one hundred percent. Anecdotal evidence from the volunteer guides was recorded and compared with the data from the survey answers and visitors' book comments.

6. Results

During the first year the SSDH was open approximately 13,000 people visited the SSDH. Ninety-four visitors completed the survey in that first year. This is approximately 0.7% of the total number of visitors. Statistically this is not impressive but reflects a growing reluctance by the public to complete surveys (see, Jarvis, 2002). In this case, the situation was made more acute as the house itself, rather than the questionnaire, was the focus of attention for the visitors (see, Helgeson et al, 2002). More visitors (approximately 2.4%) chose to make an entry in the visitors' book. This may reflect people's general desire to take the less time consuming and demanding option.

The results of the analyses of the surveys and visitors' book entries are shown in Tables 1, 2, 3, 4 and 5. Table 1 indicates that the vast majority of respondents came to the SSDH because they were planning to renovate their current home or garden or build a new home within five years and they were searching for ideas. Table 1 also shows that a significant number (29%) also came to learn about sustainability. Anecdotal evidence from the volunteer guides supports the finding that the majority of visitors coming to the house were looking at commissioning some construction work on a new home or on their existing home in the foreseeable future. However volunteers also referred to the high number of visitors simply wanting to learn about passive solar design and how much it costs.

Table 1: Multiple response categorisation of broad reasons for visitors coming to the SSDH

Broad reasons for coming to SSDH	Cases	Collated response
Renovating/building/landscaping	103	112.0%
Interest in sustainability/good design	38	41.3%
Education	27	29.3%
Sceptical	7	7.6%
Save money	2	2.2%

Table 2 shows that more than half the respondents (54%) found out about the SSDH through a story in the press. This is not surprising as during the 12 month period being discussed there were 14 editorial articles and 9 advertisements about the SSDH in the press or in journals. The next largest group of respondents (17%) heard about the SSDH by word of mouth from someone they knew.

Table 2: How did respondents find out about the SSDH

Finding out about SSDH	% of respondents
In press	53.8
TV/radio	2.2
Home show/expo/public lecture	4.4
Word of mouth	16.5
Journal/magazine article	2.2
Work	3.3
Passing by	8.8
Excursion visit	1.1
Internet	3.3
Other unspecified	4.4

The results in Table 3 highlight the reactions of respondents to the SSDH. When asked to briefly describe their reaction to the house, the majority of respondents felt they could aspire to a similar sort of home as the features they saw seemed reproducible and affordable.

Table 3: Multiple response categorisation of general impression of SSDH

Impressions of SSDH	Cases	Collated response %
Feel good	121	35.3%
Achievable	175	51.0%
Wow	115	33.5%

It is clear from the results in Table 4 that achieving comfortable indoor temperatures without space heating or cooling was the most particular area of interest for the majority of visitors. Sixty-eight percent of respondents referred to this aspect of the design in their comments. Other specific matters that appealed to respondents were the grey water system (32%), the general design of the house (24%) and active systems contributing to sustainability such as the photovoltaic panels and solar water heating (23%).

Table 4: Multiple response categorisation for particular interests

Particular interests of visitors	Cases	Collated response %
Efficient appliances, fittings, fixtures	2	2.4
Healthy & accessible	5	6.0
Central mass wall	2	2.4
Active systems	19	22.6
Grey water system	27	32.1
Design & materials in general	20	23.8
Design for thermal comfort	57	67.9

Anecdotal evidence from the volunteer guides suggests that visitors most frequently mentioned the following four features of the house:

- The achievement of comfortable temperatures without space heating or cooling
- How well people felt in the home
- The recycled rammed rubble wall
- How easy it was to understand the purpose of the design solutions and how readily people could see how to utilise some of the solutions in their own homes

Ninety-five percent of respondents stated, in survey question number 8, that they thought they would apply some of the features they saw at the SSDH in the foreseeable future. Table 5 shows the features nominated for application in response to survey question number 9.

Table 5: Visitors perceptions of design elements that they would apply

Ideas visitors would apply	Cases	Collated responses
<i>Passive control of thermal conditions</i>		
*insulation	7	9.9
*thermal mass	21	29.6
*passive solar heating	26	36.6
*louvres to shade windows	12	16.9
*insulated curtains	3	4.2
*ceiling fans	2	2.8
*cross ventilation	7	9.9
* heat removal behind fridge	1	1.4
<i>Water efficiency</i>		
*water efficient taps	3	4.2
*water wise garden	5	7.0
*grey water system	33	46.5
*rainwater tank	10	14.1
<i>Energy efficiency</i>		
*Energy efficient lights	1	1.4
*Solar water heating	3	4.2
*photovoltaic cells	8	11.3
*smart wiring	3	4.2
<i>Universal design</i>		
*disability access	4	5.6
*non-toxic paint	5	7.0
*low allergen design/finishes	5	7.0

7. Discussion

A number of factors coalesced in the late 1990s that led to the building of the SSDH. These included the CoS commitment to CCP and LA21, the redevelopment of a major site in which the CoS had a financial and administrative interest and a sound financial position. It took approximately six years for the SSDH to materialise in March 2004. It has now been open to the public for approximately one and a half years. The evidence suggests that the SSDH has met its goal of demonstrating to a significant number of people that environmentally sensitive design is attainable, attractive and affordable whilst at the same time being accessible.

A measure of success is the large number of visitors attracted to the SSDH (16,800 between March 2004 and September 2005). The results of survey question number 4 as shown in Table 2 and feedback from the volunteer guides indicated that the high numbers were largely attributable to newspaper publicity given to the house. Fourteen editorials appeared prior to May 2004 and, to date, CoS records show that the SSDH has been referenced in either the West Australian Newspaper or in local papers 65 times as either an editorial or as an advertisement.

Free public seminars related to the SSDH, or sustainability more broadly, organised by CoS have also attracted large numbers which in turn have increased the interest in the SSDH. The high attendance at seminars indicates that, given the opportunity, people are prepared to invest time in learning about sustainability. Evidence from the volunteer guides and the results in Table 2 shows that word of mouth was also a significant contributor to visitor numbers.

Another measure of success of the SSDH is that the project has been recognised for its exceptional qualities by the housing construction industry and government bodies interested in construction. This is evidenced by awards⁶ from the Housing Industry Association (HIA), the Master Builders Association (MBA), the Local Government Association (LGA), the State Government Insurance Office (SGIO) and the Building Designers Association (BDA). It is also evidenced by the number of industry workshops or training sessions held at SSDH. For example, WESROC (Western Suburbs Regional Councils) held four seminars and the Sustainable Energy Development Office (SEDO) held three workshops for house designers at the SSDH. In addition, the HIA held training sessions for their GreenSmart[®] accreditation program at the SSDH. To date approximately 100 participants from the Perth metropolitan area and country Western Australia have attended these HIA training sessions. The participants included builders, designers, trades people, local council planners, land developers and real estate agents. The HIA has noted a rising number of participants in the Housing Industry Association GreenSmart training program that now has 423 GreenSmart accredited professionals (www.greensmart.com.au). It is also of note that at least three other sustainable display homes have been constructed by the industry in the greater Perth area since March 2004.

A third measure of success comes from comments made in the Visitors' Book, on survey forms, by volunteers and from attendees at the CoS seminars. Many visitors talked about replicating ideas and principles used in the SSDH such as those shown in Table 5. The greatest area for action indicated by survey respondents was in passive control of indoor temperatures. A similar response came from anecdotal evidence of the volunteers and from seminar attendees, although there was also great interest in grey water treatment.

Public education was clearly the primary aim of CoS. Reports from the volunteers suggested that they found themselves taking on an important but unexpected educative role at the SSDH. They became dispellers of myths associated with sustainable housing

⁶ Awards for energy efficiency, water efficiency, creating partnerships in the industry, design concept, display home of the year, smart housing and specialised accommodation have been received from the HIA, awards for building sustainability, environmental home and water efficiency have been received from the MBA, an award for greenhouse gas reduction from LGA, awards for eco building and leading by example from SGIO and an award for environmentally sustainable design from BDA.

as they found themselves able to provide visitors with information that challenged assumptions about traditional project home construction, particularly in relation to passive solar design. For example many visitors assumed that the traditional Perth standard cavity brick wall and tile roof home was the best construction solution in all circumstances for Perth's climate. They were unaware of the poor insulation properties of such construction.

It has been suggested that display houses which are occupied are more effective as exemplars if the householder is available to discuss the house with visitors. The householder communicates as a lay person with practical and first-hand living experience⁷. The CoS is considering applying a condition of sale on the SSDH that will enable the indoor temperatures and water and energy consumption to be monitored for a 12 month period after it is sold. It may be that future owners of the SSDH will agree to become part of a future National Solar House Day thus continuing the role of the SSDH as an education tool.

Seeing an example of what can be done is one method of enabling behavioural change. However, it is very difficult to measure the long term impact of a demonstration project such as the SSDH. There is no evidence to suggest that demonstration projects, of themselves, translate into pervasive changes in housing design or changes in occupant behaviour. They are just one aspect of changing behaviour through education. More work is needed to establish the main barriers (see, McKenzie-Mohr and Smith, 1999) to changing behaviours around both choice of house design and occupants' habits.

Changes to construction industry practices and building regulations are also required to improve the sustainability of housing. If standard residential design in Perth is compared with the design of the SSDH it is clear that there is still a significant gap between the building regulatory requirements for energy efficiency in houses (see, ABCB, 2005) and sustainable performance. It is also particularly important to provide planning control mechanisms that protect passive solar designed houses from overshadowing in winter. A situation arose in the SSDH where, after obtaining planning approval for solar collectors on a particular surface, subsequent planning approval on a site to the north of the SSDH created significant and unacceptable overshadowing. Changes during construction were consequently required.

8. Conclusion

The SSDH surpassed expectations in terms of number of visitors and local and international interest in public education of ideas related to sustainability of housing. It has also encouraged other interested parties in the greater Perth area, including business and government, to construct demonstration homes that incorporate sustainable features.

The reaction of those visiting the SSDH based on the Visitors' Book, survey forms and anecdotal evidence shows that a significant proportion intended to apply some of the sustainable features of the SSDH in their own homes. This was largely based on the

⁷ The Australian New Zealand Solar Energy Society annually showcase sustainable houses in all major cities in Australia and New Zealand. The organiser in West Australia believes that theoretical descriptions may not have the same impact as learning from others' experiences, which is why occupiers sharing their experiences with visitors is an integral part of Solar House Day. "Visitors learn heaps of reality stuff from occupiers" (Sunny Miller, personal correspondence 25th July 2005).

visitor seeing that sustainable design can be practical and appealing. However translating this sentiment into action is still subject to numerous barriers. Without further incentives or regulatory controls in the construction industry, progress towards sustainability will be slow.

References

- Australian Greenhouse Office (1999), 'Australian residential building sector greenhouse gas emissions 1990-2010 Final report', AGO, Canberra.
- ABCBA Australian Building Codes Board (2005), 'Building Code of Australia', CanPrint Communications Pty Ltd, ACT.
- City of Subiaco (1997), 'Local Agenda 21 – Development and Community Services Committee Agenda', 9 December 1997.
- City of Subiaco (2001), 'Minutes of Council Meeting – Item 10.10', 13th November 2001.
- Helgeson, James G., Voss, Kevin E. and Terpening, Willbann D. (2002), 'Determinants of mail-survey response: Survey design factors and respondent factors', *Psychology & Marketing*, 19(3), 303-328.
- Jarvis, S. (2002), 'CMOR finds survey refusal rate still rising', *Marketing News*, 36(3), 4.
- Local Government Focus (2001), 'The Toronto declaration', Retrieved: 18 July 2005, from <http://www.lgfocus.com.au/editions/2001/november/toronto.shtml>
- Macdonald, S. (ed) (1998), 'The politics of display: museums, science, culture', Routledge, London.
- McKenzie-Mohr, D. and Smith, W. (1999), 'Fostering sustainable behaviour', New Society Publishers, Canada.
- McKeown, R. (2002), 'ESD Toolkit version 2', Retrieved: 12 June, 2005, from <http://www.esdtoolkit.org/discussion/default.htm>
- Parnell, M. and Cole, G. (1983), 'Australian solar houses', Second Back Row Publishing, Leura, NSW.
- Roth, W-M. and Lee, S. (2002), 'Scientific literacy as collective praxis', *Public Understanding of Science* 11(1), 33-56.
- State Government of South Australia (2005), 'Local Agenda 21', Retrieved: 18 July, 2005, from <http://www.environment.sa.gov.au/sustainability/la21.html>.