Barriers that impact on the implementation of sustainable design

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Abstract

This paper aims to discuss interior designers and architects understandings of sustainable design and barriers that influence their sustainable design practices. The paper reflects on findings that were obtained from a research study, performed in 2011, that conducted semi-structured interviews with practicing interior designers and architects within the KwaZulu-Natal region in South Africa. This research is considered as significant, because it communicates findings that were documented for the first time in this region and gives insight into challenges that the practitioners experience. Conclusions showed that education and experience informs a designer's understanding and values towards sustainable design. Designers' understandings and sustainable design values affect their behaviour, attitudes, and likelihood of practice in accordance with the constitution, legislation, policy and building regulations. These in turn determine whether these designers are blocked by barriers that impact on the implementation of sustainable design solutions. Barriers to sustainable interior design include education, cost, products and materials, rating tools and the client. Solutions that were established during the study include an improved knowledge of sustainable design, implementation of national regulation, improved knowledge and scope of products and materials, and educating the client.

KEYWORDS: sustainable design, barriers, sustainable design practices

Introduction

Since the early 1960s environmental activists proclaimed that the Earth is the collective responsibility of all human beings and that everyone should be involved in combating abuse and neglect (Margolin, 2007). In 1996, Wackernagel and Rees (1996) warned that extensive evidence had determined that the world was in a state of "overshoot" which indicates that humanity's ecological footprint had exceeded the global carrying capacity of the Earth

(p.125). These revelations urged people across the globe to embrace a paradigm shift which shifts human beings from being environmentally irresponsible to environmentally responsible. Jones (2008, p.5) maintains that this paradigm shift is "the acceptance by the majority of people in a changed belief, attitude, or way of doing things, a fundamental change in people's worldview".

Bonda (2003) suggests that designers of the built environment need to make the personal decision to take moral responsibility for what they do. Stieg (2006) argues that designers should also understand the impact of their activities and take responsibility for their actions. According to Pidcock (2005) there is much evidence to show that if the design industry embraces the future with openness to new paradigms of thinking and doing, there are many exciting opportunities to be realised. She believes that the design profession plays an integral part in creating a future that maintains a healthy economy and attempts to save the world. Pidcock (2005, p.15) argues that "The design industry is well placed to take a fresh look at problems and create design solutions that are both creative and desirable".

Embracing sustainable design practices could however present a number of challenges to designers. According to Hes (2005, p. 224) integrating green innovation into the built environment is a "wicked" problem, which makes identifying barriers hindering this practice essential (Aye, 2003; Mate, 2006). Stieg (2006) presents similar observations in referring to the practice of sustainable design as both difficult and complex. Designers should therefore understand the social and moral obligation associated with sustainable design whilst acknowledging that the practice of sustainable design presents various difficulties.

Research conducted in the United States of America (US) and Australia suggest that although there is interest in sustainable design, its frequency of application is poor (Aye, 2003; Kang & Guerin, 2009; Mate, 2006). These authors identified multiple barriers to incorporate sustainable design into practice. These include perceived cost (Aye, 2003; Mate, 2006); time to source materials, education and training, understanding and in house experts (Aye, 2003). Studies also identified client resistance (Aye, 2003), knowledge of materials, limited material selection and authenticity of suppliers (Mate, 2006), along with understanding of the impact of materials (Kang & Guerin, 2009), accurate and accessible information and appropriate tools (Aye, 2003). Other barriers that were identified are client demands (Hes, 2005), client knowledge and call backs from clients (Davis, 2001), accurate and accessible information (Hes, 2005; Davis, 2001) and appropriate tools (Hes, 2005).

Although it is evident that a number of international studies have been conducted within this topic, similar studies are not available within South Africa. Using ecological footprinting, which is a popular quantitative method, it has been estimated that South Africa's footprint is 4,02 hectares per person (South Africa, 2008, p.16). Footprinting is an accounting tool that measures how much biologically productive land is required to support the living standards of an individual, a city or country. The World Wildlife Fund estimates that the global fair share is 1,8 hectares per person - if everyone was to live within the carrying capacity of the planet's ecosystems. In relation to the South African value it means that the world "would need two planets if everyone lived like the average South African" (South Africa, 2008, p.16). The high footprinting calculation indicates that it is of importance that sustainable practices be considered and integrated at various levels. Although national policy and legislation have been implemented since 2005, very slow implementation and execution is evident– especially in the built environment. This paper therefore focuses on sustainable design within the built environment and reflects on the interpretation and application thereof by interior designers and architects practising in KwaZulu-Natal, South Africa. In focusing on these aspects the research aims to explain the barriers that impact on the implementation of sustainable design within this region.

Research Methodology

A qualitative research approach was employed for this study. Aided by this research approach, the research study aimed to establish whether or not sustainable design practices are being employed by designers (interior designers and architects) in KwaZulu-Natal within the design and implementation of interior spaces. Focus groups and individual interviews were employed to establish the designers' understanding of sustainable design and to determine the barriers that influenced their practices. Through personal interaction with people in the design field, the study aimed to present thick and rich descriptions by critically reflecting on data elicited from focus groups and individual interviews. Ethical clearance was obtained from the University of Johannesburg prior to commencing with the interviews.

Participants

Purposive sampling of participants was used in the study, as this was vital to the success of the interviews. Purposive sampling means that participants are selected accroding to a defining characteristic that makes them holders of the data needed for the study (Nieuwenhuis, 2007, p. 79, 90). The study aimed to use group interviews in which the groups represented sustainable design practices within the KwaZulu-Natal region. The intention was to approach firms which had been identified as agents that had participated in a sustainable design project, or claimed to be sustainable design practitioners. The process presented considerable challenges, which lead to a decision to invite firms to participate in the study, regardless of their sustainability agendas. The final research design consisted of five interior design firms and five architectural firms and interviews were conducted with either a group or individual within these firms.

Data collection and analysis

Interviews were conducted by using an interview guide and the interviews were recorded by using both hand written notes and a dictaphone. The notes were used to highlight major themes and follow up or refer to points at a later stage in the interview. The semi-structured nature of the interview guides allowed the interviewer to focus on issues salient to those being studied. A computer software program, NVivo 7, was used to assist with the data analysis. The programme assisted in analysing and managing the qualitative data, as well as to easily manipulate the data and conduct searches. By working back and forth between codes and subthemes, it was possible to establish a comprehensive set of themes and thereafter three distinct categories of design practitioners.

Presentation of findings through introduction of an analogy

It was decided to introduce an analogy to explain the three different categories identified through data analysis. The intention of the analogy was to depart from the traditional linear or scientific approach often used in research findings, and to instead provide the reader with a clear and interesting narrative. The chosen analogy relates to the discipline of running and will be used within the presentation of the findings. Three distinct groups were identified. These consisted of the long distance runner, the jogger and the spectator, and were adapted from White's (2010, p.1-3) three personality types. The personality types are based on the participants' degree of knowledge and experience which comes from their professional backgrounds, as well as their personal values and attitudes towards sustainable design.

The analogy of the long distance runner is used to describe the category whose attitudes and values demonstrate their commitment to the implementation of sustainable design. This includes being well informed of the race ahead, undertaking preparation and regular training to endure a strenuous race. Designers in this category have a good understanding of sustainable design, are well informed and regularly engage with the topic.

The second category is compared to the jogger. Joggers have a fair understanding and appreciation of running but run shorter distances than long distance runners. Many joggers run sporadically, and often for leisure. Designers in this category display a fair interest and understanding of sustainable design, are informed when required, and engage sporadically in the practice of sustainable design.

The third category comprises the spectators. Some spectators are satisfied to observe the race and have no ambition to run or compete themselves. Others become enthused with the idea of running but do not follow it through. The analogy of the spectator is used to describe participants who had a limited understanding of sustainable design, and appeared to be disinterested in its practice. Designers in this category engage with the topic of sustainable design by chance.

Findings

Four main barriers were identified through the study, namely: cost, education and experience, materials and the client.

Barrier 1: Cost

Bottom line. A major barrier to sustainable design, reiterated by all the focus groups and individual interviewees was cost. Long distance runners, joggers and spectators explained that despite their personal commitment to sustainable design, and often the client's intention to choose a sustainable design approach, the costs involved in opting for and implementing such a solution were usually an overriding barrier. When discussing the amount of sustainable design projects that get funded and implemented, a long distance runner exclaimed, "we've got about 200 sustainable designs on our books and we've probably got about 15 buildings built. So the kill rate [rejection] is high. They're expensive things and often when people are forced to face up to that, they get scared" (participant 1, group 4).

Discussing the implications of cost, a long distance runner explained that "it is more expensive, so you need clients to be on board to pay a little bit extra. In total I think it is about a 10 or 20 per cent extra cost, but still, that 20 per cent makes a difference. You need someone to really want to do it" (participant 1, group 6). In essence a number of long distance runners agreed that it was always about the bottom line. According to long distance runners, joggers and spectators, at present environmentally responsible materials and systems carry cost implications. This is due to a number of factors, a few being research and development costs, the fact that these products are not mass produced like their unsustainable counterparts and, being fashionable, carry a novelty price tag.

Immediate saving. Long distance runners explained that as far as possible, clients want immediate savings. Long distance runners stated, "people want immediate saving as opposed to long term saving" (participant 1, group 2) and "the issue that a lot of people don't want to hear is that there are some upfront costs, so you would be investing more money" (participant 1, group 4). One of the long distance runners suggested presenting

clients with a report outlining long term economic savings. She recognised that a study of this nature would take time and have cost implications and stated that, "you would have to almost do that study and show the saving to the client, for them to spend the money" (participant 1, group 2).

Time and research. Time was identified by all participants within all the categories as another cost-related barrier. Long distance runners, joggers and spectators expressed difficulty in finding time to do research into what materials and systems are environmentally dependable. The overall lack of time to conduct this research has a definite negative impact on the implementation of sustainable design. The concerns around time and relation to cost is expressed as follows; "If it requires research it will be more expensive, and the client will go for the cheapest option nine times out of ten' (participant 1, group 2). Another observation indicates that, "To fully practice in a sustainable way is difficult. It takes a lot of time. I should be charging more fees, which I don't, now, but the plan is to eventually charge more so that I can kind of compensate for the amount of effort it takes" (participant 1, group 6). The spectators group identified time and costs to gain knowledge and an understanding of sustainable design, a major barrier to the implementation.

Barrier 2: Education and inexperience in sustainable design

Sustainable design not studied at Technikon or University. Fifty per cent of long distance runners and spectators stated that sustainable design was not studied whilst they were at Technikon or University. A spectator stated, "I never encountered sustainable design at University, but I like to think I would go to a course if one arose" (participant 1, group 9). The other 50 per cent of long distance runners and spectators explained that "it was touched on" (participant 1, group 6; participant 1, group 3 & participant 1, group 2) but in no way comprehensively covered. Fifty per cent of joggers explained that sustainable design had not been studied at Technikon or University, while the other 50 per cent stated that they could not be sure.

Continued professional development (CPD). In South Africa professional architects are required to engage with CPD in order to acquire points and maintain membership with the South African Council for the Architectural profession (SACAP). Although architects appeared to be rather displeased about the mandatory nature of CPD, they had a better knowledge of the conferences, courses and seminars that take place in KwaZulu-Natal, and attend these events more regularly than the interior designers.

The interior designers on the other hand, explained that the only conferences, courses and seminars that they are aware of, take place outside the region in Cape Town and Johannesburg. Examples of conferences that interior designers identified were the Design Indaba and the Green Building Council Conference and Exhibition. A long distance runner stated that "all the conferences are in Johannesburg and Cape Town, and because of the affordability thing, I haven't been able to attend anything like that" (participant 1, group 2). Despite this observation, 80 per cent of interior designers expressed an interest in conferences, courses and seminars that could help them improve their knowledge of environmentally sustainable design. The remaining 20 per cent of interior designers did not have the time or an interest in attending.

Inexperience with sustainable design projects. During the interviews only one firm, of all of the focus group participants and individual interviewees, works solely on sustainable design projects. In the study the percentages of work on sustainable design projects were identified as follows:
» 10 per cent work exclusively on sustainable design projects;
» 70 per cent occasionally work on sustainable design projects; whilst

» 20 per cent have yet to work on a sustainable design project.

A major theme, that was made evident by long distance runners, joggers and spectators, is that there are not enough clients or projects that allow designers to gain much needed experience in sustainable design. For this reason, most participants discussed feeling somewhat "new" and inexperienced in the practice thereof.

Barrier 3: Materials

Long distance runners, joggers and spectators identified a number of problems regarding material selection. The three concerns raised most by participants are discussed.

Reliability of information from product suppliers and manufacturers (greenwashing). Participants explained that product suppliers and manufacturers are developing and marketing products that are environmentally responsible. However, without certification ensuring that a product is indeed environmentally responsible, designers find it hard to decipher what is authentic from that which is not. This is commonly referred to as greenwashing. This notion was a major challenge discussed by long distance runners and spectators seeking to specify environmentally sustainable products and materials.

Due to the non-transparent nature of product suppliers and manufacturers, designers explained that not only is it difficult to source environmentally responsible materials and products, but it is also almost impossible to establish which products are authentically environmentally sustainable. With environmentally sustainable products being relatively new and often manufactured by new small business, the majority of long distance runners and joggers expressed caution when specifying them. This is due to the fact that very few of these products are common-place in the industry or have been widely established. Long distance runners expressed wariness and caution that unaccredited products could prove to be inferior, and result in call backs from clients, down the line.

Limited selection of environmentally responsible materials. Another barrier that was frequently raised by participants is the limited selection of environmentally responsible products and materials being produced by product suppliers and manufacturers. Participants from the long distance running, jogging and spectator categories explained that suppliers ranges are often limited and don't accommodate a client's needs.

With regards to selection of environmentally responsible materials long distance runners stated: "Well there's not a whole bank of green stuff to choose from, so it is a barrier, because you are limited in what you can actually select from" (participant 1, group 5). Spectators comprehensively discussed the subject of limited environmentally responsible products and materials. The following remark was presented, "It's hard for the client to choose from a limited range of those that are sustainable, when there are so many other options out there" (participant 1, group 9).

Imported products. A major obstacle experienced by long distance runners is the inability to source locally produced environmentally responsible products. Considering that imported products carry a carbon footprint, designers, where possible, should try to specify local manufacturers and suppliers products.

Long distance runners stated, "I don't think that we are geared in this country as yet for green materials" (participant 1, group 1) and "Everybody wants imported stuff and then you've got to fly it over so the carbon footprint increases. I don't think people are aware of that" (participant 1, group 2).

Barrier 4: The client

Cost. Long distance runners, joggers and spectators explained that a number of clients expressed interest in a sustainable design. When it came to implementation however, various factors inevitably deterred their commitment to this approach. The greatest obstacle is feasibility or cost, which often results in the client disregarding sustainable design. Participants explained that environmentally responsible materials and systems require greater upfront costs, which clients are often not prepared to pay. They also explained that, as many designers are new to the process of sustainable design, time is required for research. This inevitably costs the client which can be problematic because as a long distance runner explains, "it always comes down to bottom line" (participant 1, group 4). With time and experience costs should decrease. Until such time, this is an expense to the client.

Material selection and systems. Again participants explained how clients are committed to environmentally responsible materials and systems, until they are faced with the limited material selection on offer, and the not so user-friendly systems. This indicated that many clients are not prepared to compromise on their aesthetic material choices or on the convenience of the non-environmentally friendly systems on offer. One jogger remarked, "it's convenience and reliability, and a lot of these eco things come with compromises" (participant 1, group 7). Until such time that there is a wider selection of materials and systems, designers need to specify and clients need to choose from a limited range.

Education. Although clients have expressed interest in sustainable design solutions, and are to some extent aware of the need for sustainability, it is rarely insisted on. For this reason, it seems that the South African public still has a way to go in becoming informed and educated on the importance of sustainable development, before sustainable design will become a priority and common practice in the profession.

A jogger reiterated the need for education on sustainable development, by stating that "sustainable design is a kind of niche market and certainly not everybody's main concern, most people have other concerns. At the end of the day it's not the only factor that goes into the built environment, there are all sorts of other factors". Until such time that environmental responsibility is a priority, and is enforced by government, it is not likely that clients will insist on and embrace sustainable design.

Discussion

This research study identified the following aspects as areas that could receive attention in South Africa to improve sustainable practices. This discussion also speculates on the potential transformation of practitioners from joggers and spectators to long distance runners. Should an increasing number of practitioners transform to become long distance runners, their skills and expertise would affect the barriers identified by the study.

Improve sustainable design knowledge

According to Nelson Mandela (2003:[sp]) in his speech titled 'Lighting your way to a better future', at the launch of Mindset Network at the University of the Witwatersrand Johannesburg, " education is the most powerful weapon which you can use to change the world".

There is no doubt that sustainable design is an imperative part of design education today. Higher Education in South Africa needs to make sustainable design a priority in the curriculum. This could encompass sustainable development, sustainable design processes, principles, policies and building regulations. At post graduate level, research on the topic of sustainable design could expand South Africa's knowledge on the subject, and provide important insight into current issues.

The lack of exposure to sustainable design in Higher Education requires that this education needs to be obtained. To bridge the education gap, practitioners could utilise the services of a facilitator, consultant or local resource centres.

Primary data showed that interior designers, unlike architects, are not familiar with building regulations that promote energy efficiency and environmental sustainability. It is suggested that the professional body for interior designers (IID) needs to attend to the inclusion of continued professional development (CPD) courses, conferences and workshops within sustainable practices.

A major barrier mentioned by all participants was the availability of time to conduct research. Once spectators and joggers decide to invest their time and resources in to such research, their increased knowledge would offer a worthwhile investment to their design firms. Through the process of "diving in head first" and learning through trial and error, it is anticipated that the knowledge gap would be bridged.

Support government policy and implement regulations

Government policy is in favour of sustainable development and energy saving. Regulations are being developed in South Africa, which should assist the built environment in becoming more sustainable. At present there are two South African National Standards which promote environmental sustainability and energy savings. These are SANS 204:2011 (SABS SANS 204 2011) which regulate energy usage in new buildings and SANS 10400-XA (SABS SANS 10400-XA 2011) which has two parts:
i.   Part X which concerns environmental sustainability, and
ii.   Part XA which considers energy usage in buildings.

SANS 204:2011 is a voluntary standard for best practice, SANS 10400-XA has recently been made mandatory and SANS 10400-X is still in progress. The levels of SANS 10400-XA will be raised over the next several years (Technical communiqué. Important standards SANS 204 and SANS 10400-XA for energy usage in buildings published 2011). Though voluntary standards are valuable, mandatory regulations should give built environment professionals a "good push" in the direction of becoming more sustainable. The mandatory implementation of these regulations will have an immediate impact on the findings of the study. Practitioners that are currently spectators and joggers would be forced by law, to improve their knowledge and practices in order to comply with national regulation.

Product suppliers and manufacturers

It is essential that product suppliers and manufacturers continue developing environmentally responsible products, and broadening their product ranges, as with greater selection, designers and clients are more likely to choose this alternative. In addition to this, and despite its difficulty, designers need to continually ask product suppliers and manufacturers about their raw materials, processes and the origin of products. With persistence, this should yield positive results.

With an increased number of practitioners specifying environmentally responsible solutions, manufacturers and suppliers could be motivated to invest in research and development costs that are necessary to provide sustainable solutions. With increased popularity, suppliers would increase their quantities which should stabilise costs and combat the novelty mark-up currently added onto sustainable alternatives.

Use rating tools

The Green Star rating system was developed and has been managed by the Green Building Council of South Africa (GBCSA. Vision and mission [sa]), as a voluntary tool that provides the property industry with "an objective measurement for green buildings, [and] recognises and rewards environmental leadership in the property industry" (GBCSA. Green Star SA rating tools [sa]). According to Halliday (2008) the Green Star rating system originated in Australia, and credits its development to the British Building Research Establishment Environmental Assessment Method (BREEAM) and the North American Leadership in Energy and Environmental Design (LEED) system (p.112). Sebake (2009) explains that in the same manner as the LEED adapted the US LEED adapted its tools for Canada, the Australia Green Star was adapted for New Zealand and South Africa.

Although there is no disputing that rating tools aid corporates and developers improve a projects sustainability status and enjoy sustainability credentials, it requires capital expenditure to invest in this costly tool and cannot be achieved by an interior designer in isolation. Instead it requires all stakeholders on a project (i.e. developers, contractors and built environment professionals) to collaborate with the common aim of environmental sustainability. For this reason, a number of participants were sceptical about the tool. Discussing the type of client that would be able to afford the tool, one jogger exclaimed, 'it's a few high end corporate clients wanting it for political mileage and the spinoff they are going to get' (participant 1, group 7).

Educate the client

Barriers preventing clients from committing to a sustainable design approach are presently surplus cost, a restrictive selection of materials and user-friendly systems, as well as education into the pressing need for sustainability. This results in clients not willing to consider the environmental responsibility, and lack of enthusiasm from designers to advocate sustainable design.

An increase in long distance runners could result in clients becoming better informed. Long distance runners would be able to educate clients to the benefits of selecting sustainable design alternatives. Should costs reduce and material selection increase, it is anticipated that clients would be more likely to consider a sustainable solution when well informed solutions is presented.

References

Aye, E. (2003). *Taking the Pulse. Sustainability and the Interior Design Practice.* Retrieved 11 05, 2011, from Green Building Services: http://www.greenbuildingservices.com/news/releases/2003_13__55_pulse.pdf

Bonda, P. (2003). *Why Green Design Matters.* Retrieved 06 03, 2011 from
http://www.asid.org/NR/rdonlyres/4BEE1DB3-2E24-4714-84B1-759C60686CE1/0/
WhyGreenDesignMatters.pdf

Davis, A. (2001). *Barriers to Building Green.* Retrieved 11 05, 2010, from Architecture Week
http://www.architectureweek.com/2001/0822/ environment_1-1.html

GBCSA (Green Building Council of South Africa). Green Star SA rating tools. [Sa].
Retrieved 04 10, 2011, from Green Building Council of South Africa:
http://www.gbcsa.org.za/greenstar/ratingtools.php

GBCSA (Green Building Council of South Africa). Vision and Mission. [Sa]. Retrieved 04
10, 2011, from Green Building Council of South Africa:
http://www.gbcsa.org.za/about/ vision.php

Hes, D. (2005). *Facilitating 'green' building: turning observation into practice.* PHD dissertation,
RMIT University, Melbourne.

Halliday, S. (2008). *Sustainable Construction.* Oxford: Butterworth-Heinemann.

IID (The South African Institute of the Interior Design Professions). [Sa]. Retrieved 05 05,
2011, from The South African Institute of the Interior Design Professions:
http://www.iidprofessions.com

Jones, L. (2008). *Environmentally responsible design: green and sustainable design for interior designers,*
edited by L Jones. New Jersey: John Wiley & Sons, Inc.

Kang, M., & Guerin, D.A. (2009). The state of environmentally sustainable interior design
practice. *American Journal of Environmental Sciences.* 5(2).pp.179-186.

Kang, M., Kang, J.H & Barnes, B. 2008. Interior Design Characteristics Influencing
Sustainable Energy Awareness and Application. *International Journal of Spatial Design &
Research* 8(10):17-28.

Mandela, N. (2003). *Lighting your way to a better future.* Speech delivered by Mr N R Mandela at
launch of Mindset Network, 16 July, University of Witwatersrand, Johannesburg, South
Africa. Retrieved 10 15, 2011, from Nelson Mandela Centre of Memory:
http://db.nelsonmandela.org/speeches/pub_view.asp?pg=item&ItemID=NMS909&txts
tr=change the world

Margolin, V. (2007). Design, the future and the human spirit. *Design Issues* 23(3), Summer.
pp.4-15.

Mate, K.J. (2006). Champions, Conformists and Challengers: Attitudes of Interior Designers
as Expressions of Sustainability through Material Selection. Paper 0066. Paper presented
at Design *Research Society International Conference.* Wonderground. 1-4 November, Lisbon.

Nieuwenhuis, J. (2007). *First steps in research,* edited by K Maree. Pretoria: Van Schaik
Publishers.

Pidcock, C. (2005). A sustainable design. *Object.* 46:15.

Rider, T.R. (2005). *Education, environmental attitudes and the design professions: a masters thesis.* MA
dissertation, Cornell University, Ithaca.

South African Bureau of Standards See SABS

SABS. (2008a). *South African National Standard. Energy efficiency in buildings. Part 1: General
requirements.* Pretoria: SABS Standards Division.

SABS. (2008b). *South African National Standard. Energy efficiency in buildings. Part 2: The application
of the energy efficiency requirements for buildings with natural environmental control.* Pretoria: SABS
Standards Division.

SABS. (2008c). *South African National Standard. Energy efficiency in buildings. Part 3: The application
of the energy efficiency requirements for buildings with artificial ventilation or air conditioning.* Pretoria:
SABS Standards Division.

SABS. (2011a). *South African National Standard. Energy efficiency in buildings.* Pretoria: SABS
Standards Division.

SABS. (2011b). *South African National Standard. The application of National building regulations. Part X: Environmental sustainability. Part XA: Energy usage in buildings.* Pretoria: SABS Standards Division.

SACAP (South African Council for the Architectural Profession). *Membership.* [Sa]. Retrieved 05 01 2010 from South African Council for the Architectural Profession: http://www.sacapsa.com

Sebake, S. (2009). *An overview of green building rating tools. Green Building Handbook South Africa* (1) p. 27-33.

South Africa. (2008). *Department of Environmental Affairs and Tourism. People-Planet-Prosperity: A National Framework for Sustainable Development in South Africa.* Retrieved 10 01, 2011, from South African Government Department of Environmental Affairs: http://www.environment.gov.za/HotIssues/2008/nfsd/nfsd.html#

Stieg, C. (2006). The sustainability gap. *Journal of Interior Design* 32(1). Pp. vii-xx.

UNEP (United Nations Environment Programme)/UNCTAD. (1974). The Cocoyoc Declaration. *UNEP/UNCTAD Symposium of Patterns of Resource Use, Environment and Development Strategies*, Cocoyoc, Mexico, 8-12 October. United Nations General Assembly, 29th Session, Second Committee, Agenda item 46. A/C.2/292.

Wackernagel, M., & Rees, W. (1996). *Our ecological footprint: reducing human impact on earth.* Gabriola Island: New Society Publishers.

White, T. (2010). *Three personality types: which one are you?.* Retrieved 06 05, 2011 from Crazy Egg Blog: http://blog.crazyegg.com/business/personality-types